

**ENVIRONMENTAL SERVICES GROUP
REPORT NO. 2129/95**

**REPORT ON THE
REMEDIATION OF DRAINS**

**FORMER RARDE SITE
WALTHAM ABBEY (NORTH)**



BRITISH AEROSPACE
DEFENCE
ROYAL ORDNANCE

**ENVIRONMENTAL SERVICES GROUP
REPORT NO. 2129/95**

**REPORT ON THE
REMEDIATION OF DRAINS**

**FORMER RARDE SITE
WALTHAM ABBEY (NORTH)**

This document is of UK origin and is © Royal Ordnance plc. It contains proprietary information which is disclosed for the purposes of assessment and evaluation only. The contents of this document shall not in whole nor in part: (i) be used for any other purpose, (ii) be disclosed to any member of the recipient's organisation not having a need to know such information nor to any third party individual, organisation or government, (iii) be stored in any retrieval system nor be reproduced or transmitted in any form by photocopying or any optical, electronic, mechanical or other means, without the prior written permission of the Personnel & Resources Director, Royal Ordnance plc, Chorley, England.

**Environmental Services Group
Royal Ordnance Division
British Aerospace Defence Limited
Westcott
Aylesbury
Bucks HP18 ONP**

**Date: September 1995
Ref: 9449/2129/95/1**

REPORT NO. ESG2129/95

Subject: Report on the Remediation of Drains

Client: MOD DLS

ORIGINATOR: *P. Mayell* P MAYELL *18/9/95* DATE

CHECKED BY: *DR G Bulloch* DR G BULLOCH *19/9/95* DATE

AUTHORISED BY: *DR G Bulloch* DR G BULLOCH *19/9/95* DATE

CONTENTS

1. INTRODUCTION
 2. BACKGROUND
 3. STATUS OF DRAINS
 4. REMOVAL PHILOSOPHY
 5. TREATMENT PROCEDURES USED
 6. DETAILS OF DRAINS REMOVED
 7. SAMPLING
 8. DISCUSSION OF RESULTS
 9. RECOMMENDATIONS
-
- | | | |
|------------|---|-------------------------|
| APPENDIX 1 | - | SITE PLAN SHOWING AREAS |
| APPENDIX 2 | - | DRAIN LOCATION PLANS |
| APPENDIX 3 | - | ANALYSIS RESULTS |

1. INTRODUCTION

The former RARDE Waltham Abbey Site contains a number of buildings which in the past were used for the storage, processing and testing of explosive materials. As a consequence, many of the drains on the site which originate from these buildings are possibly contaminated by such materials.

In order to develop a safe and cost effective method for decontamination of drains, Procedure ESG28/93 was produced covering an initial trial to be carried out on one drain run. After completion of this trial, a more extensive set of trials resulting in the making safe of all drains associated with building L157 was carried out. The trials were reported in ESG37/93. As the trials progressed, a more detailed removal procedure was produced. This was regularly revised to introduce improved methods resulting from experience, and to incorporate comments from the Environmental Health Officer and others, and was issued in November 1994 as ESG41/93. This procedure was used for all further drains removed on the site, replacing ESG28/93.

The full removal programme for drains associated with buildings was not completed due to financial constraints. This document reports on all drains removed during the Remediation Project, and highlights the location of known remaining drains which must be regarded as suspect.

2. BACKGROUND

During the normal operations in an explosive process building, drains are frequently the recipient of cleaning wash down waters and certain waste process liquors, and hence they may be contaminated by explosives despite the use of 'savealls' at the end of the internal drain line. This contamination may well be present in any remaining sludge, construction materials and (should the drain have leaked due to the deterioration or disruption of joints) in the surrounding soil. Foul, process or mixed use drains are the most likely to be contaminated, but surface water drains may sometimes be contaminated by spillages external to buildings, or by illicit disposal.

Evidence from other explosive sites has been that deposits of explosives can build up in drains to the point where a significant explosive risk is presented. However, no drains excavated to date at Waltham Abbey North Site (WANS) (other than in T area) have revealed significant explosive contamination.

3. STATUS OF DRAINS

The buildings present at WANS have been assessed to determine whether their drains present a hazard, given their past use, and the projected future use of each area. A plan showing areas is at Appendix 1. This assessment is below:

H Area: This area contained only a small number of buildings known to have been used with explosives. All drains except those immediately

associated with building H7 have been removed coincidentally with ground remediation. H7's drains should be regarded as low-medium risk.

North P Area: This area contained no buildings known to have been used with explosives. However, the majority of drains have been removed coincidentally with ground remediation. Any remaining drains may be regarded as low risk.

L & M Areas: These areas contain explosive processing buildings, including laboratories. Re-use plans for the areas make it advisable that any drains suspected of explosive contamination be rodded and/or removed. A programme of drain removal has been undertaken, but is not complete. Section 6 reports the extent of work carried out, and work remaining. Drains from most buildings within these areas should be regarded as high risk, although no significant contamination has been detected to date.

S & B Areas: These areas contain buildings most of which were used for processing or storage of explosives. The drains must therefore be regarded as high risk. However, planned future use of the area does not include occupation, renovation works or demolition, and therefore exposure of personnel to the risks presented will not occur. Some drains have been removed coincidentally with ground remediation. Any change to the planned future uses of the areas will require a reassessment of the risks presented by drains.

T Area: This area was the site of a former tetryl factory. The drains within the area were high risk, and a number were encountered containing quantities of tetryl. All known drains were removed coincidentally with ground remediation, thermally treated and disposed of.

N Area: It is believed that the Nitroglycerine (NG) manufacturing facility in this area was never used. If this assumption is correct, the associated drains will not be explosively contaminated. If the facility was used for NG manufacture, the drains must be considered high risk. Other buildings in the area were used for cordite charge machining. The drains from these buildings may be regarded as medium risk. No drains have been investigated or removed from this area.

4. REMOVAL PHILOSOPHY

- 1) Following comments from the EHO, it was decided to consider all drains from former explosive buildings as requiring treatment, not just those from which positive samples were obtained.
- 2) Shallow drains, or deep drains found by sampling and analysis to be contaminated were planned for removal.

- 3) All conventionally constructed manholes must be treated as points where contamination could escape to the surrounding soil and were removed together with the surrounding soil.
- 4) All arisings from the removal of drain lines and manholes suspected to contain contamination were assumed to be contaminated until proven otherwise.
- 5) Some deeper drains proved prohibitively difficult to remove, and were instead pressure grouted in-situ.

5. TREATMENT PROCEDURES USED

The procedure followed during the trials is contained in draft issues of ESG 41/93. The final procedures adopted are detailed in the formal issue of ESG 41/93, covering four pipe remediation methods:

- (1) Removal of non-metallic drains
- (2) Removal of exposed cast-iron drains
- (3) Removal of concrete encased cast iron drains
- (4) Pressure grouting of deep drains in-situ

The removal strategies all involved removal of manholes, rodding of the drain, followed by testing of the arisings for explosives, then exposure of the drain run and remote hydraulic cutting into sections. The sections were then thermally treated on the burning ground prior to disposal. The procedures ensured that operations which could possibly detonate explosive materials trapped in the pipes were carried out remotely.

6. DETAILS OF DRAINS REMOVED

Area M is the only area in which drains have been removed, other than coincidentally during ground remediation (see Section 3). The drains removed or grouted are shown on the plan at Appendix 2, as are the remaining drains.

7. SAMPLING

Sampling of material removed from the drainage system, or immediately surrounding it was carried out. Results are at Appendix 3. Appendix 3 also contains the results of sampling from drains removed from Area S, from gun cotton and tetryl stoves.

8. DISCUSSION OF RESULTS

Of 38 samples taken from material from man holes and pipe runs in Area M, analysed to Open Space detection limits, six positive results were obtained, the highest of which was 43010 at 110 mg/kg Nitroglycerine. Nitroglycerine at this level presents no explosive hazard, and the toxic hazard during removal can be minimised by the use of protective clothing and safe procedures. The material was disposed of to landfill through the site waste system. The results do prove, however, that explosives have entered some drain runs.

Of 117 results from material above and below drain runs in Area M, analysed using the waste tip method, only one positive result was obtained, for Nitrocellulose at >0.5%, and a trace of NG. This result indicates the presence of cordite. The low number of positives is as one would expect, given the relatively uncontaminated nature of the drains themselves.

The sediment from the main wet sumps of the two pumping stations (L126 & L170) associated with L157 were analysed using the Waste Tip method, and a result of 85mg/l of tetryl was determined in L170. This level does not present any form of hazard. The sediment was removed for disposal.

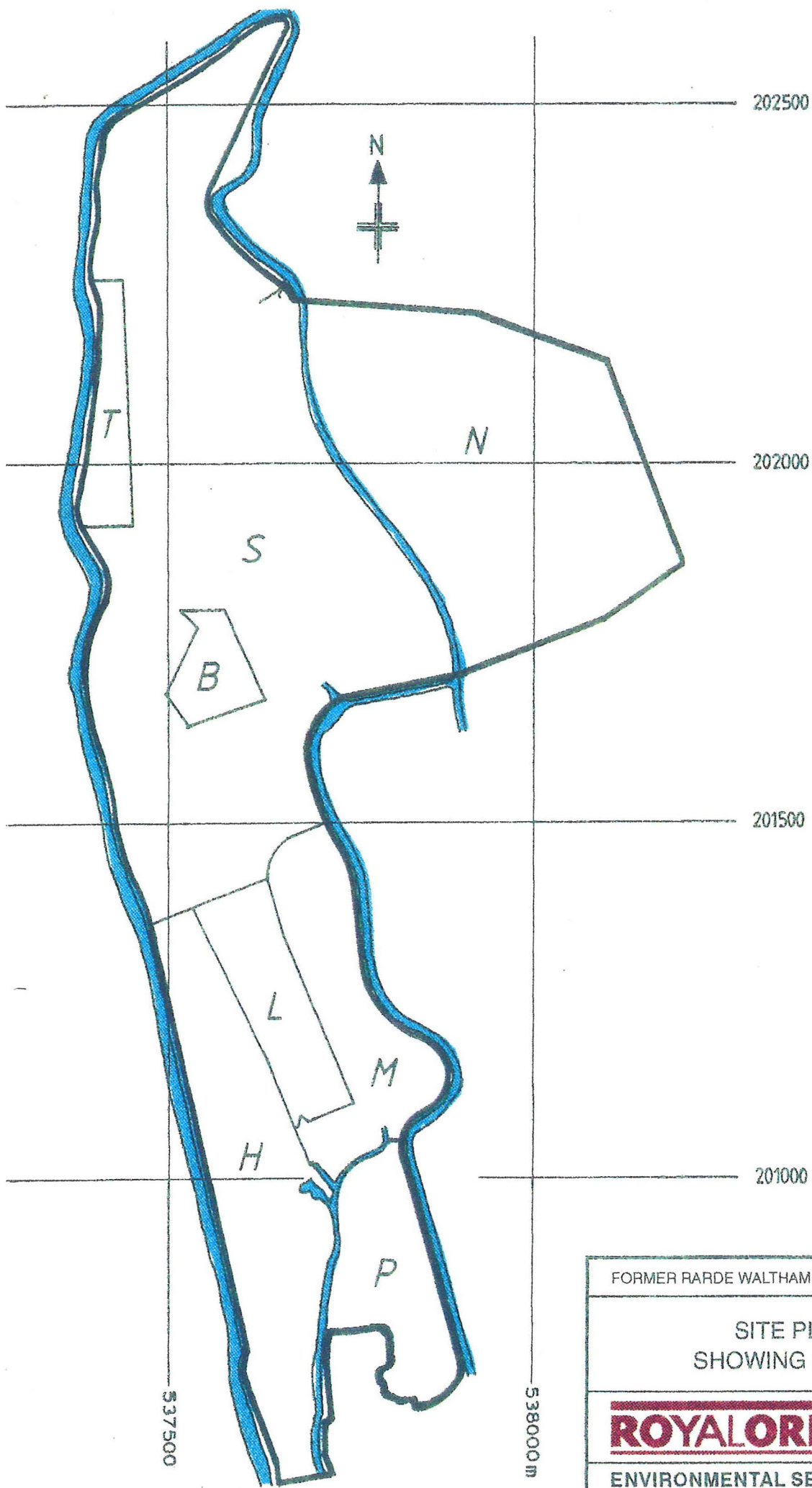
Material from and around drains removed during ground remediation adjacent to gun cotton and tetryl stoves was found to contain Nitrocellulose at up to 1.66 %. Of 14 samples, 13 were positive for Nitrocellulose, 3 above 1%. This level of Nitrocellulose is not a significant cause for concern. The material was diluted and disposed of through the site contaminated waste system.

9. RECOMMENDATIONS

Although the level of explosives determined in the drains excavated to date gives no significant cause for concern, the results cannot be reliably extrapolated. This is because each building has a different history, and a past incident or process in any particular building may have resulted in a dangerous accumulation of explosives in a particular drain. Therefore, the procedures contained in document ESG41/94 must be followed for any further removal of drains classified as medium or high risk.

It is recommended that the remaining drains within area M be investigated (and removed if contaminated) prior to preparation of the area for alternative use. Surface water drains are in theory less likely to contain explosive contamination, but this has not always been borne out on other sites.

APPENDIX 1



FORMER RARDE WALTHAM ABBEY (NORTH SITE)
SITE PLAN SHOWING AREAS
ROYALORDNANCE
ENVIRONMENTAL SERVICES GROUP


APPENDIX 2

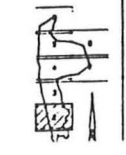
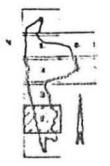
SERVICES SURVEY AT :
RARDE - WALTHAM ABBEY
FOR
DEFENCE LANDS SERVICE
MINISTRY OF DEFENCE

SCALE 1:500 - JOB No 4423 - DATE OCTOBER 1994
SHEET 2

LEGEND

DRAINS REMOVED
SHOWN THUS:- 

DRAINS PRESSURE
GROUTED WITH CONCRETE
SHOWN THUS:- 



LAND SURVEY AT :
RARDE - WALTHAM ABBEY
FOR
DEFENCE LANDS SERVICE
MINISTRY OF DEFENCE

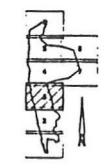
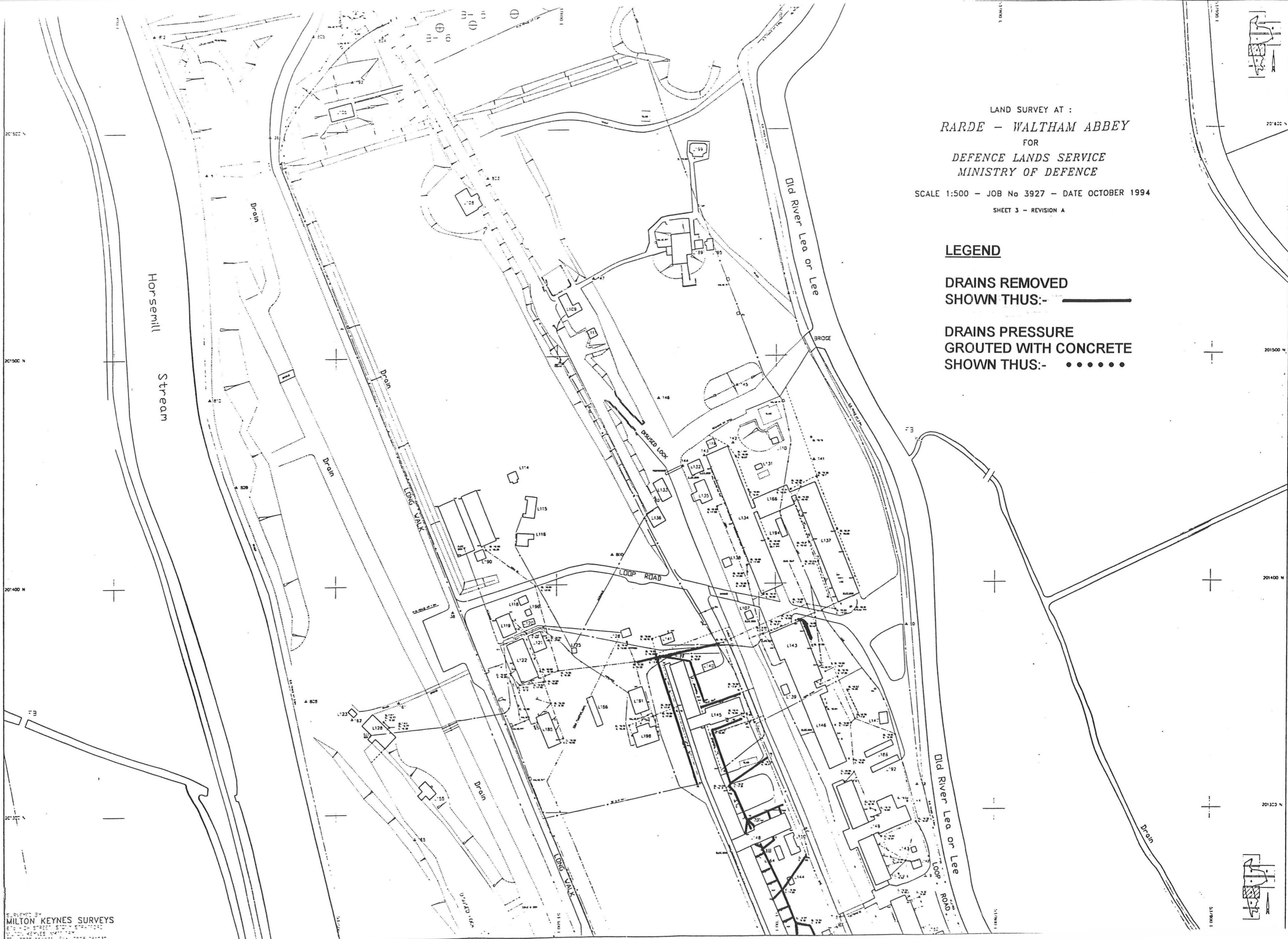
SCALE 1:500 - JOB No 3927 - DATE OCTOBER 1994

SHEET 3 - REVISION A

LEGEND

DRAINS REMOVED
SHOWN THUS:- ————

DRAINS PRESSURE
GROUTED WITH CONCRETE
SHOWN THUS:- ●●●●●



APPENDIX 3

WALTHAM ABBEY NORTH SITE (L157 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS
		NC %	HMX mg/kg	RDX mg/kg	EGDN mg/kg	TETRYL mg/kg	NG mg/kg	TNT mg/kg	PETN mg/kg	HNS mg/kg	PICRITE mg/kg	PICRIC ACID mg/kg	
LN 886/O/94	43002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH15
LN 887/O/94	43003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH14
LN 888/O/94	43004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH12-MH13
LN 889/O/94	43005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH12
LN 890/O/94	43006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH11-MH12
LN 891/O/94	43007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH11
LN 892/O/94	43008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH9
LN 893/O/94	43009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH8-MH9
LN 894/O/94	43010	ND	ND	ND	ND	ND	110	ND	ND	ND	ND	ND	Sediment in MH7
LN 895/O/94	43011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH6A-MH6B
LN 896/O/94	43012	ND	ND	ND	ND	ND	40	ND	ND	ND	ND	ND	Sediment MH6-MH7
LN 897/O/94	43013	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH4-MH6
LN 898/O/94	43014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH4
LN 1029/O/94	43015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH10-G8
LN 1030/O/94	43016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment MH10-MH11
LN 1031/O/94	43017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in MH10
LN 1032/O/94	43018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in Gully 7
LN 1033/O/94	43019	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in Gully 8
LN 1034/O/94	43020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in Gully 9
LN 1035/O/94	43021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in Gully 10
LN 1036/O/94	43022	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sediment in Gully 11
Detection limits		0.1	50	50	100	50	100	50	50	50	100	100	
Open Space threshold trigger level		1.0	10000	10000	800	10000	800	4000	10000	4000	3600	800	
Key:		ND = Not detected		SP = Small Peak		= Above Open Space threshold trigger level							
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP										Tel No. 0296 652123			
Westcott, Aylesbury, Bucks HP18 ONP										Fax No. 0296 652121			

WALTHAM ABBEY NORTH SITE (L148 & L153 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS	
		NC %	HMX mg/kg	RDX mg/kg	EGDN mg/kg	TETRYL mg/kg	NG mg/kg	TNT mg/kg	PETN mg/kg	HNS mg/kg	PICRITE mg/kg	PICRIC ACID mg/kg		
LN 3385/O/94	43133	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: Sediment in MH1	
LN 3386/O/94	43134	ND	ND	ND	ND	70	ND	ND	ND	ND	ND	ND	L153: MH1 - MH2	
LN 3387/O/94	43135	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: Gully - MH3	
LN 3388/O/94	43136	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: Sediment in MH3	
LN 3389/O/94	43137	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: Sediment in MH2	
LN 3390/O/94	43138	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: MH2 - MH3	
LN 3391/O/94	43139	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: MH2 - MH4	
LN 3392/O/94	43140	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: MH17 - MH18	
LN 3393/O/94	43141	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: Gully G1	
LN 3394/O/94	43142	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: MH18 - MH19	
LN 3395/O/94	43143	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L153: MH16 - MH17	
LN 3396/O/94	43144	ND	ND	ND	ND	ND	SP	ND	ND	ND	ND	ND	L148: MH22 - MH24	
LN 3397/O/94	43145	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH25 - MH26	
LN 3398/O/94	43146	ND	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: G45 - G46	
LN 3399/O/94	43147	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: G47 - MH33	
LN 3400/O/94	43148	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH28 - MH30	
LN 3401/O/94	43149	ND	ND	ND	ND	ND	SP	ND	ND	ND	ND	ND	L148: MH27 - MH28	
Detection limits		0.1	50	50	100	50	100	50	50	50	100	100		
Open Space threshold trigger level		1.0	10000	10000	800	10000	800	4000	10000	4000	3600	800		
Key:		ND = Not detected		SP = Small Peak		= Above Open Space threshold trigger level								
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP										Tel No. 0296 652123				
Westcott, Aylesbury, Bucks HP18 ONP										Fax No. 0296 652121				

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L157 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l	
LN 884/E/94	43000	ND	ND	ND	ND	85	ND	ND	ND	ND	ND	ND	L126 Sump
LN 873/E/94	43001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L170 Sump
LN 1176/E/94	43023	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1177/E/94	43024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1178/E/94	43025	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1179/E/94	43026	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1180/E/94	43027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1181/E/94	43028	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1182/E/94	43029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1183/E/94	43030	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1184/E/94	43031	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1185/E/94	43032	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1186/E/94	43033	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1187/E/94	43034	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1188/E/94	43035	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1189/E/94	43036	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1190/E/94	43037	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1191/E/94	43038	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1192/E/94	43039	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1193/E/94	43040	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH4 - MH6A
LN 1194/E/94	43041	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Below MH6A - MH7
LN 1195/E/94	43042	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Below MH6A - MH7
LN 1196/E/94	43043	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Below MH6A - MH7
LN 1197/E/94	43044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Below MH6A - MH7
LN 1198/E/94	43045	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Below MH6A - MH7
Nominal Detection limits		0.5	100	100	200	100	100	100	100	1000	200	200	
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the materia for disposal by road. For this purpose, equate 1000mg/l to 1%													
Key:		ND = Not detected	SP = Small Peak	= Above 1% transport limit									
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP											Tel No. 01296 652123		
Westcott, Aylesbury, Bucks HP18 ONP											Fax No. 01296 652121		

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L157 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l	
LN 1199/E/94	43046	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1200/E/94	43047	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1201/E/94	43048	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1202/E/94	43049	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1203/E/94	43050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1204/E/94	43051	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1205/E/94	43052	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1206/E/94	43053	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1207/E/94	43054	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1208/E/94	43055	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1209/E/94	43056	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1210/E/94	43057	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1211/E/94	43058	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1212/E/94	43059	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1213/E/94	43060	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1214/E/94	43061	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1215/E/94	43062	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1216/E/94	43063	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1217/E/94	43064	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1218/E/94	43065	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1219/E/94	43066	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1220/E/94	43067	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1221/E/94	43068	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1222/E/94	43069	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1223/E/94	43070	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
Nominal Detection limits		0.5	100	100	200	100	100	100	100	1000	200	200	
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the material for disposal by road. For this purpose, equate 1000mg/l to 1%													
Key:		ND = Not detected		SP = Small Peak								= Above 1% transport limit	
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP										Tel No. 01296 652123			
Westcott, Aylesbury, Bucks HP18 ONP										Fax No. 01296 652121			

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L157 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l	
LN 1224/E/94	43071	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above minor runs
LN 1611/E/94	43072	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1612/E/94	43073	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1613/E/94	43074	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1614/E/94	43075	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1615/E/94	43076	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1616/E/94	43077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1617/E/94	43078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1618/E/94	43079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1619/E/94	43080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1620/E/94	43081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH7 - MH8
LN 1621/E/94	43082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1622/E/94	43083	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH6A - MH7
LN 1623/E/94	43084	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above gullies, MH11-MH17
LN 1666/E/94	43085	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above gullies, MH11-MH17
LN 1667/E/94	43086	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above gullies, MH11-MH17
LN 1668/E/94	43087	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above gullies, MH11-MH17
LN 1669/E/94	43088	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
LN 1670/E/94	43089	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
LN 1671/E/94	43090	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
LN 1672/E/94	43091	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
LN 1673/E/94	43092	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
LN 1674/E/94	43093	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Excavation by L170
Nominal Detection limits		0.5	100	100	200	100	100	100	100	1000	200	200	
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the material for disposal by road. For this purpose, equate 1000mg/l to 1%													
Key:		ND = Not detected	SP = Small Peak	= Above 1% transport limit									
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP											Tel No. 01296 652123		
Westcott, Aylesbury, Bucks HP18 ONP											Fax No. 01296 652121		

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L153 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS	
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l		
LN 2270/E/94	43094	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above Midden - Canal	
LN 2271/E/94	43095	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2272/E/94	43096	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2273/E/94	43097	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2274/E/94	43098	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Under MH1 - MH2	
LN 2275/E/94	43099	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2276/E/94	43100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2277/E/94	43101	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2278/E/94	43102	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Above MH1 - MH2	
LN 2390/E/94	43103	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around concealed run	
LN 2391/E/94	43104	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around concealed run	
LN 2392/E/94	43105	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2393/E/94	43106	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2394/E/94	43107	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2395/E/94	43108	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2396/E/94	43109	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2397/E/94	43110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2398/E/94	43111	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2399/E/94	43112	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH19	
LN 2400/E/94	43113	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2401/E/94	43114	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2402/E/94	43115	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2403/E/94	43116	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2404/E/94	43117	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
LN 2405/E/94	43118	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH17 - MH18	
Nominal Detection limits		0.5	100	100	200	100	100	100	100	1000	200	200		
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the materia for disposal by road. For this purpose, equate 1000mg/l to 1%														
Key:		ND = Not detected		SP = Small Peak		=						Above 1% transport limit		
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP										Tel No. 01296 652123				
Westcott, Aylesbury, Bucks HP18 ONP										Fax No. 01296 652121				

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L153 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS		
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	IINS mg/l	PICRITE mg/l	PICRIC ACID mg/l			
LN 3404/E/94	43152	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH34 - MH35
LN 3405/E/94	43153	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH34 - MH35
LN 3406/E/94	43154	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Around MH34 - MH35
Nominal Detection limits		0.5	100	100	200	100	100	100	100	100	1000	200	200		
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the materia for disposal by road. For this purpose, equate 1000mg/l to 1%															
Key:		ND = Not detected		SP = Small Peak				=		Above 1% transport limit					
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP											Tel No. 01296 652123				
Westcott, Aylesbury, Bucks HP18 ONP											Fax No. 01296 652121				

WALTHAM ABBEY NORTH SITE (MATERIAL SURROUNDING L145 & L148 DRAINS) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS	
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PEFN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l		
LN 2482/E/94	43119	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH22 - MH24
LN 2483/E/94	43120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH24 - MH26
LN 2484/E/94	43121	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH22 - MH24
LN 2485/E/94	43122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH22 - MH24
LN 2486/E/94	43123	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L148: MH19 - MH20
LN 2799/E/94	43124	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2800/E/94	43125	>0.5	ND	ND	ND	ND	ND	SP	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2801/E/94	43126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2802/E/94	43127	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2803/E/94	43128	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2804/E/94	43129	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2805/E/94	43130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH27 - MH30
LN 2806/E/94	43131	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH25 - MH26
LN 2807/E/94	43132	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH25 - MH26
LN 3402/E/94	43150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH30 - MH32
LN 3403/E/94	43151	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	L145: MH30 - MH32
Nominal Detection limits		0.5	100	100	200	100	100	100	100	1000	200	200		
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the material for disposal by road. For this purpose, equate 1000mg/l to 1%														
Key:		ND = Not detected	SP = Small Peak				=	Above 1% transport limit						
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP										Tel No. 01296 652123				
Westcott, Aylesbury, Bucks HP18 ONP										Fax No. 01296 652121				

WALTHAM ABBEY NORTH SITE (GUNCOTTON & TETRYL STOVES) - ANALYSIS OF SOIL SAMPLES FOR EXPLOSIVES (WASTE TIP ANALYSIS)

LABORATORY REFERENCE	SITE REFERENCE	EXPLOSIVE											REMARKS	
		NC %	HMX mg/l	RDX mg/l	EGDN mg/l	TETRYL mg/l	NG mg/l	TNT mg/l	PETN mg/l	HNS mg/l	PICRITE mg/l	PICRIC ACID mg/l		
LN C 404/95	41198	0.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 14
LN C 405/95	41199	1.66	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 16A
LN C 406/95	41200	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 18
LN C 407/95	41201	1.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 18A
LN C 408/95	41202	0.20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 23
LN C 409/95	41203	0.61	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 29
LN C 410/95	41204	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 62
LN C 411/95	41205	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 92A
LN C 412/95	41206	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 93A
LN C 413/95	41207	0.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 93C
LN C 414/95	41208	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 96A
LN C 415/95	41209	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 96B
LN C 416/95	41210	1.07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove 98A
LN C 417/95	41211	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Stove E5
Nominal Detection limits		0.05	100	100	200	100	100	100	100	1000	200	200		
Waste Tip Method analysis was carried out to determine if samples were less than 1% explosives to allow legal shipment of the materia for disposal by road. For this purpose, equate 1000mg/l to 1%														
Key:		ND = Not detected	SP = Small Peak											= Above 1% transport limit
ROYAL ORDNANCE ENVIRONMENTAL SERVICES GROUP Westcott, Aylesbury, Bucks HP18 ONP										Tel No. 0296 652123 Fax No. 0296 652121				