ROYAL AIR FORCE

LAND QUALITY ASSESSMENT TEAM

WORKING PAPER 08/03

RAF SCAMPTON LAND QUALITY ASSESSMENT PHASE 1 - DESK STUDY

VOLUME 1 (OF 2): REPORT

[redacted]

PTC/496181/12/03/LQA

Nov 03

EXECUTIVE SUMMARY

The following report documents the findings of a 'Phase 1', Desk Study and Preliminary Investigation of the Land Quality Assessment (LQA) for the RAF Scampton site. The aim of the study is to identify areas of actual and potential contamination. The information collected will be used to aid further phases of the LQA including geophysical and physiochemical investigations, and also remediation of the site as appropriate. All available sources of information were researched.

RAF Scampton is located in the county of Lincolnshire. The site lies approximately 5 km north of the city of Lincoln and 1 km east of the village of Scampton. The site centre is located at UK National Grid Reference (NGR) SK 965 800 on Ordnance Survey Sheet 121, 1:50 000 Landranger series. RAF Scampton occupies a total area of approximately 317 hectares. The site is surrounded by open agricultural land except the A15, which runs along part of the station's eastern boundary.

The site is immediately underlain by Lincolnshire Limestone of the Middle Jurassic period capped by a thin alkaline soil horizon. The Environment Agency Groundwater Vulnerability Map records the site to be located over a major aquifer and in a Groundwater Source Protection Zone. The limestone aquifer supports a local public water supply (PWS) at Welton, therefore RAF Scampton is situated within an environmentally sensitive area.

As part of Personnel and Training Command (PTC), RAF Scampton provides a training facility for the RAF Aerobatic Team (RAFAT), accommodates a private civilian aviation company and an aircraft restoration company. The station has one active runway, two de-activated runways with associated taxiways, six large dispersal areas (A-F) and an aircraft-servicing platform (ASP). The station consists of the airfield, the main technical site, administration offices and domestic accommodation.

The site was originally used in the First World War, an area in the centre of the present airfield being occupied by a Training Depot Station. This closed in the early 1920s but a larger area of land in the same location was purchased in 1935. The station opened in 1939. The site consisted of a main technical site to the south-west, bomb stores in the north-east and a grassed landing area and dispersals to the west. The site boundary has been extended since the WWII station although the general layout has not changed markedly. There no air raid shelters (ARS) present on the site now, although several ARSs were shown as being present at the technical site in the 1946 Air Ministry Plan. There are, however, three basement ARSs remaining beneath H blocks in the technical site. The removal of the ARS may not have been complete and potentially contaminative back fill materials may have been used.

Demolition and construction of new facilities at RAF Scampton has taken place over its history. Asbestos was widely used in many buildings and facilities on the station, the majority of which have been listed in the asbestos register. There exists a possibility that hitherto undiscovered asbestos may be present in buildings, facilities or buried on site.

The station has operated a number of bulk fuel installations (BFIs) at a variety of locations around the site, together with associated underground pipelines. There is the potential for ground contamination in the vicinity of all fuel compounds, pipelines and fill points from leaks and spills that may have occurred in the past; identification of contaminated soils at several removed BFIs and a POL storage area has led to remedial action, by excavation of

the contaminated soil and disposal off site. Soil samples were not taken at all BFIs, therefore, there exists the potential for residual contamination of the ground at these locations. The survey noted a buried redundant BFI that has not been investigated and a limited number of 45 gallon drums across the station that were not stored in appropriately bunded areas. There was also evidence of spills from generator houses.

It is considered that all distribution substations (DSSs) could lead to contamination of the ground by past leakage of transformer oils and in particular those that originally contained polychlorinated biphenyls. One DSS still contains an appreciable concentration of PCBs. The station workshops, engineering facilities, contractors' yards and the motor transport (MT) section have undertaken a variety of engineering activities in the past. The present day practices are minimal due to the relatively low activity of the station since closure.

A number of potential waste tipping sites were identified on site and at the airfield perimeter from site investigation and aerial photographs. Whilst there is good evidence of ground disturbance on the photographs, there was little visual evidence other than made ground. Anecdotal evidence indicated that tipping took place in local council tips from the mid 1950s onwards. Two former fire training areas are identified as having contributed to ground and groundwater contamination. This involved the uncontained burning of aviation fuels and old cars on dispersals to the south and north of the site. Anecdotal evidence also indicated that additional car burning activities might have occurred on open ground to the east of the site. There is the possibility that residual ground contamination exists at the locations where fire training took place in the past.

RAF Scampton held stocks of Blue Steel nuclear missiles. It is reported by DRPS that it is very unlikely that any contamination would have arisen at the site as a result of storage or servicing activities. An incident was reported which involved a burnt out Vulcan that was allegedly carrying a Blue Steel training weapon, although a radiation survey carried out by DRPS of the site including the former nuclear weapons storage area, did not identify levels of radiation above that of background noise levels. The station does, however, hold luminised dials (containing radium-226) in the station museum and in an aircraft kept by a civilian company.

The station has had three EOD incidents, involving the discovery of live and inert munitions. An EOD clearance has been issued covering the majority of the site, but the certificate is invalid until a clearance has been carried out at the site of the removed WWII bomb stores.

LQAT archive research indicates that RAF Scampton was authorised to store chemical weapons (CW) during WWII and documentary evidence indicates that a stored weapon was found to be leaking on the site in 1941. It is also possible, that training exercises were carried out using live agents and that CW test kits were held and potentially subsequently disposed of on site.

Furthermore, areas where the vehicle and aircraft washing has been undertaken, aircraft servicing pans and areas where refuelling and defuelling has taken place, dye storage, the old motor club, the runway sweeper and installed engine test facility, are all areas prone to contamination. Additional ground contamination may have also occurred from burning of surplus explosive ordnance after WWII.

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RAF SCAMPTON LAND QUALITY ASSESSMENT PHASE 1 PRELIMINARY INVESTIGATION - DESK STUDY AND SITE RECONNAISSANCE

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2. Site plan indicating site boundary, crash gates, current ownership and building list.
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11. EOD Clearance Certificates.
12. LQA Target Based Environmental Risk Assessment for CW at RAF Scampton.
13. DSTL Radioactive Contamination Issues Report.
14. Plan showing location of main areas of concern.
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References:

A. Remedial Treatment for Contaminated Land Volume 3 - Site Investigation and Assessment. Construction Industry Research Information Association (CIRIA) Special Publication 103, 1995.

B. BS 10175 – Code of Practice for Investigation of Potentially Contaminated Sites, 2001.

INTRODUCTION

1. The Land Quality Assessment Team at the HQ Personnel and Training Command (HQ PTC) has been tasked with progressing a Land Quality Assessment (LQA) for the RAF Scampton site. The Phase 1 of a contaminated land investigation is a preliminary investigation comprising a Desk Study and Site Reconnaissance/walkover survey/preliminary inspection. References A and B detail the format of the investigation and subsequent report.

2. The results of this work are to be used to inform the design of a risk based or target based (Phase 2) intrusive site investigation by a competent environmental consultant/external contractor. The results of any Phase 2 intrusive investigation works and chemical analyses will further characterise the risks, and determine the requirement for remediation (Phase 3) and/or sale of the site as appropriate.

AIM

3. The aim of this desk study is to obtain initial information on the actual and probable nature and location of contamination and identify other hazards, which may affect the design and implementation of any Phase 2 investigation.

OBJECTIVES

4. The primary objectives of the preliminary investigation are to:

   a. Provide background information on the history of the site, including the nature of any industrial processes and highlighting those pertinent activities and incidents that are likely to have contaminated, damaged or otherwise degraded the site.

   b. Provide background information on the geology, hydrogeology and hydrology of the site.

c. Identify the potential for contamination of the land from substances and artefacts deposited on or in the land (including spillages, deliberate burial of waste, accidents, enemy action, etc).

d. Identify areas of actual or suspected potential contamination, some or all of which will require further investigation.

e. Provide information relevant to worker health and safety and protection of the environment during on site investigations.

f. Identify targets or features of immediate concern i.e. where a significant hazard/risk is present or where the public and children in particular are able to trespass on to sites where hazards and risks are present.

g. Provide data for hazard ranking and a preliminary risk assessment to identify actual and potential contamination.

h. Provide the information needed to decide site-specific exploratory and detailed investigation objectives and procedures for the next phase of the assessment, the on-site investigation together with an early indication of remedial needs or containment action where appropriate.

CONDUCT OF THE INVESTIGATION

5. The sources of information utilised to complete the desk study are detailed at Annex A.

SITE INFORMATION

Location

6. RAF Scampton is located in the county of Lincolnshire situated in the Region of East Anglia in the south-east of England.

7. The site is located roughly 5 km north of the city of Lincoln, 1 km east of the village of Scampton and 4 km west of the village of Welton.

8. A site location map is provided at Enclosure 1, Volume 2.

Site Description

9. The site is irregular in shape and covers UK National Grid Squares SK 95 78, 95 79, 95 80, 96 78, 96 79, 96 80, 97 78, 97 79, 97 80 and 97 81. The site centre can be defined by UK National Grid Reference (NGR) SK 965 800 on Ordnance Survey sheet 121, 1:50 000 Landranger Series.

10. Access to the Technical and Airfield Site is gained via the main gate entrance on the A15. The Domestic Site is also accessed from the A15 approximately 200 metres south of the main gate entrance. The site is surrounded by mostly agricultural land and is bounded to the east by the A15 running north/south to Lincoln and to the south by the A1500 running

east/west. Several minor roads pass close to the establishment to the north of the site. There are 7 crash gates located at access points around the perimeter fence.

11. Geographically, the site is situated on a topographic rise, known as the Lincolnshire Ridge, which runs north/south. The site is generally level and follows a gentle incline from 60m above Ordnance Datum (AOD) in the west down to 50 m AOD in the east of the site.

11. RAF Scampton presently occupies a total area of approximately 317 hectares and is occupied by approximately 250 personnel including servicemen and women, civilians, and contractors.

Station Role

12. RAF Scampton is parented by RAFC Cranwell under HQPTC. The station was closed in 1996 and the Royal Air Force Aerobatic (RAFAT) Red Arrows moved to RAFC Cranwell. In Dec 2000 the Red Arrows returned to RAF Scampton and in Apr 2000 the Tucano Fatigue Modification Program (2 FMP) moved into No 1 Hangar.

13. The role of the station is to provide support for training of the RAFAT and as a relief landing ground for RAFC Cranwell and other stations in Lincolnshire. The RAFAT currently occupy Hangar 3 supporting one squadron of BAE SYSTEMS Hawk aircraft.

14. The following lodger units are also present at the station:

a. Tucano aircraft servicing by a civilian company, Vosper Thorneycroft Aerospace, is carried out in Hangar 1.

b. The Old Flying Machine Company, which have various aircraft, including Hunters and a Buccaneer, in various stages of restoration in Hangar 3.

Site Layout

15. During the "run down" to closure in 1996 the station has been subject to an ongoing program of demolition of the support infrastructure with the primary objective to make several risk areas "safe" to an acceptable standard. Some of the work already undertaken includes the removal of redundant bulk fuel installations (BFIs), various technical and non-technical buildings/facilities, isolation of electrical supplies and water etc. Some of this work has led to the discovery of potentially contaminated land, the details of which are discussed later in this report, and have led to physiochemical soil and water analyses, soil excavation and off site removal (dig and dump style remediation).

16. The site can be divided into various functional areas in relation to the airfield:

a. Main Technical Site .

b. Domestic Site.

c. SSA (Supplementary (or "Special") Storage Area).

d. The Airfield Site.

17. Main Technical Site. The Main Technical Site occupies the south-east of the site. It is the area in which most of the engineering practices are carried out and where the administration buildings are located.

18. The following units and facilities are based within the technical site:

a. RAFAT bays and storage - Hangar No 4 (Bldg No 45).

b. RAFAT Dye bay (Bldg No 616).

c. MT Hangar (Bldg No 20) and stores (Bldg Nos 459 and 460).

d. Combined Mess and Barrack Blocks (Bldg Nos 91, 92, 93, 112, 113, 115, 116, 117, 119, 139, 140, 141).

e. Utilities buildings comprising Central Heating Station (Bldg No 82), Water Tower /HQ intake substation (ISS - Bldg No 52), Compressor Houses (Bldg No 86, 45A and B), Standby Set House (Bldg No 157).

f. Salvage compound (Bldg No 65), ground maintenance equipment store/skips, station workshops (Bldg No 133) and battery recovery shop (Bldg No 133A).

g. 4 C-Type Hangars (Nos 1-4, Bldg Nos 48, 47, 46, 45 respectively).

h. Bowling alley/swimming pool (Bldg No79).

i. Station Headquarters (Bldg No 144).

19. Many of the previous station buildings have been demolished during the rundown of the station before and after station closure in 1996.

20. Domestic Accommodation. The married quarters are located in the far south of the site, south of Follyplatt lane (also annotated on some maps as Pollyplatt Lane). Historically there was also a married quarters complex on the eastern site boundary dating from World War II. This complex was demolished to the ground in the late 1980s. Between 1997-1999, some of the domestic site properties were sold to Annington Homes and are currently managed by DHE. Since closure in 1996 personnel from RAF Waddington have occupied properties in the south of the domestic site. The site plan indicating the site boundary and current ownership responsibilities is provided at Enclosure 2, Volume 2.

21. When the land was sold some of the ownership and responsibility for the utilities were included in the contract of sale and are not currently owned by the MOD. Responsibility of certain utilities situated on the domestic site may have implications on the MOD's potential liabilities. In view of this, the standing contracts and any future contracts should carefully consider the RAF's position and potential responsibilities (under the "Polluter Pays Principle") in context to any contamination related issues raised in this report.

22. SSA. The Supplementary (or Special) Storage Area, located to the north of disused runway 11-29 houses 24 HE silo bays (A-H, J-Y) and historically a HE store and a standby

generator facility. The complex was designed and used for the storage of Blue Steel Missiles (Nuclear Weapons) during the cold war V-Force era.

23. The Airfield. The airfield layout is based upon the original WWII layout comprising three runways in an A-Type Configuration. The airfield can be split into three functional sub-areas:

a. Runways (The station currently has one active runway and two disused).

b. Taxiway.

c. Dispersals.

24. The Runway. The airfield has one active runway at 05 - 23 measuring approximately 2940 m long and 60 m wide, built to Class 1 bomber standard during the V-Force Reconstruction Phase, the runway is positioned over the original 05 - 23 WWII runway. There are two disused or 'lazy' runways at 01 - 19 and 11 - 29, which were rendered unusable when they had H-shaped dispersals built over them in the late 1950s and partially grassed over.

25. Taxiway. All three runways are connected via a concrete based taxiway system that surrounds the runways.

26. Dispersals. The airfield has 6 H-shaped dispersals (A-F), which are accessed from the taxiway. These were built during V-Force reconstruction with each having independent fuel hydrants, and amenities. D-dispersal intercepts the shortest disused runway (11 - 29), in the north, while C-Dispersal, B-Dispersal and A-Dispersal are located along the western perimeter taxiway. F-dispersal is situated on the southern taxiway in the south-west of the site and E-Dispersal is situated west of the Technical site, in the front of Hangar 1. There are also several round asphalt hardstandings dispersed across the airfield some having access directly off the main taxiway but many are isolated and partially grassed over.

27. The following facilities are located on or around the airfield:

a. Air Traffic Control (ATC) Tower (Bldg No 105) and Fire Section (Bldg No 106).

b. Engine Running Platform (ERP) and Compass Swing Base.

c. Pipeline Receipt Enclosure (PRE).

d. Aircraft Readiness Platform (ARP on 05 threshold).

e. 25yd firing range.

f. Interceptors.

g. Distribution Sub-stations (DSSs).

h. Fire Hydrants.

Site Services

28. Information/plans of site services for the station are limited. Due to several reports of ineffective and suspected damage to drains and inconsistencies and inaccuracies in historical site service plans (held in the EWC archive), a CCTV assisted service/pipe integrity survey was finally undertaken in early 2003 in order to establish the extent and integrity of the still active drainage systems. Historical service plans have been reviewed and use was made of them during the drafting of this report. It is possible that much of the foul water and surface water drainage infrastructure/pipework originates from WWII and some subsurface infrastructure may lie isolated in-situ and in poor condition, creating a rapid pathway for contaminants.

29. Electrical Supply. The source of supply for the High Voltage Distribution System is from the National Grid through Eastern Electric. The supply enters the technical site at the ISS (Bldg No 52) on the technical site. Electricity is distributed throughout the station via a network of 17 distribution substations (DSS) that transform the supply for local distribution.

30. The (emergency) standby power generation capacity at RAF Scampton is provided by the standby set house at Bldg No 157, which is fuelled by 3 tanks of heavy fuel oil (3/50 FFO).

31. Gas Supply. Transco currently provides the gas supply to the station. The gas supply enters the RAF Scampton site at the gas meter house located in front of the squash court. Gas powered installations have replaced FFO tanks across the site in recent years.

32. Water Supply. The Anglian Water Authority supplies water to RAF Scampton. Water is distributed around the station from a water main via a network of supply pipes of varying diameter. There is a record of a disused on-site water supply borehole, located just south of Bldg No 20. Although the station has applied for an abstraction licence for the borehole, the Environment Agency will not issue one on the grounds that the aquifer would not support the abstraction. NRA records detail a further two abstraction boreholes on site but the station holds no records to confirm their viability or existence.

33. BFIs and Fuel Pipelines. RAF Scampton currently has one BFI for aviation fuel, which is a former NATO installation (BFI 7). Until closure in 1996, RAF Scampton was connected to the Government Pipeline Storage System (GPSS), which supplied AVTUR (F-34) to BFI 7 from an underground pipeline running from a depot at Mistarton. The fuel was premixed with corrosion and ice inhibiting chemicals before being pumped into the system. The pipeline entered the site from the west from a spur of the main pipeline and connected to the PRE from where fuel was pumped directly to BFI 7 via an underground pipeline. The pipeline was fitted with cathodic protection and was tested on a regular basis. The pipeline is now disconnected and the on site section of pipeline running between the PRE to BFI 7 was removed in 1996.

34. At present, 18 000 litre bowsers travel by road from RAFC Cranwell to fill BFI 7 on a daily basis, having to cross the main runway at the 05 threshold to access the BFI. Further details about past and present fuel installations are provided later in the Findings section.

35. Telecommunications. British Telecom (BT) provides telephone connections and COGENT provide IT connections across the site.

36. District Heating System (DHS). A single central heating station (CHS - Bldg No 82) exists at RAF Scampton. The CHS was probably historically coal fired but was converted to oil in the early 1940s before being converted to gas more recently.

37. Surface Water Drainage. Surface water drainage from the site is collected via a network of drains, which either falls to soakaway or outfall. The majority of surface water drainage from the technical site is believed to feed into a main oil interceptor and balancing tank located south of Canberra Drive (Bldg Nos 606 and 607), although it is considered that some drains may soak straight to ground without first being intercepted. The majority of surface drains across the airfield site (i.e. dispersals) feed into independent oiltrap interceptors and then to ground via local soakaway. The Main Runway is drained by French Drains running down both sides of its extent and then direct to soakaway without interception.

38. Outfalls. There are no outfalls located within the site boundary itself; however, the main technical site drains to an external outfall. The water flows through an underground pipe that runs out of the site boundary from the interceptor and balancing pond. The pipe goes under the A15 in an eastward direction for approximately 2 km until reaching the surface at Old Man's Head Spring located at NGR SK 9968 7945. The spring forms 'Welton Beck' a tributary of the 'Barlings Eau' (Figure 1).

39. A plan indicating the extent of the catchments, and the associated Outfall drainage route is included at Enclosure 3a, Volume 2.

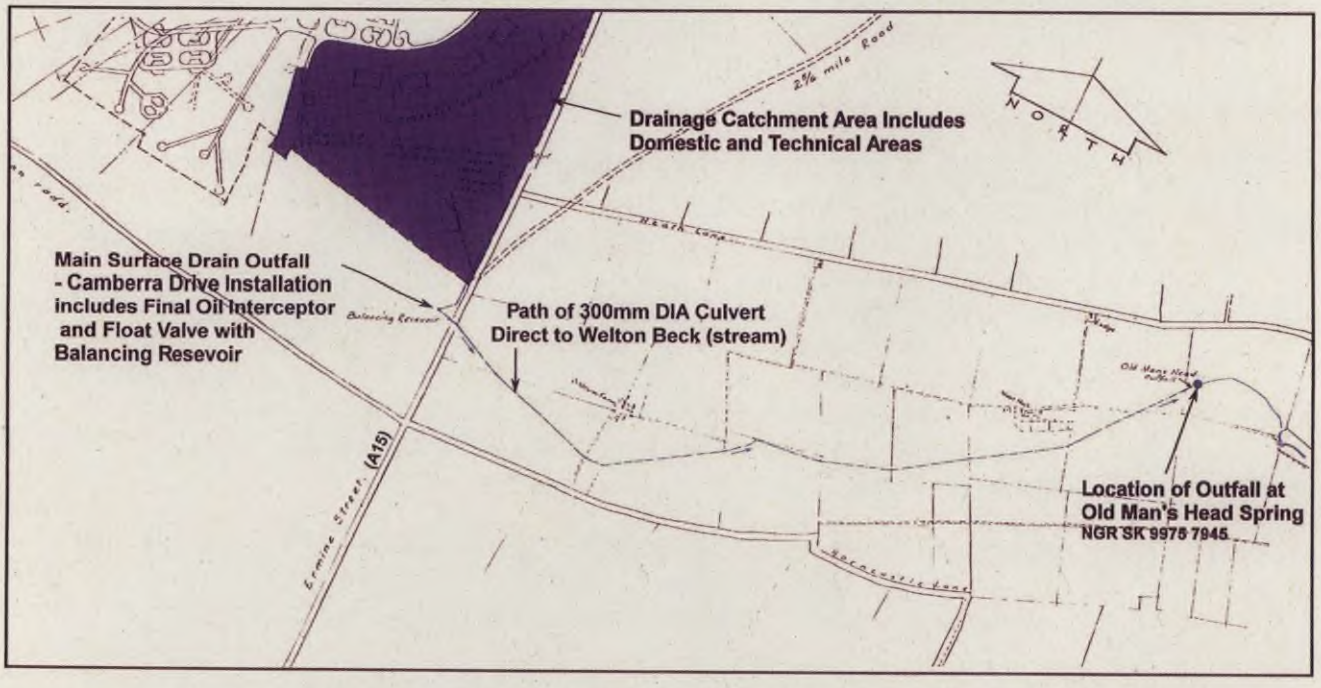

Figure 1. Approximate catchment area and route of outfall pipe at RAF Scampton.

40. Interceptors. The available site plan indicates there are 12 functional oil traps around the site, most of which serve the dispersal areas and servicing pans. There are also three below ground oil separators supplying POL storage areas. All surface water drains on the site that are intercepted have been painted red. The location of the interceptors and separators is indicated at Enclosure 3b, Volume 2. There are penstock valves at all the interceptors.

41. Discharge Consents and Prohibition Notices. RAF Scampton has two discharge consents authorising discharges to the sewage works. One for discharge of compressor wastewater and one for the aircraft and vehicle wash area at No 2 Hangar. Analysis of discharged water samples taken on 30 Oct 02 showed full compliance. There are Prohibition Notices covering the discharge of surface water via oil interceptors to 8 soakaways across the site, as well as for the off site outfall at Old Mans Head Spring. The Discharge Consents and Prohibition Notices are given at Enclosure 3c, Volume 2.

42. Foul Drainage. Foul waste from the domestic and technical sites are collected by a network of pipes and transported by a gravity feed system supported by three sewage ejector pumps housed within separate ejector pump stations and conveyed to an off site sewage treatment works. There are also three onsite cess pits connected to foul drainage in the north of the site. The cesspits are emptied as required under contract. Anglian Water is currently responsible for maintaining the foul water system.

43. Sewage Treatment Works. Historically the site owned a dispersed sewage treatment works located 0.5 km to the west of the western site boundary (NGR SK 95344 79851), and down gradient of the site. The plant was sold to Anglian Water in 1995/6 on station closure but continues to serve the station's foul drainage system.

44. Discharge Quality. There is an Environment Agency sampling point at the off site sewage works. The Environment Agency data classifies the sewage discharge as "Live". The sewage discharges as final/treated effluent controlled by Anglian Water.

Environmental Setting

45. This section has been compiled using publications by the British Geological Survey (BGS), the Environment Agency, LQA archive material, and information provided by the site including previous environmental and contamination investigation reports as referenced.

46. Geology. The published geological map (Sheet 102 Market Rasen - Solid and Drift, 1:50 000) indicates the site is underlain by two sub-Formations of the Lincolnshire Limestone Formation, an upper unit of the Inferior Oolite Group (InO) from the Middle Jurassic Period (Figure 2, overleaf). The formation ranges from 15 to 25 metres in thickness and shows compositional variability between lithologies, with the lower units consisting of peloidal wackestones and packstones and the upper units, ooidal grainstones. Down dip and towards the east of Welton the limestone is overlain by younger estuarine deposits including the Blisworth Clay Formation (BwC) and the Oxford Clay Formation (OxC). The limestone has a high permeability with a high secondary porosity (extensively fractured). The Lincolnshire Limestone Formation is a source of readily exploitable potable ground water and therefore an aquifer of regional importance.

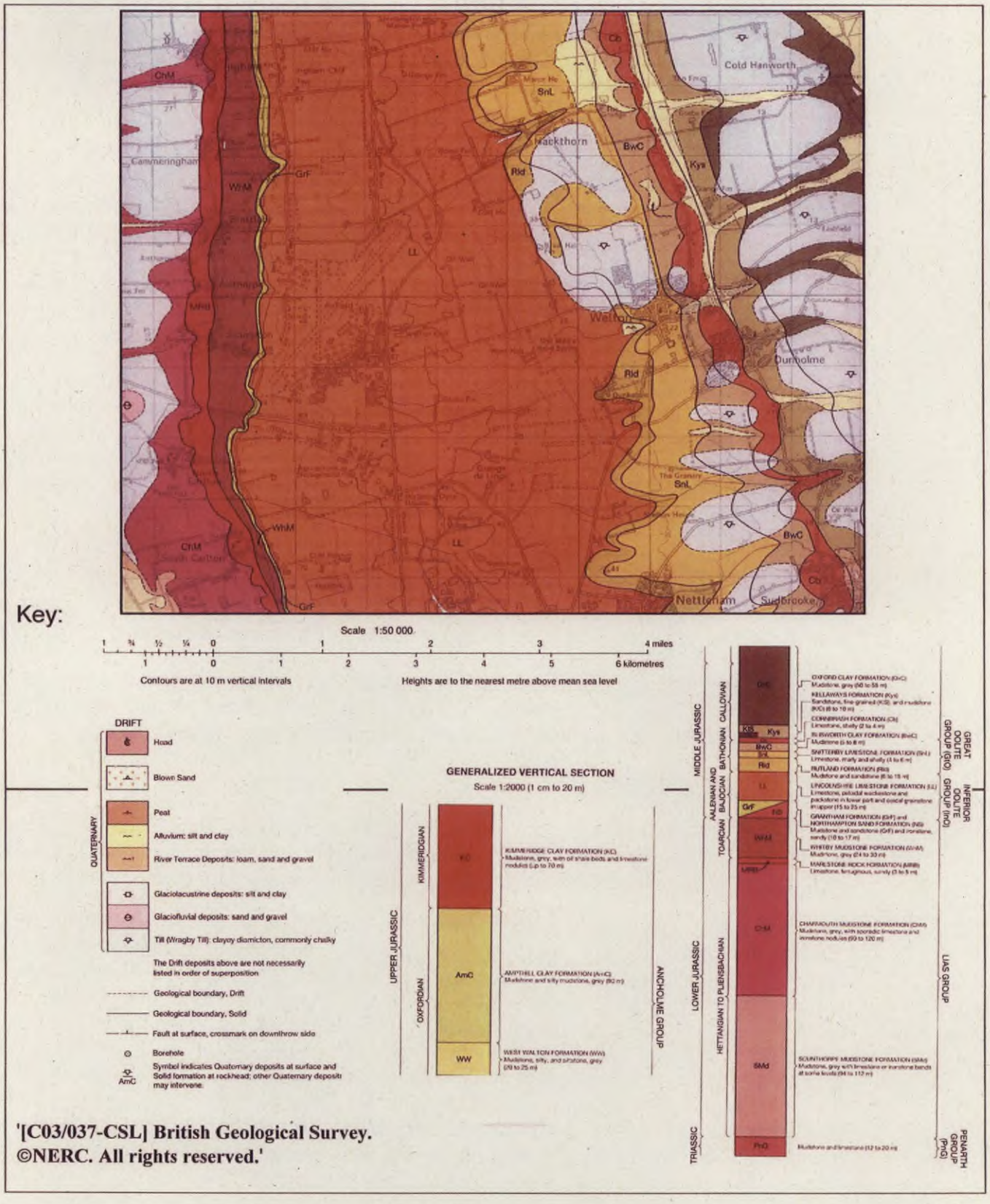

Figure 2. Extract from BGS Geological Map (Sheet 102 Market Rasen - Solid & Drift) showing geology underlying RAF Scampton.

47. Ground Conditions. The ground conditions on site have been ascertained by various Geotechnical Investigation Reports, which have been conducted on the RAF Scampton site. The following reports were considered relevant in determining the ground conditions present beneath the entire site area:

a. Investigation of Soil Contamination at Bulk Fuel Installations Nos 1,2 and 3, RAF Scampton, Golder Associates – Jan 96.

b. Contaminated Land – Unit First Phase Survey – Mar 04.

c. Report No FGE/1024, RAF Scampton - POD and HDU BAY, Review of recent available Geotechnical information – 1979.

(1) Report No STL/56/53, Soil Survey – Nov 1953.

(2) Report No CA TL/5/391/61, ORP on Runway End 23 – March 1961.

(3) Report No CA TL/5/493/62, Proposed Overrun Runway End 05 – Sept 1962.

48. The available borehole and trial pits record alkaline soils, which have probably developed in-situ, on a limestone regolith. The soils are well draining, described as shallow calcareous brown earths. Available borehole records indicate that soil depth varies in thickness across the site, ranging generally from 0.3 m to 1.6 m, and up to 3 m. Soils are loamy or clay loam in texture, compositionally immature and are generally homogenous in structure down to the limestone bedrock, which is sometimes capped with thin, 2 - 3 cm thick Clay/sand horizons. Clay comprises between 20% and 30% of the soil matrix with a large percentage of 'fine' sand grains. Angular to sub-angular shaped limestone cobbles are common becoming larger and more closely packed toward the rock head. Organic matter content is commonly 2% to 3% and soil alkalinity lies around pH 8. The soil has a California Bearing Ratio (CBR) of 10-15% and a "k" value of 80-120 $MN/m^2/m$.

49. Hydrogeology. The processes of groundwater flow and contaminant transport are strongly influenced by the local structure of the limestone. Within the Lincolnshire Limestone, flow is largely dominated by secondary permeability (interconnected fracture and fissure networks). The aquifer also has a duel porosity nature resulting in the potential for retention of fluids and potentially product, in pore space where the pore pressure is lower than in the main fissure flow ducts. A more detailed discussion of the limestone's hydraulic properties is given in the reference discussed earlier in the report.

50. Groundwater Vulnerability. The published 1:1 000 000 Groundwater Vulnerability Maps Sheets 18 & 19 (Figure 3) show that the entire site is located on a major aquifer overlain by soils with a high leaching potential (H1). Major aquifers are defined as highly permeable formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. A soil classified as having a high leaching potential describes soils with little ability to attenuate diffuse source pollutants and in which non-adsorbed diffuse source pollutants and liquid discharges will percolate rapidly to the aquifer below.

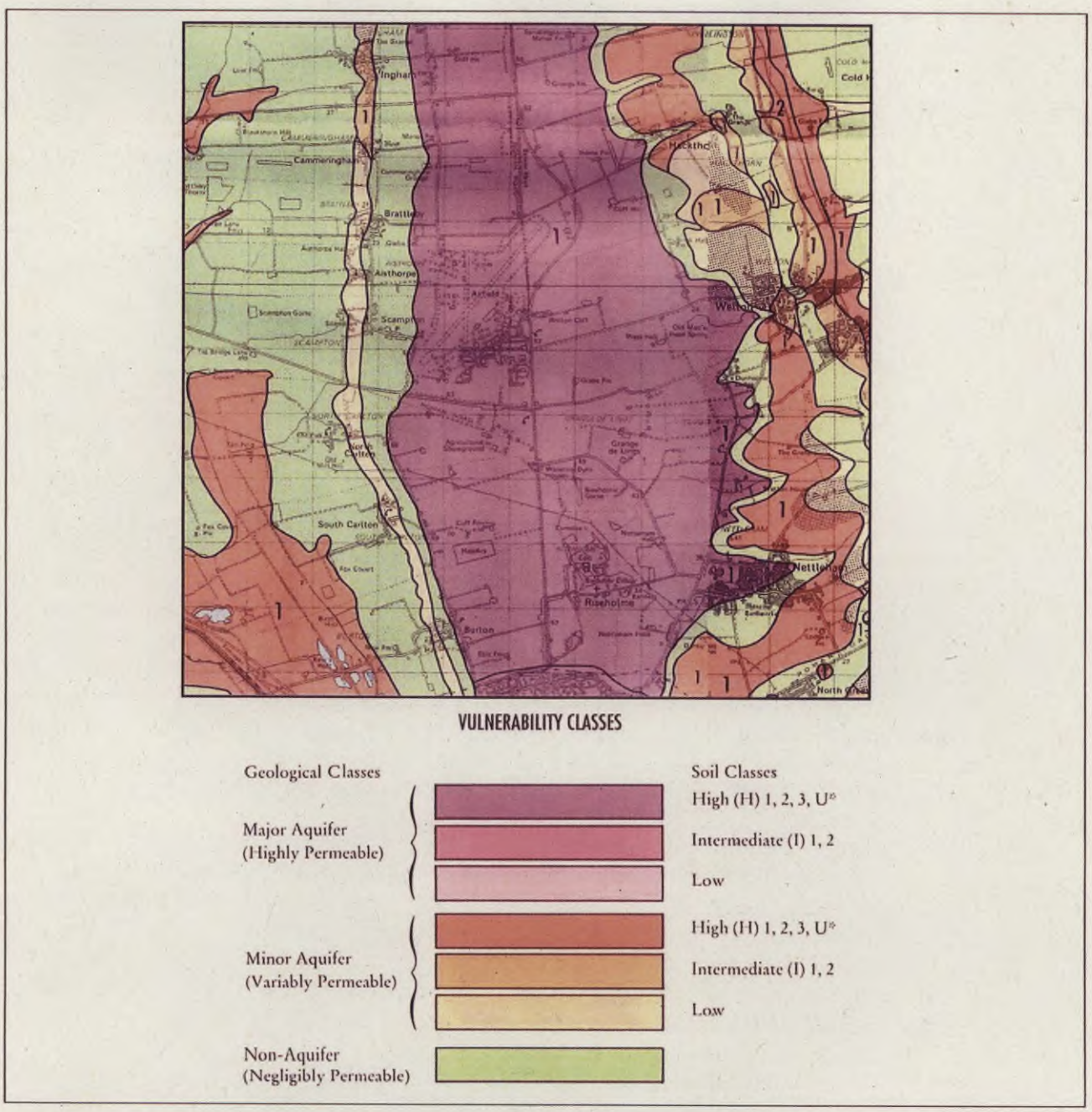

Figure 3. Groundwater Vulnerability Maps (Sheets 18 and 19) showing RAF Scampton situated on a Major Aquifer with H1 class soils.

51. It is believed that groundwater flow beneath RAF Scampton is generally from west to east - following the hydraulic gradient imposed by the eastwardly dipping strata. However, ground water flow direction may be towards the west in the vicinity of the western site boundary due to the topographic influence of the escarpment along the Lincolnshire Ridge. Local variations in ground water flow may also result from the interaction between seasonal and annual fluctuations in the water table, climatic effects (effective precipitation) and local groundwater extractions.

52. Groundwater Abstraction. The Lincolnshire Limestone supports several licensed abstraction boreholes within 2 km of RAF Scampton. There is also the relatively large Public Water Supply (PWS) source at Welton roughly 4 km to the east of the site. The borehole supplies drinking water to at least three villages in the area and there is another supply at Spridlington. The Welton PWS borehole abstracts around 2Mm^3/year of groundwater from the Lincolnshire Limestone Aquifer.

53. RAF Scampton presently holds no groundwater abstraction licences. Station records show there is a disused abstraction borehole just south of the T2 Hangar (Bldg No 20), at approximately NGR 9688 7973. Although an application to reinstate the borehole has been made to the Environment Agency, the licence has not been granted on the grounds that the Aquifer could not support another abstraction.

54. The NRA record also lists three further disused boreholes in the vicinity of RAF Scampton, however, the location plan provided does not give Grid References, as their exact position is unknown.

55. Off Site Private Abstractions. The National Abstraction Licensing Database (NALD) records one private off site abstraction licence for a single groundwater abstraction borehole at Hackthorn, located approximately 2.8 km north-west of RAF Scampton. The extraction licence covers General Farming and Domestic purposes only.

56. Source Protection Zones. RAF Scampton lies within Zone II of the Welton and Spridlington Source Protection Zones. Source Protection Zones delineate areas around public water supply abstractions, which are particularly sensitive to pollution. In the case of RAF Scampton the limestone is found approximately 1.5 m below ground level covered by a relatively thin highly permeable soil. The Inner Protection Zone (Zone I) is defined by a time of 50 days or less for groundwater/contaminants from any point within the zone to reach the abstraction, the Outer Protection Zone (Zone II) is similarly defined by a travel time of 400 days or less.

57. Hydrology. The topography of the airfield slopes gently to the east. It is likely that any effective precipitation would flow either, via surface runoff and through flow towards the south-east corner of the site, eventually leaving through the surface water drainage system or, percolate through the soil horizon infiltrating directly into the Lincolnshire Limestone bedrock. Rainfall on the technical site is likely to migrate towards the east. There are no watercourses within the site boundary; therefore no water quality data is available for onsite surface water systems.

58. Areas Prone to Flooding. The Canberra Drive interceptor is situated in a field that forms a topographic low in the south-east of the site and prone to flooding. This area may be vulnerable to contaminants that enter the drainage network at times of flooding.

59. Meteorology. Information from RAFC Cranwell Metrological Office records the average wind direction is from the south-west, with a mean speed of around 10 knots. Annual mean rainfall is 720mm, with a mean sea-level pressure of around 1010mB.

60. Sites of Special Scientific Interest (SSSI) and Protected Sites. There are no SSSIs within a 3 km radius of RAF Scampton. There is a Roman Burial Site shown on various old maps located off site in a farmer's field approximately 500m south of Crash Gate 1.

61. Oil wells. There is an inactive exploratory oil well (Site A) just outside the eastern perimeter of the station, between the old Ermine Street and the current A15. It is believed that the well was sunk during September 1985 and operated for 6 weeks.

62. There are also 2 additional active oil wells (Sites B and C) located within 2 km east of the site accessible from a minor road running between the A15 and the village of Welton. All three wells are situated on the Lincolnshire limestone. The wells are owned by British Petroleum and run by Star Energy.

Historical Land Use at RAF Scampton

63. The land use history has been compiled using various archive sources: historic maps and the recent Ordnance Survey map (OS), Station Site Plans, Air Ministry Plans, Aerial Photographic coverage, various private literal publications and collections, Station Operational Records (F540s) and Cardex histories.

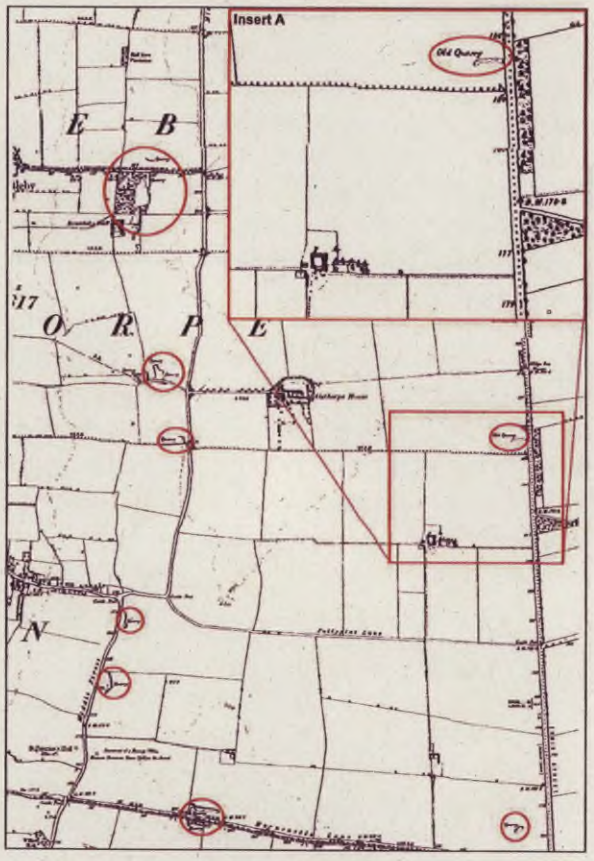

Figure 4. 1891 Ordnance Survey Map of the site location.

64. A historical map dating from 1891 records the site from greenfield (Figure 4 and reproduced to larger scale at Enclosure 4a, Volume 2). The area comprises tree bound fields and small farm buildings with dwellings and several dispersed small-scale limestone

quarries - circled in red. Insert A is an enlarged extract showing the area of the WWI technical and domestic site before its construction. There is an old quarry highlighted on Insert A, which lies to the immediate north of the 1918 technical and domestic site and within the station boundary. The 1891 map also records the site of a Roman Villa and Stone Coffins discovered in an area south of Pollyplatt Lane in the south west of the main map.

65. RAF Scampton's history began in November 1916 under the name of Brattleby Aerodrome. In December 1916 a searchlight unit was established on fields belonging to Aisthorpe House, a farm situated approximately at the centre of the present day site. In August 1918 the airfield was described as a Training Depot Station, with 72 single seat fighters, until the aerodrome was disbanded in March 1919. By April of that year the site was reformed as a Storage Delivery Station.

66. The 1918 site layout comprised a domestic and technical site, both to the south-east, and a landing ground to the west, with a total site area of 112 ha (Figure 5).

67. The domestic and technical site housed six large wooden (Belfast Type) hangars and a number of timber administration and barrack huts and tents. Other technical buildings included MT sheds, workshops, technical stores, an oil store, a petrol store, six instructional huts including a gunnery workshop and photographic hut. Other significant technical buildings included a power house, latrines, machine gun range and an ammunition store. Regimental buildings included residential facilities and two coal yards. The station accommodated 839 personnel and 42 vehicles. The precise locations of the associated technical buildings are unknown.

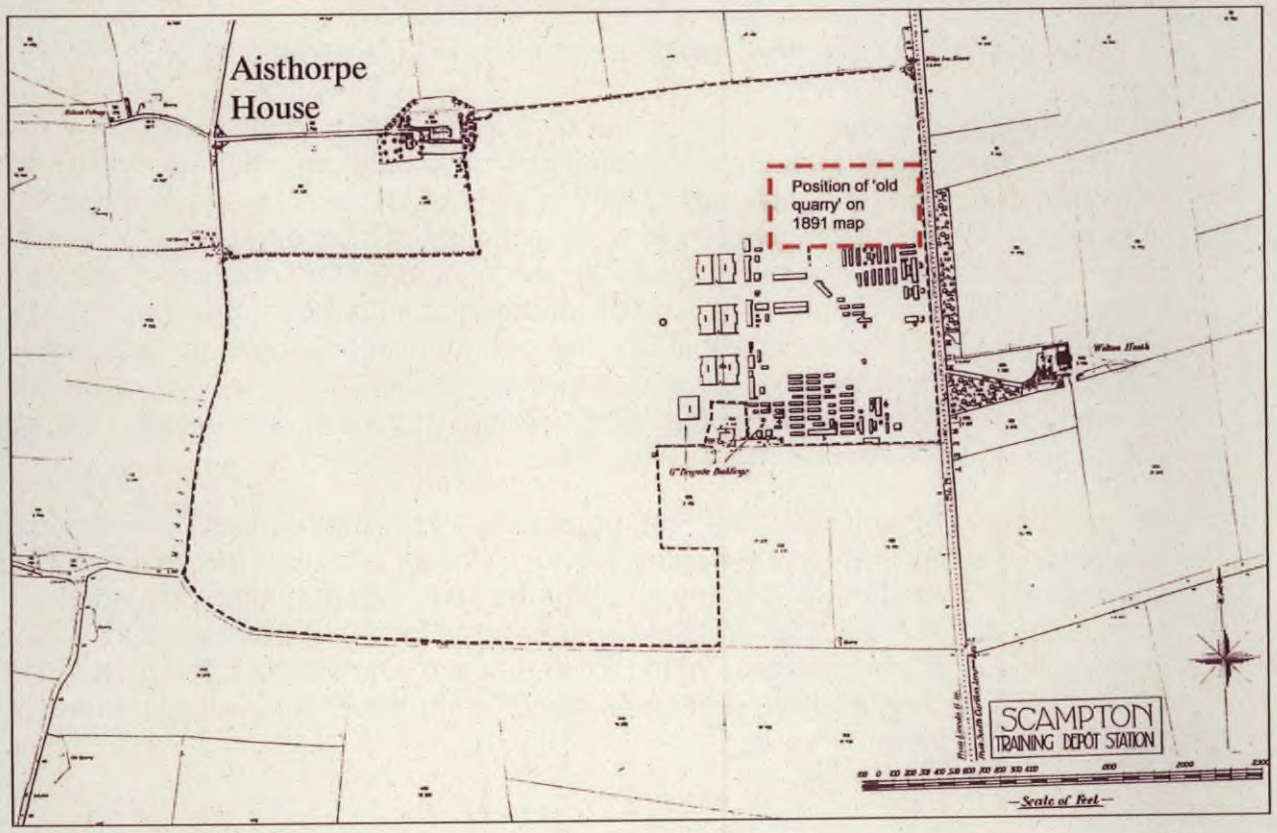

Figure 5. WWI site layout of the Scampton Training Depot Station.

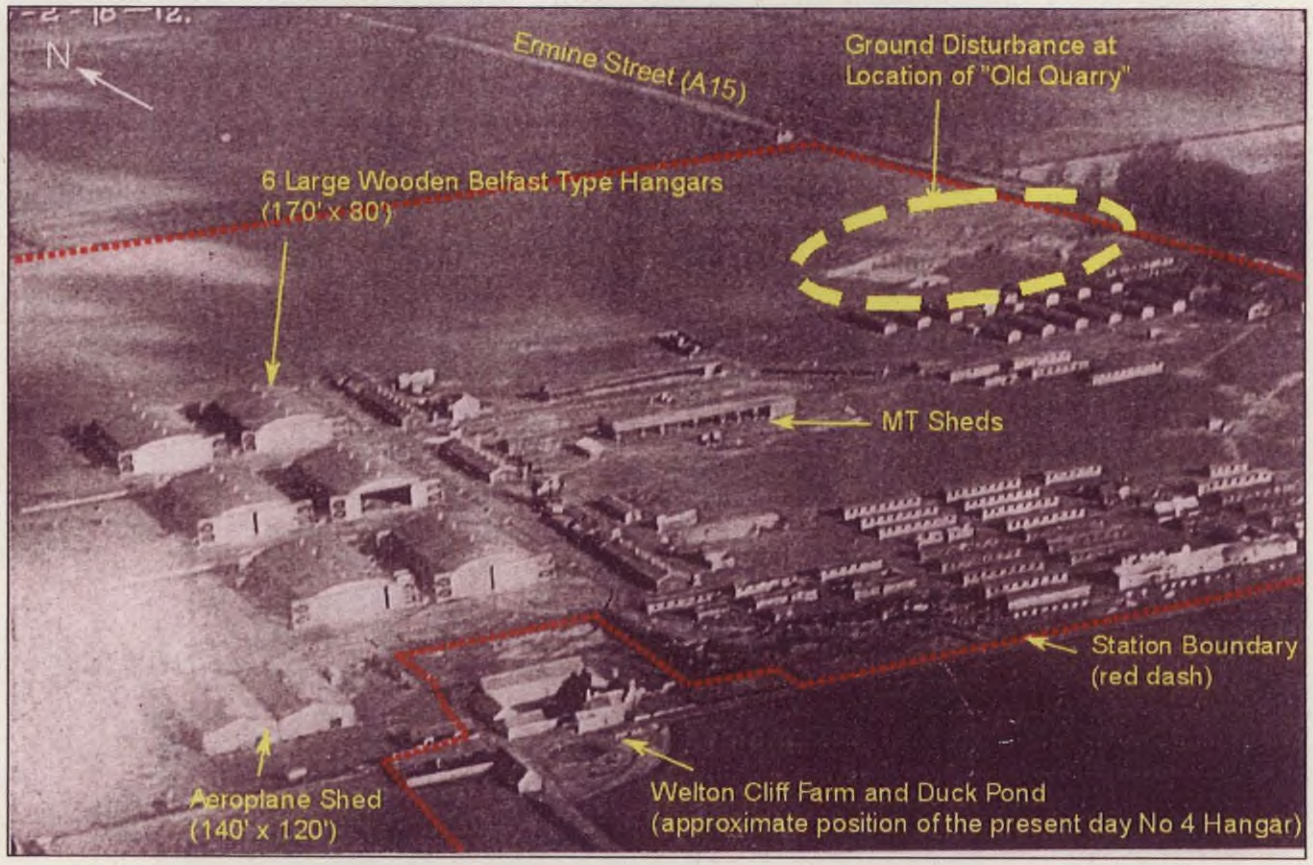

Figure 6. Oblique aerial photograph taken of RAF Scampton on 8 Feb 18.

68. Anecdotal evidence suggests that by the year 1920, all the buildings, including the six Belfast type Hangars, had been removed from the site and that the ground was returned to its former use under agriculture. There is currently no available evidence to suggest how or where the scrap building materials were disposed of after demolition. Waste types would have included timber, and building rubble, amongst other potentially contaminative materials. Figure 6 highlights ground disturbance at an old quarry on the 1918 technical site photograph. It seems possible that the 'old quarry' could have been accessed from the site and could therefore have made a convenient station tip. There are several other areas marked as quarries featured on the 1891 OS map (Figure 4), and these in turn could potentially be considered candidate tip sites.

69. With the expansion of the RAF during the 1930s the former WWI aerodrome site at Scampton was chosen for a new airfield site. A larger area was required resulting in the acquisition of more farmland to the south of the 1919 site to house the station accommodation. Anecdotal evidence suggests the land was purchased in 1935 and construction work commenced, taking for nearly two years to complete. The RAF occupied the station from August 1936 (before its official completion) and was in general use by early October of that year.

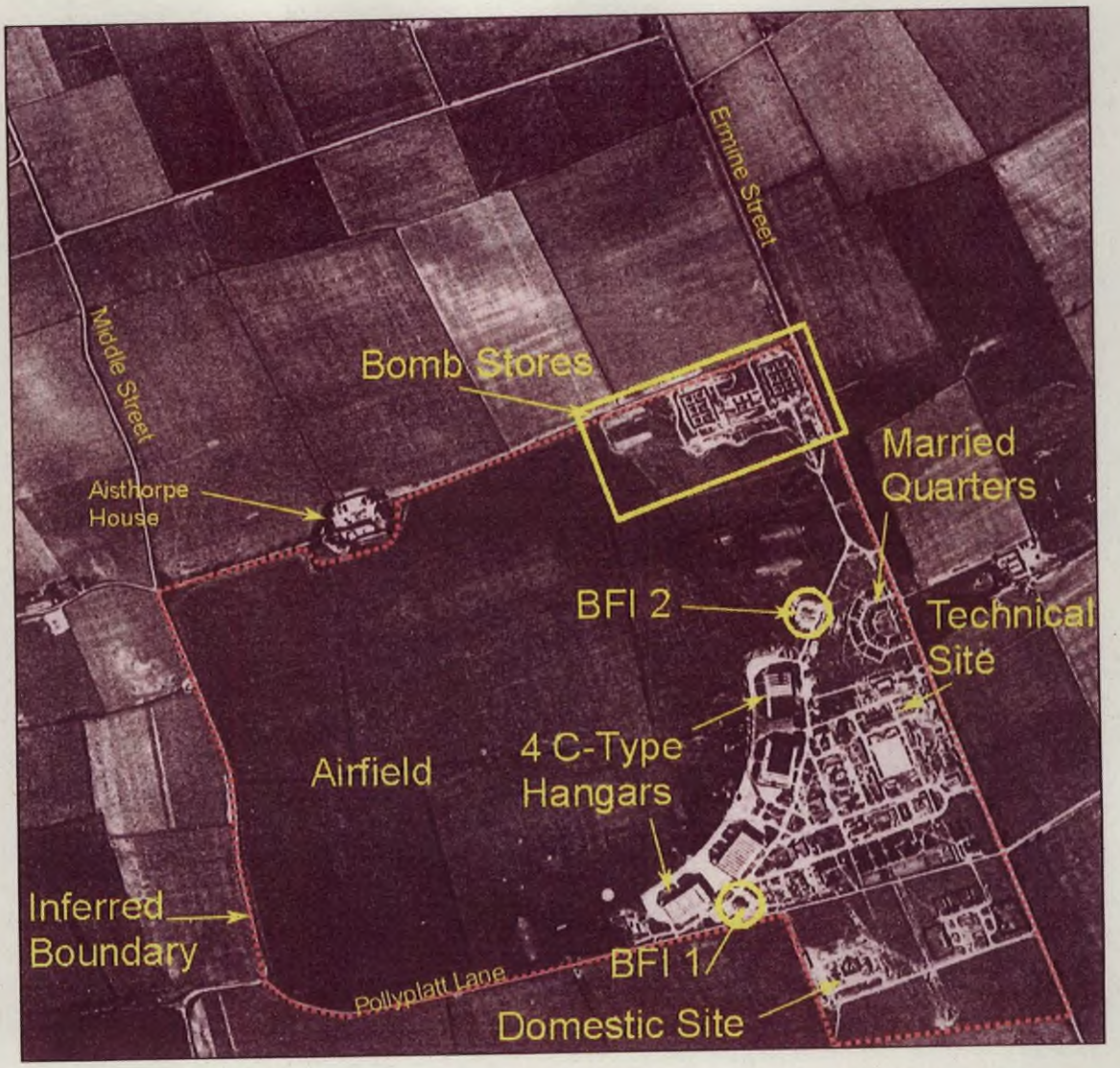

Figure 7. Aerial reconnaissance photograph recovered from a German Target Dossier dated 11 Sep 39, shows the site in the typical pre-war layout.

70. The 1939 aerial photograph (Figure 7) shows the typical station layout of airfields constructed in the mid 1930s, as well as the extent to which the site has expanded. The eastern boundary is constrained by Ermine Street, while the northern perimeter is bounded by the original field boundary that runs level with Aisthorpe House. 'Middle Street' forms the western perimeter and Pollyplatt Lane southern perimeter, with the exception of the newly developing married quarters and Officers Mess, which has extended beyond Polyplatt Lane. Welton Cliff Farm and the duck pond is no longer present. The changing site boundary is provided at Enclosure 4b, Volume 2.

71. A significant number of buildings, which can be seen on the 1939 photograph above, are also marked on the 1946 Air Ministry Record Site Plan provided at Enclosure 5a, Volume 2. The WWII site can be divided into 4 main areas: the technical site, in the south-east of the of the site; station camp (accommodation and officers quarters), in the far south-east; bomb stores, in the far north-east corner of the site and the grass landing ground covering the entire western area of the site. The technical site itself includes four C-Type

hangars in the west and two BFIs, both having a capacity of 72 000 gallons (227 000 litres). BFI 1 is located in south-west and BFI 2 is located in the north-east of the technical site. Other buildings include MT garages, a decontamination centre, sick quarters, Stanton type Air-raid shelters, blast shelters, parade ground and married quarters in the north-east of the technical site.

72. An aerial photograph (Figure 8) taken between 1939 and 1942 shows the site boundary extended to the north. There can also be seen the addition of three fusing points adjacent to the bomb stores. It also shows the expansion of the landing ground to the north and south-west of the site, including the addition of two dispersal branches south of Pollyplatt Lane. A grass taxiway route is also established around the old 1939 perimeter margin. Loss of hedgerow segments and wearing of the turf at two points could indicate access points into the fields to the north of Aisthorpe House, which was possibly being used as a runway.

Figure 8. RAF Scampton between 1939 and 1942.

73. There are scattered deposits of unidentifiable materials surrounding the BFI situated to the north of the technical site. There are also similar deposits of unidentifiable materials

20m north of the northern most limb of the western dispersal branch situated in the south-west of the site.

74. The 1942 photograph (Figure 9), shows further extension of the landing ground and taxiway toward the north with round asphalt dispersals accessed from the taxi way. Aisthorpe House is no longer present in the 1942 photograph with the hedgerow that separated the airfield from the fields in the north removed extending the length of the landing strip. Additional dispersals are present in the southern airfield making a total of three dispersal branches in the south of the airfield. One main grass runway trending north-east/south-west, is marked out on the ground.

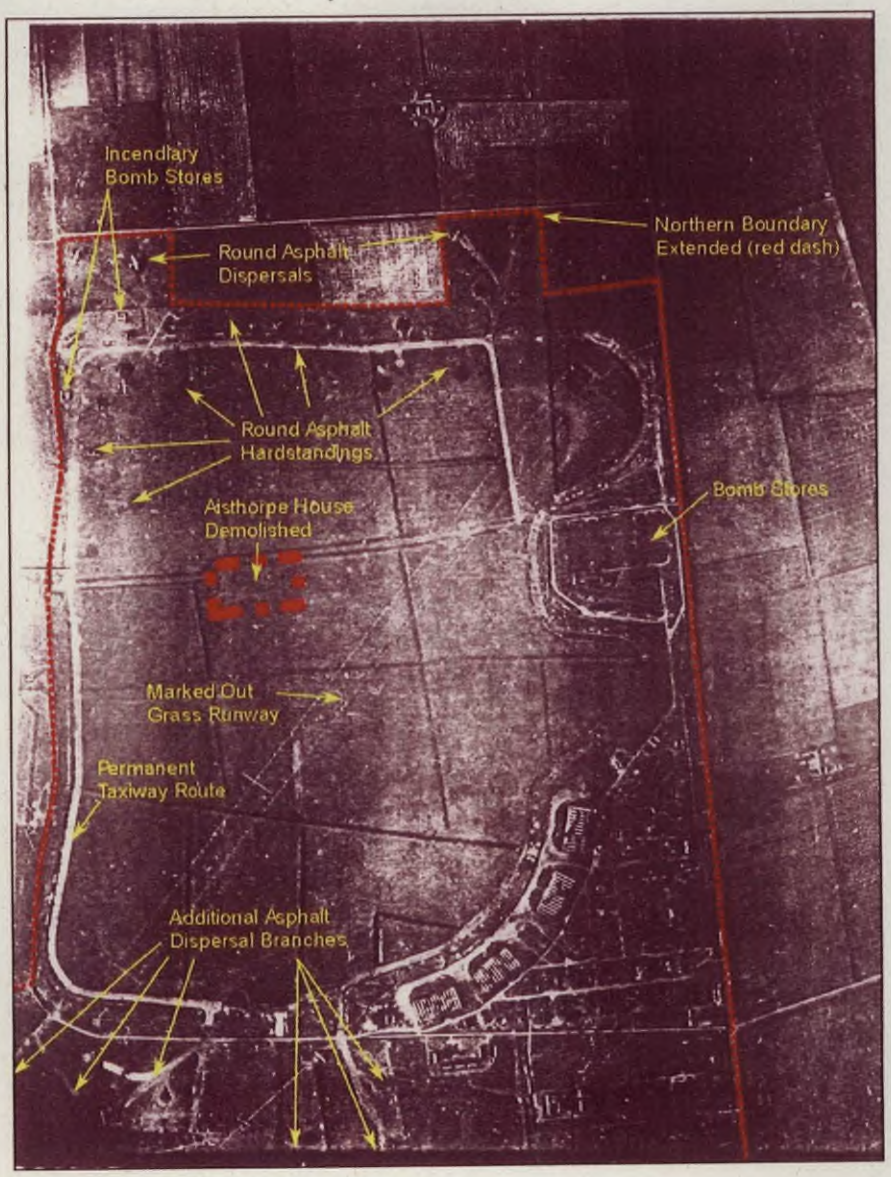

Figure 9. Aerial Photograph of RAF Scampton on the 1st October 1942. Annotations depict changes.

75. An aerial photograph from the 6 Dec 46 (Figure 10) shows several new structures that do not feature on the 1942 aerial photograph (Figure 9), such as the three concrete runways, a new area of bomb storage, additional dispersals and an asphalt taxiway.

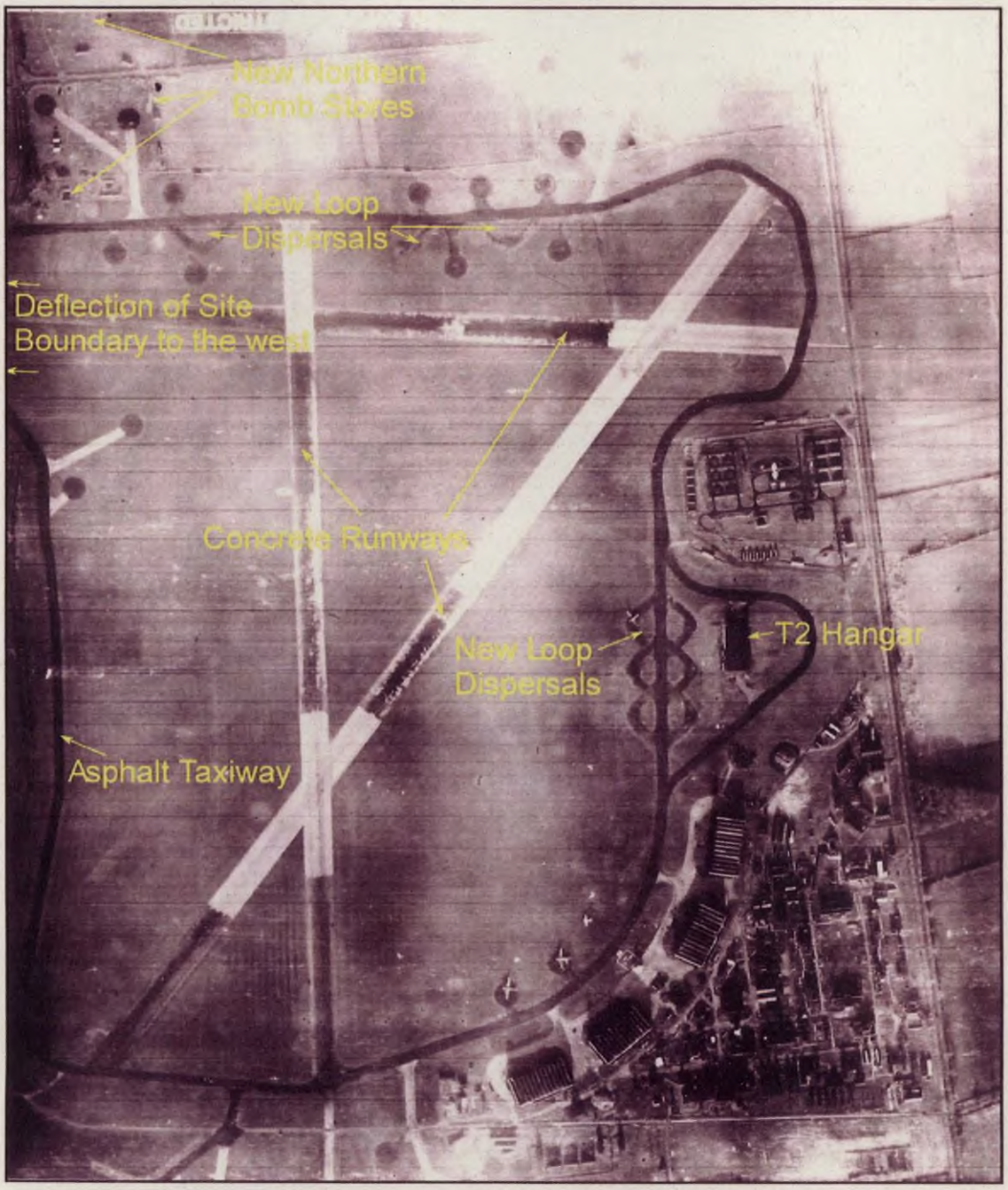

Figure 10. Aerial Photograph of RAF Scampton in 1946. Annotations depict major structural changes.

76. The F540s state that on 31 Aug 43 Scampton ceased its flying operations and work commenced on the construction of concrete runways. They were constructed in an A-Type configuration, the layout of which has survived until the present day. The runways were 05-23 at 2000 yards, 01-19 at 1,500 yards and 11-29 at 1,400 yards. Runway 11-29 crosses

'Middle Street' to the north west of the site, pushing the site boundary approximately 150m into the fields west of 'Middle Street' and covering several dispersals. A total of 11 'spectacle' (or loop) hardstandings were laid down along the perimeter track to replace those lost or isolated by the construction.

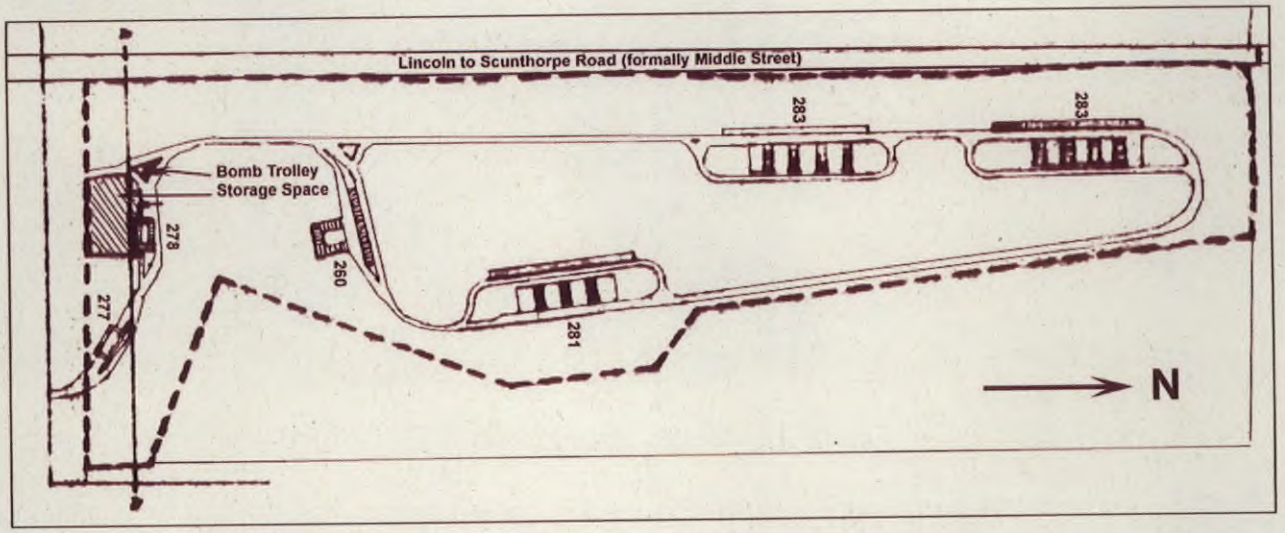

Figure 11. Extract from 1946 Air Ministry Plan, detailing the new bomb stores.

77. 'New' bomb stores were constructed on land located north of the 1942 north-west boundary of the airfield (Figure 11). The new bomb stores are accessed from the north-west dispersal branch. Note that the new bomb stores are an extension of limited pre-existing open bomb stores in the north of the site (Figure 12). The new bomb stores contained three bomb store facilities and a southern area containing fusing points, fused and spares bomb stores, a component store and three incendiary bomb stores.

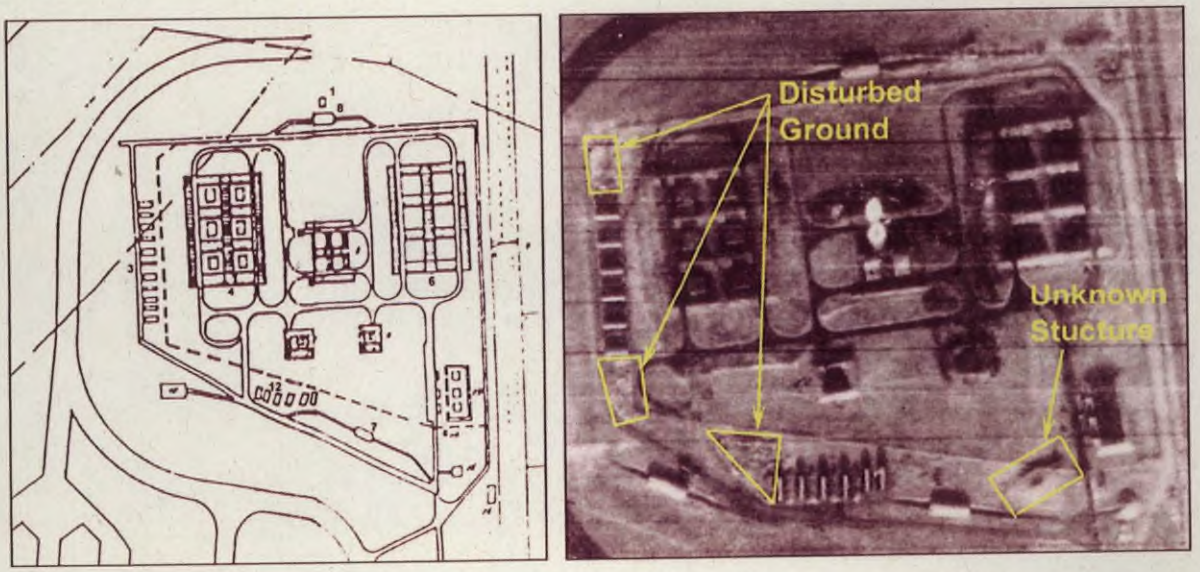

Figure 12. (left) The old bomb stores as depicted on the Air Ministry Plan and (right) the 1946 aerial photograph shows evidence of disturbed ground.

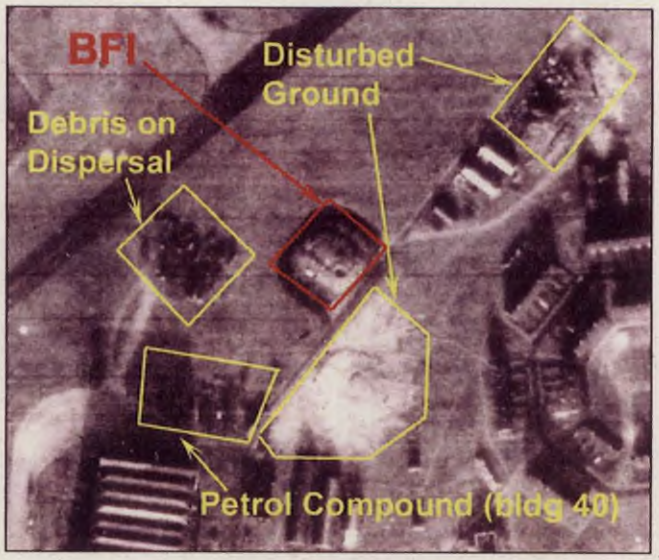

Figure 13. Aerial Photograph of BFI 2 in 1946.

78. The 1946 aerial photograph (Figure 13) shows areas of disturbed ground just south of the BFI and approximately 50m north-east of the BFI is the Air Ministry Works Department (AMWD) compound, which is most likely a contractors yard. Also, unknown debris is apparent on the dispersal 20m east of the BFI, which appears connected to the northern C-Type hangar by a path.

79. Two 1948 Aerial Photographs (Figures 14 and 15) clearly show ground disturbances in the south-west of the site (presently F- dispersal). Figure 14 highlights an area of ground disturbance on several WWII dispersals and in the old quarries. There are also blackened areas visible on the WWII dispersal that could be indicative of burning.

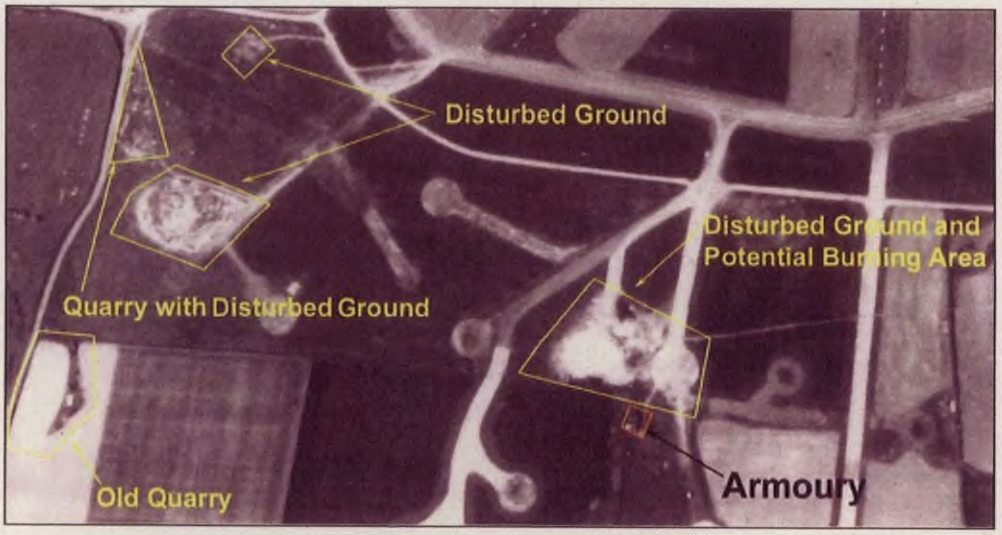

Figure 14. Aerial photograph of southern dispersals dated May 1948, showing areas of ground disturbance and potential burning.

80. Figure 15 shows a black colouration on several of the dispersals, which could be attributed to a number of factors, for example, burning or staining from oil or tyres.

Adjacent to the 'Potential Burning Area' was an armoury as recorded on the 1946 Air Mininstry Plan. This area shows ground disturbance and darkened patches. It is recorded in the F540s that "burning under precautions" was carried out at this location, both in Feb 46 and Nov 95. This activity involved the burning of a large quantity of unserviceable explosives (detonators, signal cartridges, etc). The F540s mention the demolition of explosives intermittently between January 1945 and June 1948, with a specific record in the 1948 reference to pits being constructed for disposal. The photograph also clearly shows the shooting butt, where aircraft tested their machine guns.

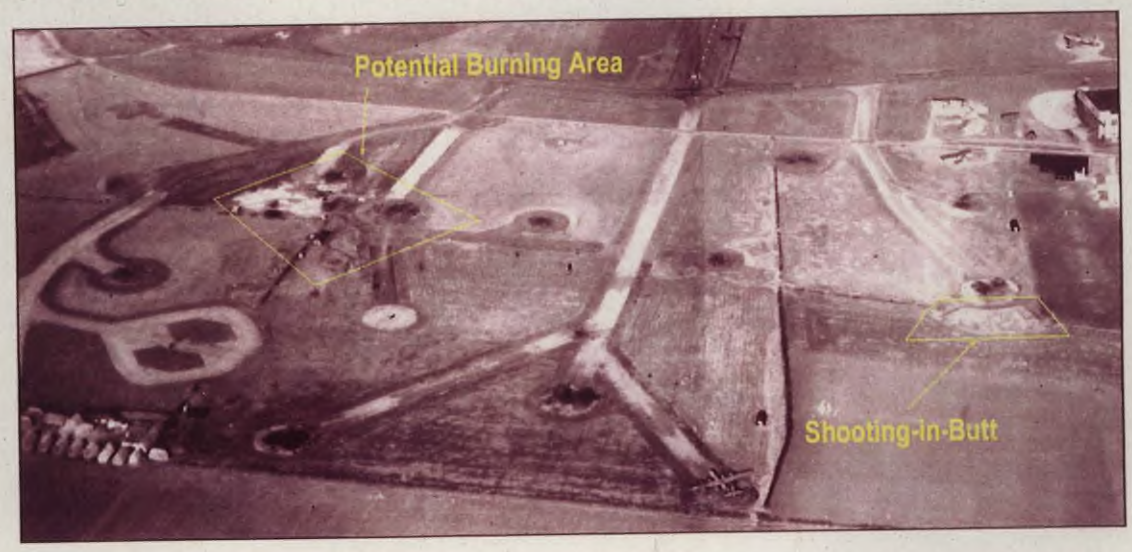

Figure 15. Aerial Photograph (Oct 48), showing potential burning activity.

81. The 1948 aerial photograph shows two small areas of disturbed ground located approximately 10m and 50m from the western site boundary, with access via paths from Middle Street (Figure 16). The areas were previously marked on the WWI site plan as old quarries. The old quarries could potentially be the site of fly tipping and also burning activities. This photograph also shows the location and extent of the sewage works.

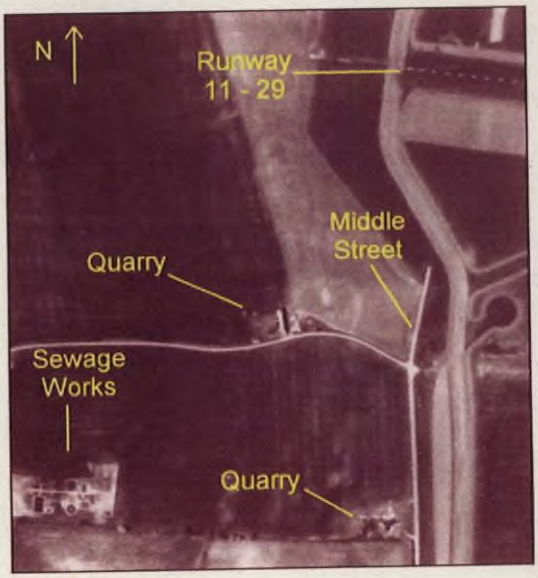

Figure 16. Ground disturbance at the location of the two quarries in 1948.

82. The 1954 Aerial photograph (Figure 17) shows continued disturbance in the south-west dispersal area. A 'tear drop' shaped area still displays evidence of ground disturbance in the location of the areas identified in the 1948 aerial photograph (Figure 14). It is possible that this location was used for the localised tipping of station waste as a track is clearly visible leading to the disturbance.

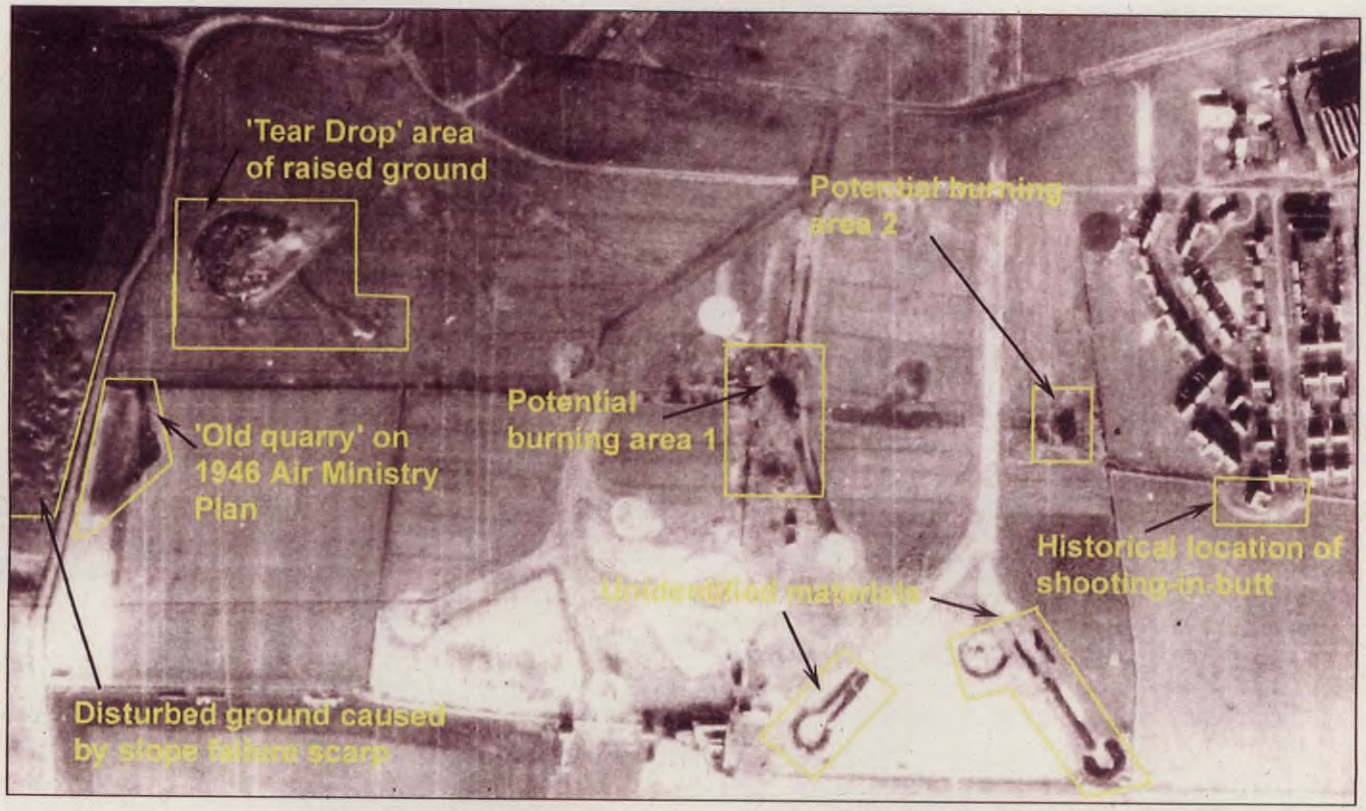

Figure 17. Areas of potential concern identified on the 1954 aerial photograph.

83. There may also be an additional smaller 'off-shoot' mound emerging to the south-east of the 'tear drop' mound. The three dispersal limbs of the eastern branch (bottom right of Figure 17) have some dark unidentified material(s) lining the hardstanding margins. A number of new married quarters in the far right of the picture have been built over a 1942 dispersal branch and the WWII Shooting Butt.

84. Considerable engineering works took place during the mid 1950s to modernise the station, during which time the station was closed. The 1963 aerial photograph has been annotated to highlighted the major changes that took place during the V Force reconstruction phase (Figure 18).

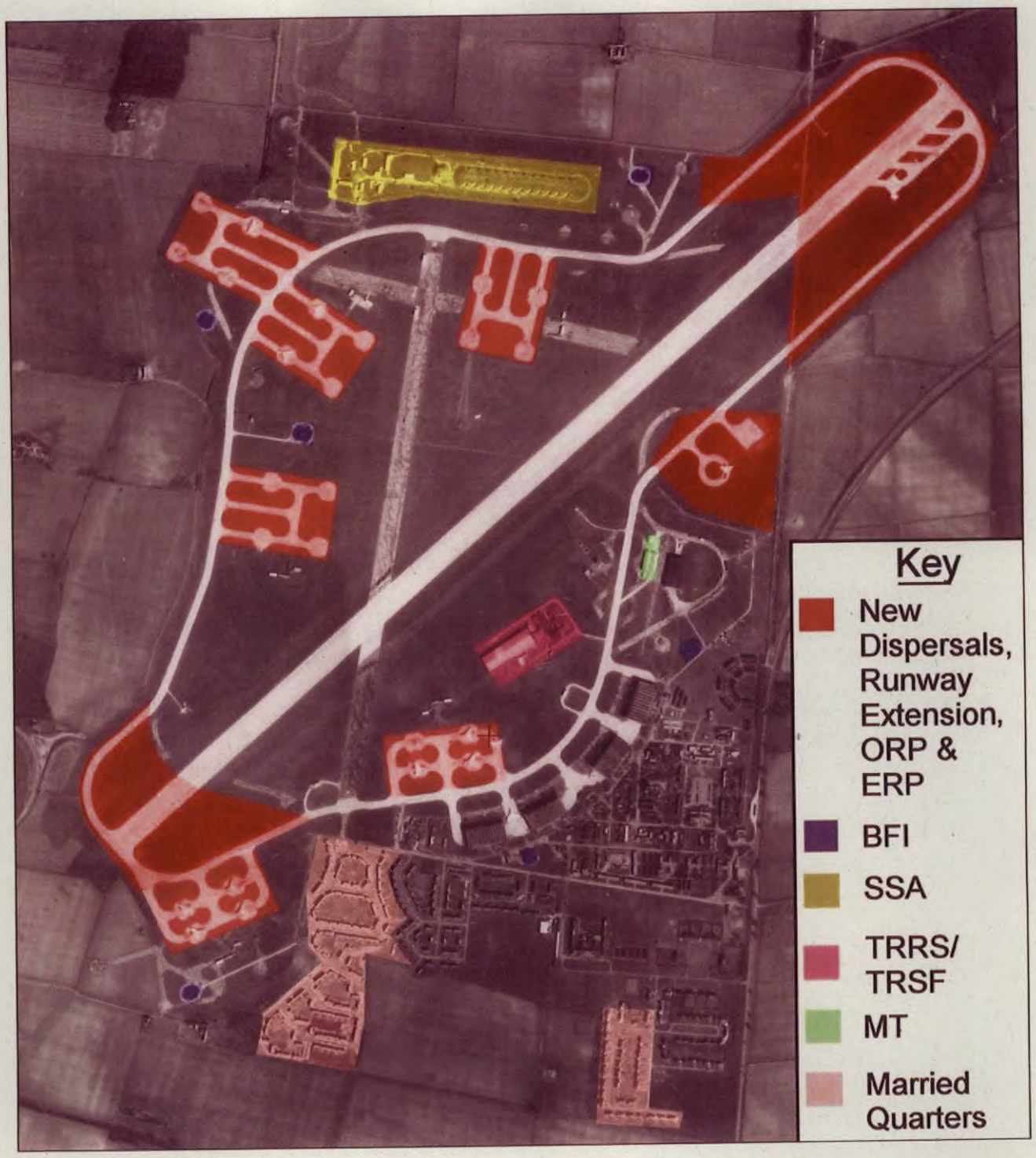

Figure 18. 1963 aerial photograph of RAF Scampton with new infrastructure annotated.

85. There are six new V-bomber dispersals (A-F), which have their own operating facilities including, crewroom accommodation. Runway 05-23 has been extended to 3000 ft and broadened, with an operational readiness platform (ORP) positioned laterally adjacent to the Runway 23-threshold that contains 2 (High Test Peroxide) HTP pits. HTP pits for emergency dumping of missile fuel also exist at each of the new dispersal area. The extension of Runway 23 to the north-east necessitated the diversion of the A15. Four

additional BFIs have been installed with oil traps across the station to supply fuel to each of the new dispersal areas.

86. The taxiway serving the west side of the threshold to runway 05 curves closely to 'tear drop' shaped disturbed ground that no longer appears visible. Runway 11-29 has been partially removed with large sections covered by the Vulcan dispersals and other sections are now just grass. The 01-19 runway has been designated as disused by crosses at either end.

87. The WWII bomb store to the north-east of the station and shown previously in Figure 12, is no longer present and in its place there is an engine running platform (ERP), with an associated wash down plant and oil trap. Also about 30m to the south of the ERP is the compass swing. The WWII bomb store built in the far north-west of the station appears inactive. A new explosive storage area (ESA) or Supplementary (or Special) Storage Area (SSA), consisting of 24 HE silo bays (A-H, J-Y) and other supporting buildings including a battery charging room have been built along the northern perimeter of the station. The complex was designed for the storage of Blue Steel Missiles. Major servicing of these missiles took place in Bldg No 398 (TRRS/TRSF).

88. The MT section has also moved to the T2 hangar (vehicle storage) and ancillary buildings (MT control, MTSS, vehicle wash, etc). Further expansion has occurred to the south of the site, with the construction of more married quarters, some of which have been constructed in an area previously occupied by WWII dispersals.

89. Aerial Photographic information and F540 records depict no significant changes to the site infrastructure between 1963 and 1971. The 1971 aerial photograph shows Vulcans at the ERP. There is a black staining on the hardstanding to the rear of the aircraft, which is likely to be soot from the engines exhaust. The mottled areas of grass beyond probably results from the scorching hot exhaust emissions (Figure 19).

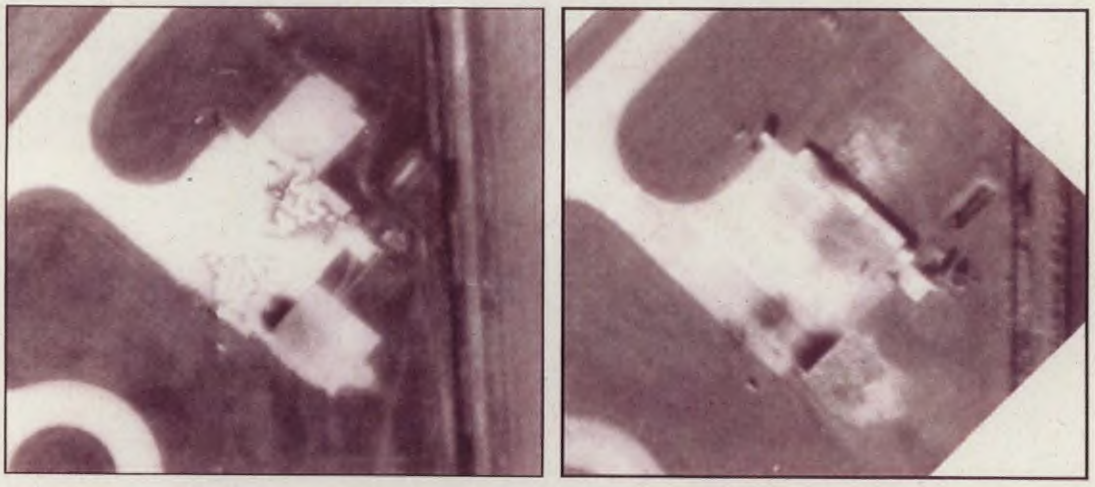

Figure 19. Aircraft at the ERP.

90. Evidence of aircraft burning is visible on a WWII dispersal just south of F-Dispersal (Figure 20). The aerial photograph from 1977 also shows the vertical cylindrical fuel tank (locally referred to as a silo tank) adjacent to BFI 4, that is also present on the December

1975 aerial photographs but is absent on the August 1983 photograph, suggesting the tank was removed between December 1977 and August 1983.

Figure 20. Evidence of burning activities and the vertical fuel tank at BFI 4 in 1977.

91. The vertical fuel tank was removed by 1983 when a NATO funded BFI was installed adjacent to BFI 5 to the west of the station (Figure 21).

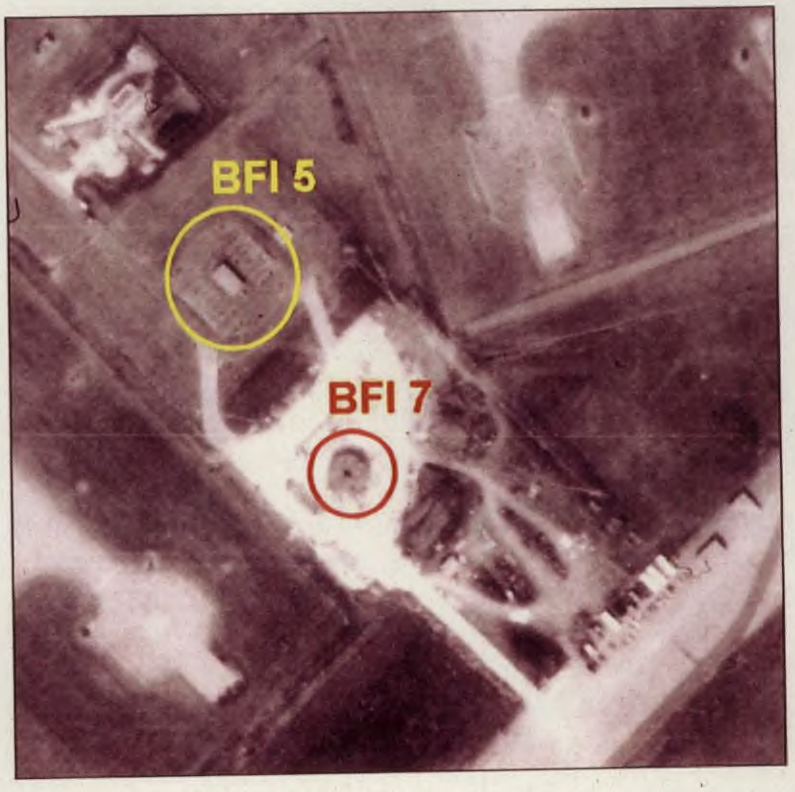

Figure 21. BFI 7 and the PRE under construction during August 1983.

92. Further evidence of burning on site is provided by the 1983 aerial photograph as a large plume of smoke rises into the air from an area near to the waste oil compound and the contractors compound.

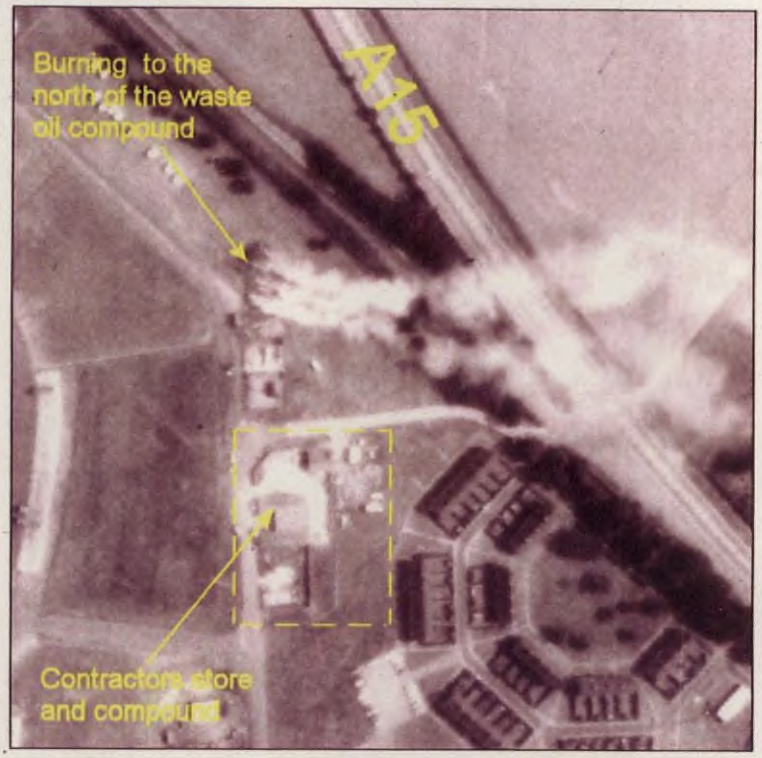

Figure 22. Evidence of a burning to the north of the waste oil compound in 1983.

93. At the end of 1982 the station was transferred to Support Command, retaining only an engineering detachment of Strike Command. In April 1983 RAF Scampton became the home of the Royal Air Force Aerobatic Team (The Red Arrows). The Trade Management Training School for Trade Groups 1 and 2 started forming in Jan 83 and was up to full strength by Jul 84. The Central Flying School arrived in September 1984 from RAF Leeming and in May 85 No 2503 Royal Auxiliary Air Force (Regiment) squadron left for RAF Waddington. The Joint arms Control Implementation Group (JACIG), a tri-service independent lodger unit, arrived on the station in 1990. Scampton completed a major change to its organisation in 1993 with the Engineering and Supply Wing being taken on by contractors.

94. In July 1994 it was announced that RAF Scampton was to close. In early 1996 the Red Arrows were relocated to RAFC Cranwell, the Joint Arms Control Implementation Group was located at RAF Henlow, and the Trade Management School went to RAF Cosford. The decision to close RAF Scampton was reversed and in Dec 2000 the Red Arrows returned to RAF Scampton, and in Apr 2000 the Tucano Fatigue Modification Program (2 FMP) moved into Hangar 1. The Old Flying Machine Company have various aircraft in various stages of restoration in No 3 Hangar.

95. Site History. The land use at the site has been varied over the station's lifetime and relevant historical plans have been reproduced and provided at Enclosure 5b and 5c,

Volume 2. For the purposes of clarity, a chronological site history utilising all of the sources listed above is included at Enclosure 6, Volume 2.

FINDINGS

GENERAL CONTAMINATION

96. The following paragraphs detail typical general contamination that could be expected to be present on site. The details of any actual and potential contamination identified in this section will be included on a Plan of Actual and Potential Site Contamination provided at Enclosure 7, Volume 2.

Site Buildings

97. Air Raid Shelters (ARS). Several ARS of varying capacities are indicated on the 1946 Air Ministry Plans of RAF Scampton. The current station site plan does not list any ARS indicating that none remain. No independent ARS were identified during the site investigation, although the three H-shaped barrack blocks (Bldg Nos 191,192,193) were built with a shelter below the ground floor level. Access to the shelters was restricted/secure and they have been listed on the register of confined spaces.

98. The historical aerial photograph taken between 1939 -1942 shows a number of independent ARS to be present dispersed around the RAF Scampton technical site (Figure 23). The ARS are generally of Stanton-type or larger accommodating up to 100 people.

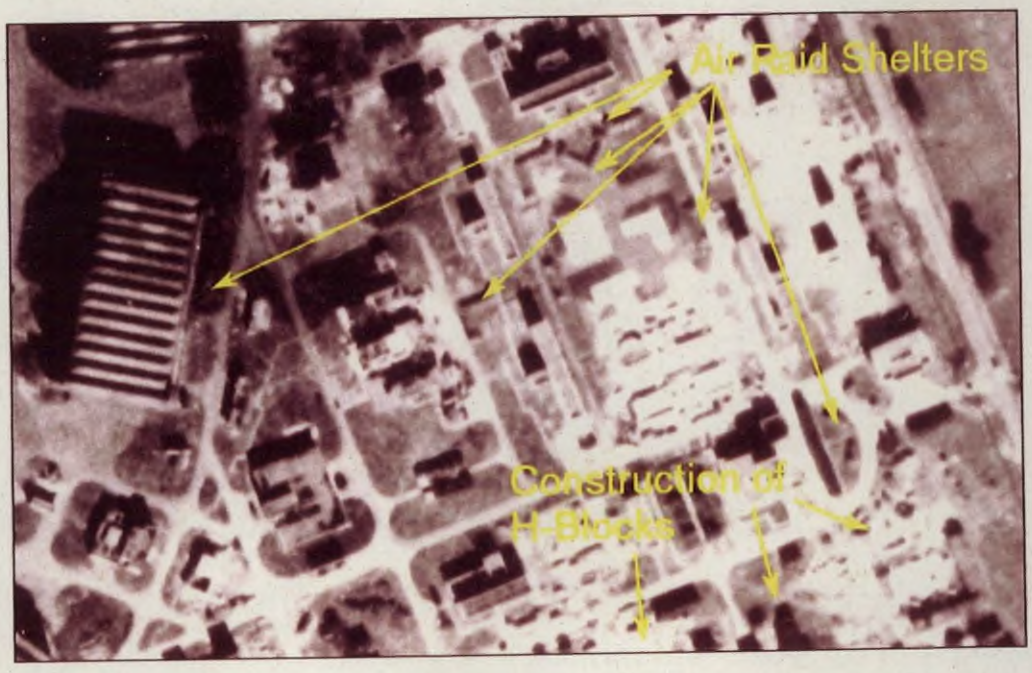

Figure 23. Aerial photograph of RAF Scampton technical site with several ARS annotated.

99. On the 1948 aerial photograph many of the War time Air Raid Shelters are no longer seen indicating they were removed shortly after WWII. Historically old Air Raid Shelters, when demolished, were backfilled with any available material. This may have led to

potentially contaminative fill materials being used, and thus, the ground at former air raid shelters should be considered potentially contaminated until proven otherwise.

100. The ARS list displayed on the site plan is not exhaustive, and it is possible that some ARS have remained undetected or have existed and not been recorded on the 1946 Air Ministry Plan.

101. Asbestos. Asbestos was widely used in the construction of buildings and facilities at RAF Scampton. The Asbestos Materials Register is ideally a document that identifies the type, location and condition of asbestos materials on the site. Unfortunately, the register is limited in content, listing the majority of asbestos as unknown. Where damaged material has been identified there is no indication that any remedial action has been taken, suggesting that the problem remains unchecked until the next inspection. It is considered unlikely that the list of asbestos materials is complete and therefore there is still a possibility that undiscovered asbestos may be present in buildings, facilities or buried on site. The register is provided at Enclosure 8, Volume 2.

102. During the site visit it was noted that most buildings within the SSA contain asbestos, either in roof tiles or rainwater fall pipes. These buildings display asbestos hazard warnings. However, the silo bay complex (Bldg No 409) contains an asbestos type material as a sleeve surrounding a vent pipe protruding from the top, which is not recorded on the Asbestos Materials Register (Figure 24).

Figure 24. Asbestos type material forming a sleeve around a vent pipe.

103. Broken asbestos roof sheeting and drain pipes were present outside Bldg Nos 42, 421 and 398, where nuclear missiles were assembled during the V-Force era. This building is reportedly in a very poor state and access is restricted.

104. Asbestos may have been present in the former married quarters to the north-east of the technical site, which were demolished in late 1980s. There are no records available regarding the disposal of building waste from the former married quarters. A visual

inspection of the site of the married quarters identified the buildings were demolished to ground level and grassed over.

105. During the removal of the redundant BFIs, asbestos gaskets were found in the above ground fuel pipeline and associated equipment. Records show that the valves were bought by Albion Valve Company LTD in April 97 and transported off site in June 97. The redundant valves were to be stripped and reconditioned for further use.

106. In addition to the asbestos recorded in the register, asbestos material was found tipped at the following locations:

a. Fragmented asbestos sheeting on a former WWII 'round' dispersal at Crash Gate 5.

b. Fragmented asbestos sheeting in the topsoil at the packed POL compound (Bldg No 40).

107. Asbestos may also be present in the other areas of the station that have previously been used as tip sites.

108. Information provided by work service staff indicates that sections of the underground pipework that forms the district heating system (DHS) is lagged with asbestos. It should be noted that asbestos materials might also have been used as a lagging material on the older boiler systems present on the station.

109. Demolished Buildings, Old Foundations and Buried Structures. Historical records and aerial photographs that indicate buildings and installations at RAF Scampton show that considerable demolition and replacement of old infrastructure has taken place over the site's history. Many original wartime dispersals were built over or replaced by runways and V Force Dispersals. For example the old WWII bomb store, originally located in the position of the current Compass Swing Base, was demolished during V-Force reconstruction. During the station 'rundown' and closure in 1996 a large number of buildings were demolished over 3 'closure phases'. The stations Health and Safety files, held by the EWC, have been consulted in order to provide information regarding building/infrastructure demolition across the site since station closure in 1996. The progressive demolition of buildings and infrastructure is continuing on the site.

110. The majority of historical fuel storage installations/areas have been removed from the site. This activity has led to the discovery of land contaminated with fuel and the implementation of the subsequent remedial measures required.

111. The major changes in infrastructure on the station have been detailed in the Land Use History.

112. Central Heating Station (Bldg No 82). The technical site at RAF Scampton was originally constructed with a single central heating station (CHS). This provided heat to the rest of the technical site via the district heating system (DHS), a network of above and below ground pipes. The CHS was coal/coke fired and there were two solid fuel compounds situated to the north at Bldg Nos 62 and 72. The CHS was subsequently

converted to burn furnace fuel oil (FFO). The FFO was stored in 6 above ground steel tanks, each of 40 000 litre capacity, installed adjacent to the south wall Bldg No 82.

113. There is a "Bulk Oil Installation" (Bldg No 83) recorded on the 1946 Air Ministry Plan, situated west of the CHS. On the Air Ministry Plan the installation is listed separately to Bldg No 82. It is considered that this installation was associated more with engineering practices rather than for heating purposes since the CHS was coal/coke fired.

Fuel Installations and Storage, Including POL

114. There is the potential for hydrocarbon and heavy metal contamination of the ground at the location of all fuel storage, handling and receipt and despatch areas. A number of historical BFIs noted on the Air Ministry Plan and archive aerial photographs have been included on the Plan of Actual and Potential Contamination. Research and discussions with station personnel have revealed the following information regarding pipelines, BFIs and POL stores at RAF Scampton.

115. Current Aviation Bulk Fuel Installations (BFIs). At present RAF Scampton has one operational BFI, listed as BFI 7 (Figure 25). The installation has always been used for the storage of AVTUR with a nominal capacity of 1 250 000 litres and was constructed for NATO in the 1980s. The installation was refuelled from the Government Pipeline and Storage System (GPSS), which entered the site from the west via the Pipeline Receipt Enclosure (PRE). AVTUR (F-34) fuel was pumped to the PRE from a pumping station on the coast at PSD Mistarton. On closure, the Oil Pipeline Agency (OPA) removed the section of pipeline between the PRE and the western boundary fence. The section of pipeline between the PRE and BFI 7 was decommissioned in March 1997. The PRE itself has been decommissioned and the main items of equipment removed including the back flush tank. On reactivation of the station the BFI was refurbished and converted to receive fuel via road tankers. The AVTUR is then conveyed from the BFI to the aircraft by bowser as required by RAFAT. The drainage system surrounding the receipt and despatch area is intercepted with two 10 000 litre full retention interceptors. BFI 7 was last cleaned in April 2003. There have been no reported incidences involving leakages from the GPSS and the site investigation did not note any issues of concern.

Figure 25. BFI 7 and the redundant Pipeline Receipt Enclosure (PRE).

116. Training Depot Station Scampton (1916- 1920). Information on the technical installations of the WWI station is limited, however the Training Depot Station plan which records the layout of the 1918 site, lists an oil store, petrol store, MT sheds (42 vehicles), a power house and two coal yards. This evidence suggests that the above fuels types were stored on the station although the precise locations of these facilities are not given. Evidence obtained from the designs of other WWI Royal Flying Corps stations has shown that the fuel installations were up to tens of thousands of gallons and some installations were underground. It is likely that fuel would have been brought on the station either in a fuel tanker or in drums, the latter of which may have been stored in a compound on site. Potential ground contamination by fuels would probably have been related to minor fuel spillages, generally localised to the technical area, in front of the hangars and the MT section. It is likely that any remaining fuel and/or lead contamination is diffuse, having undergone natural attenuation in the soil.

117. Historical BFIs. Prior to the construction of the NATO BFI, the station operated six independent BFIs installed near to each of the V-Force dispersals. These installations consisted of six tanks of approximately 52 500 litres each. BFIs 1 and 2 were installed prior to WWII, with BFI 3 being installed during WWII. BFIs 4 – 6 were installed as part of the V-Force reconstruction phase in the 1950s. Each installation was either fully or partially submerged.

118. Second World War Station. The WWII site had several fuel installations and storage compounds which are listed on the 1946 Air Ministry Plan Building List. Areas of main concern have been tabulated below:

Building Name	AM Plan Bldg No	Tank Capacity	Fuel Type and Comments
BFI 1	No 154	72 000 gallons (approx 330 000 litres)	Aviation fuel (AVGAS) in 6 x 52 500 litre Tanks
BFI 2	No 24	72 000 gallons (approx 330 000 litres)	Aviation fuel (AVGAS and AVTUR) in 6 x 52 500 litre Tanks
MT Bulk Fuel Installation	No 163	5000 gallons (approx 22700 litres)	Petrol
Bulk Oil Installation	No 132	7000 gallons (approx 32000 litres)	Oil
Bulk Oil Installation	No 83	Unknown	Oil (possibly separate from tanks at Bldg No 82)
Petrol Compound	No 40		Held petrol in WWII, still used as "Packed POL Compound"
Fuel Store	No 113	Unknown	Unspecified - probably coal
Fuel Compound	No 62	Unknown	Unspecified - probably coal (later used as a "scrap compound")
Fuel Compound	No 74	Unknown	Unspecified - probably Coal

Table 1. Summary of WWII fuel installations.

119. It is believed that the installations shown in Table 1 were built when the station opened in 1936. BFIs 1 and 2 are clearly present on the 'Luftwaffe' (September 1939) Aerial Photograph.

120. British Petroleum Board Pipeline. Historically the British Petroleum Board (PB) pipeline supplied BFIs 1 and 2. Form 540 records (Oct 44; Dec 44 and July 45) make clear reference to aviation fuel being pumped into both fuel installations by the PB underground pipeline. The EWC holds a historical plan, which indicates that the pipeline runs onto the site from the west, beneath or close to the threshold to Runway 05. A section of pipeline was apparently, removed during the construction of F Dispersal. The extent of remaining in situ pipeline is unclear, however it has been surmised that the pipeline is still in the ground probably running from the vicinity of F Dispersal due north-east parallel to the line of the road behind the hangars to BFI 2, with a spur to BFI 1.

121. During the removal of redundant BFIs a 3-inch diameter pipeline was discovered near BFI 1. The pipe is recorded as entering the BFI area from the north-east, and was thought to be the remnants of the old WWII PB pipeline. The works plans do not record whether this pipe contained any residual substances/fuel nor does it comment on the extent of existing pipe or the condition of the section of removed pipe. It therefore seems likely that sections of the original PB pipeline remain in the ground. Anecdotal evidence suggests that a similar pipeline runs across the site, resting on bed rock, in the vicinity of BFI 2, having been excavated during on-site maintenance work

122. Anecdotal evidence also suggests that a manhole and underground pump station still exists in a farmer's field to the west of the site. It is possible that this structure could be a remnant of a PB Pipeline infrastructure.

123. It is thought that the pipeline may have been laid during the period Sept 43 to Oct 44, when RAF Scampton was temporally closed for the laying of concrete runways.

124. A very substantial fuel leakage was discovered and documented in the Jul 45 F540 entry:

> "supplies of petrol being received were many thousands of gallons less than those stated by the petroleum board at have been pumped... due to the bursting of the actual supply pipeline".

125. This record does not state where the rupture occurred along the pipeline. It is therefore possible that the leakage could have occurred on or near the site and so the free product derived from this pollution incident could have contaminated the ground and groundwater system near RAF Scampton. It is unknown how long the fuel pipeline operated for, however, it is considered unlikely that fuel was issued to the site following the V-Force reconstruction, since V-bombers used a different grade of fuel to piston engined aircraft. It is likely that sections of the pipeline remain in the ground and that these sections may still contain residual fuel or vapours.

126. Reconstruction for V-Force Several additions were made to the fuel supply system at RAF Scampton during the V-Force reconstruction phase. The main changes include:

a. Construction of three additional BFIs (BFIs 4 - 6) for the storage of AVTUR and conversion of BFI 2 from its former fuel (AVGAS) to AVTUR.

b. Laying of local 8" pipe networks from BFIs 2 - 6 to fuel hydrants on the new dispersals (A - F)

Removal of Redundant Fuel Installations

127. Removal of Redundant Aviation BFIs. Since station closure in 1996 there has been a systematic removal and remediation programme for the six redundant BFIs and various other fuel tanks. In September 1995 Golder Associates (UK) Ltd undertook contamination surveys of BFIs 1, 2 and 3 in order to determine whether the buried tanks required removal. The results of this survey are included in the following paragraphs. The station Health and Safety files have been used to provide information on the removal of BFIs 1, 2, 4, 5 and 6.

128. BFIs 1, 2 and 3. BFIs 1, 2 and 3 consisted of six underground tanks each of approximately 52 500 litres capacity, with a mounded underground pump house. The BFIs were decommissioned in Mar 88 by de-gassing and filling with concrete slurry. In 1997, the pump houses were demolished and all structures taken down to floor slab level. There were six concrete ring structures approximately 15 feet deep, these held contaminated water, which was removed by Alpheus Environmental (Figure 26). Contamination (described as grey/black in colour with an oily aroma) was found at the loading points, which were subsequently excavated and removed off site to licenced landfill. All hard core was pulverised and used as fill for the excavation, then covered in soil and then topsoil then grass seeded. Some contaminated soil remains in situ as identified by post demolition soil samples. The major aquifer beneath the site represents a receptor as well as a controlled water. The residual products in the ground may be considered as a source of contamination, with the pathway being migration through the soils and bedrock. There is a potential source – pathway – receptor linkage, which requires further investigation to ensure that appropriate remedial action is taken in compliance with current legislation.

Figure 26. Removal of BFI 1 – trial pit showing concrete ring structure extending vertically.

129. BFI 3. During the site investigation it was noted that some of the pipe infrastructure at BFI 3 that fed D Dispersal still remains in the ground (Figure 27). The pipeline has reportedly been made safe and filled with RG22 Neutrofoam Foam.

Figure 27. Remnants of cross base pipeline and BFI 3.

130. The Golders report on BFI 3 states that the soil around the decommissioned BFI 3 is contaminated with petroleum hydrocarbons, together with localised lead and asbestos. It was considered that the asbestos originated from the demolished pump house. The

contamination by hydrocarbons was described as "extensive" with free aviation fuel found floating on the superficial aquifer. It was suggested that the BFI was a point source for the hydrocarbon contamination found, but the Command Scientific Support Branch (CSSB) commissioned the Laboratory of the Government Chemist to carry out additional water testing in November 1995. The Total Petroleum Hydrocarbon content was 1410 μgl^{-1} (ppb), exceeding the permitted level of 10 μgl^{-1} outlined in the Private Water Supply Regulations 1991 for water intended for drinking. The trace produced showed a good match for 'fresh kerosene'. It was therefore determined that the most probable source of the contamination was due to the recent fire training activities that took place in the area between 1992 - 95.

131. BFIs 4, 5 and 6. BFIs 4, 5 and 6 including pump houses and above ground pipework were removed in 1997 by John Mowlem & Co plc through AQUMEN Services Ltd. Findings made during tank removal have been described and discussed below.

132. The installations consisted of six underground tanks each of approximately 52 500 litres nominal capacity (except BFI 5, which consisted of 12 tanks – Figure 28), together with an above ground pump house. The BFIs held AVTUR F-34, which contains icing and corrosion inhibitors. Each tank was mounted on a concrete base resting on the bedrock. At the time of decommissioning no soil samples were taken. On inspection of the tanks at BFI 4, a repair was noted at Tank 2, suggesting that it had leaked in the past. Minor contamination was found (described as an oily/petrol aroma and grey/black in colour), below the tanks on the concrete bases and around the edge of the bases. The contamination was removed off site to a licenced landfill. Contamination was also reportedly found at the loading points but this was left in situ. The excavations were backfilled using processed hardcore from the pump house and aggregate and sand. The areas were subsequently covered with topsoil and grassed.

Figure 28. PRE, BFI 5 and BFI 7 at RAF Scampton.

133. Although the accessible contaminated material was excavated from the installations it remains possible that any mobile contaminants could have entered the limestone bedrock. In addition, the contaminated soil left in situ around the loading points remains a potential source of contamination to the surrounding ground and major aquifer beneath.

134. There was a spill from the vertical cylindrical fuel tank, a temporary BFI located near BFI 4 (Figure 29). The tank was installed in 1973/4, but removed in 1984 because it was found to be leaking. The volume of fuel lost from the leaking tank could not be established, as it was not recorded. The tank rested in close contact with the ground, providing a direct pathway for fuel to migrate through the thin soil and potentially down to bedrock and into the groundwater system. The secondary containment system surrounding the tank consisted of an earth bund. It is unknown whether any soil sampling was carried out to assess the degree of contamination and whether any subsequent remediation took place.

Figure 29. Area of former fuel tank with open grass in the centre and earth bund.

135. Removal of Dispersal Fuel Pipelines and Associated Works. During the V-Force era, fuel was piped between the BFI and fuel hydrants at the dispersals (A – F), via an 8 inch underground pipeline. On decommission, the pipeline was cut into approximately 100m lengths and filled with RG22 -chemical absorbing foam. Where the pipeline contained a water/fuel mixture, Alpheus Environmental carried out removal of the wastewater. The

sections that ran beneath hardstandings were also filled with foam by reverse injection. The pipelines were left in situ. A visual inspection noted that some of the fill point infrastructure still exists at a number of dispersals (Figure 30).

Figure 30. Remnants of a fuel fill point at C Dispersal.

136. Although each of the dispersal hardstandings have intercepted storm drainage, there is a likelihood of minor contamination at the fill points due to minor spills during refuelling activities.

There were no records found to suggest that the cross base pipelines had ever ruptured/leaked in the past. There is the potential for contamination along the route of the pipelines which should be considered when designing a Phase 2 intrusive survey.

Current Aircraft Refuelling

137. Aircraft are currently fuelled at RAF Scampton using 18 000 litre capacity fuel bowsers containing AVTUR. Bowsers refuel Aircraft at intercepted hardstandings. The Red Arrows are refuelled on the Red Arrows Servicing Pan in front of No 4 Hangar.

138. During the site visit it was established that fuel bowsers are usually parked on an intercepted hardstanding at the northern end of No 3 Hangar by day (Figure 31). On visual inspection it was noted that the edge of the hardstanding outside the hangar area is only partially bunded by kerb stones and may pose a risk in the event of a spill on or at the edge of the hardstanding. At night bowsers are parked within a fenced area at BFI 7, although one often remains at the day park, in case after hours refuelling is requested. The BFI compound has recently been refurbished with two new full retention interceptors.

Figure 31. Current 'day park' for bowsers located north of No 3 Hangar.

139. A bowser containing DIESO is also stored on the station at the day bowser park. The diesel is used for the Red Arrows dye pods, the fire tenders and other MT vehicles. The DIESO Bowser is occasionally parked on the hardstanding outside the RAFAT Dye Bay just north of No 4 Hangar. This area is intercepted but is not adequately bunded for bulk POL storage as the levels of protection would be insufficient to prevent a major fuel spillage overflowing the drains/kerbstones and contaminating the surrounding grassed areas and groundwater.

140. Station personnel (including the Station EPO) could not recall any major spills of AVTUR (F-34) in recent years relating to the use of bowsers for refuelling. There were no records of a major spill from bowsers, although it may be likely that regular refuelling practises could involve minor spillages of AVTUR, which would most likely have occurred in the vicinity of the refuelling points on the dispersals.

141. Removal of Redundant Fuel Oil Tanks from Bldg No 82. Following the transition of the central heating station (CHS) from oil fired to gas fired, the six fuel tanks associated with it were removed (Figure 32). An initial investigation of the tanks discovered asbestos materials in the oil valves and on the pipe leading to the boiler house, which was duly removed. Initial soil samples were taken from outside the above ground tank bunds and tested for total petroleum hydrocarbons (TPH). The highest levels for TPH were 1290 mg/kg (Tank no 5), indicating that the surrounding soils had been contaminated from activities at the CHS.

Figure 32. Building 82, Central Heating Station with the area where fuel tank compound was formally located.

142. The tanks were emptied to dispose of the remaining heavy fuel oil they contained and wastewater was collected from the bund before tank removal. The tanks were then removed (Jun 97) and all remaining structures (bunds etc) were subsequently demolished.

143. After tank removal, a second suite of soil sampling was carried out (Jul 97), this time from beneath the location of the former tanks. The results showed elevated levels of total petroleum hydrocarbons (TPH) in the soil underlying the tanks, with the highest concentration being 2510 mg/kg. Subsequently, a large quantity of contaminated soil was excavated from the area (Aug 97), taken off site as 'Special Waste', and disposed of accordingly.

144. Following soil removal two further samples were taken (at depth) within the excavated area. The highest level of TPH, taken at a depth of 1.8m (at bedrock), reached 972 mg/kg, suggesting that further hydrocarbon contamination still exists. The WSM also had anecdotal evidence that a spill had occurred in that area in the past. In addition to the hydrocarbon contaminants present, several other substances were identified during soil analysis in addition to weathered heavy gas oil, including: coal tar based creosote, lubricating oil, and polyaromatic hydrocarbons (PAHs), specifically phenanthrene, pyrene, fluoranthrene and related products and benzo(a)pyrene and benzo(c)phenanthrene. It is thought that yet still more contamination of soils may exist beneath the CHS Building itself. After further consultation with the Environment Agency it was advised that a visual inspection (under duct slabs) should be made to assess the extent of the contamination under the main CHS building. No further contamination was discovered under the floor duct slabs and therefore further investigation under the building was not undertaken. The excavated area was finally backfilled with 'clean' aggregate, top soiled and grassed over.

145. There is no record of any further groundwater investigation and so it is not known whether the groundwaters have also been subject to hydrocarbon contamination. The ground under the CHS will require further investigation (soil sampling) when it is eventually removed.

146. WWII Fuel Compounds. The 1946 Air Ministry Plan lists two "Fuel Compounds". These were located just to the north of the CHS (Bldg No 82) and may have stored both solid fuel (coal) and liquid fuels types over their existence. It is therefore possible that the PAHs detected in the soil at Bldg No 82 could be linked to coal burning at the CHS. It is therefore also possible that these "Fuel Compound" areas could, potentially be contaminated from solid and liquid fuel related products.

147. Removal of ESA/SSA Standby Generator fuel tanks (Bldg No 416). A standby generator (Bldg No 416) was located within the SSA complex. Two underground tanks each of approximately 22 700 litres nominal capacity fuelled the generator. The tanks were buried between the generator Bldg No 416 and the SSA Admin Block (Bldg No 401). The tanks were installed in 1960 and had been disused for some time, probably since the mid 1970s, but had not been decommissioned. They had both held PLANT DIESO fuel and were found to be lying on bedrock. No soil samples were taken at the time of removal. On removal the two tanks and associated pipework were emptied of residual fuel and then purged with nitrogen gas, prior to cold cutting and dismantling. The tanks were then removed and processed for smelting. The concrete resulting from the demolition was then used to backfill the excavation, which was covered in soil from BFI 1, then seeded with grass.

148. Since the available records do not indicated whether any contamination was found in the vicinity of the redundant tanks, there is the potential hydrocarbon contamination of the ground.

149. The generator building (Figure 33) was accessed for a visual inspection during the site visit. Residual oil staining was found on the floor of the building despite the generator having been removed. It is possible there may also be some residual contamination in the ground under the building and soil sampling will be required.

Figure 33. Inside the Emergency Power House (Bldg No 416) at the SSA.

150. MT Fuel and POL Storage. Various MT fuel installations have been used to store fuel for use of vehicles at the site. There have been two technical MT sections since WWII and one MT section on the WWI site, although the latter is poorly documented. The WWII MTSS is located in the south of the technical area, behind No 2 Hangar. The more recent MT storage facilities and wash down plant is located to the north of the main technical site and incorporates the old T2 Hangar (Bldg No 20). Historical POL storage areas are listed on the 1946 Air Ministry Plan and the modern site plan, which are discussed in the following sections. The locations of all past and present POL storage areas are shown on the plan of actual and potential contamination at Enclosure 7, Volume 2.

151. Current MT fuel storage. The current MT fuel storage area is a kerbside facility located on Hardstanding No 17 at E Dispersal (Bldg No 617). The vehicle/Diesel bulk fuel facility is an all-bunded modular building (Figure 34). The facility holds MT Dieso in one 11 000 litre tank, and UK Dieso in a second 25 000 litre tank. The UK Dieso is for mixing with the dye used in aerobatic displays. The facility area is bunded by kerbs with surface water drainage falling to a local below ground full retention interceptor of 10 000 litre holding capacity.

Figure 34. Current MT fuel storage facility located on hardstanding No 17 at E Dispersal.

152. Recently Removed MT BFIs. Three underground MT tanks were installed in 1965 (Bldg No 507) located at the vicinity of a round dispersal just off the main taxiway in front of No 4 Hangar and west of BFI 2 (Figure 35). The hardstanding of the dispersal provided access for fuel tankers and MT vehicles, which were filled by kerb side pumps. The installation included pumps, distribution pipework, electrical services, pump rooms, standing areas for tankers, drainage and water services. The tanks had capacities of 5 000 gallons (22 700 litre), 3 000 gallons (13 600 litre) and 4000 gallons (18 000 litre), with the 5000 gallon tank containing MT Gas and the other two containing UK DIESO.

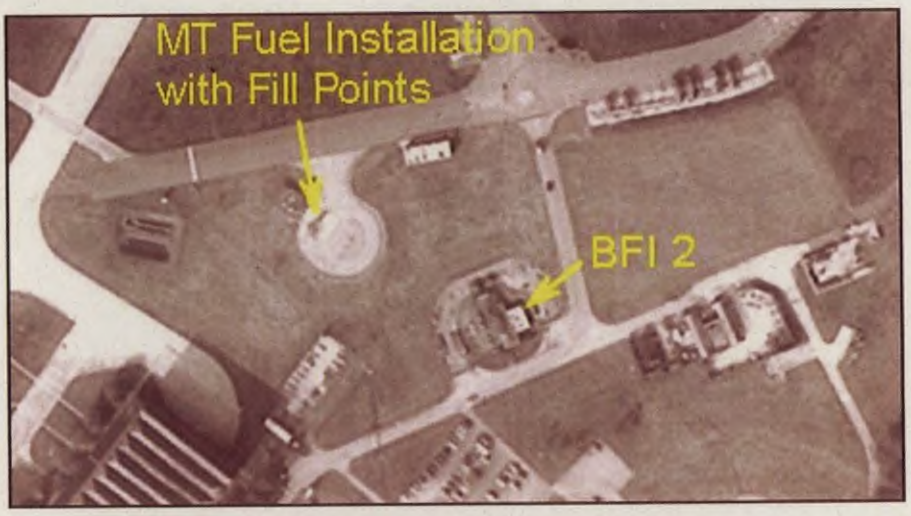

Figure 35. Showing the location of the recent MT fuel installation (Bldg No 507) in 1992.

153. In 1997 the MT installation was removed. The three tanks and fuelling pumps were emptied of all residual fuels and the tanks foam filled, excavated and taken to licenced

landfill. The tanks were mounted on a concrete base resting directly on the Limestone bedrock, and so no soil samples from under the tanks were obtained. Hydrocarbon contamination of the soil was found at the loading points; this was subsequently removed off site to licenced landfill. The tank excavation damaged a nearby water main, which was subsequently repaired. The excavation was backfilled using the material surrounding the tanks and soil from BFI 2, the area was then topsoiled and grassed.

154. The available records do not state whether there was any contamination present around the tanks themselves, therefore it is unknown whether any contamination exists under the tanks. A historical 1950s contamination risk plan (held by the EWC) states that Bldg No 507 had no drainage. During the removal of the installation contaminated soil was found at the fill points. This soil was excavated and removed off site. However, since the hardstanding had no drainage, any spilt fuel could have potentially leached into the ground beneath the hardstanding.

155. Historical MT Fuel Installations. Historically the MT section was located in the south of the technical site. The old MT section had a bulk petrol installation (Bldg No 163) with a capacity of 5 000 gallons. The single tank was buried and probably installed in the late 1930s during original site construction. It is thought that the tank was decommissioned in 1965. It is unknown whether the tank still remains in the ground and no documentary evidence was found indicating whether any soil sampling, laboratory analysis and subsequent remediation of the ground had been carried out at the location of the underground tanks. The area is now grassed and no evidence remains of the former installation (Figure 36). It must be noted that the hardstanding which vehicles were filled on has never been intercepted and so it is highly possible that spilt fuel could have entered the surface water drainage system. The site investigation noted that the drains appeared to be free from visible contamination.

Figure 36. Site of old MT Bulk Petrol Installation (Bldg No 163).

156. At the old MT section there is an above ground waste oil tank of 3 500 litres capacity (Bldg No 161). Station personnel state that the tank is now empty. The tank is linked to a sump collection system at the MT servicing bays, which collected waste oil from the inspection pits/sumps and pumped it into the tank. On visual inspection the tank appeared structurally sound, but has never been bunded and lies halfway over the bare ground (Figure 37).

Figure 37. Waste oil tank next to Bldg No 161 at the MTSS section.

157. Small amounts of fuel and POL would most probably have been stored at the MTSS area for the servicing of vehicles including materials used in paint stripping, and paints. Since all buildings were welded shut at the time of the site visit (since station closure) an assessment of the condition of the servicing bays could not be conducted, and so it remains unclear whether there have been oil spills in the bays, or whether the service pits are clean.

158. Ground Fuels. Historically there have been a number of storage areas across the RAF Scampton site that have been used for the storage of furnace fuel oil (FFO); petrol, oils and lubricants (POL); diesel and waste POL. All historical ground fuel BFIs were visually inspected during a site walk over.

159. Current POL Stores. The site investigation visually inspected all recent and historical POL storage areas including FFO tanks, where access was permitted. POL is usually stored in above ground tanks or in lockers outside the associated buildings.

160. Packed POL Compound (Bldg No 40). During the site visit a preliminary intrusive investigation was being conducted at the Packed POL compound, an area of hardstanding surrounded by kerbstones. During excavation of part of the hardstanding to replace a drain and upgrade the bund it was noted that the surface water drain, which consisted of earthenware sections, had collapsed. The area was used during the WWII site as a "Petrol Compound", and is suspected to have been prone to fuel spillages up to the time of station closure.

161. When the drain was excavated for refurbishment, hydrocarbon contamination was discovered in the soils beneath the concrete hardstanding. Following a meeting with the contaminated land officer at the Lincoln office of the Environment Agency, four trial pits were dug down to bedrock (max depth of soil approximately 1.75m) and soil samples were taken in order to assess the presence and degree of hydrocarbon contamination. Trial pits 1, 2 and 4 were dug from the centre of the excavated hardstanding outwards (Figure 38). It was considered that to determine how far the contamination may have migrated, it would be necessary to take the samples as close to the edge of the compound as possible. Therefore trial pit 3 was dug as a single hole, independent from the rest of the excavation and did not display any evidence of contamination. Samples were taken at approximately half the depth of the trial pit on either side and a third sample was taken at the soil/bedrock interface at the base of the pit.

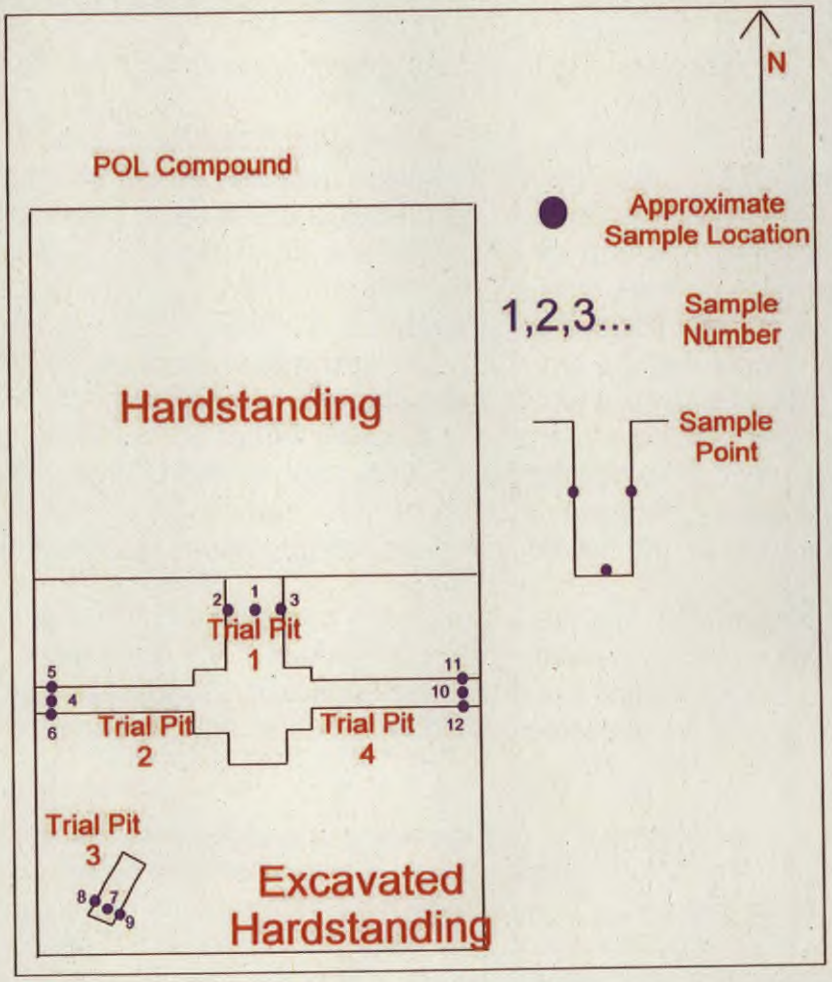

Figure 38. General plan of intrusive investigation (not to scale).

162. During the excavation a smelly odour and black/grey residue was observed, to varying degrees throughout the soils. Contamination was also suspected where residual product rested on a sandy clay horizon at the rock head. Contaminated soil was excavated from the area and stored in a temporarily bunded area at the former Motor Club before being removed to licensed landfill (Figure 39). The remaining excavation pit was temporarily covered with a tarpaulin to prevent the ingress of rainwater and limit the migration of remaining product.

Figure 39. (left) Trial pits dug to assess extent of contamination and (right), resultant spoil.

163. The initial soil samples were screened for Total Recoverable Petroleum Hydrocarbons (TPH), with the highest value detected as 1882 $mgkg^{-1}$ at a depth of 1.6m (at bedrock). Preliminary laboratory interpretation of the soils, based on olfactory observation, suggested hydraulic oil and weathered aviation fuel might be present. The approximate sampling points and a general schematic of the area under investigation (together with analytical results) is provided at Enclosure 9, Volume 2. It should be noted that due to the constraints imposed at the time of the sampling exercise it was not possible to take a sample of soil as a control and the sampling equipment was not to British Standard. In addition, an oily residue was noted in the JCB digger bucket following washing with tap water. This was due to contamination from asphalt and bitumen remaining stuck to the inside of the bucket from previous works. The sampling exercise was not satisfactory to accurately inform on the actual concentration of contaminants in the ground.

164. It is highly likely that the main source of contamination was from the leakage of cracked drain sections that served the compound. The drain flows into an underground separator, which is itself in good working condition. Sources of contamination at the compound could potentially include various POL products, solvents, de-greasing agents etc.

165. It is suspected that the surface water drainage system across the site is in a poor state of repair. Therefore, cracked drain sections serving other technical areas across the site, could potentially provide a pathway for contaminants to migrate directly into the ground before they reach an interceptor. For example, at the MTSS section courtyard, where it is thought that the drains are not intercepted and the condition of the drains is uncertain. The legacy of cracked drains poses a risk to the condition of the ground and groundwater systems and therefore the provision of effective drainage should be addressed when considering any redevelopment of the station infrastructure.

166. Waste POL is currently stored in self-bunded steel containers on the access road of the former BFI 2 (Figure 40).

Figure 40. POL storage containers on hardstanding at the former BFI 2.

167. Waste Oil Compound. The current waste oil compound (Bldg No 498) holds 45 gallon drums of various chemicals including: Dye (red and blue for the RAFAT displays), self-contained bunded containers, nitrogen tanks and drums of waste AVTUR. On inspection it was noted that the bunding at the edge of the compound was cracked, although the compound appeared reasonably clean and tidy (Figure 41).

Figure 41. Waste oil compound (Bldg No 498) showing cracked bunding around the edge and on the compounds concrete base.

168. It should be noted that the ad hoc storage of unbunded drums may ultimately lead to the contamination of surface and groundwater systems. The following conditions were noted during the survey with respect to POL storage:

a. Several 45 gallon metal drums of diesel were being stored unbunded on the edge of hardstanding outside the RAF Dye Bay. Any spillage could run straight onto the grass, as the area is not bunded.

b. The civilian 'Tucano' aircraft servicing company was storing drums labelled 'waste AVTUR' on an octagonal hardstanding 17 at E Dispersal. The hardstanding has recently had new kerbstones laid and a new underground oil interceptor installed, however the drums were being stored by the edge of the hardstanding where bunding kerb stones are absent (Figure 42). Any spillage could run on to the grassed area at the edge of the hardstanding and ultimately contaminate the groundwater.

Figure 42. Storage of waste AVTUR and other waste substances at the edge of No 17 hardstanding, E Dispersal.

c. Staining was identified on the ground at the standby set house (Bldg No 157). The building has 3 above ground bunded tanks each of approximately 54 500 litres used for the storage of Plant DIESO. The unbunded fill point on one of the tanks was dripping oil onto the road, which is served by a surface water drain (Figure 43). This provides a direct pathway for hydrocarbon to enter the surface water system. Staining was also found around the base of the door of the standby set house. Anecdotal evidence suggests that there was a recent oil leak inside the building. On inspection of the facility it was noted that the sump under the generator still contained oil. The outside brick walls of the building were also stained from oil leakage over time and oil drums were being stored unbunded inside the building. Therefore, it is possible that residual fuel oil contamination is present within the building materials and therefore also potentially in the ground under the building.

Figure 43. Diesel found dripping from a Standby Set House (Bldg No 157) tank fill point (left) onto the tarmac road (right).

d. An unbunded drum labelled "Transformer Oil" and waste oil cans were found at the back of the standby set house (Figure 44).

Figure 44. Transformer oil drum and miscellaneous oil cans at the back of the Standby Set House.

e. Miscellaneous half full 25 litre drum labelled "hydraulic oil 32" being stored unbunded and in the open, outside Building No 404 in the SSA (Figure 45).

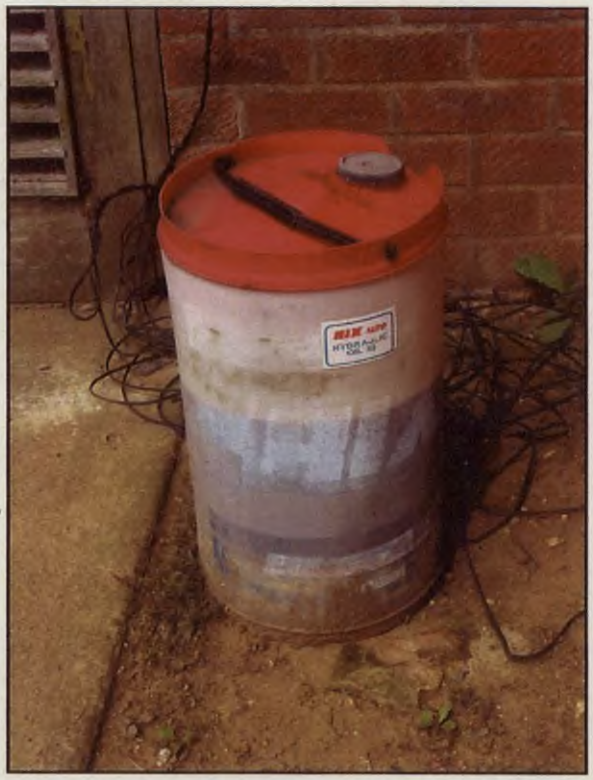

Figure 45. Half full drum left at the ESA/SSA.

f. Staining was also noted on the door of the former MT spray bay at Bldg No 507, possibly as a result of solvent spillage (Figure 46).

Figure 46. Staining at MTSS Spray paint bay

g. Both bunds at each of two 7 500 litre tanks supplying the Uniter buildings Nos 602 and 601 (Figure 47) were full of water. In the event of a tank rupture the bunds may prove ineffective. Bunds should be free of rainwater and other debris to ensure full holding capacity is available.

Figure 47. Water filled bunds at Uniter NUB 1 & 2 (Bldg Nos 601 and 602).

h. A temporary diesel tank (Figure 48) is located within the salvage compound (now Ground Services and Maintenance), Bldg No 65. The tank shows fuel staining on the outside, at the dispense point, the base of the brick bund and on the surrounding floor area. Due to the poor design of this facility any leak from the sides of the tank are likely to bypass the bund wall and contaminate the ground in the vicinity and groundwater.

Figure 48. Staining on diesel tank and fill area at Bldg No 65.

169. Historic Fuel Oil Storage. A "bulk oil installation" (Bldg No 132) is listed on the 1946 Air Ministry Plan. The installation had a nominal capacity of 7000 gallons (32 000litres) and held fuel oil during WWII. The installation was located east of Bldg No 133 and anecdotal evidence suggests tanks are now disused or removed. On inspection of the area there was no indication at the surface that the installation remains in the ground. There is the potential for hydrocarbon contamination at this location until proven otherwise.

170. Additional Fuel Storage. An unmarked fuel fill point (Figure 49) exists in the visitors car park at the main site entrance. Anecdotal evidence suggests that the point is used to fill a fuel tank situated at RAF Scampton Primary School via an underground pipeline. On inspection it was noted that the unbunded fill point was stained with black oil and that the ground beneath the point had minor contamination. Neither the age of the fill point and tank or the capacity of the tank was ascertained. It is unknown what the current condition of the pipeline is, whether there has been any maintenance/testing carried out on the pipeline or any spillage incidents reported.

171. A visual inspection could not ascertain whether the pipeline was suitably protected against corrosion (for example with cathodic protection) or equipped with a leakage alarm indicator. The pipeline is suspected of having mechanical joints underground that are not easily accessible by removing a hatch or cover and the fill point is not fitted with a drip tray. The pipeline is very close to a controlled water (the underlying aquifer). It is possible that the Regulatory Authority will consider that it contravenes The Control of Pollution (Oil Storage)(England) 2001 Regulations that came into force in September 2003 for installations within 10m of a controlled water for some of the points above.

Figure 49. Fill point for the fuel tank at Scampton Primary School, located in the RAF Scampton visitor's car park.

172. Domestic Kerosene Tank. An underground kerosene fuel tank (Bldg No 592), of capacity 34 000 litres, and associated pipework is located just south of [redacted] at NGR SK 971 785. The Buried Tank Integrity Study undertaken by SO POL in Jan 96, suggests the tank was installed in 1971 to supply domestic heating fuel to the Officers Married Quarters and was filled every 9 months. It is surmised that before 1971 the Quarters boilers were coal-powered. When the RAF sold these properties to Defence Estates after Station Closure, DE also took on the responsibility for the installation. It is thought that the tank may remain in the ground because pipework could be seen in an underground service duct at the documented location of the tank. No evidence was found in station files to suggest that the tank has ever leaked.

173. As with any old BFIs there is a potential for leakage, especially in old tanks, and so it must be considered that the surrounding ground could potentially have been subject to hydrocarbon contamination. It is recommended that the relevant parties should formally conduct an investigation into the current status of this installation. As with the pipeline at the primary school, the underground tank and associated pipelines used to fill the tank and also feed the married quarters could contravene The Control of Pollution (Oil storage) (England) 2001 Regulations, if the system contains residual fuel and has not been decommissioned satisfactorily.

Interceptors and Outfalls

174. The condition of the drainage network is considered to be poor at RAF Scampton. At the time of the Site Visit a CCTV site survey of all surface and fowl drains was being undertaken in order to assess the condition of the drains and determine the extent of the active drainage network. The results of this survey are available from the Establishment Works Consultant (EWC). There are 10 oil traps listed in the current RAF Scampton building register. In addition there are three oil separators on the site. It is believed that not all the surface water drainage from the site is intercepted. Soakaways are located at each of the oil interceptor except the main interceptor at [redacted] (Figure 50), which discharges to outfall. The interceptors are inspected annually by the works service staff and cleaned as appropriate.

Figure 50. Interceptor at Canberra Drive.

175. A survey of the stations interceptors/oil traps was carried out in Nov 92. The survey concluded that the general condition of the oil traps is satisfactory, however defects of individual interceptors were incurred. A visual survey of all interceptors was carried out during the site visit, which found that the majority of oil traps were in a reasonable condition.

176. A Supply report dated 19 Oct 93, gives reference to a considerable amount of flooding which submerged the Canberra oil trap installation. The record also states that there was oil product floating on the water surface, which may have derived from the interceptor catchment area. The report goes on to suggest that the oil-based product may cause contamination of the surrounding ground when the water subsides. There may be a residual contamination issue in this area.

177. On site boreholes. Boreholes under certain circumstances can provide a direct pathway for contaminants to enter groundwater and are therefore an area of concern. Disused abstraction boreholes are especially vulnerable as they can act as a pathway for surface and subsurface fluids directly into the aquifer below, leading to contamination of the groundwater. RAF Scampton has had several boreholes dug during ground investigations, the details of which are held in the technical reports held within the EWC archive. The locations of boreholes at RAF Scampton have been provided at Enclosure 10, Volume 2.

Electrical Installations: Naphthenic Oils and Polychlorinated Biphenyls (PCBs)

178. Electricity is distributed around the site via 17 Distribution Substations (DSS) from the intake substation at Bldg No 54. At each of the transformer locations, there is the possibility of ground contamination by transformer oils containing polychlorinated biphenyls. Although naphthenic oils tend to have been used in installations on RAF airfields in recent years, it is considered likely that PCBs were used in the past. Therefore all known past and present DSS locations have been included on the Plan of Actual and Potential Contamination at Enclosure 7, Volume 2.

179. Many of the contemporary electrical installations were installed during the V-force reconstruction phase between 1955 and 1958. Some installations were installed in the late 1930s during the original station construction. Several installations have recently been demolished/removed and isolated following station closure in 1996. A list of the remaining installations is provided below.

a. Distribution Sub Stations (DSSs) - 17 on 2002 building list: G, M, N, P, Q, V, W, X, Y, Z, AA, BB, CC, DD, EE, HH, JJ.

b. Intake Substation (ISS) - Bldg No 52.

c. Standby Set House (Bldg No 157): SBSS transformers 1-3.

d. Central Heating Station old transformer (Bldg No 82).

e. BFI 7 Standby Power House (Bldg No 302).

f. Power House/Shorts ALS (Bldg No 422).

g. HV Substation KK (Bldg No 528).

h. ESA set.

180. Four High Voltage (HV) Substations within the domestic site have changed ownership since 1996 and are not at present the responsibility of the EWC. They include:

a. [redacted] HV Substation (Bldg No 568A).

b. Officers Playing Fields HV Substation (Bldg No 569).

c. [redacted] HV Substation (Bldg No 570).

d. [redacted] HV Substation (Bldg No 571).

181. In addition, two DSSs have been removed since 1996, they are:

a. DSS U (Bldg No 578 - D Dispersal).

b. DSS RR or R (Bldg No 593 - B Dispersal).

182. Shell Oils carried out a "Spot Check" Investigation into all existing installations containing insulating oils at RAF Scampton in September 1995.

183. Out of the 19 transformers tested, 15 installations contained PCBs as a constituent of the oil, with most detectable concentrations ranging between 1 to 5.6 $mgkg^{-1}$. There was however, one exception, DSS AA (Bldg No 582), which showed a level of 74.9 $mgkg^{-1}$. DSS AA was noted to show signs of staining during visual inspection on the site visit (Figure 51). It is unclear whether DSS AA has been drained of its PCB contaminated oil, flushed clean and replenished with a PCB free alternative. It is a requirement under legislation that these installations should no longer contain PCBs.

Figure 51. DSS AA, showing signs of past leakage.

184. Oil leakage was also previously observed from a transformer at DSS X, but this was one of the five installations tested with PCB levels below that of the detectable limit, (i.e. <1 $mgkg^{-1}$). There is no documentary evidence to suggest soil samples were taken to establish the extent of any resultant contamination or the species of contaminants present. It is possible the leakage occurred while the installation contained PCB based insulator oil. At the time of the survey it appeared that the DSS at the standby set house was leaking (Figure 52).

Figure 52. Leaking transformer at the standby set house (Bldg No 157).

185. At present the transformers at RAF Scampton have their oils changed every 3 years basis and the feeder pillars have their oils changed annually. There is also a rolling programme to replace the old transformers across the site.

186. Power Factor Correction Capacitors and Mains Filtering Capacitors. Four of the DSSs at RAF Scampton (X, Z, EE & JJ) were fitted with power factor correction capacitors (PFCCs) in Jun 85, which were utilised to improve the efficiency. None of the 4 PFCCs fitted at Scampton are a type that contains PCBs. There are no Mains Filtering Capacitors (MFCs) at RAF Scampton.

187. Electrical Equipment. In general, PCBs have been used traditionally in capacitors as dielectric materials. It is likely that much of the electrical and electronic equipment, which might be found in buildings and aircraft at RAF Scampton, could have contained such components. Although, all equipments and spares should have been cleared from the site before disposal, any equipment that has been either burnt or stored at the site has the potential to cause contamination from PCBs. For example, the Scrap Compound (originally Bldg No 62) situated between Bldg No 65 and 59, may have stored disused electrical goods, which could have contained PCBs, therefore minor contamination from PCBs in such areas should be considered.

188. Historical Electrical Installations. It is considered unlikely that the WWI site would have had large oil filled transformers as power distribution was from the on site "Power House" a facility listed on the 1918 Depot Station Building List.

189. Second World War. The 1946 Air Ministry Plan Building List, references several electrical installations which are listed below:

a. Transformer Plinth (Bldg No 1) - supplied electricity to Eastern WWII Bomb Stores. This installation no longer exists, but was located near the present DSS W to the north of the Engine Running Platform (ERP).

b. Transformer Plinth (Bldg No 96) - supplied electricity to technical site in WWII. No longer exists, but was located adjacent to Bldg No 97, behind No 3 Hangar.

c. Transformer Plinth (Bldg No 156) - supplied electricity to technical site in WWII. No longer exists, but was located adjacent to the Standby Set House (Bldg No 157) and east of BFI 1.

d. Standby Set House (Bldg No 157) - building still present, housing standby generator, located behind No 1 Hangar.

e. Transformer Plinth (Bldg No 262) - supplied electricity to the southern part of the site. This installation no longer exists, but was located near the present day hardstanding 25 at F Dispersal.

f. Transformer Plinth (Bldg No 275) - supplied electricity to northern WWII Bomb Stores. No longer exists, but it was located approximately between the current Bldg Nos 401 and 402.

190. At each of the former transformer locations there is a potential for contamination of the soils and any remaining foundations from historical leakage of transformer oils, and therefore potentially PCBs, which were often a constituent of the transformer oils.

191. In addition to the DSSs on-site, there are smaller electrical connection boxes on the V-Force dispersals. These electrical installations probably served as an electrical 'hook up' for Vulcan aircraft.

Engineering Workshops, Supply and Related Activities

192. Whilst in recent years, disposal of waste substances has been carefully controlled, with the implementation of waste management principles, in the past a wide range of materials have been used and improperly stored and disposed of. Therefore where past engineering practices have been carried out there remains the potential for contamination.

193. Substances associated with engineering include oils, greases, lubricants; hydraulic fluids; degreasing agents including VOCs; paints (likely to contain isocyanates, chromium compounds etc), thinners and related cleaning agents; historically, fuselage dopes; engine coolants, antifreezes, and de-icers (glycols, etc); batteries (lead/cadmium), acids and alkalis; smoke dye stuffs; detergents or cleaning agents (containing sulphates) used for air craft washing and vehicle washing, chlorides used in laundering; silver nitrate and other substances used in photographic development etc.

194. Technical site environment. The potential for localised contamination of the ground and certain technical components in the vicinity of the buildings associated with technical practises needs to be considered. The main technical buildings past and present include:

a. Hangars 1 - 4 (Bldg Nos 45, 46, 47 & 48).

b. Engineering workshops and miscellaneous servicing facilities.

c. Paint spraying facilities (Bldg No 506, at MTSS).

d. MT servicing facilities (MTSS).

e. Vehicle and aircraft washing facilities (No 2 Hangar, ERP and MT wash plant).

f. Battery charging facilities (Bldg Nos 133A and 404).

g Hydraulic rigs - Tucano flight simulator (Bldg No 599) and launcher simulator (inside Bldg No 398).

h. Red Arrows Dye Store (previously at Bldg No 50, now Bldg No 616).

i. Former Humber Gliding Club (Bldg No 59 - store).

j. Former motor club.

195. Servicing at Hangars and Dispersals. In view of the Hangars being at the centre of most aircraft servicing activities throughout the existence of the station, the potential for technical related contamination in the vicinity of these particular areas is probable. The areas where technical activities take place outside the hangars are now concreted and well drained via interceptors. However, historically (pre-1944) in the vicinity of the hangars the ground was grass on which servicing of aircraft would have been carried out. It is likely that fuel and chemical spills would have occurred in the vicinity of the hangars. Any potential contamination at the hangars is likely to have been moved elsewhere as a result of the hardstanding construction. The contamination present at the dispersals and hangars is likely to be diffuse and would have undergone a high degree of natural attenuation, and therefore is unlikely to present a significant contamination hazard at present.

196. Airfield De-icing Activities. Three substances (Konsin, Urea and BP Clearway) have been widely used on the operating surfaces at RAF Scampton (runways, taxiways, hardstandings) in past and present years, with limited use on the technical site, during winter months. Road Salt (sodium chloride) will also have been widely over the site (road surfaces) across the site. Only BP Clearway 3 (which is mainly potassium acetate) is currently used on the site. Ad hoc storage of the 45 gallon drums in No 3 Hangar was noted during the site visit. The hangars are well drained via an interceptor and BP Clearway 3 should not present a major risk in the event of a spillage, as its risk rating is "Low". The station keeps a record of the usage and volumes of de-icer used.

Motor Transport (MT)

197. MT Paint Spray Bays. The condition of the MT paint spray bays (Bldg No 506) could not be assessed due to a restricted access to the facility at the time of the site visit. The facility has not been used for a number of years (Figure 53). Details regarding drainage of this section remain obscure, but it is thought that the surface water drainage in this area has never been intercepted. On inspection it was noted that there is staining at the bottom of the door at Bldg No 506.

Figure 53. MTSS paint spraying facility.

198. MT Storage/Vehicle Park. The MT general storage and vehicle park is located to the north of the technical site, the section occupies several buildings, including the T2 Hangar (Bldg No 20), storage areas, vehicle parks and a vehicle wash area. Minor vehicle servicing would have taken place at MT. On visual inspection of the T2 Hangar, it appeared to be relatively clean and in good condition with the appropriate precautions in place to deal with any minor spills. Bldg No 20 is currently used for storing the main fire tender, however there are plans to build a new garage at the current Fire Section. While the section was still relatively active before closure in 1996, vehicles were parked on hardstanding areas positioned around the perimeter track that runs around Bldg No 20.

199. Vehicle Wash Plant. The vehicle wash plant (Bldg No 460) located at the MTSS has not been used for some time (Figure 54). The wastewater from the facility is recycled, with the resulting waste being collected in a tank and disposed of off site. As previously discussed vehicle washing is currently only permitted at the consented aircraft wash plant located in No 2 Hangar.

Figure 54. MT vehicle wash plant (Bldg No 532).

200. The 1946 Air Ministry Plan identifies the current Bldg Nos 159, 161 and 162 as the main WWII MT servicing bays.

201. Electrical Engineering. The station site plan of RAF Scampton indicates that battery servicing took place at two locations on the site. Firstly, at the Battery Recovery Shop (Bldg No 133A), next to the main workshops (Bldg No 133) on the main technical site (Figure 55), and secondly at a Battery Charging Room (Bldg No 404) located within the SSA complex. There is a potential for lead contamination at both these sites from battery acid leakage and disposal. During visual inspection of the Battery Recovery Shop it was noted that the acid was drained into a ceramic sink, but the disposal route for drained waste acid is unknown.

Figure 55. Battery Recovery Shop (Bldg No 133A).

202. There is the possibility that acid could have spilt on the ground at this facility during routine servicing of batteries. This activity has the potential to contaminate the ground with heavy metals at this location, which should be considered when carrying out intrusive works in the future. A waste acid tank for the collection of acid prior to removal has not been identified at the station, a facility that was common on many stations.

203. Additional electrical engineering would probably have taken place at the squadron workshops within the hangars around the station. It is possible that waste battery acid would then have been disposed of at a neutralisation pit nearby. It is likely that this pit would go to soakaway, which could have led to an elevated level of lead at that location. It is possible that the pit exists on site and has yet to be discovered, which should be considered when carrying out intrusive works in the future.

204. Humber Glider Club. It is suggested that the former glider store (Bldg No 59) could potentially be subject to residual contamination from maintenance related activities.

Contractors' Yards

205. Works Services Area. The station work services operate from the following buildings:

a. Bldg No 144 (SHQ) and 599 - 600 (EWC portakabins).

b. Bldg No 65 (Ground Maintenance).

206. A Service and Maintenance yard is located at Bldg No 65. A visual inspection was carried out at the yard, which found old fluorescent tubes piled up in a corner. The tubes were not double bagged and were being stored in the open on concrete.

207. Historical Ground Maintenance Yard. From the WWII site up until closure there has been a contractors stores and compound at Bldg No 22. The compound was demolished on station closure and a concrete base now only remains, the yard is clearly visible on the 1942 aerial photograph, showing signs of disturbed ground in the northern quarter of the compound. A picture of the compound in 1992, shows the layout of the compound has not changed markedly from that time (Figure 56).

Figure 56. Contractor's facilities consisting of buildings and yard areas (1992).

208. It is likely that machinery maintenance was carried out in this area involving the use POL substances. It is also likely that disused parts, old batteries, creosote and POL drums would have been stored in the compound and ad hoc burning practises may have gone on in the yard. This area has the potential for contamination from a variety of hydrocarbon-based substances and other technical substances. The area has never been intercepted and so it is likely that effluent/spilt substances could have leached directly into the ground where they may reside or they may have naturally attenuated.

WASTE MANAGEMENT ISSUES

Current Practice

209. Waste Disposal - Controlled (Directive) Waste. Controlled waste is collected on site in skips and then taken for disposal by a number of specialist waste contractors. Non-hazardous waste, including paper, plastic bags and containers, glass and food waste, produced across the station is put into skips, which are emptied by a waste contractor.

210. Special Waste. Waste POL and AVTUR is stored in identified drums in the waste POL compound (Bldg No 498). Waste dye and diesel from the Red Arrows dye bay is stored in a demarcated tank at the side of the building.

211. Solvents and Thinners. Waste solvent from the painting and finishing facilities are collected and disposed of off-site by a suitably licensed contractor.

212. Clinical Waste. RAF Scampton generates little clinical waste. Babcock (HSC) oversees the collection, storage and disposal of all types of clinical waste produced.

213. Contracts for disposal of waste are let to specialist contractors through the 'John Mowlem & Aqumen Services Ltd' Contract (MAC) and the waste is collected in accordance with the MAC Statement of Requirement. Babcock (HSC) RAFC Cranwell has a site foreman at RAF Scampton who administers and monitors the waste contracts.

Historical Practice

214. Waste Tipping Sites. The site walk over identified no current areas of waste tipping on the site. There were a number of potential off site waste tipping areas identified close to the perimeter of the station, which were former quarries that could have been subject to historical tipping by the RAF. It should be noted that ground maintenance clippings and runway sweepings are removed off site to RAF Cranwell for disposal.

215. A review of archive aerial photographs and maps, together with the Land Use History and site walkover identified a number of areas of possible disturbed ground and/or infilling, which have been investigated in this report and have been treated as potential historical tip sites. All potential tip sites have been included in the Plan of Actual and Potential Contamination found at Enclosure 7, Volume 2. The areas identified may deserve further investigation in view of their potential impact on the groundwater system leading to the contamination of a controlled water, an offence under the Water Resources Act 1991, and the potential hazard of methane gas production as a by-product of organic decomposition. An offence may also be committed where a source of contamination is present in the ground that has a proven pathway to impact on a receptor. The land may be legally

determined as contaminated land under the Contaminated Land (2000)(England) Regulations. In addition, the RAF may be liable under the 'polluter pays principle' which could be imposed if it can be proven that the tipping on and off site is proven to arise from military sources.

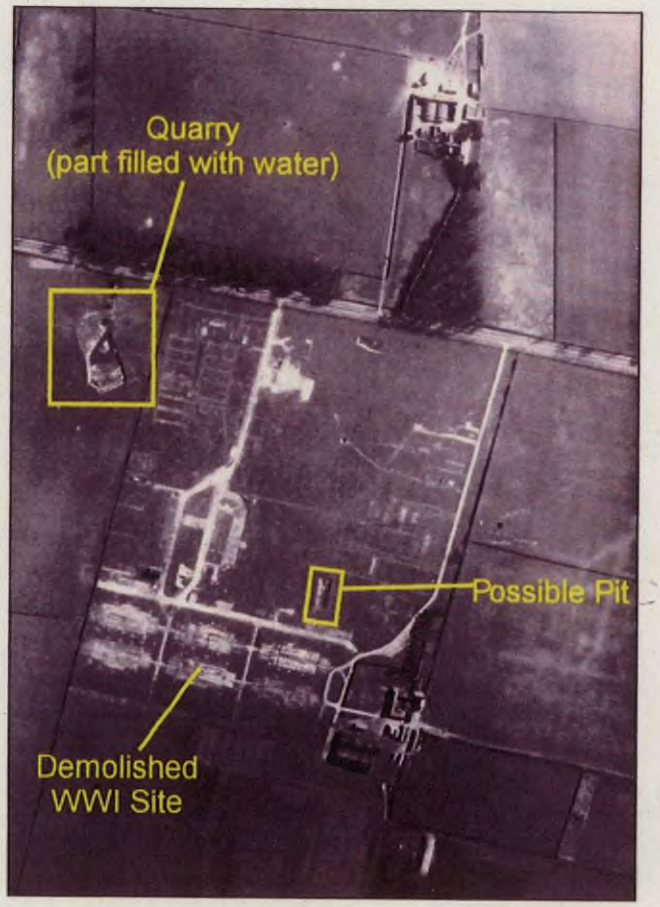

Figure 57. WWI Training Depot Station with quarry annotated.

216. WWI 'on site' Tip. The 1891 Ordnance Survey plan shows an "Old Quarry" within the original site boundary and the aerial photographs from 1918 show ground disturbance in the same area (Figure 57). It is possible that the station could have used this void for tipping of technical and domestic wastes between 1916 and 1920. The area is now relatively flat and is grassed over. The available evidence suggests that the area has never been built on. The centre of the large rectangular shaped area is interpreted from the old plans and photographs as being located at approximately NGR SK 9720 7982. The size of the area is estimated at 340 feet long (along its east/west axis) by 80 feet wide (along its north/south axis). A smaller area of disturbed ground that appears rectangular in shape is visible within the area of the former WWI technical site.

217. Initially, a non-intrusive approach might be most suitable to investigate this area for two main reasons. The first is that the potential landfill is located within a designated Source Protection Zone on a major aquifer, and is therefore particularly vulnerable to new contaminant pathways being created. The second is that the contents of this landfill could potentially be military specific and no EOD clearance certificate exists for this area and could therefore contain unexploded ordnance.

218. WWII. The 1918 Training Depot Station site plan shows a quarry to the south-west of the site. Disused quarries that were on or near to the sites were often the most suitable location for tipping activities. This area became officially part of the site in around 1942 and aerial photographs from 1940 show an area of recently disturbed ground and so could have potentially been used by the station from around 1936 to 1940 (Figure 58).

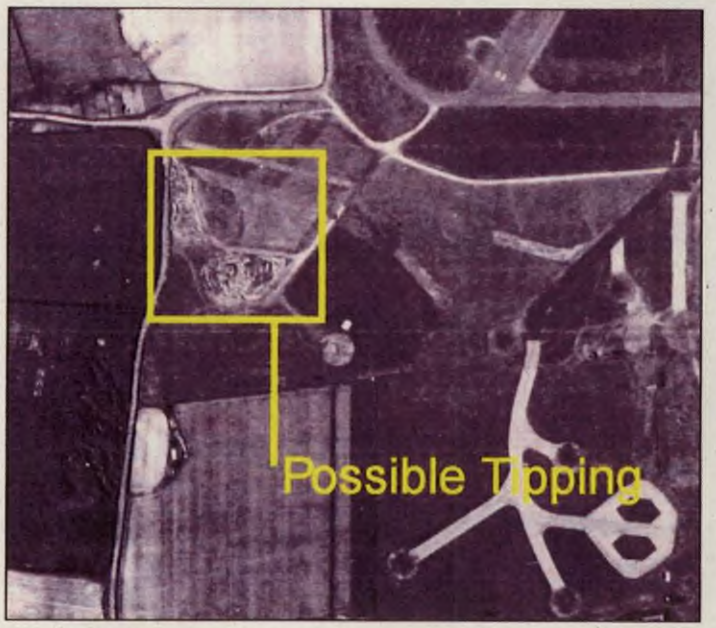

Figure 58. Possible tipping activities to the south-west of the site.

219. The site investigation noted that this area of ground now lies relatively flat, and it is suspected that this area may have been bulldozed flat when the runway was extended to the south during the V-Force reconstruction period in the late 1950s. This area was slightly raised and had highly weathered asphalt and concrete protruding from several places at the surface (Figure 59). Indeed there were WWII dispersals formally at this location and so the material could be remnants of the original dispersal surfacing.

Figure 59. Exposed weathered concrete in area of slightly raised ground to the south-west.

220. Historic Salvage Dump. Standing Orders issued during WWII for No 9 Anti-Aircraft Flight, refer to a "Salvage Dump" on the south side of Pollyplatt Lane, opposite the MTSS yard. There is no indication from the reviewed historical maps and aerial photographs that a salvage dump existed at this location. On visual inspection of this area during the site visit the area appears flat and there was no visual evidence to indicate the presence of dumped materials. Furthermore it seems unlikely that this area would have been established as major salvage ground as it bordered the Officers Mess lawn.

221. Salvage Compounds. Two station salvage compounds are listed on the 1946 Air Ministry Plan Building List. They are located on the concrete base of the former fuel stores, Bldg Nos 62 and 74. Remnants of fragmented scrap materials including asbestos, glass, electrical components, were noted on the hardstanding at Bldg No 62 during the site visit. Bldg No 65 is listed as the present salvage compound. The compound has a skip for organic waste and there was a stockpile of discarded signalling florescent tubes. The compound was also used as a ground maintenance store and servicing area.

222. Station Refuse. Anecdotal evidence from ex station personnel, whom had carried out station refuse collection and disposal since 1954, indicated that waste was not deposited on the site as it was taken off site to municipal landfills in the area. One such landfill was a disused quarry in the nearby village of Nettleham, which is now the location of the Police Headquarters. The source suggested that the removed waste included domestic and technical waste, although items such as oil drums were recycled for reuse. The closed landfill was visited for verification purposes as part of the desk study.

223. From discussions with the refuse collectors it appears that local disused quarries were often filled until full and then another was selected and filled accordingly, making it possible that a number of off site locations could have been used for waste disposal.

224. It is not known what the policy on waste disposal was on the WWI site (apart from the potential landfill area suggested) or for the period between 1936 and the mid 1950s and so waste disposal over this period remains unclear.

225. Two potential areas that have been subject to tipping activities are located to the west of the station. On the historical OS map these areas were designated as quarries (Figure 60). The site investigation extended to these quarries and noted that the southernmost quarry was virtually flat and covered in trees and other vegetation, and the northern quarry contained a three metre high mound of tipped material. Neither of these quarries were within the historic or current site boundary at RAF Scampton and may have been used to tip materials before the mid 1950s.

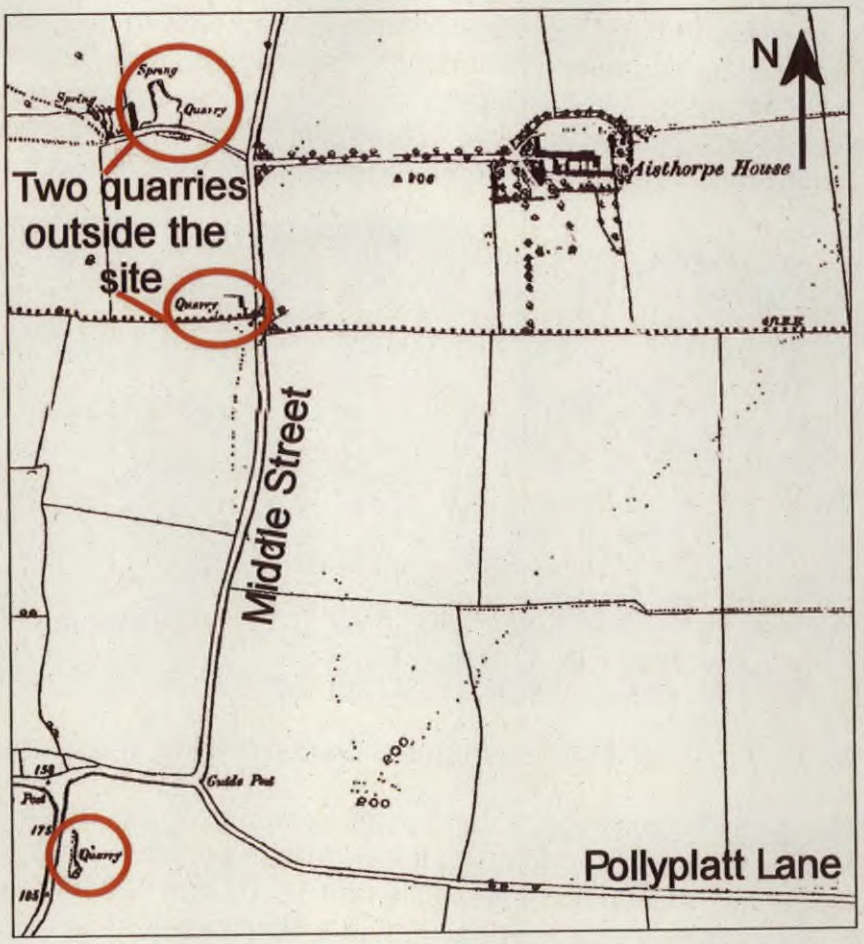

Figure 60. Two quarries located to the west of the site.

226. A small sample of the material buried or dumped was visible in the southernmost quarry where burrowing animals had been active. The material noted was metal work, ash and fragments of building materials (Figure 61).

Figure 61. Evidence of tipped material in the wooded area to the west of the station.

227. It is possible that the materials present in the northern quarry could have been derived from military sources. This material consisted of large sections of concrete and building materials, drums, asbestos sheeting, tarmac, metal work and vehicle parts (Figure 62). The waste was partially covered in earth, which was colonised with small trees, brambles and grass. There was visual evidence that material had been burnt in the past.

Figure 62. Further tipped materials in a quarry.

228. High Test Peroxide Pits. There used to be twenty pits by the Vulcan dispersal hardstandings, designed for dumping the hydrogen peroxide fuel load of Blue Steel missiles in an emergency. Vulcan bombers in the late 1950s and 1960s carried these nuclear missiles. If a missile developed a fault, then it would need to be rendered safe for transport. This would necessitate dumping the missiles 2-part fuel load of hydrocarbon fuel and High Test Peroxide (HTP). The HTP would be drained into a pit and diluted with large volumes of water to neutralise it. It is surmised that the hydrocarbon fuel load could be drained directly into an oil trap/interceptor.

229. The HTP pits were approximately 12 feet deep and 8 feet in diameter and were located as follows: 4 at A Dispersal, B Dispersal and C Dispersal; 2 at E Dispersal and F Dispersal and 4 at the Operational Readiness Platform. It is not known whether the pits were concrete lined/self contained or simply dug straight into the ground and possibly bedrock. The pits were filled with aggregate before station closure in 1996 and capped, either with a concrete slab or soil.

230. The pits are unlikely to have been contaminated to any significant extent as a result of their original use to "dump HTP" because HTP contains only trace amounts of additives and the sole products derived from neutralisation of hydrogen peroxide are oxygen gas and water. An F540 record from Oct 67 states: "An emergency offload of HTP took place", suggesting that at least some the pits were used.

231. Suspicious ground. Two areas of rough hummocky ground were noted during the site visit. The first, an area of small irregular earth mounds in an area of open ground in the far south-west of the married quarters. The area was visually inspected for evidence of tipped/foreign materials, however the material appeared to only consist of natural topsoil. This area was located on top of a WWII dispersal and was thought to have been

landscaped during the development of the married quarters. The second area is located in the south of the playing field, south-west of the Officers Mess. This area was also visually inspected and only natural topsoil was found between concrete pipes laid out seemingly to create a play area.

Fire Training and Burning Activities

232. Current Fire Section and Training Area. The Fire Section (Bldg No 106) is currently located in close proximity to ATC. The Fire Section hosts mobile fire units and a foam store. The Fire Section is due to be refurbished including a new foam store. Drainage from the section is intercepted.

233. Fire Fighting Foam. The station currently uses two types of foam:

a. Petroseal 'M' 6% (FFFP)

b. Flourochemical Foam (AFFF)

234. At present all fire training activities are carried out at RAFC Cranwell.

235. Historical Fire Training. A review of the archive aerial photographs and anecdotal evidence has suggested that fire training has been undertaken at several locations on the RAF Scampton site.

236. Aircraft and Vehicle Fire Training Areas. Two areas used for fire training have been identified. The first, a training site situated on an old WWII round concrete and asphalt dispersal located in the south-west of the site at NGR SK 958 787. The 1975 aerial photograph shows an obsolete Vulcan aircraft parked on this dispersal (Figure 63).

Figure 63. Obsolete aircraft used for fire training exercises (1977 aerial photograph).

237. Anecdotal evidence suggests that aircraft were used for fire training. Training at this location ceased in October 1992 and the aircraft was subsequently removed. Although site personnel have stated that a FOD sweep had been conducted on the area, the hardstanding surface was still littered with debris, including melted metal fragments and aircraft remains (Figure 64), burnt wood and scraps of burnt carpet.

Figure 64. Recovered burnt material at dispersal.

238. On inspection of the area it was noted that the asphalt surface is weathered and cracked and the area has never been bunded. It is therefore highly possible that any un-burnt fluids could have entered the ground, either via cracks in the hardstanding or percolate straight into the ground at the grassed margin of the dispersal hardstanding. It is likely that the fuels burnt at this site consisted of aviation fuel, POL, waste POL and solvents, which would give rise to a range of thermal decomposition products. The use of fire fighting foams may also contribute to the potential contamination in the ground. The high leaching potential of the thin soils overlying the site will allow swift transport of liquid contaminants into the Lincolnshire Limestone below.

239. The Station EPO has reported that when the remaining Vulcan Aircraft was finally disposed of, soil testing was undertaken in the area, although it is unknown whether any remediation was required or carried out. However, anecdotal evidence suggests that the relevant files containing these soil-sampling results were subsequently sent to RAFC Cranwell and have not been recovered since.

240. It is suggested that the results of this investigation should be retrieved and reviewed to determine whether the soils in the area contained unsatisfactory levels of potentially harmful contaminants, which might pose a significant risk to controlled waters and contaminated land. Furthermore, if the results are not recovered it will be necessary to carry out further soil sampling in order to characterise the potential risks and to determine whether any further investigation is required.

241. Another fire training area was later developed in the north of the site, near to BFI 3. An obsolete Phantom aircraft was positioned at the southern inner edge of the road encircling the BFI site and the area was used for Fire Training by dousing the aircraft with fuel and setting it alight. In addition to training on the Phantom aircraft, additional fire training and burning was also carried out upon three round WWII asphalt hardstandings in the vicinity of BFI 3 and Crash Gate 5. On inspection during the site visit a variety of scrap material was found littering both hard standing surfaces. Materials identified include car parts; fragments of aircraft parts, metal and electronics and melted aluminium (Figure 65). The areas have never been fitted with a retaining bund and the condition of the hardstanding surface is poor.

Figure 65. Melted metal and other scrap materials at the fire training area.

242. Golder Associates (UK) Ltd undertook a Geotechnical Investigation of BFI 5 in 1995, in which contamination by aviation fuel was discovered in groundwater at a depth of 2.7m. The relevant sample was taken from a borehole sunk close to where the Phantom aircraft had been left for fire training. The TPH content was measured as 1.56% by volume for the sample taken and it was concluded that the source of contamination had most likely originated from fire training activities, rather than due to leakage of BFI 3. Contamination issues involving BFI 3 have been discussed in an earlier section.

243. Minor Fire Training Areas. A "fire training pit" is listed on the buildings list as Bldg No 529 (Figure 66). This is located within the airfield, no more than 50m to the west of the present Fire Section building (Bldg No 106). This area is most likely to have been used for small practice fires since the Fire Section has in the past been responsible for general fire training of station personnel. This probably involved extinguishing small fuel fires. No evidence of burning was noted it the area during the site walkover.

Figure 66. The fire training pit, used to train personnel how to deal with small scale fires.

244. Suspected Minor Burning Activities. There is also photographic evidence of burning activities in the vicinity of the WWII Air Ministry Works Department (AMWD) compound (Bldg No 21 on the Air Ministry building list), currently a waste oil compound (Bldg No 498). The 1983 aerial photograph captures smoke coming from the area (Figure 67). It is thought that this compound was an Airfield Maintenance yard. However it is unknown what substances were actually burnt in this area and there remains the possibility that thermal decomposition products and heavy metals could have contaminated the soils in the vicinity from burning activities.

Figure 67. Evidence of burning to the north of the waste oil compound (1983).

245. Station Personnel report that there has been some vehicle burning (Figure 68) in the vicinity of the NATO aggregate store just south of the modern 25 yd firing range (Bldg Nos 253/254).

Figure 68. Potential area of vehicle burning.

246. Station Bonfire. Until recently an annual station bonfire took place in an area between the married quarters and F - Dispersal. A F540 record from Nov 1986 states, "Bonfires held on Foxtrot Dispersal". However, after a time the area had become unmanageable and was attracting fly tipping, creating a FOD hazard. The area was subsequently tidied and remediated involving excavation of potentially contaminated topsoil and replacement with 'clean' soil. This area is no longer considered a significant risk.

247. Station Incinerator. There are no available records to indicate that there was a station incinerator at RAF Scampton.

248. All historic burning areas have the potential to cause minor localised contamination of the ground through the cumulative concentration of thermal decomposition products. These represent a range of environmental problems that can result in contamination; examples of which are cyanides, alkalis, polycyclic aromatic hydrocarbons (PAH), chlorinated hydrocarbons, dioxins and furans. POL are regularly used as accelerants and fuels and so it is likely that these will cause hydrocarbon contamination in the vicinity of fire training and burning areas. In addition AVTUR contains toxic de-icing inhibitors, which could cause contamination of surface and ground water systems.

Other Areas of Potential Contamination

249. Aircraft Wash Facilities. Aircraft and vehicles are currently washed at a dedicated facility in No 2 Hangar (Figure 69). Aircraft were previously washed at the Engine Running

Platform. There is the potential for aircraft wash water to contain elevated levels of cadmium that has leached from the aircraft. The ERP is drained by storm drains, which flow into an interceptor (Bldg No 494). It is unclear whether wastewater containing surfactants (detergents) also flow into the oil trap. If this is the case, it could render the oil trap less effective. There have been no documented pollution incidents involving aircraft wash water at RAF Scampton.

Figure 69. Gnat aircraft in the aircraft and vehicle wash plant in No 2 Hangar.

250. Specific data for cadmium levels in the wash waters at RAF Scampton were not available. However, Anglian Water undertakes washing water tests for suspended solids (but not separates). Cadmium levels are recorded as "Low" and fall within the acceptable standards. It should be noted that the UK Environmental Quality Standard for cadmium in surface waters is $5\mu gl^{-1}$. The authorised consent to discharge covers wash down waters.

251. Aircraft Servicing Pans. The refuelling of the Red Arrows 'Hawk' aircraft is carried out on the aircraft servicing pan, E Dispersal and in No 4 Hangar at RAF Scampton. These areas are intercepted.

252. Engine Test Facilities. An Installed Engine Test Facility (IETF) is visible on the 1989 and 1992 aerial photographs of the site where it is located on the northern margin of No 11 (octagonal) hardstanding on C Dispersal.

253. The IETF consists of a large horizontal chamber connected to a vertical exhaust stack (Figure 70). In previous aerial photographs fuel staining and phytotoxic stress is evident on the surrounding grass. The dispersal is not bunded but is intercepted by drains and so there is a slight possibility that any free fuel could leach into the ground surrounding the hardstanding. Therefore, it is possible that the soils surrounding and under No 11 (octagonal) hardstanding could be potentially contaminated with aviation fuel.

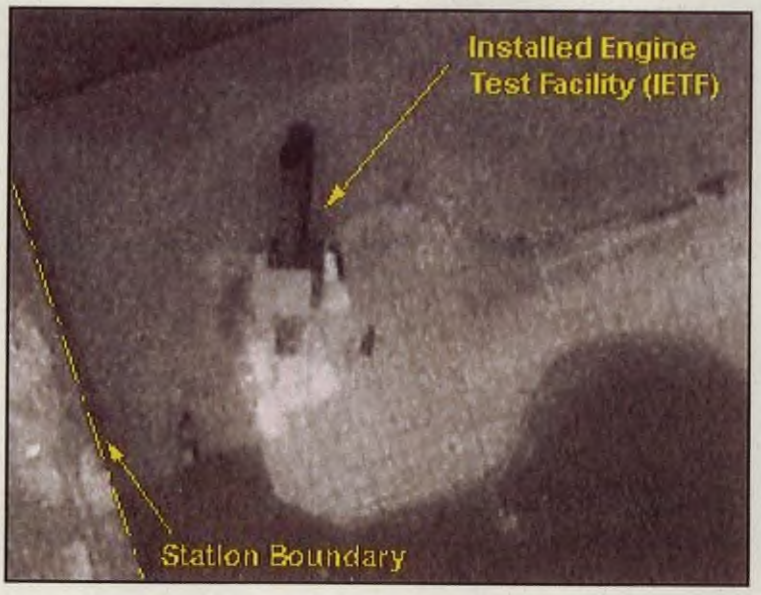

Figure 70. The installed engine test facility the hardstanding at C dispersal (July 1990).

254. RAF Scampton Motor Club. The former RAF Scampton Motor Club existed at the recently demolished (1997/8) Bldg No 521, located just east of the current Bldg No 50. The club consisted of a concrete hardstanding area and central workshops. The hardstanding now only remains and has been used for temporary open storage of contaminated soil from beneath Bldg No 40.

255. The hardstanding has no dedicated drains. In areas where vehicle servicing and related activities have taken place there is the potential for contamination from substances such as waste batteries, solvents, paint spraying, washings, etc in the area. On visual inspection there were no obvious signs of residual contamination. The hardstanding was cracked, which could allow waste and spilt substances to leach into the ground below, potentially causing contamination to the immediate and surrounding ground and should therefore be subject to further investigation involving soil sampling.

256. Runway Sweeper. The runway and taxiways at RAF Scampton are routinely cleaned with the use of runway sweepers. No dry waste arisings from sweeping the runway is deposited on the unit, however, during inclement weather the sweeper can sweep up as much as 2 - 2.5 tonnes of water from the runway surface. The surplus water is deposited through F dispersal interceptor. There is a possibility that the runway sweepings contain an elevated level of cadmium from the aircraft, however, this has not yet been substantiated. The station EPO has stated that all runway sweeping are collected, transported off site and taken to RAFC Cranwell for disposal. It is unknown how long this arrangement has been in practice. However, there is the possibility that historically sweepings were tipped on site and could lead to locally elevated levels of cadmium solids in the ground. During the site walk over, no stockpile of runway sweepings were found. The risk from elevated cadmium levels is considered very low.

257. Red Arrows Dye Bay. The Red Arrows use a dye and diesel fuel mixture to create smoke during their aerobatic displays. The station has recently built an all-bunded facility for servicing and maintenance of the pods, which often involves emptying the dye and

diesel from the pods (Figure 71). Any dye effluent that is spilt collects in the floor sump, the contents of which are pumped into a 6 000 litre tank. The pumps automatically stop when the tank is nearing its working capacity, preventing over flow into the surface watercourse. The tank is emptied by a specialist contractor and disposed of as special waste.

258. The dye is stored in 25 litre drums, usually in the Packed POL Compound (Bldg No 40), although at the time of the site visit the drums were being stored in the Waste Oil Compound, due to refurbishment and remediation work being carried out to the Packed POL Compound. Total storage at any one time is no more than 150 drums, which is equivalent to 3750 litres.

Figure 71. Modular bunded building housing the Red Arrows Dye Bay.

259. The Solvent Dyes used as Aerobatic Smokes are:

a. Automate™ Red 9BHF Liquid Dye (C.I. Solvent Red 164).

b. Automate™ Blue 9HF Liquid Dye (C.I. Solvent Blue 98).

260. The Blue Dye is considered a Marine pollutant as it contains an aromatic hydrocarbon mixture, which is toxic to aquatic organisms. It appears there have been concerns from local inhabitants regarding the atmospheric dispersion of the dye onto their land/gardens. The dye has a high dispersion factor and so even a minute volume of dye can stain a large surface area.

261. The Rohm and Haas Company carried out a Human Health and Environmental Risk Assessment for the Solvent Dyes in Mar 03. The survey, which was based on exposure to the ground during air displays concluded, "the risk to human and aquatic or terrestrial organisms is considered negligible". Another assessment is currently underway to study the level of risk to the atmospheric system and the organisms that inhabit it.

Historical Aircraft Activities and Crash Sites.

262. In general, wreckage and debris will have been cleared after any incident or accident, as debris in the airfield environment is a foreign object damage (FOD) hazard. Whilst in the modern era, meticulous attention is paid to recovering debris at a crash site as part of the accident investigation, similar efforts were not always made in the past, especially in the WWII era when operational pressures were high and meticulous clearance will not have been the highest priority. Therefore any crash related debris remaining could include metal fragments, unexploded ordnance, spilt fuels, other fluids and thermal decomposition products.

263. More recently, efforts have been made to recover all debris and remediate any ground contaminated (fuels etc) by such incidents. There are several references to aircraft crashes and incidents documented in the station F540s listed at Enclosure 6, Volume 2, however, information is not given on the precise location of crash sites.

264. Burnt Out Vulcan Aircraft. In addition to those incidents specifically referenced in the F540s listed above, it is known that a Vulcan aircraft was completely burnt out on the airfield in April 1967. An unconfirmed account is that Vulcan B2 XL385 burnt out following an explosion in No 1 engine on the evening of the 6th. The accident could have led to localised contamination of the ground from thermal decomposition products.

MILITARY SPECIFIC CONTAMINATION

265. The following paragraphs detail those contamination issues specific to military sites. The details of any potential for contamination identified in this section will also be included on a Plan of Actual and Potential Contamination, included at Enclosure 7, Volume 2.

Explosive Ordnance

266. Buildings and Facilities Associated with the Use, Storage or Holdings of Explosive Ordnance. The role of RAF Scampton as a bomber station since WWII and its subsequent development to a Vulcan bomber station in the late 1950s has necessitated the on site storage of large quantities of explosive ordnance, including nuclear weapons. The locations for the storage of explosive ordnance at RAF Scampton are as follows:

267. First World War. Little is known about the operation of the original airfield, which was a flying training depot station. One source, which provides a limited building list of the station, lists the presence of a gunnery workshop, wireless and bombing hut, machine gun range and ammunition store. These facilities suggest the station held and used small arms ammunition (SAA). Furthermore, the presence of a bombing hut suggests the station may have held bombs, probably practice bombs, for training purposes. It is therefore possible that explosive ordnance from this era may be recovered from the area of land which constituted the WWI airfield. It is also possible that any dump or tip site from this period has the potential to contain explosive ordnance from the WWI.

268. World War II. In Aug 1936 the station opens as a No 3 Group Bomber Command station. F540 records suggest the station held a variety of bombs from 30lb incendiary bombs to the "Tallboy" (12 000lb) bomb and "Grand Slam" (22 999lb) bomb.

269. A list of buildings associated with the use, storage or holdings of explosive ordnance is given below, derived from the 1946 Air Ministry Plan building list.

a. The "old" bomb stores, built around 1936 and demolished in 1954/55 were situated in the north-east of the original WWII airfield in the area presently occupied by the Engine Running Platform (ERP) and compass base.

b. The 'new' bomb stores, located in a north-west spur extending down onto the modern explosives storage area (SSA). The greater part of the site lies north of the road running east to west parallel to the northern boundary of the site, which was sold to a farmer in around 1963. This northern area is partly demolished with only the access road and bomb-loading ramps remaining. The area included Bldg Nos 266 - 268 (incendiary bomb stores) and Bldg Nos 275 - 283 (bomb stores and fusing point buildings). The section of the new bomb stores that lay south of the road is totally demolished with part of the access road (which was originally the access road to two round WWII hardstandings) is still intact.

c. Additional potential bomb stores. The 1942 aerial photograph shows two 'square' shap ed open bomb bays, the only bomb storage facilities in the north-west of the site before the "new" bomb stores were constructed as an extension to this area. When the concrete runways were constructed in 1943 one of the isolated bomb bays was built over, with the runway running virtually over the top of the area where it had been located. This store did not exist when the 1946 Air Ministry Record Plan was produced and subsequently has not been highlighted for a targeted EOD search. Although the store itself was constructed over it is considered that a search should be carried out in the immediate area surrounding it.

d. Armouries. There were two armoury buildings, comprising the main armoury (Bldg No 109, situated between No 2 and 3 Hangars) and a second armoury (Bldg No 260), situated at F Dispersal, but demolished in the late 50s.

e. Aircraft Arms and Aircraft Armament Equipment Buildings. Aircraft Armament buildings (Bldg Nos 17 and 18) are demolished, they were Nissen huts located to the immediate west of Bldg No 20. Aircraft Armament Equipment buildings (Bldg Nos 54, 55 and 56, have since been demolished, but were situated east of No 4 Hangar on land adjacent to the current Bldg No 511.

f. Small Arms Ammunition (SAA) Stores. SAA stores were located as follows:

i) SAA Store House - Bldg No 15, located on original Bomb Stores site (demolished).

ii) SAA Stores - Bldg Nos 51,52 and 53, located east of No 4 Hangar, between Bldg Nos 521 and 57/189 (demolished).

iii) SAA Stores - Bldg No 158, located east of No 1 Hangar and BFI 1.

iv) Ammunition Store - Bldg No 253 (demolished).

270. Current Armament Storage. There are also numerous buildings and facilities present on site where minor explosives and pyrotechnics and small arms may be held or stored, dispersed around the site. Armament stores at RAF Scampton are in the following buildings.

a. No 1 Hangar (Bldg No 48).

b. No 4 Hangar, including safety equipment (Bldg No 45).

c. Main guardroom (Bldg No 148).

d. Pyrotechnic store (Bldg No 105b).

e. ATC (Bldg No 105).

f. Bird Control Unit Vehicle.

g. Ejection seat store (Bldg No 525).

h. Prep building (Bldg No 109).

i. Ready use store (Bldg No 123).

271. Weapons Ranges and Test Butts. Leaded bullets area a source of lead contamination. For this reason all areas of former weapons firing are considered potential sites where elevated levels of lead may be found.

272. Rifle Range. The modern 25 yd range (Bldg Nos 253/254) is not currently used, having been temporarily decommissioned. The range contained a large quantity of sand, which was sieved to remove spent rounds and then disposed of accordingly as lead contaminated soil. However, the land surrounding the range might contain lead from dispersion or earlier sand removal.

273. Former WWII Small Arms Ammunition (SAA) storage areas and rifle ranges have been identified at the following locations:

a. Machine gun firing range, 15 yard (Bldg No 253; sited between No 1 Hangar and Bldg No 500).

b. Machine gun test butt (Bldg No 252; also sited between Hangar 1 and Bldg No 500).

c. Shooting Butt (Bldg No 239; aerial photographs show this facility comprised a large mounded bank at the end of a round dispersal into which aircraft shoot.

274. A 1948 oblique aerial photograph shows the historical location of some of the above facilities (Figure 72).

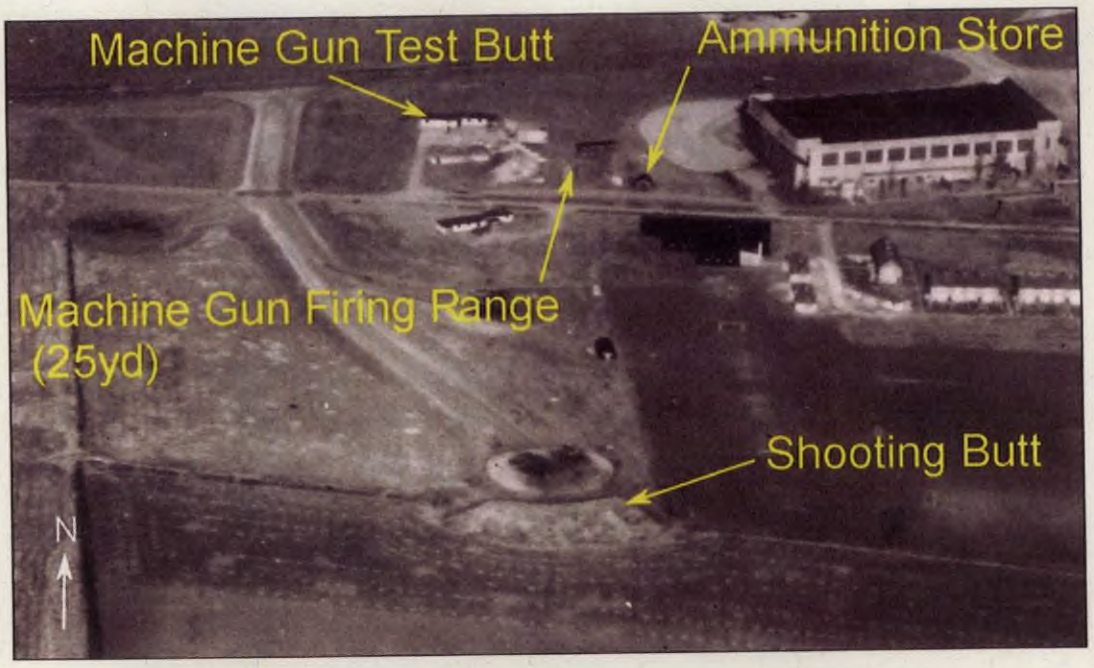

Figure 72. Showing the location of firing ranges in 1948.

275. Anti Aircraft (AA) Gun Emplacements. From station F540 Appendices, the location of AA gun emplacements have been identified. On the ground near these sites, there is the potential for the recovery of spent or live rounds of ammunition. The guns were positioned as follows:

a. Hispano gun - west of No 1 Hangar.

b. Hispano gun - south of No 1 Hangar.

c. Hispano gun - south side of Pollyplatt lane, south of MT yard, near salvage dump.

d. Hispano gun east of Ermine St, opposite station main gate.

e. Twin Browning Machine Gun - Guard Room roof.

f. Twin Browning Machine Gun - Station HQ.

g. Twin Browning Machine Gun - Sergeants Mess roof.

h. Twin Browning Machine Gun - Station Armoury roof.

i. Twin Browning Machine Gun - South of No 5 Hangar.

j. Twin Browning Machine Gun - South side of Pollyplatt lane, opposite MT.

k. Twin Browning Machine Gun - South-east of No 1 Hangar.

276. Explosive Ordnance Disposal (EOD) Clearance Certificates and Incident Reports. Archive research at the Armament Support Unit (RAFASU) reports that a total of four partial EOD searches have been conducted at RAF Scampton. The following details are given:

1. A search was undertaken in 1964 over the "new" WWII bomb storage area. A certificate of clearance was issued and the land was sold into private ownership. This area is no longer part of the current RAF Estate.

2. In March 1983, 3 x .303 rounds of ammunition were found during the demolition of some buildings which were the property of the Lincoln Education Authority, adjacent to the Primary School. The site of the incident was visually searched with no further ammunition found.

3. A search was undertaken in October 1983 following the discovery of explosive ordnance in the ground during excavations for the new "30m outdoor range" (Bldg No 253). Several "Live" recoveries were made and disposed of at Theddlethorpe. The additional recoveries were "inert", including practice bomb heads, tails and components, amongst gun barrels, mountings and clips.

4. A station wide search was commenced in December 1995 using various levels of clearance, as deemed necessary. Levels include a visual search, a search to the parameters of a 4c Detector and a search to the parameters of a 4021 Locator. The clearance certificate certifying that the site was free from any explosive ordnance to defined parameters was issued on 2 Sep 96. Both "live" and "inert" recoveries were made including rounds, a bomb detonator, practice bomb heads and tails, and flares. Various ferrous and non-ferrous recoveries were also made.

277. A plan indicating the extent of the 1996 EOD search, along with full details of EOD recoveries and Clearance Certificates, is provided at Enclosure 11, Volume 2.

278. In is noted that the RAF Waddington Rough Shoot Club hold shoots at RAF Scampton and the Bird Control Unit also use shotguns on the site. The 5131 (Bomb Disposal) Squadron has confirmed that the use of shotgun cartridges should not, so long as used under the appropriate conditions, invalidate the Clearance Certificate.

279. During an additional inspection of the "old" WWII ESA area subsequent minor ordnance findings were made. A pit was subsequently dug in a safe area (approx 50m east of Bldg No 253), and the findings were destroyed (Figure 73).

280. On account of this unexpected 'find' the EOD Certificate covering the area of the "Old" WWII ESA was rescinded. Formal notification of this invalidation is required and should be forwarded to the Station Armament Officer.

Figure 73. The EOD burning pit and contents.

CHEMICAL ORDNANCE

281. LQA Team Archive Research. The Chemical Weapons (CW) database compiled and held by RAFIO LQAT suggests that RAF Scampton was authorised to store CW. RAF Scampton was authorised to hold 30lb and 250lb mustard gas bombs as well as 1000lb smoke curtain installations (SCI). Stocks were greatest during the early war period, but reduced steadily after 1942. These particular weapons are considered to have been resistant to leakage and there has been no documented evidence to indicate that the 30lb and 250lb bombs did leak.

282. There is an account of a leaking SCI stored at RAF Scampton, that was taken to Dunholme Lodge before being transported for disposal in the North Sea. CW would most likely have been stored on site in the original bomb stores and potentially in the two isolated bomb stores in the north-west of the site shown on the 1940 - 1942 aerial photograph.

283. Gas Defence Training. There are several entries in the station F540s referring to gas practices and gas defence during early WWII.

a. 17 Feb 42 - [Gas] defence officer reports "gas", 14:34 hours; all clear "gas", 15:26 hours. This could have been a gas defence training exercise, or a genuine false alarm.

b. 11 Jun 42 - reference to Gas Exercise.

284. The 1946 Air Ministry Plan also marks gas defence centre (Bldg No 122) defence/clothing stores, decontamination centres and a gas chamber existed on the site. In common with all RAF stations during World War II the RAF will have been required to undertake gas defence training. A gas defence exercise could range from a simple drill to test the readiness in putting on respirators, to a full-scale exercise involving contamination of the ground, aircraft or equipment with live chemical agents or simulants.

285. WWI. Although mustard gas was used extensively on the continent during WWI, it is considered very unlikely that it was ever stored on the Training Depot Station.

286. A CS gas chamber (Bldg No 483) existed on the modern site south of the rifle range.

287. Survey Findings. The survey did not identify any direct evidence for areas used to dispose of CW via burial or burning or any visible evidence of residual contamination from the storage of CW on the site. It is understood that a number of CW test and detection kits would have been issued to RAF stations during WWII. These contained phials of live agents for demonstration and training purposes.

288. WWII Chemical Weapons Legacy Target Based Environmental Risk Assessment. It is the LQA teams policy to draw up a Target Based Environmental Risk Assessment (TBERA) based on historical research, experience and survey findings on the likelihood of the presence of CW on certain parts of a site. This is shown at Enclosure 12, Volume 2. In the LQA Report into the Second World War Chemical Weapons Legacy little evidence has been found to suggest that leakage occurred from the types of bombs stored at RAF Scampton. RAF Scampton was therefore classified as a 'Category 3' site and the TBERA reflects the potential for disposal by burning or burial to range from low to not having been carried out, except for the disposal of 'test sets'.

289. It should also be noted that disposal of waste from gas defence exercises/training and the storage/use of CW test/detection kits will have taken place within a pit located somewhere on the site. It is considered likely that the tip sites in the south-east and potentially a munitions burning area at F Dispersal are the most likely location for the disposal of CW and any test kits.

Radioactive Contamination

290. DRPS report. A report from the DERA Radiation Protection Service (DRPS), from 1996 detailing radioactive contamination, states that no radioactive contamination has been found at RAF Scampton.

291. Storage of Nuclear Weapons. As a Vulcan Bomber station, Scampton had a storage facility for nuclear weapons, known as the Supplementary Storage Area (SSA). This area was surveyed by DRPS and levels of radioactive contamination were found to be no higher than background.

292. Luminising Paint. Luminising paint containing radium - 226 was used on aircraft instruments from the WWII era until the late 1960s. RAF Scampton was subject to a DRPS visit in August 2001 as part of the RAF Cranwell Radiation Protection Adviser (RPA) visit. During this visit it was established that the "Old Flying Machine Company" and the "Station Museum" both held equipment, which incorporated radium luminised dials.

293. RAF Scampton had a luminised paint store adjacent to the Central Flying School building, but the area showed no anomalous levels of radiation on the DRPS survey.

294. There is a low risk that some isolated areas of radium-226 contamination could be present in any waste tips or areas where ash from station burning has been dumped. Although radium-226 is a naturally occurring radioactive element, it was widely used as a constituent in early luminous paint. It is possible that radioactive contamination may be present on site if the luminised equipment was buried or burnt on the site in the past. The DRPS report is provided at Enclosure 13, Volume 2, found no significant levels of radiation during its survey.

CONTAMINATION FROM OFF SITE ACTIVITIES

295. The majority of the land surrounding RAF Scampton is either agricultural or residential. The potential exists for agricultural activities, including the application of fertilisers, herbicides and pesticides, to contaminate the near surface soils and groundwater surrounding the site.

296. A former exploratory oil well is located to the immediate west just off the station boundary (Figure 74). This well operated for approximately 6 months, however, two additional and operational oil wells are located between the site and the village of Welton to the east. There is the potential for leaks and spills of crude oil and drilling related substances to impact on the land quality and adjacent surface/ground water at RAF Scampton.

Figure 74. Functioning oil well and infrastructure.

CONCLUSIONS

297. RAF Scampton is environmentally vulnerable because it is situated on a major aquifer overlain by soils of high leaching potential. There is also a source protection zone at the site because of the nearby Public Water Supply abstraction at Welton. These factors make any spills or leaks of fuels, oils and solvents potentially very serious. At each location where tipped material exists there is the potential for the generation of leachate either through microbial action, migration of liquid wastes associated with the percolation of rainwater through the waste matrix. Under the Water Resources Act (1991), it is an offence to contaminate controlled waters. It is possible that the leachate may impact on the groundwater and contaminate it, contravening these regulations. In addition, where there is

a significant pollutant linkage (i.e a clear source – pathway – receptor link), and contamination in the ground is continuing to enter a controlled water or is likely to do so, the land in which the contaminant exists is legally described as Contaminated Land under Part IIa of the Environmental Protection Act 1990. In this respect, the leachate from the tip sites may be considered the contaminant/source; the pathway is transmission vertically downwards through the soil and the receptor is the groundwater. In addition to these sensitive site specific considerations, there are numerous areas of actual and potential land contamination at RAF Scampton. These are as follows:

a. Several air raid shelters were present on the site during the WWII period, including some built below the barrack blocks. It appears that the air raid shelters were removed shortly after the War, except those at the barrack blocks, which have been sealed. Historically old air raid shelters, when demolished, were backfilled with any available material, which may have led to potentially contaminative fill materials being used. Whilst there is no evidence to indicate that the air raid shelters beneath the barrack blocks contain contaminated material, any other former air raid shelters should be considered potentially contaminated until proven otherwise (para 97 – 100).

b. Asbestos is present in various forms and condition throughout the site, although it was not identified dumped on the site, other than sporadic surface fragments at the dispersal at Crash Gate 5 and the Packed POL Compound. The district heating system is known to have originally contained asbestos lagging in some locations (para 101 to 108). The asbestos register is a poor document giving insufficient information about potential asbestos materials. Additionally, there are no comments as to whether any remedial action is to be taken, other than further inspections.

c. A number of buildings and installations have been demolished over the years at RAF Scampton. Numerous old WWII dispersals have fallen into disrepair, been covered with earth and grassed and some have become colonised with pioneer vegetation. The presence of old hardstandings and building foundations should be considered when identifying areas for building and development (para 109 to 113).

d. All fuel storage facilities are potential areas of contamination from filling, emptying and servicing activities (para 114 to 140). There are numerous existing and decommissioned or removed BFI sites dispersed around the airfield, some of which had associated underground pipelines. The majority of aviation BFIs have been removed and some of the contaminated soil excavated and disposed of at a licensed landfill facilities. There is evidence to suggest that a full remediation strategy was not adopted during removal of the BFIs, with some contamination remaining in situ. There appears to have been no post remediation environmental monitoring at the former fuel storage areas. This could act as a source under the risk based approach to determining contaminated land via the Source – Pathway – Receptor linkage, with the aquifer as the receptor. Additionally, no evidence exists as to whether any sampling was carried out near the underground pipelines. Anecdotal evidence indicates a major fuel spill from the old Petroleum Board pipeline and the vertical cylindrical fuel tank tank. This requires confirmation by further investigation.

e. A number of ground fuels BFIs have also been removed. The standard and method of removal appears comparable to those employed during the removal of the aviation BFIs (para 141 – 149).

f. The current MT refuelling facility consists of two fuel tanks within a self contained ISO type container (para 151). The historical MT BFIs have since been removed at different periods during the station's history. Limited environmental samples were taken at the time of removal of the 1965 MT BFI, with soil determined as contaminated through olfactory and visual observations (para 152 – 154).

g. A historical MT BFI existed at the entrance to the old MT section. It was thought that the tank was decommissioned but no documentary evidence has been found to determine whether the tank has been removed or its current condition (para 155).

h. There are a number of issues that require addressing with the current fuel storage facilities (para 158 – 173). For example, the fill point to one of the tanks at the standby set house was noted to be leaking with evidence of staining on the ground beneath. The bund to this facility was cracked and it would not have been able to contain a spill. There is a small temporary fuel installation at the contractors compound, which although bunded that showed evidence of spillage outside the bund due to careless filling of vehicles. There is ad hoc storage of drums at a variety of locations at the station which were not bunded, or stored beyond the reach of bunded areas. It is considered that the underground fuel pipeline that feeds the Scampton Primary School and potential infrastructure remaining from the married quarters Domestic Kerosene Tank (Bldg No 592) potentially contravenes current legislation.

i. A large volume of land contaminated with hydrocarbons is present at RAF Scampton in the location of the POL handling area (Bldg No 40). Excavation of the hardstanding covering the area revealed that the drainage network beneath had collapsed and the surrounding soil was grey/black in colour and exhibited a strong odour of hydrocarbons. Following a soil sampling exercise it was discovered that the ground was contaminated with high levels of total petroleum hydrocarbons, suspected of being weathered AVTUR and hydraulic oil. The area had been covered with a temporary tarpaulin cover to prevent the ingress of rain pending implementation of a remediation strategy (para 160 – 164).

j. The condition of the drainage network at RAF Scampton is considered to be poor and could provide a pathway for contaminants directly into the groundwater (para 174 – 177).

k. There are currently 17 DSS at the station. All installations appeared in good order, except for DSS AA and the DSS at the standby set house. In the past a number of the DSS were found to contain traces of PCBs, with DSS AA showing the highest level. At each of the DSS, there is the possibility of contamination of the ground by PCBs as well as other hydrocarbons (para 178 to 191).

k. Engineering activities have taken place at numerous locations across the station. It is likely that some of these activities involved the use of substances that could have potentially contaminated the ground including aircraft painting and paint stripping (para 192 – 195).

l. The MT section has been relocated since the original infrastructure was installed in the military build up to WWII. There is the potential for contamination at both MTSS from engineering activities carried out there involving the use of solvents, paint products and stripping agents (para 197 – 200).

m. Electrical engineering took place at two locations on the site. A battery acid neutralisation pit was not identified during the site investigation, however, it is considered that the known battery servicing buildings were unlikely to have been installed prior to WWII. It is likely that the neutralisation pit would have been located nearby the original battery charging bay (para 201 – 203).

n. There are several site service contractors areas at RAF Scampton. Spillage of fuel at the BFI within the ground maintenance contractors compound was observed at the time of the site investigation. In addition, numerous old fluorescent tubes were also found piled up in a corner. The tubes were not appropriately stored (para 205 – 208).

o. Current waste disposal practices at the station appear satisfactory. Historically, waste disposal usually took place on site in a station tip. Aerial photographic coverage provided areas of potential concern, but there was no obvious evidence of tipping that is characteristic of other RAF stations. Anecdotal evidence indicated that waste was disposed of to municipal tips off site as early as 1954 (para 209 – 227).

p. Large scale fire training in known to have taken place at two locations on the current site. There is the potential for contamination of the land at these locations from fuel and thermal decomposition products (para 232 – 242). Other burning activities were also identified on aerial imagery (para 244 – 245). The area of the station bonfire has been remediated and the annual bonfire no longer takes place at the site (para 246). Current fire training is carried out at RAF Cranwell.

q. A motor club operated at RAF Scampton until station closure. There is the potential for residual ground contamination from activities carried out there (para 254 - 255).

r. RAF Scampton has undergone an EOD clearance, however, a small burning pit was identified in the vicinity of the "old" WWII ESA and the EOD certificate for this part of the site has been withdrawn (para 279 – 280).

s. RAF Scampton held stocks of chemical weapons. They included 30lb and 250lb mustard gas bombs, as well as 1000lb SCIs. It was reported that one of the SCIs leaked. The leaking weapon was removed to RAF Dunholme Lodge and subsequently disposed of in the North Sea (para 282). As is the policy of the LQAT a TBERA has been carried out for this site.

t. There is the potential for contamination from off site activities involving the application of fertilisers, herbicides and insecticides on adjacent farmland and potentially from crude oil leaks at the oil wells (para 295 – 296).

298. The main areas of potential contamination have been indicated on the plan summarising the survey findings at Enclosure 14, Volume 2. A conceptual model for the site based on all the available information from the Phase 1 has been devised and is provided at Enclosure 15, Volume 2.

RECOMMENDATIONS

299. It is recommended that this report is used as a basis to develop a further investigation by a competent environmental consultant, subject to the following restrictions:

a. A further desk study by the consultant will not be required, although it is anticipated that a site visit and a preliminary inspection will be necessary in order to assist in the specification of study.

b. The consultant is responsible for designing an investigation into any forms of general contamination regarded as being pertinent, based on this report, any site visits undertaken, and the consultant's experience and expert knowledge.

c. The consultant's activities shall specifically exclude:

(1). Any investigation or searches for explosive or chemical ordnance, which are the responsibility of the RAF's EOD Authority.

(2). Any investigation or searches for radioactive contamination, materials, or artefacts, which are the sole responsibility of the DSTL Radiation Protection Service (DRPS).

d. The consultant will undertake a phased investigation, with each successive phase being optional at the client's discretion, and subject to the Land Quality Assessment Teams (LQAT) approval. The initial phase should be restricted to upper groundmass investigations, on a risk basis. Later, optional phases of work will focus on further investigations in sufficient detail to determine cost-effective remediation strategies (if initial phase work does not furnish adequate data).

e. Costed proposals are to be submitted to the RAFIO LQAT for discussion and approval at each stage.

f. A report is to be provided at the end of each stage of the work, including recommendations for any further investigations (if required) and remediation options (if required).

g. Acceptance of consultant's reports will be subject to LQAT scrutiny, who will retain overall scientific and technical authority for the work undertaken.

300. In undertaking this study, the whole site has been considered and it is therefore recommended that contamination investigations should cover the whole site, irrespective of

present or future ownership. It is considered prudent in order to safeguard the health and safety of personnel involved in subsequent intrusive investigations and any remedial work that a COSHH assessment is carried out with regard to toxic substances and should include the provision of appropriate protective clothing.

Recommendations Allied to a Preliminary Risk Assessment

301. In addition to the above investigations, the following recommendations are graded on their degree and type of suspected contamination allied to a preliminary risk assessment relating to the hazard:

a. A remediation strategy should be developed and implemented at the area of land contaminated at Bldg No 40. At present some of the soil has been removed, but the area has been temporarily capped awaiting further action. It will be necessary to determine the extent of the contamination present and, based on the volume of material involved, adopt an effective and appropriate remedial strategy. It is possible that the contamination has migrated into the limestone aquifer, therefore it is likely that any remedial technique will need to be ex situ (for example dig and dump, soil washing, thermal desorption or bioremediation). As the area of contamination has been reported to the Environment Agency, it will be necessary to inform the Agency of the steps taken, and provide documentary evidence as to the level of contamination remaining in the excavated material when remediation is complete. The remediation is being carried out in partnership with the Agency and will be complete when they are satisfied the area no longer poses a risk.

b. Due to the limited information available about the post remediation environmental monitoring, and the potential for hydrocarbon contamination to exist, it is recommended that groundwater monitoring boreholes are sunk by a competent contractor in the vicinity of all former fuel storage areas and the two fire training areas. This will allow an assessment of whether the aquifer is being contaminated by hydrocarbons held in the soil that has not been removed (the source). Water samples taken from the boreholes should be subject to laboratory analysis using a UKAS accredited laboratory. If there is evidence of contamination, advice should be sought from the appropriate Regulatory Authority. If there is no evidence of a breach of regulations, a six monthly monitoring regime should be adopted to ensure there is no contamination of the aquifer. The records of sampling and analysis should include the installation details (Bldg No, BFI No, etc), a GPS sample location reference and a plan, together with analytical results and as much information as possible to fully inform auditors or those tasked with carrying out later environmental assessments. These records should be kept indefinitely to assist in any subsequent investigations required by the Regulatory Authorities.

c. Excavation of trial pits (and geophysical investigations where appropriate) should be undertaken at the location of suspected tip sites to identify the extent and nature of buried materials. Care should be taken while carrying out intrusive investigation not to create contaminant pathways to the underlying aquifer.

d. An appropriate asbestos removal strategy should be adopted, prior to any land use changes at areas of the site where asbestos is known to be present. This includes both the current station infrastructure and station tip sites.

e. Hand excavated inspection pits should be undertaken in the vicinity of the transformer banks and distribution substations, to determine the presence of any PCBs and other hydrocarbon contamination.

f. A waste battery acid tank has not been identified at RAF Scampton. It is likely that waste acids were decanted into a tank prior to removal off site by a licensed contractor. Further investigation will be required to identify the location of where waste acids were stored in the past with a view to sampling the ground for elevated levels of lead.

g. The station workshops, MT and contractors' yards require further investigation and characterisation as appropriate.

h. The location, nature and contents of all air raid shelters should be determined.

Source - Pathway - Receptor Relationships at RAF Scampton

302. The source-pathway-receptor scenario has only been considered for the major contamination/pollution risks identified during the investigation at RAF Scampton. The preliminary environmental risk assessment has been formulated using the following definitions:

a. Source - A hazardous contaminant/pollutant with the potential to cause harm.

b. Pathway - A route by which the source is brought into contact with the receptor.

c. Receptor - This includes a vast quantity of subjects. These subjects include:

i. People

ii. Communities and habitats

iii. The term 'receptor' may be used to cover a wider context, including land regulatory compliance and public relations.

d. Risk is the likelihood of the source coming into contact with the receptor. The level of risk is graded as follows:

Certain
High
Medium
Low
Very Low
Negligible

e. The potential significance of the source coming into contact with the receptor is graded as follows:

A. Immediate significant risk of health hazard or contrary to UK Statutory requirements.
B. Immediate significant risk of unacceptable damage to the environment.
C. Large Remediation liability to comply with Statutory/standards requirements.
D. Minor Remediation liability.
E. Minor significance, no remediation required.
F. No effect on re-use options or site value.

303. Sources. The sources of contamination/pollution which have the potential to cause harm, are summarised as follows:

a. BFIs and POL.

b. Acid pits/tanks.

c. Asbestos.

d. Landfills (gases and leachate).

e. Air raid shelters and buried structures.

f. Fire training and burning areas (including particulate fall out area).

g. Station Work Shops and maintenance areas.

h. Radioactive materials.

i. PCBs.

j. Explosive ordnance.

k. Chemical ordnance.

304. Pathways. The pathways that may exist which allow harmful sources to come into contact with a receptor are shown in Table 1.

305. Receptors. The sources highlighted in paragraph 303 potentially reach a receptor where ultimately they could cause harm. The 'receptors' considered to be at risk include:

a. Service personnel and civilian staff.

b. Contractors/visitors.

c. Communities and habitats.

306. The identified source-pathway-receptor relationships at RAF Scampton are listed in Table 2.

Area/ Building	Potential Contaminant/ Pollutant	Potential Receptor	Potential Pathway to Receptor	Associated Hazard	Risk	Potential Significance
Fuel Installation Spillages Fire Section Burning Activities	Fuel	Services	Leaching of contaminants	Degradation of plastic materials (plastic water supply pipes)	Low	B & C
		Groundwater	Leaching/ Human consumption	Water pollution/ Contamination	High	A, B & C
		Surface water	Runoff	Water pollution/ Contamination	Low	A, B & C
		Humans	Direct ingestion, inhalation, skin contact	Toxic	Medium	A
Fire Burning Areas/ Incinerators	Various (Thermal decomposition products, Harmful gases produced)	Humans and Environment	Atmosphere, Contact with ground. Direct ingestion, inhalation, skin contact	Toxic & Carcinogenic	Low	A, B & C
Station Workshops	Chemicals	Humans and Environment	Inhalation, ingestion and skin contact	Toxic	Very Low	A, B & C
Buildings/ Landfills/DHS	Asbestos	Humans & Environment (remediation, construction & demolition works)	Inhalation/ Ingestion	Carcinogenic	Medium	A, B & C
Landfills	Leachate	Controlled Waters Humans & Environment	Leaching of contaminants	Toxic	High	A, B & C
	Gas	Humans	Migration	Explosion/ asphyxiation	Medium	A, B & C
Landfills or areas where ash from incinerators has been dumped and fire burning Areas	Radioactive Materials	Humans & Environment	Radiation	Carcinogenic	Very Low	A, B & C
Explosive Storage Areas	Explosive wastes/residue and CW	Humans and Environment	Inhalation/ Ingestion	Explosion/ Toxic	Very Low	A, B & C
DSSs	PCBs	Humans and Environment	Ingestion	Toxic	Medium	A, B & C
Former firing ranges	Lead, cupro-nickel, explosive residues	Humans and Environment	Inhalation/ Ingestion	Toxic	Very Low	A, B & D

Table 2. Source-Pathway-Receptor and Preliminary Risk Assessment Information for chemicals at RAF Scampton.

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