

Proposed Housing, Queens Road, Brymbo, Wrexham Geo-environmental Report TRE Developments



GroundSolve Limited
Consulting Geotechnical, Engineering Geology and
Environmental Engineers

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1.0 INTRODUCTION

TRE Developments (TRED) proposes to develop a site in Queens Road, Brymbo in Wrexham, with some 24 conventional two to three storey houses.

The Parry Davies Partnership (PDP) is the architects for the scheme and GroundSolve Ltd (GL) have been appointed by TRED to carry out a desk study and site investigation at the site. The desk study was carried out first in order for the site investigation to be appropriately designed.

This report presents the findings of the desk study and site investigation and supersedes the desk study report, Reference 1. It gives geotechnical recommendations for the development, along with a qualitative environmental risk assessment.

2.0 THE SITE

2.1 Site Location and Description

The site is located in Queens Road, Brymbo in Wrexham at National Grid Reference SJ 297 537, see Figure 1.

The site is bounded by Queens Road, which runs along the north eastern side of the site and Railway Road, which runs along the southern and south western site boundary. To the south west of the road is new housing being constructed on the site of the recently reclaimed Brymbo Steelworks. To the north of the site is housing and a public house called Y Tai, see Figure 2.

Until recently the site was heavily wooded, although this has recently been cleared by the client, with the exception of four small areas of Japanese Knotweed observed growing in the northern section of the site.

Several footpaths cross the site in a north east to south west direction

The western half of the site is dominated by a disused railway embankment crossing the site in a NNW to SSE direction. It is at grade at the southern end of the site, where it is crossed by Railway Road. It is generally at an elevation of around 40mSD and it increases in height northwards to a maximum height of around 6m.

To the east of the embankment is a low area next to the car park, which appears to have been filled and a depression was noted. Several remnants of previous structures on site were noted.

The general gradient across the site is in a westerly direction, although the ground levels also fall along Queens Road in a northerly direction. At its highest point on the south east site boundary the elevation is around 47mSD, falling to a low of 34mSD on the western site boundary.

The northern section of the site slopes in a westerly direction from an elevation of 40mSD (Site Datum) in the east to 33mSD in the west towards the public house car park.

Photographs showing the site are presented in Appendix A.

2.2 Geology and Hydrogeology

The geology of the site has been studied on the 1:50,000 scale geology plan, Sheet 121, and the associated geological memoirs, Reference 2. In addition, the Wrexham Applied Geological Mapping project has been consulted, Reference 3.

The geology plan does not show any superficial deposits beneath the site, with bedrock comprising mudstones and sandstones of the Carboniferous Period

shown beneath the site. The conjectural outcrop of several coal seams is shown to the immediate west of the site.

No major faults are shown in the vicinity of the site and an old opencast mine is shown to the south west of the site.

Reference 3 confirms the site to be devoid of any superficial deposits, with bedrock at surface and with made ground comprising the railway embankment.

It also shows the open casting to the south west to be on the Upper Stinking Seam. However, a fault is shown between the opencast and the site trending in a NNW to SSE direction, with its downthrow to the west. Reference 2 records a westerly downthrow of 460' (140m) for this fault at the Brymbo Ironworks.

It also shows the details of the Coal seams outcropping immediately west of the site and it would appear that the shallowest seam is probably the Smiths Coal Seam, with the Lower Stinking outcropping across the eastern section of the site. The Upper Stinking seam is shown outcropping to the east of the site.

Sections from nearby collieries taken from Reference 2 and nearby jobs undertaken by GL are presented below.

Colliery	Westminster	Black Lane
Seam	Top Stinking	
With	55	
Separation in metres	Sulphur	
	12	
	Lower Stinking	Hollin or Four Feet
	9.5	12
	Smiths	Smiths
	10.7	12
	Drowsell	Drowsell
	9	10
	Powell	Powell
	7	
	Two Yard Coal	16
	6.7	
	Crank	Crank
	10.4	
	Brassy	
	28.6	
	Main	
	85	
	Wall and Bench	

It would therefore appear that whatever coal seam is shown outcropping to the west of the site shallow seams should be anticipated beneath the site, which would have been worked at an early date.

Reference 3 also shows the presence of a shaft on site to the west of the embankment and one immediately south of the site.

The site is underlain by a minor aquifer, which is described as one which can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for both local supplies and in supplying base flows to rivers.

The soils are classified as being of high leaching potential, although this is based on fewer observations than elsewhere. A worst case classification (H) is assumed, until proved otherwise.

No watercourses are shown in the vicinity of the site.

2.3 History

The history of the site has been studied on old Ordnance Survey Plans (OS) dating from 1873 and aerial photographs held by the Welsh Assembly dating from 1947.

The 1873 OS plan at a scale of 1:2,500 shows that the railway embankment and railway line had already been constructed across the site and the roads had already been constructed around the site. A coal shaft is shown at the western toe of the railway embankment. Several small buildings are shown on the site, with housing to the north of the site. Brymbo Iron works are shown to the south west of the site, see Figure 3a.

Little change can be seen on the 1899 OS plan, although the shaft was no longer shown, possibly because it appears that the embankment had been widened, as more railway lines had been laid on top of the embankment. In addition, a small building to the east of the embankment had been demolished, and a footpath is shown crossing the northern section of the site, see Figure 3b.

The road to the north east was called Queens Road, while the road on the western site boundary was called Railway Road, with Brymbo Station to the south east of the site and a new signal box on the southern site boundary adjacent to the railway line. A Methodist Chapel had been constructed to the south of the site.

No changes can be seen on the 1912 OS plan, see Figure 3c.

The 1947 and 1951 aerial photographs showed that the railway line in the southern section of the site was at grade, although it quickly goes onto embankment. The photographs show that apart from the embankment, the site is open fields with well defined hedgerows.

The 1958 aerial photograph clearly showed a low point to the north of the embankment, with a possible drainage ditch leading into it.

No changes are shown on the 1962 aerial photograph, although several footpaths can be seen crossing the site, which are also shown on the 1963 OS plan, see Figure 3d. The aerial photograph also showed a level crossing where the railway line crosses the road on the southern site boundary. The OS plan also shows an issue (water seepage) on the northern site boundary leading to a sink (water flow into ground) where the low point on the aerial photograph was observed, which may lead to a drainage culvert beneath the embankment. A spot height recording an elevation of 570'OD (173.78mOD) is on Railway Road on the western site boundary. The plan also shows that Brymbo station had become dis used.

No changes are shown on the 1967 OS plan, see Figure 3e.

An aerial photograph dated 1971 shows what appears to be filling on the northern site boundary in the location of the public house car park. This forms a distinct boundary with the low point mentioned above. A thin veneer of possible filling was also observed in the southern section of the site, to the south west of the railway embankment.

The 1973 and 1975 aerial photographs confirmed the presence of the filling discussed above and also shows that open casting had commenced at Brymbo Steel Works. The signal box adjacent to the railway line could also be clearly seen. A small depression could also be seen to the west of the railway embankment, possibly relating to the position of the shaft discussed in Section 2.3. The embankment sides are also starting to become lightly vegetated.

An aerial photograph dated 1977 confirmed that the railway line was still in use. It also showed a drain on the western side of Railway Road leading to two below ground water tanks with a crane between the features.

The 1978 aerial photograph clearly shows the level crossing still in operation and the spread of vegetation, although still immature around the site, see 1980 OS plan, Figure 3f.

No change is shown on the 1984 OS plan; see Figure 3g, although the 1985 aerial photograph shows that the vegetation to be becoming fairly mature and the railway line appears to be closed.

The 1989 aerial photograph confirms that the level crossing had been demolished confirming that the line had been closed. The low point to the north of the embankment was becoming heavily vegetated. The later aerial photographs show that site to be becoming heavily vegetated and by 1995 Brymbo Steel Works had been demolished, see Figures 3h and 3i.

2.4 Mining

A Coal Authority report has been obtained for the site, the main findings are summarised below and the full report presented in Appendix B.

- The property is within the likely zone of influence on the surface from workings in three seams of coal at shallow to 210m depth, the last date of working being 1913,
- There are no current mine workings,
- On or within 20m of the site there are two mine entries,
- There are no recorded subsidence incidents at the site.

The report concluded that a prudent developer would seek technical advice before works are undertaken on site

In addition, a shaft report has been obtained, which is summarised below and also presented in full in Appendix B.

Shaft 147 (South of Site)

- Original source from former NCB shaft register,
- No 8 Pit,
- Depth of superficial deposits 2m,
- Depth of shaft 76.2m,
- No treatment details are known.

Shaft 233 (On site)

- Source OS plan 1871 and 1912 editions,
- Treatment details unknown.

Consequently, to assist in the understanding of the mining history beneath the site the Coal Authority Headquarters in Mansfield were visited. No details of shallow mining were found for the site, and no plans showing shaft 233 were found, which is surprising given the fact that the shaft was on plans dating after 1872, when it became legal to deposit mine plans. However, this is consistent with the shaft report, which failed to indicate a mine plan source for the shaft. The mining in 1913 beneath the site was in the Wallsend Coal seam, which is at considerable depth.

However, information on the local geology was obtained from the Mine plan for the open casting some 500m to the south west of the site. This work was carried out in the early 1970's and was on the Top Droughy Seam, which corresponds to the Upper Stinking Coal Seam. These workings proved the seam to dip at 1 in 5.6 (10°) to the ESE.

2.5 Planning Conditions

Discussions with the Local Authority have revealed that the sites past use as a railway will mean that a contamination clause will be put on the planning condition, with the following standard clause being used.

“Development shall not begin on site until a scheme to deal with potential contamination at the site has been submitted to and approved in writing by the Local Planning Authority. This scheme shall include a phased investigation approach to identify the extent of contamination and any measures require to remediate the site, including post development monitoring. Where remediation measures are required, the development shall not be occupied/used until a Validation Report to show that the works have been satisfactory carried out has been submitted to and approved in writing by the Local Planning Authority”.

A copy of the letter from the Local Authority is presented in Appendix C.

2.6 Existing Services

A public sewer crosses the eastern section of the site, see Figure 4. A 3m development easement has been imposed along the route of the sewer, which can be identified on site by the presence of several man holes.

In addition, a water main crosses the central section of the site, approximately along the route of the pedestrian access, see Figure 4. An overhead electricity supply with a short underground section to the adjacent houses is present in the northern section of the site.

3.0 ENVIRONMENTAL SEARCHES

A Sitecheck report has been supplied by the client for an area 500m around the site. The report is summarised below and presented in full in Appendix D.

Summary

- Between 3 to 5% of homes are above the action level, full radon protection measures are required,
- The risk from shallow mine workings is low to moderate,
- No potential for collapsible ground,
- Low potential for Compressible ground,
- No potential for ground dissolution,
- Moderate potential for landslide instability,
- Very low potential for running sands,
- Very low potential for shrinking or swelling clay.

Waste/Landfill Sites

- There is a licensed waste management facility (Landfill Boundary) within 250m of the site,
- There is a Local Authority Recorded Landfill site within 250m of the site,
- There is a registered landfill site between 250 and 500m of the site,
- There are no registered waste transfer sites or waste treatment disposal sites.

The Landfill boundary refers to Works Bank at Brymbo Steel Lodge and is to the south east of the site and is for an Industrial landfill. While the Local Authority has identified landfilling on site, this is probably a reference to the railway embankment. In addition, Bryn Malley tip is within 250m of the site, although this is thought to be a colliery spoil tip.

Statutory Authorisations

- There is a Local Authority Pollution Prevention Control between 250 and 500m of the site,
- There are no contaminated land entries within 500m of the site,
- There are no registered radioactive substances,

Discharge Consents

- There are two discharge consents within 250 to 500m of the site.

Industrial Processes

- There are no industrial processes within 500m of the site.

Storage of Hazardous Substances

- There are no sources of Hazardous substances within 500m of the site.

Potentially Contaminative Uses

- There are two contemporary trade directory entries between 250 and 500m of the site.

- There are two past potentially contaminative land uses on site with a further 11 within 250m,
- There are also two records of potentially infilled land within 250m.

However, it should be noted that none of the eleven sites is adjacent to this site and the potentially contaminative land use on site is recorded as being the railway line.

Surface Water Features

Apparently there is also a water feature within 250m of the site, however, its location is not known.

4.0 PROPOSED DEVELOPMENT

TRED proposes to develop a site in Queens Road, Brymbo in Wrexham, with some 24 conventional two to three storey houses at the site. The site layout is presented in Figure 4.

The location of an existing sewer is shown crossing the site trending in north to south direction.

In the southern section of the site substantial cut will be required into the slope to achieve level building platforms for Plots 1 to 6. Consequently, retaining walls between 3 and 4.5m high will be required on the south eastern site boundary. Elsewhere substantial cut and fill will be required to create level building platforms necessitating significant earthworks. A summary of the existing and proposed levels is presented in Table 1 below:

TABLE 1 – Summary of Cut/Fill Required

Plot No	Floor Slab Level	Ground level	Cut (m)	Fill (m)	Retaining Wall height (m)
1	43	42.8-46.4	0-3.4		4.5
2	43	42.5-46.4	0-3.4		4.5
3	42.5	42.07-44	0-1.5		3.2
4	42.5	42-44	0-1.5		3.2
5	42	40.7-41.7		0.3-1.3	
6	42	40.7-41.7		0.3-1.3	
7	41	40.8			
8	41	40.8			
9	40	40-41		0-1	
10	40	40-41		0-1	
11	39	38		1	
12	39	38		1	
13	38	35.5		2.5	
14	38	35.5		2.5	
15	37	35		2	
16	37	35		2	
17	36.5	35.6		0.9	
18	36.5	35.6		0.9	
19	36	36			
20	36	36			
21	37	34.7		2.3	
22	37	40.4	3.4		
23	37	41	4		
24	37	40-41	3-4		

At this stage foundation loadings are not known, however, loads from similar developments have been typically around 50kN/m run for two storey and 75kN/m run for three storey developments. Floor slab loadings are not anticipated to exceed 5kN/m².

As part of the planning conditions an area of open space is required. This will be to the west of the railway embankment. To construct it to adoptable standards it will be necessary to construct side slopes from the reduced railway embankment height down to the road of around 1 on 3 (18°). Between Railway Road and the slope a 3m wide cycle way is proposed. It will also be necessary to construct retaining walls at the base of the slope, with retained heights of around 1 to 2m being anticipated.

The access road on the southern site boundary is at an elevation of 41mOD, where it joins Railway road, rising to 42mOD in front of Plot 6, before falling gently at a gradient of 1 in 20 to the end of the access road outside Plot 21. A spur to the access road will extend to Plot 20 on the northern site boundary, where it will be at an elevation of 35mOD.

These road levels will entail raising the road above existing ground level in the southern section of the site, around 1m by Plot 3 increasing to 3m by Plot 6. The approximate cut/fill line will be around Plot 7; from here northward a small amount of cut will be required until the edge of the existing railway embankment is encountered, from where around 3m of filling will be required.

The following recommendations are based on the above assumptions; consequently, they should be reviewed and if necessary revised during the detailed design process.

5.0 THE INVESTIGATION

5.1 Fieldwork

The fieldwork was carried out on the 13 and 14th August 07. The locations of the investigation were limited by the presence of several services, see Section 2.6 and the site topography, which prevented boreholes and trial pits on the steeper sections of the site.

It comprised twelve rotary percussive boreholes drilled to a maximum depth of 30m by Piletec Ltd (PL) to investigate shallow mine workings at the site. The boreholes were supervised on a part time basis by an engineer from GL.

The location of the boreholes is presented on Figure 5 and the logs in Appendix E.

In addition, twelve trial pits were excavated to examine the shallow ground conditions for foundation design and suitability for earthworks. The pits were excavated to a maximum depth of 4m and were logged by an engineer from GL in general accordance with BS 5930, Reference 4.

The locations of the trial pits are presented on Figure 5, and the logs presented in Appendix F.

Soakaway tests were carried out in selected trial pits, with the pits being filled within two minutes using a 2000 gallon water tanker. The results of the soakaway tests are discussed in Section 6.3 and presented in Appendix G.

5.2 Search for Shaft

During the site investigation the shaft was searched for by excavation. However, the excavation was limited by the presence of a nearby water main and the fact that the shaft was beneath the edge of the embankment. Consequently, while the edge of the shaft was proved it was not possible to prove the extent of the shaft due to the risk of causing instability of the railway embankment.

Photographs showing the search for the shaft are presented in Appendix H and its approximate location presented on Figure 5.

5.3 Laboratory Work

Samples were taken from the trial pits and taken to the Laboratories of Geotechnics and Alcontrol in Chester for the following physical and chemical testing:

Physical Testing (Geotechnics)

- Moisture content,
- Atterberg Limits,
- Sulphate content (2:1 water extract).

All testing was carried out in accordance with BS 1377, Reference 5. The results of the testing are discussed in Section 6 and the results presented in full in Appendix I.

Chemical Testing (Alcontrol)

CLEA Contaminants – Arsenic (As), Cadmium (Cd), Chromium (total) (Cr), Mercury (Hg), Nickel (Ni), Lead (Pb), Selenium (Se) and Phenols.

Other Contaminants – Boron (B), Copper (Cu), Zinc (Zn), Sulphide, Sulphate (2:1 water extract), Cyanide total (Cn), pH, Sulphur total, PAH (Speciated).

In addition, specific testing for Aromatics and Aliphatics was carried out, along with leachate testing on two of the samples.

6.0 GROUND CONDITIONS

For the purposes of a discussion on ground conditions the site has been divided up into areas of natural ground and areas where there are differing types of made ground.

6.1 Natural Ground

Natural Ground comprised glacial till and bedrock, which was encountered at surface in the southern section of the site either side of the railway embankment. It was also encountered below made ground in the northern section of the site and beneath the railway embankment fill.

The glacial till was typically weathered at surface to a soft, orange brown, sandy, silty clay, with a little gravel. With depth it became a firm to stiff, orange brown mottled grey, clay, with a little rounded gravel.

Atterberg testing recorded liquid limits of 52 to 53%, plastic limits between 23 and 29%, with plasticity indices between 23 and 30%, indicating it to be a clay/silt of high plasticity. However, it should be stressed that only between 3 and 5% of the sample passed the 425 micron sieve. Natural Moisture contents were between 26 and 30%, see Appendix I.

The sulphate content when measured as 2:1 water extract were between 0.04 and 0.06g/l, with pH values between 6.96 and 7.08.

The underlying mudstone bedrock was weathered at surface and was described as a stiff, grey mottled brown, silty clay, with a little mudstone gravel. With depth it graded into a weak, grey, thinly bedded mudstone.

The drilling proved the bedrock to be mudstone to depths of 30m with several coal seams, several of which had been worked. A summary of the drilling is presented in Table 2 below:

Table 2: Summary of Drilling

BH No	Superficial/made ground Cover (m)	Rock Cover (m)	Coal	Void/broken Ground	Coal	Final Depth (m)
1	2	3		5.5-11.50 and 18-19		19
2	2.20	7.8	10-11.2		20-20.8	30
3	2.80	3.7		6.5-9.5		10.5
4	2.8	5.8	8.6-9.5		15-16.2 & 17.3-17.6&24-24.5	30
5	3	0	3-4.5		12.8-13.9/17-17.4/24-24.4	30
6	4	0	4-5.4	22-24	14.5-15.1	25
7	7	6.6	13.6-14.5		23-24.8	30
8	3.8	1.2		5-7.5		8.5
9	4	1.5		5.5-6.5		7.5
10	4.5	0	4.5-5		14.3-14.9/23.5-25.5	30
11	1.80	3.7	5.7-6/8.5-9.5		10-10.4/20-21.1	30
12	2	4.2	6.2-7.1/15.5-16		17-17.3/22-23.10	30

6.2 Made Ground

The railway embankment was found to comprise many differing fill materials, which are summarised below.

- Loose to medium dense, dark grey brown, sub angular, fine to medium gravel, mainly of ash and clinker, which was generally encountered at the top of the embankment,
- Loose, light to medium brown, gravely sand,
- Loose, grey, sub angular, coarse gravel of slag,
- Light grey, fine to medium gravel of mudstone in a clay matrix, which is considered to be colliery spoil derived from mining operations in the area, possibly the adjacent shaft excavation,
- Soft to firm, to stiff, orange brown and grey, silty clay, with some mudstone gravel, which was considered to be derived from excavations into natural ground.

In the northern section of the site made ground was encountered that is a combination of historic and recent tipping.

At the north end of the site the made ground typically comprised colliery spoil, which was described as, dense, grey, sandy, sub angular to platy, fine to coarse gravel/stiff, grey, silty clay, with gravel. The trial pits revealed the general thickness of made ground in this area to be 2m thick.

Sulphate testing of the colliery spoil, when measured as 2:1 water extract recorded a value of 0.05g/l, with a pH value of 6.02.

In TP 6 what was possibly a backfilled old culvert was encountered, as traces of brick and masonry were observed along with slag cobbles.

In the low point adjacent to the railway embankment and the car park for the public house evidence of recent tipping from the pub was observed. This comprised old beer barrels, bottles, plastic and timber, see Appendix F.

6.3 Soakaway Tests

Three soakaway tests were carried out during the site investigation in TP 7, TP 8 and TP 9, see Appendix G. In TP 9 in the glacial till and weathered bedrock no fall in water level was recorded in 1 hour and twenty minutes.

In TP 8 the test was carried out in weathered bedrock and a permeability of 3.6×10^{-6} m/sec has been calculated, which is on the limit usually recognised as acceptable for soakaways.

TP 7 encountered glacial till at the base, although made ground was above the till. The soakaway test recorded a permeability of 1×10^{-5} m/sec, which would be acceptable. However, the water loss is probably in the made ground and this would not be acceptable to the Environment Agency.

Since a large amount of the site is covered by made ground and the rest is underlain by fairly impermeable glacial till and weathered bedrock, the use of soakaways at this site is not considered appropriate. However, as there is a significant area of open space it may be possible to attenuate water flows prior to entering into the storm water drainage system.

6.4 Groundwater

No groundwater seepages were observed in any of the trial pits or boreholes, even in the old mine workings.

7.0 SUMMARY OF CHEMICAL TEST RESULTS

The results of the chemical tests are presented below, where they are compared against the recent CLEA Soil Guidance Values (SGV's) where they exist. Elsewhere in the absence of CLEA guidance, the results are compared to Generic Assessment Criteria (GAC) determined by LQM and CIEH in accordance with current legislation and guidance. In the absence of guidance on several contaminants the results are compared to the ICRCL guidelines, even though they have officially been withdrawn, they remain useful in the absence of statutory guidance.

CLEA Contaminants

<i>Determinant</i>	<i>No of Tests</i>	<i>Range (mg/kg) (Mean)</i>	<i>CLEA SGV Guidelines A*</i>	<i>% exceeding Clea</i>
Arsenic	6	<3-26 (12)	1 20 2 20 3 500	17 17 0
Cadmium	6	0.4- 2.0 (0.6) pH dependant	1 2 2 30 3 1400	0 0 0
Chromium (Total)	6	11-52 (27.5)	1 130 2 200 3 5000	0 0 0
Lead	6	79-380(186)	1 450 3 750	0 0
Mercury	6	<0.6-22 (4)	1 8 2 15 3 480	17 17 0
Nickel	6	18-50 (29)	1 50 2 75 3 5000	0 0 0
Selenium	6	<3	1 35 2 260 3 8000	0 0 0
Phenol	6	<0.15	1 78** 2 21900** 3 21900**	0 0 0

A* 1 SGV for residential use with plant uptake.

2 SGV for residential use without plant uptake.

3 SGV for commercial/industrial use.

** based on a conservative soil organic content of 1%.

Of the above tests only arsenic in the topsoil in TP8 and mercury in the made ground in TP2 exceeded the CLEA SGV's for residential use with plant uptake. However, TP8 is in an area that is to be raised by two metres and TP 2 is on the top of the railway embankment, with this material being buried by several metres in the area of open space, see Section 10.

Other Contaminants

Determinant	No of Tests	Range (mg/kg) (Mean)	Clea SGV Guidelines A*	GAC	% exceeding Clea/GAC
Boron	6	<3.5	NA	3	NA/0
Zinc	6	70-390 (220)	NA	330	NA/17
Copper	6	38-210 (117)	NA	111	NA/50
PAH (tot)	6	5.90-87 (22.80)	NA	1.12***	NA/NA

*** based on benzo (a) pyrene PAH species, which were between 0.23 and 5.8mg/kg, average 1.23mg/kg. However, only TP11 exceeded 1.12mg/kg.

Of the above results only zinc in the made ground in TP 11 and copper in TP's 2, 3 and 4 on the embankment exceeded the GAC's for residential use with plant uptake. As mentioned above this material is to be placed beneath several metres of fill in the area of open space. In addition, the PAH values in TP11 exceeded the benzo (a) pyrene GAC values. This trial pit is in an area due to be raised by 2m and consequently, the risk to site end users is addressed.

Other Contaminants

Determinant	No of Tests	Range (mg/kg) (Mean)	Clea SGV Guidelines A*	ICRCL Guidelines ½	% exceeding Clea/ICRCL
Sulphide	6	<50-970(430)	NA	250/1000	NA/50/0
Total Cyanide	6	<1	NA	NA	NA/0
Sulphur	6	<70-820(195)	NA	5000/20000	NA/0
Sulphate Wat sol	6	0.023-0.23 (0.074)	NA	2000/10000	NA/0/0
pH	6	6.47-8.44	NA	3/5	NA/0

Notes

1 Threshold/Action levels domestic gardens, allotments

2 Threshold/Action level landscaped areas.

None of the above results give cause for concern.

Aromatics and Aliphatic

TP	Depth	Total Aliphatics µg/kg	GRO C4 – C10 µg/kg	Total Aromatics µg/kg	TPH (Aliphatics and Aromatics) µg/kg
1	0-0.4	700000	<10	330000	1000000
2	0-0.3	550000	<10	210000	760000
3	0-0.5	130000	<10	170000	300000
4	0-0.5	210000	<10	350000	560000

TP	Depth	Benzene µg/kg	Toluene µg/kg	Ethyl Benzene µg/kg	M & p Xylene µg/kg	o Xylene µg/kg	MTBE µg/kg
1	0-0.4	<10	<10	<10	<10	<10	<10
2	0-0.3	<10	<10	<10	<10	<10	<10
3	0-0.5	<10	<10	<10	<10	<10	<10
4	0-0.5	<10	<10	<10	<10	<10	<10

Due to the high level of aromatics and aliphatics present in the trial pits on the top of the embankment the results were analysed further to try and identify the source, see Appendix J.

Unfortunately, the additional testing was inconclusive, being identified as possible diesel or naturally occurring hydrocarbons. However, the lack of other hydrocarbons associated with diesel and the lack of any odour in the ground would suggest it is not diesel, but naturally occurring hydrocarbons. Examination of the trial pit logs records the presence of ash and clinker and fragments of coal, which are more likely to be the source of the hydrocarbons.

Consequently, additional analysis was instructed in the form of a Product Source Signature Double Plot of Fluoranthene: Pyrene versus Benz (a) anthracene: Chrysene on the PAH results. The results show the PAH in TP's 1 and 3 to be from combustion products, with the remainder of the pits being coal derived. None of the tests indicated a potential fuel source, see Appendix J.

In any case, the leachate testing has proved that these hydrocarbons are not leachable, with no values being recorded above the detection limit of 10 µg/l. They therefore will not present a risk to controlled waters.

8.0 ENVIRONMENTAL RISK ASSESSMENT

This risk assessment has been carried out in accordance with current guidelines, using a Hazard (Source) → Pathway → Receptor analysis. It is based on the findings of the desk study and the site investigation and at this stage is only qualitative. This is mainly due to the low levels of contamination encountered. However, it may become necessary to carry out a more detailed quantitative risk assessment using the new CLEA guidelines at a later date, although this will need to be agreed with the Local Authority.

In order for a risk to exist, a source (hazard), a receptor and a pathway between the two must all be present.

Sources (Hazards)

The desk study revealed the only past land uses to have been the railway embankment, which crosses the site. Railway lines can be contaminated with fuel spillages and also detergents from cleaning of engines. However, this is more common in railway sidings, with the desk study showing this to contain no more than two lines. Pesticides are also common on railway embankments to control vegetation, although this is a more recent practice and not considered to have been carried out when this line was operational. Finally, railway lines are frequently constructed using ash and clinker, which may contain low levels of heavy metal contamination and hydrocarbons present in unburnt coal. In this case, the investigation only encountered ash and clinker close to the top of the embankment construction.

In addition, the site investigation revealed it had been undermined at shallow depth, with one shaft identified on site.

The site investigation revealed isolated slightly elevated zinc, mercury, copper, arsenic, PAH and hydrocarbon contamination in the low area in the northern section of the site and on top of the railway embankment. However, the lack of visual or olfactory evidence of contamination and the fact that the material was mainly ash and clinker, suggests that the heavy metals and the hydrocarbon contamination is from the ash and clinker.

While no significant contamination has been encountered on site, it has to undergo extensive reprofiling to construct level building platforms. This provides an opportunity to address the slight risk from contamination and this is discussed in more detail in the following sections.

Pathways

Possible pathways by which the hazards may reach the target groups include: -

- Ingestion and skin contact with soils on site,
- Ingestion of vegetables grown on site,
- Inhalation from wind blown dust,
- Direct contact with contaminated material during construction,
- Leaching into the ground and then to the buried aquifer,
- Run off into surface watercourses.

Receptors

The potential impact of a hazard must be assessed with regard to the following target groups:

- Existing site users,
- Future site users,
- Construction workers,
- Surface and groundwater, both on and off the site,
- Nearby vegetation,
- Building materials and buried services.

Existing Site Users

There are no obvious risks to existing site users, as the site use is limited to occasional pedestrians crossing the site on the existing footpaths. The main risk to surrounding people would be wind blown dust since the stripping of the vegetation. However, the imminent development of the site makes this immaterial.

There would however be a possible short-term exposure risk due to dust during the construction period, although this can be catered for by using water bowsers during dry spells, and in any case will only be short term.

The risk to existing users is therefore considered to be negligible.

Future Site Users

The site use is to be residential with garden areas and as such is the most sensitive end use. The risk to future site users has been identified as ingestion of soil and home grown vegetables. To reduce the risks mentioned above, it is recommended that a cover system be placed on the garden areas underlain by made ground to isolate any remaining contamination. In addition, a clean cover should be placed over the area of open space.

As mentioned above it is intended to re profile the site and this offers an opportunity to ensure that any potentially contaminated material is sufficiently buried. In addition, there will be significant generation of natural materials, which are suitable for capping in garden areas.

The low area in the northern section of the site, identified as having slightly elevated contamination levels is to be raised by around 2m; consequently the risk to end users is eliminated. If it is found to be unsuitable from an engineering point of view this material will be excavated and placed in the area of open space beneath several metres of fill.

However, it should be pointed out that of all the plots, only plots 20 to 24 will have the back gardens in an area of made ground. All of the remaining plots will be in natural ground on the eastern side of the site.

It is envisaged inert material can be won on site in the form of glacial deposits and weathered mudstone bedrock from foundation excavations, and this

material will be used to cap the garden areas for plots 20 to 24, with clean topsoil lain over the cover.

Construction Workers

Should any contamination be encountered during the site works it can be catered for by good site practices, whereby site personnel should be made aware of the possibility of encountering contaminated ground during the works. The following normal precautions will offer adequate protection:

- Avoiding direct skin contact,
- Washing facilities should be provided and used, particularly before eating,
- Excavated material that is observed to be contaminated should be covered during transport and taken to a suitably licensed facility,
- no naked lights or smoking should be allowed in areas being excavated,
- Unauthorised persons should not be allowed on site.

A COSHH statement should be prepared prior to commencement of the works,

In addition, in line with good practice a watching brief should be kept on all excavations, any contaminated material encountered, should be excavated, stored safely in designated areas, tested and disposed of at a suitably licensed facility.

Surface and Groundwater

Apparently there is a surface water feature within 250m of the site, although its location is not known. However, the low levels of contamination on site and the leachate results show that the risk to surface waters is negligible.

The aquifer below the site is a minor aquifer, and the shallow mining beneath the site in several seams means that groundwater beneath the site is already contaminated.

Consequently, the risk to surface and groundwater from this site is considered to be very low.

Vegetation

The site until recently had been well vegetated with mature trees and bushes, consequently, the low level of contaminants in the ground are not currently affecting site vegetation.

The risk to future site vegetation from the phytotoxic elements in the ground has been discussed above, with suitable cover systems being incorporated in the garden and open space areas.

Building Materials and Buried Services

Sulphate testing of the made ground has indicated that chemical attack of buried concrete will not be an issue. In addition, no elevated phenol values were encountered, indicating that chemical attack of service supplies should not be an issue. However, service suppliers should be consulted and the chemical test results supplied to them.

Conclusions

Based on the above discussion, it is considered that the site would not be classified as contaminated under Part IIA of the Environmental Protection Act.

As the definition of contaminated land in the Act is, “any land, which appears to be in such a condition, by reason of substances in, on or under the land, that: –

- Significant harm is being caused or there is a significant possibility of such harm being caused; or,
- Pollution of controlled waters is being, or is likely to be caused”.

9.0 SHALLOW MINING RISK ASSESSMENT

There are two main issues presented by the mining history at the site, these are:

- Shallow abandoned mine workings,
- One mine entrance.

Shallow Abandoned Mine workings

There are two types of mining, partial and total extraction. Methods of partial extraction are nearly all variations on "Pillar and Stall" techniques, with pillars of coal being left to support the roof of the mine. Extraction ratios of between 30 to 75% were typical, depending on geological conditions and depths.

However, it was common practice to work pillars on withdrawal from the mine, so higher extraction ratios may have been possible.

Total extraction is achieved by long wall working and also by various pillar and stall techniques, where the pillars were removed in a second phase of mining, normally on retreat from the mine.

It is important to know the method of mining employed, as total extraction methods normally result in total collapse of the workings, with the exception of the main roadways. While partial abstraction techniques leave voids in the mine, which can become unstable and migrate to surface. These take the form of "crownholes" at surface, which are generally circular and can be several meters in diameter.

The site investigation has revealed shallow mine workings present beneath the site in several coal seams. Where encountered a borehole was drilled within several meters to determine if pillars had been left in. This proved conclusively that the extraction was by partial extraction techniques.

As the mining must have taken place pre 1872, when it became law to deposit mine plans it would have been typical for workings to have been by pillar and stall techniques, with voids left, although they may have been partially backfilled with mine waste.

While no detailed research into mining subsidence has been undertaken in the North Wales area, extensive research has been carried out in South Wales, where similar pillar and stall mining would have taken place, References 6 and 7.

Research into mining subsidence in South Wales, revealed:

- Almost all incidents are "crownholes" in form, delayed general subsidence is very rare,
- About 75% of subsidence incidents are caused by the collapse of mine entrances or workings close to outcrop,
- Mine entrances present the greatest risk and account for over 50% of recorded incidents,
- The recorded rate of occurrence is very low.

The remaining subsidence incidents were analysed for their migration ratio (H/T), where H is the thickness of rock above the workings and T is the typical seam/void thickness, taken here as 2m, the height of a typical roadway. Of these 75% of the incidents had an H/T ratio of less than 2 (4m rock cover), with 90% of incidents having an H/T ratio of less than 6 (12m rock cover).

The majority of the remaining incidents were related to special events, probably relating to collapses on main roadways, which would have continually been cleared by miners leading to bigger residual voidage.

There is also strong evidence from data gathered from grouting contracts, opencast sites and site investigations that migration of voids above workings generally extends to a limited height above the original void. Records of over 10,000 drill and grout boreholes were collected, in almost every case, the record of broken ground, workings or voids, occurred at or immediately above the anticipated elevation of the worked horizon.

From the above it can be concluded that the majority of residual voids have already collapsed to a stable profile. Otherwise voids would be encountered at a wide range of depths as they progress to the surface.

To assess the risk from the shallow abandoned mining the following risk based approach is followed, where risk (R) may be defined as:-

$$R = F \times C$$

Where F is the frequency of an undesirable event and C is the consequences of it happening.

The assessment of risk due to mining subsidence is a twofold process, involving first the assessment of probability of a subsidence event happening, i.e. the subsidence potential; secondly the consequences resulting from that event. For a crown hole to occur, the following must coincide at any one point:

- There must be a potential for mining (PM),
- There must be workings under the site (PW),
- A void must remain in the workings (PV),
- The void must be unstable and able to migrate to surface (PI),
- The thickness of rock overburden must be insufficient to choke the collapse feature before hitting rockhead (PR),
- The thickness of drift must be insufficient to prevent the void reaching the surface (PD).

PW Workings Exist

The site investigation has identified workings in several coal seams beneath the site.

PV Voids remain in Workings

Two voids were identified in BH's 8 and 9. In addition, broken ground and loss of flush was encountered in several boreholes, see Table 2.

It is also considered extremely likely that roadways exist beneath the site. These would typically be the only well constructed part of the mine, as they provided access to the mine.

PI Voids become unstable

While no significant void migration was encountered, BH 1 encountered broken ground well above the seam level, suggesting that migration had occurred and the migrating void choked by falling debris.

PR Rock cover insufficient to prevent migration of rock

The site investigation has indicated that over most of the site the seams virtually outcrop, with no substantial rock cover above any of the seams.

PD Drift cover insufficient to prevent migration to surface

The site investigation has revealed that there is little superficial cover above the site and the made ground can be ignored.

As can be seen from the above assessment the risk to the surface from crownhole collapse cannot be discounted. This must then be compared to the consequences and an appropriate remedial measure installed. Should a crownhole occur from shallow mine workings, it is likely that due to the shallow nature of the workings that any collapse would be a small feature by the time it reached surface, which would probably result in a small circular depression several meters wide and several meters deep.

It is currently proposed to build houses on the site, with associated access roads and an area of public open space is also planned. The greatest risk is considered to be the properties and access roads, where occupation times are greatest and the financial consequences are highest.

In the area of open space the number of personnel movements and the likely failure mechanism make injury the only occurrence, although this is considered very low risk. It is considered extremely unlikely that a death could result and the worst case scenario is a member of the public being slightly injured.

Consequently, it can be seen that the risk of an event occurring is present the consequences to the houses are high. The risk to properties could largely be eliminated by drilling and grouting the mine workings, with all properties requiring treatment.

Drilling and grouting would involve drilling a perimeter curtain to the workings starting at the deepest point, i.e. down dip, where boreholes would typically be drilled at 1.5m centres and injected with a thick grout/gravel mix to form a perimeter to the subsequent infill grouting. The workings would then be grouted from a series of boreholes drilled on a 3m grid between the perimeter curtain and the outcrop position.

Mine Entrances

However, mine entrances are considered to represent a far greater risk than the shallow mine workings. The desk study and site investigation identified one old shaft. However, due to the age of the workings the possibility of unrecorded mine entrances cannot be discounted.

The shaft is in an area of public open space, which is to be raised by filling, see Figure 5. Consequently, the risk once treated to the public is considered to be very low.

Treatment of shafts should be carried out in accordance with References 8 and 9, with the following recommendations being pursued.

Where rockhead is sufficiently close enough to surface, the preferred option is to cap shafts at rockhead. This would typically involve constructing a reinforced concrete cap over the shaft of at least twice the diameter of the shaft.

However, as the shaft is largely buried by the embankment this would involve excavation of most of the embankment width. As the shaft has been backfilled and rockhead is at surface it and the shaft is in an area of public open space it is considered more appropriate to carry out the following treatment.

- Expose shaft and surrounding bedrock,
- Excavate shaft one times the diameter of the shaft,
- Taper the excavation sides to produce a plug,
- Cast a mass concrete plug into the shaft.

10.0 GEOTECHNICAL RECOMMENDATIONS

10.1 Earthworks and Site Preparation

While the trees on site have already been cut down their roots will need to be grubbed out and any resulting excavations backfilled with suitable well compacted site won granular material. In addition, any topsoil should be stripped and stored on site for later re use, if suitable.

Excavations on site will be in made ground, glacial till and weathered bedrock and should be possible using conventional earthmoving equipment. Excavations in the bedrock should be feasible using conventional earthmoving equipment. However, deeper excavations into unweathered bedrock may be difficult in confined excavations, necessitating the use of pneumatic/hydraulic breakers to break out the bedrock. In addition, obstructions associated with former buildings on site may need to be broken out. While excavations in the bedrock will probably be stable, all excavations that are to be entered should be supported or battered back for safety reasons.

Groundwater seepages are generally not anticipated. If encountered they should easily be catered for by pumping from sumps cut within the excavation.

To construct the final development landform significant earthworks will be required, which will involve,

- Excavation to remove material containing Japanese Knotweed,
- Backfilling of excavated areas using suitable site won material,
- Excavation of recent tipping in the low area adjacent to the pub car park,
- Excavation into natural ground in the southern section of the site,
- Lowering the level of the northern section of the railway embankment by up to 4m,
- Raising the level of the railway embankment beneath the access road on the southern section of the site,
- Filling the area to the west of the embankment to form a public open space,
- Filling the northern section of the site.

This will involve excavation of the embankment material and placing it in a controlled manner in accordance with an approved earthworks specification. However, this will depend on the suitability of the material in the embankment and other excavations and this is discussed in more detail below.

10.2 Sequence of Work and Suitability of Materials for Re use

It is proposed to fill the area of open space to the west of the railway embankment. Once filled it is proposed to top the public open space with the soil derived from the excavations for Japanese Knotweed.

However, prior to backfilling the public open space some preparation works will be necessary. Firstly it will be necessary to treat the mine shaft.

Secondly, it will not be possible to surcharge the existing public sewer, which crosses the site without protecting it first. However, it would be possible to backfill over the sewer if it was protected and permission obtained from the operators. Typical protection would include installing wing walls either side of the sewer and placing a concrete raft above the pipe supported on the wing walls. A gap should be left beneath the concrete raft, which would be typically backfilled with compressible material such as polystyrene.

In addition, a water pipe crosses the public open space, which also should not be surcharged. This issue would best be addressed by temporarily raising the water pipe above ground while the land is raised. The pipe could then be relain once the land filling is complete.

The material to be used for the public open space would include those materials not suitable for use as a structural fill or those materials not suitable from an environmental perspective.

The investigation encountered slight hydrocarbon contamination in the ash and clinker at the surface of the embankment. This should be placed at the base of the open space construction and lightly tracked in using excavators on site. It is envisaged that the rest of the public open space will be made up with material from the low point in the northern section of the site and soft clays derived from glacial till, which is not suitable for use elsewhere. This should also act as a suitable seal to the materials below. As the public open space is to be constructed at gradient of 1 on 3 (18°) then slope stability will not be an issue. The material excavated and treated for the knotweed should then be spread over the surface and seeded.

Following excavation beneath the areas of knotweed the resulting excavation should be inspected prior to filling, so the suitability of the materials can be assessed. It will then be necessary to excavate the recently tipped material. This material should be sifted and all unsuitable material screened and taken off site to a domestic landfill tip. The remaining screened soil should be put into the open space construction.

During the above excavation it is highly likely that an old culvert will be encountered. If encountered it should be excavated for its full length and replaced with suitable material compacted in accordance with an approved earthworks specification.

From inspection of the made ground in this area it is likely to be suitable for inclusion in the works, as it is generally colliery spoil. However, prior to commencement of filling this material should be proof rolled; any loose/soft spots should be excavated and replaced with suitable well compacted material.

Material encountered in the embankment is generally considered to be suitable for use as structural fill, with the exception of the soft clays. The sand

encountered near surface is suitable, as is the colliery spoil. However, the slag should be treated with care as some slags have the potential to heave on exposure due to chemical reactions by up to 10% of their volume. In which case, they are only considered appropriate for use as either road capping or in general areas of fill, it should only be used beneath buildings if it is buried by at least 1m beneath final ground levels.

Elsewhere the natural ground will be suitable, with the exception of the upper weathered clay, which should be set aside and used for cover to the area of open space or garden areas in the north of the site underlain by made ground.

The underlying unweathered till and weathered bedrock will be suitable for reuse. However, it should be stressed that these materials are prone to rapid deterioration on exposure to wet weather and trafficking.

It is likely that small quantities of unweathered bedrock will become available in excavations in the south east corner of the site and this material will be suitable for re use.

Due to the variability of suitable materials across the site it is recommended that excavations be inspected on a regular basis. It is also likely that some degree of double handling will be necessary to obtain the best use of materials on the site and to reduce the possibility of having to take materials off site.

10.3 Foundations and Floor Slabs

As discussed in Section 9 it will be necessary to drill and grout all house plots on site. It is recommended that this exercise is carried out following the earthworks, as the current site condition makes access very difficult to most plot locations. It will also be more cost effective as the amount of drilling necessary will have been substantially reduced. Construction can then follow on immediately the grouting is completed.

It is understood that building control insurance is to be provided by the NHBC, who require houses to be founded on rafts, even if sites have been successfully grouted. In this case, a pseudo style raft is recommended with reinforced beams and a suspended floor slab.

However, this form of construction is also recommended to cover the fact that all houses with the exception of plots 1 to 6 will be constructed on made ground, albeit controlled fill. In addition, as the source of fill is likely to be variable, it is recommended that a regulating layer of suitable imported granular material be constructed beneath house plots 7 to 24. This should comprise a layer of 6F2 extending 1m below the base of the foundations and 1m outside the building line, which should be compacted in accordance with an approved earthworks specification.

The pseudo rafts should be designed assuming an allowable bearing pressure of 75kN/m² beneath the prepared building platforms and natural ground. The

beams should extend at least 900mm beneath final external ground level to provide protection from frost heave.

An easement will need to be left for the existing sewer and houses should be situated to avoid the foundations stressing the sewer.

10.4 Japanese Knotweed

GroundCoverDBM have been appointed by the client to treat the Japanese knotweed on site, which is present in four small areas in the northern section of the site.

It is proposed to treat the knotweed on site with a three year course of spraying with Herbicide. The coarse strands will be removed and the remaining soil containing the Rhizomes will be spread over the area identified for public open space, probably in a 300 to 500mm thick layer and treated annually.

It has been estimated that there is around 650m³ of knotweed infested material.

10.5 Protection of Buried Concrete

Chemical testing on site has indicted that chemical attack of buried concrete is not an issue; buried concrete should therefore be designed as Class AC-1 as described in Reference 10.

10.6 Access Roads and Hardstandings

No California Bearing Ratio Tests (CBR's) were carried out as part of this investigation. Construction of access roads and hardstandings are likely to be in a combination of natural ground and controlled earthworks. In either case, extra over normal construction costs are not anticipated due to the road formation.

The fact that the southern section of the road is to be raised using controlled earthworks, means that high CBR's should be possible and these will need to be confirmed by on site testing. Where the road formation is being lowered, the net unloading of the formation should also mean that road construction should be minimal. However, this will also need to be confirmed on site.

However, all formations should be proof rolled prior to filling and any loose/soft areas encountered excavated typically an additional 300mm and backfilled with suitable well compacted granular material.

However, shallow mine workings are present beneath the site, it is therefore recommended to address the risk from the mine workings that road and hardstanding construction be reinforced with reinforcing geotextiles, which would protect the road in the event of any potential collapse and allow any reinstatement to be carried out.

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10.7 Landfill and Radon Gas

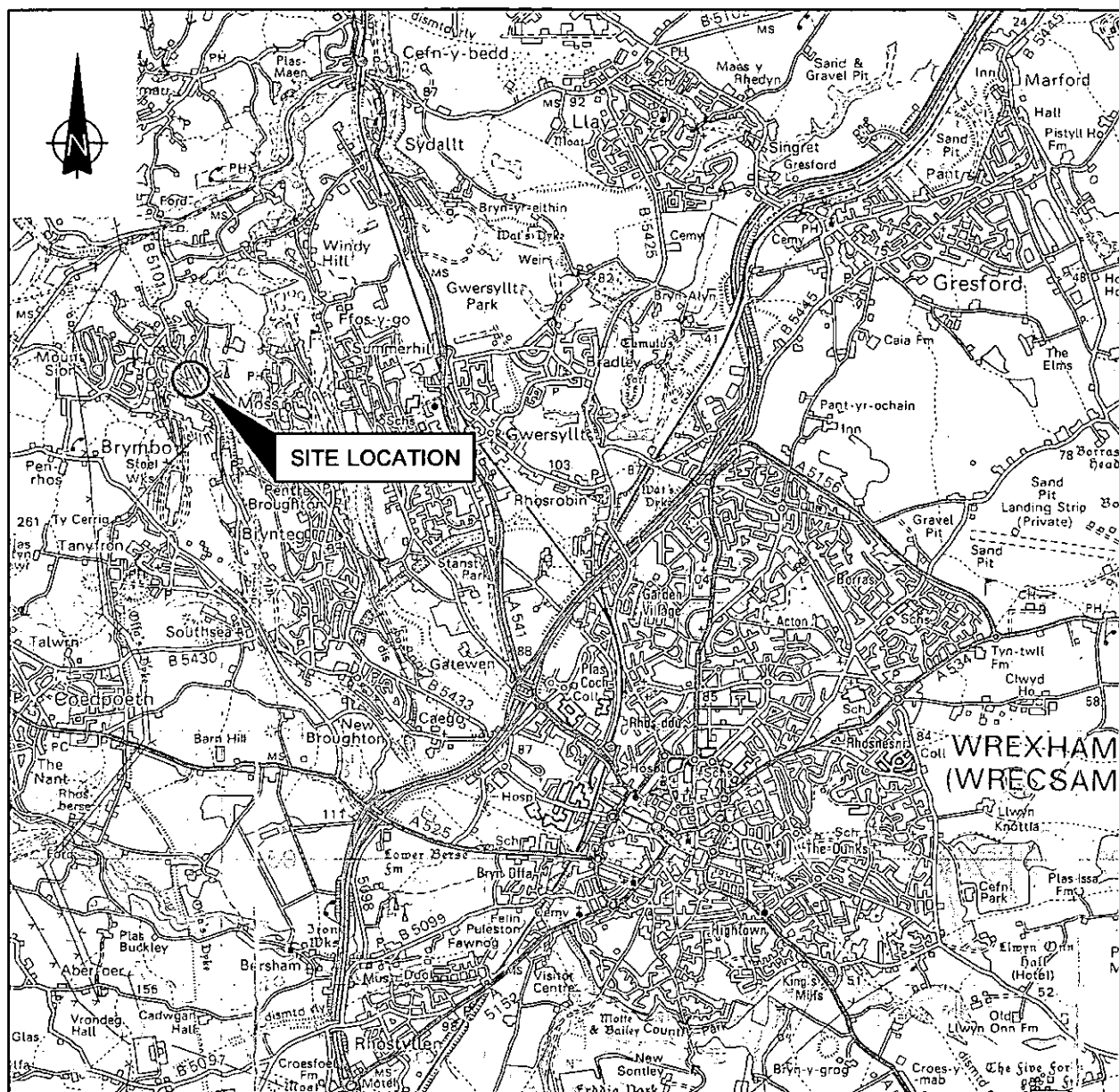
While the desk study has revealed the presence of a landfill within 250m of the site, it was for industrial and not domestic use and landfill gas is unlikely to be an issue. This is considered particularly so, as the location of the tip is at a significantly lower elevation than the site and the underlying ground conditions in this area comprise fairly impermeable glacial till.

The Sitecheck report identified that the site requires full radon protection measures. However, examination of Reference 11 shows that the site is in an area where basic radon measures should be installed, but a geological assessment should be carried out to determine if full protection measures are necessary.

In this case, the site has been included as having radon potential due to Limestone outcropping several kilometres to the west of the site. As the site is underlain by Coal measures strata, which has a low radon generation potential, full radon measures are not deemed to be necessary.

In addition, the site is protected from upward migration of radon, as it is underlain by fairly impermeable glacial till and the majority of the buildings are founded on controlled fill on a sloping site. Consequently, even if radon did migrate upwards, as it is 7.5 x heavier than air it would not migrate upwards through the controlled fill.

FIGURES

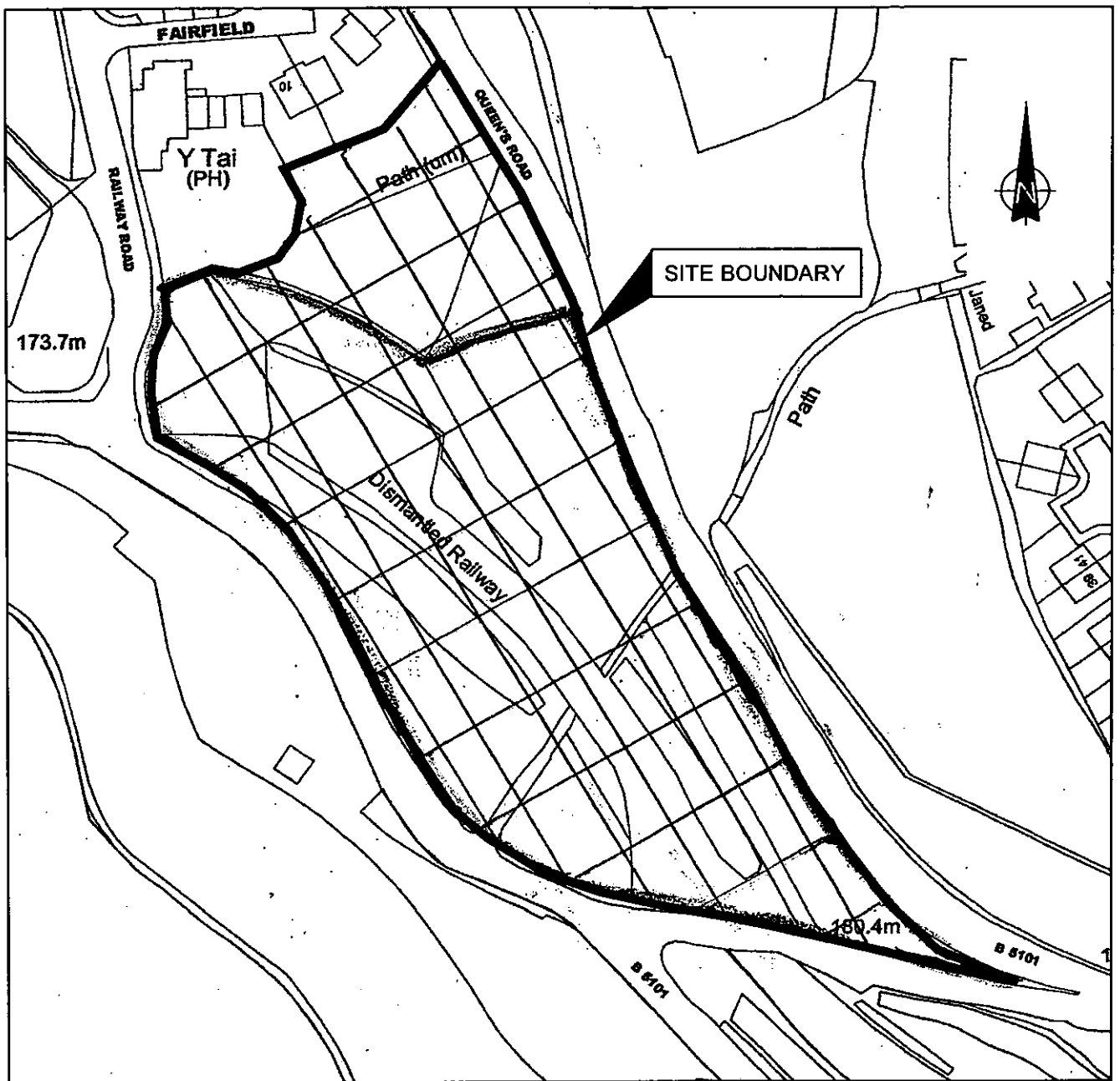


SCALE - 1 : 50000

LICENSE No. 100030802

SITE LOCATION

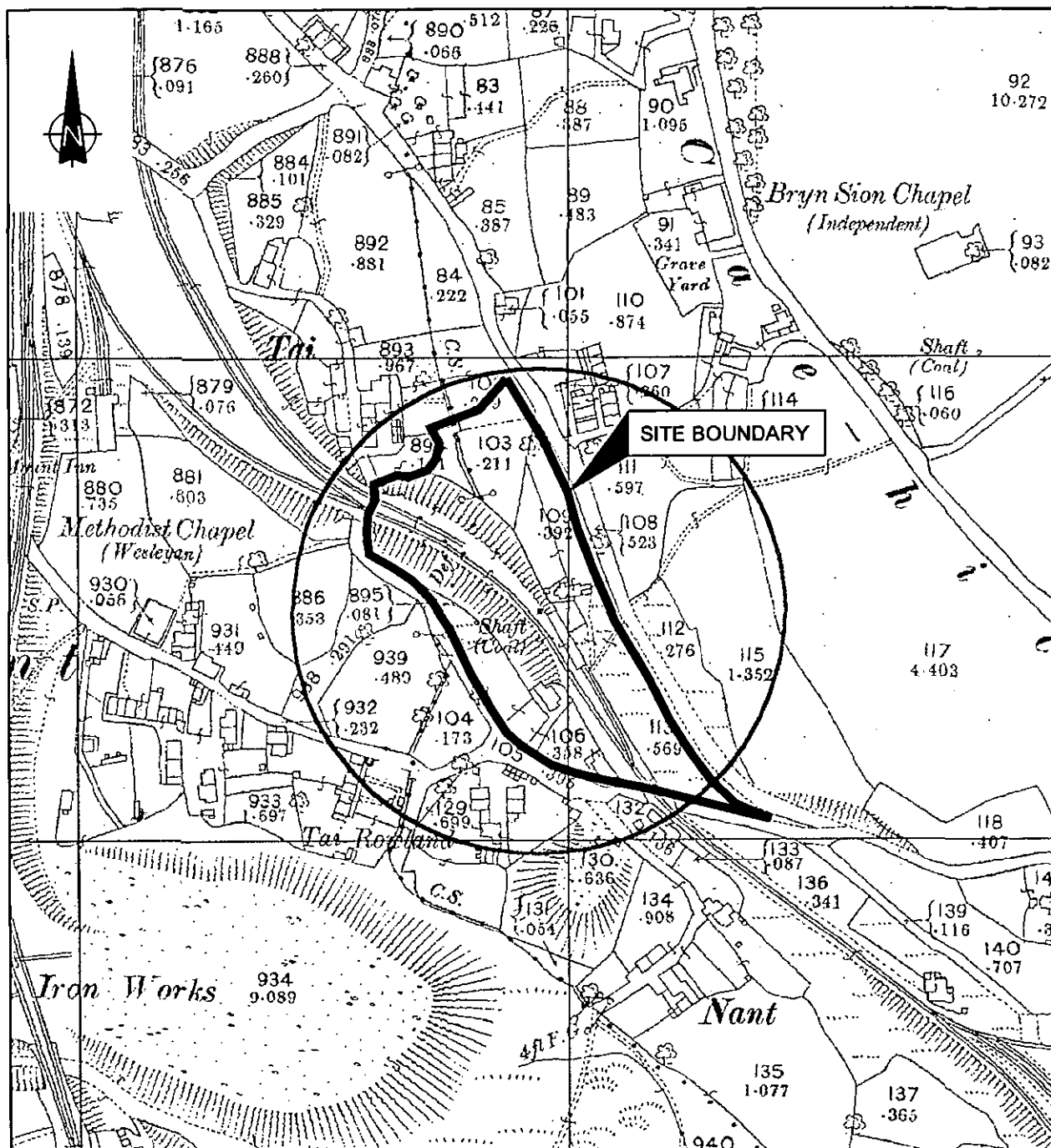
FIGURE **1**



SCALE - 1 : 1250

SITE LAYOUT

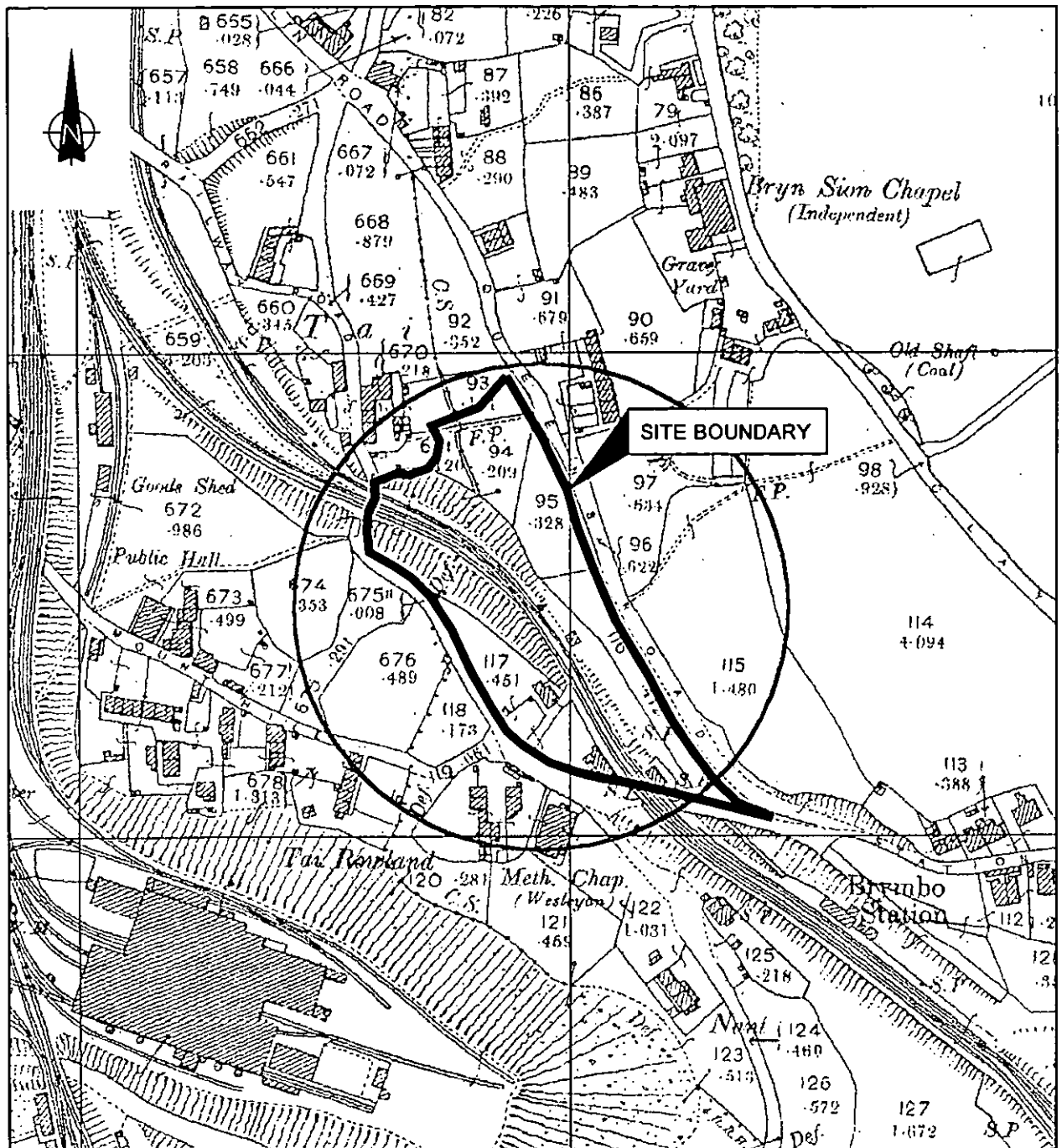
FIGURE **2**



SCALE - 1 : 2500

HISTORY - 1873

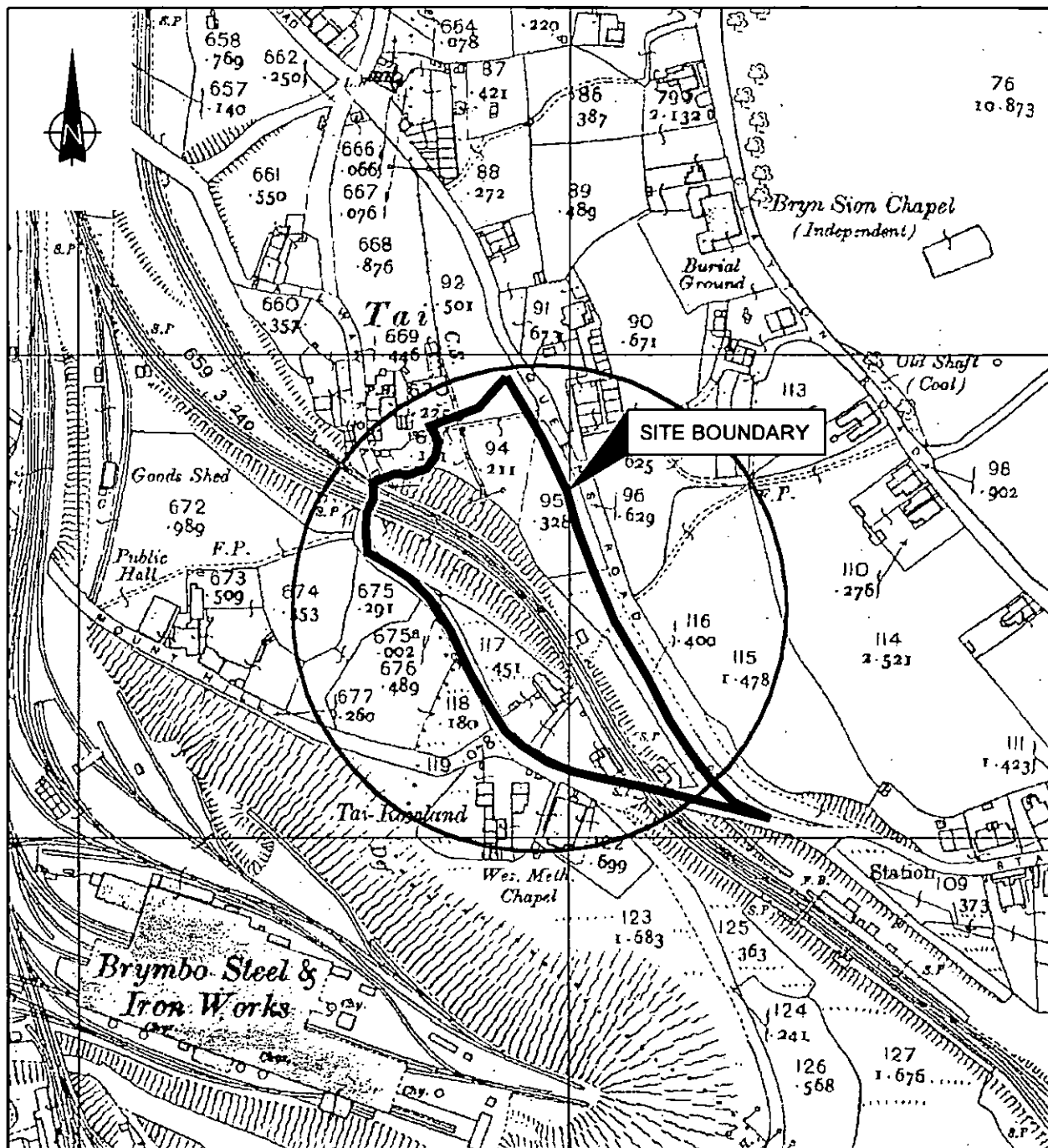
FIGURE **3a**



SCALE - 1 : 2500

HISTORY - 1899

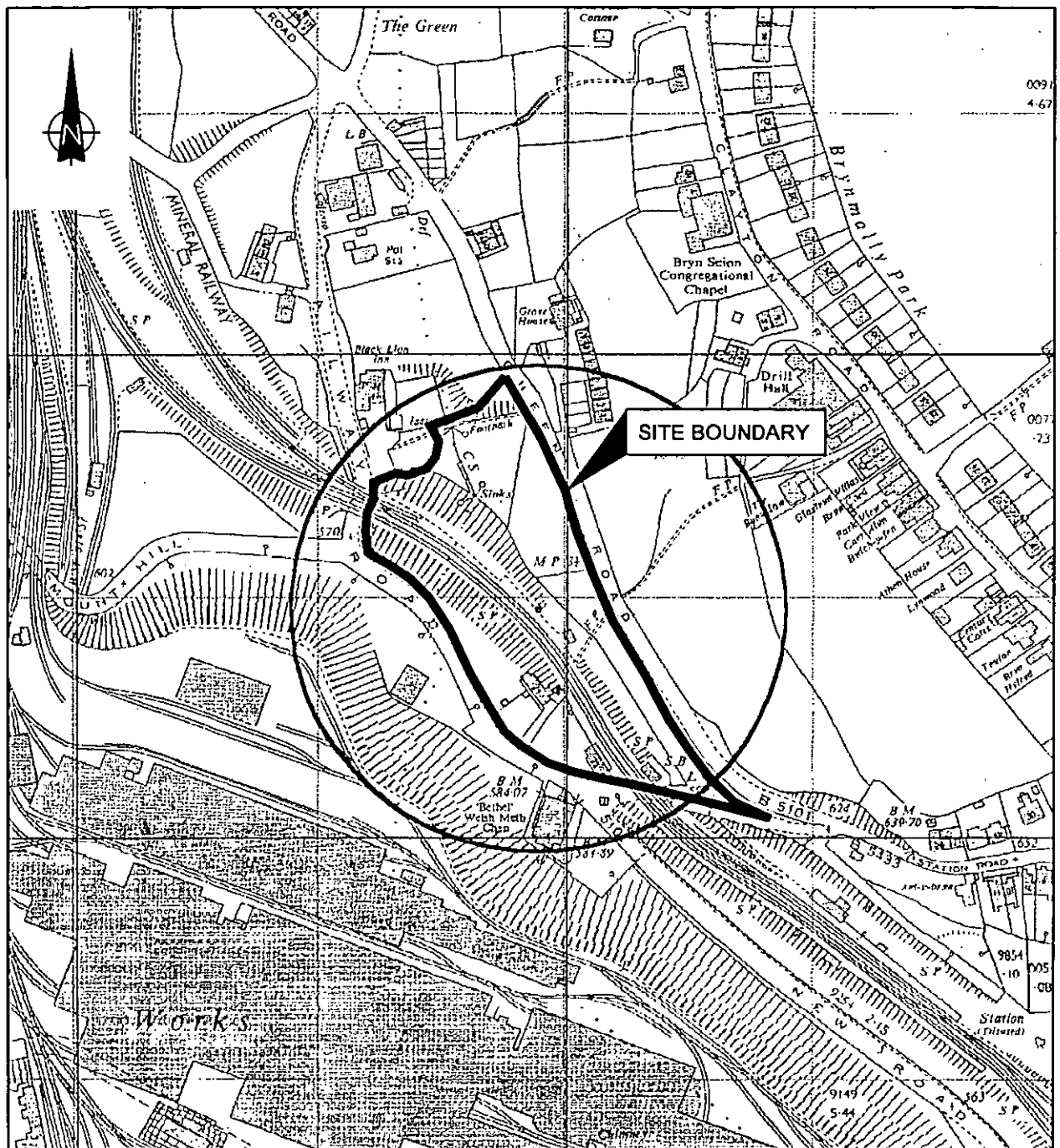
FIGURE **3b**



SCALE - 1 : 2500

HISTORY - 1912

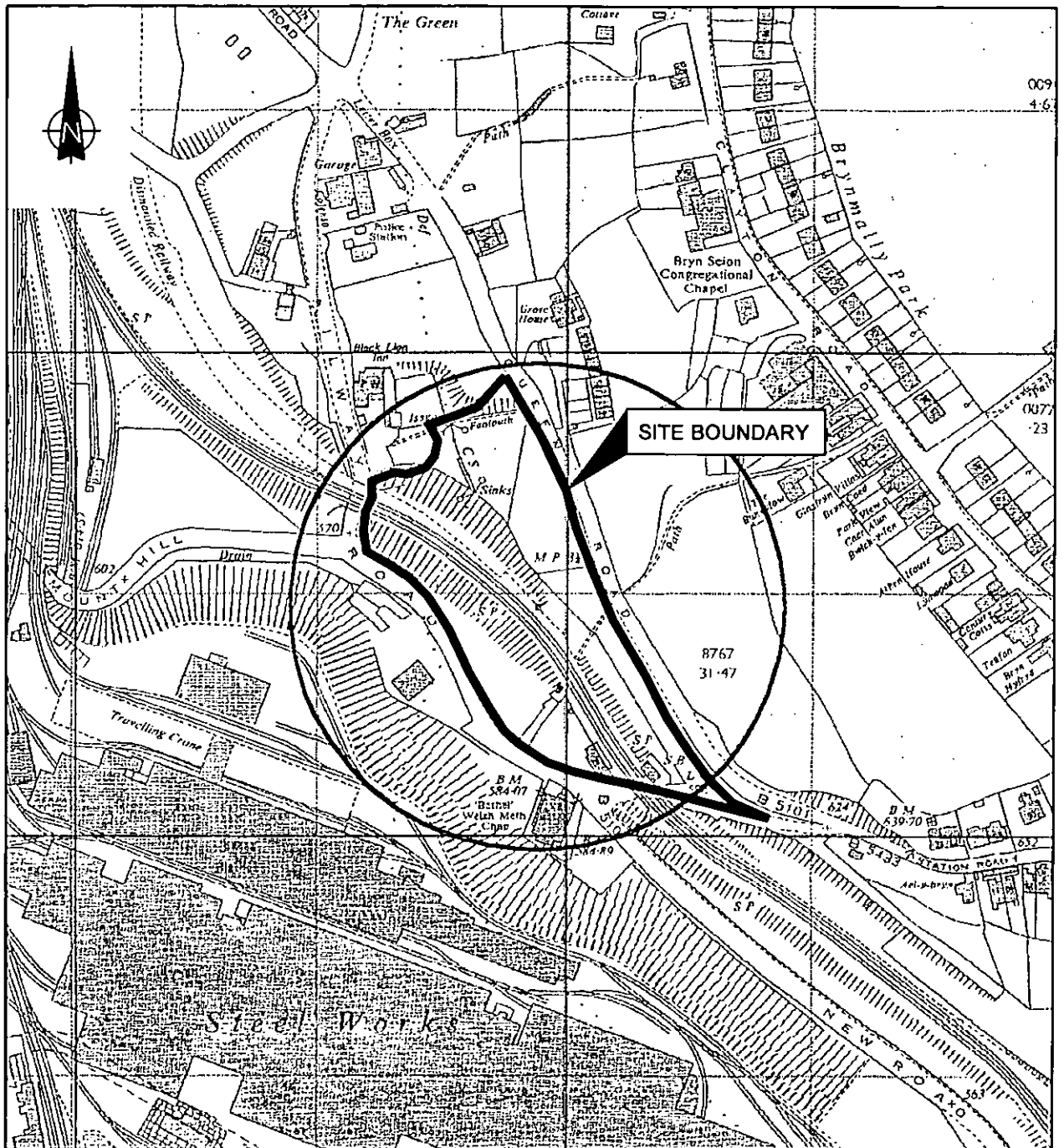
FIGURE **3c**



SCALE - 1 : 2500

HISTORY - 1963

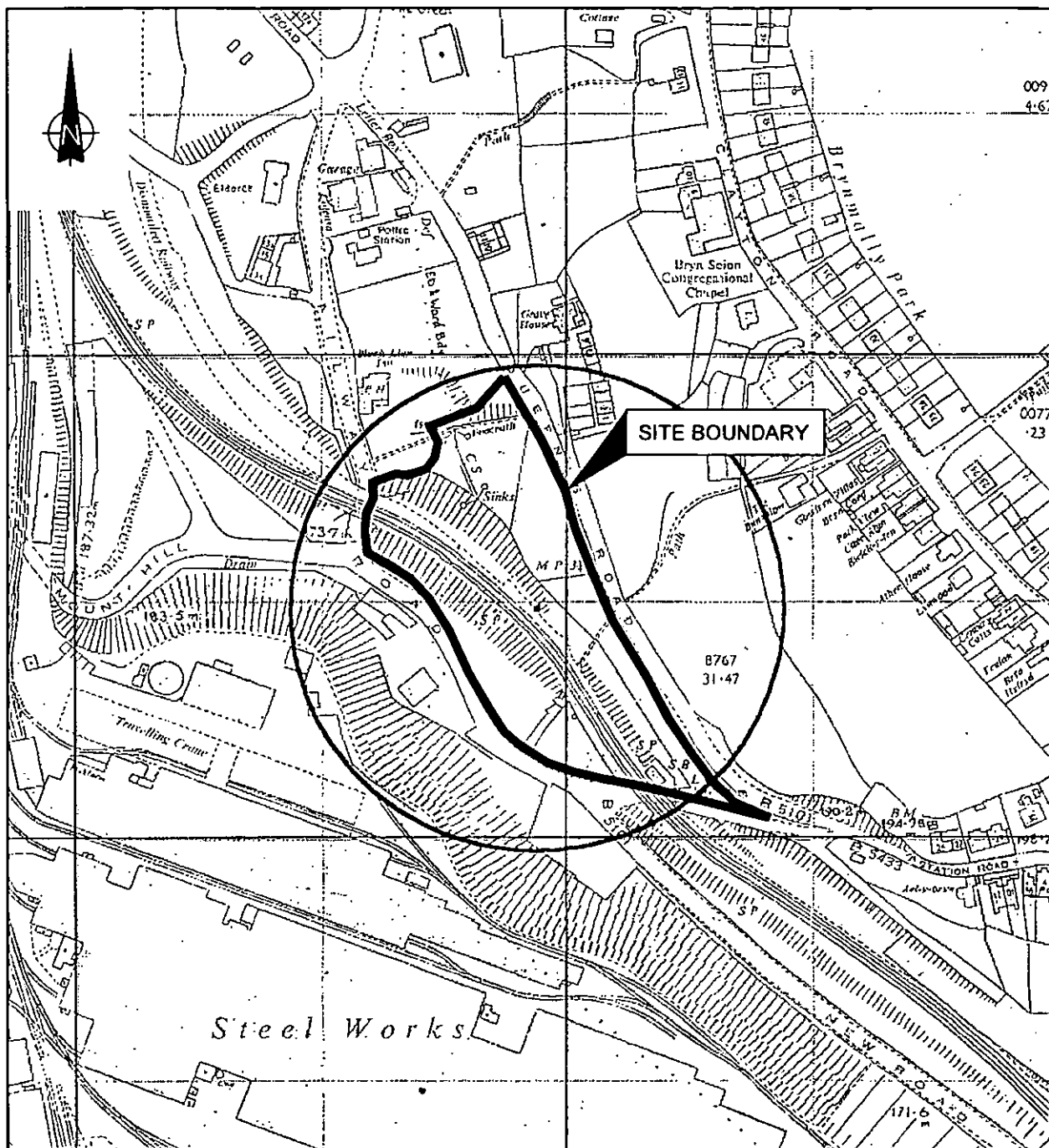
FIGURE **3d**



SCALE - 1 : 2500

HISTORY - 1967

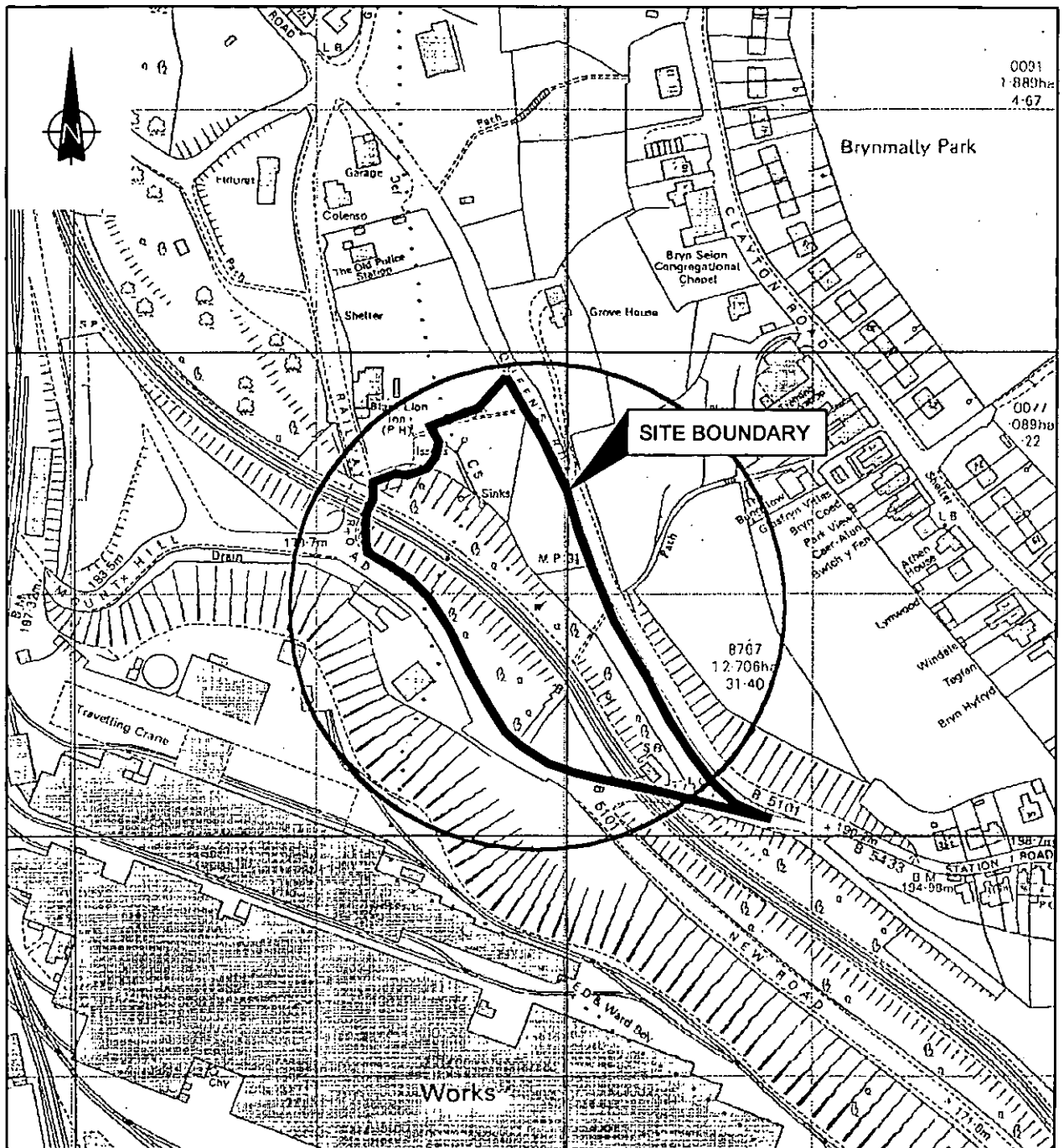
FIGURE **3e**



SCALE - 1 : 2500

HISTORY - 1980

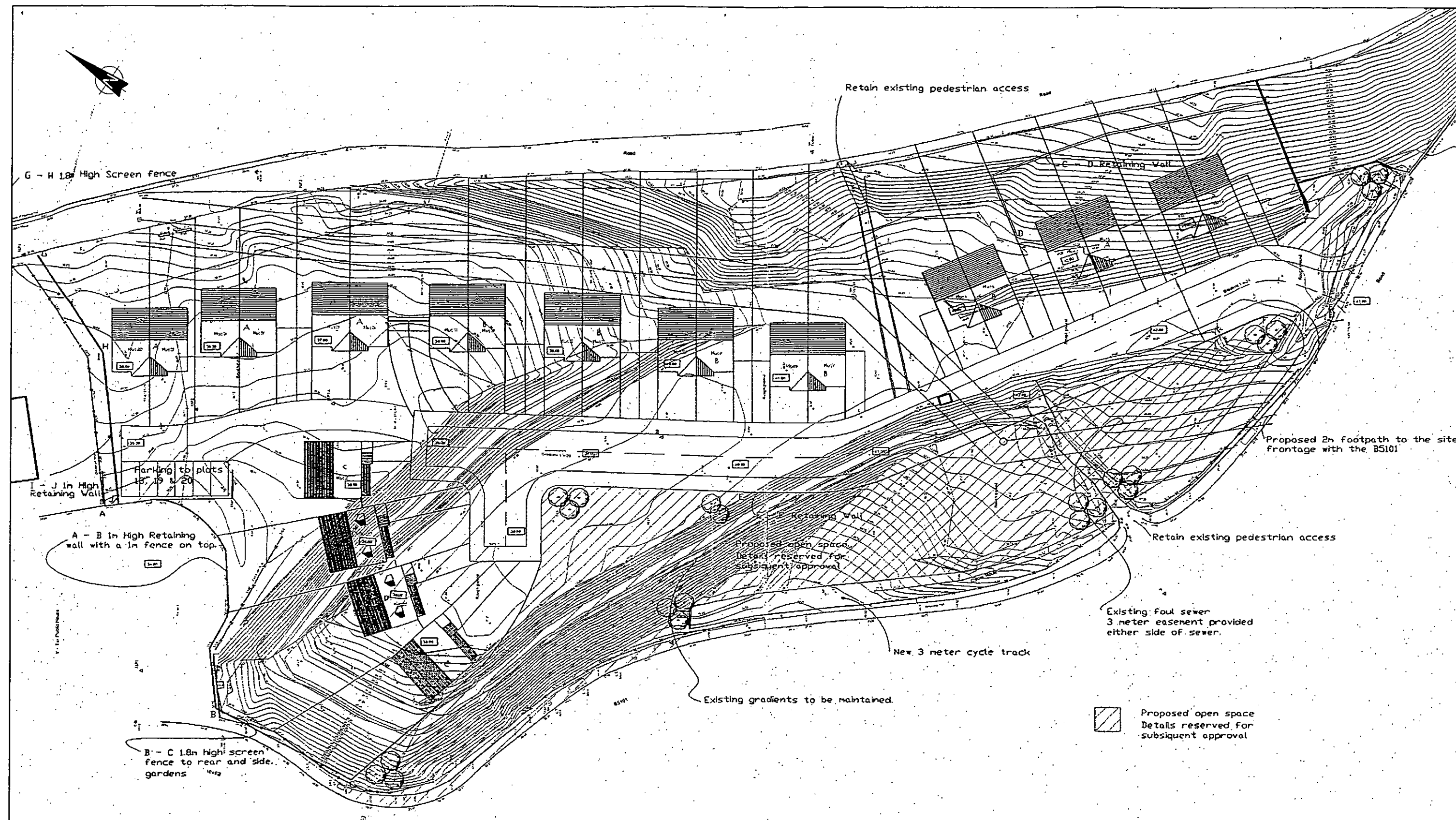
FIGURE **3f**



SCALE - 1 : 2500

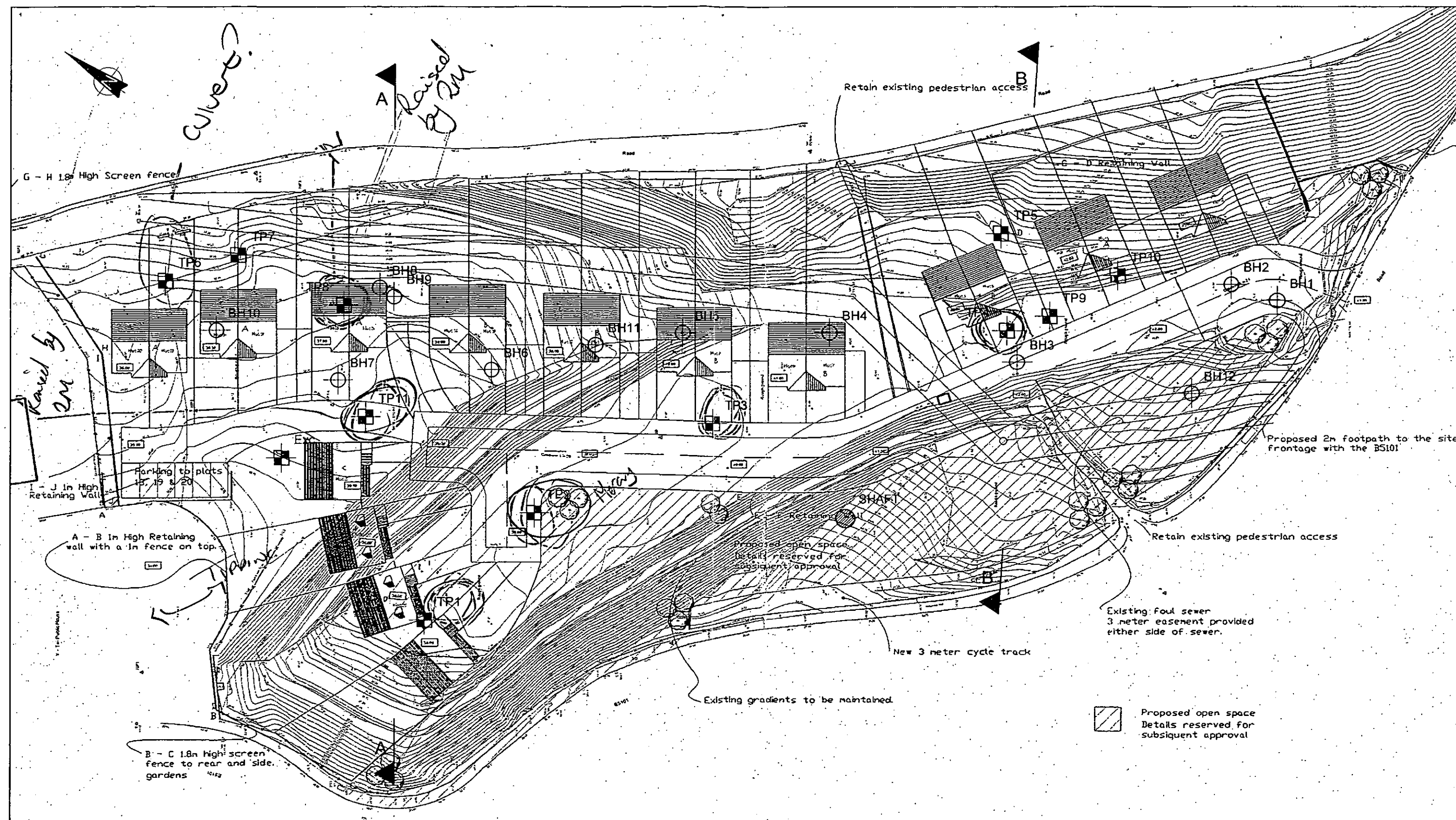
HISTORY - 1984

FIGURE **3g**



**PROPOSED
SITE LAYOUT**

FIGURE **4**



SCALE 1:500

LEGEND

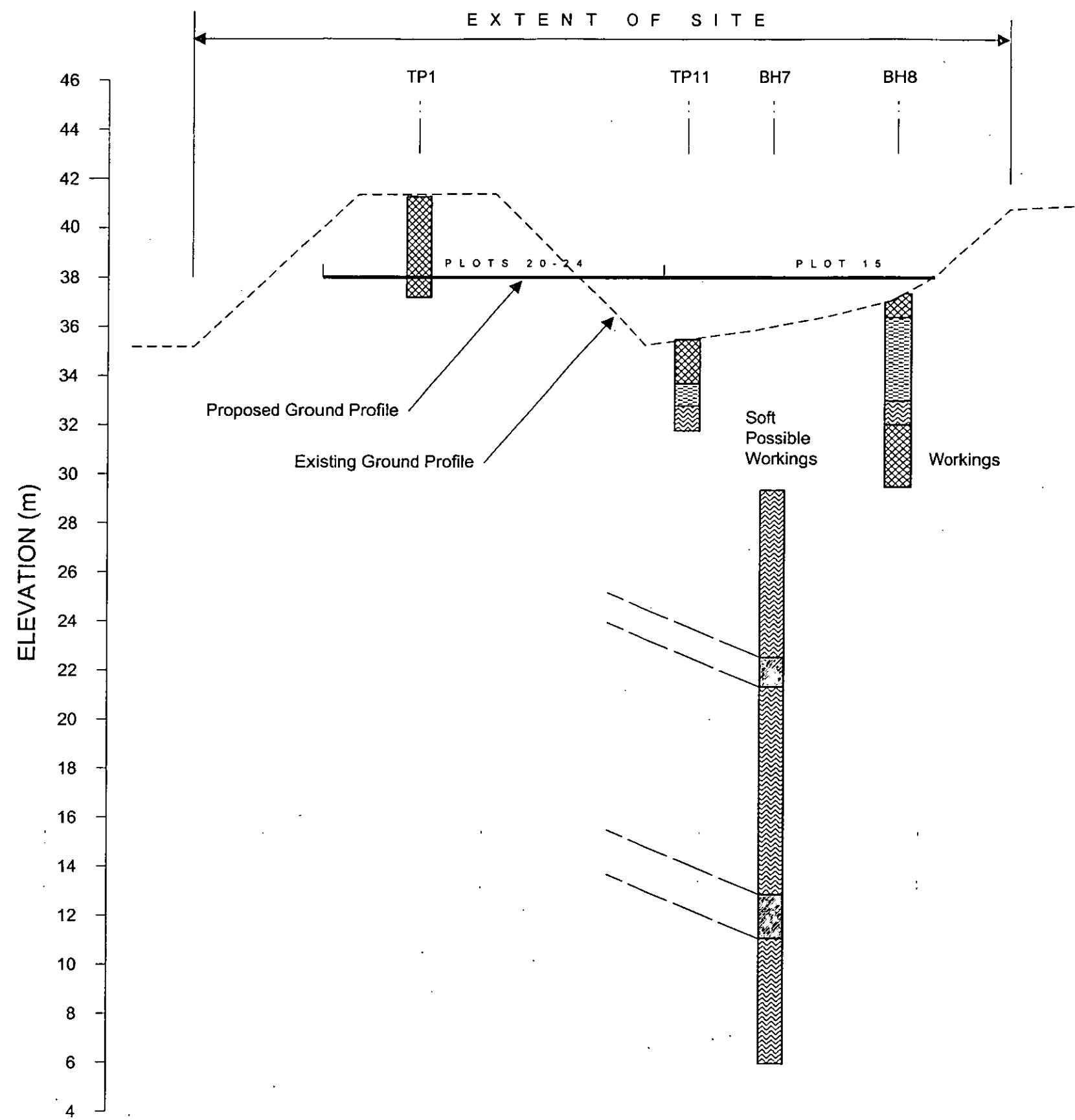
BH
 BOREHOLES

TP
 TRIAL PIT

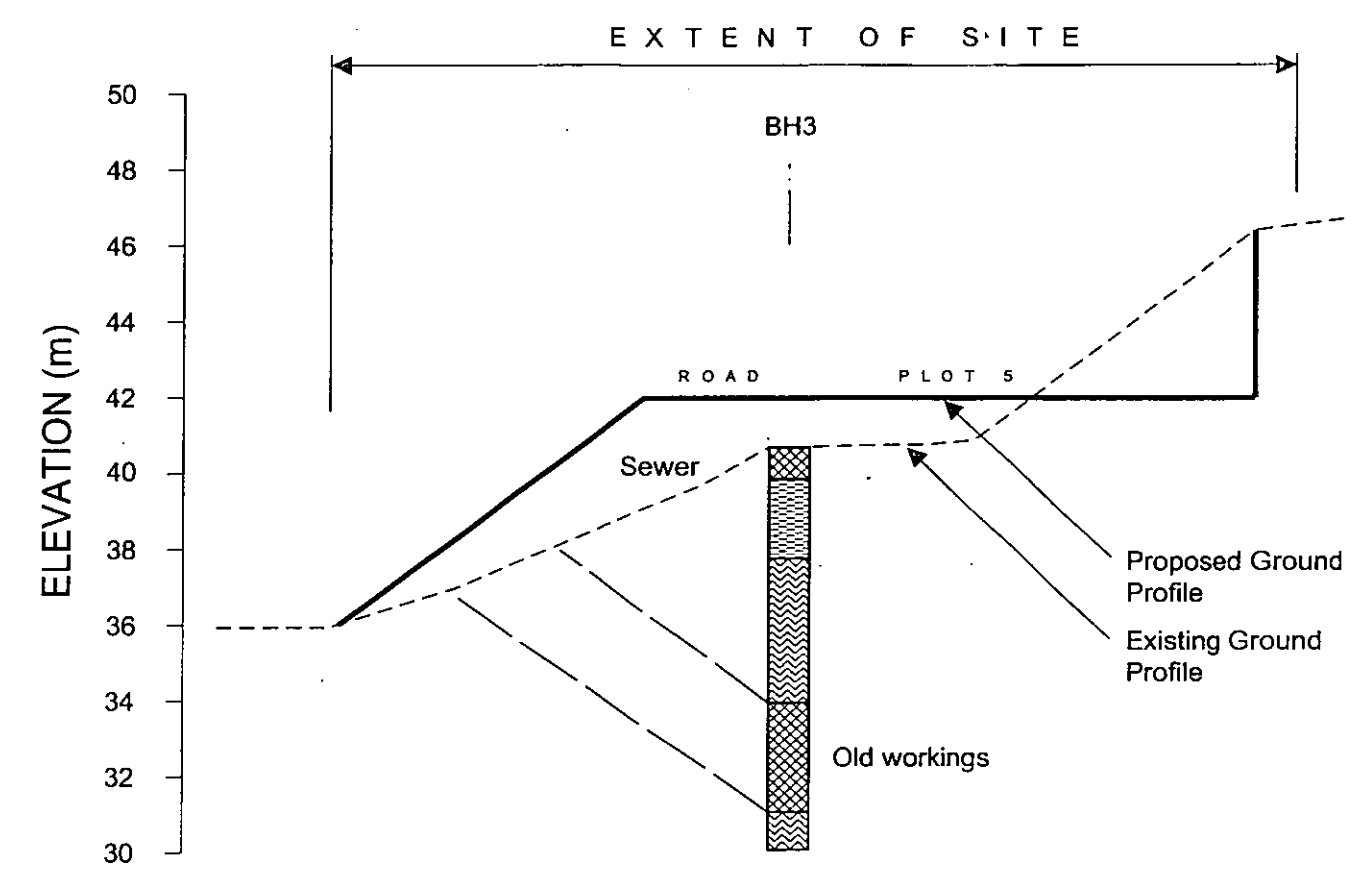
REFER TO FIGURE 6
 FOR CROSS SECTIONS

**LOCATION OF
 BOREHOLES
 AND TRIAL PITS**

FIGURE **5**



Section A - A
Scale - 1:500 Horiz, 1:200 Vert



Section B - B
Scale - 1:500 Horiz, 1:200 Vert

Legend

- Made Ground
- Clay (Glacial Till)
- Mudstone
- Coal

APPENDIX A

Site Photographs



Remnants of footpath crossing site



Location of old railway crossing on southern site boundary



Eastern side of railway embankment looking towards Y Tai Public House



As above from southern site boundary

Southern and Western sections of the site



Looking south from Y Tai car park



Depression immediately south of Y Tai car park

Northern Section of site



Looking west from Y Tai car park



View from Queens Road towards Y Tai Public House



Top of railway embankment looking north



Evidence of slope instability on south eastern site boundary

APPENDIX B

Coal Authority Reports

The Coal Authority,
Mining Reports Office,
200 LICHFIELD LANE,
BERRY HILL,
MANSFIELD,
NOTTINGHAMSHIRE,
NG18 4RG
Telephone: 0845 762 6844
DX 716176 MANSFIELD S
On-Line Service: www.coalminingreports.co.uk

Emma
The F: - 01352 763601
**COAL
AUTHORITY**

X-PRESS LEGAL SERVICES LIMITED,
DX 17822 WARRINGTON

This matter is being dealt with by Simon Leeming

Our Ref: 00000431-06

Your Ref: LLE/46420/SCE

Electronic Ref: EME_00003869640001_005

RRUID: 005.00003869640001

Date: 09 January 2006

Dear Sir,

**Coal Mining Report
LAND TO THE WEST OF, QUEENS ROAD, BRYMBO, WREXHAM**

I refer to the enquiry dated 21st December 2005, received 21st December 2005, in connection with the above.

This report is based on and limited to the records in the possession of The Coal Authority at the time the search is answered.

Ordnance Survey (O.S.) is undertaking a Positional Accuracy Improvement Programme of its mapping data. The Coal Authority (CA) has no control over the timing of issue of Positionally Improved mapping data by O.S. or over users of that data. In some instances the relative position between surface features and coal mining features may alter as a consequence of this programme. The CA will ensure that the integrity of its database is maintained by replotting some mining information to sustain the relationship between that mining information and the improved O.S. surface positions, some of which are now being released. However, mining reports are currently being produced against pre improved O.S. mapping whilst the Authority updates its database in line with the O.S. changes.

Past Underground Mining

The property is within the likely zone of influence on the surface from workings in 3 seams of coal at shallow to 20m depth, the last date of working being 1913.

Present Underground Mining

The property is not within the zone of likely physical influence on the surface from any present underground coal workings.

Future Underground Mining

The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination by the Coal Authority.

The property is not within a geographical area for which a licence to extract coal by underground methods has been granted.

the property is not within the zone of likely physical influence at the surface from plans of future workings in our possession.

Whether reserves of coal exist in the locality which could be worked at some time in the future subject to feasibility, economics, and planning consents.

We have no record of any notice of the risk of the land being affected by subsidence being given under S.46 of the Coal Mining Subsidence Act 1991.

Adits

Within or within 20 metres of the property there are 2 mine entries, the approximate positions of which are shown on the attached plan. Your attention is drawn to the statements made on that plan.

We have no record of what steps, if any, have been taken to treat the mine entries.

The records held by the Coal Authority may be incomplete. Consequently, there may exist in this locality mine entries of which we have no knowledge.

Geology

Records in our possession do not disclose any fault or other line of weakness at the surface as having affected the boundary of the property.

Opencast Mining

The property is not located within the geographical boundary of an opencast site from which coal has been extracted by opencast methods.

Opencast Mining

The property does not lie within 200 metres of the geographical boundary of an opencast site within which coal is being extracted by opencast methods.

Opencast Mining

The property is not within 800 metres of the geographical boundary of an opencast site for which a licence to extract coal by opencast methods is awaiting determination.

The property is not within 800 metres of the geographical site boundary of an opencast site for which a licence to extract coal by opencast methods has been granted.

Subsidence

Records in our possession do not disclose any damage notice or claim having been given, made or pursued in respect of the property since 1 January 1984.

Records in our possession do not disclose any current "Stop Notice" affecting the property.

Records in our possession do not show any request having been made to execute preventative works under S.33 of the Coal Mining Subsidence Act 1991.

Withdrawal of Support

The property does not lie within a geographical area in respect of which a notice of entitlement to withdraw support has been published.

The property does not lie within a geographical area in respect of which a notice has been given under S.41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Mining Facilities Orders

Property is not within a geographical area that is the subject of an Order made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to Owners of Former Copyhold Land

Property is not within an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

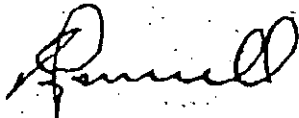
Additional Remarks

of the mining circumstances a prudent developer would seek appropriate technical advice before works are undertaken on site. All proposals should have regard to good engineering practice in mining areas as identified in authoritative publications on mining stability problems. In any event, no activities should be undertaken that intersect or interfere with any coal or mines of coal without permission of the Coal Authority.

These replies are prepared in accordance with the 2003 editions of the Coal Authority's Terms and Conditions, User Guide and the Law Society's Guidance Notes.

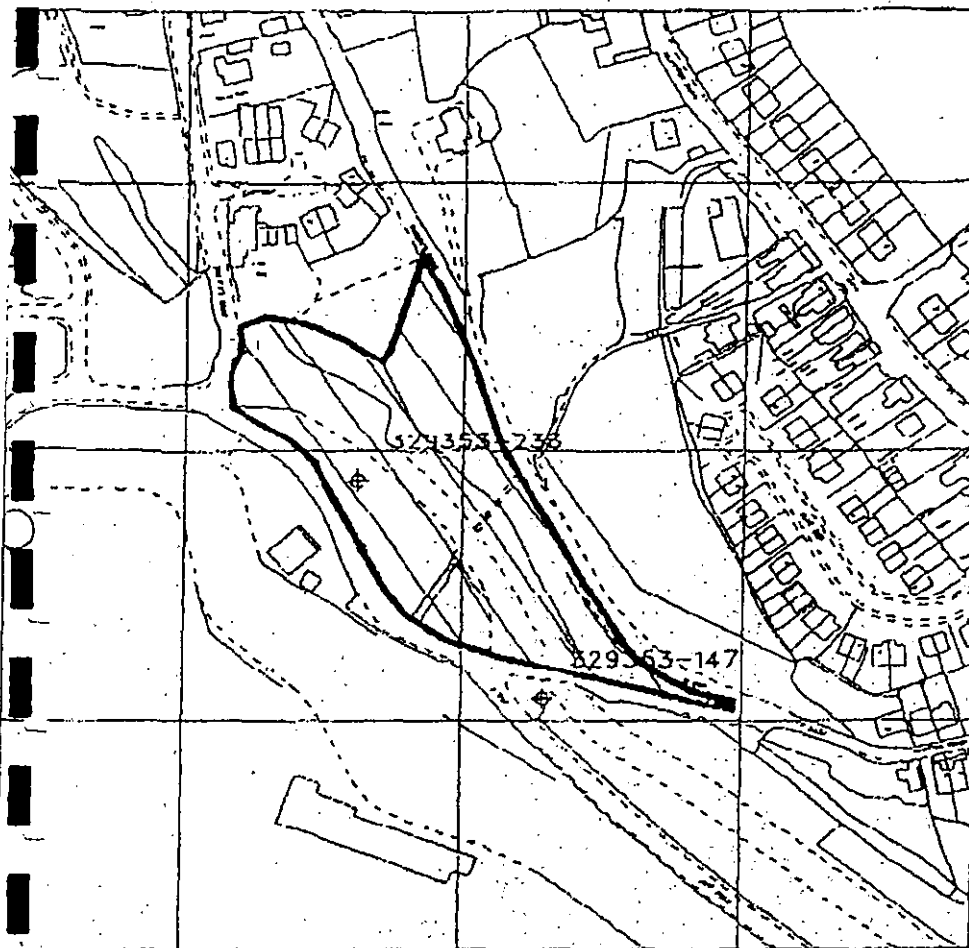
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Yours faithfully



Stephen Pennell

Director of Mining Information and Services



Crown Copyright.

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This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



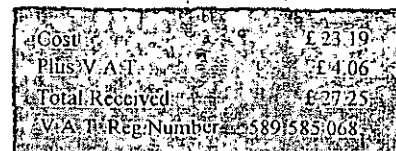
APPROXIMATE POSITION OF DISUSED MINE SHAFTS SHOWN



This plan shows the approximate location of the disused mine entry/entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan. Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A DTI leaflet setting out the rights and the obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by telephoning 0845 762 6849. If you wish to discuss the relevance of any of the information contained in the attached report you should seek the advice of a qualified mining engineer or surveyor. If you or your adviser wish to examine the source plans from which the information has been taken these are available at our Mansfield office, free of charge, by prior appointment, telephone 01623 658233. Should you or your adviser wish to carry out any physical investigations that may enter, disturb or interfere with any disused mine entry the prior permission of the owner must be sought. For coal mine entries the owner will normally be the Coal Authority. The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out service in coalfield areas to assess the public safety implications of mining features (including disused mine entries). Our emergency telephone number at all times is 01623 646333.

The Coal Authority,
Mining Reports Office,
200 Lichfield Lane,
Berry Hill,
Mansfield,
Nottinghamshire,
NG18 4RG
Telephone: 0845 762 6848
DX 716176 MANSFIELD 5
On-Line Service: www.coalminingreports.co.uk

**The Coal
Authority**



MIKE SCOTT,
GROUNDSOLVE LIMITED,
ADLINK HOUSE,
86 THE HIGHWAY,
HAWARDEN,
HAWARDEN,
FLINTSHIRE,
CH5 3 DJ

This matter is being dealt with by Simon Leeming

Our Ref: 00011012-07

Your Ref: QRB/TE/SR/MJS

RRUID: 007.00016184490001

Date: 05 February 2007

Dear Sir.

Coal Mining Report
QUEENS ROAD, BRYMBO, WREXHAM, NORTH WALES

I refer to your enquiry dated 5 February 2007, received 5 February 2007, in connection with the above.

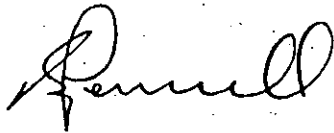
This report relates to the address given above and the location plan where supplied.

As requested I enclose the mine entry data sheet(s) held for the shaft(s) referred to.

Ordnance Survey (O.S.) is undertaking a Positional Accuracy Improvement Programme of its mapping data. The Coal Authority (CA) has no control over the timing of issue of Positionally Improved mapping data by O.S. or over users of that data. In some instances the relative position between surface features and coal mining features may alter as a consequence of this programme. The CA will ensure that the integrity of its database is maintained by replotting some mining information to sustain the relationship between that mining information and the improved O.S. surface positions, some of which are now being released. However, mining reports are currently being produced against pre improved O.S. mapping whilst the Authority updates its database in line with the O.S. changes.

We acknowledge receipt of your remittance in payment of our fee.

Yours faithfully

A handwritten signature in black ink, appearing to read 'Pennell', written in a cursive style.

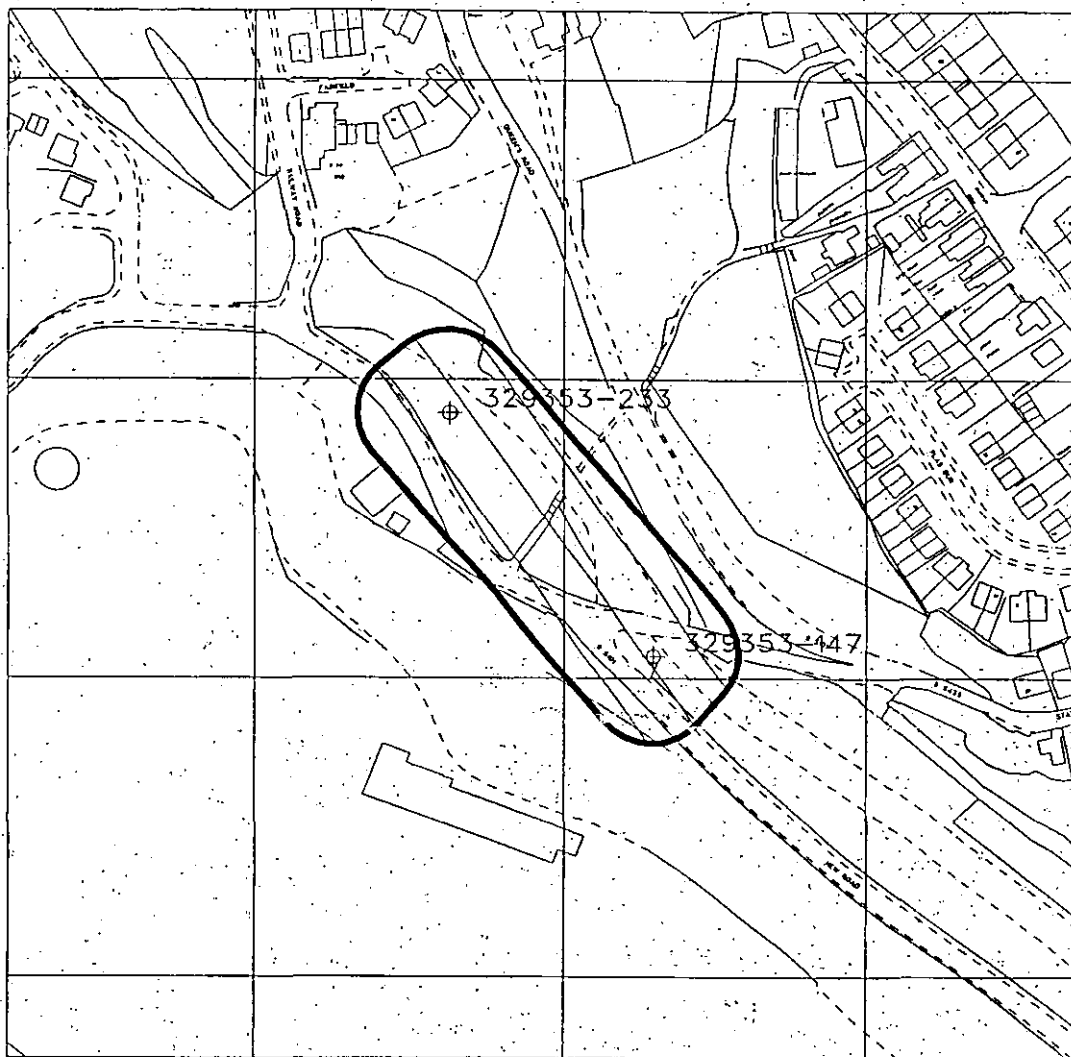
Stephen Pennell
Director of Mining Information and Services

Mine Entry Data (Continued)

Shaft/Adit:	Shaft
Mine Entry Reference:	329353-147
Source:	Other: Original source unknown obtained from former NCB shaft regi
Colliery Name:	Unknown
Entry Name:	No. 8 Pit
Date Abandoned:	N/A
Depth of Superficial Deposits (m):	2.0
Depth of Shaft (m):	76.2
Diameter of Shaft (m):	Unknown
Probable Adit Azimuth:	0
Treatment Details:	None
Conveyance:	N/A
Other Information:	Y

Mine Entry Data (Continued)

Shaft/Adit:	Shaft
Mine Entry Reference:	329353-233
Source:	OS: 1/2500 plan DB 28/2 - 1871 and 1912 editions.
Colliery Name:	Unknown
Entry Name:	
Date Abandoned:	N/A
Depth of Superficial Deposits (m):	Unknown
Depth of Shaft (m):	Unknown
Diameter of Shaft (m):	Unknown
Probable Adit Azimuth:	0
Treatment Details:	None
Conveyance:	N/A
Other Information:	Y



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This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN



APPROXIMATE POSITION OF DISUSED MINE SHAFTS SHOWN



This plan shows the approximate location of the disused mine entry/entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A DTI leaflet setting out the rights and the obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by telephoning 0845 762 6848.

If you wish to discuss the relevance of any of the information contained in the attached report you should seek the advice of a qualified mining engineer or surveyor. If you or your adviser wish to examine the source plans from which the information has been taken these are available at our Mansfield office, free of charge, by prior appointment, telephone 01623 637233. Should you or your advisor wish to carry out any physical investigations that may enter, disturb or interfere with any disused mine entry the prior permission of the owner must be sought. For coal mine entries the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries). Our emergency telephone number at all times is 01623 646333.



GENERAL CONDITIONS OF CONTRACT FOR THE SUPPLY OF MINING INFORMATION

1. In the General Conditions, the Coal Authority is referred to as the CA and the Company, firm or person to whom the information and/or material is to be supplied is referred to as the Purchaser. The supply of any information and/or material by the CA to the Purchaser shall be subject to these General Conditions of Contract.
2. The following should be taken into account by the Purchaser when making use of any information and/or material supplied.
 - (1) The information supplied is constantly updated. The CA will supply the Purchaser with the most up to date information and/or material at the time of supply, but give no warranty or representation that such information and/or material will not become obsolete or incorrect over any period of time.
 - (2) Information supplied should not be enlarged to any greater scale than that at which it is supplied or accuracy will be affected.
3. The information and/or material supplied is composed from data based in many cases on measurements and records of various standards of reliability and age. Under no circumstances should the information and/or material be relied on as the sole or major basis for any production, construction or financial decisions. The CA make no financial decisions. The CA make no representations and do not warrant the accuracy or completeness of the information and/or material.
4.
 - (1) Subject to sub-clause 3 of this Condition, the CA shall indemnify the Purchaser against all and any claims for loss or damage suffered or expense incurred arising out of death or personal injury to any person to the extent that such death or injury results from negligence in the supply of the information and/or material by the CA or its employees.
 - (2) Save as set out in the sub-clause 1 of this Condition, the CA's liability to the purchaser for the loss or damage suffered or expenses incurred to persons and property arising directly or indirectly from the supply of the information and/or material by the CA and/or its interpretation by the Purchaser or any third party shall be limited to a sum equal to the total sum payable by the Purchaser to the CA for the supply of information and/or material; but there shall be no liability whatsoever on the CA (save as set out in sub-clause 1) where the information and/or material is supplied free of charge.
 - (3) In any event, the CA shall not be liable for any indirect economic loss (including, but not limited to, loss of profits, loss of value, loss of contracts, loss of production or wastage of labour) arising directly or indirectly out of the supply of the information and/or material and/or its use or interpretation by the Purchaser or any third party.
 - (4) The Purchaser shall fully indemnify the CA and its employees against all and any claims for loss or damage suffered or expense incurred save for death or personal injury resulting from the CA's negligence (but including any indirect or consequential loss or damage to CA property) arising directly or indirectly from the supply of the information and/or material by the CA and/or its use or interpretation by the Purchaser or any third party.
- (5) The Purchaser shall insure his liabilities under this Condition with acceptable to the CA and shall, if required by the CA, produce satisfactory evidence that such a policy of insurance has been effected and maintained.
5.
 - (1) Copyright in any information supplied remains with the CA and the Purchaser shall only use the information and/or material for the purpose of the assignment to which their request for information and/or material relates.
 - (2) All information and/or material and any interpretation thereof shall be strictly confidential and shall not be supplied to any third party (or a member or officer of the Purchaser not directly employed by the Purchaser) to the assignment to which the request for information and/or material relates, without the written consent of the CA. Any Consent shall be on such conditions as the CA thinks fit.
 - (3) The information and/or material or any interpretation thereof shall not be published by the Purchaser (or any employee not directly employed by the Purchaser) in the assignment to which the request for information and/or material relates, independently or as part of any other document without the prior written consent of the CA. Any consent shall be on such conditions as the CA thinks fit.
 - (4) The Purchaser shall maintain such security as is necessary to ensure that the information and/or material and any interpretation thereof remains secure and is not obtained by any person not directly employed by the Purchaser in the assignment to which the request for information and/or material relates, without the Purchaser's knowledge.
6. Unless payment is made in advance, the CA shall issue an invoice to the Purchaser on supply of the information and/or material and payment shall be made by the Purchaser to:

Finance Department, The Coal Authority, 200 Lichfield Lane
Berry Hill, Mansfield, Notts, NG18 4RG

within 30 days from the date of the invoice. Any sums outstanding shall bear interest, at the rate of 5% per annum above the Lloyds TS base, from the date of the invoice to the date of actual payment. If payment is not made within 30 days from the date of invoice, the CA shall have the absolute right to require the return of the information and/or material by written notice.
7. Copies of any results from tests on materials, or based on information supplied by the CA, will be made available to the CA free of charge.
8. The Purchaser shall ensure that these General Conditions (and in particular Conditions 2, 3 and 5) are brought to the attention of any of its employees who use the information and/or material and any other person to whom the information and/or material is disclosed with the consent of the CA.

Our Ref:

Your Ref:

QR

RRUID:

007.0001

Date:

5

APPENDIX C

Letter from Local Authority

Chief Housing and Public Protection Officer/Prif Swyddog Tai a Diogelu'r Cyhoedd
Andy Lewis

Crown Buildings, Chester Street, Wrexham. LL13 8BG Tel: 01978 297005 Fax: 01978 297003 Minicom 01978 292067
Adeiladau'r Goron, Stryt Caer, Wrecsam. LL13 8BG Ffôn: 01978 297005 Ffacs: 01978 297003 www.wrexham.gov.uk



Mike Scott
GroundSolve Limited
Adlink House
86 The Highway
Hawarden
Deeside
CH5 3DJ

Your Ref/Eich Cyf
Our Ref/Ein Cyf
Date/Dyddiad
Ask for/Gofynner am
Direct Dial/Rhif Union
E-mail/E-bost

AG/Enquiry
03 January 2007
Angela Guy
01978 297041
angela.guy@wrexham.gov.uk

Visit our website at:
www.wrexham.gov.uk

Dear Mr Scott

QUEENS ROAD, BRYMBO, WREXHAM

Thank you for your fax dated 02 January 2007. Having carried out checks of our limited records I can confirm that due to the site having had a railway on it in the past and the fact that the DoE (former) Industry Profiles identify railway land as potentially contaminative, this Department would recommend that the standard planning condition be applied to any permission granted. A planning application was actually submitted in 2003 but I believe permission was refused, on that occasion this Department did recommend a condition be applied.

The standard condition and note to applicant is as follows:

Condition

Development shall not begin on site until a scheme to deal with potential contamination at the site has been submitted to and approved in writing by the Local Planning Authority. This scheme shall include a phased investigation approach to identify the extent of contamination and any measures required to remediate the site, including post-development monitoring. Where remediation works are required, the development shall not be occupied/used until a Validation Report to show that the works have been satisfactory carried out has been submitted to and approved in writing by the Local Planning Authority.

Note to Applicant

Further advice on compliance with this condition may be obtained by contacting the Council's Environmental Protection section on 297041. Should the investigation identify contamination issues that may affect receptors other than the site users e.g. groundwater, then it is recommended that these issues are also addressed in consultation with the Public Protection Department prior to works commencing on site, so as to avoid enforcement under Part II of the Environmental Protection Act, 1990.

As you are aware in assessing a site for potential contamination issues the Council expects that authoritative best practice guidance is followed e.g. BS10175, CLR11 etc... Should



material on site be identified as having elevated contaminants present then its suitability for re-use on the site should be assessed.

Should you have any queries regarding this letter then please do not hesitate to contact me on the above number.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Angela Guy', with a stylized flourish at the end.

Angela Guy
Contaminated Land Officer

APPENDIX D

Sitecheck Report



Report on:
Land to the West of Queens Road
Brymbo
Wrexham

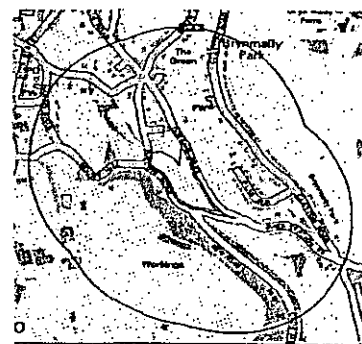
Prepared For:
X-press Legal Services Limited
10 Friars Court
Warrington
WA1 1EN

Report Reference:
SCPRO-16353031-1-1

Report Date:
21st December 2005

Your Reference:
lle/46420/sce_SCD

Report Centre
National Grid Reference:
329810, 353690



If you have any questions on the contents of this Report please contact X-press Legal Services Limited

Telephone: 01925 577377
Fax: 01925 574216

Email: XLS@btopenworld.com

X-PRESS
>legal services limited<

LANDMARK
Information Group

Contents of the Report

This report is divided into eleven sections

Aerial Photo

The aerial photo gives an overall view of the area. The smaller large-scale Ordnance Survey map includes the site boundary and search zone buffers used throughout the report at 250m and 500m.

Location Map

The accurate large-scale Ordnance Survey map confirms the boundary of the subject site. The descriptive text may identify other features which could be of relevance but not reported. The smaller aerial photo includes the site boundary.

Summary of Site

This section comprises source, pathway and receptor information found on site. Other factors which may affect the site are also included.

Summary

This section comprises of a summary table of the information found on site and in its vicinity.

Current Land Use

This section contains a map, which shows current land use features. The following pages detail these features and identify the Reference Number and direction.

Historical Land Use

This section contains a map, which shows historical land use features. The following pages detail these features and identify the Reference Number and direction. A table listing all the maps used to source this information is included.

Sensitivity

This section contains a map, which shows pathway and receptor features. The following pages detail these features and identify the Reference Number and direction. The section also contains a separate Flood Map.

Other Factors

This section contains information on other factors which may affect the site and its vicinity.

Useful Information

This section contains information which may be of use when interpreting the report.

Useful Contacts

All textual information is linked by the 'Contact Ref' to this quick reference list of contacts. These contacts may be able to supply additional information or answer any subsequent query relating to that record.

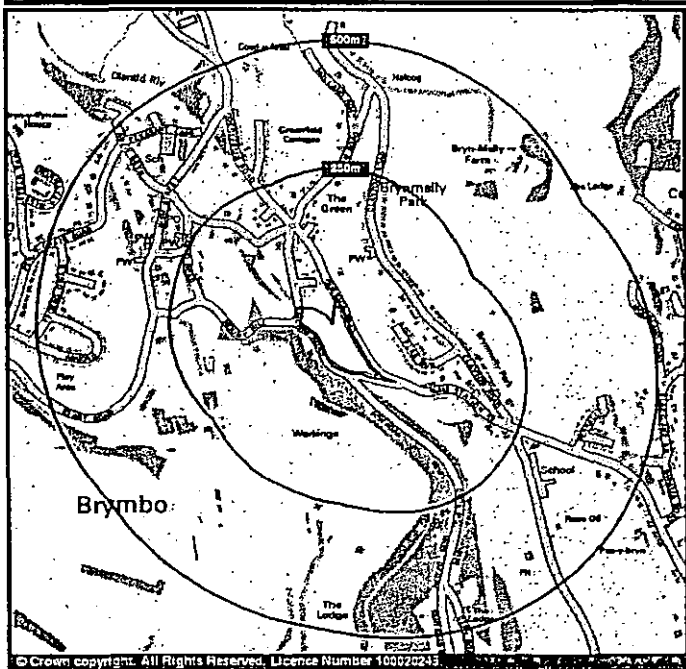
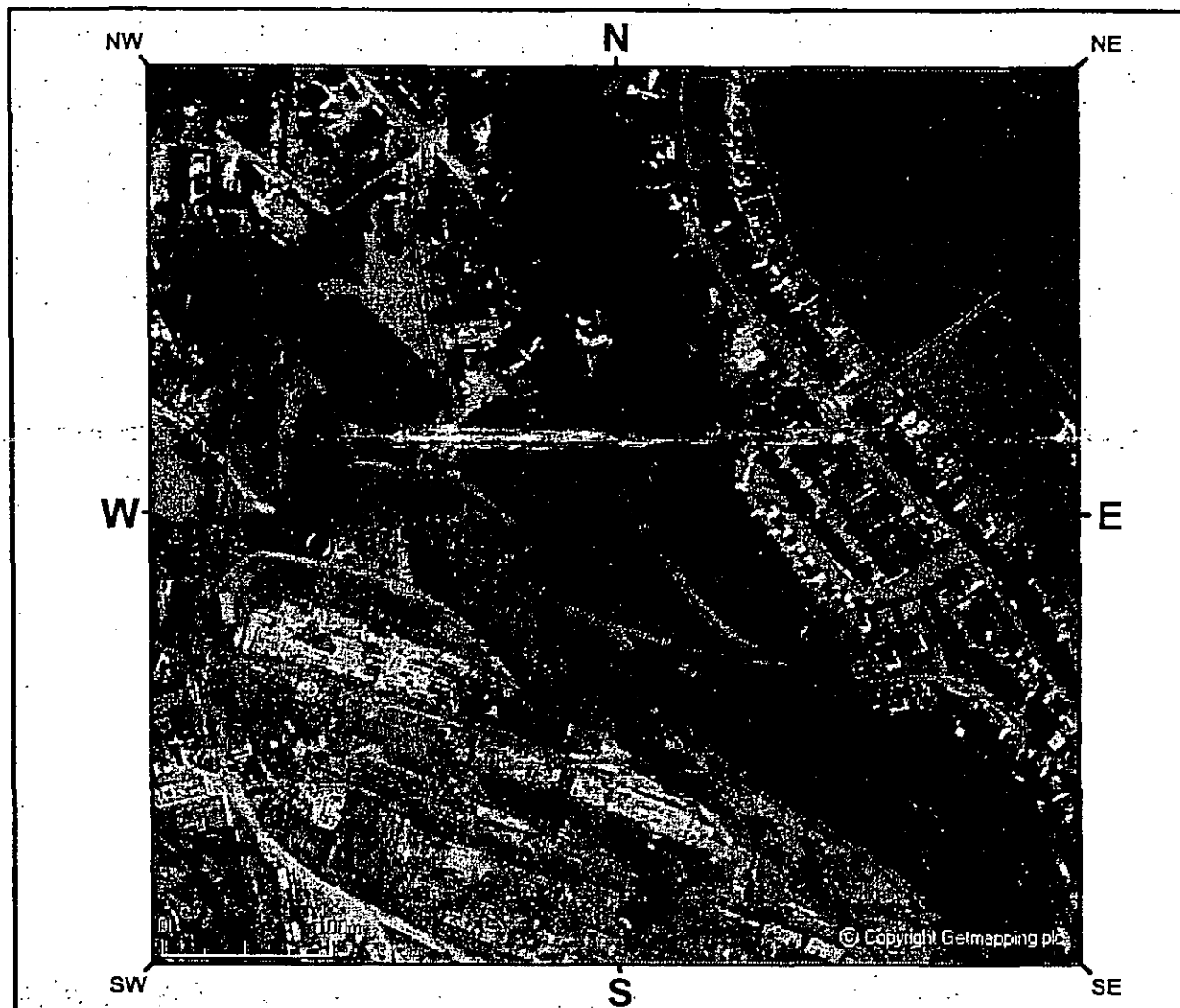
Terms and Conditions

Landmark Information Group Limited Terms and Conditions of Sale.

The information in this Sitecheck Data Report is derived from a number of statutory and non-statutory sources. While every effort is made to ensure accuracy, Landmark cannot guarantee the accuracy or completeness of such information or data, nor to identify all the factors that may be relevant. If you are a private individual using this report Landmark recommend that you discuss its contents in full with your professional advisor. It is essential to read this report in conjunction with the Product User Guide and your attention is drawn to the scope of the report section within this guide.

The Sitecheck Data User guide is available free of charge from our website www.landmark-information.co.uk

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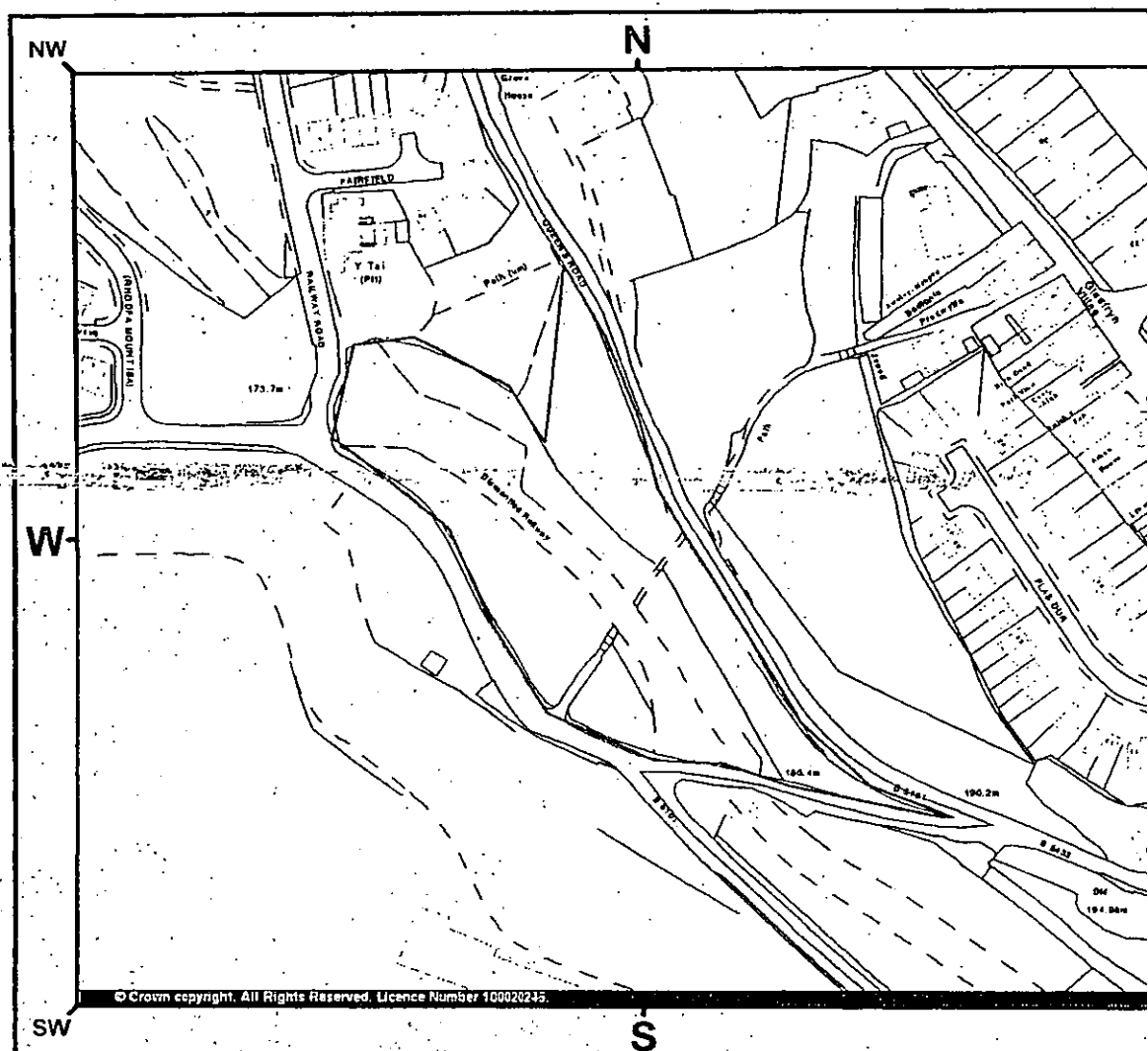
Site

Land to the West of Queens Road
Brymbo
Wrexham

Grid Reference

Easting 329810

Northing 353690



Site

Land to the West of Queens Road
Brymbo
Wrexham

Grid Reference

Easting 329810

Northing 353690

Land to the West of Queens Road, Brymbo Wrexham

Sources

Current Land Use

Waste/Landfill Sites

Local Authority Landfill Coverage

Wrexham County Borough Council, - Has supplied landfill data. Contact ref: 2.

Historical Land Use

Potentially Contaminative Uses

Potentially Contaminative Industrial Uses (Past Land Use)

Railways, Date of mapping: 1879-1963

Railways, Date of mapping: 1879-1963

Land to the West of Queens Road, Brymbo Wrexham

Pathways and Receptors

Sensitivity

Pathways

Groundwater Vulnerability

Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers. Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 16 West Cheshire. Contact ref: 1

Drift Deposits

No

Extreme Flooding from Rivers or Sea without Defences

No

Flooding from Rivers or Sea without Defences

No

Areas Benefiting from Flood Defences

No

Flood Water Storage Areas

No

Flood Defences

No

**Land to the West of Queens Road, Brymbo
Wrexham****Other Factors****Brine Compensation Areas**

No

Coal Mining Affected Areas

In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report. Contact ref: 5

Mining Instability

Inconclusive Coal Mining

Radon Affected Areas

Between 3% and 5% of homes are above the Action Level. Contact ref: 6

Radon Protection Measures

Full radon protective measures are necessary in the construction of new dwellings or extensions. Contact ref: 4

Potential for Collapsible Ground Stability Hazards

No Hazard

Potential for Compressible Ground Stability Hazards

Low. Contact ref: 4

Potential for Ground Dissolution Stability Hazards

No Hazard

Potential for Landslide Ground Stability Hazards

Moderate. Contact ref: 4

Potential for Running Sand Ground Stability Hazards

Very Low. Contact ref: 4

Potential for Shrinking or Swelling Clay Ground Stability Hazards

Very Low. Contact ref: 4

Shallow Mining Hazards

Low-Moderate. Contact ref: 4

Current Land Use

Sources	On Site	0-250m	250m+
Waste/Landfill Sites			
BGS Recorded Landfill Sites	0	0	
Licensed Waste Management Facilities (Landfill Boundaries)	0	1	
Licensed Waste Management Facilities (Locations)	0	0	
Local Authority Recorded Landfill Sites	0	1	
Registered Landfill Sites	0	0	
Registered Waste Transfer Sites	0	0	
Registered Waste Treatment or Disposal Sites	0	0	
Statutory Authorisations			
Local Authority Pollution Prevention and Controls	0	0	
Contaminated Land Register Entries and Notices	0	0	
Registered Radioactive Substances	0	0	
Discharge Consents			
Discharge Consents	0	0	
Water Industry Act Referrals	0	0	
Industrial Processes			
Integrated Pollution Controls	0	0	
Integrated Pollution Control Registered Waste Sites	0	0	
Integrated Pollution Prevention And Control	0	0	
Local Authority Integrated Pollution Prevention And Control	0	0	
Storage of Hazardous Substances			
Control of Major Accident Hazards Sites (COMAH)	0	0	
Explosive Sites	0	0	
Notification of Installations Handling Hazardous Substances (NIHHS)	0	0	
Planning Hazardous Substance Consents	0	0	
Contraventions			
Local Authority Pollution Prevention and Control Enforcements	0	0	
Enforcement and Prohibition Notices	0	0	
Planning Hazardous Substance Enforcements	0	0	
Prosecutions Relating to Authorised Processes	0	0	
Prosecutions Relating to Controlled Waters	0	0	
Substantiated Pollution Incident Register	0	0	
Potentially Contaminative Uses			
Contemporary Trade Directory Entries	0	2	
Fuel Station Entries	0	0	
Miscellaneous			
BGS Recorded Mineral Sites	0	0	

Historical Land Use

	On Site	0-250m	250-500m
Sources	2	15	25
Potentially Contaminative Uses			
Historical Tanks And Energy Facilities	0	1	3
Potentially Contaminative Industrial Uses (Past Land Use)	2	11	15
Potentially Infilled Land			
Former Marshes	0	0	0
Potentially Infilled Land (Non-Water)	0	2	7
Potentially infilled Land (Water)	0	1	0

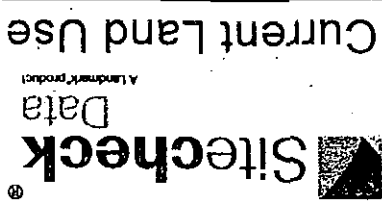
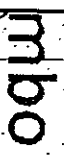
Sensitivity

	On Site	0-250m	250-500m
Pathways and Receptors	1	1	0
Pathways			
Groundwater Vulnerability	1	N/A	N/A
Drift Deposits	0	N/A	N/A
Historical Flood Liabilities	0	0	0
Extreme Flooding from Rivers or Sea without Defences	0	0	0
Flooding from Rivers or Sea without Defences	0	0	0
Areas Benefiting from Flood Defences	0	0	0
Flood Water Storage Areas	0	0	0
Flood Defences	0	0	0
River Flood Data (Scotland)	0	0	0
Environmentally Sensitive Receptors			
Areas of Outstanding Natural Beauty	0	0	0
Environmentally Sensitive Areas	0	0	0
Local Nature Reserves	0	0	0
Marine Nature Reserves	0	0	0
National Nature Reserves	0	0	0
Nearest Surface Water Feature	0	1	0
Ramsar Sites	0	0	0
Sites of Special Scientific Interest	0	0	0
Source Protection Zones	0	0	0
Special Areas of Conservation	0	0	0
Special Protection Areas	0	0	0
Water Abstractions	0	0	0
Protected Countryside Areas			
Forest Parks	0	0	0
National Parks	0	0	0
National Scenic Areas	0	0	0

Summary

Other Factors

	On Site	0-250m	250-500m
	9	5	0
Brine Compensation Areas	0	N/A	N/A
Coal Mining Affected Areas	1	N/A	N/A
Mining Instability	1	0	N/A
Natural and Mining Cavities	0	0	0
Radon Affected Areas	1	N/A	N/A
Radon Protection Measures	1	N/A	N/A
Potential for Collapsible Ground Stability Hazards	0	0	N/A
Potential for Compressible Ground Stability Hazards	1	1	N/A
Potential for Ground Dissolution Stability Hazards	0	0	N/A
Potential for Landslide Ground Stability Hazards	1	1	N/A
Potential for Running Sand Ground Stability Hazards	1	1	N/A
Potential for Shrinking or Swelling Clay Ground Stability Hazards	1	1	N/A
Shallow Mining Hazards	1	1	N/A



Sources

Description	Ref. No.	Search Buffer	Direction
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Waste/Landfill Sites

Licensed Waste Management Facilities (Landfill Boundaries)

Works Bank, Brymbo Steel Works, Lodge, Brymbo, LL11 5BT, Reference: 37002, Status: Active, Industrial Waste Landfills, Positional Accuracy: Positioned by the supplier, Boundary Accuracy: As Supplied. Contact ref: 1	1	0-250m	SE
--	---	--------	----

Licensed Waste Management Facilities (Locations)

Brymbo Steel Works, Lodge, Brymbo, LL11 5BT, Licence Number: 37002, Site Category: Industrial Waste Landfills, Licence Status: Closed, IPPC Reference: Not Supplied, Positional Accuracy: Located by supplier to within 10m. Contact ref: 1	2	250-500m	SE
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Local Authority Landfill Coverage

Wrexham County Borough Council, - Has supplied landfill data. Contact ref: 2	-	On Site	-
--	---	---------	---

Local Authority Recorded Landfill Sites

Bryn Malley, Station Road, Brymbo, Wrexham; Reference: 6955/0014, Positional Accuracy: Positioned by the supplier, Boundary Quality: Good. Contact ref: 2	3	0-250m	E
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Registered Landfill Sites

Brymbo & Broughton British Legion, Bryn-Y-Ffynnon Road, Penycraig, Wrexham, Chwyd, Reference: L40, Status: Cancelled, Positional Accuracy: Manually positioned to the road within the address or location, Boundary Accuracy: Not Applicable. Contact ref: 1	4	250-500m	NW
--	---	----------	----

Statutory Authorisations

Local Authority Pollution Prevention and Controls

Clay Colliery Ltd, The Smelt, Brymbo, WREXHAM, Part B - Mineral Industry Sector, Reference: WMBC/HJB/02/046, Status: Cancelled, Positional Accuracy: Manually positioned to the address or location. Contact ref: 3	5	250-500m	W
---	---	----------	---

Discharge Consents

Discharge Consents

Brymbo Developments Ltd, Brymbo Steelworks Brymbo Wrexham, Trade Discharge, Reference: CM0100901, Version: 3, Status: New Consent, by Application (Water Resources Act 1991, Section 88), Positional Accuracy: Located by supplier to within 100m. Contact ref: 1	-	250-500m	S
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Brymbo Developments Ltd, Brymbo Steelworks Brymbo Wrexham, Trade Discharge, Reference: CM0100901, Version: 2, Status: Revoked, Positional Accuracy: Located by supplier to within 10m. Contact ref: 1	-	250-500m	S
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Potentially Contaminative Uses

Contemporary Trade Directory Entries

Queens Cross, Railway Road, Brymbo, Wrexham, Mot Testing Centres, Status: Active, Positional Accuracy: Automatically positioned to the address	6	0-250m	NW
--	---	--------	----

Lemaire Vascular Ltd, Harwd Road, Brymbo, Wrexham, Medical Equipment Manufacturers, Status: Inactive, Positional Accuracy: Manually positioned to the road within the address or location	7	0-250m	NW
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Lemaire Vascular, Cambrian House, Railway Road, Brymbo, Wrexham, Medical Equipment Manufacturers, Status: Active, Positional Accuracy: Automatically positioned to the address	8	250-500m	NW
--	---	----------	----

A Green, 2, Bryn Awel, Coed y Felin Road, Brymbo, Wrexham, Coal & Smokeless Fuel Merchants & Distributors, Status: Active, Positional Accuracy: Automatically positioned to the address	9	250-500m	NW
---	---	----------	----

E Cunnah & Son Ltd, Bryn Haul, Black Lane Road, Penre Broughton, Wrexham, Oil Fuel Distributors, Status: Active, Positional Accuracy: Automatically positioned to the address	-	250-500m	SE
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Current Land Use

Description

Ref. No.	Search Buffer	Direction
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Miscellaneous

BGS Recorded Mineral Sites

Brymbo Steelworks Occs, Brymbo, Wrexham, Clwyd, Status: Active, Reference: 13210, Positional Accuracy: Located by supplier to within 10m. Contact ref: 4

-	250-500m	S
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Brymbo Colliery, Brymbo, Wrexham, Clwyd, Status: Ceased, Reference: 14112, Positional Accuracy: Located by supplier to within 10m. Contact ref: 4

-	250-500m	W.
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General:

- | | |
|---|-------------|
| ☐ Gas Shrinkage | |
| ☒ Arced Bulbs | |
| X Being Replaced Fast | |
| ☒ Old Lines | |
| ☐ Electrician's Remarks | |
| Potentially Contaminative Use | |
| Potentially Contaminative Use | |
| ☐ Part Failure | Use Failure |
| Airt Pressure | |
| Potentially Infilled Land | |
| Potentially Infilled Land | |
| ☐ Part Failure | Use Failure |
| Airt Pressure | |

Sources

Description

Ref. No.	Search Buffer	Dis
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Potentially Contaminative Uses

Historical Tanks And Energy Facilities

Potential Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1967 - 1984	1	0-250m
Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1984	2	250-500m
Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1976	-	250-500m
Tanks, Scale of Mapping: 1:2,500, Date of Mapping: 1986	-	250-500m

Potentially Contaminative Industrial Uses (Past Land Use)

Railways, Date of mapping: 1879-1963	3	On Site
Railways, Date of mapping: 1879-1963	4	On Site
Factory or works - use not specified, Date of mapping: 1963-1991	5	0-250m
Metal casting/foundries, Date of mapping: 1879-1938	6	0-250m
Heap, unknown constituents, Date of mapping: 1879	7	0-250m
Cemetery or Graveyard, Date of mapping: 1879	8	0-250m
Mineral railway, Date of mapping: 1879-1963	9	0-250m
Mining of coal & lignite, Date of mapping: 1879	10	0-250m
Mineral railway, Date of mapping: 1900-1963	11	0-250m
Heap, unknown constituents, Date of mapping: 1879-1900	12	0-250m
Mineral railway, Date of mapping: 1879	13	0-250m
Heap, unknown constituents, Date of mapping: 1992	14	0-250m
Mining of coal & lignite, Date of mapping: 1879	15	0-250m
Oil, petroleum & gas refining & storage, Date of mapping: 1879	16	250-500m
Mining of coal & lignite, Date of mapping: 1900-1964	17	250-500m
Heap, unknown constituents, Date of mapping: 1879	18	250-500m
Railways, Date of mapping: 1879-1963	19	250-500m
Mineral railway, Date of mapping: 1879-1963	20	250-500m
Cemetery or Graveyard, Date of mapping: 1879	21	250-500m
Mineral railway, Date of mapping: 1879-1963	22	250-500m
Mining of coal & lignite, Date of mapping: 1879	-	250-500m
Mining of coal & lignite, Date of mapping: 1879-1900	23	250-500m
Mineral railway, Date of mapping: 1900-1964	-	250-500m
Mining of coal & lignite, Date of mapping: 1879-1938	24	250-500m
General quarrying, Date of mapping: 1900	-	250-500m
Mining of coal & lignite, Date of mapping: 1879	-	250-500m
Mineral railway, Date of mapping: 1900-1938	25	250-500m
Mining of coal & lignite, Date of mapping: 1879	-	250-500m

Potentially Infilled Land

Potentially Infilled Land (Non-Water)

Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1991	26	0-250m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1992	27	0-250m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1992	28	250-500m

Description

Ref. No.	Search Buffer	Dir
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Potentially Infilled Land (Non-Water)

Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1991	-	250-500m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1992	29	250-500m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1991	30	250-500m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1991	-	250-500m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1992	-	250-500m
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1991	-	250-500m

Potentially Infilled Land (Water)

Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1963	31	0-250m
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Historical Land Use

Map Details

The following maps have been analysed for Historical Tanks and Energy Facilities.

1:2,500	Mapsheet	Published Date
National Grid	SJ3053	1962
National Grid	SJ3054	1962
National Grid	SJ2953	1963
National Grid	SJ2954	1963
National Grid	SJ2953	1967
National Grid	SJ3053	1970
National Grid	SJ3053	1976
National Grid	SJ2953	1984
National Grid	SJ3053	1986

The following maps have been analysed for Potentially Contaminative Uses and Potentially Infilled Land information.

1:10,560	Mapsheet	Published Date
Denbighshire	021_00	1879
Denbighshire	028_00	1879
Denbighshire	021_SW	1900
Denbighshire	028_NW	1900
Flintshire	017_SW	1900
Flintshire	019_NW	1900
Denbighshire	021_SW	1914
Denbighshire	028_NW	1914
Flintshire	017_SW	1914
Flintshire	019_NW	1914
Denbighshire	028_NW	1938
Flintshire	019_NW	1938
Denbighshire	021_SW	1954
National Grid	SJ25SE	1963
National Grid	SJ35SW	1964
1:10,000	Mapsheet	Published Date
National Grid	SJ25SE	1991
National Grid	SJ35SW	1992



Pathways and Receptors

Description

Search
Buffer Direction

Pathways

Groundwater Vulnerability

Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers, Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 18 West Cheshire. Contact ref: 1

On Site

Drift Deposits

No

N/A

Extreme Flooding from Rivers or Sea without Defences

No

N/A

Flooding from Rivers or Sea without Defences

No

N/A

Areas Benefiting from Flood Defences

No

N/A

Flood Water Storage Areas

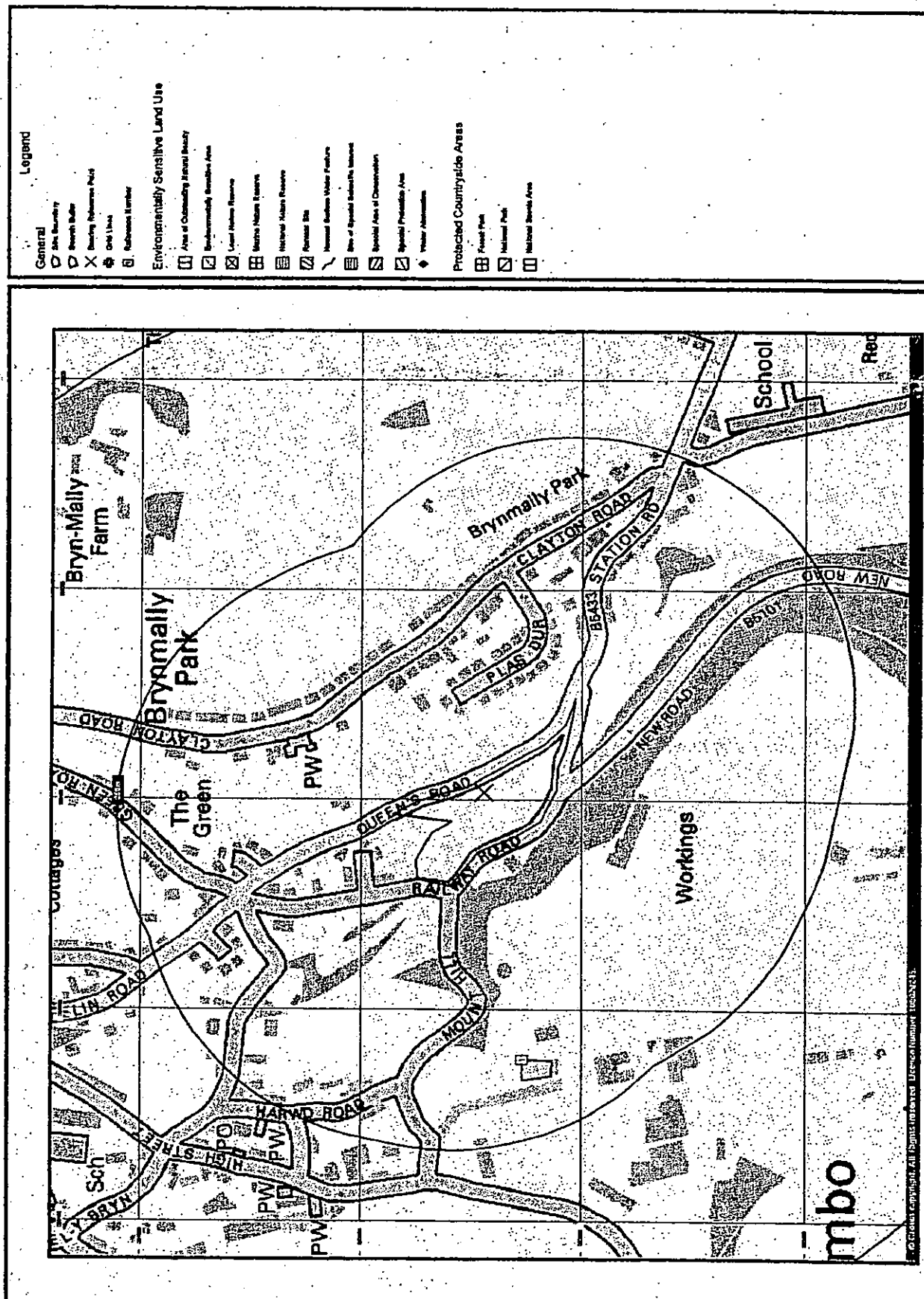
No

N/A

Flood Defences

No

N/A



Pathways and Receptors

Description

Environmentally Sensitive Receptors

Nearest Surface Water Feature

0-250m

Ref. No.	Search Buffer	D
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1	0-250m	
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Description	Search Buffer	Direction
Brine Compensation Areas		
No	N/A	
Coal Mining Affected Areas		
In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report. Contact ref: 5	On Site	-
Mining Instability		
Inconclusive Coal Mining	On Site	-
Radon Affected Areas		
Between 3% and 5% of homes are above the Action Level. Contact ref: 6	On Site	-
Radon Protection Measures		
Full radon protective measures are necessary in the construction of new dwellings or extensions. Contact ref: 4	On Site	-
Potential for Collapsible Ground Stability Hazards		
No Hazard	N/A	
Potential for Compressible Ground Stability Hazards		
Low. Contact ref: 4	On Site	W
Moderate. Contact ref: 4	0-250m	S
Potential for Ground Dissolution Stability Hazards		
No Hazard	N/A	
Potential for Landslide Ground Stability Hazards		
Moderate. Contact ref: 4	On Site	-
Moderate. Contact ref: 4	0-250m	SE
Potential for Running Sand Ground Stability Hazards		
Very Low. Contact ref: 4	On Site	SW
Very Low. Contact ref: 4	0-250m	N
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
Very Low. Contact ref: 4	On Site	-
Very Low. Contact ref: 4	0-250m	E
Shallow Mining Hazards		
Low-Moderate. Contact ref: 4	On Site	-
Low-Moderate. Contact ref: 4	0-250m	E

Useful Information

Useful Information

Registered Landfill Sites

At present no complete national data set exists for landfill site boundaries, therefore a point grid reference, provided by the data supplier, is used for some landfill sites. In certain cases the point grid references supplied provide only an approximate position, and can vary from the site entrance to the centre of the site. Where the exact position of the site is unclear, Landmark construct either a 100 metre or 250 metre "buffer" around the point to warn of the possible presence of landfill. The size of this 'buffer' relates to the positional accuracy that can be attributed to the site. The "buffer" is shown on the map as an orange cross-hatched circle and is referred to in the map legend as a Potential Landfill Buffer. Where actual boundaries are available, the landfill site area is shown on the map as a red diagonal hatched polygon and referred to in the map legend as Registered Landfill Site.

Local Authority Recorded Landfill Sites

Local Authority landfill data are sourced from individual local authorities that were able to provide information on sites operating prior to the introduction of the Control of Pollution Act (COPA) in 1974.

Appropriate authorities are listed under Local Authority Landfill Coverage with an indication of whether or not they were able to make landfill data available. Details of any records identified are disclosed. You should be aware that if the local authority 'Had landfill data but passed it to the relevant environment agency' it does not necessarily mean that local authority landfill data is included in our other Landfill datasets.

In addition if no data has been made available, for all or part of the search area, you should be aware that a negative response under 'Local Authority Recorded Landfill Sites' does not necessarily confirm that no local authority landfills exist.

Mining Instability Data

The Mining instability data was obtained on Licence from Ove Arup & Partners Limited (for further information, contact mining_review@arup.com). No reproduction or further use of such Data is to be made without the prior written consent of Ove Arup & Partners Limited. The Information and data supplied in the Product are derived from publicly available records and other third party sources and neither Ove Arup & Partners nor Landmark warrant the accuracy or completeness of such Information or data.



Contact Name and Address

- 1 Environment Agency National Customer Contact Centre (NCCC)**
PO Box 544
Templeborough
Rotherham
S60 1BY

enquiries@environment-agency.gov.uk

Telephone 08708 506 506
- 2 Wrexham County Borough Council**
Lampet Street
Gulldhall
Wrexham
Clwyd
LL11 1WL

www.wrexham.gov.uk

Telephone 01978 292000
Fax 01978 292502
- 3 Wrexham County Borough Council Environmental Health Department**
Crown Buildings
P O Box 1297
Wrexham
Clwyd
LL13 8ZE

www.wrexham.gov.uk

Telephone 01978 297038
Fax 01978 292502
- 4 British Geological Survey Enquiry Service**
British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
Nottinghamshire
NG12 5GG

enquiries@bgs.ac.uk
www.bgs.ac.uk

Telephone 0115 936 3143
Fax 0115 936 3276
- 5 The Coal Authority Mining Report Service**
200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

thecoalauthority@coal.gov.uk

Telephone 0845 7628848
- 6 Health Protection Agency**
Chilton
Didcot
Oxfordshire
OX11 0RQ

Telephone 01235 831600
Fax 01235 833891

Please note that the Environment Agency / SEPA have a charging policy in place for enquiries.

Other Contacts

- X-press Legal Services Limited**
10 Friars Court
Warrington
WA1 1EN

XLS@btopenworld.com

Telephone 01925 577377
Fax 01925 574216

APPENDIX E

Borehole Logs

Borehole 1

Depth (m)	Strata
0.00 – 1.40	Made Ground (Railway Ballast?)
1.40 – 2.00	CLAY
2.00 – 5.50	Grey MUDSTONE
5.50 – 11.50	Broken Ground
11.50 – 18.00	MUDSTONE
18.00 – 19.00	Broken Ground

Notes

1. Air flush lost at 5.50m but quickly regained.
2. At 19m rods became stuck in squeezing mine workings, hole abandoned.
3. No groundwater seepage encountered.

Borehole 2

Depth (m)	Strata
0.00 – 0.80	Made Ground (Railway Ballast?)
0.80 – 2.20	CLAY
2.20 – 10.0	Grey Mudstone
10.0 – 11.20	COAL
11.20 – 20.0	Grey MUDSTONE
20.0 – 20.80	COAL
20.80 – 30.0	MUDSTONE with Siltstone bands

Notes

1. No groundwater seepage encountered.

Borehole 3

Depth (m)	Strata
0.00 – 0.80	Made Ground
0.80 – 1.20	Coarse SAND and GRAVEL
1.20 – 2.80	CLAY
2.80 – 5.50	Light Brown MUDSTONE
5.50 – 6.50	Grey MUDSTONE
6.50 – 9.50	Broken Ground
9.50 – 10.5	Solid Drilling

Notes

1. No groundwater seepage encountered.
2. Lost flush at 6.50m.

Borehole 4

Depth (m)	Strata
0.00 – 1.40	Made Ground
1.40 – 2.80	CLAY
2.80 – 4.10	Light brown Mudstone
4.10 – 8.60	Grey MUDSTONE
8.60 – 9.50	COAL
9.50 – 15.0	Grey MUDSTONE
15.0 – 16.20	COAL
16.20 – 17.30	Grey MUDSTONE
17.30 – 17.60	COAL
17.60 – 24.0	Grey MUDSTONE with Siltstone bands
24.0 – 24.50	Loose COAL
24.50 – 30.0	MUDSTONE

Notes

1. No groundwater seepage encountered.

Borehole 5

Depth (m)	Strata
0.00 – 0.60	Made Ground
0.60 – 3.0	CLAY
3.0 – 4.50	Loose COAL
4.50 – 7.0	Grey Mudstone
7.00 – 9.0	Light brown MUDSTONE
9.0 – 12.80	Grey MUDSTONE
12.80 – 13.90	COAL
13.90 – 17.0	Grey MUDSTONE
17.0 – 17.4	COAL
17.40 – 24.0	Grey MUDSTONE with siltstone bands
24.0 – 24.4	COAL
24.4 – 30.0	Grey MUDSTONE

Notes

1. No groundwater seepage encountered.

Borehole 6

Depth (m)	Strata
0.00 – 1.30	Made Ground
1.30 – 4.00	CLAY
4.00 – 5.40	Loose COAL
5.40 – 9.00	Light brown Mudstone
9.00 – 14.50	MUDSTONE
14.50 – 15.10	COAL
15.10 – 22.0	Grey MUDSTONE
22.0 – 24.00	Broken Ground
24.0 – 25.0	Solid Drilling

Notes

1. No groundwater seepage encountered.
2. Lost Returns at 24m.

Borehole 7

Depth (m)	Strata
0.00 – 0.40	Made Ground
0.40 – 7.0	CLAY
7.0 – 10.0	Light brown Mudstone
10.0 – 13.60	Grey MUDSTONE
13.60 – 14.50	COAL
14.50 – 23.0	Grey MUDSTONE
23.0 – 24.80	COAL
24.80 – 30.0	Grey MUDSTONE

Notes

1. No groundwater seepage encountered.

Borehole 8

Depth (m)	Strata
0.00 – 0.50	Made Ground
0.50 – 3.8	CLAY
3.8 – 5.0	Light brown Mudstone
5.0-5.50	VOID
5.50-7.50	BROKEN GROUND
7.5-8.5	Solid Drilling

Notes

1. No groundwater seepage encountered.
2. Lost Returns at 5m.

Borehole 9

Depth (m)	Strata
0.00 – 0.50	Made Ground
0.50 – 4.0	CLAY
4.0 – 5.50	Light brown Mudstone
5.50-6.50	VOID
6.5-7.5	Solid Drilling

Notes

1. No groundwater seepage encountered.
2. Lost flush at 5.50m air blowing up BH 8.

Borehole 10

Depth (m)	Strata
0.00 – 0.20	Made Ground
0.20 – 1.0	CLAY
1.0 – 1.20	Sandstone boulder
1.20 – 4.50	VERY Soft Drilling
4.5 – 5.0	Loose COAL
5.0-10.3	Light Brown Mudstone
10.3 – 14.3	Grey MUDSTONE
14.3 – 14.90	COAL
14.90 – 23.5	Grey MUDSTONE
23.5-25.5	COAL
25.5-30.0	Grey Mudstone

Notes

1. No groundwater seepage encountered.

Borehole 11

Depth (m)	Strata
0.00 – 0.50	Made Ground
0.50 – 1.80	CLAY
1.80-2.0	Sandstone
2.0 ~ 4.0	Light brown Mudstone
4.0 – 5.70	Grey MUDSTONE
5.70 – 6.00	COAL
6.0 ~ 8.50	Grey MUDSTONE
8.5 ~ 9.40	COAL
9.4 ~ 10.0	Grey MUDSTONE
10.0-10.4	COAL
10.4-20.0	Grey Mudstone
20.0-21.10	Loose COAL
21.0-30.0	Grey Mudstone

Notes

1. No groundwater seepage encountered.

Borehole 12

Depth (m)	Strata
0.00 – 0.40	Made Ground
0.40 – 2.0	CLAY
2.0 – 5.0	Light brown Mudstone
5.0 – 6.20	Grey MUDSTONE
6.20 – 7.10	COAL
7.10 – 15.50	Grey MUDSTONE
15.50 – 16.0	COAL
16.0 – 17.0	Grey MUDSTONE
17.0-17.3	COAL
17.3-22.0	Grey Mudstone
22.0-23.10	Loose COAL
23.10-30.0	Grey Mudstone

Notes

1. No groundwater seepage encountered.

Shaft Photos

APPENDIX F

Trial Pit Logs

TRIAL PIT 1

Depth (m)	Strata
0.00 – 0.40	Loose to medium dense dark grey brown sub angular fine to medium GRAVEL mainly of ash and clinker (MADE GROUND)
0.40 – 0.90	Loose light to mid brown slightly gravelly SAND gravel is fine to coarse and sub angular (MADE GROUND)
0.90 – 2.50	Loose grey sub angular coarse GRAVEL of slag with a little cobble in a sand to medium gravel matrix and occasional small boulder (MADE GROUND)
2.50 – 4.00	Soft becoming firm to stiff orange brown and grey silty CLAY with some mudstone gravel mix of glacial till and weathered bedrock Becoming with much gravel with depth (possible MADE GROUND?)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.





TRIAL PIT 2

Depth (m)	Strata
0.00 – 0.30	Loose dark grey gravely silty SAND with a trace of coal (MADE GROUND)
0.30 – 0.70	Loose light to mid brown slightly gravely fine SAND gravel is fine to medium sub rounded (MADE GROUND)
0.70 – 1.20	Loose to medium dense brown grey sandy sub angular fine to coarse GRAVEL of slag with a little cobble (MADE GROUND)
1.20 – 3.30	Firm to stiff light grey sub angular fine to medium GRAVEL in a clay matrix becoming gravel sub angular to platy fine to coarse with some cobble in a clay matrix (COLLIERY SPOIL)
3.30 – 3.50	Soft light grey CLAY with some mudstone gravel (COLLIERY SPOIL)
3.50 – 4.00	Soft orange brown and grey mottled gravely CLAY (Possible GLACIAL TILL)

Notes

1. Colliery spoil slightly damp and becoming unstable.
2. No groundwater seepage.

TRIAL PIT 3

Depth (m)	Strata
0.00 – 0.10	Ash and Clinker
0.10 – 0.90	Loose to medium dense dark brown gravely SAND gravel is generally fine to medium sub rounded to sub angular (MADE GROUND)
0.90 – 1.70	Loose light to medium brown gravely fine to medium SAND gravel is sub rounded fine to coarse (MADE GROUND)
1.70 – 1.80	Soft orange brown CLAY
1.80 – 4.00	Soft orange brown and grey gravely CLAY (possible GLACIAL TILL)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Surface to dark brown sand slopes towards Brymbo Road.







TRIAL PIT 4

Depth (m)	Strata
0.00 – 0.70	Loose to medium dense dark brown and black sandy GRAVEL mainly of ash and clinker (MADE GROUND)
0.70 – 1.70	Loose brown and grey brown coarse GRAVEL to COBBLE of sub angular slag in a brown sandy matrix, becoming a brown sand with some gravel (MADE GROUND)
1.70 – 3.30	Firm to stiff orange brown mottled grey CLAY with a little sub rounded gravel (GLACIAL TILL)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Large boulder at base of pit.



TRIAL PIT 5

Depth (m)	Strata
0.00 – 0.50/0.90	Firm orange brown and grey gravelly CLAY (HEAD/Possible MADE GROUND?)
0.50/0.90 – 1.70	Firm to stiff orange brown mottled grey CLAY with a little gravel (GLACIAL TILL)
1.70 – 3.60	Stiff grey mottled brown silty CLAY with a little mudstone gravel (Completely Weathered Bedrock)
3.60 – 4.00	Weak grey thinly bedded MUDSTONE in a clay matrix (Slightly Weathered Bedrock)

Notes

1. Slight groundwater seepage at 1.70m.
2. Sides of pit stable.



TRIAL PIT 6

Depth (m)	Strata
0.00 – 1.50	Dense grey sandy sub angular to platy fine to coarse GRAVEL/stiff grey silty CLAY with a little gravel (MADE GROUND – Derived from Colliery Spoil)
1.50 – 2.30	Traces of brick masonry and slag cobbles (Possible old Culvert)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Pit excavated for soakaway test, abandoned when old culvert encountered.



TRIAL PIT 7

Depth (m)	Strata
0.00 – 2.00	Firm to stiff brown and grey silty CLAY with a little fine to coarse gravel of mudstone (MADE GROUND – Derived from Colliery Spoil)
2.00 – 2.50	Loose dark brown SILT with a little coal (OLD TOPSOIL)
2.50 – 2.80	Soft orange brown sandy silty CLAY with a little gravel (Weathered GLACIAL TILL)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Pit dimensions 0.60m wide, 1.80m long and 2.80m deep.

Time	Depth Of water (m)	Fall (cm)	Cumulative Fall (cm)
0	0.605	0	0
1	0.625	2	2
2	0.645	2	4
3	0.655	1	5
4	0.67	1.5	6.5
5	0.68	1	7.5
6	0.685	0.5	8
7	0.7	1.5	9.5
8	0.71	1	10.5
9	0.715	0.5	11
10	0.72	0.5	11.5
15	0.755	3.5	15
20	0.78	2.5	17.5
25	0.815	3.5	21
30	84	2.5	23.5
60	0.97	13	36.5
96	1.03	6	42.5
131	1.15	12	54.5
224	1.38	23	77.5

TRIAL PIT 8

Depth (m)	Strata
0.00 – 0.30	Loose brown clayey SILT with roots (TOPSOIL)
0.30 – 1.90	Firm orange brown CLAY with a little gravel (Weathered GLACIAL TILL)
1.90 – 2.90	Firm to stiff grey brown silty CLAY with some fine to coarse platy mudstone gravel (Completely Weathered Bedrock)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Pit dimensions 0.60m wide, 1.80m long and 2.90m deep.

Time	Depth Of water (m)	Fall (cm)	Cumulative Fall (cm)
0	0.45	0	0
1	0.46	1	1
2	0.465	0.5	1.5
3	0.47	0.5	2
4	0.48	1	3
5	0.48	0	3
6	0.485	0.5	3.5
7	0.485	0	3.5
8	0.49	0.5	4
9	0.49	0	4
10	0.495	0.5	4.5
15	1.51	1.5	6
20	0.52	1	7
25	0.525	0.5	7.5
30	0.55	2.5	10
64	0.59	4	14
184	0.715	12.5	26.5

TRIAL PIT 9

Depth (m)	Strata
0.00 – 0.90	Loose dark brown slightly gravely silty SAND mainly of ash and clinker (MADE GROUND)
0.90 – 1.20	Loose mid brown gravely SAND gravel mainly slag (MADE GROUND)
1.20 – 2.30	Soft becoming firm to stiff orange brown mottled grey CLAY with a little gravel (Weathered GLACIAL TILL)
2.30 – 2.90	Weak grey thinly bedded MUDSTONE in a clay matrix (weathered BEDROCK)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Soakaway test carried out in pit starting level 1.06m, no fall in level in one hour and twenty minutes.

TRIAL PIT 10

Depth (m)	Strata
0.00 – 0.40	Loose dark brown gravely SILT gravel is mainly sub angular coarse (TOPSOIL)
0.40 – 1.30	Firm quickly becoming firm to stiff light brown mottled grey CLAY with a little gravel (Weathered GLACIAL TILL)
1.30 – 2.50	Firm to stiff dark grey mottled orange brown CLAY (Weathered BEDROCK)
2.50 – 4.20	Very weak becoming weak dark grey slightly carbonaceous very thinly bedded fissile MUDSTONE with occasional clay layers, excavated as a platy fine to coarse gravel with a little clay/silt matrix (BEDROCK)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.
3. Trial pit excavated into side of slope, base of pit approximately 1.5m below top of embankment level.



TRIAL PIT 11

Depth (m)	Strata
0.00 – 1.80	Firm brown sandy silty CLAY with much sub angular to sub rounded fine to coarse gravel with a little cobble and traces of brick and pottery (MADE GROUND)
1.80 – 2.10	Dark brown slightly clayey SILT with a little gravel (OLD TOPSOIL LAYER)
2.10 – 2.70	Firm orange brown silty gravelly CLAY (Weathered GLACIAL TILL)
2.70 – 3.70	Firm to stiff/stiff grey mottled orange brown silty CLAY with some fine to coarse gravel and a little cobble with depth becoming much gravel and a little cobble (weathered BEDROCK)

Notes

1. No groundwater seepage encountered.
2. Sides of pit stable.



EXCAVATION IN LOW POINT

Depth (m)	Strata
0.00 – 2.00	Brown gravelly silty SAND with old beer barrels, tyres, boulders, bottles, plastic (MADE GROUND)
2.00 – 2.10	OLD TOPSOIL LAYER







Location of Trial Pits and Boreholes

BH/TP No	E	N
BH 1	29821	53633
2	29821	53640
3	29801	53663
4	29798	53688
5	29790	53705
6	29778	53729
7	29770	53748
8	29783	53746
9	29787	53748
10	29771	53765
11	29785	53717
12	29804	53639
TP 1	29743	53727
2	29761	53717
3	29780	53699
4	29805	53663
5	29822	53670
6	29774	53775
7	29780	53765
8	29779	53751
9	29808	53665
10	29809	53654
11	29767	53743
Exc	29760	53752
Shaft	29764	53665

APPENDIX G

Soakaway Test Results

Queens Road, Brymbo, Wrexham
TP7 Test 1
00/00/07

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

APPENDIX H

Photographs of Shaft



Edge of shaft showing contrast between mudstone bedrock and shaft infill



Made ground extending beneath railway embankment construction in far corner of pit.

APPENDIX I

Physical Test Results

LABORATORY RESULTS - Chemical Analysis

Project BRYMBO ROAD, BRYMBO, WREXHAM

Project No: PN071629

[illegible]

Remarks Tesis performed in accordance with BS 1377: Part 3: 1990
Sulphate reported as SO₃, results in brackets reported as SO₄



Project No: PN071629

Remarks	Tests performed in accordance with BS 1377: 1990
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APPENDIX J

Chemical Test Results



ALcontrol Geochem

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.co.uk
website: www.alcontrol.co.uk

Ground Solve
Unit 7
Well House Barns
Chester Road
Bretton
CH4 0DH

ATTN: Mike Scott

CERTIFICATE OF ANALYSIS

Date: 28 September, 2007
Our Reference: 07/14268/02/01
Your Reference: BRB 001
Location: BRYMBO ROAD, BRYMBO, WREXHAM

A total of 12 samples was received for analysis on Friday, 17 August 2007 and completed on Wednesday, 26 September 2007. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials- whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Signed

<u>Diane Whittlestone</u>	<u>Jane Seymour</u>	<u>David O'Hare</u>	<u>Caroline Suttie</u>
Customer Services	Customer Services	Customer Services	Customer Services

Valid if signed by any of the above signatories.

Compiled By

Sarah Broadbent



ALcontrol Geochem TEST SCHEDULE

JOB NUMBER : 07/14268/02

CLIENT : Ground Solve

CONTACT : Mike Scott

DATE OF RECEIPT : 17/08/07

LOCATION : BRYMBO ROAD, BRYMBO, WREX

BATCH NUMBER : 1

CLIENT REF/CODE : BRB 001

ORDER NUMBER : BRB 001

TURNAROUND : 10 days

Numeric values indicate
additional scheduling

* Indicates test subcontracted

UKAS Accredited ?																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
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ALcontrol Laboratories

TPHCWG Interpretations

Client: Ground Solve
Job Number: 07/14268

Sample Numbers	Sample ID	Interpretation
001	TP1	Possible Diesel and naturally occurring hydrocarbons
003	TP2	Possible Diesel and naturally occurring hydrocarbons
005	TP3	Possible Diesel and naturally occurring hydrocarbons
007	TP4	Possible Diesel and naturally occurring hydrocarbons

Note: The interpretations, above, are subjective and represent an opinion of the contamination present which is visible on the respective TPH CWG traces available. It does not take into account any compounds or class of compounds that may have been removed during the column chromatography separation procedure.

Sample Descriptions

Job Number: 07/14268/02/01

Client: Ground Solve

Client Ref : BRB 001

Grain sizes

<0.063mm

Very Fine

0.1mm - 0.063mm Fine

0.1mm - 2mm Medium

2mm - 10mm Coarse

>10mm Very Coarse

[illegible]

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

¹ Sample Description supplied by client

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: SOLID » Shown on prev. report
Location: BRYMBO ROAD, BRYMBO, WREXHAM
Client Contact: Mike Scott

[illegible]

All results expressed on a dry weight basis.

Date 28.09.2007

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Job Number: 07/14268/02/01
Client: Ground Solve
Client Ref. No.: BRB 001

Matrix: SOLID » Shown on prev. report
Location: BRYMBO ROAD, BRYMBO, WREXHAM
Client Contact: Mike Scott

[illegible]

All results expressed on a dry weight basis.

Date 28.09.2007

Validated	☒
Preliminary	☐

ALcontrol Geochem Analytical Services

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Job Number: 07/14268/02/01
Client: Ground Solve
Client Ref. No.: BRB 001

Matrix: SOLID » Shown on prev. report
Location: BRYMBO ROAD, BRYMBO, WREXHAM
Client Contact: Mike Scott

[illegible]

All results expressed on a dry weight basis.

Date 28.09.2007

☒

11

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LEACHATE

Location: BRYMBO ROAD, BRYMBO, WREXHAM

Client Contact: Mike Scott

Date 28.09.2007

☒

1

- # ISO 17025 accredited
- M MCERTS accredited
- * Subcontracted test
- » Shown on prev. report

Matrix: LEACHATE

Location: BRYMBO ROAD, BRYMBO, WREXHAM

Client Contact: Mike Scott

Date 28.09.2007

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 07/14268/02/01
 Client: Ground Solve
 Client Ref. No.: BRB 001

Report Key :

NDP No Determination Possible
 NFD No Fibres Detected
 # ISO 17025 accredited
 PFD Possible Fibres Detected

* Subcontracted test
 » Result previously reported (Incremental reports only)
 M MCERTS Accredited
 EC Equivalent Carbon (Aromatics C8-C35)

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10⁻⁷

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	Accredited ISO 17025	Accredited MCERTS	Wet/Dry Sample ¹	Surrogate Corrected
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection			NA	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection	✓	✓	WET	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.			NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.	✓		DRY	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.	✓	✓	DRY	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)			WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓		WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓	✓	WET	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser			NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓	✓	DRY	
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser			WET	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy			NA	
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter			NA	

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

ALcontrol Geochem Analytical Services

Table Of Results - Appendix

Job Number: 07/14268/02/01
 Client: Ground Solve
 Client Ref. No.: BRB 001

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10⁻⁷

NDP No Determination Possible	* Subcontracted test	
NFD No Fibres Detected	» Result previously reported (Incremental reports only)	
# ISO 17025 accredited	M MCERTS Accredited	
PFD Possible Fibres Detected	EC Equivalent Carbon (Aromatics C8-C35)	

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample ¹	Surrogate Corrected
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓	✓	WET	
TM136	Method 17.10, Second Site property, March 2003	Determination of Sulphur by HPLC			NA	
TM136	Method 17.10, Second Site property, March 2003	Determination of Sulphur by HPLC	✓		DRY	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	✓		WET	
TM173		Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID	✓		DRY	
TM174		Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID			NA	
TM181	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Routine Metals by iCap 6500 Duo ICPOES			DRY	
TM181	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Routine Metals by iCap 6500 Duo ICPOES	✓	✓	DRY	
TM61/89		see TM061 and TM089 for details			WET/DRY	

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

ALcontrol Geochem Analytical Services
Table Of Results - Appendix

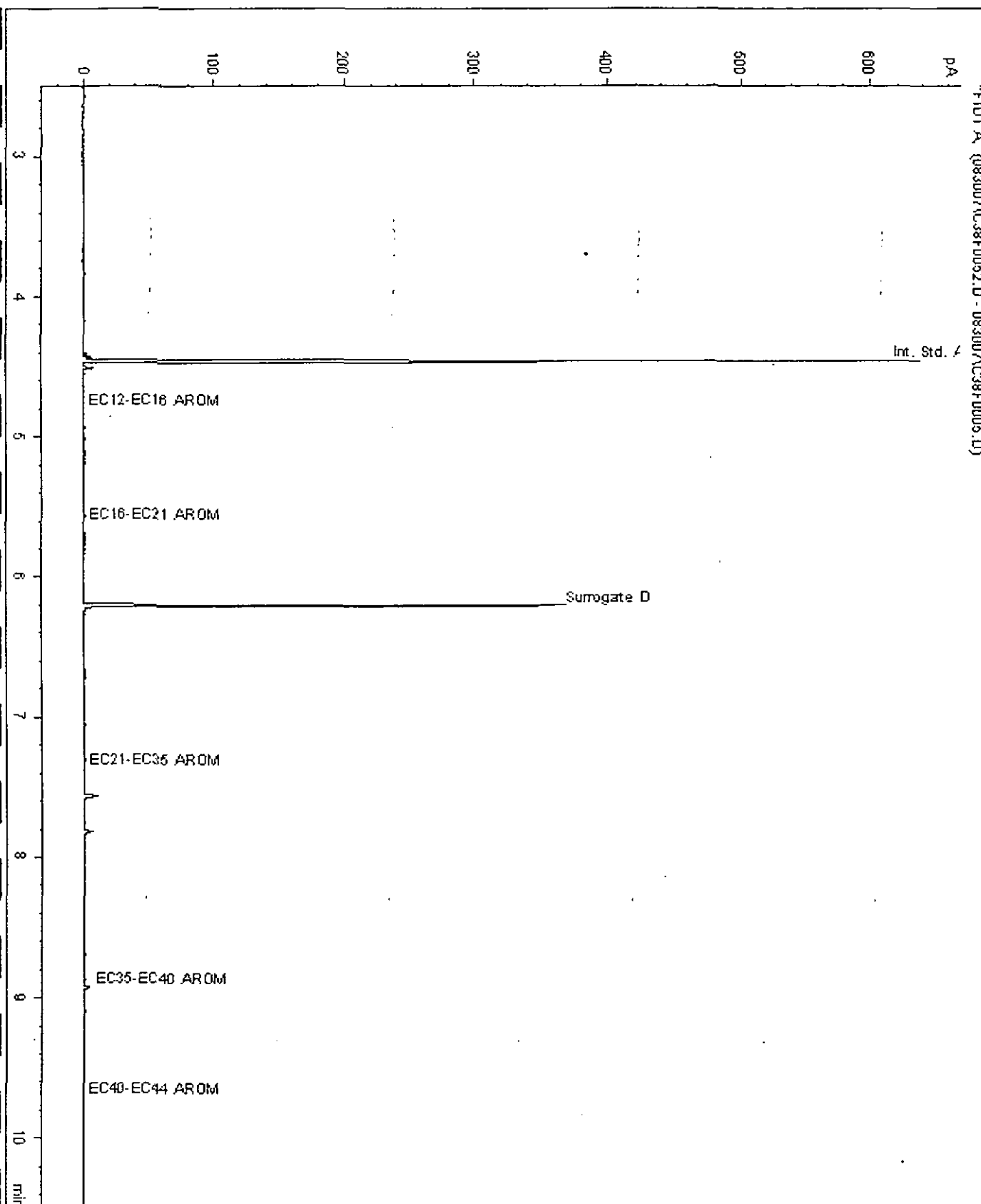
Job Number: 07/14268/02/01
Client: Ground Solve
Client Ref. No.: BRB 001

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	21°C

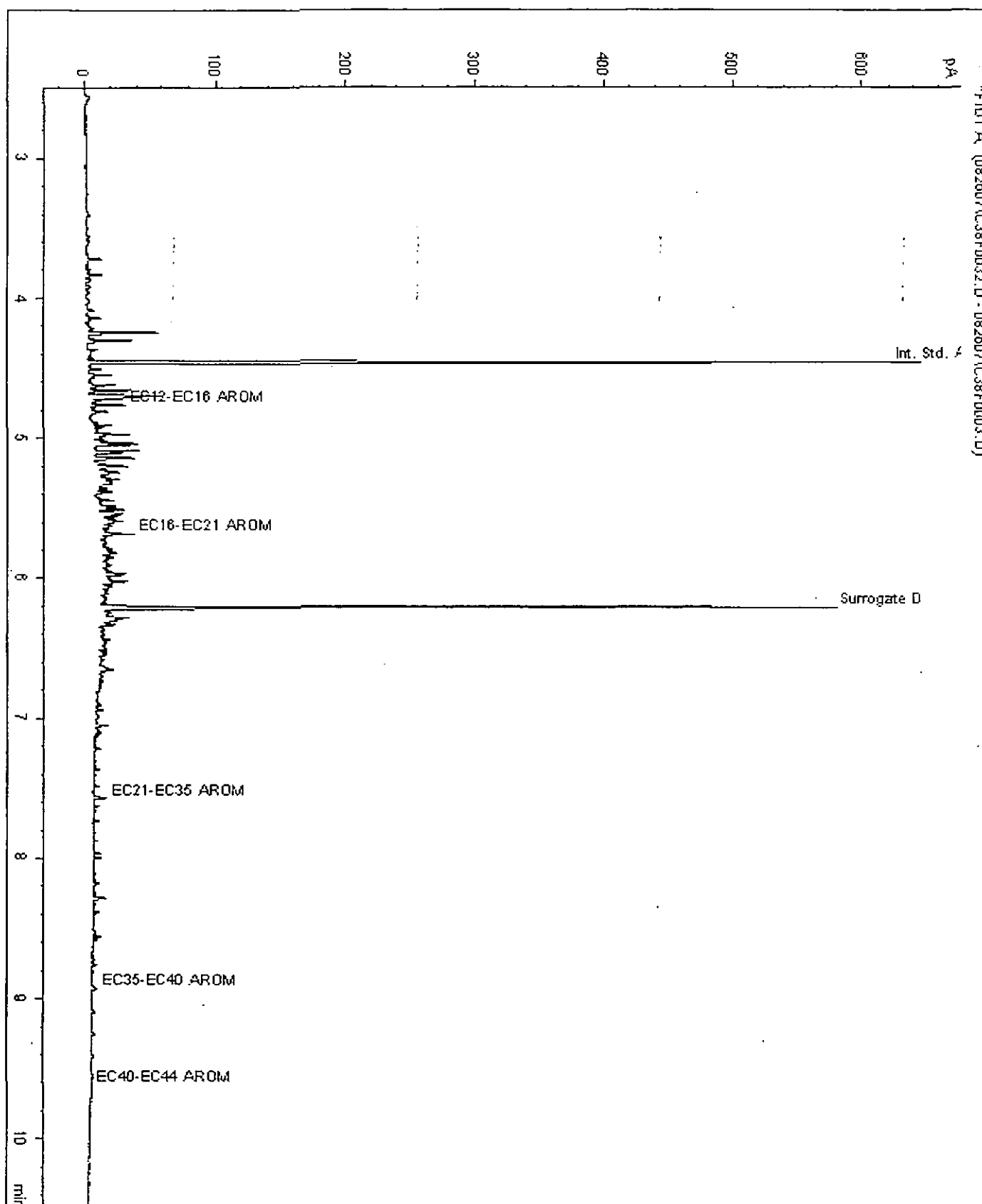
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200714268-1/N
Date Acquired : 31/08/07 09:53:51 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



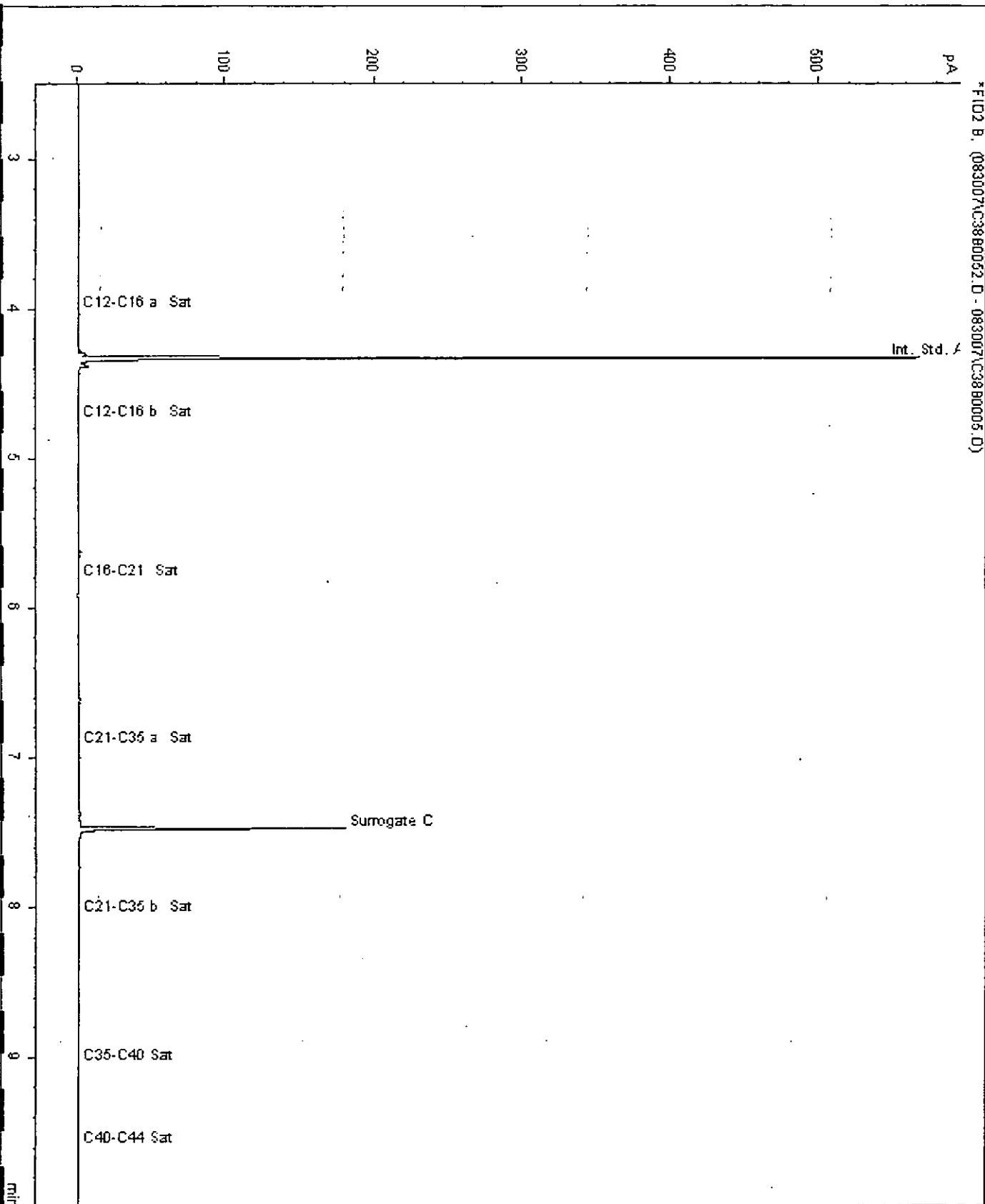
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200714268-1/S
Date Acquired : 28/08/07 07:06:14 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.004



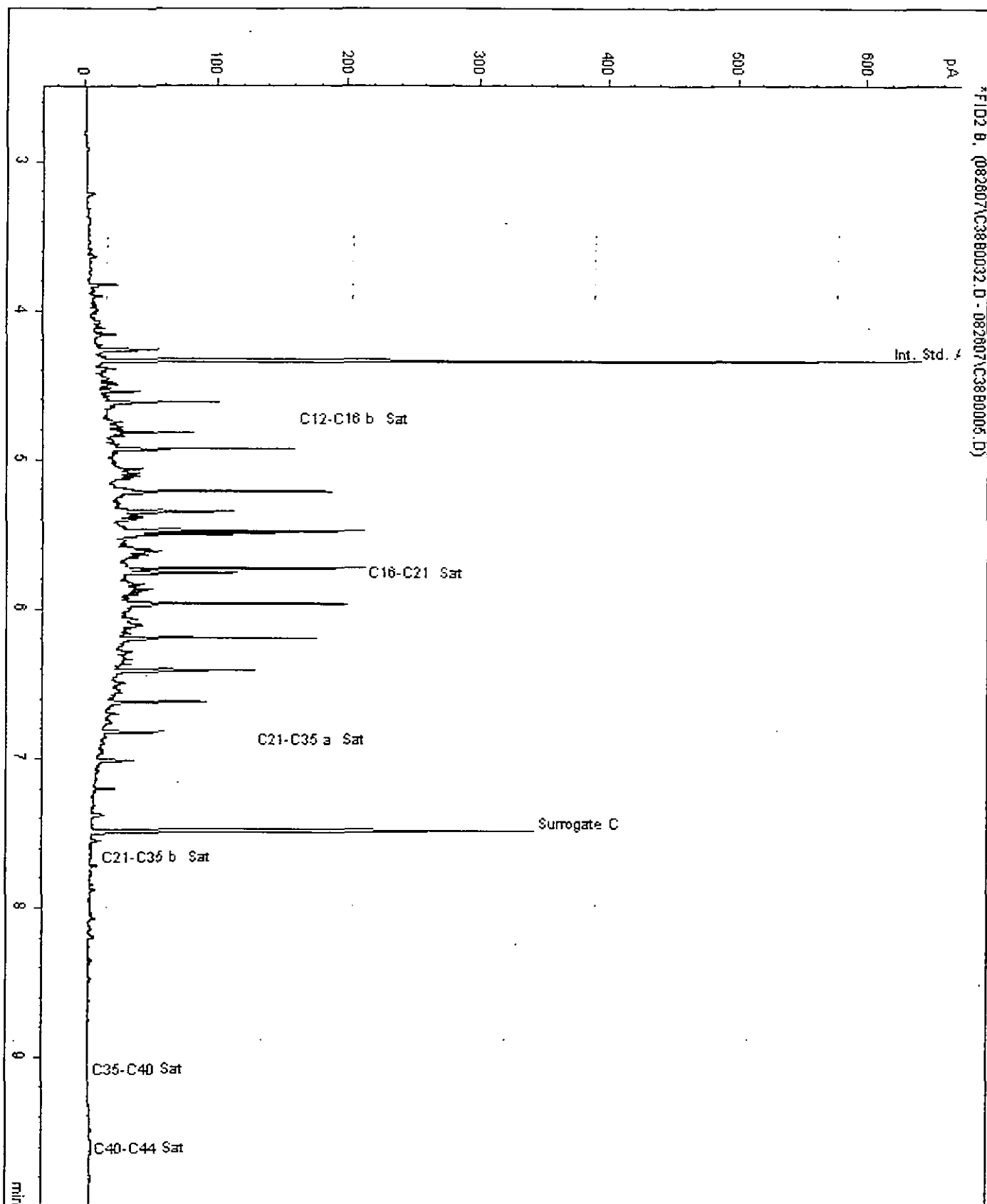
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200714268-1/W
Date Acquired : 31/08/07 09:53:51 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



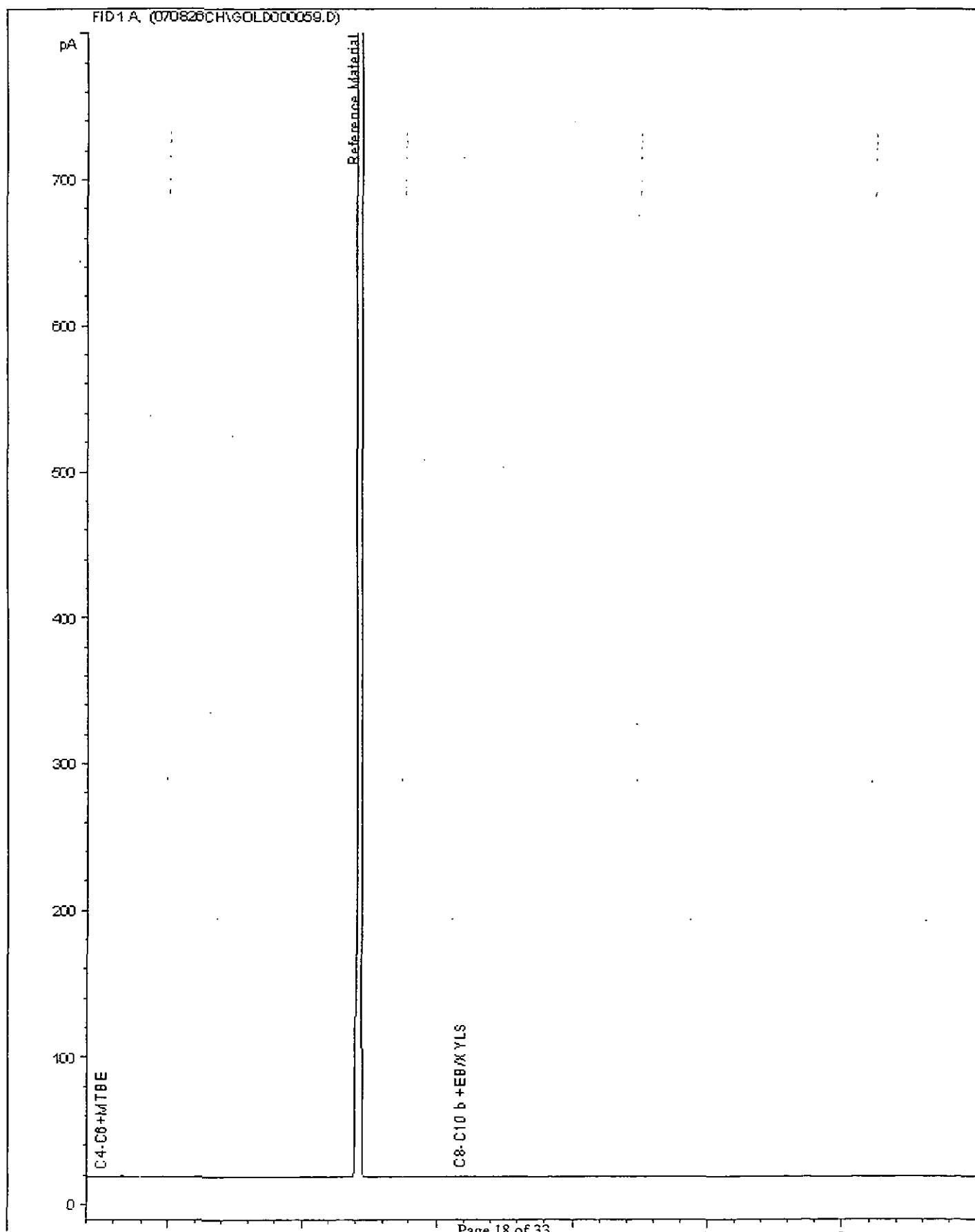
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200714268-1/S
Date Acquired : 28/08/07 07:06:14 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.004



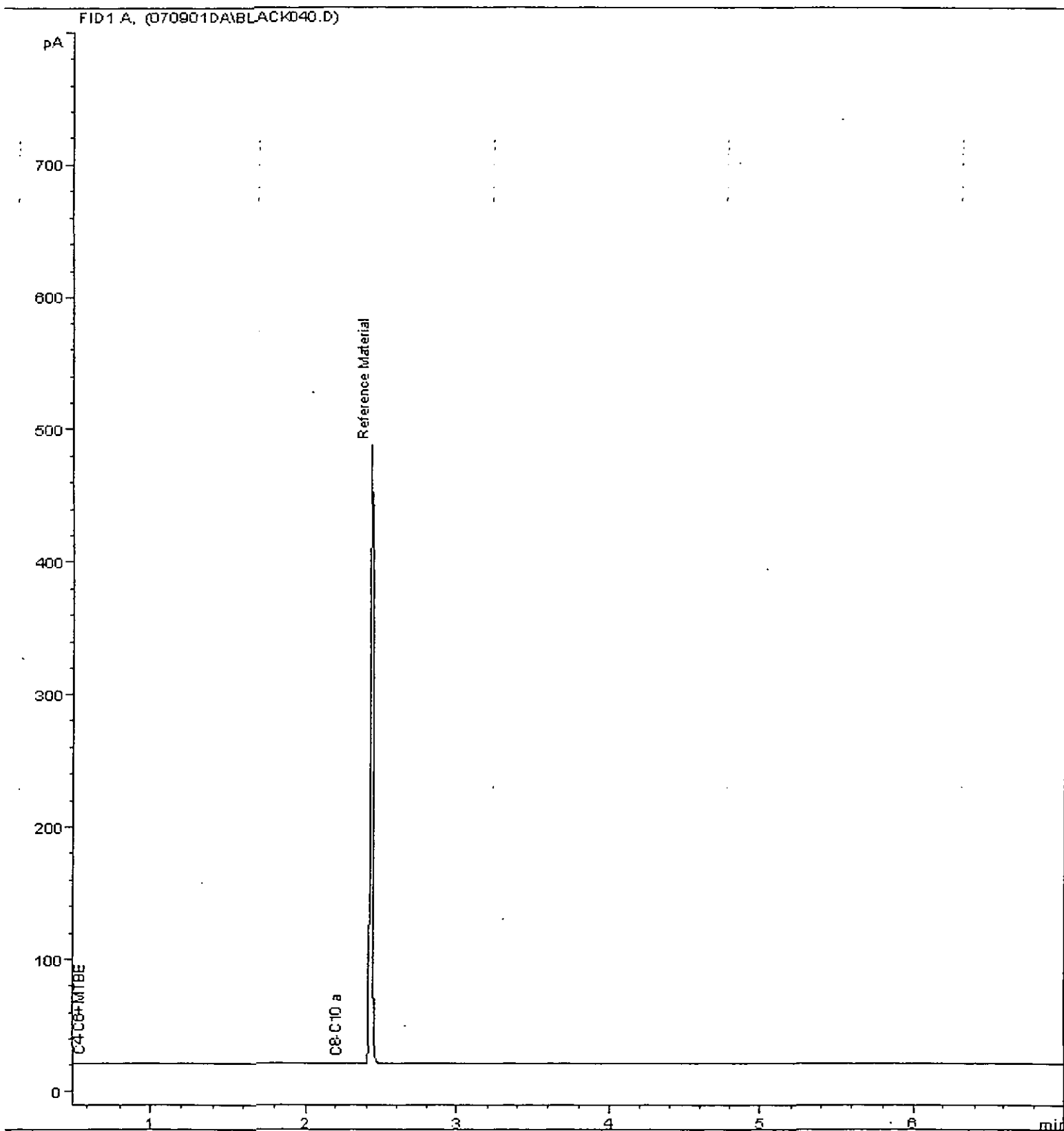
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-1/M
Date Acquired : 27/08/07 04:43:55
Units : ppb
Dilution : 1



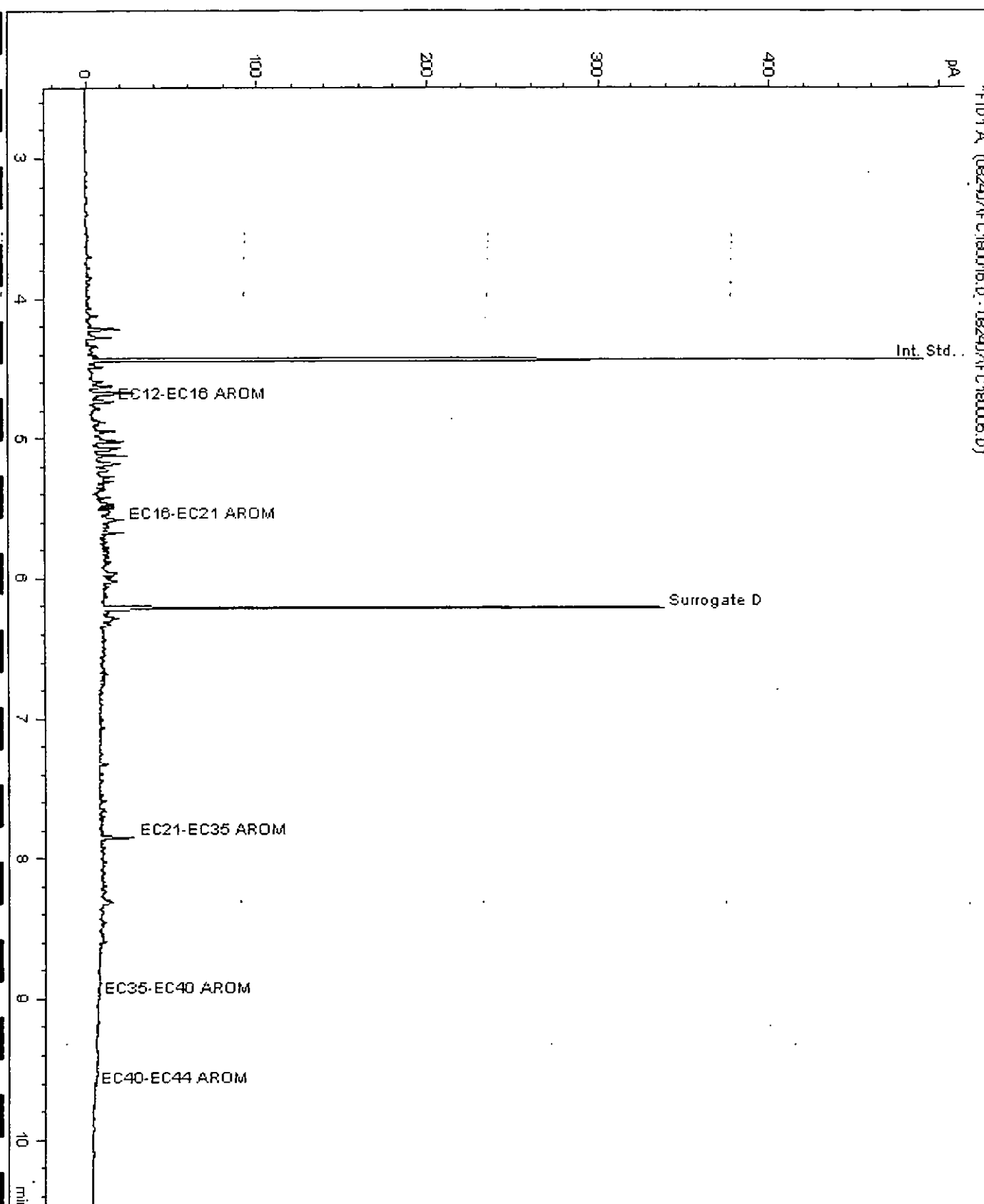
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-1/S
Date Acquired : 02/09/07 02:42:41 PM
Units : ppb
Dilution : 1



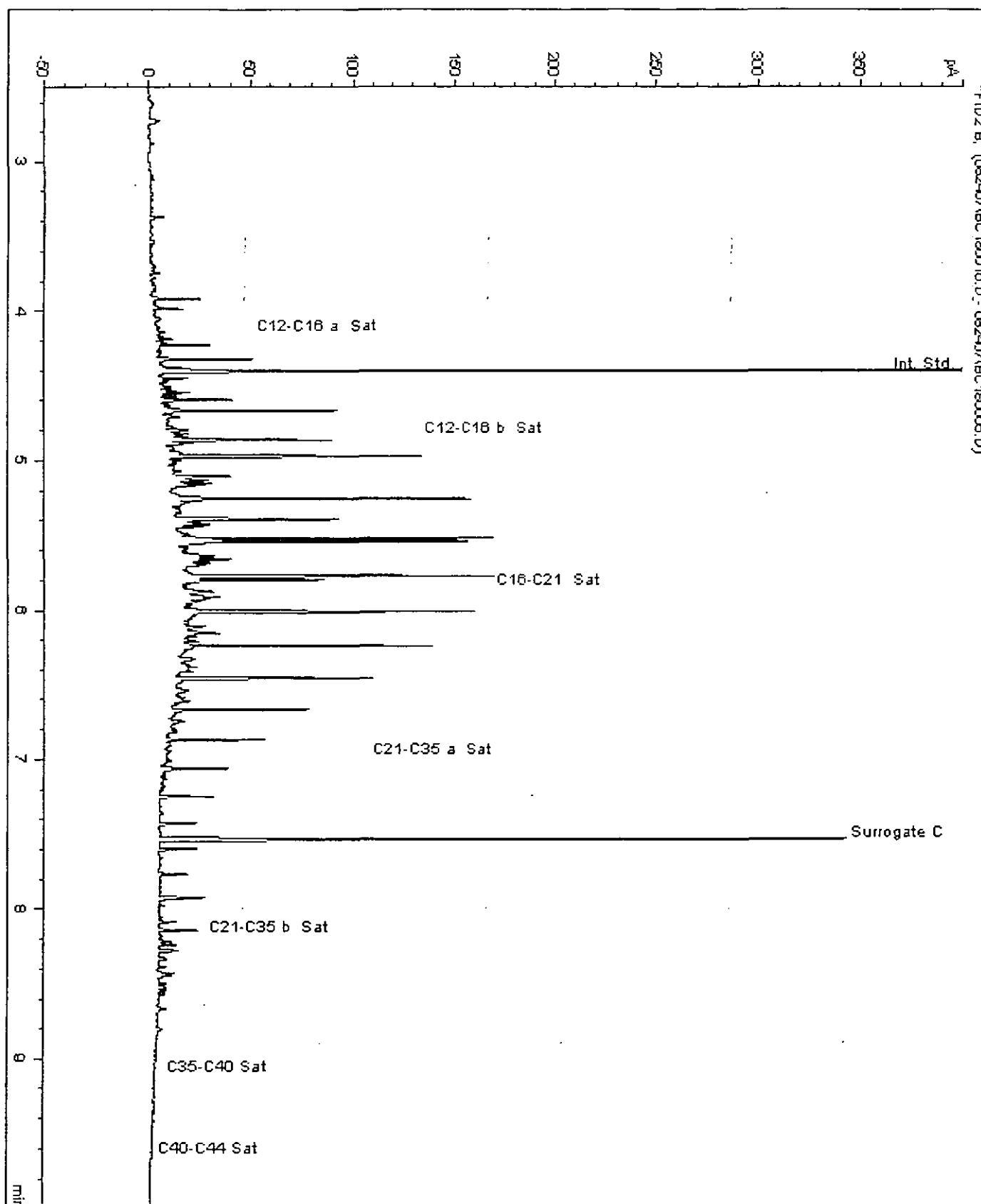
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40.)

Sample Identity: 200714268-3/S
Date Acquired : 24/08/07 21:07:17
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.999



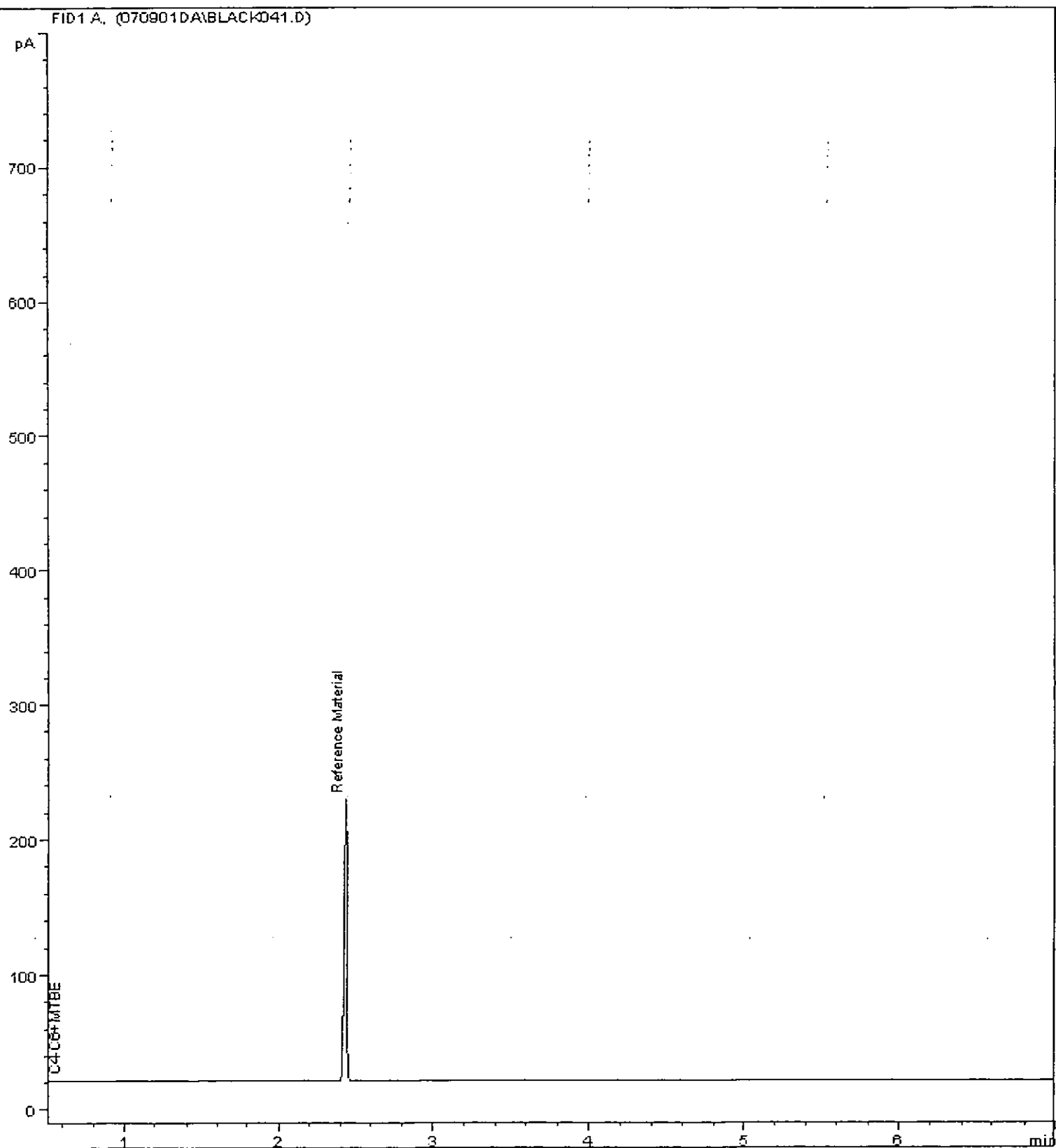
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200714268-3/S
Date Acquired : 24/08/07 21:07:18
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.999



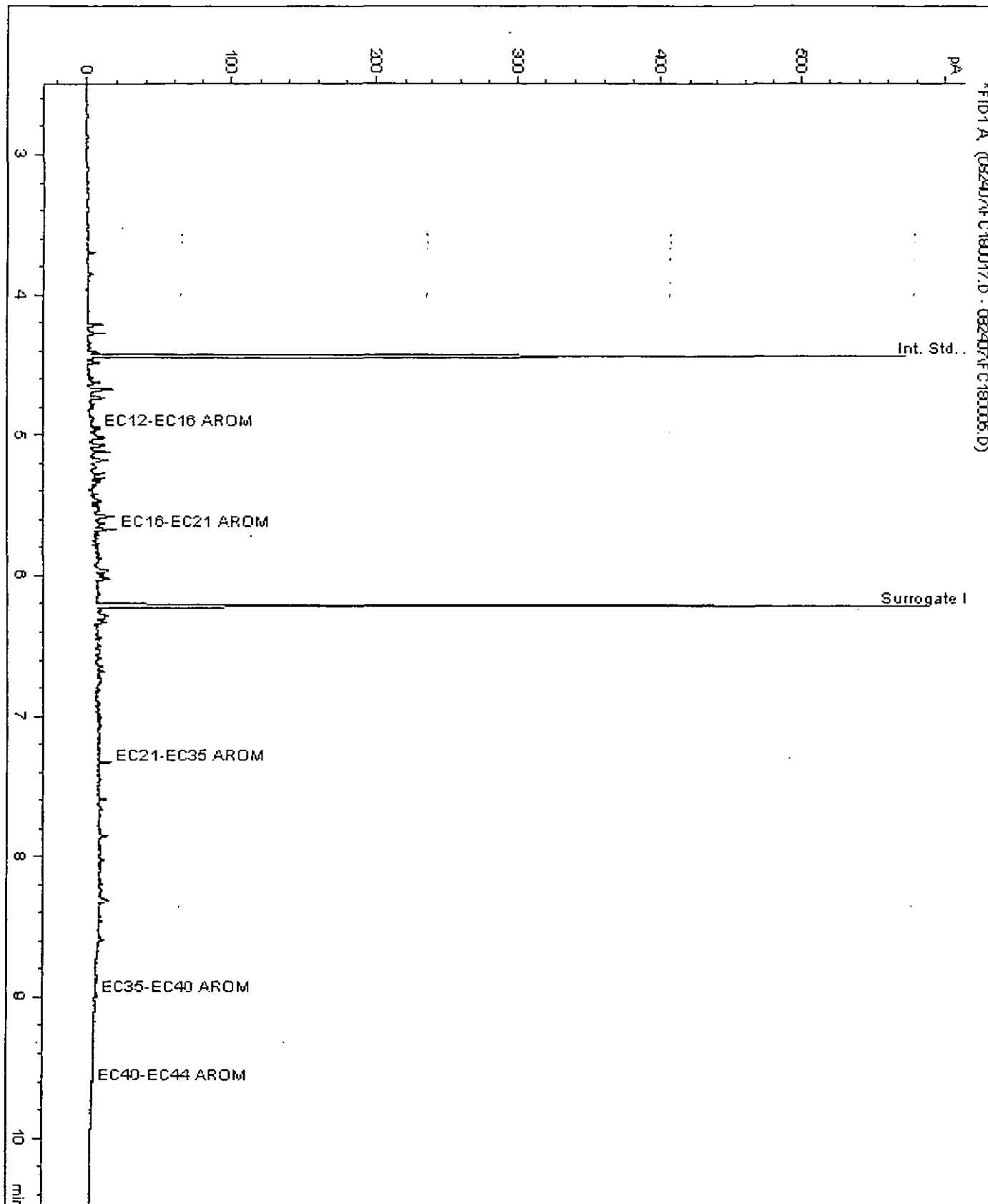
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-3/S
Date Acquired : 02/09/07 02:57:55 PM
Units : ppb
Dilution : 1



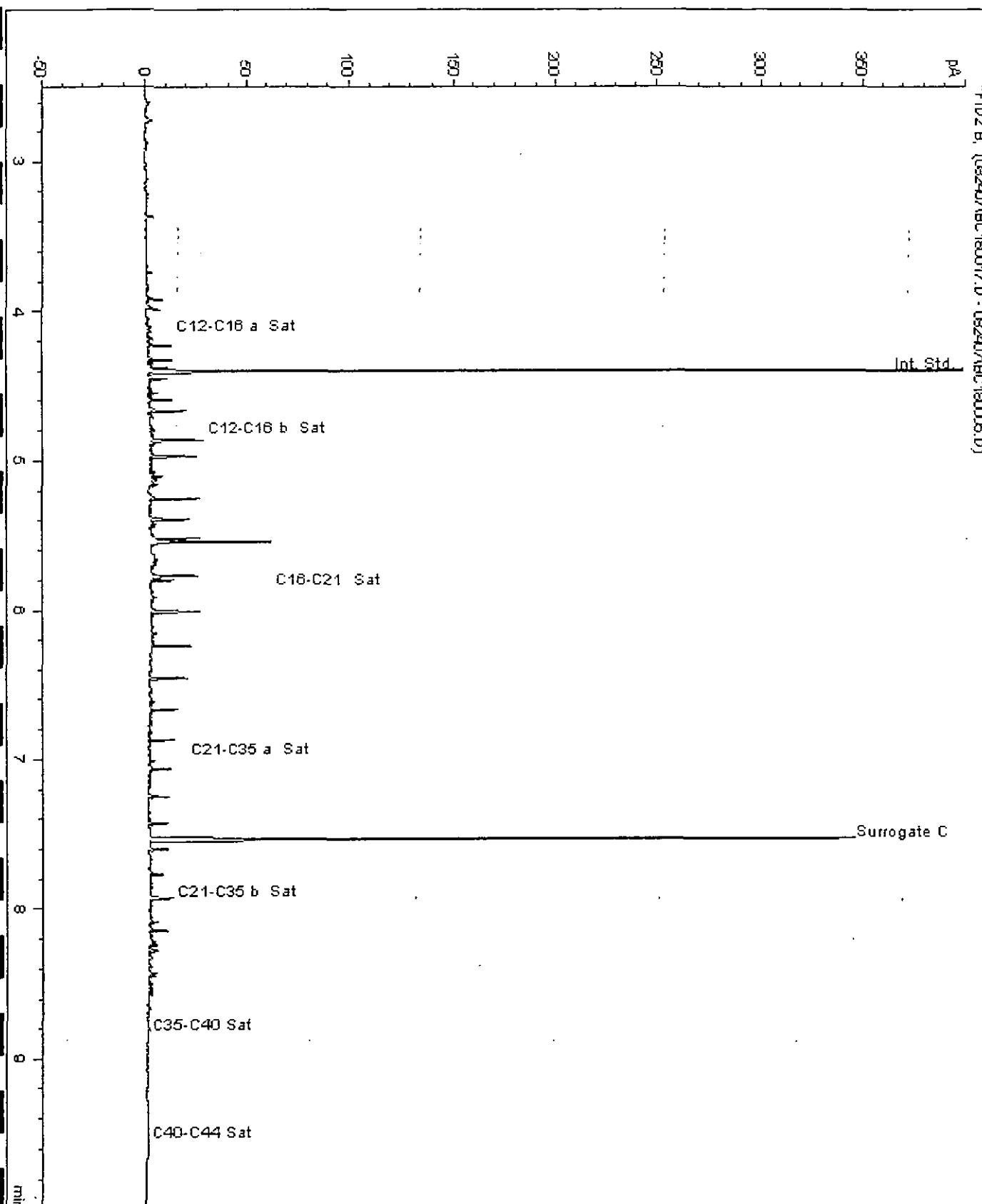
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200714268-5/S
Date Acquired : 24/08/07 21:26:06
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.005



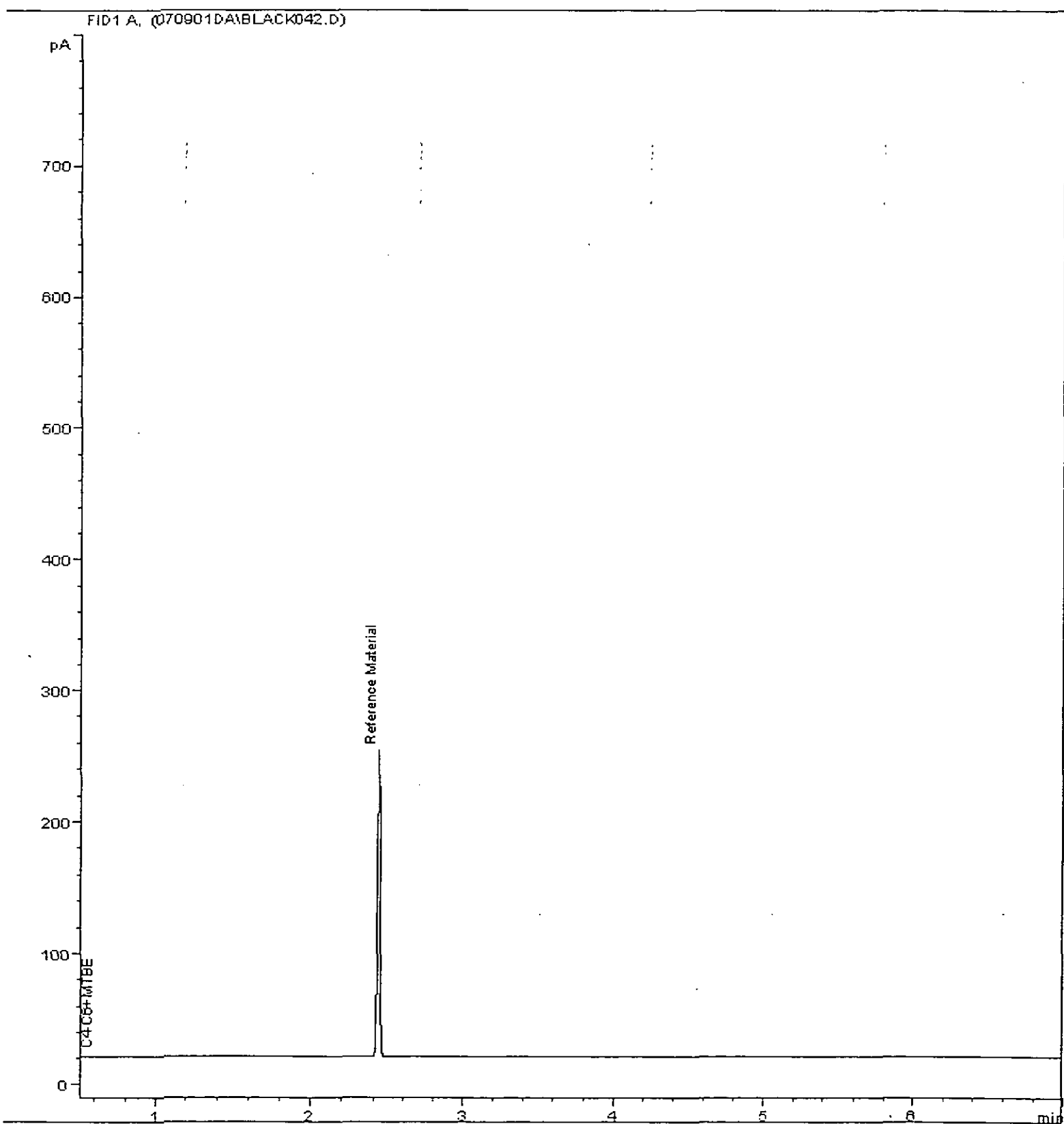
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

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Units : ppb
Dilution :
CF : 1000
Multiplier : 1.005



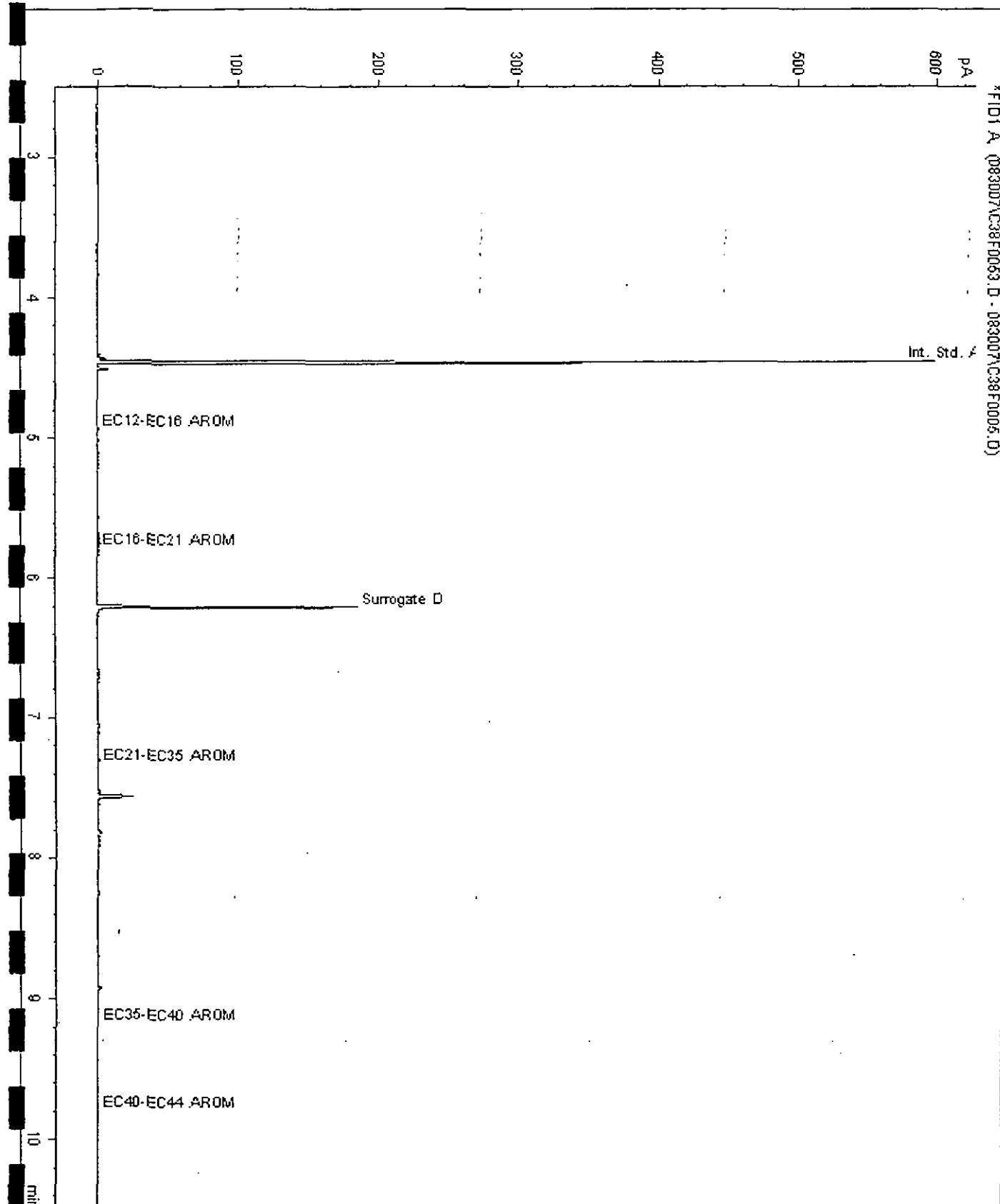
ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-5/S
Date Acquired : 02/09/07 03:13:05 PM
Units : ppb
Dilution : 1



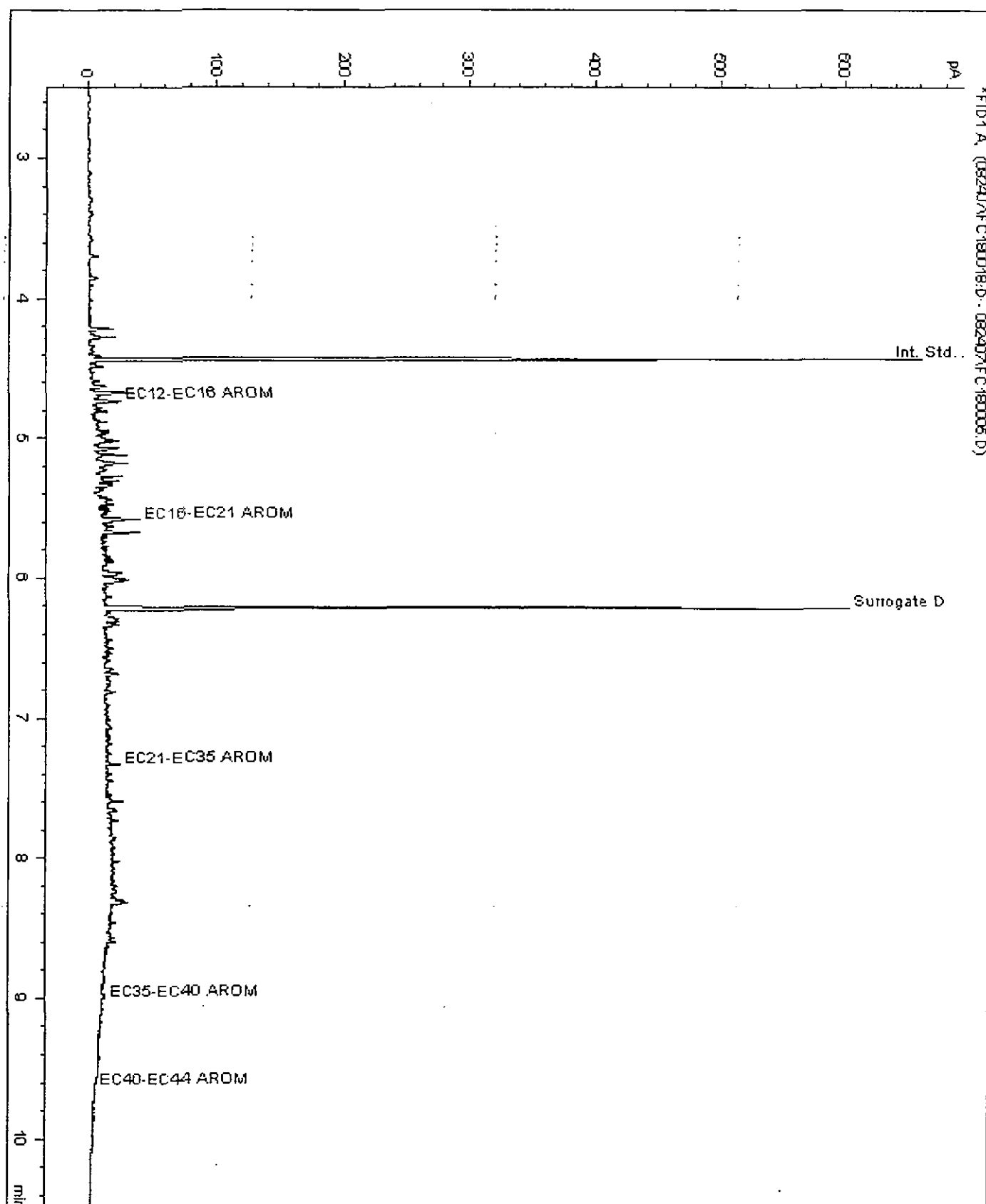
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200714268-7/N
Date Acquired : 31/08/07 10:11:51 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



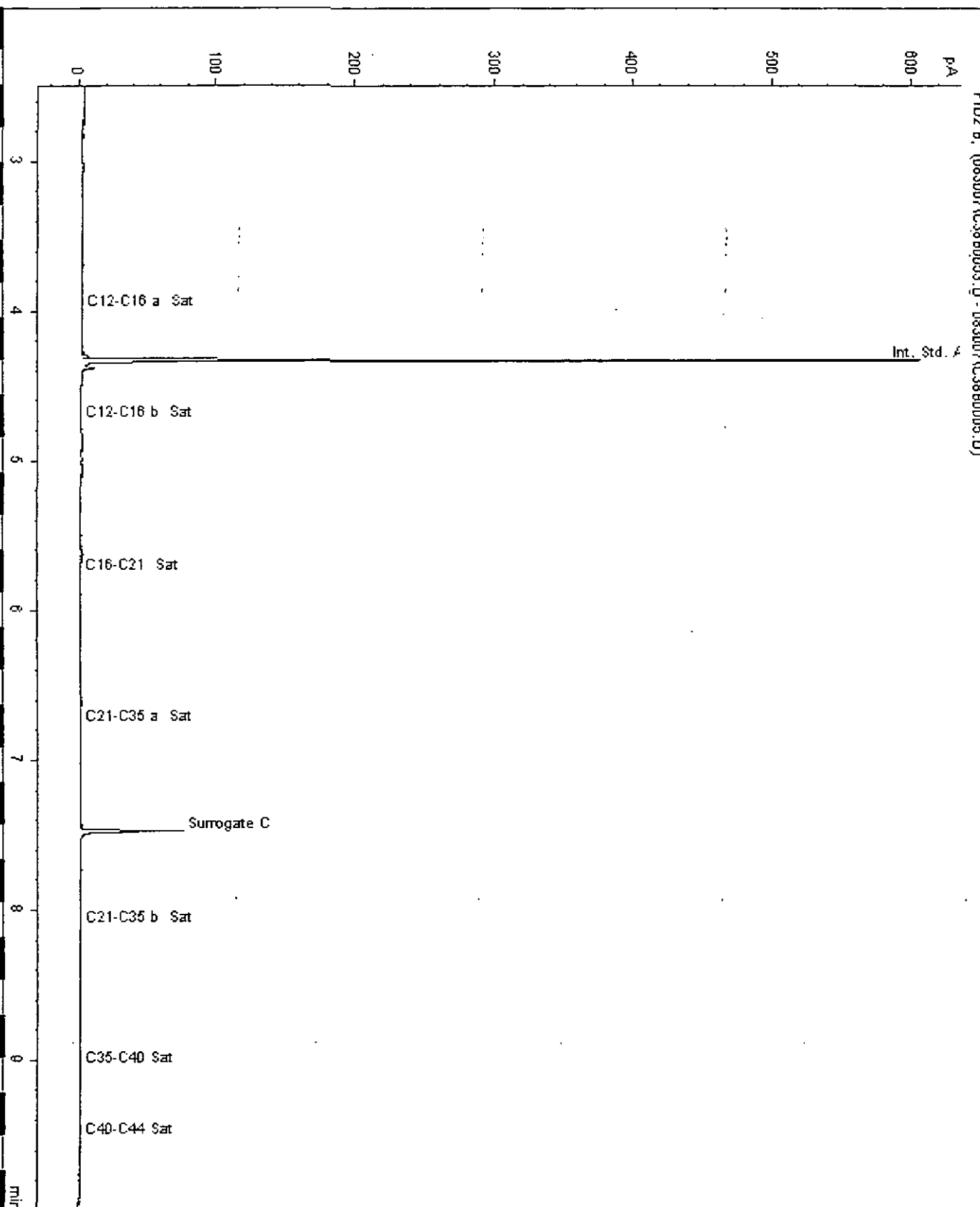
Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 200714268-7/S
Date Acquired : 24/08/07 21:44:58
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.003



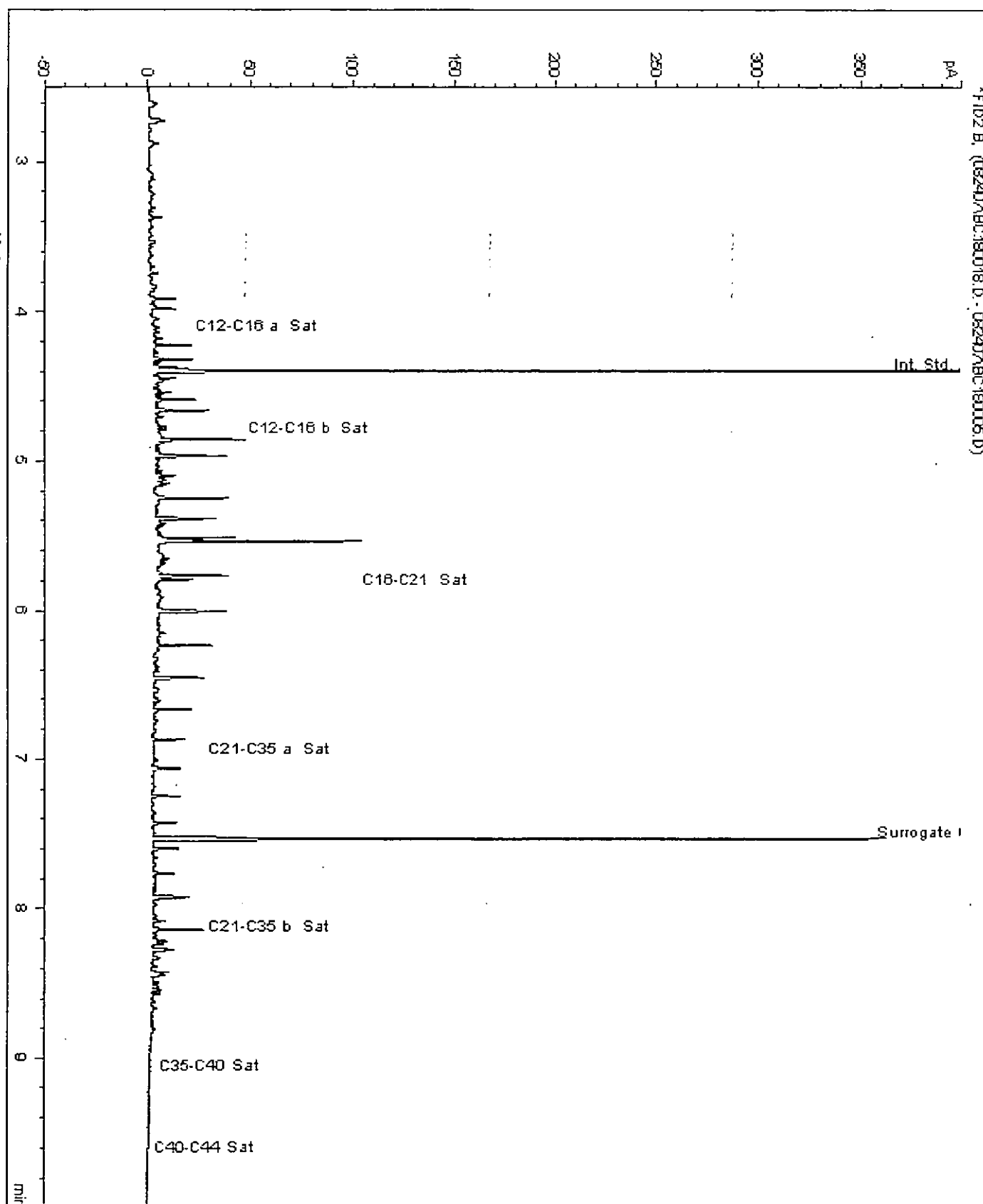
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200714268-7/M
Date Acquired : 31/08/07 10:11:51 PM
Units : ppb
Dilution :
CF : 1000
Multiplier : 0.016



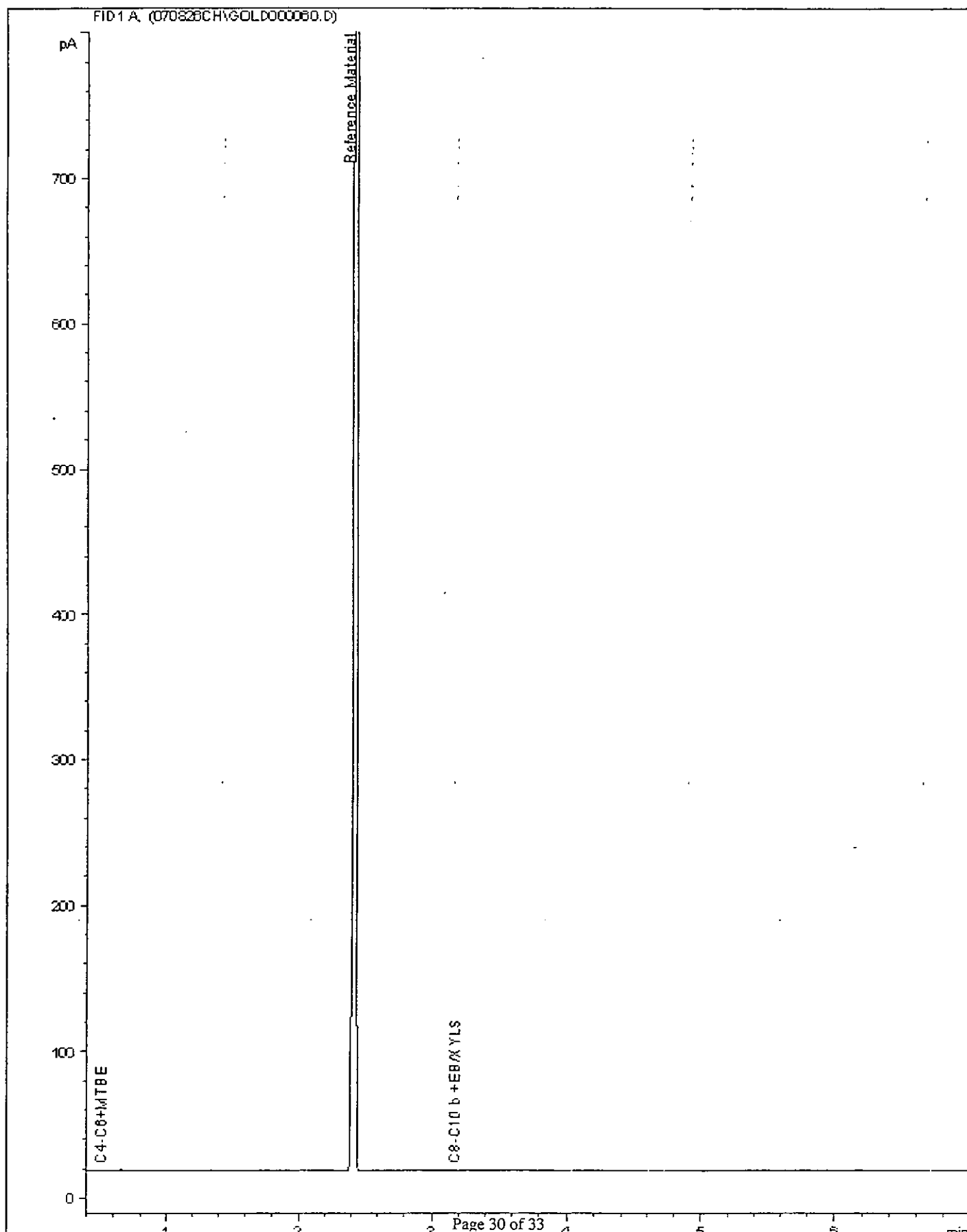
Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 200714268-7/S
Date Acquired : 24/08/07 21:44:59
Units : ppb
Dilution :
CF : 1000
Multiplier : 1.003



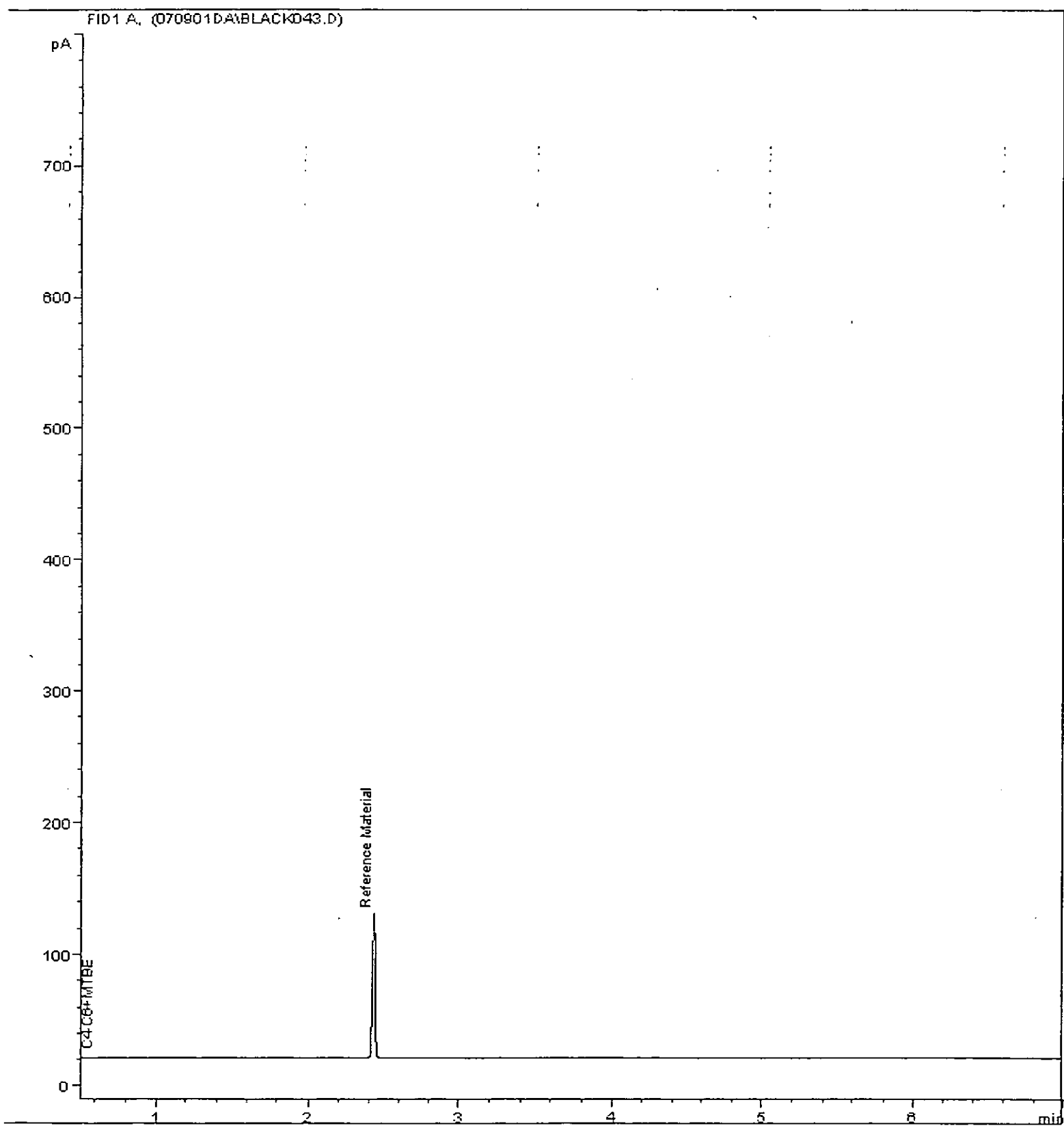
Alcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-7/N
Date Acquired : 27/08/07 04:58:00
Units : ppb
Dilution : 1



Alcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 200714268-7/S
Date Acquired : 02/09/07 03:28:17 PM
Units : ppb
Dilution : 1



APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH₄ by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for one month after analysis is completed (e-mailed) for both soil jars and tubs. All waters, volatile jars and vials will be discarded after one month of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Geochem reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If asbestos is detected, then identification is carried out by ALcontrol Shutler. If a sample is suspected of containing asbestos, then further preparation and analysis will be suspended on that sample until the asbestos result is known. If asbestos is present, then no further analysis will be undertaken.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. NDP – No determination possible due to insufficient/unsuitable sample.
9. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
10. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
11. **Surrogate recoveries** – Currently the only analysis, which is surrogate corrected, is PAHs on soils. For EPH on soils the result is not surrogate corrected, but a percentage recovery is quoted.
12. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
13. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).
14. Total of 8 speciated phenols by HPLC includes Resorcinol, Catechol, Phenol, Naphthol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 13).
15. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
16. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
17. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
18. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
19. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GC/FID/GCMS and all subcontracted analysis.
20. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
21. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

ALcontrol Laboratories

TPHCWG Interpretations

Client: Ground Solve
Job Number: 07/14268

Sample Numbers	Sample ID	Interpretation
001	TP1	Possible Diesel and naturally occurring hydrocarbons
003	TP2	Possible Diesel and naturally occurring hydrocarbons
005	TP3	Possible Diesel and naturally occurring hydrocarbons
007	TP4	Possible Diesel and naturally occurring hydrocarbons

Note: The interpretations, above, are subjective and represent an opinion of the contamination present which is visible on the respective TPH CWG traces available. It does not take into account any compounds or class of compounds that may have been removed during the column chromatography separation procedure.