APPENDIX D

KEY ENVIRONMENTAL DATA

AIR PRODUCTS DRAINAGE PLAN

KEY

:BLUE INDICATES SURFACE WATER DRAINAGE SYSTEM

:RED INDICATES WASTE DRAINAGE SYSTEM

:MINE SHAFT (INCLUDES NUMBER)

:ARCHEOLOGICAL DIG

:RESERVOIR

:ELECTRICAL SUB STATIONS

:GAS SUB STATION

THIRD ANGLE PROJECTION

BOUNDARY

ELECTRICAL SUBSTATION 'C'

INCOMING ELECTRICAL SUB STATION 11KV

PNEUMATIC TEST BUNKER

PACKING LINE

CANTEEN

INTERCEPTOR TANK

SAW STORES

JOINERS

STORES

Test Bay

Prep shop

ELECTRICAL SUB STATION 'A'+'B'

GAS SUB STATION

Office block

M/C Shop

MAINTENANCE

SHOT BLAST HOUSE

DEGREASE FACILITY

Shop 5

Shop 4

Shop 3

Shop 2

Shop 1

X-RAY

ROADWAY

PLATE YARD

WASTE DRAINAGE LEADER SITE

LLANGOLLEN ROAD

BOUNDARY

NOTES

1. DRAWING IS PRINTED TO BEST FIT PAPER SIZE. REFERENCE THIS FOR ANY SCALING:

50000mm OR 50mt

50000

REV.	ECN NO.	ZONE	REVISION DESCRIPTION	DATE	DRAWN	CHK'D	APPD.
00			ORIGINAL ISSUE	10.8.09	C.JONES		

DRAWING SYMBOLS

WPS/PT NDT REQUIREMENTS

A NOZZLE IDENTIFICATION

WPS/PQR WELD PROCEDURE

A DETAIL REFERENCE

1A ITEM NUMBER

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ALL DIMENSIONS IN mm UNLESS SHOWN OTHERWISE

TOLERANCE

LINEAR ±0.5

HOLE LOCATION ±0.8

ANGULAR ±0.25°

HOLE SIZE ±0.4

TITLE

WORKS PLAN - 2009

AIR PRODUCTS

ACREFAIR

DWG NO. IED4906B

A0

SCALE NTS

VESSEL FILE No.

SHEET 1 OF 1

ACREFAIR WORKS HISTORY

BRIEF HISTORY OF THE SITE OF AIR PRODUCTS LTD., ACREFAIR, NR. RUABON, N. WALES.

The site now occupied by Air Products Limited Manufacturing facility at Acrefair near Ruabon in North Wales, has been a scene of industry for over a century and a half. It was originally developed by Edward Lloyd Rowland, who launched out as owner of two large Blast Furnaces. Before going bankrupt in 1823, he had added to his original establishment, a Rolling Mill and eighteen Puddling Furnaces. The puddling process does not seem to have been used at Acrefair before 1802, although the Pont-y-blew forge at Chirk, about 6 miles south of the Works, had been using it since the beginning of the Napoleonic War with France

War time prices of pig iron for forge use were in the range of £5 to £7 per ton, but after the Duke of Wellington decisively beat Napoleon at the Battle of Waterloo in 1815, the War ended, and by 1816 it was less than £4. By 1819, however, it had recovered to its war time level and six years later, reached the unprecedented figure of £7.10.0. per ton.

Lloyd Rowlands sank nearly thirty coal pits before going bankrupt, most of which were in the Ruabon area, about 2 miles from Acrefair. These pits, together with the Acrefair furnaces, were taken over by the British Iron Company in about 1824. This firm owned extensive works at Abersychan in Monmouthshire, with which Richard Cort, son of the Inventor of the puddling process, was connected for a time. It was one of the larger companies that was able to keep its head above water financially, spending £140,000 on the Ruabon works. Though they were suspected of juggling the finances and openly accused of frauds by Cort, nothing was ever proved.

A Directory for 1828 refers to the firm by the name of its Managing Directors, Messrs. Small, Shears & Taylor, but the following year, the British Iron Company was advertising for 220 miners and colliers.

By 1833 most large collieries were using steam for winding and pumping, though horse whinseys or gins were to stay for another decade. Weighing machines too, were introduced about this time, and coal was being sold at eight or nine shillings a ton.

cont.....

The Commission for the Employment of Children, reported in 1842 that the British Iron Company had in their employment, 380 boys whose ages ranged between eleven and eighteen, though there were none under eleven. Only a few years earlier it was no uncommon thing for boys of seven and over to be underground, generally with their fathers carrying the younger ones on strong shoulders. Women too, were employed on the banks of the pits of the British Iron Company, which was common practice throughout the industry at this time.

It was at the Ruabon pits that the miners' wives tried to prevent their husbands,with, to use The Inventor, Sir Humphrey Davy's own words, "noise and lamentation" from taking the miners' safety lamp, "these new scientific horrors", down with them to their work. North Wales and Lancashire incidentally, were the only districts in which the miners had to buy their own lamps.

The "truck" system was said to be worst of all under the British Iron Company. This virtually permitted employers to pay for labour in kind. Miners' wives complained that they had to waste precious hours waiting for their turn to be served in the "tommy shops", as the places were called where the "truck" or "sist" tickets, or even Company token money could be exchanged for the necessary things of life, taking the form of flour, bacon, etc. and even clothing.

"Truck" was sometimes paid at the request of the colliers, though more usually it was a hated system perpetrated by the masters, who became first of all house-builders, then shop owners, which led in time to the "truck" system. Sometimes "truck" shops were owned by the "Chalter-masters" who were types of subcontractor, employing mostly their own families. Colliers generally were paid once a fortnight on what was known as "reckoning Monday", and if the cash had run out, they were forced to apply for "sist." It was only when the system was extended to cover complete payment, and wives were forced to sell food, etc. for cash to provide other necessities, that it became hated by the men.

In November, 1830, the Friendly Associated Coalminers' Union formed its first Welsh Lodge at Bagilt Backel on the North Wales Coast. On 20th December, the colliers at Hawarden, a village about 15 miles north of Ruabon, went on strike for a minimum wage of 3s.0d. per week for skilled workers and 2s.6d. for the lowest grade. Taken a little by surprise, the owners were forced to meet

cont.....

their demands. The men returned to work on Christmas Eve. Meanwhile, Union representatives visited all the neighbouring collieries for the purpose of calling on the miners to support the Union, and administering the Union Oath.

The Mine-owners, together with the Magistrates, who were of course closely connected with the owners, or at least had similar interests at stake, were planning retaliation, particularly because of the rumour that a general strike was to start on 27th December, 1830. On this date, the Magistrates had the Denbighshire County Yeomanry, a volunteer force similar to our present day Territorial Army, mustered at Wrexham, the nearest town, about seven miles from Acrefair. On the following day, they made for Rhos, a large village about half way between Wrexham and Acrefair, to anticipate a contingent of colliers who were there to continue the swearing-in process. Finding themselves thus confronted, the miners stated their demands and refused to disperse.

The Yeomanry were headed by the Lord Lieutenant of the County, Sir Watkin Williams Wynn, a very wealthy Welsh land-owner and member of the aristocracy, who was supported by a number of Special Constables. Two of the leaders were thereupon arrested and the remainder then rushed to free them,and reassembled on an old slag or cinder heap. Sir Watkin then had the "Riot Act" read, which only had the effect of making the boys and miners' wives throw cinders at the troopers. This in turn so annoyed a couple of troopers that they drew their muskets and fired one or two random shots, without however causing any injury. A third arrest was made, but on the personal intervention of Sir Watkin, he was released. Sir Watkin publicly reprimanded the troopers and the crowd gradually drifted home. The incident has since been known as "the battle of Cinder Hill."

The following day, the miners assembled in driving snow at Acrefair to demonstrate against the British Iron Company 'Tommy' Shop. (The proprietors of this establishment were prosecuted in 1831 for charging extortionate prices - 8d. per lb. for sugar instead of 5d. and ls.4d. for flannel instead of ls.Od. They were convicted of selling short weight).

Again the Yeomanry were called out and the Riot Act was read. However, on the promise of Sir Watkin to arrange a meeting between the masters and a deputation of the men on the following morning, the crowd dispersed.

cont.....

On 30th December, the meeting took place at the Wynstay Arms Hotel, Ruabon, but Sir Watkin was not present. One account says he left in disgust because of the masters' attitude in refusing to make any concessions. When the miners learned of this, they rushed the building and gave the employers a rough handling, almost killing Mr. Wood, Manager of British Iron Company. It is said that while the meeting was taking place, Mr. Wood was sneering at the miners through the window and that he later escaped from the Hotel dressed as a woman.

Following this fracas, Sir Watkin arranged for a further meeting at his own house, at which he persuaded most of the employers to sign their names to a document which met the miners' demands in writing.

Following on this, it was agreed among the miners that the neighbouring coal pits over the Shropshire border (Trefonen and Morda) should concede the same conditions. Accordingly, a body of Denbighshire miners set out for Oswestry on 3rd January, 1831.

They were met at Chirk Bridge, on the border between the counties of Denbighshire and Shropshire, by the Shropshire Yeomanry. A deputation was allowed to cross the bridge to interview the leading employers, but before they returned, after successfully gaining their point, the crowd grew restive. Again the Riot Act was read and one of the Officers drew his sabre and charged the miners, who were quick to disperse, so of course yet another Battle had chalked up its name in Industrial history. Lord Melbourne, the Prime Minister at that time, was to sharply rebuke Sir Watkin for his slackness in bringing the ring-leaders to justice.

For this purpose, three Bow Street Runners, the C.I.D. or F.B.I. of those days, were sent with a detachment of Infantry, sent from Chester to Wrexham, in support. The arch-offender, Samson Jones, of Brymbo (the swearing collier), who went about with a bible under his arm swearing-in Union members, was never aprehended. Three men who were brought to trial for assaulting Mr. Wood were each given a year's imprisonment, though the British Iron Company pressed for deportation. Apparently this failure was due to the skilful defence put forward by John Harvis, later to become Attorney General.

cont.....

In the next few years, the parent Union gradually died out, exhausted by numerous strikes and the determination of the masters to "break them", among the strongest of whom, was the British Iron Company. It was not for another 50 years that a strong and lasting union was to come to the fore in industrial disputes between men and masters.

Paradoxically, the Calvanistic Methodist Assembly in October 1831, forbade its members to join Trade Unions. Their fellowship was to be spiritual and there is no doubt that the moral influence extended by them over a period of squalor and hard physical graft was to lead to social and cultural improvements among miners and their way of life.

Around 1855, the new British Iron Company took over at Acrefair and Ruabon where they survived until 1888 when, as the result of an explosion which killed 40 men, they closed down.

The next industrial concern to occupy the site was an Engineering Company who had commenced the manufacture of sewage ejectors in the City of Chester, some 20 miles away, in 1865. This Company, which exists today as a Department of Air Products Limited with its headquarters at Acrefair, purchased the site in 1891, and moved from their premises in Chester to continue the sewage handling business. This industry flourished and they extended their activities into the fields of textile, mining and air compression machinery. After the death of Mr. John Hughes before the Second World War, Mr. Wilfred Lancaster, the founder's son, assumed complete control of the Company and successfully developed the business until he sold out to The Butterley Company of Derby in 1947.

With a view to extending operations at Acrefair, the Butterley Company negotiated an agreement to manufacture Oxygen plants under license, with Air Products Incorporated, of Allentown, Pennsylvania, in 1951. This agreement led to a merger of the two Companies in 1957, which continued until October, 1961, when the Butterley Company withdrew from the partnership leaving the Company wholly owned by Air Products Incorporated.

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REPORT OF SOILS AND FOUNDATION CONDITIONS

SOILS & MATERIALS TESTING LTD.

REPORT No.

LS 3526

JUNE 1992

REPORT OF SOILS AND FOUNDATION CONDITIONS

SOCIAL CLUB FIELD

AIR PRODUCTS

ACREFAIR

By

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APPENDIX 'A'

BOREHOLE LOG SHEETS

APPENDIX 'B' - Laboratory Test Results

TABLE I RESULTS OF CHEMICAL TESTS - Borehole Logs

TABLE II RESULTS OF CHEMICAL TESTS - Test Pit Logs

APPENDIX 'C'

SUMMARY OF DEPARTMENT OF ENVIRONMENT GUIDELINES FOR SULPHATES

SKETCH BOREHOLE AND TEST PIT LOCATION PLAN

1. FACTUAL REPORT

1.1. INTRODUCTION

1.1.1. This report describes an investigation carried out in accordance with instructions received from the Works and Maintenance Department of Air Products Limited of Acrefair, Wrexham.

1.1.2. The order required a Geotechnical Investigation to be carried out with boreholes and laboratory testing providing factual information on the soil profile and properties upon which recommendations could be made on the contamination aspects of the land.

1.1.3. The order was for six boreholes which were put down at locations selected by the Soils Engineer in consultation with the Drilling Technicians and shown on the Sketch Borehole Location Plan, Figure 1.

1.2. SITE LOCATION

1.2.1. The site is located on the main Wrexham-Llangollen Road through Acrefair.

1.2.2. It is an existing sports field with a Club House and flat grassed area for the pitches.

1.3. PROPOSED DEVELOPMENT

1.3.1. The proposal is to evaluate the fill on which the sports field is built, for the type, level and extent of contaminants.

1.4. METHOD OF INVESTIGATION

1.4.1. Between 3rd and 8th April 1992, six boreholes were put down with the aid of a one-ton Edeco light cable percussion rig on the site, using 154 mm diameter casing.

1.4.2. The maximum depth of investigation was 12.50 metres below existing ground level.

1.4.3. The positions of the boreholes were set out on the site by the Drilling Technicians after consultation with the Soils Engineer.

1.4.4. The description of the soil through which the boring was made is given on the drillers daily reports and must be considered as an indication of the mass characteristics of the soil at that location. The nature of the boring procedure makes identifying or sampling of anything less than a major change of character difficult, but careful examination of disturbed and core samples should result in the smaller changes being identified during laboratory inspection and testing.

1.4.5. Small disturbed samples from the soils encountered were taken regularly at half metre intervals. The depths are as

reported on the borehole logs which form part of Appendix 'A' to this report.

1.4.6. After some testing had been completed the site was revisited and samples taken at shallow depth for chemical testing mainly for sulphate content. These were put down on 22nd May by hand digging.

1.5. LABORATORY TESTING

1.5.1. All samples were transported to the Contractor's laboratory at Llanddulas for testing and a test programme determined.

1.5.2. The small disturbed samples were examined and visually classified in the laboratory by a Soils Enginer and the moisture content of each one determined. These values have been plotted on the borehole logs in Appendix 'A' to produce the moisture content profile at each location.

1.5.3. Samples from the boreholes were combined from various depths and tested for sulphate content, pH value, cyanide and phenols. These results form Table I. These same tests were run on the eleven samples taken from shallow depth from the last series of test pits. These results form Table II.

2. INTERPRETATIVE REPORT

2.1. NATURE OF SOIL PROFILE

2.1.1. The site is covered with made ground. This consists mainly of a cover of topsoil, clay and ash, but with mainly cinder and ash below. There are, however, layers of coal waste and enclosures of brick. Some layers of white deposit were also noted.

2.1.2. The fill is to depths of 11.20, 5.40, 7.70, 5.70, 11.90 and 4.40 metres at this depth in the boreholes except number 2 is clay. This is brown in colour, silty and firm to stiff in consistency.

2.1.3. In Borehole 2, a weathered shaley mudstone rock was encountered to the bottom of the borehole at 6.50 metres deep.

2.1.4. A trickle of water is present at 10.00 metres deep in Borehole 1; at a trickle in Borehole 3 at 5.80 metres and at a trickle in Borehole 4 at 4.40 metres. The other boreholes were dry.

2.2. DISCUSSION OF TEST RESULTS

2.2.1. The results of the borings showed a varied thickness of fill above the natural soils and bedrock.

2.2.2. The main constituents are cinder fills; broken rock; clay and chemical deposits containing much white sulphate.

2.2.3. The phenol and cyanide contents are low indicating no oily or gas waste products are present on the site.

2.3. DISCUSSION OF SITE

2.3.1. The results of the tests show there are some hign sulphates present on the site. This is probably in the form of sodium sulphate as a by-product of the production of a chemical operation.

2.3.2. The problem with the material is that in the right condition of temperature and moisture and with calcium and aluminium salts present as there are in clays it reacts to form other products of much greater volume than the original volume.

2.3.3. Hence land cannot be used for buildings as this swelling is sufficient to cause buildings and floor slabs to heave, distort and crack.

2.3.4. The presence of sulphates does not require the material to be taken to special tips for disposal. However, any material excavated will need to be taken to a lined tip for disposal to prevent any leaching out of soluble sulphate reaching water bearing layers, streams, or rivers.

2.3.5. The high level of suphate should not cause problems for most people in contact with the skin, unless they are really sensitive.

2.3.6. The sulphates have a pH just over the natural value of 7 up to 9. These values should not cause a problem in contact with skin.

2.4. POSSIBLE FUTURE DEVELOPMENT

2.4.1. From the previous section any re-development of the site will require special precautions. The fill will need to be removed from below any buildings for at least three metres or any buildings founded on piles into the clay or bedrock.

2.4.2. Material removed from excavations will need to be run to a lined tip by a licenced carrier.

M J CHETTLEBURGH

APPENDIX 'A'

Borehole Logs.

SYMBOLS

FIELD SAMPLE:-

Small disturbed sample ---------- D

Undisturbed sample (Sample size in m.m.) ---------- U(100)

Water sample ---------- ▼

Standard Penetration Test
(Blows for 300 m.m. penetration) ---------- N( )

Standard penetration test (m.m. penetration
for 50 blows) ---------- N( )

Subscript N_c denotes solid core

LABORATORY TESTS:-

Natural moisture content ---------- ●

Plastic limit ---------X----------O---------- Liquid limit

Triaxial compression test ---------- Tx

Consolidation ---------- C_v

Chemical ---------- Ch

Particle size distribution ---------- P

PROJECT: SPORTS FIELD

BOREHOLE NO.: 1

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 3.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on brown clay and ash. MADE GROUND	
			D	1.00		
	1.50		D			
			D	2.00	MADE GROUND, black ash, cinder mainly silt sizes but with some medium grained gravel sizes	
			D			
			D	3.00		
			D			
	3.80					
			D	4.00	MADE GROUND, much white sulphate with clay	
			D			
			D	5.00		
			D			
			D	6.00		
	6.50		D			
			D	7.00	MADE GROUND black cinder and ash, mainly silt sizes but with medium grained gravel sizes and coarse grained shale, gravel	
			D			
			D	8.00		
			D			
			D	9.00		
			D			
			D	10.00		

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

70%

92%

Ground water

Encountered at	10.00		
Standing level	-		

SHEET 1 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 1

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 3.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits (Percent: 10, 20, 30, 40)
			D		MADE GROUND black cinder and ash		
	10.80		D	11.00	Soft black silty CLAY, contaminated		
	11.20		D		Firm brown silty CLAY with scattered medium grained gravel.		
	12.00		D	12.00			

Ground water

Encountered at / Standing level			

SHEET 2 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 2

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 7.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
	0.30		D	0.50	Grass on TOPSOIL	
			D	1.00	MADE GROUND clay and ash, silt to fine grained gravel sizes	
			D			
			D	2.00		
			D			
			D	3.00		
	3.30		D			
			D	4.00	MADE GROUND coal waste and shale silt sizes to medium grained gravel sizes	
			D			
			D	5.00		
	5.40		D		Weathered SHALEY MUDSTONE weak	
			D	6.00		
	6.20				SHALEY MUDSTONE moderately strong	
	6.50		D			

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at

Standing level

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 3

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 7.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on MADE GROUND Dark grey silty clay, ash, shale	
			D	1.00		
			D			
			D	2.00		
	2.50		D			
			D	3.00	MADE GROUND black cinder and ash. Silt sizes with traces of gravel sizes	
			D			
			D	4.00		
			D			
			D	5.00		
			D			
			D	6.00		
	6.20		D			
			D	7.00	Contaminated ash MADE GROUND, black, silt sized	
			D			
	7.70		D	8.00	Stiff brown silty CLAY with rounded medium grained gravel.	
	8.50		D			

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at	5.80		
Standing level	-		
Quantity	Trickle		

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 4

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 8.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on MADE GROUND of soft brown silty clay and ash.	
			D	1.00		
			D			
			D	2.00		
	2.30		D		MADE GROUND, dark brown chemical waste with much white sulphate	
			D	3.00		
			D			
			D	4.00		
	4.40		D		MADE GROUND black ash, mainly silt sizes	
			D	5.00		
			D			
	5.70		D	6.00	Stiff brown silty CLAY with streaks of grey silt	
	6.50		D			

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at	4.40		
Standing level	-		
Initially			

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 5

LOCATION: ACREFAIR

GROUND LEVEL: FILED LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 9.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
	0.50		D	0.50	Grass on MADE GROUND, Dark grey silty clay	
			D	1.00	Black ash and cinder MADE GROUND Silt sizes with traces of fine to medium grained gravel	
			D			
			D	2.00		
			D			
			D	3.00		
			D			
			D	4.00		
			D			
	4.70					
			D	5.00	MADE GROUND hard iron ore and brick.	
			D			
	6.00		D	6.00		
			D		MADE GROUND brick, ash, cinder and iron ore.	
			D	7.00		
			D			
			D	8.00		
			D			
			D	9.00		
			D			
	9.80		D	1.00	MADE GROUND soft silty contaminated clay	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at Standing level	NIL		

SHEET 1 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 5

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 9.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits (Percent 10 20 30 40)
			D		MADE GROUND soft silty contaminated clay		
			D	11.00			
			D				
	11.90		D	12.00			
					Firm brown silty CLAY		
	12.50		D				

Ground water

Encountered at Standing level			

SHEET 2 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 6

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 8.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits (Percent: 10 20 30 40)
			D	0.50	Grass on MADE GROUND of ash and cinder		
			D	1.00	Silt sizes up to fine grained gravel		
			D				
			D	2.00			
			D				
			D	3.00			
	3.50		D				
			D	4.00	MADE GROUND clay and shale		
	4.40		D				
			D	5.00	Firm brown silty CLAY with scattered medium grained gravel.		
	5.50		D				

Ground water

Encountered at	NIL		
Standing level			

SHEET 1 OF 1

SHEET No.

TABLE I

RESULTS OF CHEMICAL TESTS

Borehole No.	Sample Depths Metres	pH	Sulphate Content gms/litre 2:1 Water/Soil Extract	Cyanide ppm	Phenols ppm
1	0.50 1.00 1.50	7.0	0.2	<5	<5
	2.00 2.50 3.00 3.50	7.4	43.2	<5	<5
	4.00 4.50	7.3	0.2	<5	<5
	6.00	9.0	28.8	<5	420
	7.00 7.50	7.3	6.6	<5	<5
	8.00 9.00 10.00	7.2	1.2	<5	<5
2	0.50 1.00 1.50	7.0	1.1	<5	<5
	2.00 3.00 4.00 5.00	7.0	1.4	<5	<5
	5.50 6.50	5.1	0.3	<5	<5
	12.50	7.8	0.2	<5	<5
3	1.00 1.50	7.1	0.1	<5	<9
	2.50 3.50 4.50 5.50	6.7	3.2	<5	<5
	7.00 7.50	7.5	0.8	<5	135
	8.00	7.7	1.9	<5	<5
4	0.50 1.00	7.3	0.3	<5	<5
	1.50 2.00	7.1	5.7	<5	120
	2.50 3.50	8.2	32.9	<5	<5
	5.00 6.00 6.50	7.5	4.7	<5	<5

5	1.00 2.00 3.00 4.00 5.00	7.2	1.3	<5	<5
	6.50 7.00 8.00	7.5	0.8	<5	<5
	8.50 9.00 9.50 10.00	7.7	0.7	<5	<5
	10.50 11.50	7.7	0.8	<5	<5
6	0.50 1.00	7.9	0.1	<5	<5
	2.00 3.00	7.5	0.2	<5	<5
	5.00	7.8	0.1	<5	<5

TABLE II

RESULTS OF CHEMICAL TESTS

Test Pit No.	pH	gms/litre Sulphate Content 2:1 Water/Soil Extract	Cyanide ppm	Phenols ppm
1	7.4	0.1	<5	<5
2	6.9	<0.1	<5	<5
3	6.7	34.3	<5	<5
4	7.1	<0.1	<5	<5
5	6.5	<0.1	<5	<5
6	7.2	0.1	<5	<5
7	6.8	0.2	<5	<5
8	7.3	<0.1	<5	<5
9	6.8	0.2	<5	<5
10	6.7	0.1	<5	<5
11	6.8	<0.1	<5	<5

A P P E N D I X ' C '

SUMMARY OF DEPARTMENT OF ENVIRONMENT

GUIDELINES FOR SULPHATES

SUMMARY OF DEPARTMENT OF ENVIRONMENT
GUIDELINES FOR SULPHATE IN DEPOSITS

Method of Test BS 1377, 1990

Results are in grams per litre i.e. 1:1000

Guidelines give limits in milligrams per kilogramme which is the same as 1 part in 1,000,000

6.8 Sulphate

6.8.1 Summary of Possible Hazards

As sulphate concentrations on gas works sites as high as 20% have been observed, this will obviously be a 'priority contaminant' in most site investigations.

The potential hazards covered in Annex A (Section A.5) are summarised below.

- Ingestion of sulphate alone is unlikely to prove an acute or chronic hazard to humans.

  However, metal sulphates can be toxic. For instance, a level of 80,000mg/kg ferrous sulphate in soil may be acutely toxic to a small child eating one mouthful.

- High sulphate levels in soil may irritate sensitive skins.

- The potential for sulphate contamination of drinking water should be borne in mind. The acceptable level in drinking water is 250mg/l.

- Phytotoxic effects are not well documented and depend on other factors besides sulphate concentration, such as soil pH and total salt concentration in the soil.

  A reasonable phytotoxic threshold would appear to be 2,000mg/kg sulphate in soil.

- High sulphate levels in soil may lead to metal corrosion. However, there is no information on what sulphate levels in soil are significant for corrosion of metals.

- High sulphate levels may also lead to attack on concrete. No effect on concrete is likely if the concentration of total SO_3 is below 2,000mg/kg in soil or 300ppm in groundwater. At levels between 2,000mg/kg and 20,000mg/kg in soil, or 300-5000 ppm in groundwater, guidance is available as to the increasingly strict requirements for concrete to resist attack by sulphate. Above levels of 20,000mg/kg total SO_3 in soil, or 5000 ppm in groundwater, additional protection of concrete is required, e.g. by use of a protective coating.

  These levels apply to near neutral soil and in the absence of highly soluble sulphates, particularly ammonium. At significant ammonium levels and in acid conditions, additional precautions will be appropriate.

6.8.2 Threshold Trigger Value

The critical targets affected by sulphate contamination of soil are plants and building materials.

Since phytotoxicity and concrete attack are both likely to be a problem at sulphate levels in soil greater than **2,000mg/kg**, this is therefore proposed as the threshold trigger value for all end-uses. (For use category E, with no plants or buildings, corrosion of metal pipes is still a possibility.)

A caveat is necessary here in the case of building materials (concrete). Even below the threshold trigger value, some precautions may still be necessary in the presence of other contaminants, particularly acidity (as indicated by the threshold trigger value) and ammonium (for which insufficient information is available to set trigger values).

Above the threshold trigger value, it is necessary to specify concrete which will resist attack by sulphate.

6.8.3 Action Trigger Values

Domestic gardens, allotments and landscaped areas (use categories A, B, C)

For these end-uses the phytotoxic effect of sulphate is of primary importance. Unfortunately, few data are available.

A **tentative** action trigger value of **10,000mg/kg** sulphate in soil, five times the phytotoxic threshold for sensitive varieties, is proposed for these end uses.

Buildings (use category D)

For this end-use, plants are assumed not to be a critical target.

Levels of sulphate in soil above 20,000mg/kg require the additional protection of concrete, for example by use of a protective coating. The action trigger value is thus set at **20,000mg/kg** sulphate in soil.

It is emphasised that "action", in the sense of a protective coating in addition to the correct formulation of the concrete to provide sulphate resistance, may be necessary at levels between the threshold and action triggers, in the presence of either acidity or soluble sulphates (particularly ammonium). Professional judgement is required in the light of all the available information.

Hard-cover (use category E)

Where no buildings are to be constructed, no action trigger value for sulphate is set. However, appropriate precautions would be needed if, for example, concrete drainage channels were to be used.

6.8.4 Note on Analysis for Sulphate

The above levels of sulphate are for total sulphate. Where concrete is the critical target, the Building Research Establishment (BRE) recommend the use of a limited water extract to provide further more detailed information (Section A5.5.1). Analysis of pH, ammonium and possibly also sodium, potassium and magnesium, is required to enable a proper evaluation to be made.

TABLE III

ICRCL 59/83 (Second Edition): TABLE 3 TENTATIVE "TRIGGER CONCENTRATIONS" FOR SELECTED INORGANIC CONTAMINANTS

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed. All proposed values are tentative.

3. The lower values in Group A are similar to the limits for metal content of sewage sludge applied to agricultural land. 2(b) The values in Group B are those above which phytotoxicity is possible.

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentration, remedial action will be required or the form of development changed.

Contaminants	Planned Uses	Trigger Concentrations (mg/kg air dried soil)	
		Threshold	Action
Group A: Contaminants which may pose hazards to health			
Arsenic	Domestic gardens, allotments	20	*
	Parks, playing fields, open space	40	*
Cadmium	Domestic gardens, allotments	3	*
	Parks, playing fields, open space	15	*
Chromium (hexavalent) (1)	Domestic Gardens, allotments	25	*
	Parks, playing fields, open space		
Chromium (total)	Domestic gardens, allotments	600	*
	Parks, playing fields, open space	1,000	*
Lead	Domestic gardens, allotments	500	*
	Parks, playing fields, open space	2,000	*
Mercury	Domestic gardens, allotments	1	*
	Parks, playing fields, open space	20	*
Selenium	Domestic gardens, allotments	3	*
	Parks, playing fields, open space	6	*
Group B: Contaminants which are phytotoxic but not normally hazards to health			
Boron (water-soluble) (3)	Any uses where plants are to be grown (2, 6)	3	*
Copper (4, 5)	Any uses where plants are to be grown (2, 6)	130	*
Nickel (4, 5)	Any uses where plants are to be grown (2, 6)	70	*
Zinc (4, 5)	Any uses where plants are to be grown (2, 6)	300	*

NOTES:

* Action concentrations will be specified in the next edition of ICRCL 59/83.

1. Soluble hexavalent chromium extracted by 0.1M HCl at 37°C; solution adjusted to pH 1.0 if alkaline substances present.

2. The soil pH value is assumed to be about 6.5 and should be maintained at this value. If the pH falls, the toxic effects and the uptake of these elements will be increased.

3. Determined by standard ADAS method (soluble in hot water).

4. Total concentration (extractable by $HNO_3/HClO_4$).

5. The phytotoxic effects of copper, nickel and zinc may be additive. The trigger values given here are those applicable to the 'worst-case': phytotoxic effects may occur at these concentrations in acid, sandy soils. In neutral or alkaline soils phytotoxic effects are unlikely at these concentrations.

6. Grass is more resistant to phytotoxic effects than are most other plants and its growth may not be adversely affected at these concentrations.

TABLE III

ICRCL 59/83 (Second Edition) TABLE 4: TENTATIVE "TRIGGER CONCENTRATIONS" FOR CONTAMINANTS ASSOCIATED WITH FORMER COAL CARBONISATION SITES

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed.

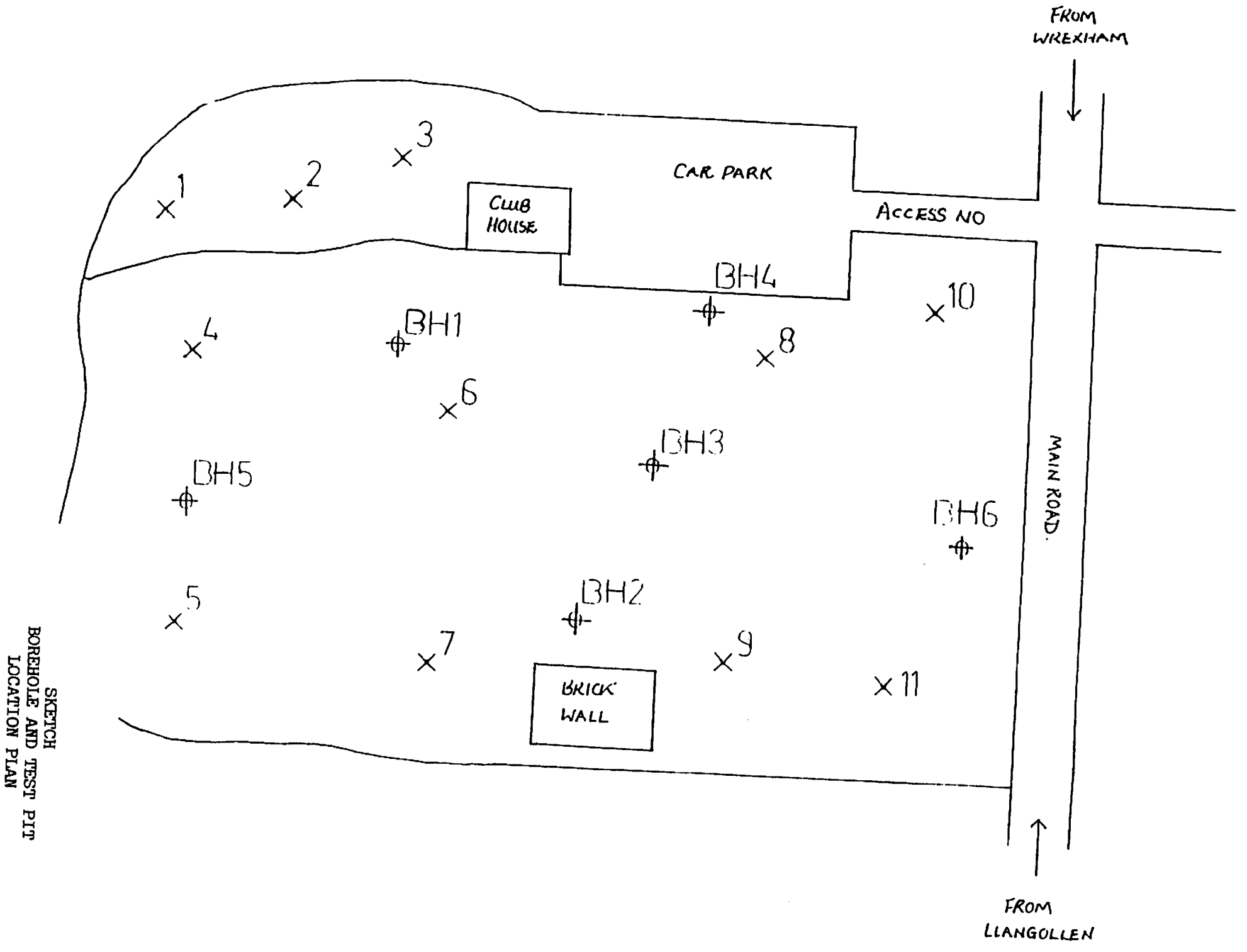
3. Many of these values are preliminary and will require regular updating. They should not be applied without reference to the current edition of the report "Problems Arising from the Development of Gas Works and Similar Sites"

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned, and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentrations, remedial action will be required or the form of development changed.

Contaminants	Proposed Uses	Trigger Concentrations (mg/kg air-dried soil)	
		Threshold	Action
Polyaromatic hydrocarbons(1,2)	Domestic gardens, allotments, play areas.	50	500
	Landscaped areas, buildings, hard cover.	1000	10000
Phenols	Domestic gardens, allotments.	5	200
	Landscaped areas, buildings, hard cover.	5	1000
Free cyanide	Domestic gardens, allotments landscaped areas.	25	500
	Buildings, hard cover.	100	500
Complex cyanides	Domestic gardens, allotments.	250	1000
	Landscaped areas.	250	5000
	Buildings, hard cover.	250	NL
Thiocyanate(2)	All proposed uses.	50	NL
Sulphate	Domestic gardens, allotments, landscaped areas.	2000	10000
	Buildings(3).	2000(3)	50000(3)
	Hard cover.	2000	NL
Sulphide	All proposed uses.	250	1000
Sulphur	All proposed uses.	5000	20000
Acidity (pH less than)	Domestic gardens, allotments, landscaped areas.	pH5	pH3
	Buildings, hard cover.	NL	NL

NOTES

NL: No limit set as the contaminant does not pose a particular hazard for this use.
(1): Used here as a marker for coal tar, for analytical reasons. See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" Annex A1.
(2): See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" for details of analytical methods.
(3): See also BRE Digest 250: Concrete in sulphate-bearing soils and groundwater.



SKETCH
BOREHOLE AND TEST PIT
LOCATION PLAN

SITE INVESTIGATION REPORT

05/3597

REPORT ON SITE INVESTIGATION AT AIR PRODUCTS, WREXHAM

FOR

HUGHES AND CRAWFORD

DECEMBER 2005

CC Geotechnical

Consulting Geotechnical & Geoenvironmental Engineers

Essex House, Bridle Road, BOOTLE, Merseyside L30 4UE.

Telephone: (0151) 523 0202 Fax: (0151) 523 0252

APPENDIX D

SOIL AND SOIL LEACHATE CONTAMINATION ANALYSES CERTIFICATES

ECõS Environmental
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

Client: **CC GEOTECHNICAL**
Essex House
Bridle Road
Bootle
Liverpool
Merseyside
L30 4UE

FAO: Mr C Bolan

Analytical Report Number: R05/3296

Client Project Name:	**Air Poducts, Wrexham**
Client Project Number:	**05/3597**
Your Order Number:	**None Specified**
Order Receipt Date:	**02/12/05**
Reporting Date:	**Friday 16 December 2005**

If you have any queries regarding this report please contact our Customer Services Manager

ECõS Environmental
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

Client Project Name: Air Poducts, Wrexham

Project Number: 05/3597

Client: CC GEOTECHNICAL

Reporting Date: Friday 16 December 2005

Soil Samples

Method Statement

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	Accredi-tation	Sub-Contracted	Result Date
Arsenic	ICP-OES	D	0.1 mg/kg	17025	No	07/12/05
Cadmium	ICP-OES	D	0.2 mg/kg	17025	No	07/12/05
Chromium (hexavalent)	ICP-OES	D	1.0 mg/kg	17025	No	07/12/05
Chromium (total)	ICP-OES	D	0.2 mg/kg	17025	No	07/12/05
Lead	ICP-OES	D	0.5 mg/kg	17025	No	07/12/05
Mercury	ICP-OES	D	0.1 mg/kg	17025	No	07/12/05
Selenium	ICP-OES	D	1.0 mg/kg	17025	No	07/12/05
Boron (water soluble)	ICP-OES	D	0.5 mg/kg	17025	No	07/12/05
Copper	ICP-OES	D	0.2 mg/kg	17025	No	07/12/05
Nickel	ICP-OES	D	0.2 mg/kg	17025	No	07/12/05
Zinc	ICP-OES	D	0.2 mg/kg	17025	No	07/12/05
PAH (total)	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Phenols (monohydric)	Colorimetry	R	1.0 mg/kg	17025	No	06/12/05
Cyanide (free)	Colorimetry	R	2.0 mg/kg	17025	No	06/12/05
Cyanide (total)	Colorimetry	R	2.0 mg/kg	17025	No	06/12/05
Cyanide (complex)	Colorimetry	R	2.0 mg/kg	17025	No	06/12/05
Sulphate (water soluble)	HPLC-IC	D	0.001 g/l SO4	17025	No	13/12/05
Sulphide	Colorimetry	R	2.0 mg/kg	17025	No	06/12/05
Sulphur (free)	HPLC-UV	D	100 mg/kg	17025	No	07/12/05
pH	pH-meter	D	N/A	17025	No	08/12/05
TPH	GC-FID	D	5.0 mg/kg	17025	No	07/12/05
Naphthalene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Acenaphthylene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Acenaphthene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Fluorene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Phenanthrene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Anthracene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Fluoranthene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Pyrene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Benzo(a)anthracene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Chrysene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Benzo(b)fluoranthene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Benzo(k)fluoranthene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Benzo(a)pyrene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Indeno(1,2,3-cd)pyrene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Dibenz(a,h)anthracene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Benzo(g,h,i)perylene	GC-MS	D	0.1 mg/kg	17025	No	07/12/05
Barium	ICP-OES	D	0.2 mg/kg	None	No	07/12/05
Beryllium	ICP-OES	D	0.2 mg/kg	None	No	07/12/05
Vanadium	ICP-OES	D	0.2 mg/kg	None	No	07/12/05
Nitrate	HPLC-IC	D	2.0 mg/kg	None	No	13/12/05
Sulphate (total)	ICP-OES	D	30 mg/kg SO4	17025	No	09/12/05

ECõS Environmental
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Client Project Name: Air Poducts, Wrexham

Project Number: 05/3597

Client: CC GEOTECHNICAL

Reporting Date: Friday 16 December 2005

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	Accredi-tation	Sub-Contracted	Result Date
Chrysotile (white)	Microscopy	D	0.1% w/w	17025	No	08/12/05
Amosite (brown)	Microscopy	D	0.1% w/w	17025	No	08/12/05
Crocidolite (blue)	Microscopy	D	0.1% w/w	17025	No	08/12/05
Anthophyllite	Microscopy	D	0.1% w/w	17025	No	08/12/05
Actinolite	Microscopy	D	0.1% w/w	17025	No	08/12/05
Tremolite	Microscopy	D	0.1% w/w	17025	No	08/12/05
Non-Asbestos fibres	Microscopy	D	0.1% w/w	None	No	08/12/05
Organic Matter	BS1377	D	0.1 %	None	No	16/12/05
TPH C10-C12	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH C12-C16	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH C16-C21	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH C21-C35	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH C35-C40	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aromatic EC5-EC7	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aromatic EC7-EC8	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aromatic EC8-EC10	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aromatic EC10-EC12	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aromatic EC12-EC16	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aromatic EC16-EC21	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aromatic EC21-EC35	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aliphatic EC5-EC6	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aliphatic EC6-EC8	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aliphatic EC8-EC10	GC-FID	R	0.1 mg/kg	None	No	07/12/05
TPH Aliphatic EC10-EC12	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aliphatic EC12-EC16	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aliphatic EC16-EC21	GC-FID	D	5.0 mg/kg	None	No	07/12/05
TPH Aliphatic EC21-EC34	GC-FID	D	5.0 mg/kg	None	No	07/12/05

ECõS Environmental
Low Moor Business Park,
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Client Project Name: Air Poducts, Wrexham

Project Number: 05/3597

Client: CC GEOTECHNICAL

Reporting Date: Friday 16 December 2005

	BH/TP					
	Top Depth / m	0.80	0.60	0.30	0.70	0.60
	Bottom Depth / m					
	Customer ID	WS1	WS2	WS3	WS4	WS5
	Sample Type					
	Date Sampled					
	Receipt Date	02/12/05	02/12/05	02/12/05	02/12/05	02/12/05
	ECoS Sample ID	S0527633	S0527634	S0527635	S0527637	S0527638
	Matrix Type	Soil	Soil	Soil	Soil	Soil
Determinand	**Units**					
Arsenic	mg/kg	13.0	15.7	64.6	8.1	3.4
Cadmium	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Chromium (hexavalent)	mg/kg	<1.0	1.1	<1.0	1.0	1.0
Chromium (total)	mg/kg	30.8	40.7	25.8	46.7	24.2
Lead	mg/kg	41.1	14.0	46.2	2.0	<0.5
Mercury	mg/kg	5.7	5.5	13.1	1.3	<0.1
Selenium	mg/kg	2.2	3.7	<1.0	8.7	16.4
Boron (water soluble)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	mg/kg	102.2	66.4	136.3	20.1	38.3
Nickel	mg/kg	25.6	22.7	50.0	9.1	20.9
Zinc	mg/kg	831.0	44.3	38.9	8.8	16.8
PAH (total)	mg/kg	<0.1	4.0	<0.1	<0.1	<0.1
Phenols (monohydric)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Cyanide (free)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
Cyanide (total)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
Cyanide (complex)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
Sulphate (water soluble)	g/l SO4	0.033	0.296	0.160	0.264	0.551
Sulphide	mg/kg	463.7	466.9	<2.0	2763.4	2605.5
Sulphur (free)	mg/kg	<100	228	<100	126	105
pH	N/A	12.1	10.2	9.0	9.4	10.1
TPH	mg/kg	5.3	23.8	<5.0	<5.0	<5.0
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	1.4	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.1	0.9	<0.1	<0.1	<0.1

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Client Project Name: Air Poducts, Wrexham

Project Number: 05/3597

Client: CC GEOTECHNICAL

Reporting Date: Friday 16 December 2005

	BH/TP					
	Top Depth / m	0.80	0.60	0.30	0.70	0.60
	Bottom Depth / m					
	Customer ID	WS1	WS2	WS3	WS4	WS5
	Sample Type					
	Date Sampled					
	Receipt Date	02/12/05	02/12/05	02/12/05	02/12/05	02/12/05
	ECoS Sample ID	S0527633	S0527634	S0527635	S0527637	S0527638
	Matrix Type	Soil	Soil	Soil	Soil	Soil
Determinand	Units					
Dibenz(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	1.6	<0.1	<0.1	<0.1
Barium	mg/kg	168.7	319.2	562.5	315.8	478.9
Beryllium	mg/kg	<0.2	2.0	1.1	2.4	4.3
Vanadium	mg/kg	81.4	139.4	98.5	169.1	145.8
Nitrate	mg/kg	19.6	2.3	<2.0	<2.0	<2.0
Sulphate (total)	mg/kg SO4	5471	5205	8154	5556	9621
Chrysotile (white)	Category	ND	ND	ND	ND	ND
Amosite (brown)	Category	ND	ND	ND	ND	ND
Crocidolite (blue)	Category	ND	ND	ND	ND	ND
Anthophyllite	Category	ND	ND	ND	ND	ND
Actinolite	Category	ND	ND	ND	ND	ND
Tremolite	Category	ND	ND	ND	ND	ND
Non-Asbestos fibres	Category	ND	ND	ND	ND	ND
Organic Matter	%	0.1	0.2	0.5	1.2	1.1
TPH C10-C12	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
TPH C12-C16	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
TPH C16-C21	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
TPH C21-C35	mg/kg	<5.0	21.5	<5.0	<5.0	<5.0
TPH C35-C40	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
TPH Aromatic EC5-EC7	mg/kg	#	#	<0.1	#	#
TPH Aromatic EC7-EC8	mg/kg	#	#	<0.1	#	#
TPH Aromatic EC8-EC10	mg/kg	#	#	<0.1	#	#
TPH Aromatic EC10-EC12	mg/kg	#	#	<5.0	#	#
TPH Aromatic EC12-EC16	mg/kg	#	#	<5.0	#	#
TPH Aromatic EC16-EC21	mg/kg	#	#	<5.0	#	#
TPH Aromatic EC21-EC35	mg/kg	#	#	<5.0	#	#
TPH Aliphatic EC5-EC6	mg/kg	#	#	<0.1	#	#
TPH Aliphatic EC6-EC8	mg/kg	#	#	<0.1	#	#
TPH Aliphatic EC8-EC10	mg/kg	#	#	<0.1	#	#
TPH Aliphatic EC10-EC12	mg/kg	#	#	<5.0	#	#
TPH Aliphatic EC12-EC16	mg/kg	#	#	<5.0	#	#
TPH Aliphatic EC16-EC21	mg/kg	#	#	<5.0	#	#
TPH Aliphatic EC21-EC34	mg/kg	#	#	<5.0	#	#

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Client Project Name: Air Poducts, Wrexham

Project Number: 05/3597

Client: CC GEOTECHNICAL

Reporting Date: Friday 16 December 2005

	BH/TP	
	Top Depth / m	0.60
	Bottom Depth / m	
	Customer ID	WS6
	Sample Type	
	Date Sampled	
	Receipt Date	02/12/05
	ECoS Sample ID	S0527639
	Matrix Type	Soil
Determinand	**Units**	
Arsenic	mg/kg	14.9
Cadmium	mg/kg	<0.2
Chromium (hexavalent)	mg/kg	1.3
Chromium (total)	mg/kg	26.4
Lead	mg/kg	24.5
Mercury	mg/kg	3.4
Selenium	mg/kg	<1.0
Boron (water soluble)	mg/kg	<0.5
Copper	mg/kg	43.5
Nickel	mg/kg	42.0
Zinc	mg/kg	15.1
PAH (total)	mg/kg	<0.1
Phenols (monohydric)	mg/kg	<1.0
Cyanide (free)	mg/kg	<2.0
Cyanide (total)	mg/kg	<2.0
Cyanide (complex)	mg/kg	<2.0
Sulphate (water soluble)	g/l SO4	0.086
Sulphide	mg/kg	4.2
Sulphur (free)	mg/kg	<100
pH	N/A	8.8
TPH	mg/kg	<5.0
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b)fluoranthene	mg/kg	<0.1
Benzo(k)fluoranthene	mg/kg	<0.1
Benzo(a)pyrene	mg/kg	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.1

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	BH/TP	
	Top Depth / m	0.60
	Bottom Depth / m	
	Customer ID	WS6
	Sample Type	
	Date Sampled	
	Receipt Date	02/12/05
	ECoS Sample ID	S0527639
	Matrix Type	Soil
Determinand	**Units**	
Dibenz(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Barium	mg/kg	614.5
Beryllium	mg/kg	<0.2
Vanadium	mg/kg	56.3
Nitrate	mg/kg	<2.0
Sulphate (total)	mg/kg SO4	992
Chrysotile (white)	Category	ND
Amosite (brown)	Category	ND
Crocidolite (blue)	Category	ND
Anthophyllite	Category	ND
Actinolite	Category	ND
Tremolite	Category	ND
Non-Asbestos fibres	Category	ND
Organic Matter	%	0.1
TPH C10-C12	mg/kg	<5.0
TPH C12-C16	mg/kg	<5.0
TPH C16-C21	mg/kg	<5.0
TPH C21-C35	mg/kg	<5.0
TPH C35-C40	mg/kg	<5.0
TPH Aromatic EC5-EC7	mg/kg	<0.1
TPH Aromatic EC7-EC8	mg/kg	<0.1
TPH Aromatic EC8-EC10	mg/kg	<0.1
TPH Aromatic EC10-EC12	mg/kg	<5.0
TPH Aromatic EC12-EC16	mg/kg	<5.0
TPH Aromatic EC16-EC21	mg/kg	<5.0
TPH Aromatic EC21-EC35	mg/kg	<5.0
TPH Aliphatic EC5-EC6	mg/kg	<0.1
TPH Aliphatic EC6-EC8	mg/kg	<0.1
TPH Aliphatic EC8-EC10	mg/kg	<0.1
TPH Aliphatic EC10-EC12	mg/kg	<5.0
TPH Aliphatic EC12-EC16	mg/kg	<5.0
TPH Aliphatic EC16-EC21	mg/kg	<5.0
TPH Aliphatic EC21-EC34	mg/kg	<5.0

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Notes and Preservation Details

ASBESTOS BULK MATERIAL ANALYSIS

Samples analysed using polarised light optical microscopy with dispersion staining in accordance with a documented in-house procedure based on HSE Method MDHS 77 - Asbestos in Bulk Materials.

KEY TO ASBESTOS RESULTS

The standard analytical method used for asbestos identification cannot give an accurate quantitative value for percentag asbestos content. The following numerical categories however may be used to assess the approximate quantity of asbestos present in the sample as submitted to the laboratory:

ND	-	No fibres detected (based on a detection limit of 0.1% by weight)
1	-	Fibres detected - less than 0.1% by weight
2	-	Fibres detected - greater than 0.1% by weight
P	-	Non - asbestos fibres present

Quantitative estimates, to which the above numerical categories apply, are outside the scope of the laboratory's UKAS accreditation which covers asbestos identification only.

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Client: **CC GEOTECHNICAL**
Essex House
Bridle Road
Bootle
Liverpool
Merseyside
L30 4UE

FAO: Mr C Bolan

Analytical Report Number: R05/3297

Client Project Name:	**Air Products, Wrexham**
Client Project Number:	**05/3597**
Your Order Number:	**None Specified**
Order Receipt Date:	**02/12/05**
Reporting Date:	**Friday 16 December 2005**

If you have any queries regarding this report please contact our Customer Services Manager

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Client Project Name: Air Products, Wrexham

Client: CC GEOTECHNICAL

Project Number: 05/3597

Reporting Date: Friday 16 December 2005

Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

The test report shall not be reproduced, except in full, without the testing laboratory's written approval.

This testing laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a third party or for the competency of personnel other than its own staff.

Soil Samples

Results are expressed based on air dried mass @ 40°C unless otherwise stated.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Unless otherwise stated, results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

Key:

Accreditation:

MCERTS = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000 and the Environment Agency MCERTS for soil standard.

17025 = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000.

None = This test is currently not on our scope of accreditation.

Sample Pretreatment (Appended to Method of Detection)

D = Air Dried @ 40°C

R = As Received

Sample Type

B = Bulk disturbed sample
C = Core Sample
D = Small disturbed sample
P = Piston sample
U = Undisturbed sample - open drive
W = Water Sample

Sample Results

Analysis not requested
*** Test not completed. Please see notes on last page

Signed: _____

For and on behalf of ECõS Environmental

Approved signatories:

Name	Position
J R Brown	Customer Services Manager
L Dewell	Production Manager
P Richardson	Quality Manager
J Stoddart	Technical Manager

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Client: CC GEOTECHNICAL

Project Number: 05/3597

Reporting Date: Friday 16 December 2005

Soil Samples

Method Statement

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	Accredi-tation	Sub-Contracted	Result Date
Arsenic (leachable)	AAS-HYDRIDE	R	1.0 ug/l	17025	No	09/12/05
Barium (leachable)	ICP-OES	R	0.01 mg/l	None	No	15/12/05
Cadmium (leachable)	GF-AAS	R	0.1 ug/l	17025	No	08/12/05
Chromium (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Copper (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Lead (leachable)	ICP-OES	R	0.03 mg/l	17025	No	15/12/05
Mercury (leachable)	AAS-HYDRIDE	R	0.1 ug/l	17025	No	08/12/05
Nickel (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Selenium (leachable)	AAS-HYDRIDE	R	1.0 ug/l	17025	No	09/12/05
Vanadium (leachable)	ICP-OES	R	0.01 mg/l	None	No	15/12/05
Zinc (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Boron (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Nitrate (leachable)	HPLC-IC	R	1.0 mg/l	None	No	07/12/05
Sulphate (leachable)	HPLC-IC	R	1 mg/l SO4	17025	No	07/12/05
Phenols (monohydric) (leach)	Colorimetry	R	0.02 mg/l	17025	No	08/12/05
Cyanide (free) (leachable)	Colorimetry	R	0.01 mg/l	17025	No	08/12/05
Cyanide (complex) (leachable)	Colorimetry	R	0.01 mg/l	17025	No	08/12/05
Cyanide (total) (leachable)	Colorimetry	R	0.01 mg/l	17025	No	08/12/05
Sulphur (leachable)	HPLC-UV	R	10 mg/l	17025	No	08/12/05
pH (leachable)	pH-meter	R	N/A	17025	No	06/12/05
TPH (leachable)	GC-FID	R	0.01 mg/l	17025	No	09/12/05
PAH (total) (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Naphthalene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Acenaphthylene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Acenaphthene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Fluorene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Phenanthrene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Anthracene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Fluoranthene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Pyrene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Benzo(a)anthracene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Chrysene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Benzo(b)fluoranthene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Benzo(k)fluoranthene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Benzo(a)pyrene (leachable)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Indeno(1,2,3-cd)pyrene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Dibenz(a,h)anthracene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Benzo(g,h,i)perylene (leach)	GC-MS	R	0.01 mg/l	17025	No	09/12/05
Calcium (leachable)	ICP-OES	R	0.10 mg/l	None	No	15/12/05
Magnesium (leachable)	ICP-OES	R	0.01 mg/l	17025	No	15/12/05
Hardness (leachable)	ICP	R	1 mg/l	None	No	15/12/05

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Reporting Date: Friday 16 December 2005

	BH/TP		
	Top Depth / m	0.60	0.60
	Bottom Depth / m		
	Customer ID	WS2	WS5
	Sample Type		
	Date Sampled		
	Receipt Date	02/12/05	02/12/05
	ECoS Sample ID	S0527642	S0527644
	Matrix Type	Soil	Soil
Determinand	**Units**		
Arsenic (leachable)	ug/l	4.3	1.1
Barium (leachable)	mg/l	0.70	0.23
Cadmium (leachable)	ug/l	<0.1	<0.1
Chromium (leachable)	mg/l	<0.01	<0.01
Copper (leachable)	mg/l	0.01	<0.01
Lead (leachable)	mg/l	<0.03	<0.03
Mercury (leachable)	ug/l	<0.1	<0.1
Nickel (leachable)	mg/l	<0.01	<0.01
Selenium (leachable)	ug/l	<1.0	<1.0
Vanadium (leachable)	mg/l	<0.01	<0.01
Zinc (leachable)	mg/l	0.03	<0.01
Boron (leachable)	mg/l	0.21	0.08
Nitrate (leachable)	mg/l	<1.0	<1.0
Sulphate (leachable)	mg/l SO4	10	23
Phenols (monohydric) (leach)	mg/l	<0.02	<0.02
Cyanide (free) (leachable)	mg/l	<0.01	<0.01
Cyanide (complex) (leachable)	mg/l	<0.01	<0.01
Cyanide (total) (leachable)	mg/l	<0.01	<0.01
Sulphur (leachable)	mg/l	<10	<10
pH (leachable)	N/A	7.5	8.6
TPH (leachable)	mg/l	<0.01	<0.01
PAH (total) (leachable)	mg/l	<0.01	<0.01
Naphthalene (leachable)	mg/l	<0.01	<0.01
Acenaphthylene (leachable)	mg/l	<0.01	<0.01
Acenaphthene (leachable)	mg/l	<0.01	<0.01
Fluorene (leachable)	mg/l	<0.01	<0.01
Phenanthrene (leachable)	mg/l	<0.01	<0.01
Anthracene (leachable)	mg/l	<0.01	<0.01
Fluoranthene (leachable)	mg/l	<0.01	<0.01
Pyrene (leachable)	mg/l	<0.01	<0.01
Benzo(a)anthracene (leach)	mg/l	<0.01	<0.01
Chrysene (leachable)	mg/l	<0.01	<0.01
Benzo(b)fluoranthene (leach)	mg/l	<0.01	<0.01
Benzo(k)fluoranthene (leach)	mg/l	<0.01	<0.01
Benzo(a)pyrene (leachable)	mg/l	<0.01	<0.01

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	BH/TP		
	Top Depth / m	0.60	0.60
	Bottom Depth / m		
	Customer ID	WS2	WS5
	Sample Type		
	Date Sampled		
	Receipt Date	02/12/05	02/12/05
	ECoS Sample ID	S0527642	S0527644
	Matrix Type	Soil	Soil
Determinand	**Units**		
Indeno(1,2,3-cd)pyrene (leach)	mg/l	<0.01	<0.01
Dibenz(a,h)anthracene (leach)	mg/l	<0.01	<0.01
Benzo(g,h,i)perylene (leach)	mg/l	<0.01	<0.01
Calcium (leachable)	mg/l	10.40	11.24
Magnesium (leachable)	mg/l	0.36	0.32
Hardness (leachable)	mg/l	27	29

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Reporting Date: Friday 16 December 2005

Notes and Preservation Details

None

GROUND INVESTIGATION REPORT 1994

ACREFAIR

CLWYD

GROUND INVESTIGATION REPORT

FOR THE

AIR PRODUCTS

SOCIAL CLUB

RS0357/DE/APC/DG

JANUARY 1994

CLIENT:

Air Products UK Limited
Acrefair
Wrexham
Clwyd
LL14 3HW

Tel: (0978) 810018
Fax: (0978) 810742

CONSULTING ENGINEER:

Veryards Limited
Burton House
Rossett
Clwyd
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DRAWINGS

RS0357/GI1 - Site Location Plan
RS0357/GI2 - Borehole Location Plan

APPENDICES

A. Factual Ground Investigation Report - Exploration Associates Limited

B. Ground Investigation Report - Soils and Materials Testing Limited - June 1992.

C. Mining Report - British Coal

D. Past County Series Survey Plans

1.0 INTRODUCTION

1.01 Veryards Limited were commissioned by Air Products UK Limited to undertake a Structural Appraisal of the Works' Social Club building which was showing signs of settlement beneath its north eastern corner. As part of the appraisal, a Ground Investigation was carried out to determine the probability of mining related subsidence affecting the property.

2.0 EXISTING INFORMATION

2.01 A copy of an earlier Ground Investigation, carried out by Soils and Materials Testing Limited over the general site area, indicated a surface cover of topsoil underlain by silty clay, intermixed with cinder, ash and gravel, together with layers of coal waste, bricks, and clay with occasional bands of a white crystalline deposit. The consistency of the fill was stated to be soft to firm with ground water levels noted to lie below a depth of 4.4 metres below surface (refer to Appendix B for Soils and Materials Testing's Report).

2.02 The white crystalline deposit was subsequently spoken of as being sodium sulphate. Sulphate determination of the indicated extremely high local concentrations, i.e., in excess of 28 g/l (taken from a 2:1 soil water extract).

3.0 SITE DESCRIPTION

3.1 Location

3.1.1 The site is located immediately south of Bethania Road (formally known as Black Lion Road) and within 200 metres of the main A5 Llangollen to Wrexham Road. The site is bounded by trees and a 5 metre embankment to the west, a tree/hedge line to the south and east end and Bethania Road to the north.

3.2 Topography

3.2.1 The site is generally planar with the ground falling away from the centre of the site at gradients of approximately 1 in 100. The main access road onto the site shows signs of shallow depressions having been made up periodically with the adjacent playing field possessing a gentle secondary undulation. The site is free of surface features i.e., trees, rock, outcrops, etc.

3.3 Geology

3.3.1 The available geological maps indicate the area to be underlain by Glacial Boulder Clay, resting upon Upper Carboniferous rock strata. The Geological Succession indicates the presence of coal horizons beneath the site, dipping towards the south east.

3.4 Historical Development

3.4.1 The Past County Series Survey plans for the area indicate the site to form a plateau/depression with no sign of previous development. The site is noted to be surrounded by coal workings with 'old shafts' lying within close proximity of the site (refer to Appendix C for map enclosures).

4.0 MINING

4.01 British Coal were commissioned to produce a Coal Mining Report. The findings from this report were that the site area was underlain at shallow to moderate depth by worked coal seams. Whilst general ground subsidence should now have been complete, localised ground subsidence could occur where the worked seams lay within an influencing distance of surface.

4.02 An addendum to the Coal Report indicated the presence of 7 recorded disused mine shafts lying over the site area. No information is available on the state of these shafts or whether they have been filled and capped. British Coal cannot guarantee a complete record and, therefore, there may be unrecorded shafts lying over the site area. From the available evidence no recorded shafts lie beneath the Social Club Building (a copy of the British Coal Report is included within Appendix D).

5.0 GROUND INVESTIGATION

5.01 From the evidence of the available geological, survey and British Coal information, it was recommended that a Mining Investigation be carried out about the Social Club Building.

5.1 Fieldwork

5.1.1 Three rotary percussive open holes were drilled at locations as shown on Drawing Numbered RS0357/GI02. The results of the drilling indicated fill material to depths of 7.5 metres to 8 metres underlain by a boulder horizon to 12 metres. The boulder horizon was underlain by a firm silty clay resting upon mudstone at approximately 17 metres below existing ground level. The rock strata was shown to comprise an interbedded succession of sandstone and subordinate mudstone to depths of 30 metres. No coal seams were located from the drilling.

No ground water was observed from the recent investigations, however, previous investigations revealed water seepages lying at depths of between 5 and 10 metres.

5.2 Laboratory Work

5.2.1 No laboratory work was programmed.

6.0 CONCLUSIONS

6.01 The results of the drilling indicated no coal seams within an influencing distance of surface beneath the Social Club building. Whilst coal may be at shallow depths over other areas of the site, i.e., beneath the playing field, there is no risk of ground subsidence caused from crown hole formation beneath the structure. The present settlement of the building is, therefore, not attributable to crown hole subsidence.

6.02 Whilst the presence of unrecorded mine shafts lying beneath the structure cannot be ruled out, there is no available evidence to suggest that this is the cause of the building settlement. The known shafts all lie within the area occupied by the access road or playing field. The surface depressions noted within the access road could be attributed to a partial collapse of such shafts and care should be taken to avoid loading these areas without first ascertaining the cause of the depression. Where mine shafts are identified from any future investigation their condition should be established and suitable treatment carried out if found necessary to render the shaft safe from collapse.

7.0 RECOMMENDATIONS

7.01 No coal seams lie within a 30 metre depth of ground surface and crown hole subsidence is, therefore, not believed to cause the present ground settlement affecting the building. No further mining investigations are, therefore, deemed necessary.

7.02 The type of fill material with the included crystalline lenses lying to depths of 6 - 7 metres may possess voids caused through fine migration or solution of the crystalline material. A further investigation is recommended to establish the presence of voids within the fill material which could induce a ground bearing failure beneath the structural foundation.

.....

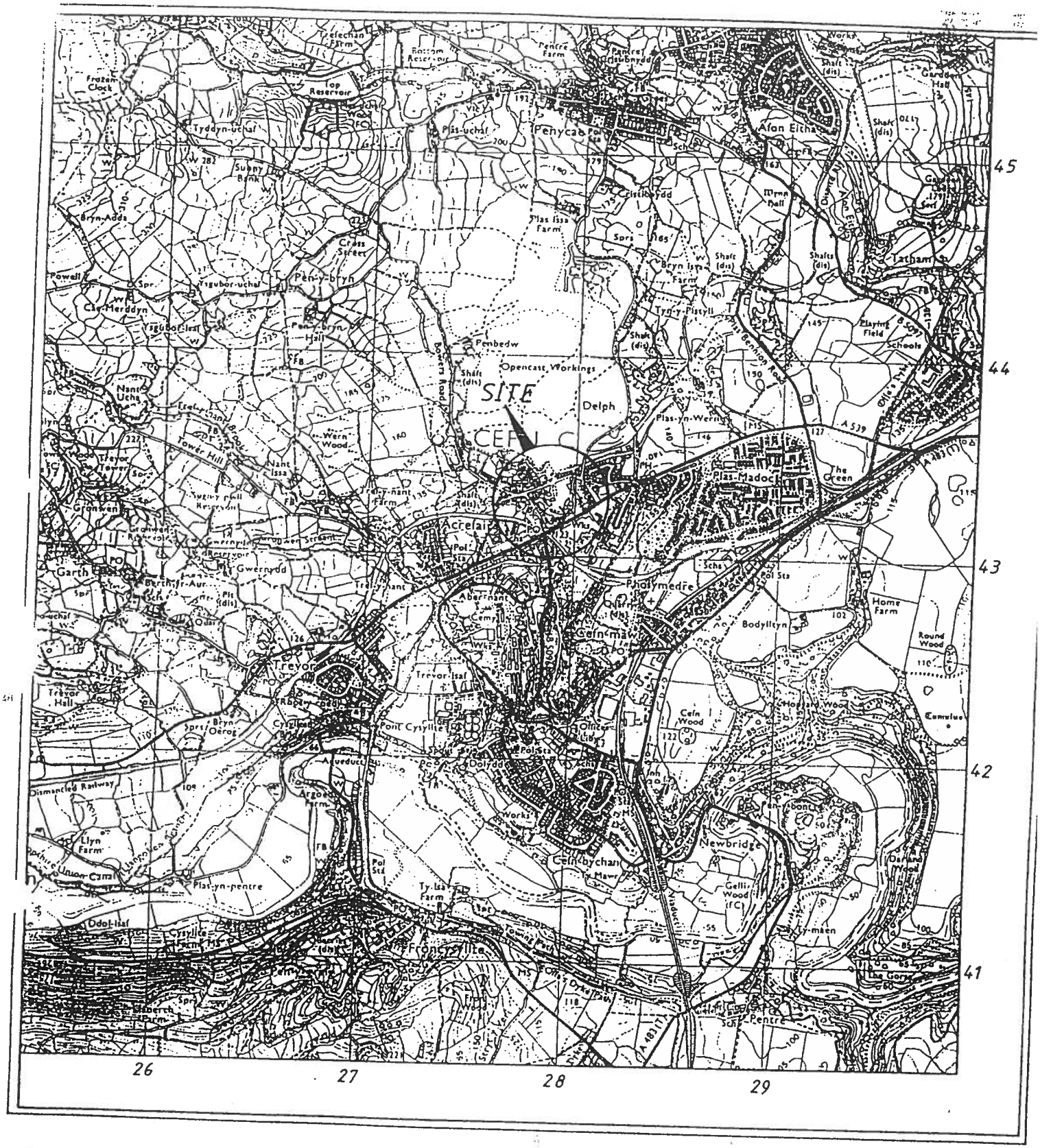
A P Cumber
Veryards Limited

RS0357/DE/APC/DG
5 January 1994

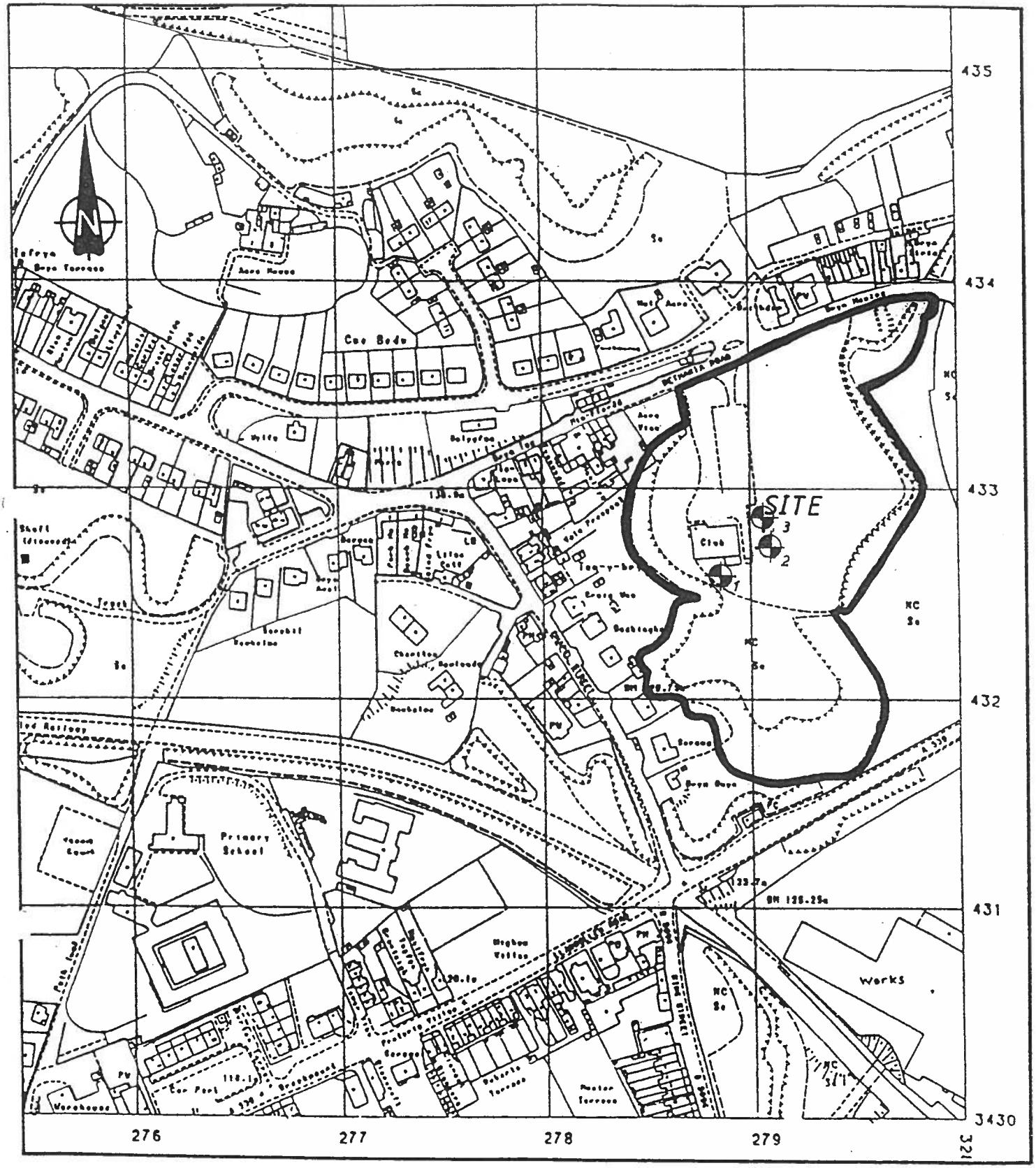
DRAWINGS

RS0357/GI1 - Site Location Plan

RS0357/GI2 - Borehole Location Plan



Project	AIR PRODUCTS' WORKS SOCIAL CLUB - ACREFAIR.			Verryard & Partners CONSULTING ENGINEERS	
Title	Site Location Plan (Taken from sheet SJ 24/34, Pathfinder 806)			TEL.	FAX
Scale 1:25 000	Date 02·07·93	Drawn IRS	Checked	No. RS0357	GI 1 / Rev.



Project	AIR PRODUCTS WORKS SOCIAL CLUB - ACREFAIR.			Verryard & Partners CONSULTING ENGINEERS	
Title	BOREHOLE LOCATION PLAN			TEL. :	FAX
Scale 1:2500	Date 04·08·93	Drawn IRS	Checked	No. RS0357 / GI 2	Rev A

APPENDIX A

Factual Ground Investigation Report -
Exploration Associates Limited

Exploration Associates, Geotechnical House, 18 Deeside Industrial Estate, Welsh Road
Deeside, Clwyd, CH5 2LR. Tel: (0244) 288200

Acrefair Works Social Club

Factual Report on Ground Investigation

D3101

Client:
Veryard and Partners
Consulting Engineers
Burton House
Rossett
Clwyd
LL12 0HY

CONTENTS

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1.	INTRODUCTION	1
2.	THE SITE	1
3.	FIELDWORK	1
4.	GROUND CONDITIONS	1
4.1	Published Geology	1
4.2	Strata Encountered	2
4.3	Groundwater	2

REFERENCES

ENCLOSURES

A Exploratory Hole Records
B Drawings

APPENDICES

A General Notes

1. INTRODUCTION

It is proposed to investigate subsidence affecting parts of the Air Products Social Club Building in Acrefair, Clwyd. On the instructions of Veryard and Partners, Consulting Engineers to Air Products Limited an investigation was made by Exploration Associates, a division of Entec Europe Limited, to provide information on the existing ground conditions. A factual report only was requested by Veryard and Partners in a facsimile transmission dated 28 July 1993.

The report contains descriptions of the fieldwork carried out and summaries of the ground and groundwater conditions revealed.

The investigation was carried out in general accordance with the relevant British Standards[1]. General notes on the techniques employed during site investigations carried out by Exploration Associates are given in the appendices.

2 THE SITE

The social club is located at National Grid reference SJ279432 as shown on the Site Location Plan (Drawing 1). It occupies the site of an old colliery waste tip.

3 FIELDWORK

The fieldwork was carried out during the period 9th to 11th August 1993.

Three boreholes were sunk at the positions shown on the Borehole Location Plan (Drawing 2) by rotary open-hole drilling methods to depths of 27.00m (Borehole 1), 42.00m (Borehole 2) and 25.00m (Borehole 3). The depths of the boreholes, descriptions of the strata encountered and comments on the groundwater conditions revealed during the fieldwork operations are given on the borehole records (Enclosure A).

All three boreholes were grouted upon completion.

The exploratory hole positions were set out by a representative of Veryard and Partners. The ground levels at the exploratory hole positions were not requested and have therefore not been determined.

4. GROUND CONDITIONS

4.1 Published Geology

Geological records[2] indicate that the site is underlain by glacial till (recorded as "Boulder Clay") overlying rocks of the Middle Coal Measures

Series which are of Carboniferous age.

4.2 Strata Encountered

Made ground, comprising various layers of mine waste and occasionally chemical waste, was revealed within all three boreholes. Beneath this made ground glacial till was encountered at 12.40m, 11.10m and 9.60m depth within Boreholes 1, 2 and 3, respectively.

Within Borehole 3, underlying the till at 16.80m depth, a layer of sandstone (4.10m thick) was encountered which in turn was found to be overlying mudstone.

At the locations of Boreholes 1 and 2, mudstone was found to be directly beneath the glacial till at depths of 14.90m and 16.90m, respectively.

With the notable exception of a void between 23.80m and 24.30m depth within Borehole 2, mudstone was encountered throughout the remainder of these boreholes.

4.3 Groundwater

Groundwater was not encountered during the drilling of the boreholes.

For and on behalf of Exploration Associates

J B Mountford
Senior Project Geologist

J P Leavy
Principal Engineer

Exploration Associates
JBM/JPL/SJJ/D3103/1993

REFERENCES

1. BS 5930 ; 1981. Code of Practice for Site Investigations. British Standards Institution.

2. British Geological Survey. 1:63,360 series, Geological Survey of England and Wales. Sheet No 121 Solid and Drift.

ENCLOSURE A

Exploratory Hole Records

	Sheet
List of Symbols	Key Sheet
Borehole Records	BH1 to BH3

KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	:	Drillers Description

SAMPLES

U ( )	:	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U ( )F, U ( )P	:	F - not recovered, P - partially recovered
U38	:	Undisturbed 38mm diameter sample
P(F),(P)	:	Piston sample, F - not recovered, P - partially recovered
B	:	Bulk sample - disturbed
D	:	Jar Sample - disturbed
W	:	Water Sample
CBR	:	California Bearing Ratio mould sample
G	:	Gas Sample and depth of hole at time of sampling

CORE RECOVERY AND ROCK QUALITY

TCR	:	Total Core Recovery %
SCR	:	Solid Core Recovery %
RQD	:	Rock Quality Designation %
FI	:	Fracture Index (discontinuities per metre) NI - not intact, NR - not recordable, NA - not applicable

GROUNDWATER

$\underline{\nabla}$	:	Groundwater strike
$\underline{\blacktriangledown}$	:	Groundwater level after standing period
Date/Water	:	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date.

IN SITU TESTING

S	:	Standard Penetration Test - split barrel sampler
C	:	Standard Penetration Test - solid 60° cone
V(H)(R)	:	Vane Test (Hand) (R) demonstrates remoulded strength
K(F), (C), (R), (P)	:	Permeability Test (falling, constant or rising head, packer)
PT	:	Pressuremeter Test
HP	:	Hand Penetrometer Test

MEASURED PROPERTIES

N	:	Standard Penetration Test - blows required to drive 300mm after seating drive
$^{x}/_{y}$	:	Denotes x blows for y mm within the Standard Penetration Test
x^{*}/y	:	Denotes x blows for y mm within the seating drive
c_u	:	Undrained Shear Strength (kN/m^2)
CBR	:	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	NOMINAL DIAMETER (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

Exploration Associates	Project Acrefair Works Social Club Air Products Limited	Contract D3101 Key Sheet

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	ft	Description	Depth (Thickness)	Level	Legend
			10/08 1993 DRY		MADE GROUND: Turf onto mine waste, ash, bricks, stone and rubble**	G.L. (2.30)		
					MADE GROUND: White concrete (possible sulphate/chemical waste)**	2.30 (2.20)		
					MADE GROUND: Mine waste, ash, brick, stone and rubble**	4.50 (2.80)		
					MADE GROUND: Limestone and slag boulders**	7.30 (5.10)		

Equipment: Truck mounted rotary coring rig. (HE50) Air Flush

Borehole Dia (mm)	Casing Dia (mm)
150 to 3.00m	S to 3.00m
118 to 9.00m	P to 9.00m
93 to 12.00m	H to 10.50m

Groundwater

No. Struck	Behaviour	Sealed
	Not Encountered	

Drilled by TB
Logged by DPC
Checked by GSH

Remarks

1. Service inspection pit excavated to 1.50m (1 hour)
2. Borehole Dia 72mm to 27.00m. Casing Dia N to 18.00m.
3. Loss of flush 7.30m to 12.00m and 21.00m to 27.00m, otherwise full flush returns.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 1(1 of 3)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	If	Description	Depth (Thickness)	Level	Legend
			10/08		(See previous sheet - MADE GROUND**)			
		10.50	DRY					
12.00			11/08					
		10.50	DRY					
					Firm brown boulder CLAY**	12.40		
						(2.50)		
					Light grey MUDSTONE with sandstone bands**	14.90		
						(8.90)		

Equipment: Truck mounted rotary coring rig. (HE50) Air Flush

Borehole Dia (mm)
150 to 3.00m
118 to 9.00m
93 to 12.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 10.50m

Groundwater
No. Struck Behaviour Sealed

Drilled by TB
Logged by DPC
Checked by JSH

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 1(2 of 3)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	⅊	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - MUDSTONE)			
					VOID**	23.80 (0.50)		
					Light grey SANDSTONE with sandstone bands **	24.30		
27.00		18.50	DRY		End of Borehole.	27.00		

Equipment: Truck mounted rotary coring rig. (HE50) Air Flush

Borehole Dia (mm)	Casing Dia (mm)
150 to 3.00m	S to 3.00m
118 to 9.00m	P to 9.00m
93 to 12.00m	H to 10.50m

Groundwater

No. Struck	Behaviour	Sealed

Drilled by TB
Logged by DPC
Checked by DJK

Remarks 4. Borehole grouted 27.00m to GL

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 1(3 of 3)

Sampling

Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	Ik
			11/08 1993 DRY	
10.00		9.00	DRY 11/08	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Turf onto mine waste, ash, bricks stone nd rubble**	G.L.	
	(7.40)	
MADE GROUND: Limestone and slag boulders**	7.40	
	(3.70)	

Legend

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)
118 to 10.00m
93 to 42.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 18.00m

Groundwater

No. Struck	Behaviour	Sealed
	Not Encountered	

Drilled by TB
Logged by DPC
Checked by JSK

Remarks 1. Full flush returns GL to 42.00m.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 2(1 of 5)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	℄	Description	Depth (Thickness)	Level	Legend
		9.00	11/08 DRY		(See previous sheet - MADE GROUND**)			
					Firm brown boulder CLAY**	11.10 (5.80)		
					Light grey MUDSTONE with sandstone bands**	16.90		

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)
118 to 10.00m
93 to 42.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 18.00m

Groundwater
No. Struck Behaviour Sealed

Drilled by TB
Logged by DPC
Checked by JSK

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 2(2 of 5)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	k	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - MUDSTONE**)			

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)
118 to 10.00m
93 to 42.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 18.00m

Groundwater
No. Struck Behaviour Sealed

Drilled by TB
Logged by DPC
Checked by JSH

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 2(3 of 5)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	⊬	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - MUDSTONE**)			

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)
118 to 10.00m
93 to 42.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 18.00m

Groundwater
No. Struck Behaviour Sealed

Drilled by TB
Logged by DPC
Checked by JSK

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 2(4 of 5)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	⅛	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - MUDSTONE**)			
42.00		18.00	DRY		End of Borehole.	42.00		

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)
118 to 10.00m
93 to 42.00m

Casing Dia (mm)
S to 3.00m
P to 9.00m
H to 18.00m

Groundwater
No. Struck Behaviour Sealed

Drilled by TB
Logged by DPC
Checked by JSu

Remarks 2. Borehole grouted 42.00m to GL

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 2(5 of 5)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	SPT N	Description	Depth (Thickness)	Level	Legend
			11/08 1993		MADE GROUND: Turf onto mine waste, ash, bricks, stones and rubble**	G.L.		
						(7.70)		
					MADE GROUND: Limestone and slag boulders**	7.70		
						(1.90)		
					Firm brown boulder CLAY**	9.60		

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)	Casing Dia (mm)
150 to 3.00m	S to 3.00m
118 to 9.00m	P to 9.00m
93 to 25.00m	H to 17.00m

Groundwater

No. Struck	Behaviour	Sealed
	Not Encountered	

Drilled by TB
Logged by DPC
Checked by JSH

Remarks 1. Full flush returns GL to 25.00m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 3(1 of 3)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	SPT N	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - CLAY**)	(7.20)		
17.00		17.00	DRY	C50*/ 50	Brown SANDSTONE, weak**	16.80 (4.12)		

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)	Casing Dia (mm)
150 to 3.00m	S to 3.00m
118 to 9.00m	P to 9.00m
93 to 25.00m	H to 17.00m

Groundwater

No. Struck	Behaviour	Sealed

Drilled by TB
Logged by DPC
Checked by JSH

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 3(2 of 3)

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	SPT N	Description	Depth (Thickness)	Level	Legend
			11/08		(See previous sheet - SANDSTONE**)			
21.10		17.00	DRY	C50*/ 50	Light grey MUDSTONE with sandstone bands**	20.90		
25.00		17.00	DRY		End of Borehole.	25.00		

Equipment: Truck mounted rotary coring rig (HE50) Air Flush

Borehole Dia (mm)	Casing Dia (mm)
150 to 3.00m	S to 3.00m
118 to 9.00m	P to 9.00m
93 to 25.00m	H to 17.00m

Groundwater

No. Struck	Behaviour	Sealed

Drilled by TB
Logged by DPC
Checked by JSH

Remarks 2. Borehole grouted 25.00m to GL

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
Acrefair Works Social Club
Air Products Limited

Contract D3101

Borehole 3(3 of 3)

ENCLOSURE B

Drawings

	Drawings
Site Location Plan	1
Borehole Location Plan	2

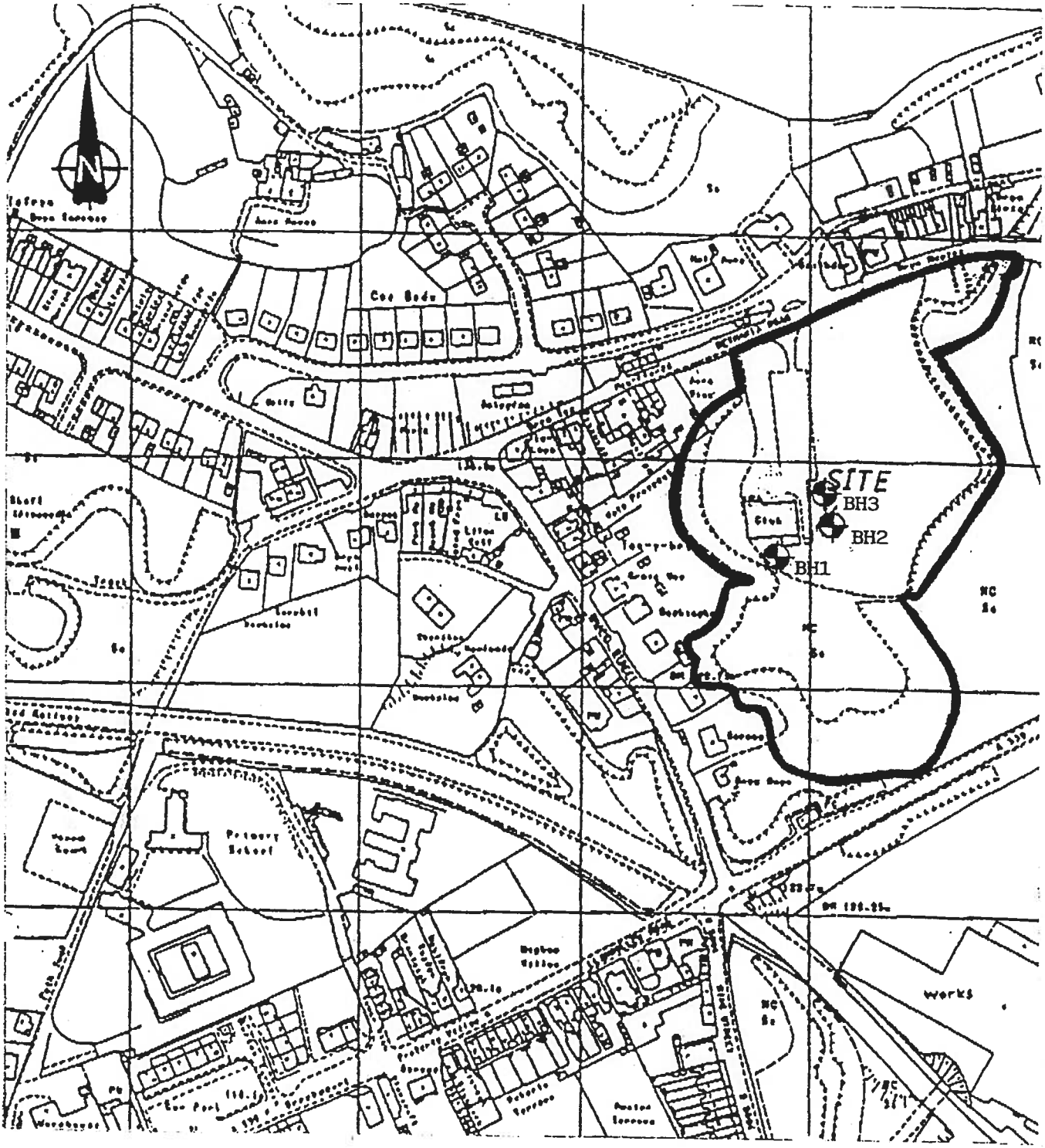


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Scale 1:50,000

Site Location Plan	Project Acrefair Works Social Club Air Products Limited	Contract D3101
Exploration Associates		Drawing 1



Scale 1:2500

Key

Borehole Location

Borehole Location Plan	**Project**	**Contract** D3101
Exploration Associates	Acrefair Works Social Club Air Products Limited	Drawing 2

APPENDICES

A General Notes

APPENDIX A

General Notes

1 The investigation was carried out in general accordance with the recommendations given in BS 5930 ; 1981, The Code of Practice for Site Investigations. The comments given in the report and any opinions expressed are based on the ground conditions encountered during the fieldwork and on the results of tests made in the field and in the laboratory. However, conditions may prevail at the site which were not revealed by the investigation and which, therefore, could not be taken into account. In particular it should be noted that groundwater levels may vary due to seasonal or other effects and are also subject to disturbance by drilling processes. Therefore they may, at times, be significantly different from those measured during the investigation.

APPENDIX B

Ground Investigation Report -
Soils and Materials Testing Limited -
June 1992

SOILS & MATERIALS TESTING LTD.

REPORT No.

LS 3526

JUNE 1992

REPORT OF SOILS AND FOUNDATION CONDITIONS

SOCIAL CLUB FIELD

AIR PRODUCTS

ACREFAIR

By

M. J. CHETTLEBURGH, B.Sc.

F.I.H.E., P.Eng. (Alberta), M.E.I.C.

Prepared for:

Air Products UK Limited
Acrefair
Wrexham
Clwyd LL14 3HW

SOILS & MATERIALS TESTING LTD.
LLANDDULAS
ABERGELE
CLWYD LL22 8HT
(0492) 517879

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1.2.	SITE LOCATION	1
1.3.	PROPOSED DEVELOPMENT	2
1.4.	METHOD OF INVESTIGATION	2
1.5.	LABORATORY TESTING	3
2.	**INTERPRETATIVE REPORT**	
2.1.	NATURE OF SOIL PROFILE	4
2.2.	DISCUSSION OF TEST RESULTS	4
2.3.	DISCUSSION OF SITE	5
2.4.	POSSIBLE FUTURE DEVELOPMENT	6

APPENDIX 'A'

BOREHOLE LOG SHEETS

APPENDIX 'B' - Laboratory Test Results

TABLE I RESULTS OF CHEMICAL TESTS - Borehole Logs

TABLE II RESULTS OF CHEMICAL TESTS - Test Pit Logs

APPENDIX 'C'

SUMMARY OF DEPARTMENT OF ENVIRONMENT GUIDELINES FOR SULPHATES

SKETCH BOREHOLE AND TEST PIT LOCATION PLAN

1. FACTUAL REPORT

1.1. INTRODUCTION

1.1.1. This report describes an investigation carried out in accordance with instructions received from the Works and Maintenance Department of Air Products Limited of Acrefair, Wrexham.

1.1.2. The order required a Geotechnical Investigation to be carried out with boreholes and laboratory testing providing factual information on the soil profile and properties upon which recommendations could be made on the contamination aspects of the land.

1.1.3. The order was for six boreholes which were put down at locations selected by the Soils Engineer in consultation with the Drilling Technicians and shown on the Sketch Borehole Location Plan, Figure 1.

1.2. SITE LOCATION

1.2.1. The site is located on the main Wrexham-Llangollen Road through Acrefair.

1.2.2. It is an existing sports field with a Club House and flat grassed area for the pitches.

1.3. PROPOSED DEVELOPMENT

1.3.1. The proposal it to evaluate the fill on which the sports field is built, for the type, level and extent of contaminants.

1.4. METHOD OF INVESTIGATION

1.4.1. Between 3rd and 8th April 1992, six boreholes were put down with the aid of a one-ton Edeco light cable percussion rig on the site, using 154 mm diameter casing.

1.4.2. The maximum depth of investigation was 12.50 metres below existing ground level.

1.4.3. The positions of the boreholes were set out on the site by the Drilling Technicians after consultation with the Soils Engineer.

1.4.4. The description of the soil through which the boring was made is given on the drillers daily reports and must be considered as an indication of the mass characteristics of the soil at that location. The nature of the boring procedure makes identifying or sampling of anything less than a major change of character difficult, but careful examination of disturbed and core samples should result in the smaller changes being identified during laboratory inspection and testing.

1.4.5. Small disturbed samples from the soils encountered were taken regularly at half metre intervals. The depths are as

reported on the borehole logs which form part of Appendix 'A' to this report.

1.4.6. After some testing had been completed the site was revisited and samples taken at shallow depth for chemical testing mainly for sulphate content. These were put down on 22nd May by hand digging.

1.5. LABORATORY TESTING

1.5.1. All samples were transported to the Contractor's laboratory at Llanddulas for testing and a test programme determined.

1.5.2. The small disturbed samples were examined and visually classified in the laboratory by a Soils Enginer and the moisture content of each one determined. These values have been plotted on the borehole logs in Appendix 'A' to produce the moisture content profile at each location.

1.5.3. Samples from the boreholes were combined from various depths and tested for sulphate content, pH value, cyanide and phenols. These results form Table I. These same tests were run on the eleven samples taken from shallow depth from the last series of test pits. These results form Table II.

2. INTERPRETATIVE REPORT

2.1. NATURE OF SOIL PROFILE

2.1.1. The site is covered with made ground. This consists mainly of a cover of topsoil, clay and ash, but with mainly cinder and ash below. There are, however, layers of coal waste and enclosures of brick. Some layers of white deposit were also noted.

2.1.2. The fill is to depths of 11.20, 5.40, 7.70, 5.70, 11.90 and 4.40 metres at this depth in the boreholes except number 2 is clay. This is brown in colour, silty and firm to stiff in consistency.

2.1.3. In Borehole 2, a weathered shaley mudstone rock was encountered to the bottom of the borehole at 6.50 metres deep.

2.1.4. A trickle of water is present at 10.00 metres deep in Borehole 1; at a trickle in Borehole 3 at 5.80 metres and at a trickle in Borehole 4 at 4.40 metres. The other boreholes were dry.

2.2. DISCUSSION OF TEST RESULTS

2.2.1. The results of the borings showed a varied thickness of fill above the natural soils and bedrock.

2.2.2. The main constituents are cinder fills; broken rock; clay and chemical deposits containing much white sulphate.

2.2.3. The phenol and cyanide contents are low indicating no oily or gas waste products are present on the site.

2.3. DISCUSSION OF SITE

2.3.1. The results of the tests show there are some high sulphates present on the site. This is probably in the form of sodium sulphate as a by-product of the production of a chemical operation.

2.3.2. The problem with the material is that in the right condition of temperature and moisture and with calcium and aluminium salts present as there are in clays it reacts to form other products of much greater volume than the original volume.

2.3.3. Hence land cannot be used for buildings as this swelling is sufficient to cause buildings and floor slabs to heave, distort and crack.

2.3.4. The presence of sulphates does not require the material to be taken to special tips for disposal. However, any material excavated will need to be taken to a lined tip for disposal to prevent any leaching out of soluble sulphate reaching water bearing layers, streams, or rivers.

2.3.5. The high level of suphate should not cause problems for most people in contact with the skin, unless they are really sensitive.

2.3.6. The sulphates have a pH just over the natural value of 7 up to 9. These values should not cause a problem in contact with skin.

2.4. POSSIBLE FUTURE DEVELOPMENT

2.4.1. From the previous section any re-development of the site will require special precautions. The fill will need to be removed from below any buildings for at least three metres or any buildings founded on piles into the clay or bedrock.

2.4.2. Material removed from excavations will need to be run to a lined tip by a licenced carrier.

M J CHETTLEBURGH

APPENDIX 'A'

Borehole Logs.

SYMBOLS

FIELD SAMPLE:-

Small disturbed sample ---------- D

Undisturbed sample (Sample size in m.m.) ---------- U(100)

Water sample ---------- ▼

Standard Penetration Test
(Blows for 300 m.m. penetration) ---------- N( )

Standard penetration test (m.m. penetration
for 50 blows) ---------- N( )

Subscript N_c denotes solid core

LABORATORY TESTS:-

Natural moisture content ---------- ●

Plastic limit ---------- ✕ ---------- ○ ---------- Liquid limit

Triaxial compression test ---------- Tx

Consolidation ---------- Cv

Chemical ---------- Ch

Particle size distribution ---------- P

PROJECT: SPORTS FIELD

BOREHOLE NO.: 1

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 3.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on brown clay and ash. MADE GROUND	
			D	1.00		
	1.50		D		MADE GROUND, black ash, cinder mainly silt sizes but with some medium grained gravel sizes	
			D	2.00		
			D			
			D	3.00		
			D			
	3.80		D	4.00	MADE GROUND, much white sulphate with clay	
			D			
			D	5.00		
			D			
			D	6.00		
	6.50		D		MADE GROUND black cinder and ash, mainly silt sizes but with medium grained gravel sizes and coarse grained shale, gravel	
			D	7.00		
			D			
			D	8.00		
			D			
			D	9.00		
			D			
			D	10.00		

Moisture Content and plot of Atterberg Limits

Percent: 10 20 30 40

70%

92%

Ground water

Encountered at	10.00		
Standing level	-		

SHEET 1 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 1

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 3.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D		MADE GROUND black cinder and ash	
	10.80		D	11.00	Soft black silty CLAY, contaminated	
	11.20		D		Firm brown silty CLAY with scattered medium grained gravel.	
	12.00		D	12.00		

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40

Ground water

Encountered at Standing level			

SHEET 2 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 2

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 7.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
	0.30	✓	D	0.50	Grass on TOPSOIL	
			D	1.00	MADE GROUND clay and ash, silt to fine grained gravel sizes	
			D			
			D	2.00		
			D			
			D	3.00		
	3.30		D			
			D		MADE GROUND coal waste and shale silt sizes to medium grained gravel sizes	
			D	4.00		
			D			
			D	5.00		
	5.40		D			
			D		Weathered SHALEY MUDSTONE weak	
			D	6.00		
	6.20					
	6.50		D		SHALEY MUDSTONE moderately strong	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at			
Standing level			

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 3

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 7.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on MADE GROUND Dark grey silty clay, ash, shale	
			D	1.00		
			D			
			D	2.00		
	2.50		D			
			D	3.00	MADE GROUND black cinder and ash. Silt sizes with traces of gravel sizes	
			D			
			D	4.00		
			D			
			D	5.00		
			D			
			D	6.00		
	6.20		D			
			D		Contaminated ash MADE GROUND, black, silt sized	
			D	7.00		
			D			
	7.70		D	8.00	Stiff brown silty CLAY with rounded medium grained gravel.	
	8.50		D			

Moisture Content and plot of Atterberg Limits

Percent: 10 20 30 40

Ground water

Encountered at	5.80		
Standing level	–		

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 4

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 8.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on MADE GROUND of soft brown silty clay and ash.	
			D	1.00		
			D			
			D	2.00		
	2.30		D		MADE GROUND, dark brown chemical waste with much white sulphate	
			D	3.00		
			D			
			D	4.00		
	4.40		D		MADE GROUND black ash, mainly silt sizes	
			D	5.00		
			D			
	5.70		D	6.00	Stiff brown silty CLAY with streaks of grey silt	
	6.50		D			

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40

Ground water

Encountered at	4.40		
Standing level			

SHEET 1 OF 1

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 5

LOCATION: ACREFAIR

GROUND LEVEL: FILED LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 9.4.92

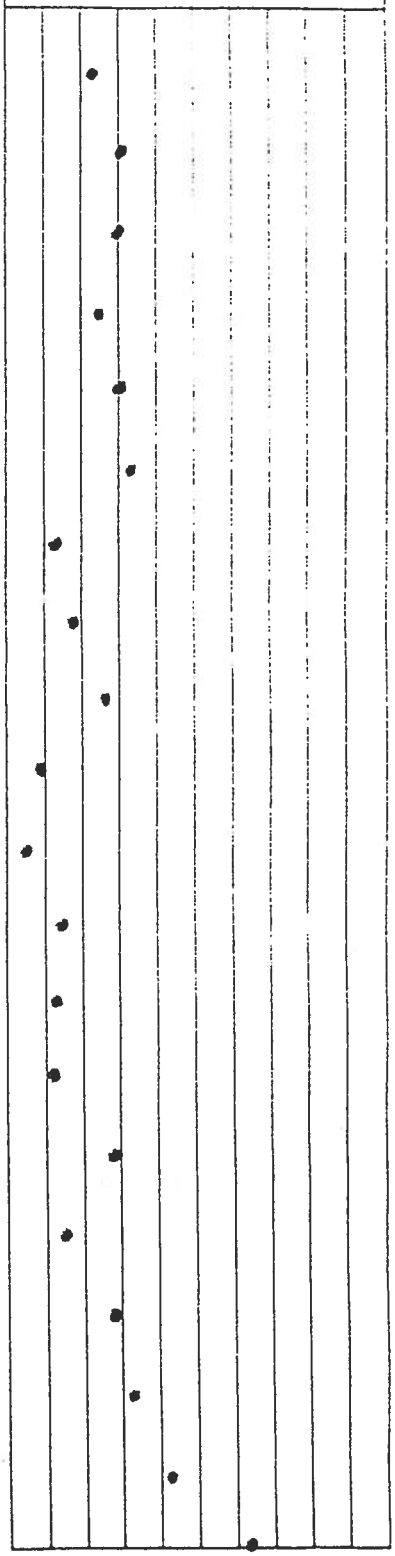
SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
	0.50		D	0.50	Grass on MADE GROUND, Dark grey silty clay	
			D	1.00	Black ash and cinder MADE GROUND Silt sizes with traces of fine to medium grained gravel	
			D			
			D	2.00		
			D			
			D	3.00		
			D			
			D	4.00		
			D			
	4.70		D	5.00	MADE GROUND hard iron ore and brick.	
			D			
	6.00		D	6.00	MADE GROUND brick, ash, cinder and iron ore.	
			D			
			D	7.00		
			D			
			D	8.00		
			D			
			D	9.00		
			D			
	9.80		D	1.00	MADE GROUND soft silty contaminated clay	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40



Ground water

Encountered at	NIL		
Standing level			

SHEET 1 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 5

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 9.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D		MADE GROUND soft silty contaminated clay	
			D	11.00		
			D			
	11.90		D	12.00		
					Firm brown silty CLAY	
	12.50		D			

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at

Standing level

SHEET 2 OF 2

SHEET No.

PROJECT: SPORTS FIELD

BOREHOLE NO.: 6

LOCATION: ACREFAIR

GROUND LEVEL: FIELD LEVEL

DIA OF CASING: 150 mm.

TYPE OF BORING: PERCUSSION DRILL

DATE DRILLED: 8.4.92

SCALE OF LOG: 1:50

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.50	Grass on MADE GROUND of ash and cinder Silt sizes up to fine grained gravel	
			D	1.00		
			D			
			D	2.00		
			D			
			D	3.00		
	3.50		D			
			D	4.00	MADE GROUND clay and shale	
	4.40		D			
			D	5.00	Firm brown silty CLAY with scattered medium grained gravel.	
	5.50		D			

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water

Encountered at	NIL		
Standing level			

SHEET 1 OF 1

SHEET No.

TABLE I

RESULTS OF CHEMICAL TESTS

Borehole No.	Sample Depths Metres	pH	gms/litre Sulphate Content 2:1 Water/Soil Extract	Cyanide ppm	Phenols ppm
1	0.50 1.00 1.50	7.0	0.2	<5	<5
	2.00 2.50 3.00 3.50	7.4	43.2	<5	<5
	4.00 4.50	7.3	0.2	<5	<5
	6.00	9.0	28.8	<5	420
	7.00 7.50	7.3	6.6	<5	<5
	8.00 9.00 10.00	7.2	1.2	<5	<5
2	0.50 1.00 1.50	7.0	1.1	<5	<5
	2.00 3.00 4.00 5.00	7.0	1.4	<5	<5
	5.50 6.50	5.1	0.3	<5	<5
	12.50	7.8	0.2	<5	<5
3	1.00 1.50	7.1	0.1	<5	<9
	2.50 3.50 4.50 5.50	6.7	3.2	<5	<5
	7.00 7.50	7.5	0.8	<5	135
	8.00	7.7	1.9	<5	<5
4	0.50 1.00	7.3	0.3	<5	<5
	1.50 2.00	7.1	5.7	<5	120
	2.50 3.50	8.2	32.9	<5	<5
	5.00 6.00 6.50	7.5	4.7	<5	<5

5	1.00	2.00	3.00	4.00	5.00	7.2	1.3	<5	<5
	6.50	7.00	8.00			7.5	0.8	<5	<5
	8.50	9.00	9.50	10.00		7.7	0.7	<5	<5
	10.50	11.50				7.7	0.8	<5	<5
6	0.50	1.00				7.9	0.1	<5	<5
	2.00	3.00				7.5	0.2	<5	<5
	5.00					7.8	0.1	<5	<5

TABLE II

RESULTS OF CHEMICAL TESTS

Test Pit No.	pH	gms/litre Sulphate Content 2:1 Water/Soil Extract	Cyanide ppm	Phenols ppm
1	7.4	0.1	<5	<5
2	6.9	<0.1	<5	<5
3	6.7	34.3	<5	<5
4	7.1	<0.1	<5	<5
5	6.5	<0.1	<5	<5
6	7.2	0.1	<5	<5
7	6.8	0.2	<5	<5
8	7.3	<0.1	<5	<5
9	6.8	0.2	<5	<5
10	6.7	0.1	<5	<5
11	6.8	<0.1	<5	<5

APPENDIX 'C'

SUMMARY OF DEPARTMENT OF ENVIRONMENT

GUIDELINES FOR SULPHATES

SUMMARY OF DEPARTMENT OF ENVIRONMENT
GUIDELINES FOR SULPHATE IN DEPOSITS

Method of Test BS 1377, 1990

Results are in grams per litre i.e. 1:1000

Guidelines give limits in milligrams per kilogramme which is the same as 1 part in 1,000,000

6.8 Sulphate

6.8.1 Summary of Possible Hazards

As sulphate concentrations on gas works sites as high as 20% have been observed, this will obviously be a 'priority contaminant' in most site investigations.

The potential hazards covered in Annex A (Section A.5) are summarised below.

- Ingestion of sulphate alone is unlikely to prove an acute or chronic hazard to humans.

  However, metal sulphates can be toxic. For instance, a level of 80,000mg/kg ferrous sulphate in soil may be acutely toxic to a small child eating one mouthful.

- High sulphate levels in soil may irritate sensitive skins.

- The potential for sulphate contamination of drinking water should be borne in mind. The acceptable level in drinking water is 250mg/l.

- Phytotoxic effects are not well documented and depend on other factors besides sulphate concentration, such as soil pH and total salt concentration in the soil.

  A reasonable phytotoxic threshold would appear to be 2,000mg/kg sulphate in soil.

- High sulphate levels in soil may lead to metal corrosion. However, there is no information on what sulphate levels in soil are significant for corrosion of metals.

- High sulphate levels may also lead to attack on concrete. No effect on concrete is likely if the concentration of total SO_3 is below 2,000mg/kg in soil or 300ppm in groundwater. At levels between 2,000mg/kg and 20,000mg/kg in soil, or 300-5000 ppm in groundwater, guidance is available as to the increasingly strict requirements for concrete to resist attack by sulphate. Above levels of 20,000mg/kg total SO_3 in soil, or 5000 ppm in groundwater, additional protection of concrete is required, e.g. by use of a protective coating.

  These levels apply to near neutral soil and in the absence of highly soluble sulphates, particularly ammonium. At significant ammonium levels and in acid conditions, additional precautions will be appropriate.

6.8.2 Threshold Trigger Value

The critical targets affected by sulphate contamination of soil are plants and building materials.

Since phytotoxicity and concrete attack are both likely to be a problem at sulphate levels in soil greater than **2,000mg/kg,** this is therefore proposed as the threshold trigger value for all end-uses. (For use category E, with no plants or buildings, corrosion of metal pipes is still a possibility.)

A caveat is necessary here in the case of building materials (concrete). Even below the threshold trigger value, some precautions may still be necessary in the presence of other contaminants, particularly acidity (as indicated by the threshold trigger value) and ammonium (for which insufficient information is available to set trigger values).

Above the threshold trigger value, it is necessary to specify concrete which will resist attack by sulphate.

6.8.3 Action Trigger Values

Domestic gardens, allotments and landscaped areas (use categories A, B, C)

For these end-uses the phytotoxic effect of sulphate is of primary importance. Unfortunately, few data are available.

A **tentative** action trigger value of **10,000mg/kg** sulphate in soil, five times the phytotoxic threshold for sensitive varieties, is proposed for these end uses.

Buildings (use category D)

For this end-use, plants are assumed not to be a critical target.

Levels of sulphate in soil above 20,000mg/kg require the additional protection of concrete, for example by use of a protective coating. The action trigger value is thus set at **20,000mg/kg** sulphate in soil.

It is emphasised that "action", in the sense of a protective coating in addition to the correct formulation of the concrete to provide sulphate resistance, may be necessary at levels between the threshold and action triggers, in the presence of either acidity or soluble sulphates (particularly ammonium). Professional judgement is required in the light of all the available information.

Hard-cover (use category E)

Where no buildings are to be constructed, no action trigger value for sulphate is set. However, appropriate precautions would be needed if, for example, concrete drainage channels were to be used.

6.3.4 Note on Analysis for Sulphate

The above levels of sulphate are for total sulphate. Where concrete is the critical target, the Building Research Establishment (BRE) recommend the use of a limited water extract to provide further more detailed information (Section A5.5.1). Analysis of pH, ammonium and possibly also sodium, potassium and magnesium, is required to enable a proper evaluation to be made.

TABLE III

ICRCL 59/83 (Second Edition): TABLE 3 TENTATIVE "TRIGGER CONCENTRATIONS" FOR SELECTED INORGANIC CONTAMINANTS

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed. All proposed values are tentative.

3. The lower values in Group A are similar to the limits for metal content of sewage sludge applied to agricultural land. 2(b) The values in Group B are those above which phytotoxicity is possible.

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentration, remedial action will be required or the form of development changed.

Contaminants		Planned Uses		Trigger Concentrations (mg/kg air dried soil)	
				Threshold	Action
Group A: Contaminants which may pose hazards to health					
Arsenic		Domestic gardens, allotments		10	*
		Parks, playing fields, open space		40	*
Cadmium		Domestic gardens, allotments		3	*
		Parks, playing fields, open space		15	*
Chromium (hexavalent) (1)		Domestic Gardens, allotments		25	*
		Parks, playing fields, open space			
Chromium (total)		Domestic gardens, allotments		600	*
		Parks, playing fields, open space		1,000	*
Lead		Domestic gardens, allotments		500	*
		Parks, playing fields, open space		2,000	*
Mercury		Domestic gardens, allotments		1	*
		Parks, playing fields, open space		20	*
Selenium		Domestic gardens, allotments		3	*
		Parks, playing fields, open space		6	*
Group B: Contaminants which are phytotoxic but not normally hazards to health					
Boron (water-soluble)	(3)	Any uses where plants are to be grown	(2, 6)	3	*
Copper	(4, 5)	Any uses where plants are to be grown	(2, 6)	130	*
Nickel	(4, 5)	Any uses where plants are to be grown	(2, 6)	70	*
Zinc	(4, 5)	Any uses where plants are to be grown	(2, 6)	300	*

NOTES:

* Action concentrations will be specified in the next edition of ICRCL 59/83.

1. Soluble hexavalent chromium extracted by 0.1M HCl at 37°C; solution adjusted to pH 1.0 if alkaline substances present.

2. The soil pH value is assumed to be about 6.5 and should be maintained at this value. If the pH falls, the toxic effects and the uptake of these elements will be increased.

3. Determined by standard ADAS method (soluble in hot water).

4. Total concentration (extractable by $HNO_3/HClO_4$).

5. The phytotoxic effects of copper, nickel and zinc may be additive. The trigger values given here are those applicable to the 'worst-case': phytotoxic effects may occur at these concentrations in acid, sandy soils. In neutral or alkaline soils phytotoxic effects are unlikely at these concentrations.

6. Grass is more resistant to phytotoxic effects than are most other plants and its growth may not be adversely affected at these concentrations.

TABLE 4 FILE

ICRCL 59/83 (Second Edition) TABLE 4: TENTATIVE "TRIGGER CONCENTRATIONS" FOR CONTAMINANTS ASSOCIATED WITH FORMER COAL CARBONISATION SITES

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed.

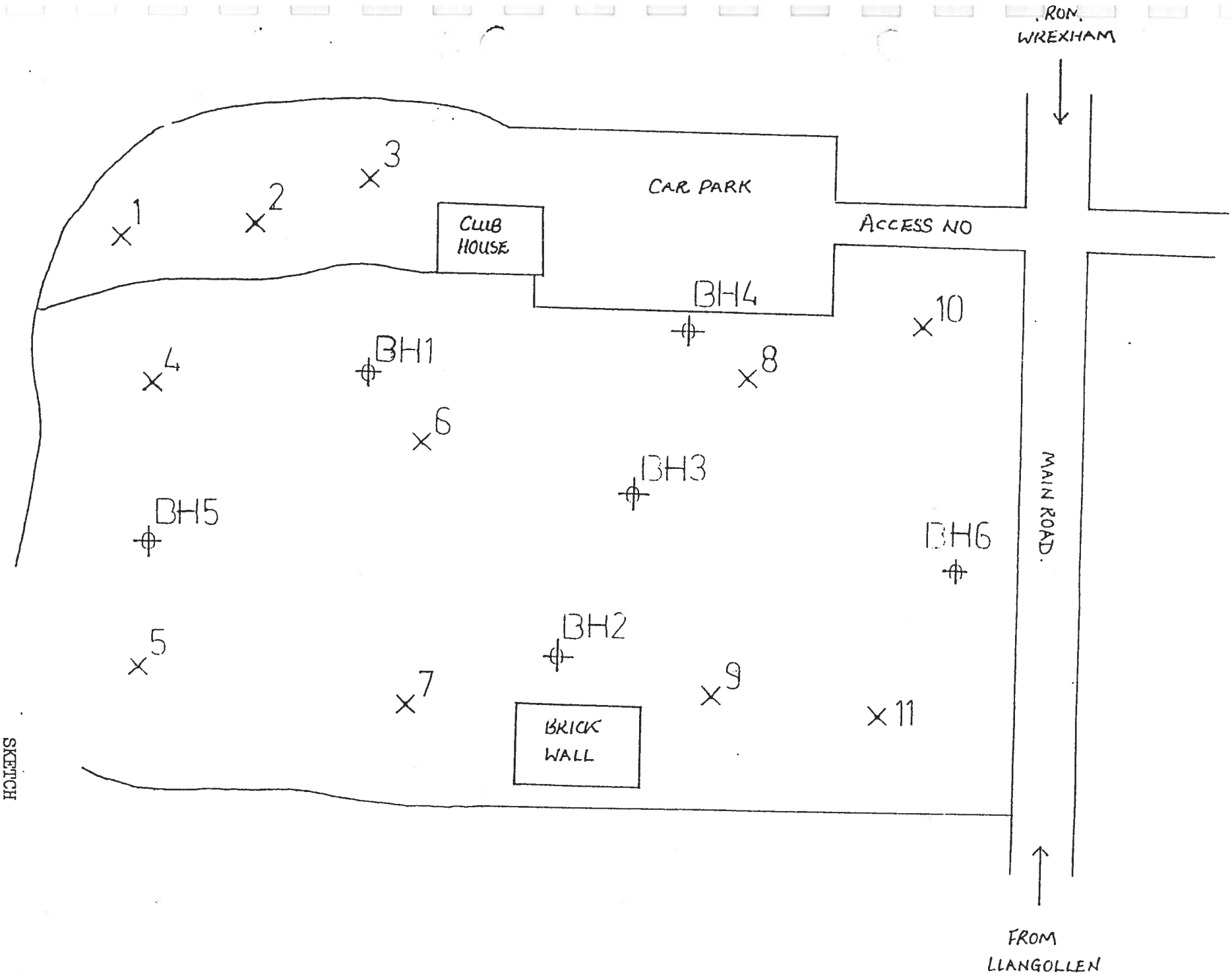
3. Many of these values are preliminary and will require regular updating. They should not be applied without reference to the current edition of the report "Problems Arising from the Development of Gas Works and Similar Sites"

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned, and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentrations, remedial action will be required or the form of development changed.

Contaminants	Proposed Uses	Trigger Concentrations (mg/kg air-dried soil)	
		Threshold	Action
Polyaromatic Hydrocarbons(1,2)	Domestic gardens, allotments, play areas.	50	500
	Landscaped areas, buildings, hard cover.	1000	10000
Phenols	Domestic gardens, allotments.	5	200
	Landscaped areas, buildings, hard cover.	5	1000
Free cyanide	Domestic gardens, allotments Landscaped areas.	25	500
	Buildings, hard cover.	100	500
Complex cyanides	Domestic gardens, allotments.	250	1000
	Landscaped areas.	250	5000
	Buildings, hard cover.	250	NL
Thiocyanate(2)	All proposed uses.	50	NL
Sulphate	Domestic gardens, allotments, landscaped areas.	2000	10000
	Buildings(3).	2000(3)	50000(3)
	Hard cover.	2000	NL
Sulphide	All proposed uses.	250	1000
Sulphur	All proposed uses.	5000	20000
Acidity (pH less than)	Domestic gardens, allotments, landscaped areas.	pH5	pH3
	Buildings, hard cover.	NL	NL

NOTES

NL: No limit set as the contaminant does not pose a particular hazard for this use.
(1): Used here as a marker for coal tar, for analytical reasons. See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" Annex A1.
(2): See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" for details of analytical methods.
(3): See also BRE Digest 250: Concrete in sulphate-bearing soils and groundwater.



SKETCH
BOREHOLE AND TEST PIT
LOCATION PLAN

APPENDIX C

Coal Mining Report -

British Coal

n Coal Corporation
g Reports Office
by Road, Burton on Trent,
ffordshire, DE15 0QD
hone: 0283-550606
: 34171 (CBTD G)
29281 BRETBY

British COAL

British Coal Corporation
Cost: £30.00
Plus V.A.T. £ 5.25
Total Received: £35.25
V.A.T. Reg. Number 239 0027 83

VERYARD & PARTNERS

	Initials	Signature
Partner	TB	
Associate	DJW	
Manager		
	26 JUL 1993	
Acknowledge		
Action	DPC	
To see		
File Ref.	RS0357	

Veryard And Partners
Consulting Engineers
Burton House
Rossett
Chester
LL12 0HY

This matter is being dealt with
by J.Egginton
Survey Dept. (Tel. 0283-550606 Extn. 31615)

Our Ref: 33/2743 SR097790-93

Your Ref: RS0357

Date: 22nd July 1993

Dear Sir,

Coal Mining Report
Works Social Club, Cefn.

I refer to your enquiry dated 1st July 1993 in connection with the above.

Past Underground Coal Mining

Coal has been mined at shallow to moderate depth under or within the vicinity of the property, the last date of working being 1912.

Present Underground Coal Mining

There are no workings presently taking place within influencing distance of the property.

Future Underground Coal Mining

Coal exists unworked in this locality although there are no present plans for future workings. Such coal could be worked at some time in the future depending on feasibility and on obtaining the necessary planning consents.

British Coal reserves the right to alter and amend its working proposals at any time should it be deemed necessary to do so.

British Coal have no record of having issued any notice of proposals relating to underground coal mining operations under S.46 of the Coal Mining Subsidence Act 1991.

Shafts and Adits

According to our records, which may not be complete, 6 shafts are situated under or close to the property.

British Coal will supply a plan showing the approximate position(s) of the above, if required, on application to the above address.

The fee will be £77.55 inclusive of VAT.

Cheques, money orders and postal orders should be made payable to BRITISH COAL and crossed "A/C Payee only". An official receipt will be provided in a form acceptable as a VAT invoice.

Surface Geology

This office is unaware of any fault, fissure or breakline at the surface which is known to affect the stability of the property.

Continued....

22-Jul-1993 15:50:21 2.9
SR097790-93

Stationery Group and other leading law stationery outlets.

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

Yours faithfully

K. Leighfield.

K. Leighfield
Chief Surveyor and Minerals Manager

British Coal Corporation
Mining Reports Office
Ashby Road, Burton on Trent,
Staffordshire, DE15 0QD
Telephone: 0283-550606
Telex: 34171 (CBTD G)
DX 29281 BRETBY

British COAL

British Coal Corporation
Cost: £66.00
Plus V.A.T. £11.55
Total Received: £77.55
V.A.T. Reg. Number 239 0027 83

Veryard And Partners
Consulting Engineers
Burton House
Rossett
Chester
LL12 0HY

This matter is being dealt with
by M.Buttress
Survey Dept. (Tel. 0283-550606 Extn. 31615)

Our Ref: SJ/2743 SR111657-93

Your Ref: RSO357 APC APJ

Date: 30th July 1993

Dear Sir,

Coal Mining Report
Works Social Club, Cefn.

I refer to your enquiry dated 27th July 1993 in connection with the above.

As requested I have indicated the mine entries referred to in our mining report for the above property on the attached plan. Additionally for your information I have plotted a further three shafts in the vicinity of the site boundary.

Please note that due to the varying age, scale and accuracy of plan information held by British Coal, plus projection difficulties, only approximate positions can be known.

British Coal has no record of what steps, if any, were taken at the time of abandonment to render the mine entries safe, or of any subsequent treatment afforded thereto.

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

Yours faithfully

K. Leighfield.

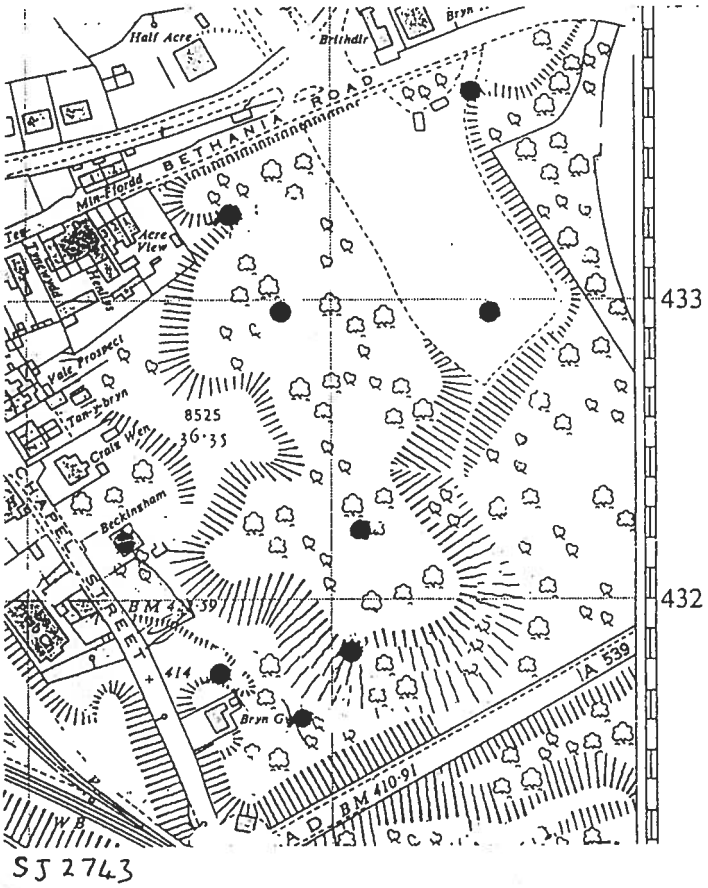
K. Leighfield
Chief Surveyor and Minerals Manager

TB
Manager
- 4 AUG 1993
Action APC
File Ref. RSO357

30-Jul-1993 15:50:55 2.9
SR111657-93

PLAN TO BE USED IN CONJUNCTION WITH COAL MINING REPORT

REFERENCE: 111657-93 DATE: 30-7-93



SCALE: 1:2500 approx

APPROXIMATE POSITION OF DISUSED MINE OUTLET SHOWN . . . . . ●

This plan shows the approximate location of known disused coal mine outlets under or close to the property to which the attached report relates. The outlet positions have been interpolated from plan information held by British Coal and there may be some inaccuracy in the plotted position.

The actual location of the outlet can only be established by physical inspection. Where this entails exploratory or excavation works the prior written approval of British Coal is required.

Reproduction from the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office.

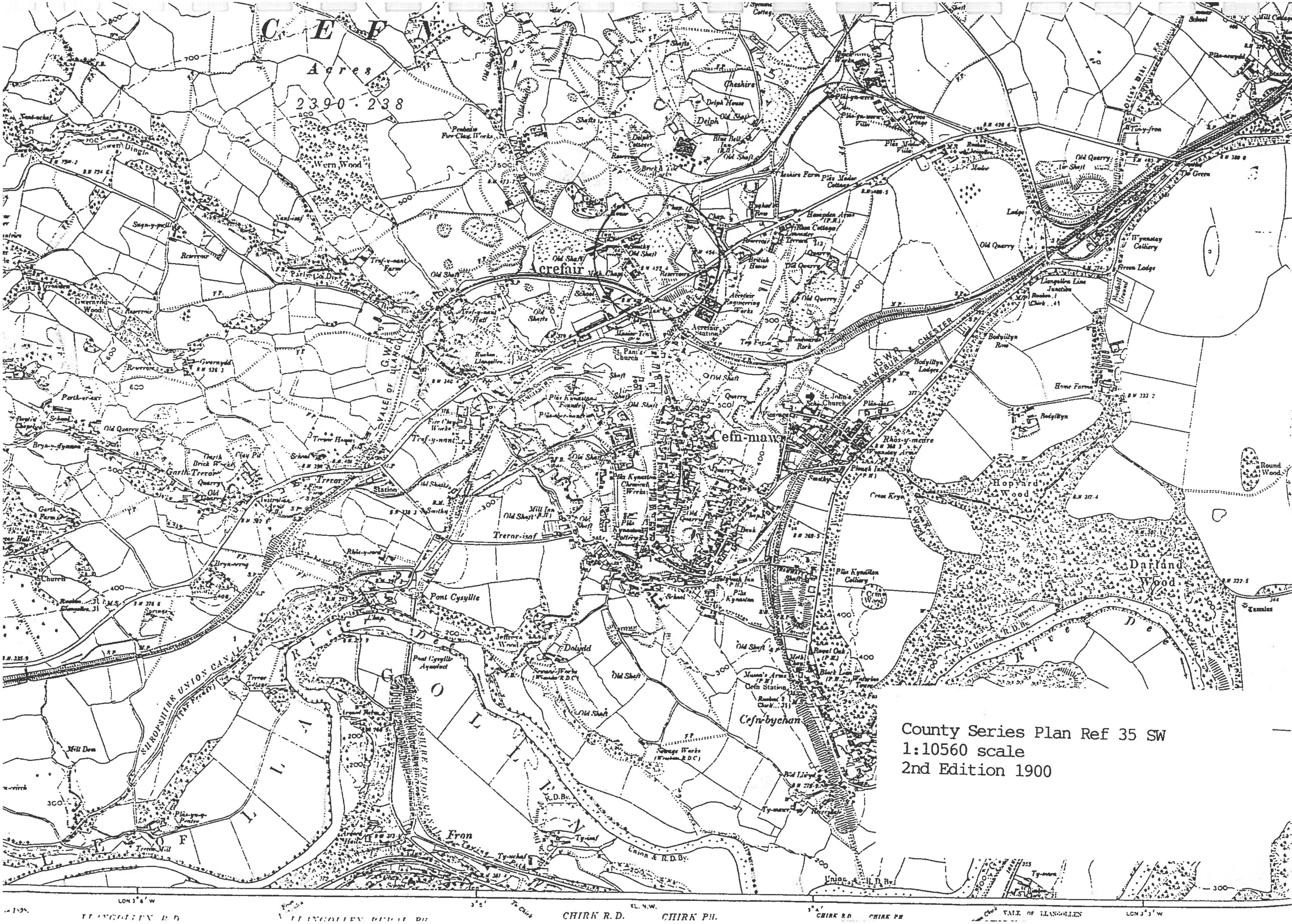
APPENDIX D

Past Ordnance and County Series Survey Plans

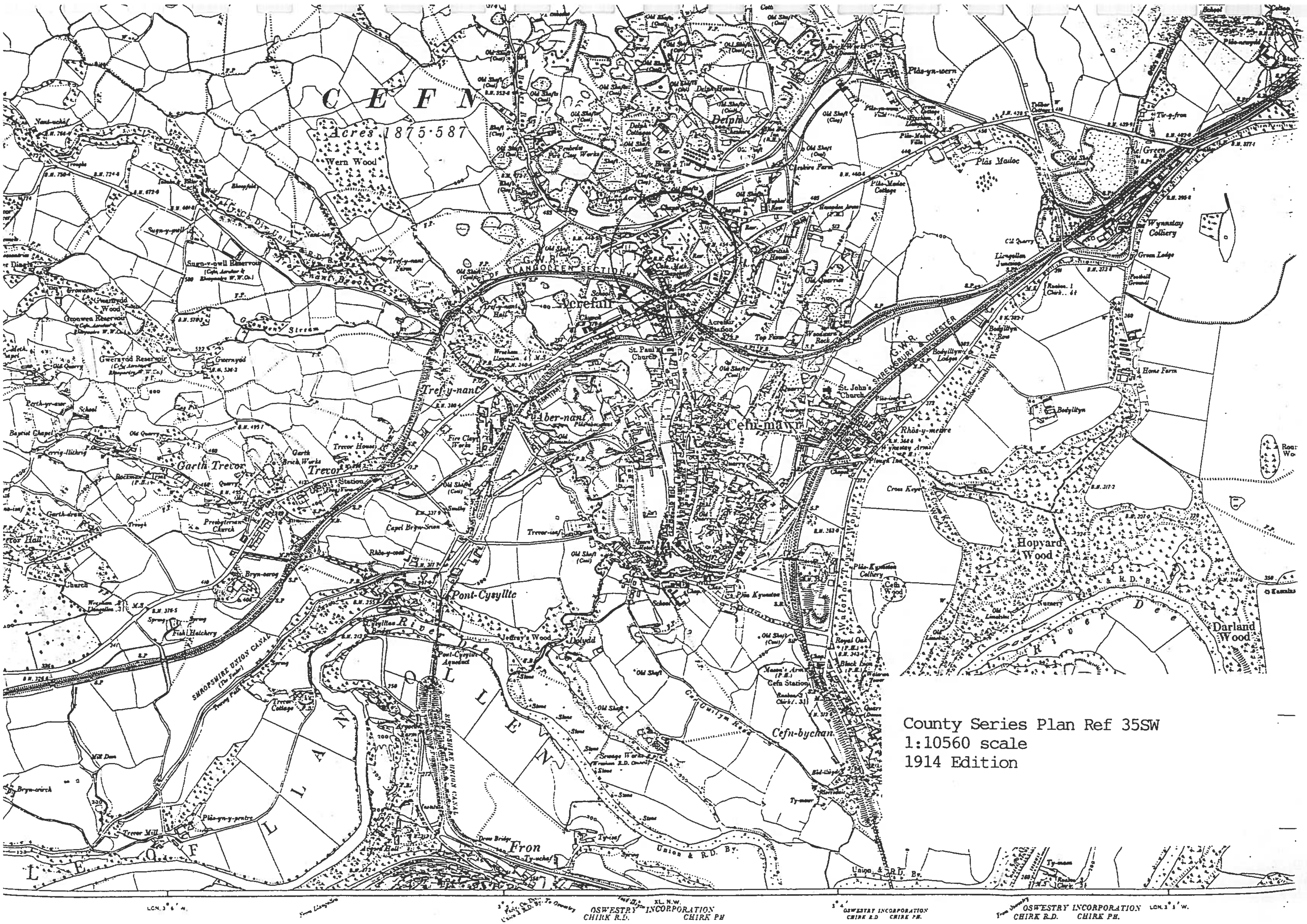
1:10,560 Scale Plans - 1914 Edition

1:10,560 Scale Plans - 1938 Edition

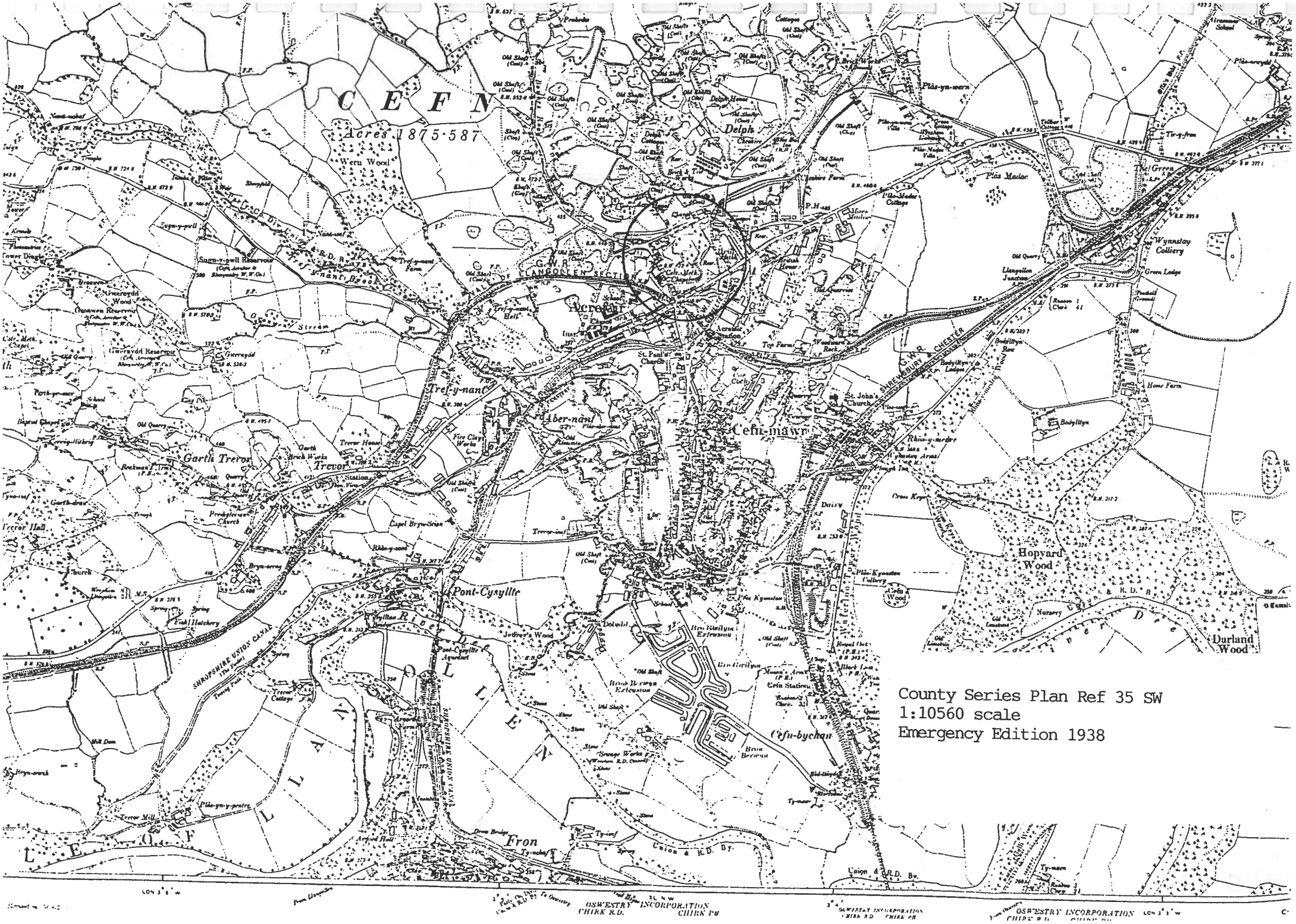
1:10,560 Scale Plans - 1949 Edition



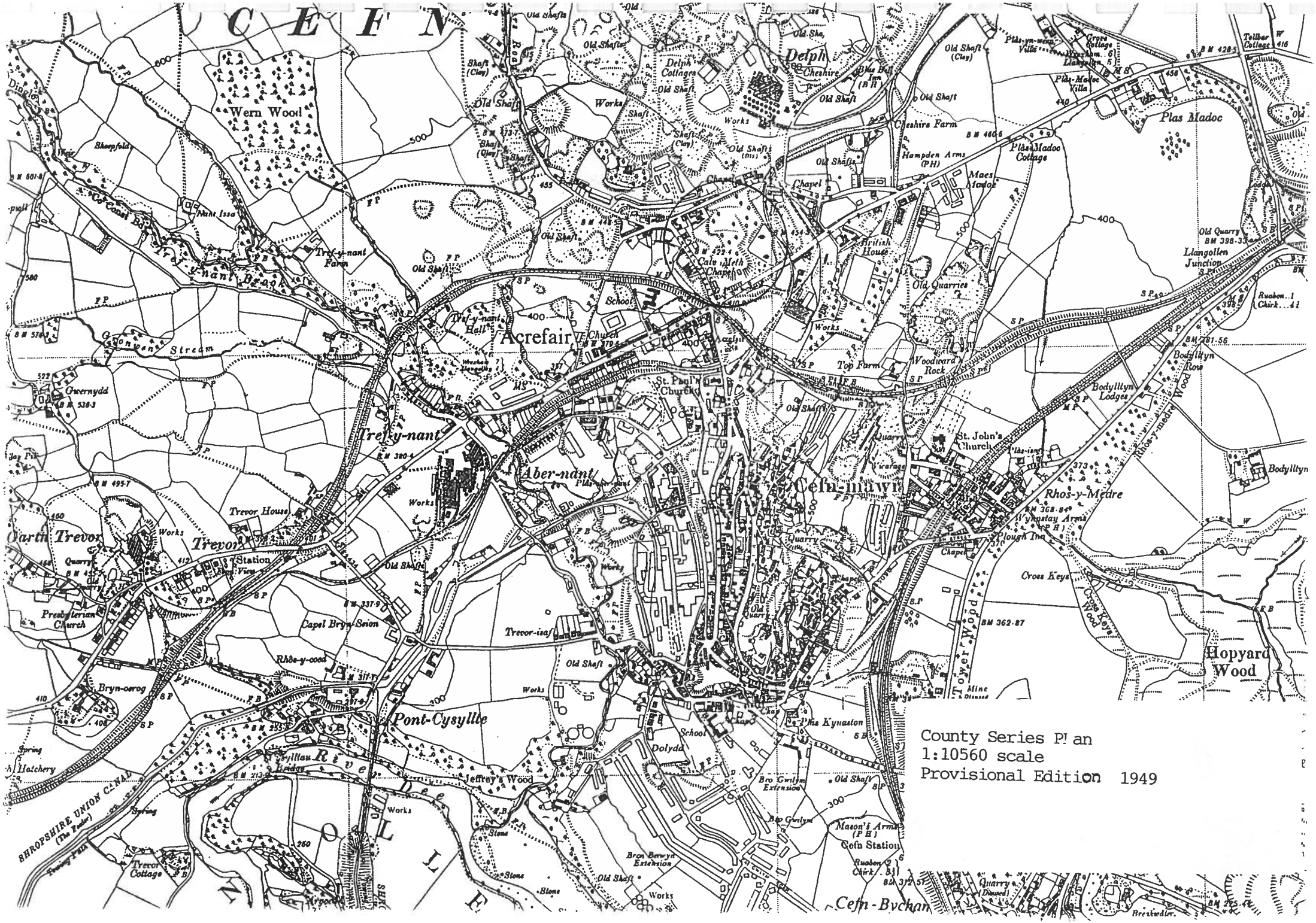
County Series Plan Ref 35 SW
1:10560 scale
2nd Edition 1900



C E F N
Acres 1875·587
Wern Wood
Plâs-yn-wern
Delph
Plâs Madoc
The Green
Wynnstay Colliery
Green Lodge
Home Farm
Bodyllyn
Acrefair
St. Paul's Church
St. John's Church
Tref-y-nant
Aber-nant
Cefn-mawr
Rhôs-y-medre
Garth Trevor
Trevor
Cross Keys
Hopyard Wood
Darland Wood
Pont-Cysyllte
River Dee
Cefn-bychan
Cefn Station
Fron
SHROPSHIRE UNION CANAL
SHREWSBURY & CHESTER G.W.R.
County Series Plan Ref 35SW
1:10560 scale
1914 Edition
OSWESTRY INCORPORATION
CHIRK R.D.
CHIRK PH.



County Series Plan Ref 35 SW
1:10560 scale
Emergency Edition 1938


CEFN
Wern Wood
Trefy-nant Brook
Trefy-nant Farm
Trefy-nant Hall
Acrefair
Parish Church
Methodist Chapel
School
Old Shafts
Old Quarries
Works
Delph
Delph Cottages
Cheshire
Cheshire Farm
Hampden Arms (PH)
Plas Madoc
Plas Madoc Cottage
Maes Madoc
British House
Llangollen Junction
Bodylltyn Rock
Bodylltyn Lodges
Bodylltyn
Rhos-y-medre Wood
Rhos-y-Medre
Wynnstay Arms (P H)
Plough Inn
St. John's Church
Vicarage
Woodward Rock
Top Farm
St. Paul's Church
Aber-nant
Cefn-mawr
Cross Keys
Cross Keys Wood
Hopyard Wood
Tower Wood
Mine
Trevor
Trevor Station
Trevor House
Garth Trevor
Presbyterian Church
Capel Bryn-Seion
Trevor-isaf
Rhôs-y-coed
Bryn-oerog
Pont-Cysyllte
Dolydd
Pen Kynaston
Bro Gwilym Extension
Bro Gwilym
Mason's Arms (P H)
Cefn Station
Bron Berwyn Extension
Cefn-Bychan
Jeffrey's Wood
Trevor Cottage
Aqueduct
Spring
Hatchery
Shropfold
Mant Issa
Gronwen Stream
Gwernydd
Old Coast Road
SHROPSHIRE UNION CANAL (The Feeder)
Ruabon
Chirk
Breidden
Quarry (Disused)
County Series Plan
1:10560 scale
Provisional Edition 1949

SUPPLEMENTARY GROUND INVESTIGATION REPORT 1994

ACREFAIR

CLWYD

SUPPLEMENTARY GROUND INVESTIGATION REPORT FOR THE AIR PRODUCTS SOCIAL CLUB

RS0357/DE/APC/DG

JANUARY 1994

CLIENT:

Air Products UK Limited
Acrefair
Wrexham
Clwyd
LL14 3HW

Tel: (0978) 810018
Fax: (0978) 810742

CONSULTING ENGINEER:

Veryards Limited
Burton House
Rossett
Clwyd
LL12 0HY

Tel: (0244) 571444
Fax: (0244) 570272

SECTION	CONTENTS	PAGE
1.0	INTRODUCTION	1
2.0	GROUND INVESTIGATION WORK	1
	2.1 Fieldwork	1
	2.2 Laboratory Work	1
3.0	CONCLUSIONS	2
4.0	RECOMMENDATIONS	3

DRAWINGS

RS0357/GI3 - Additional Borehole Location Plan

APPENDICES

A Factual Investigation Report

1.0 INTRODUCTION

Further to Veryards Limited's original commission, additional drilling was undertaken about the Air Products Work's Social Club to establish the presence of voids lying beneath the structure. The drilling depth was limited to 8 to 9 metres, the boulder bed acting as the marker horizon for hole termination (refer to Veryards Limited's report, reference RS0357/DE/APC/DG, dated January 1994).

2.0 GROUND INVESTIGATION WORK

2.1 Fieldwork

2.1.1 Fieldwork consisted of drilling a total of 12 rotary open holes to a 9 metre maximum depth. Borehole 6 was angled at 45° to assess the ground lying beneath the building foundation. All other holes were drilled vertically, placed as near to the building as possible.

2.1.2 The results of the drilling indicated the underlying ground down to a 3 to 6 metre depth to be in a very loose to soft condition with only 2 small voids at a 3 to 6 metre depth, proven to exist from the drilling programme.

2.2 Laboratory Work

2.2.1 Laboratory work included the particle size distribution determination of two mixed samples from the drilling operations, together with the chemical analysis of the soil.

2.2.2 The results of the particle size analysis indicated the material to be a very silty fine to coarse sand and fine to medium gravel. The analysis agrees favourably with the borehole descriptions from the recent and previous investigations. Whilst there is expected to be some modification to the grading envelope of the soil caused through the type of drilling technique, the descrepancy from the actual grading curve is not expected to be great.

2.2.3 The results of the chemical testing indicates sulphate concentrations to be high, 26.83% as expected (equivalent to approximately 270,000 ppm). The phenol concentration is also seen to be high at 78.3 ppm, far higher than the current ICLCR threshold value, although lying below the recommended figure for remedial action of 1,000 ppm.

3.0 CONCLUSIONS

3.01 The findings from drilling the 12 rotary percussion holes indicate the site to be underlain by very loose and soft ground to depths of 3 to 7 metres. There are small cavities within the general ground profile, together with hard spots comprised of a white crystalline sulphate salt. There is no evidence for ground water lying within 8 metres of ground surface although earlier investigations have recorded water seepages at depths of 5 metres.

3.02 The estimated allowable ground bearing pressure of the very loose sand and gravel is given to be 40 kN/m^3 for a 1 metre wide foundation reducing to 25 kN/m^2 for a 3 metre wide foundation.

3.03 The very silty nature of the fill material, together with the existence of voids, albeit small and the presence of the sulphate salt, provides the potential for ground settlement caused through fines and chemical migration of the soil deposits, followed by void collapse or gradual recompaction of the soil.

3.04 It is anticipated that the Social Club has been saved from experiencing large foundation settlements by the absence of a permanent ground water table, which would have had a tendency to remove fines from beneath the building, causing progressive foundation failure.

3.05 The broken drain run, situated within the north eastern corner of the structure, is suspected as being the main cause for the initiation of the present building settlement. The continuous discharge of water passing through the ground beneath the building foundation is expected to have removed fines from the ground, thus reducing the ground bearing pressure.

4.0 RECOMMENDATIONS

4.01 That section of the building undergoing settlement requires underpinning to prevent further foundation settlement.

4.02 Partial underpinning of the structure may allow for a greater differential settlement across the foundation, i.e., between the underpinned and non-underpinned areas. It is, therefore, recommended that periodic monitoring be carried out after any improvement work has been completed to assess the future movement of the remaining non-underpinned foundation.

4.03 Underpinning is expected to be either by piling down through the fill, boulder horizon and boulder clay to rest upon rockhead below or by grouting the area beneath the failing foundation down to the boulder horizon at a 7 metre depth.

4.04 The very high sulphates present within the ground will require special precautions against concrete attack. Piled foundations will probably require permanent metal sleeving and sulphate resisting cement to prevent rapid deterioration of the improvement measures.

4.05 Whilst the phenol concentration lies below the remedial action concentration, it is recommended that the full Health and Safety measures be undertaken to prevent sulphate and phenol exposure to any labour force involved in the underpinning works.

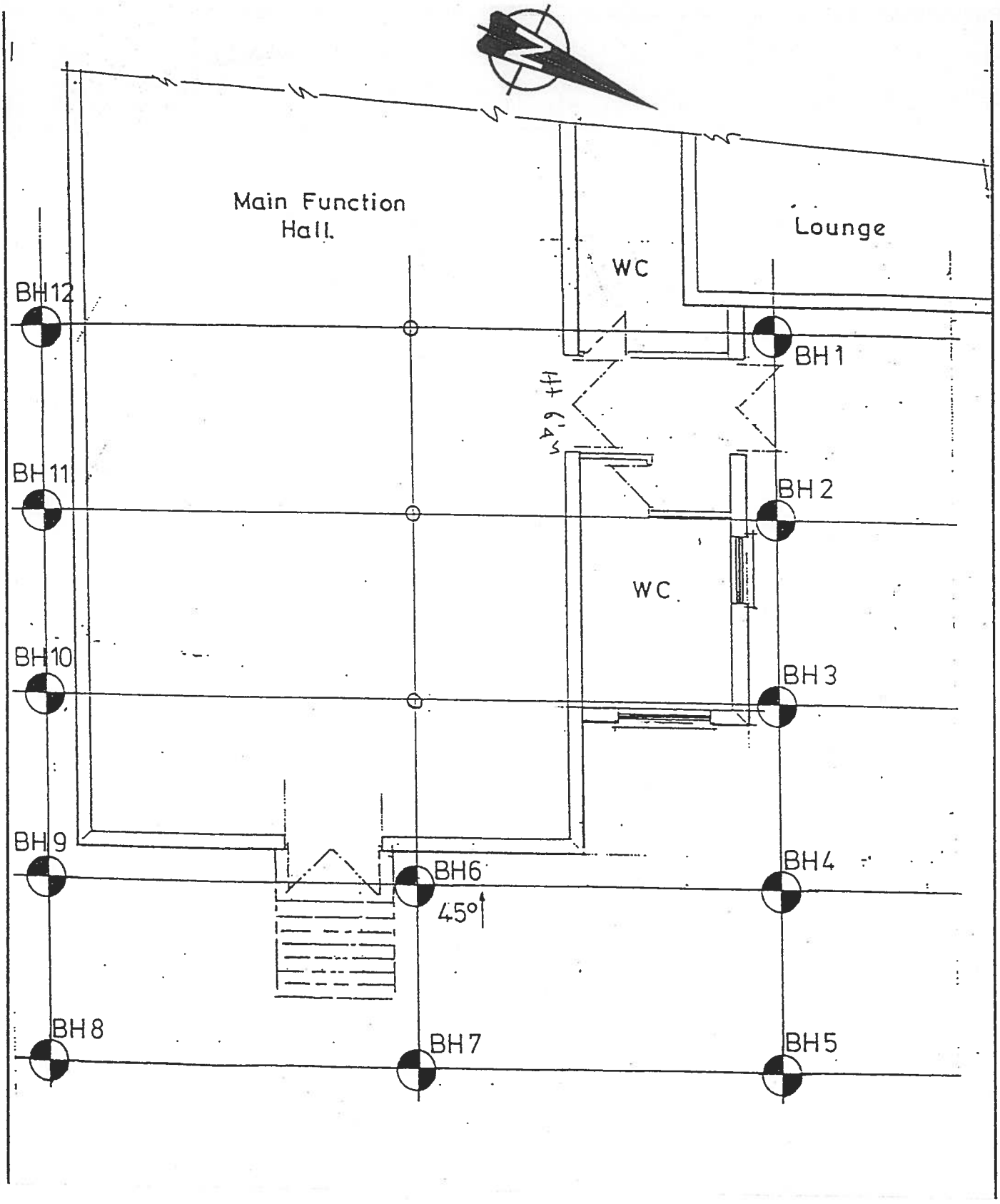
.....

A P Cumber
Veryards Limited

RS0357/DE/APC/DG
5 January 1994

DRAWINGS

RS0357/GI3 - Additional Borehole Location Plan



Project: **Air Products Work's Social Club, Acrefair**				Verdard & Partners CONSULTING ENGINEERS	
Title: **Additional Borehole Location Plan**				TEL. FAX	
Scale: **1:200**	Date: **Jan'94**	Drawn: **APC/CAJ**	Checked:	No. **RS0357** / **GI 3**	Rev.

APPENDIX A

Factual Investigation Report

Exploration Associates, Geotechnical House, 18 Deeside Industrial Estate, Welsh Road
Deeside, Clwyd, CH5 2LR. Tel: (0244) 288200

Air Products, Works Social Club, Acrefair

Factual Report on Ground Investigation

123145
December 1993

Client:
Veryard and Partners
Consulting Engineers
Burton House
Rossett
Clwyd
LL12 0HY

CONTENTS

123145

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1.	INTRODUCTION	1
2.	THE SITE	1
3.	FIELDWORK	1
4.	LABORATORY TESTING	2
5.	GROUND CONDITIONS	3

5.1 Published Geology
5.2 Strata Encountered
5.3 Groundwater

REFERENCES

ENCLOSURES

A Borehole Records & SPT Summary
B Laboratory Testing (Physical)
C Laboratory Testing (Chemical)
D Drawings

APPENDICES

A General Notes
B Summary of Descriptive Methods

1. INTRODUCTION

It is proposed to investigate subsidence affecting parts of the Air Products, Works Social Club at Acrefair, Clwyd. On the instructions of Veryard and Partners, Consulting Engineers to Air Products Limited, an investigation was made by Exploration Associates, a division of Entec Europe Limited, to provide information on the ground conditions for the design and construction of the proposed works. A factual report only was requested by Veryard and Partners in a letter ref: RS0357/APC/AMB dated 7th September 1993.

The report contains descriptions of the fieldwork and laboratory testing carried out, summaries of the ground and groundwater conditions revealed and results of tests, measurements and descriptions made in the field and in the laboratory.

The report supplements an earlier investigation carried out at the site by Exploration Associates and reported in September 1993 (Ref D3101).

The investigation was carried out in general accordance with the relevant British Standards[1,2]. General notes on the techniques employed during site investigations carried out by Exploration Associates are given in the appendices.

2 THE SITE

The social club is located at National Grid reference SJ 279432 as shown on the Site Location Plan (Drawing 1) and occupies the site of an old industrial waste tip.

3 FIELDWORK

The fieldwork was carried out during the period 29th September to 4th October 1993.

Twelve boreholes were sunk at the positions shown on the Borehole Location Plan (Drawing 2) by open-hole drilling methods using air flush to depths of between 4.00m (Borehole 12) and 9.00m (Boreholes 1, 2, 3 and 4). The depths of the boreholes, descriptions of the strata encountered and comments on the groundwater conditions revealed during the fieldwork operations are given on the borehole records (Enclosure A). Borehole 6 was drilled at an angle of 45° to intercept ground beneath the Clubhouse.

Disturbed samples were taken at the depths shown on the borehole records. However, generally very poor or no air flush returns were obtained during open hole drilling which has led to difficulties in producing accurate borehole records.

Standard Penetration Tests (split barrel sampler and cone) were carried out in the fill materials encountered in Borehole 1, to assess the relative density or hardness of the materials and to assist with sample collection. Values of penetration resistance are presented in Enclosure A both on the borehole record and on sheet SPT1.

The samples were despatched to the laboratory at Deeside, Clwyd for examination and testing. The descriptions of strata, given on the records, were made where possible, in general accordance with the recommendations given in BS 5930; 1981[1] but modified in accordance with the procedures outlined in the appendices.

The exploratory hole positions were set out by a representative of Veryard and Partners.

On completion of drilling, boreholes were backfilled to ground level with cement/bentonite grout.

4 LABORATORY TESTING

The laboratory work was scheduled by Veryard and Partners.

The principal objectives of the testing programme were: to classify the main types of made ground, to establish the general background contaminant levels and to determine the chemical composition of the crystalline waste.

The soil classification tests were carried out generally according to BS 1377; 1990[2].

The physical tests carried out were.

- Particle size distribution 2

The results of the physical laboratory tests are included in Enclosure B.

Specialist chemical testing was performed by Geochem Group Limited on a combined sample from Boreholes 1, 8 and 11.

The test carried out were:

- ICP Analysis for heavy metals
- Sodium
- Chromium (Hex)
- Total cyanide
- Free cyanide
- Naphthalene (PAH)
- Total phenol
- Thiocyanate
- Total sulphate

- Soluble sulphate
- Sulphide

- Free sulphur
- pH
- Volatile scan

The results of the chemical laboratory tests are given in Enclosure C.

5. GROUND CONDITIONS

5.1 Published Geology

Geological records[3] indicate that the site is underlain by glacial till (recorded as boulder clay) overlying rocks of the Middle Coal Measures of Carboniferous age.

The coal measures rocks dip at a shallow angle (between 10 and 20°) towards the south east. Minable or potentially already mined coal seams would include: Stone and Half-yard Coals, Ruabon Coal and Wall-and-Bench Coal.

5.2 Strata Encountered

Made ground was encountered in all of the boreholes. However, the poor sample recovery from the open hole drilling and the nature of the waste tip materials have made correlation between boreholes difficult. It would seem that all of the boreholes terminated within the waste, although it is possible that clayey deposits found at the base of Boreholes 3, 4 and 5 represent the top of the glacial till (boulder clay) referred to in Section 5.1.

The most common waste material encountered at or near to ground level is typically dark brown or black fine to coarse grained sand/gravel with varying amounts of ash, brick and clinker. The thickness of this material is not clear but may be upto 3 or 4 metres.

Beneath the black sands and gravels, most boreholes, where samples were obtained, indicated a layer of pale to dark brown or grey fine to medium sand with gravel of off-white translucent to opaque crystals. In appearance the crystals are similar to 'washing soda' and have a characteristic 'sweet' odour. Incomplete sampling has not allowed an assessment of the lateral variation in thickness to be made, however, the 'crystal sands' were encountered to depths of up to 7.80m. There is some indication, notably at Borehole 11, and also at Boreholes 8 and 9 that the 'crystal sands' are interbedded with and underlain by the black sand and gravel with ash described above.

Information on the relative density of the waste materials is available from a series of standard penetration tests performed in Borehole 1. The results indicate that the black sands and gravel occurring close to ground level are very loose, while the 'crystal sands' are very dense. However, this correlation

along with drillers descriptions of resistance to drilling progress should be used with caution.

5.3 Groundwater

Groundwater was not encountered in any of the boreholes.

For and on behalf of Exploration Associates



P.D. Shelton
Senior Engineering Geologist



J.P. Leavy
Principal Engineer

Exploration Associates
PDS/JPL/KAB/123145/November 1993

REFERENCES

1. BS 5930 ; 1981. Code of Practice for Site Investigations. British Standards Institution.

2. BS 1377 Parts 1 to 9; 1990. Methods of Test for Soils for Civil Engineering Purposes. British Standards Institution.

3. British Geological Survey. 1:63,360 series, Geological Survey of England and Wales. Sheet No 121. Solid and Drift.

ENCLOSURE A

Borehole Records

	Sheet
List of Symbols	Key Sheet
Borehole Records	BH1 to BH12
SPT Summary	SPT1

KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	:	Drillers Description

SAMPLES

U ( )	:	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U ( )F, U ( )P	:	F - not recovered, P - partially recovered
U38	:	Undisturbed 38mm diameter sample
P(F),(P)	:	Piston sample, F - not recovered, P - partially recovered
B	:	Bulk sample - disturbed
D	:	Jar Sample - disturbed
W	:	Water Sample
CBR	:	California Bearing Ratio mould sample
G	:	Gas Sample and depth of hole at time of sampling

CORE RECOVERY AND ROCK QUALITY

TCR	:	Total Core Recovery %
SCR	:	Solid Core Recovery %
RQD	:	Rock Quality Designation %
FI	:	Fracture Index (discontinuities per metre) NI - not intact, NR - not recordable, NA - not applicable

GROUNDWATER

$\underline{\nabla}$	:	Groundwater strike
$\underline{\blacktriangledown}$	:	Groundwater level after standing period
Date/Water	:	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date.

IN SITU TESTING

S	:	Standard Penetration Test - split barrel sampler
C	:	Standard Penetration Test - solid 60° cone
V(H)(R)	:	Vane Test (Hand) (R) demonstrates remoulded strength
K(F), (C), (R), (P)	:	Permeability Test (falling, constant or rising head, packer)
PT	:	Pressuremeter Test
HP	:	Hand Penetrometer Test

MEASURED PROPERTIES

N	:	Standard Penetration Test - blows required to drive 300mm after seating drive
$^{x}/_{y}$	:	Denotes x blows for y mm within the Standard Penetration Test
$^{x*}/_{y}$	:	Denotes x blows for y mm within the seating drive
c_u	:	Undrained Shear Strength (kN/m^2)
CBR	:	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	NOMINAL DIAMETER (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

Exploration Associates	Project Air Products, Works Social Club, Acrefair Veryard and Partners	Contract 123145 Key Sheet

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			04/10 1993	
1.50-1.95	SD		DRY	2
2.00-2.38	S		DRY	48/
2.00-3.00	D			225
3.00-3.15	S		DRY	50*/
3.00-4.00	D			150
4.00-4.15	S		DRY	50*/
4.00-5.00	D			150
5.00-5.15	S		DRY	50*/
5.00-6.00	D			150
6.00-6.15	S		DRY	50*/
6.00-9.00	D			150

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Black, very gravelly fine, medium and coarse grained sand with fragments of brick, ash and cinders.	G.L. (2.00)	
MADE GROUND: Soft, dark brown silty clay.	2.00	
MADE GROUND: Very dense, off white to light brown, opaque to translucent crystalline deposit (rocksalt, soda?) breaking down to fine, medium and coarse grained sand and fine and medium gravel.	2.30 (3.70)	
MADE GROUND: Hard gravel, cobbles and boulders.**	6.00	
	9.00	

Legend

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 9.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. 100% air flush returns to 6.20m.
2. 0% air flush returns 6.20 to 9.00m.
3. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 1(1 of 1)

Sampling

Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water
			01/10 1993 DRY

Strata

Description	Depth (Thickness)	Level	Legend
MADE GROUND: Gravel and cobbles with brick fragments**	G.L.		
From 2.90m to 3.60m: becoming softer.**			
From 3.60m to 3.90m: hard, with gravel and cobbles.**			
From 3.90m to 6.00m: becoming firm.**			
From 6.00m to 6.80m: gravel and cobbles.**			
From 6.80m to 7.90m: becoming clayey.**			
From 7.90m to 9.00m: becoming hard.**			
End of Borehole.	9.00		

9.00

Equipment: Truck Mounted Rotary Coring Rig (HE50) Air Flush

Borehole Dia (mm) 150 to 9.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. Service inspection pit excavated to 1.30m.
2. No samples recovered.
3. 0% air flush return to 9.00m.
4. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 2(1 of 1)

Sampling

Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water
			01/10 1993 DRY
9.00			

Strata

Description	Depth (Thickness)	Level	Legend
MADE GROUND: Gravel, brick and rubble hardcore**	G.L.		
From 2.80m to 3.20m: loose gravel.**			
From 3.20m to 4.00m: becoming clayey.**			
From 4.00m to 5.70m: becoming softer.**			
From 5.70m to 6.90m: gravel, cobbles and boulders.**			
From 6.90m to 9.00m: stiff clay.**			
End of Borehole.	9.00		

Equipment: Truck Mounted Rotary Coring Rig (HE50) Air Flush

Borehole Dia (mm) 150 to 9.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. No samples recovered.
2. 0% air flush return to 9.00.
3. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 3(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.20-1.50	D		29/09 1993	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Black, very gravelly fine, medium and coarse grained sand with fragments of brick, limestone chippings and ash.	G.L.	
From 5.16 to 8.20m: hard gravel, cobbles and boulders.**		
From 6.96 to 7.00m: void.**		
From 8.20 to 9.00m: firm clay.**	9.00	

Legend

Equipment: Truck Mounted Rotary Coring Rig (HE50). Air Flush.

Borehole Dia (mm) 150 to 9.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. No samples recovered below 1.50m.
2. 0% air flush return to 9.00m.
3. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 4(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			29/09 1993	
0.30-0.60	D			
0.60-1.00	D			

Strata

Description	Depth (Thickness)	Level	Legend
	G.L.		
MADE GROUND: Black, very gravelly fine, medium and coarse grained sand with fragments of brick, limestone chippings and ash Below 0.60m: limestone chippings absent, but with occasional clinker and cinder fragments.			
From 0.80 to 6.00m: very soft (no resistance to drilling progress).**			
From 3.00 to 3.20m: gravel and cobbles.**			
From 5.60 to 5.80m: gravel and cobbles.**			
From 6.00 to 6.70m: gravel, cobbles and boulders.**			
From 6.70 to 7.40m: becoming soft.**			
From 7.40 to 8.30m: gravel, cobbles and boulders.**			
From 8.30 to 8.70m: firm clay.**			
From 8.70 to 8.90m: hard boulder.**			
	8.90		

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 8.90m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. No samples recovered below 1.00m.
2. 0% air flush return to 8.90m.
3. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 5(1 of 1)

Sampling

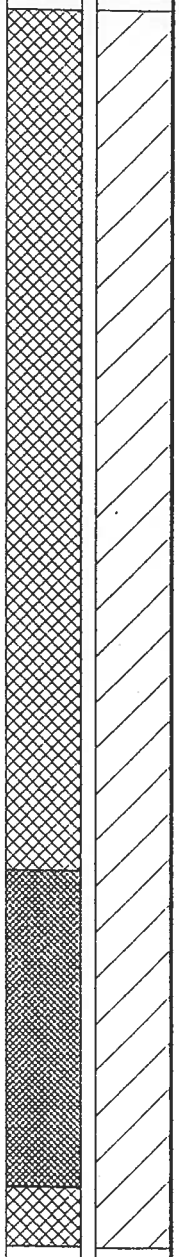
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			01/10 1993	
5.70-7.80	D			

Strata

Description	Depth (Thickness)
MADE GROUND: Soft material, no recovery.**	G.L.
	(5.70)
MADE GROUND: Light grey fine sand with occasional fine gravel.	5.70
	(2.10)
MADE GROUND: Hard gravel, cobbles and boulders.**	7.80
	8.20

Level

Legend



Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 8.20m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. Borehole drilled at 45 degree angle.
2. No samples recovered from GL - 5.70m.
3. 0% air flush return to 5.70m.
4. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 6(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			29/09 1993	
0.00-1.50	D			

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Dark brown, fine and medium grained sand with fragments of brick and ash.	G.L.	
From 1.50 to 5.80m: very soft, becoming soft (no resistance to drilling progress).**		
From 4.60 to 4.80m: hard band.**		
From 5.80 to 7.20m: hard gravel and cobbles.**		
From 7.60 to 7.90m: very hard cobbles and boulders.**	7.90	

Legend

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 7.90m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. No samples recovered from 1.50 to 7.90m.
2. 0% air flush return from 1.50 to 7.90m.
3. Borehole grouted to ground level.
4. Becoming damp below 6.50m.**

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 7(1 of 1)

Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
			30/09 1993 DRY			G.L.		
0.20-0.50	D				MADE GROUND: Stiff, dark grey silty clay with gravel of cinder, ash and slate.	(0.50)		
						0.50		
0.80-1.30	D				MADE GROUND: Black, very sandy fine and medium gravel of ash, cinder and clinker.	(2.60)		
						3.10		
					VOID	(0.50)		
3.60-4.00	D					3.60		
4.20-5.00	D				MADE GROUND: Dark brown, fine, medium and coarse grained sand with occasional fine gravel of light brown (soda?) crystals.			
5.00-6.00	D				From 4.20 to 6.20m: becoming light grey and light brown fine grained sand with off-white fine and medium angular gravel (sweet odour).	(3.90)		
6.20-6.60	D				From 6.20 to 6.60m: becoming angular gravel including (soda?) crystals (sweet odour).			
7.50-7.90	D					7.50		
					MADE GROUND: Black, fine, medium and coarse sand with gravel of ash and cinder.	8.00		

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 8.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks 1. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 8(1 of 1)

Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
			30/09 1993			G.L.		
0.20-0.80	D		DRY		MADE GROUND: Black, fine medium and coarse grained sandy gravel of ash and clinker and some firm, friable dark grey silty clay.			
						(5.80)		
					From 3.70 to 4.20m: hard gravel.**			
					From 4.20 to 4.40m: becoming soft.**			
					From 4.40 to 4.80m: hard gravel and cobbles.**			
4.80-5.80	D				From 4.80 to 5.80m: becoming black sandy fine and medium gravel of ash and cinder.**			
5.80-6.00	D					5.80		
6.00-7.20	D				MADE GROUND: Dark brown becoming light brown and grey fine and medium gravel of crystalline material (soda?) strong sweet/inky odour.	(1.40)		
7.20-7.60	D				MADE GROUND: Dark brown-black fine, medium and coarse sand with gravel.	7.20		
						8.50		

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 8.50m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks 1. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair
Veryard and Partners

Contract 123145

Borehole 9(1 of 1)

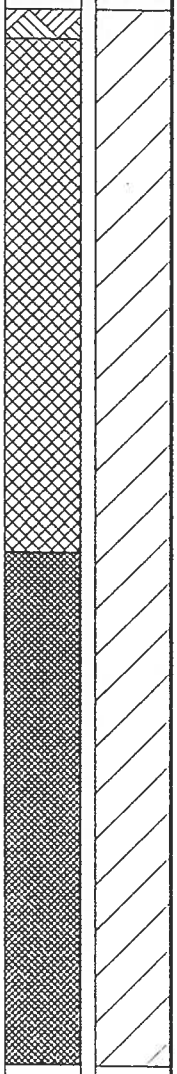
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			30/09 1993 DRY	
3.60-5.50	D			
5.50-7.00	D			

Strata

Description	Depth (Thickness)	Level
	G.L.	
TOPSOIL**	0.20	
MADE GROUND: Soft, sandy (damp).**	(3.40)	
From 3.40 to 3.60m: becoming gravelly.**		
MADE GROUND: Dark grey becoming light brown and grey fine and medium sandy angular gravel, including off-white crystalline material (soda?).	3.60	
	7.00	

Legend



Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 7.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks

1. Damp below 0.20m.
2. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 10(1 of 1)

Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
0.10-1.50	D		30/09 DRY3		MADE GROUND: Dark brown, slightly clayey fine, medium and coarse very gravelly sand with occasional fragments of brick and cinders.	G.L.		
1.50-2.80	D				Below 1.50m: becoming light brown, very sandy fine and medium gravel of crystalline material (soda?).			
2.80-3.90	D				Below 2.80m: becoming black very sandy fine and medium gravel of ash and cinder.			
3.90-4.20	D				Below 3.90m: becoming grey gravelly fine and medium grained sand (strong sweet odour) .			
					From 6.20 to 7.20m: becoming off-white gravel of crystalline material (soda?) with paper waste.**			
					From 7.20 to 8.00m: becoming gravel and cobbles.**	8.00		

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 8.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks 1. Borehole grouted to ground level

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 11(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.20-2.00	D		30/09 1993 DRY	
2.00-4.00	D			

Strata

Description	Depth (Thickness)	Level	Legend
MADE GROUND: Light brown very sandy fine and medium gravel of crystalline material (soda?) with a strong sweet odour.	G.L.		
	4.00		

Equipment: Truck Mounted Rotary Coring Rig (HE50), Air Flush.

Borehole Dia (mm) 150 to 4.00m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Drilled by MN
Logged by JL
Checked by

Remarks 1. Borehole grouted to ground level.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Air Products, Works Social Club, Acrefair Veryard and Partners

Contract 123145

Borehole 12(1 of 1)

Test			Blows						
BH	Depth	Type	Seating Drive		Test Drive				'SPT' N
			75mm	75mm	75mm	75mm	75mm	75mm	
1	1.50 - 1.96	S	1			1		1	2
1	2.00 - 2.38	S	1	1	1	1	46/ 75		48/ 225
1	3.00 - 3.15	S	15	35/ 75					50*/ 150
1	4.00 - 4.15	S	20	30/ 75					50*/ 150
1	5.00 - 5.15	S	20	30/ 75					50*/ 150
1	6.00 - 6.15	C	20	30/ 75					50*/ 150

Remarks N Value: x*/y denotes x blows for y mm penetration within the seating drive. Type: S = Split Barrel
x/y denotes x blows for y mm penetration beyond the seating drive. C = Solid Cone

Form 4/0

Standard Penetration Test

Exploration Associates

Project
Air Products, Works Social Club, Acrefair
Veryard and Partners

Contract 123145

SPT/1

ENCLOSURE B

Laboratory Test Results (Physical)

	Sheet
List of Symbols	Key Sheet
Summary of tests carried out including sample descriptions	L1/1
Results of particle size distribution tests	L2/1 to L2/2

KEY TO SYMBOLS ON LABORATORY TEST RESULTS SHEETS

U	Undisturbed Sample
P	Piston Sample
B	Bulk Sample - Disturbed
D	Jar Sample - Disturbed
W	Water Sample
pH	Acidity/Alkalinity Index
SO_3	Total Sulphate Content (acid) - Soluble Sulphate
++	Soluble Sulphate Content (2:1 Water/Soil extract)
I_p	Plasticity Index
$\underline{\%}$	% of material in sample passing 425 micron sieve
w_L	Liquid Limit
w_p	Plastic Limit
w	Water Content
γ_b	Bulk Density
U	Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
T	Single Stage Triaxial
M	Multistage Triaxial
100/40	Sample Diameter (mm)
REM	Remoulded Triaxial Test Specimen
LVT	Laboratory Vane Test
DSB	Drained Shear Box
RSB	Residual Shear Box
σ_3	Cell Pressure
σ_1-σ_3	Deviator Stress
c	Cohesion
c′	Effective Cohesion Incercept
ϕ	Angle of Shearing Resistance - Degrees
ϕ'	Effective Angle of Shearing Resistance
m_v	Coefficient of Volume Decrease
c_v	Coefficient of Consolidation
γ_d	Dry Density
Opt	Optimum
Std	Standard Compaction
Hvy	Heavy Compaction
CBR	California Bearing Ratio
*	Failed under 1st Load
**	Failed under 2nd Load
#	Untestable
##	Excessive Strain
+	Calcareous Reaction
¶	CBR Remoulded with 2.5kg rammer
§	CBR Remoulded with 4.5kg rammer
●	CBR Undisturbed Sample
●●	CBR Remoulded to 5% air voids at Natural Moisture Content
VT	Hand Vane Test
Cl	Chloride Content
S.G.	Particle Density
Sat m.c.	Saturation Moisture Content
p'o	Effective Overburden Pressure

Exploration Associates	**Project** Air Products Works Social Club, Acrefair Veryard and Partners	**Contract** 123145 Key Sheet

Samples				Chemical		Classification					Strength				
Hole	Depth	Type	Description	pH	SO_3	I_P	w_L	w_P	w%	ρ_b Mg/m^3	Test	s_3 kN/m^2	$s_1 - s_3$ kN/m^2	C kN/m^2	ø°
4	0.20 - 1.50	D	MADE GROUND: Very silty fine, medium and coarse sand and fine and medium gravel.(Combined with samples BH 7 0.20 - 1.50m and BH 9 4.80 - 5.80m)	Particle Size Analysis											
8	0.20 - 0.50	D	MADE GROUND: Clayey very silty fine, medium and coarse sand and fine and medium gravel.(Combined with sample BH 9 0.20 - 0.80m)	Particle Size Analysis											

Remarks

Form 10/0

Laboratory Results- Summary

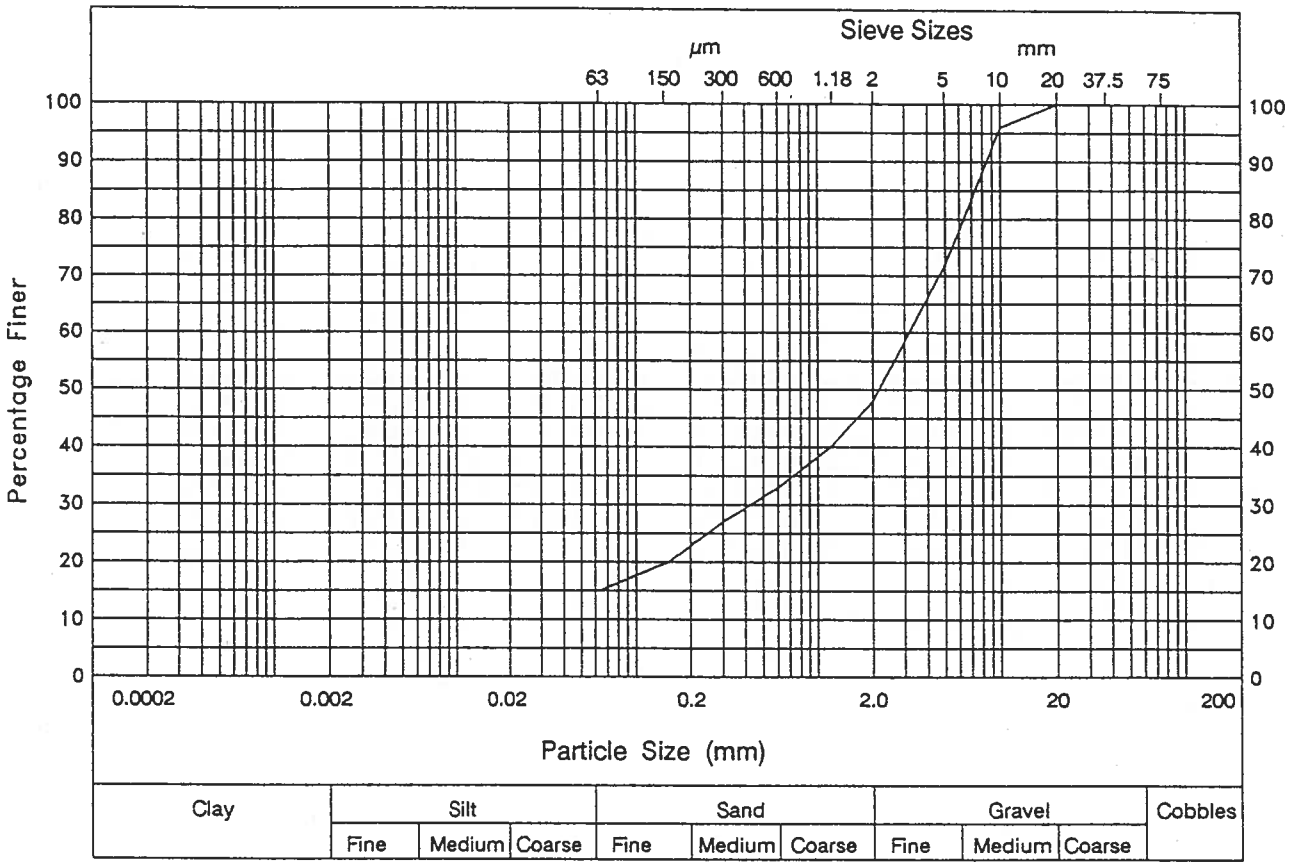
Exploration Associates

Project

Air Products, Works Social Club, Acrefair
Veryard and Partners

Contract 123145

L1/1

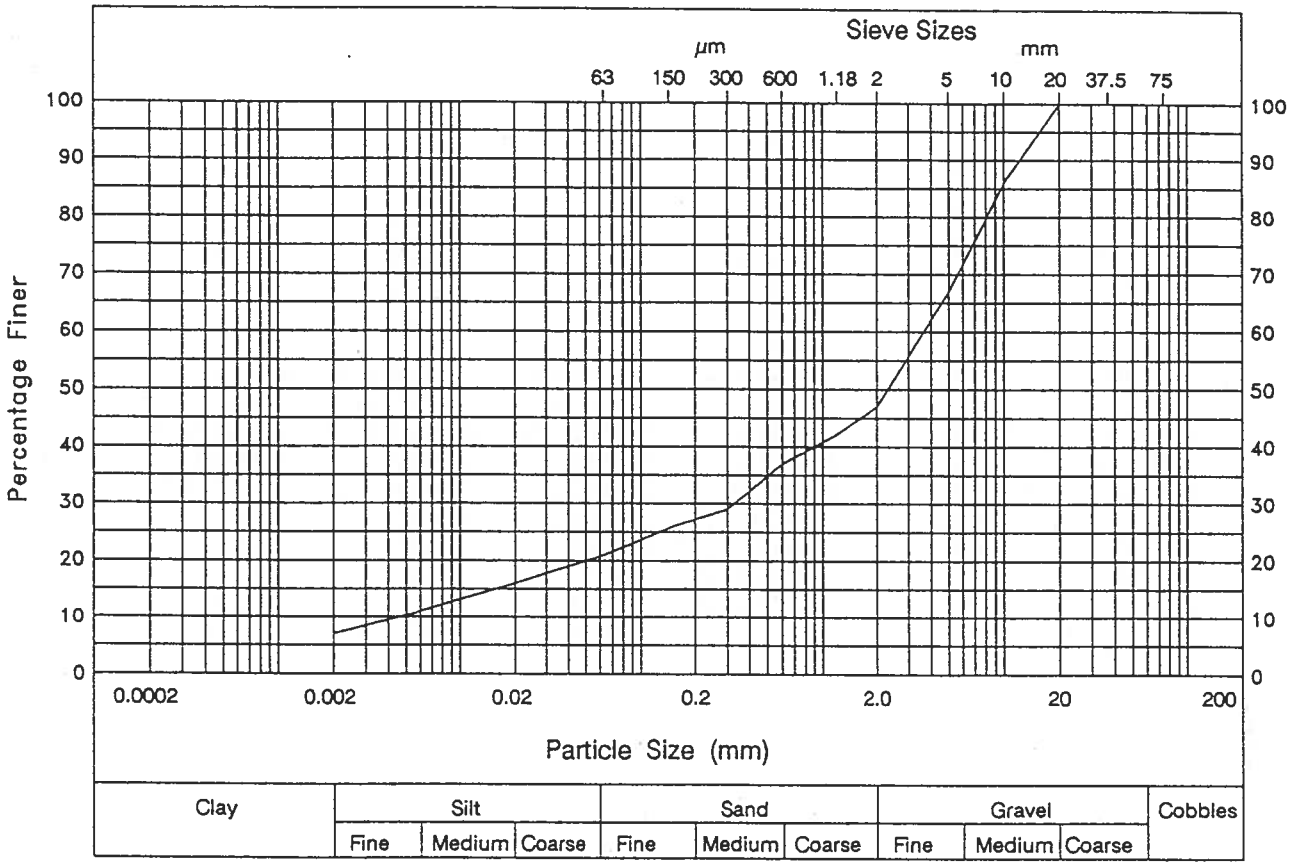


Particle Size	% Passing	Particle Size	% Passing
75 mm	100	1.18 mm	40
37.5 mm	100	600 µm	33
20 mm	100	300 µm	27
10 mm	96	150 µm	20
5 mm	72	63 µm	15
2 mm	48		

Hole 4	Sample Description
Depth 0.20-1.50	MADE GROUND: Very silty fine, medium and coarse sand and fine and medium gravel.(Combined with samples BH 7 0.20 - 1.50m and BH 9 4.80 - 5.80m)
Type D	

Form 25/1

Laboratory - Particle Size	**Project** Air Products, Works Social Club, Acrefair Veryard and Partners	**Contract** 123145
Exploration Associates		L2/1



Particle Size	% Passing	Particle Size	% Passing
75 mm	100	600 µm	37
37.5 mm	100	300 µm	29
20 mm	100	150 µm	26
10 mm	86	63 µm	21
5 mm	67	20 µm	16
2 mm	47	6 µm	11
1.18 mm	42	2 µm	7

Hole 8	Sample Description
Depth 0.20-0.50	MADE GROUND: Clayey very silty fine, medium and coarse sand and fine and medium gravel.(Combined with sample BH 9 0.20 - 0.80m)
Type D	

Form 25/1

Laboratory - Particle Size	**Project** Air Products, Works Social Club, Acrefair Veryard and Partners	**Contract** 123145
Exploration Associates		L2/2

ENCLOSURE C

Laboratory Test Results (Chemical)

Results of geochemical analyses

SAMPLE ID.

BH 1 (3.00m), + BH 8 (3.60–4.00), + BH 8 (6.20–6.60), + BH 11 (3.70–4.20)

SOLUBLE SULPHATE	g/l	69
TOTAL SULPHATE	%	26.83
pH		8.89
CADMIUM	ppm	<1
ARSENIC	ppm	10
SODIUM	ppm	199800
LEAD	ppm	39
MERCURY	ppm	<1
COPPER	ppm	68
ZINC	ppm	185
BORON	ppm	9
SELENIUM	ppm	<1
CHROMIUM	ppm	25
NICKEL	ppm	32
PHENOLS	ppm	78.3
CHROMIUM HEX.	ppm	0.06
CYANIDE TOTAL	ppm	<5
CYANIDE FREE	ppm	<1
SULPHUR FREE	ppm	115
THIOCYANATE	ppm	0
SULPHIDE ACID SOLUBLE	ppm	4.2

GEOCHEM

GEOCHEM ANALYTICAL SERVICES

Tentatively Identified Compounds

by

GCMS

NAMAS TESTING No. 1291

METHOD: PURGE AND TRAP DETECTION: GC/MS

MODE: FULLSCAN MATRIX: SOIL

INTERNAL STD: INTERNAL/SURROGATE

CONC: 200µg/kg

OUR REF: 8859-001-4

YOUR REF: BH1/BH8/BH11

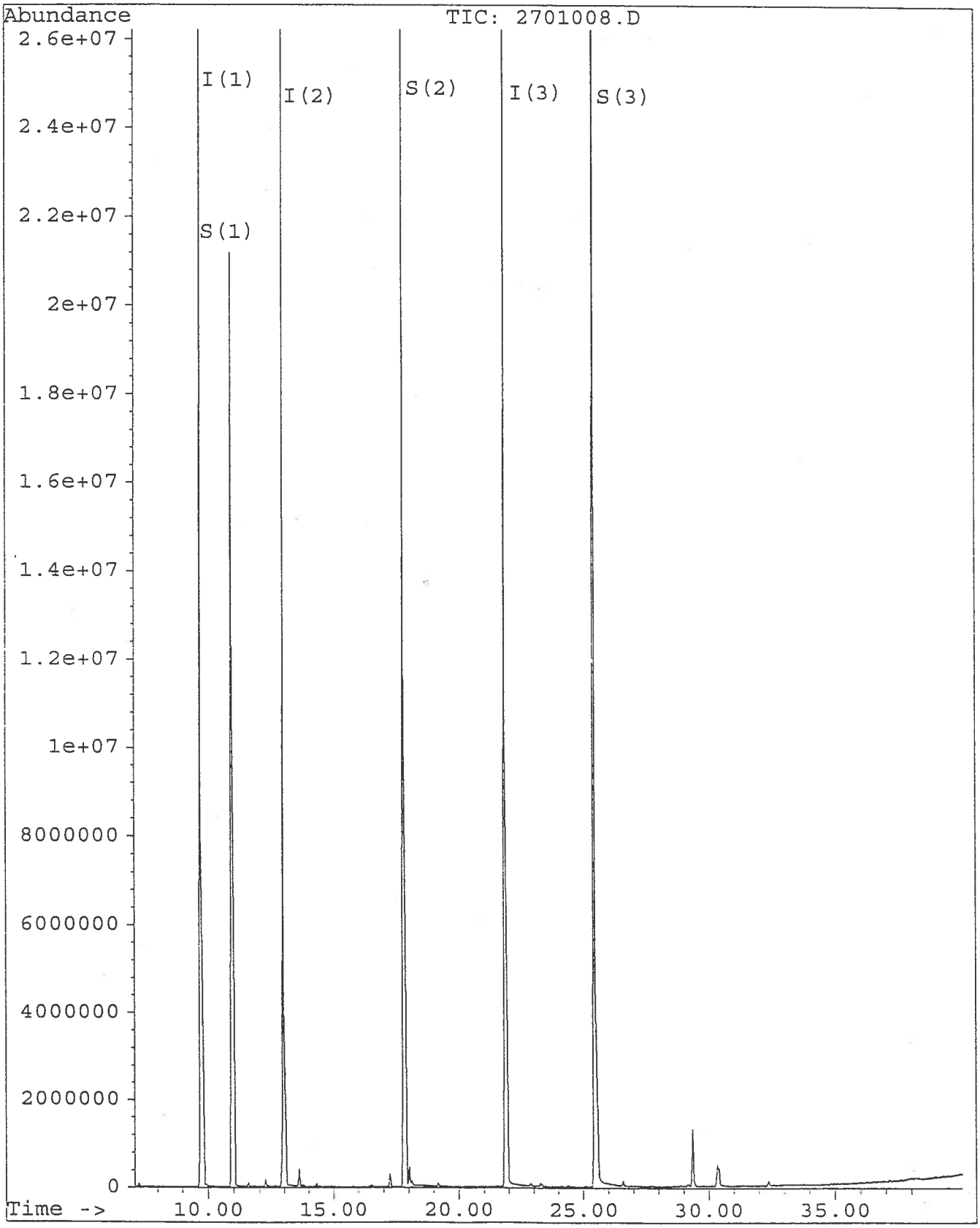
PEAK NUMBER	COMPOUND IDENTIFICATION	R.TIME min	CONC. µg/kg
-----	Total Volatile	-----	<5

UNITS: µg/kg

APPROVED BY: .....

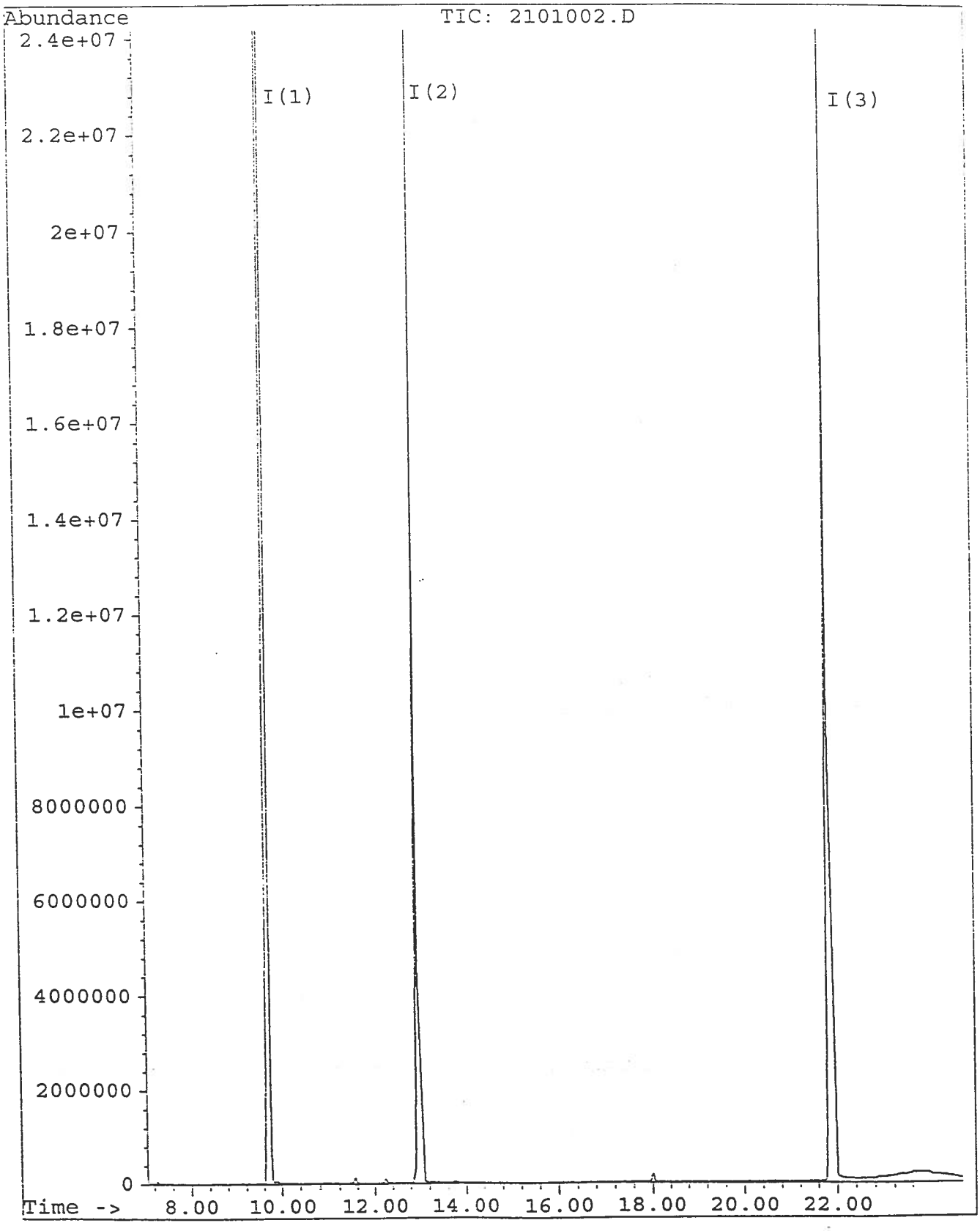
GEOCHEM GROUP LIMITED 93/08859/02/01

File: M:\2701008.D
Operator: Geochem Analytical services
Date Acquired: 19 Nov 93 1:50 am
Method File: VOLATILE
Sample Name: 8859-001-4
Misc Info: EXPLORATION ASSOCIATES
ALS vial: 27



CHECKED

File: M:\2101002.D
Operator: Geochem Analytical services
Date Acquired: 18 Nov 93 7:36 pm
Method File: VOLATILE
Sample Name: Internal std
Misc Info: 1.0ul
ALS vial: 21

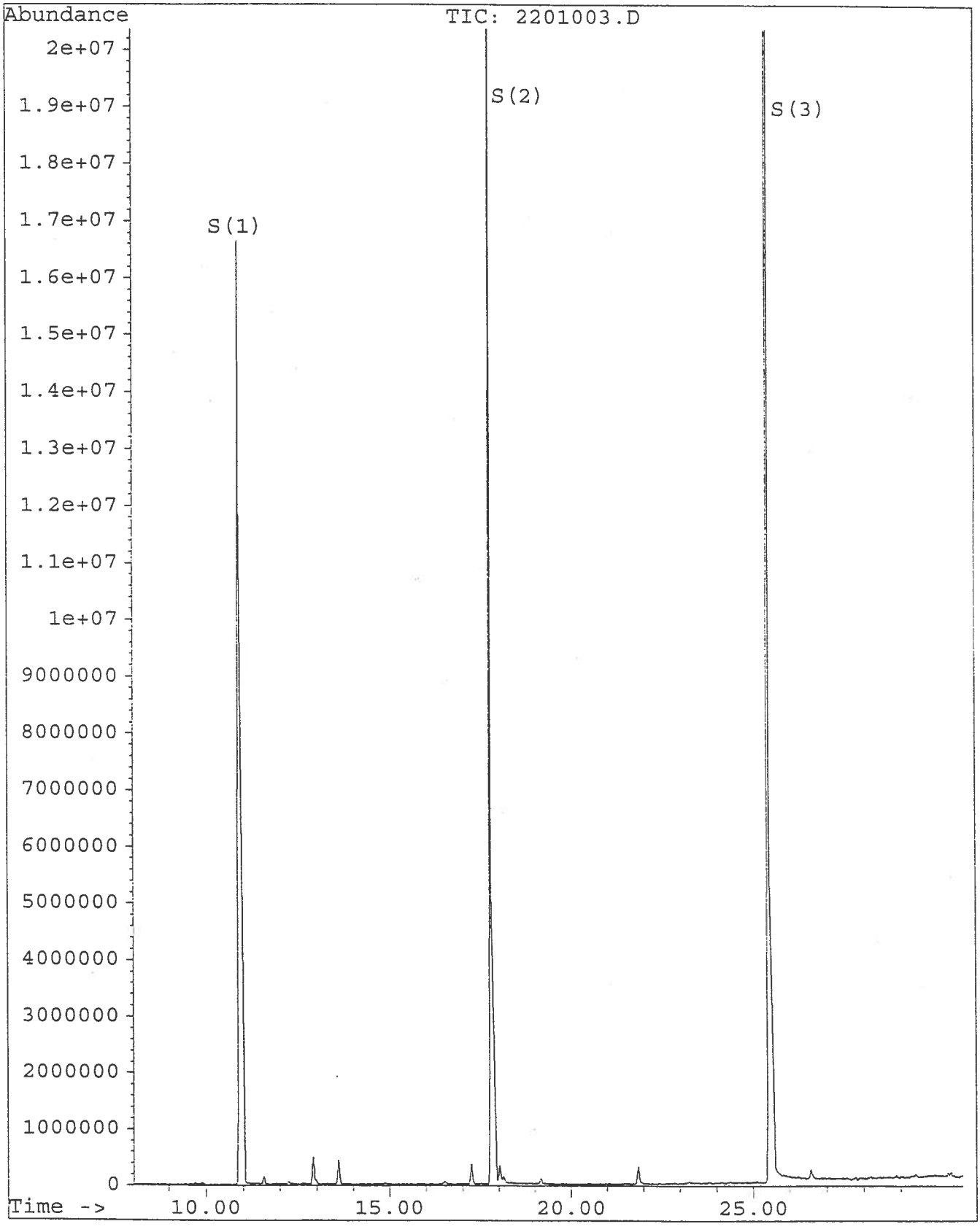


GEOCHEM GROUP LIMITED

93/08859/02/01

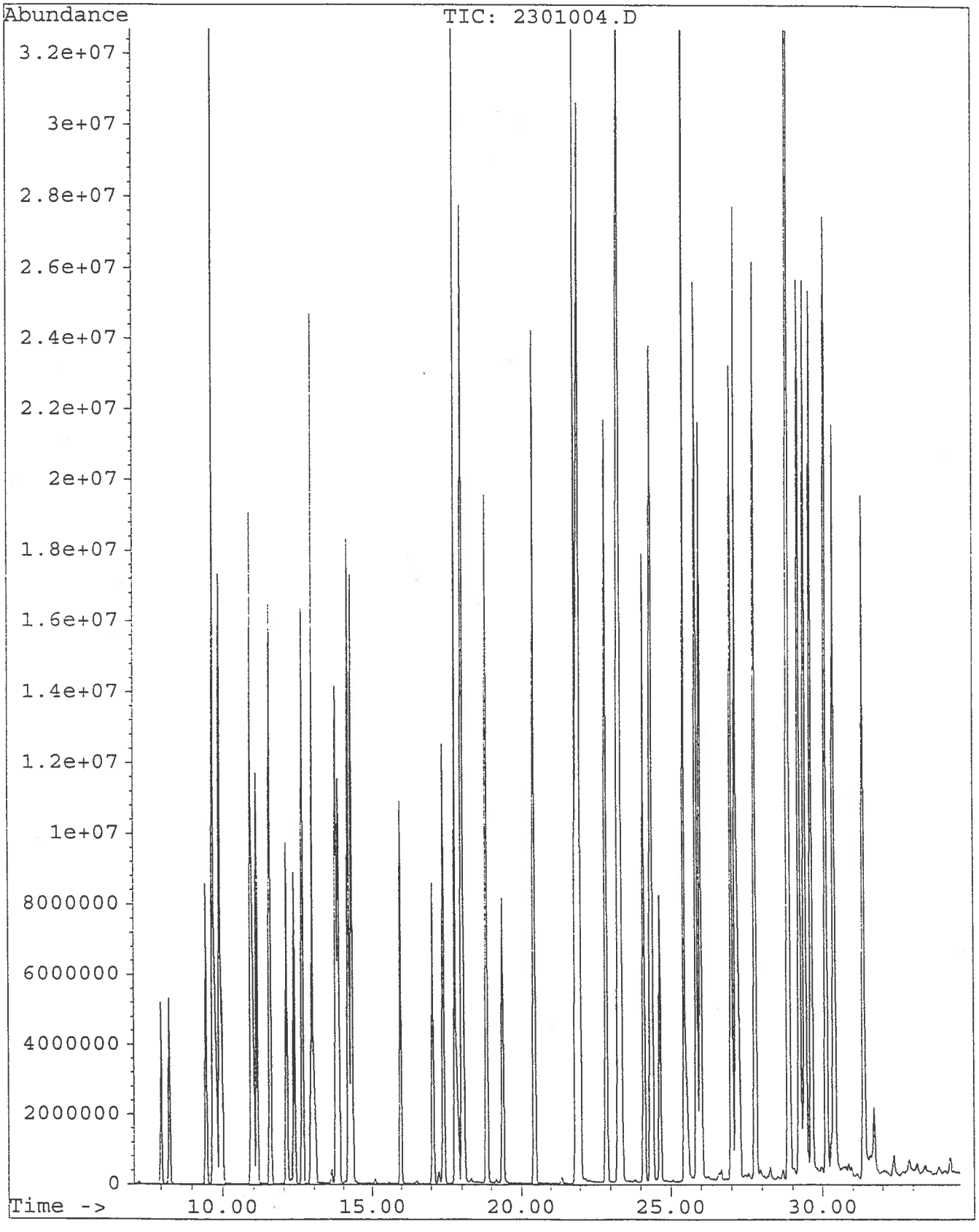
CHECKED

File: M:\2201003.D
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Date Acquired: 18 Nov 93 8:39 pm
Method File: VOLATILE
Sample Name: Surrogate std
Misc Info: 1.0ul
ALS vial: 22



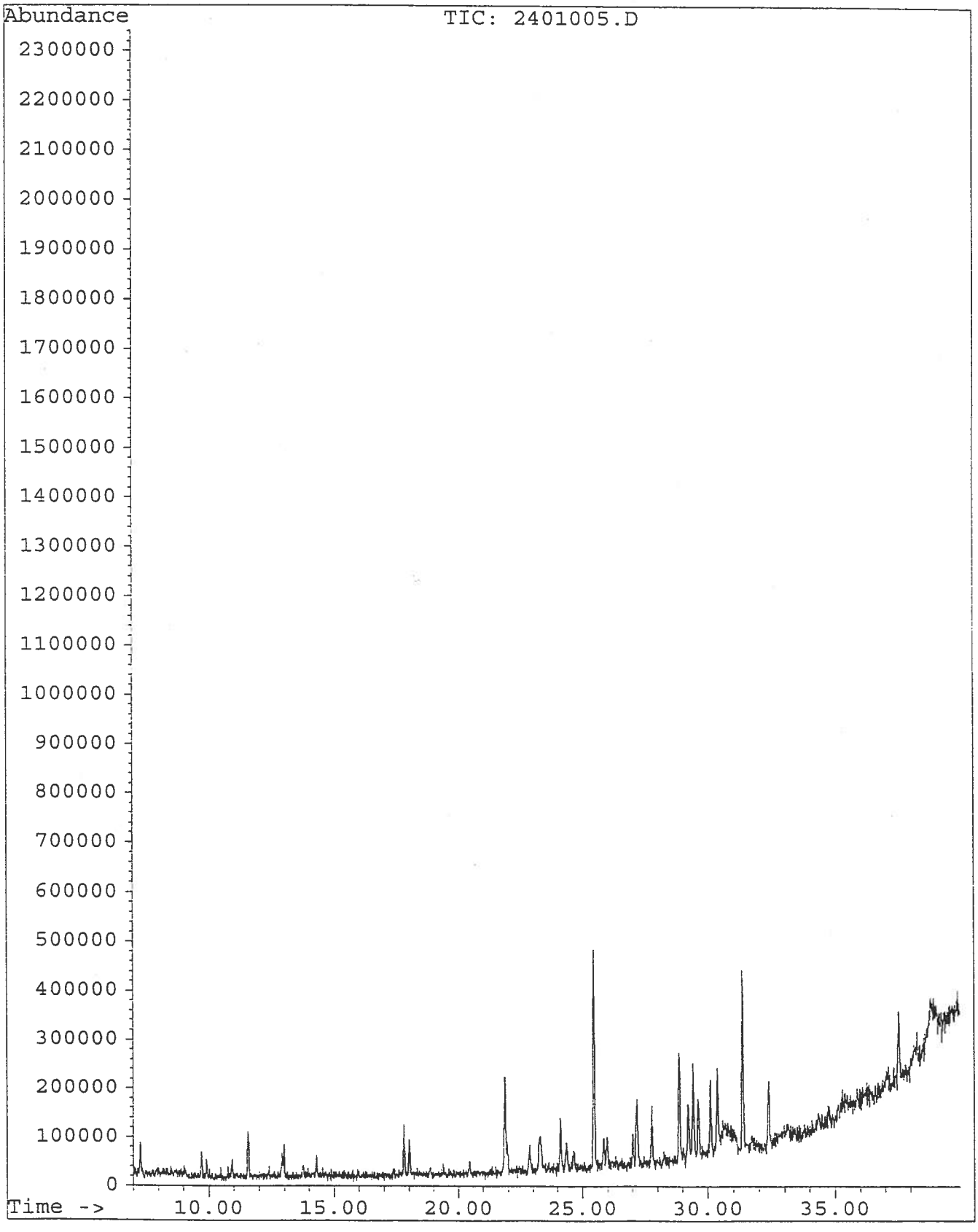
CHECKED

File: M:\2301004.D
Operator: Geochem Analytical services
Date Acquired: 18 Nov 93 9:41 pm
Method File: VOLATILE
Sample Name: 30ppb
Misc Info: 0.75ul
ALS vial: 23



CHECKED

File: M:\2401005.D
Operator: Geochem Analytical services
Date Acquired: 18 Nov 93 10:44 pm
Method File: VOLATILE
Sample Name: WATER BLANK
Misc Info: 5mls of water
ALS vial: 24



CHECKED

GEOCHEM

NAMAS
TESTING
No. 1291

GEOCHEM ANALYTICAL SERVICES

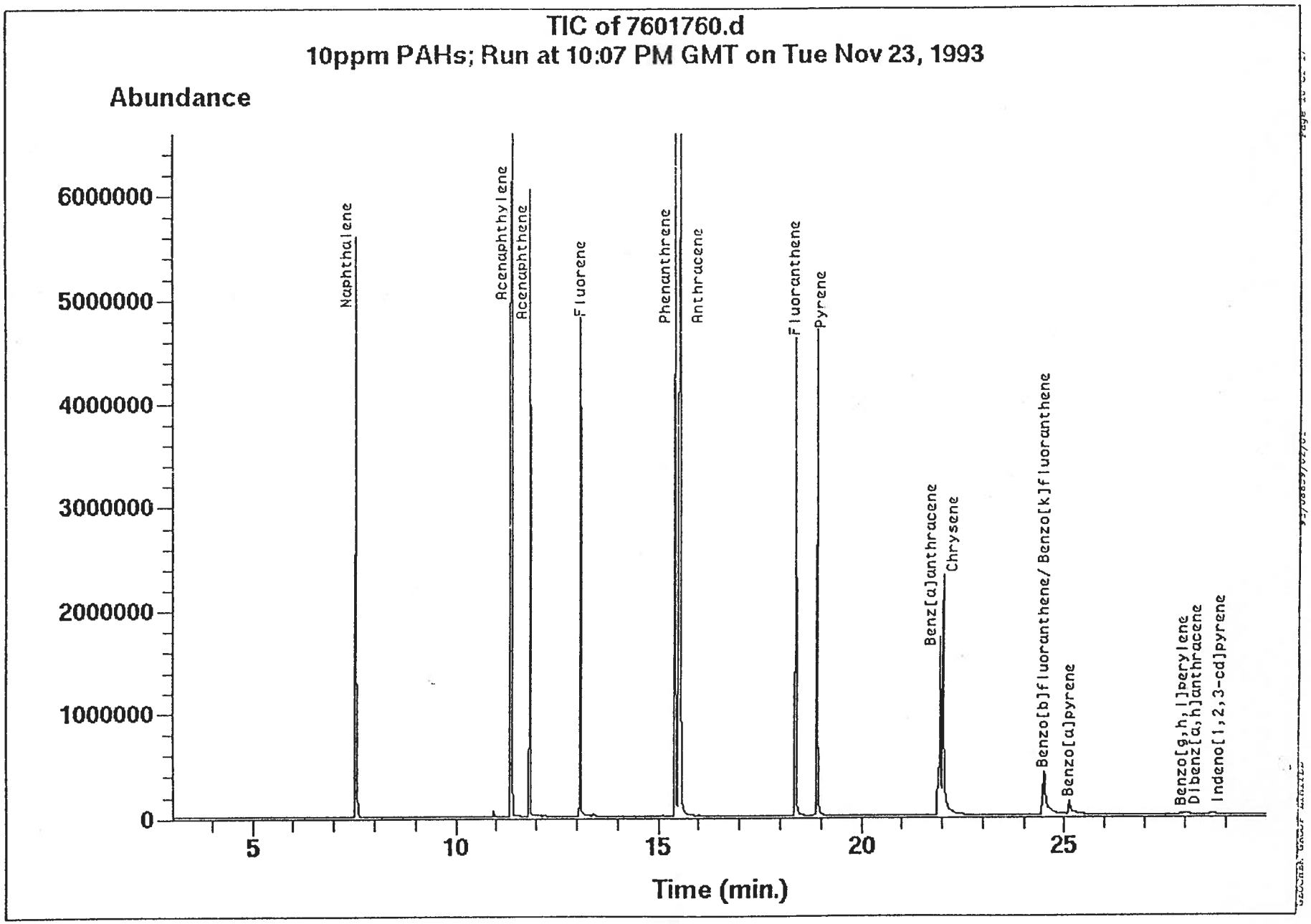
Polynuclear Aromatic Hydrocarbons
By
GCMS

Sample Matrix:	SOIL
Our Reference:	8859--1-4
Client Reference:	BH/1/8/8/11(COMBINED)
Date Sample Received:	4/11/93
Date Extracted/Prepared:	18/11/93
Separatory Funnel Ext:	NO
Soxtec Extraction:	YES
Column Extraction:	YES
Date Analysed:	23/11/93
GC-MS Mode:	SIM
Internal Standard:	External
Conc./Dilution Factor:	

CAS Number		µG/KG
91-20-3	Naphthalene	1004
208-96-8	Acenaphthylene	35
83-32-9	Acenaphthene	30
86-73-7	Fluorene	61
85-01-8	Phenanthrene	737
120-12-7	Anthracene	130
206-44-0	Fluoranthene	813
129-00-0	Pyrene	619
56-55-3	Benz[a]anthracene	194
218-01-9	Chrysene	339
205-99-2 207-08-9	Benzo[b]fluoranthene Benzo[k]fluoranthene	91
50-32-8	Benzo[a]pyrene	24
53-70-3	Dibenz[a,h]anthracene	0.5
191-24-2	Benzo[g,h,i]perylene	0.3
193-39-5	Indeno[1,2,3-cd]pyrene	2

ANALYST: H. Keogh

APPROVED BY:


TIC of 7601760.d
10ppm PAHs; Run at 10:07 PM GMT on Tue Nov 23, 1993
Abundance
6000000
5000000
4000000
3000000
2000000
1000000
0
Naphthalene
Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benz[a]anthracene
Chrysene
Benzo[b]fluoranthene/ Benzo[k]fluoranthene
Benzo[a]pyrene
Benzo[g,h,i]perylene
Dibenz[a,h]anthracene
Indeno[1,2,3-cd]pyrene
5
10
15
20
25
Time (min.)

/chem/hp1/0201762_bsb2.d
hp1 (ms5989-1)
/chem/hp1/general.s

/chem/hp1/pahs.m

Tue Nov 23 23:23:32 1993
8859-1-4 C18
Vial 2; Inj. 1; Run 762

Calibration Table
(Standard Integrator)

PAH's

Calibration Table Last Updated: Tue Dec 14 17:33:36 1993

Reference Peak Window: 5.000 % of Retention Time
Non-reference Peak Window: 5.000 % of Retention Time

Default Sample Amount: 0
Uncalib. Peak Response Factor: 0
Default Multiplier: 1

Ret Time	Pk#	Signal Descr	Amt ppm	Lvl	Area	Pk-Type	Partial Name
7.514	1	128.00 amu	5.000000	5	64422200		Naphthalene
			10.00000	1	116363000		
			20.00000	2	231843000		
11.410	2	152.00 amu	5.000000	5	68932000		Acenaphthylen
			10.00000	1	124544000		
			20.00000	2	245342000		
11.885	3	154.00 amu	5.000000	5	42529800		Acenaphthene
			10.00000	1	75232300		
			20.00000	2	149785000		
13.140	4	166.00 amu	5.000000	5	50508200		Fluorene
			10.00000	1	89797500		
			20.00000	2	181350000		
15.497	5	178.00 amu	5.000000	5	76153100		Phenanthrene
			10.00000	1	136696000		
			20.00000	2	272732000		
15.606	6	178.00 amu	5.000000	5	79641000		Anthracene
			10.00000	1	144631000		
			20.00000	2	293260000		
18.433	7	202.00 amu	5.000000	5	72453200		Fluoranthene
			10.00000	1	135884000		
			20.00000	2	265269000		
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			20.00000	2	255382000		
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			10.00000	1	48534600		
			20.00000	2	96426500		
22.083	10	228.00 amu	5.000000	5	44830100		Chrysene
			10.00000	1	88530000		
			20.00000	2	166535000		
24.534	11	252.00 amu	5.000000	5	16911500		Benzo[b]/Benz
			10.00000	1	36667300		
			20.00000	2	74266700		

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Vial 2; Inj. 1; Run 762

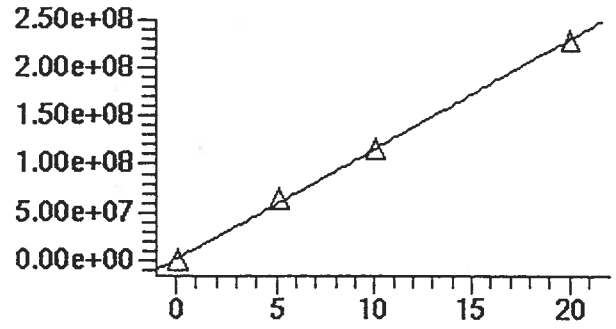
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			10.00000	1	11800500		
			20.00000	2	25773700		
27.984	13	276.00 amu	5.000000	5	270912		Benzo[ghi]per
			10.00000	1	515820		
			20.00000	2	1002970		
28.075	14	278.00 amu	5.000000	5	427877		Dibenz[ah]ant
			10.00000	1	982200		
			20.00000	2	1923110		
28.707	15	276.00 amu	5.000000	5	868664		Indeno[123cd]
			10.00000	1	1995000		
			20.00000	2	4091040		

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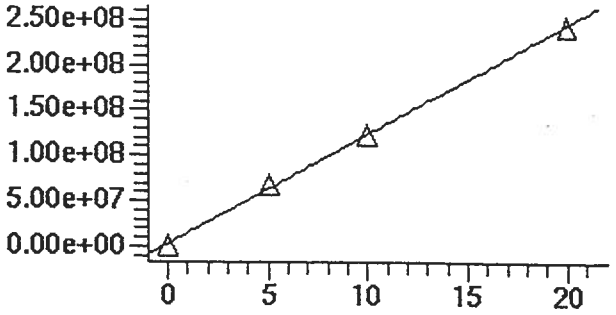
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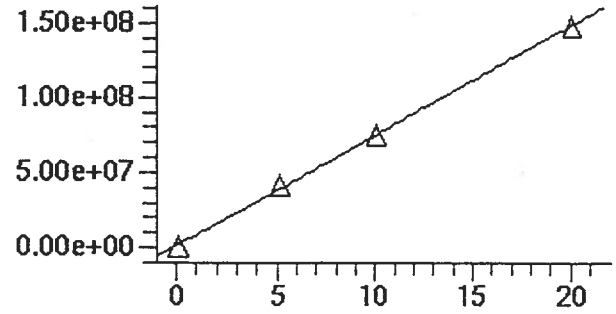
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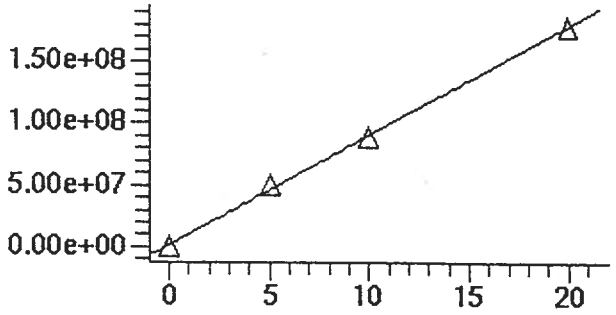
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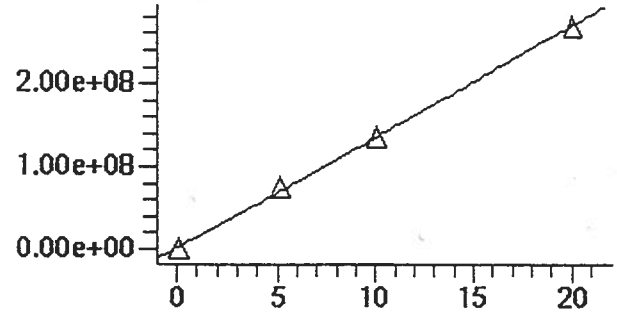
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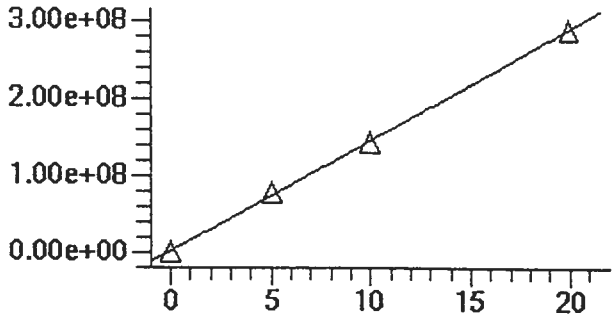
Linear Fit; Area; Peak 4; Fluorene
Ar=8.97e+06*(Amt)+1.89e+06; R^2 = 0.999



Linear Fit; Area; Peak 5; Phenanthrene
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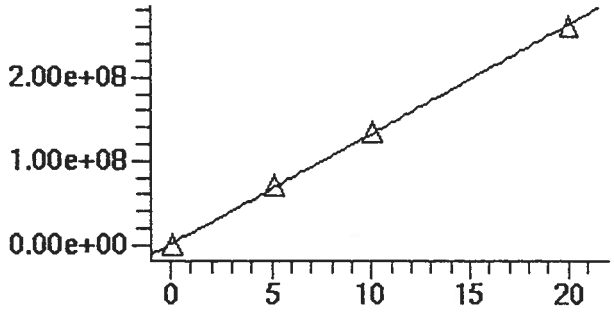


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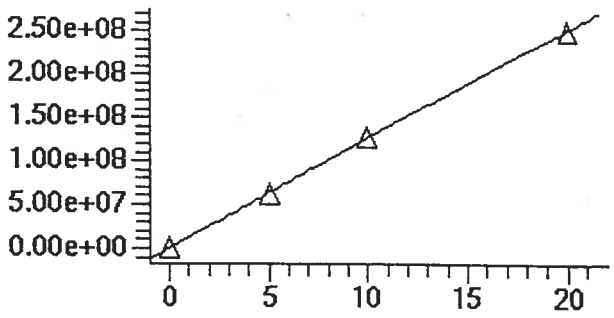
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Vial 2; Inj. 1; Run 762

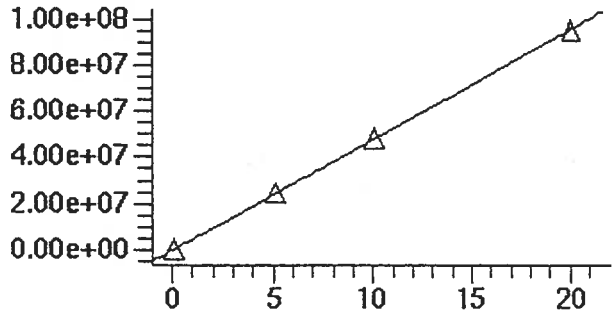
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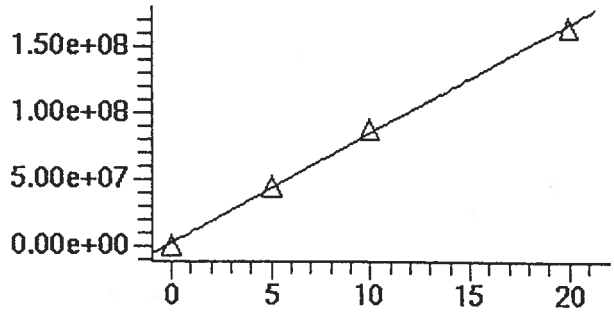
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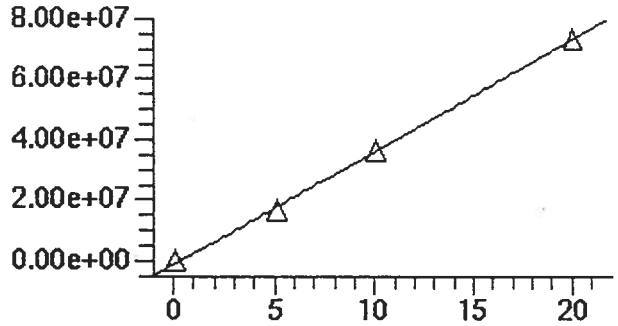
Linear Fit; Area; Peak 9; Benz[a]anthracene
Ar=4.81e+06*(Amt)+3.8e+05; R^2 = 1.000



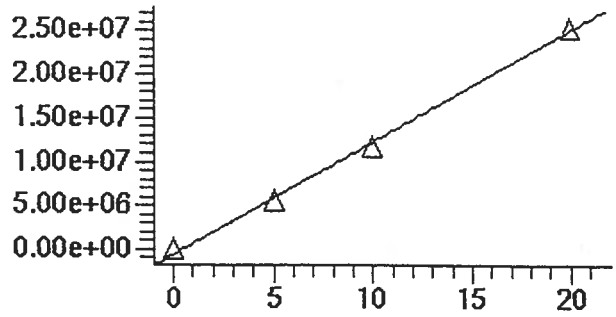
Linear Fit; Area; Peak 10; Chrysene
Ar=8.3e+06*(Amt)+2.33e+06; R^2 = 0.999



Linear Fit; Area; Peak 11; Benzo[b]/Benzo[k]
Ar=3.74e+06*(Amt)-7.55e+05; R^2 = 0.999



Linear Fit; Area; Peak 12; Benzo[a]pyrene
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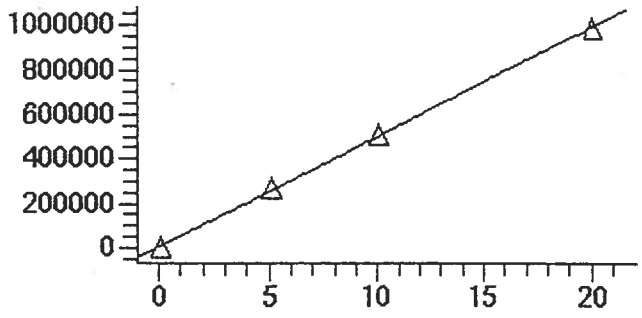


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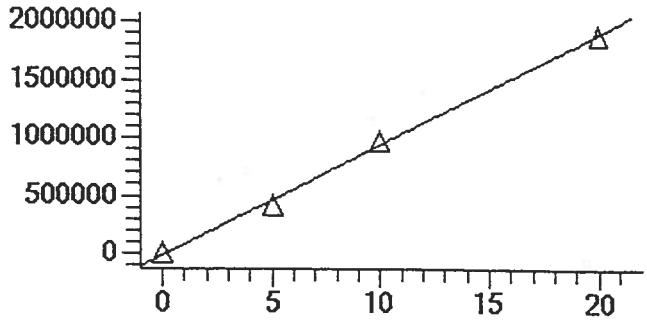
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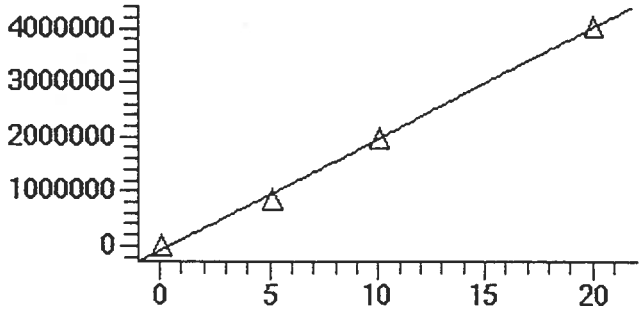
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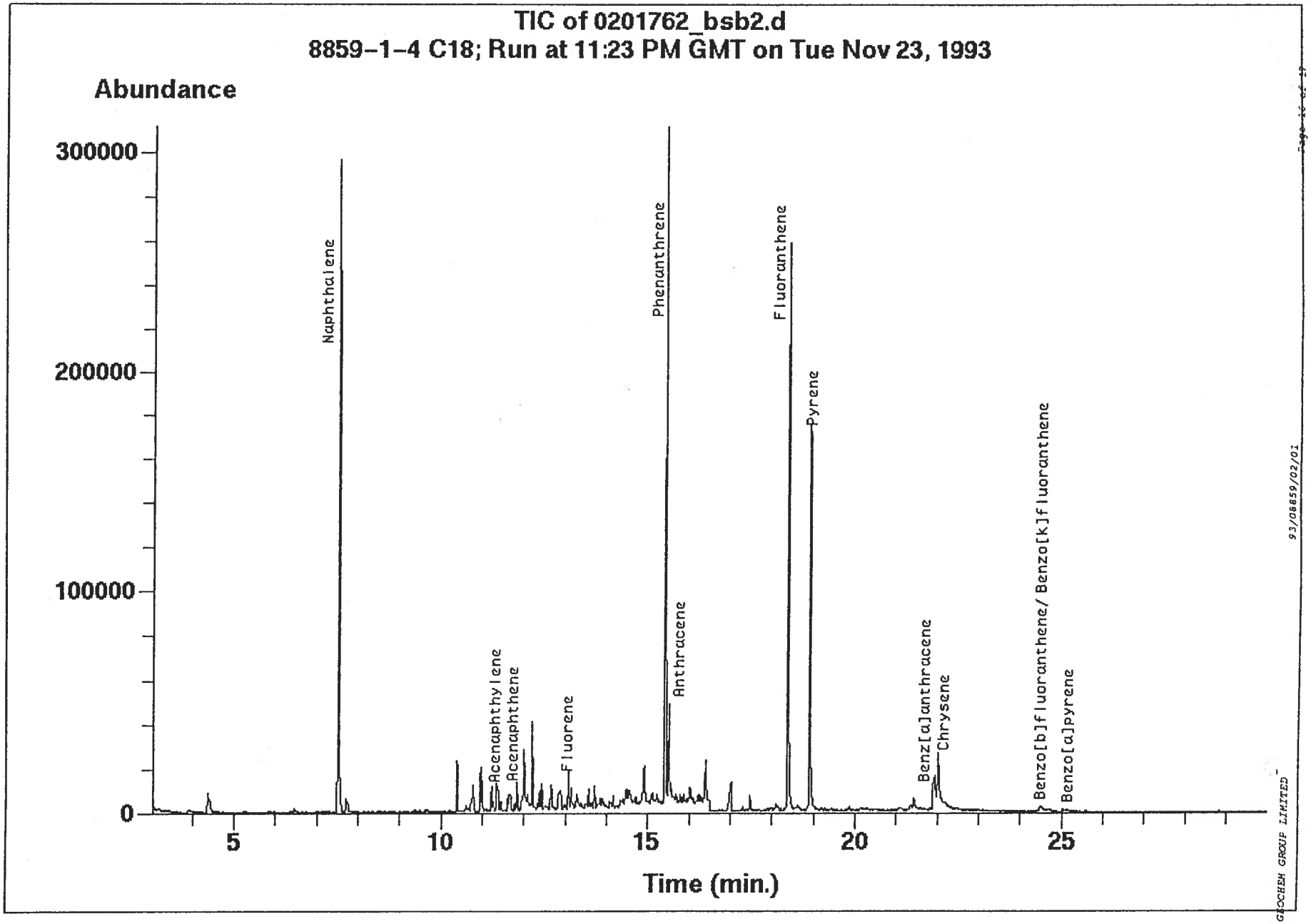


Linear Fit; Area; Peak 14; Dibenz[ah]anthracene
Ar=9.72e+04*(Amt)-1.7e+04; R^2 = 0.999



Linear Fit; Area; Peak 15; Indeno[123cd]pyrene
Ar=2.07e+05*(Amt)-7.17e+04; R^2 = 0.998

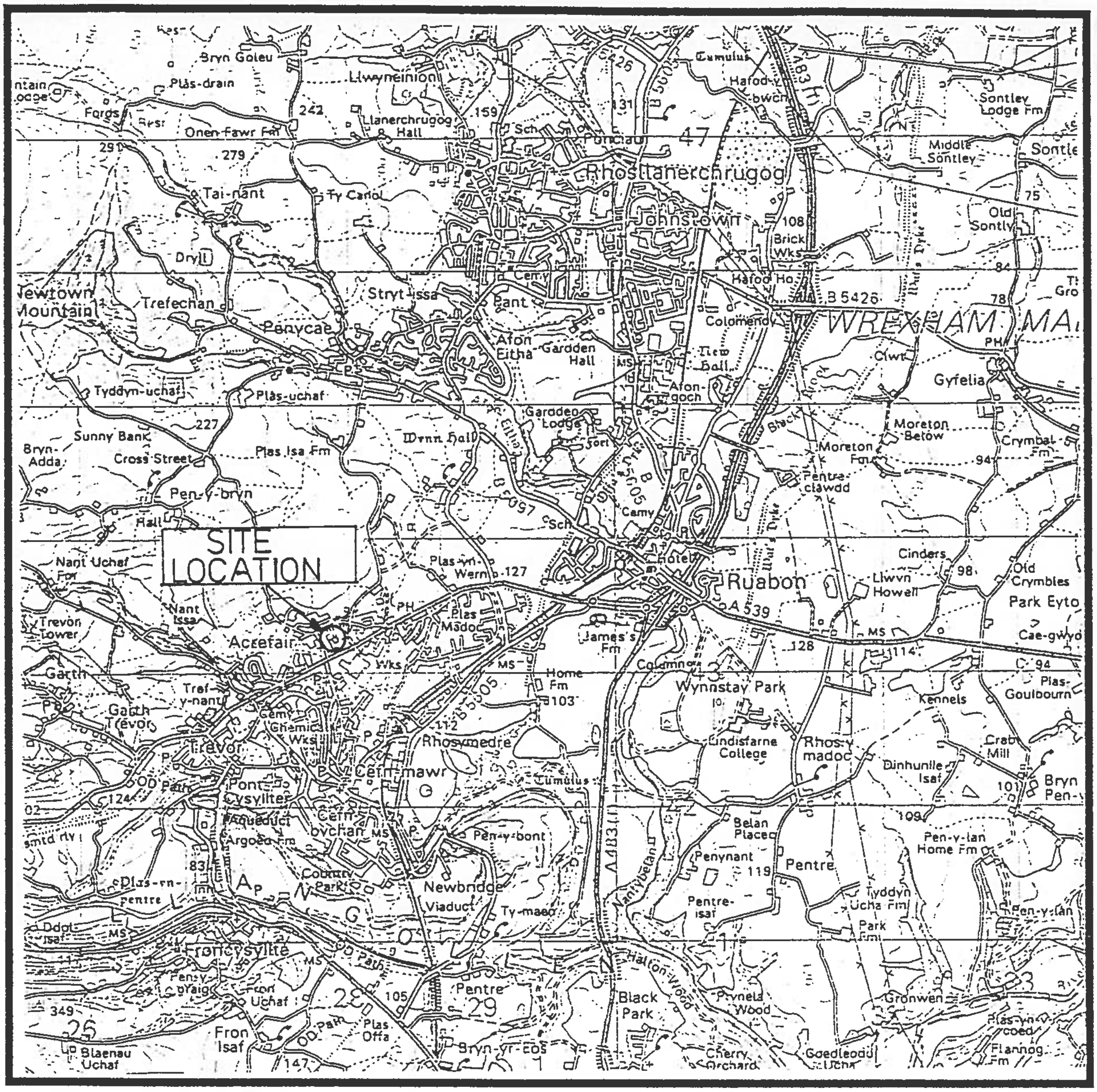



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200000
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Naphthalene
Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benz[a]anthracene
Chrysene
Benzo[b]fluoranthene/ Benzo[k]fluoranthene
Benzo[a]pyrene
5
10
15
20
25
Time (min.)
93/08859/02/01
GEOCHEM GROUP LIMITED

ENCLOSURE D

Drawings

	Drawings
Site Location Plan	1
Borehole Location Plan	2

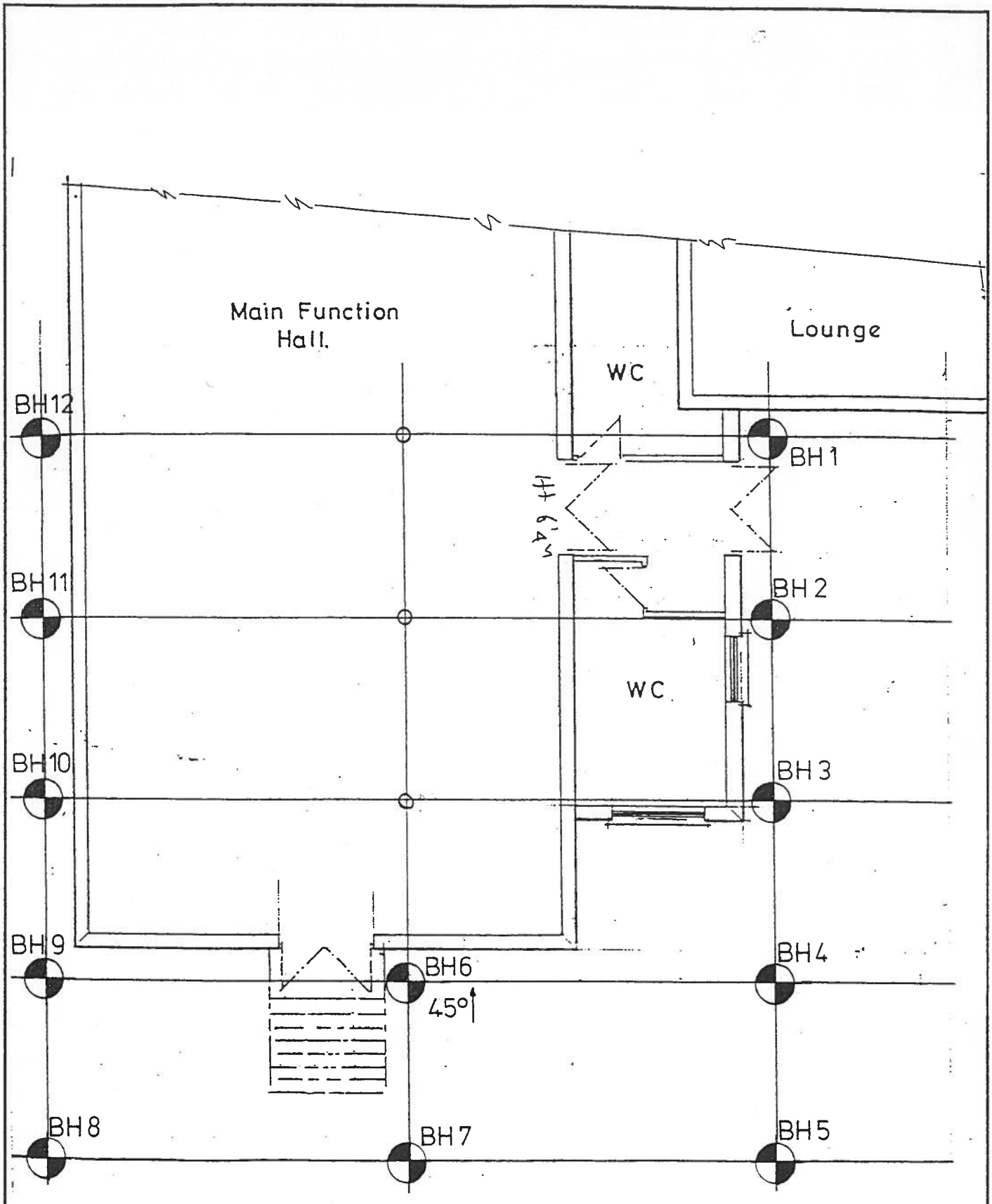


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Scale 1:50,000

Site Location Plan	Project	Contract
Exploration Associates	Air Products, Works Social Club, Acrefair Veryard and Partners	**Drawing** 1



Borehole Location Plan	Project Air Products, Works Social Club, Acrefair Veryard and Partners	Contract 123145
Exploration Associates		

APPENDICES

A General Notes

B Summary of descriptive methods

APPENDIX A

General Notes

1 The investigation was carried out in general accordance with the recommendations given in BS 5930 ; 1981, The Code of Practice for Site Investigations. The comments given in the report and any recommendations made or opinions expressed are based on the ground conditions encountered during the fieldwork and on the results of tests made in the field and in the laboratory. However, conditions may prevail at the site which were not revealed by the investigation and which, therefore, could not be taken into account. In particular it should be noted that groundwater levels may vary due to seasonal or other effects and are also subject to disturbance by boring, drilling and excavation processes. Therefore they may, at times, be significantly different from those measured during the investigation.

2 Soft Ground Boring

Cable percussive methods are usually employed since they allow a borehole to be sunk through soft ground whilst maintaining a knowledge of both its depth and the material being penetrated. Furthermore, disturbance of the strata in advance of the drilling tools is kept to a minimum and their nature and geotechnical properties are therefore largely preserved prior to testing or sampling. However, some mixing of thinly layered cohesionless soils during boring is inevitable.

Penetration of hard materials requires their fragmentation. It is therefore rarely possible to distinguish bedrock from boulders with certainty when using this technique.

3 Groundwater

Any groundwater observations, given on the exploratory hole records, were made during the sinking of the exploratory holes. On the observation of a flow of groundwater into a borehole, work was halted for between 20 minutes and 30 minutes. However many inflows may not have reached equilibrium before it became necessary to recommence boring.



APPENDIX B

Summary of Descriptive Methods

1. **Terminology used in Soil Descriptions**

The procedure and principles given in BS 5930; 1981, Section 8 have generally been adopted in producing soil descriptions but most of the modifications detailed by Norbury et al (1984) have been incorporated. These generally relate to the description of composite soil types referred to in Table 6 and Section 41.3.3.3 of BS 5930. The modifications relating to various mixtures of soil types are summarised below.

i) Predominantly Coarse Soils

BS 5930 Section 8 recommends that the secondary constituents of coarse soils should precede the main soil type. This may become ambiguous if qualifying adjectives also form part of the description. Norbury et al overcame this by suggesting that the secondary constituent may be placed after the main soil type, as outlined in Table B1.

ii) Mixtures of Coarse and Fine Soils

BS 5930 Section 8 Section 41.3.2.1 states that mixtures of coarse and fine soils with more than 35% of fine soil shall be described as clay or silt, otherwise they should be described as sand or gravel. This may lead to misleading descriptions, if strictly adhered to, since a material that in engineering terms behaves as clay may only have a clay content of between 10% and 20%. Thus the above approach is not adopted where it would lead to a description which would not reflect the engineering behaviour of the material. In such cases the percentage unit is relaxed.

iii) Predominantly Fine Soils

Fine soils generally consist of mixtures of silt and clay and are described in BS 5930 as either silt or clay with classification in accordance with plasticity. Borderline cases between silt and clay materials are often difficult to distinguish and where secondary constituent fine soils have an influence on mass behaviour the qualifying terms "very silty" and "very clayey" are used. Coarse secondary constituents may be included either before or after the main soil type, as outlined in Table B2, depending on the grain sizes of the secondary constituents.

Term Before	Principal Term	Term After	Approx % of Secondary Constituent
Slightly (sandy*)	SAND, GRAVEL COBBLES or BOULDERS	with a little (sand*) or occasional (cobbles+)	<5
(Sandy*)		with some (sand*) or some (cobbles+)	5 - 20#
Very (Sandy*)		with much (sand*) or many (cobbles+)	20 - 40#
		and (sand*) or and (cobbles+)	about 50#

* Fine or coarse soil type as appropriate
\+ Very coarse soil type as appropriate
\# Or described as a fine soil depending on mass behaviour

Table B1
Scale of Secondary Constituents with coarse soils

For clays, the extended strength scale is outlined in Table B3. The term hard is not assigned a specific range of shear strengths by BS5930 which indicates that soils possessing shear strengths greater than 150 kPa may be either very stiff or hard. The terms are defined more precisely in Table B3.

References

BS 5930 ; 1981 Code of Practice for Site Investigations
Norbury D.R., GH Child and T.W. Spink ; 1984 A Critical review of Section 8 (BS 5930) Soil and Rock Description. Proc 20th Regional Meeting of the Geological Society. Site Investigation Practice.
Assessing BS 5930. Univ of Surrey pp 353-369 (original proceedings).

Term Before	Principal Term	Term After	Approx % of Secondary Constituent
Slightly (sandy*)		with a little (sand*) or occasional (cobbles+)	<35
(Sandy*)	CLAY or SILT	with some (sand*) or some (cobbles+)	35 - 65
Very (Sandy*)		with much (sand*) or many (cobbles+)	>65#

* Coarse soil type as appropriate
\+ Very coarse soil type as appropriate
\# Or described as a coarse soil depending on mass behaviour.

Table B2
Scale of Secondary Constituents with fine soils

Term	Field Identification	Undrained Shear Strength (kPa)
Very soft	Exudes between fingers when squeezed in hand.	<20
Soft	Moulded by light finger pressure.	20 - 40
Soft to firm	Can be moulded by strong finger pressure.	40 - 50
Firm		50 - 75
Firm to Stiff	Cannot be moulded by finger pressure	75 - 100
Stiff	Can be indented by thumb.	100 - 150
Very Stiff	Can be indented by thumbnail	150 - 300
Hard	No manual indentation possible.	>300

Table B3
Field Assessment of Strength of Clays

ARCHAEOLOGICAL SURVEY

Ymddiriedolaeth
Archaeolegol
Clwyd-Powys
7a Stryd yr Eglwys
Y Trallwng, Powys
SY21 7DL

Ffôn (01938) 553670
Ffacs/Negesau (01938) 552179

Archaeological
Trust
7a Church Street
Welshpool Powys
SY21 7DL

Tel (01938) 553670
Fax/Answering Machine (01938) 552179

Cadeirydd: Frances Lynch MA FSA Chairman
Cyfarwyddwr: William Britnell MA FSA MIFA Director

CURATORIAL SECTION
Please reply to:

16 April 1996

Mr G J Evans
Chief Planning Officer
Wrexham Maelor County Borough Council
The Guildhall
Wrexham
LL11 1AY

Dear Sir

COUNTY SITES AND MONUMENTS RECORD, CONSULTATION - CONTRACTED ARCHAEOLOGICAL RECORDING SURVEY RECOMMENDATION

Wrexham CBC Planning Application 6/24228 - Air Products Plc, Acrefair, Wrexham.

Thank you for the consultation paperwork relating to this proposal.

The County Sites and Monuments Record shows that the development lies on the site of the former Acrefair Blast Furnace Ironworks which were in operation at some time prior to 1815 and up to 1888. At the location proposed for the cryogenics manufacturing unit the foundation imprint almost certainly overlies buried archaeological deposits associated with the ironworks. A long wall below the bank on the eastern boundary of the site displays architectural features dating from the time of operation of the ironworks and other possibly associated features can be seen to the north east. Unfortunately the area of any intended foundations has been recently pressure grouted with concrete. This has severley reduced the potential for archaeological recording below the present concrete platform in the form of an evaluation.

However, there is still considered to be a strong potential for sub-surface preservation of former ironworks related structural features and other associated deposits within this plot, although the integrity of the deposits may have been somewhat disturbed by subsequent development on the same site.

The potential for the recording of previously unrecognised deposits is felt to be high enough that we would wish to see an appropriate archaeological presence on site during the early stages of development so that recording of any features revealed can take place.

Accordingly we would recommend that an archaeologist is contracted to be present throughout the duration of top soiling, foundation trench cutting, and service trench excavation works in order that an adequate record of any archaeological features revealed by these works can be made. This work should be carried out as a condition of consent.

Furthermore, a desktop study should be carried out in conjunction with the watching brief to ascertain the dating, function and relationship of features found during the recording work.

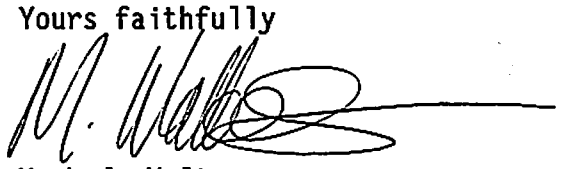
The archaeologist should be part of a recognised professional archaeological organisation working within the Code of Conduct, and adhering to the By-Laws

of, the Institute of Field Archaeologists. The archaeologist should be working to the prescription set out in a curatorial design brief which will be drawn up by Wrexham Archaeology Service (contact Steve Grenter on 01978 297520).

A suitable grampian style condition to facilitate the contracted recording survey and desk top study is enclosed.

Should you wish to discuss the above recommendation do not hesitate to contact me.

Yours faithfully



Mark J. Walters
Development Control Officer, County Sites and Monuments Record

CLWYD-POWYS ARCHAEOLOGICAL TRUST

County Sites and Monuments Record

16 April 1996

Wrexham CBC Planning Application 6/24228 - Air Products plc, Acrefair, Wrexham.

Suggested planning condition/note to facilitate archaeological recording survey and desk top study prior to development:

Development shall not begin until appropriate archaeological notification, visits and investigation have been carried out in accordance with details to be submitted to, and approved by, the local planning authority.

Mark Walters
Development Control Officer County Sites and Monuments Record.

MEMORANDUM

wrexham
COUNTY BOROUGH
BWRDEISTREF SIROL
wrecsam

From: Chief Public Protection Officer **To:** Chief Planning Officer

Our Ref: **Your Ref:**

Date: 17th April, 1996

Town and Country Planning Act, 1990
Town and Country Planning Development Orders, 1988

GR: 28130 43080
Air Products Plc., Wrexham

Erection of building for the manufacture and storage of Cryogenic process equipment

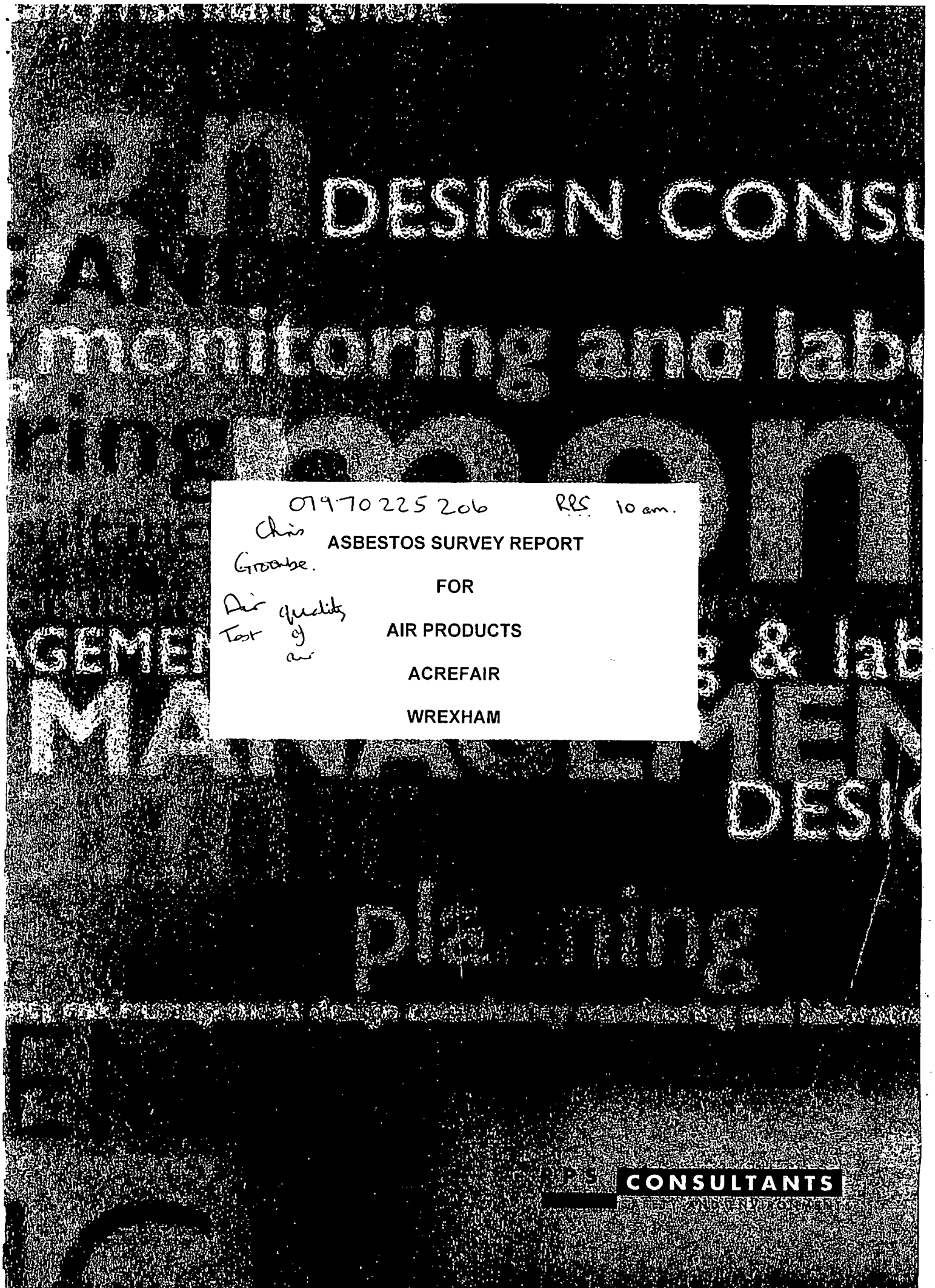
I am writing with regard to your memorandum of the 19th March 1996 on the subject of the above application. I have to inform you I have the following observations.

The proposal to construct this facility on a site which is boarded by residential properties has the potential to give rise to complaints of noise nuisance. In this respect the applicant should be advised to submit detailed information regarding predicted noise levels at the site. This data should include details of sound pressure levels of machinery, attenuation afforded by the building and predicted noise levels at the boundary of the site.

In summary, the applicant should, ideally, submit an assessment of the noise impact of this development following the British Standard method BS 4142 - Rating industrial noise affecting mixed residential and industrial areas. Failing this, enough information should be submitted so that this Department can undertake such an assessment.

.....

ASBESTOS SURVEY REPORT



079-70225206 RRS 10 am.

Chris Groombe.

Air quality Test of air

RPS CONSULTANTS
SAFETY AND ENVIRONMEN

Date: Issue 1/August 2000
Report: WE0263/gkt

21 BRIDGE ROAD
WOOLSTON
WARRINGTON
CHESHIRE WA1 4AT
TEL: 01925 831000
FAX: 01925 831231
email: rpswo@rpsplc.co.uk
http://www.rpsplc.co.uk

CWLS - 849800

Chris Groome.

ASBESTOS SURVEY REPORT

FOR

AIR PRODUCTS

ACREFAIR

WREXHAM

Prepared For:

Nicholas Lodge
H & S and Environment Controller
GEG Manufacturing Europe
Air Products plc
Acrefair
Wrexham

Prepared By:

.....

G K Turnock BSc
Asbestos Manager

Reviewed By:

.....

L D Stear
Asbestos Quality Manager

ALTON
CHESTER
DARTFORD
DERBY
DURHAM
HUDDERSFIELD
LONDON
MANCHESTER
MILTON KEYNES
OXFORD
PORTSMOUTH
SOUTHAMPTON
WARRINGTON

ABERDEEN
EDINBURGH
GLASGOW

CHEPSTOW

BELFAST
CORK

ROTTERDAM

A MEMBER OF THE RPS GROUP PLC

RPS CONSULTANTS LTD
REGD. IN ENGLAND
No. 2182945
CENTURION COURT
85 MILTON PARK
ABINGDON
OXFORDSHIRE OX14 4RY

CONTENTS

1 INTRODUCTION

2 SURVEY OBJECTIVES

3 LIMITATIONS OF SURVEY

4 METHODOLOGIES

5 LEGAL REQUIREMENTS

6 SURVEY RECORD AND RISK ASSESSMENT SHEETS

7 FINDINGS

8 RECOMMENDATIONS

9 RISK ASSESSMENT

APPENDICES

Appendix A: Certificates of Analysis

Appendix B: Sample Locations

Appendix C: Bulk Sampling Methodology

1 INTRODUCTION

At the request of Mr Nicholas Lodge of GEG Manufacturing Europe, Environmental Scientists from RPS Consultants, have carried out an asbestos survey of the Air Products factory, located in Acrefair, Wrexham.

The brief of RPS Consultants can be summarised as follows:

1. To provide an experienced survey team to site, to carry out a full survey of all accessible parts of the site.

2. To take samples of any materials suspected of containing asbestos and to analyse these at our UKAS (NAMAS) accredited laboratory, in accordance with MDHS 77 'Asbestos in Bulk Materials'.

3. To prepare a detailed written report showing all asbestos installations and the types detected.

In addition to identifying asbestos containing materials, each incidence of asbestos was assessed and a priority rating in the form of a numerical weighting was calculated. The risk assessment has been designed to allow the Property Manager to identify areas which require possible attention and to undertake long term planning. The factors included in the risk assessment include the position, condition, accessibility, friability and whether the material has been sealed. The numerical value extends from 0 – 17+, with four categories of risk assessment.

Category A is a high risk situation requiring immediate action.

Category B is a high risk situation requiring action as soon as possible.

Category C is a medium risk situation requiring regular inspection and maintenance.

Category D is a low risk situation.

In each location where asbestos material has been detected the risk assessment category has been identified within the body of the report.

The survey was carried out on the 31st July 2000 and 1st August 2000 by Mr G K Turnock and Mr M Evans of RPS Consultants.

2 SURVEY OBJECTIVES

The objectives of the survey was to identify, where practicable, asbestos containing materials used in the building structure fabric, which if worked upon are regulated by the Control of Asbestos at Work Regulations 1987 (CAWR 1987), and Amendment Regulations 1992 and 1998.

In particular, reference was to the following features, where present, throughout the building:

Building Fabric	Internal partitions
Insulation flues	Beam encasings

Soffits	Thermal encasings
Suspended ceilings	Sprayed Coatings
Riser cupboards	Wall linings
Upstands, firebreaks and bulkheads	Fire doors
Window sills	Heaters
Cement roofing	Guttering

3 LIMITATIONS OF SURVEY

Whilst the survey team made every effort to examine all suspect materials, we cannot guarantee that all asbestos-based materials have been located. Some materials may well be hidden within the fabric of the building and may only come to light when the building is being demolished or refurbished.

The results of sample analysis refer specifically to the sample taken from the locations defined in the report. Experience has shown that materials can vary greatly in relatively short distances from sample points. It should not be assumed that materials similar in appearance to those sampled are asbestos-free.

Asbestos fuse pads, rope seals, rope tubes and cement separator products, have been seen to be present in electrical switchgear throughout the site as indicated in Appendix B, however, these could not be accessed for sampling purposes at the time of survey due to Health and Safety reasons (Refer to colour key code and sample location plan in Appendix B for specific locations).

No equipment, machinery, or ducting was moved, opened up or examined during the survey.

Where asbestos materials prevented further access to areas (e.g. above asbestos ceilings), the investigation was halted.

Floor finishes such as linoleum and carpets etc. were not taken up.

Manhole covers believed to be part of the drainage system were not accessed.

To minimise damage to the fabric of the building, sub-face examinations of walls, floors (such as concrete, solid plaster, resins and timber materials etc.) and ceilings were not carried out.

Fire doors frequently contain an inner layer of asbestos material for fire retardant purposes. The presence of such an inner layer is difficult to determine without causing significant damage to doors. Such sampling activities were therefore not undertaken unless specifically requested. Under normal circumstances the asbestos contained within a fire door does not present a risk to health but caution is advised during maintenance work, i.e. renewing locks etc.

Access in ceiling voids throughout the main office block, high level roofing to factories and floor ducts was limited at the time of survey due to safety reasons.

Remaining inaccessible areas in addition to those listed below, can be seen indicated in Appendix B:

- Roof void above room 102 and conference room opposite to room 102
- Roof void above rooms 105, 106, 107 and 108
- Room 111
- Rooms 109 and 015
- Compressor house
- Ceiling void above locker room.

Should any further suspicious materials be encountered during refurbishment works, then these should be immediately reported to RPS Consultants and the materials identified before work can proceed.

4 METHODOLOGIES

The survey has been conducted by a team of experienced surveyors who have carried out representative sampling of any materials suspected of containing asbestos, following the code of practice - "Sampling of bulk materials for asbestos" (Institute of Occupational Hygienists, June 1988).

The samples were collected only where areas were unoccupied and using low disturbance techniques. (The details of the bulk sampling methodology is given in Appendix C).

Samples were assigned a unique sample number and sealed inside two layers of polythene for return to our UKAS (NAMAS) accredited analytical laboratory.

Samples were examined using a low power stereo binocular microscope (10x). Sub samples of any fibrous content were then mounted in Cargille refractive index oils for inspection using polarised light microscopy (150x), under polarised and dispersion staining conditions as defined in the HSE guidance method MDHS 77 'Asbestos in Bulk Materials'.

Results of analysis are recorded in Section 6 and Appendix A of this report.

5 LEGAL REQUIREMENTS

Work with all asbestos containing materials is controlled under the Control of Asbestos at Work Regulations 1987 (amended 1992 and 1998). The object of these regulations, which are made under the Health and Safety at Work etc. Act 1974, is to minimise worker's exposure to asbestos fibre within the work place.

This is further addressed under the Management of Health & Safety at Work Regulations 1999, which place a duty on employers to assess all significant risks posed as part of their undertaking, including their buildings, and to take suitable steps to reduce these risks. Hence, if asbestos is present in the workplace, it is the responsibility of the employer to ensure, firstly, that he knows where it is, and secondly, that it is maintained in a safe and proper manner so as not to pose a threat to the health of his workforce.

Two approved Codes of Practices' and a number of guidance notes have been produced by the Health and Safety Executive so that building managers, employers, employees and contractors can achieve compliance with the requirements of the regulations.

The substantial majority of projects which involve work with asbestos spray coating, thermal insulation materials and asbestos insulating boards, require the contractor or persons carrying out the works to be licensed under The Asbestos (Licensing) Regulations 1983 as amended 1998.

The principal statutory and regulatory requirements are:

Health and Safety at Work etc. Act 1974

The Management of Health & Safety at Work Regulations 1992

The Control of Asbestos at Work Regulations (CAWR) 1987 as amended by the Control of Asbestos at Work (Amendment) Regulations 1992 and the Control of Asbestos at Work (Amendment) Regulations 1998.

Approved Code of Practice *"Work with asbestos insulation and asbestos insulating board"(3rd Edition 1999).*

Approved Code of Practice *"The Control of Asbestos at Work"(3rd Edition 1999).*

Asbestos (Licensing) Regulations 1983 as amended by the Asbestos (Licensing) (Amendment) Regulations 1998.

Special Waste Regulations 1996

Construction (Design and Management) Regulations 1994.

Working with asbestos cement HSG 189/2, 1999.

In order to comply with Regulation 5 of the Control of Asbestos at Work Regulations, a detailed "Plan of Work" and "Risk Assessment" should be prepared by the employer engaged in asbestos removal, to ensure workers' exposure to asbestos fibres is estimated and appropriate controls put in place to ensure that this exposure is minimal.

Work with asbestos cement and other asbestos containing materials such as resins, rubbers, and plastics are exempt from the Asbestos (Licensing) Regulations 1983, and therefore it is not mandatory to employ licensed asbestos removal contractors to remove this material. However, there is still a requirement under the ACOP "The Control of Asbestos at Work" to undertake a risk assessment, although if the work is straightforward and if the anticipated exposure to asbestos is low, the assessment does not have to be in a written form.

Practical guidance on achieving the standards required by the ACOP "The Control of Asbestos at Work" is provided by the HSE in their Guidance Note HSG189/2 "Working with asbestos cement" 1999.

If an employer elects to use his own employees to carry out work with asbestos under the Health and Safety at work, etc., Act 1974, he has a duty to ensure the health, safety and welfare of his employees by providing such information, instruction, training and supervision required to maintain a safe system and safe place of work. Therefore, in addition to providing training on asbestos hazards and the appropriate control measures which will be

required, the employer also has to supply his staff with the appropriate safety equipment, i.e. respiratory protection, protective overalls and decontamination facilitates.

Asbestos waste containing > 0.1% w/w asbestos in the waste is classified as 'Special Waste' and must be consigned to a site which is authorised to accept asbestos waste. Special Waste Regulations 1996, Schedule 2 part 3 applies, this is enforced by the Environment Agency in England and Wales and the Scottish environmental agency in Scotland.

In most situations, particularly because of the requirements to dispose of Crocidolite asbestos as a special waste, it is often more cost effective to use a licensed asbestos removal contractor. RPS Consultants therefore recommend that asbestos cement is removed by a licensed asbestos contractor, to ensure full compliance with legislation.

6 SURVEY RECORD AND RISK ASSESSMENT SHEET

LOCATION (BUILDING): Air Products – Acrefair, Wrexham	CLIENT: GEG Manufacturing Europe	DATE OF SURVEY: 31/07/00	SURVEYED: GKT/ME

JOB NO.	TEST SAMPLE NO.	AREA SURVEYED DESCRIPTION	AREA SURVEYED ROOM NO.	QTY (M^3)	MATERIAL	ASBESTOS TYPE	POSITION	CONDITION	ACCESSIBILITY	EXISTING PROTECTION	FRIABILITY	ASBESTOS CONTENT	TOTAL POINTS	RISK ASSESSMENT CATEGORY	RELATED COLOUR PHOTOGRAPH
WE0263/01	SO38938	Cladding to structural beams	114 office block	50	B	A	1	1	0	4 nail fixed	1	2	9	C	N/A
WE0263/02	SO38939	Base of fume cupboard	25 office block	1	A	C	1	1	4	4 nail fixed	0	1	11	C	N/A
WE0263/03	SO38940	Wall panel to rear of fume cupboard	25 office block	0.4	B	A	1	1	1	4 screw fixed	1	2	10	C	N/A
WE0263/04	SO38941	Durasteel panelling forming storage cabinet	25 office block	1.5	A	C	1	1	4	2 painted frame fixed	0	1	9	C	N/A
WE0263/05	SO38942	Rope seal to redundant oven doors	Kitchen – canteen block	< 1	H	C	2	1	1	4	1	3	12	C	N/A
WE0263/06	SO38943	Ceiling panelling in boiler room	Boiler house	9	B	A	1	4	1	4 nail fixed	1	2	13	B	N/A
					A. Asbestos board greater than 1000kg/m³ B. Asbestos board less than 1000kg/m³ C. Sprayed asbestos D. Asbestos insulation lagging E. Supalux F. Plasterboard G. No asbestos H. Other asbestos	A. Brown (Amosite) B. Blue (Crocidolite) C. White (Chrysotile) D. Other E. No asbestos detected	External - 0 Internal - 1 Heating - 2	Good - 0 Fair - 1 Poor - 4	Limited - 0 Medium - 1 High - 4	Rigid cover -0 Flexible cover -2 Uncovered - 4	Low - 0 Medium - 1 High - 4	Low - 1 Medium - 2 High - 3		Cat A - is a high risk situation requiring immediate action Cat B - is a high risk situation requiring action ASAP Cat C - is a medium risk situation requiring regular inspection and maintenance Cat D - is a low risk situation	

Signed: ..... **Sampler**

Signed: ..... **Analyst (if different from sampler)**

SURVEY RECORD AND RISK ASSESSMENT SHEET

LOCATION (BUILDING): Air Products – Acrefair, Wrexham	CLIENT: GEG Manufacturing Europe	DATE OF SURVEY: 31/07/00	SURVEYED: GKT/ME

JOB NO.	TEST SAMPLE NO.	AREA SURVEYED DESCRIPTION	ROOM NO.	QTY (M^2)	MATERIAL	ASBESTOS TYPE	POSITION	CONDITION	ACCESSIBILITY	EXISTING PROTECTION	FRIABILITY	ASBESTOS CONTENT	TOTAL POINTS	RISK ASSESSMENT CATEGORY	RELATED COLOUR PHOTOGRAPH
WE0263/07	SO38944	Rope seal to boiler No. 1 burner	Boiler House	< 1	H	C	2	1	1	4	1	3	12	C	N/A
WE0263/08	SO38945	Internal cladding to roof and walls	Shop 1/2	-	G	E	1	1	0	2	N/A	N/A	N/A	N/A	N/A
WE0263/09	SO38946	Wall partitioning (double sided)	Copper-smith shop	30	B	A	1	1 some areas of damage	4	2 painted, bolt fixed	1	2	11	C	N/A
WE0263/10	SO38947	Wall cladding	Degrease facility	-	A	B and C	1	1	4	4	0	1	11	C	N/A
WE0263/11	SO38945	Wall cladding	Copper-smith shop	≈250	A	C	1	1	4	2 painted, bolt fixed	0	1	9	C	N/A
WE0263/12	SO38946	Ceiling tiles	MC shop	-	G	E	1	1	0	2 painted	N/A	N/A	N/A	N/A	N/A
					A. Asbestos board greater than 1000kg/m³ B. Asbestos board less than 1000kg/m³ C. Sprayed asbestos D. Asbestos insulation lagging E. Supalux F. Plasterboard G. No asbestos H. Other asbestos	A. Brown (Amosite) B. Blue (Crocidolite) C. White (Chrysotile) D. Other E. No asbestos detected	External - 0 Internal - 1 Heating - 2	Good - 0 Fair - 1 Poor - 4	Limited - 0 Medium - 1 High - 4	Rigid cover -0 Floxible cover -2 Uncovered - 4	Low - 0 Medium - 1 High - 4	Low - 1 Medium - 2 High - 3		Cat A - is a high risk situation requiring immediate action Cat B - is a high risk situation requiring action ASAP Cat C - is a medium risk situation requiring regular inspection and maintenance Cat D - is a low risk situation	

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SURVEY RECORD AND RISK ASSESSMENT SHEET

LOCATION (BUILDING): Air Products – Acrefair, Wrexham	CLIENT: GEG Manufacturing Europe	DATE OF SURVEY: 31/07/00	SURVEYED: GKT/ME

JOB NO.	TEST SAMPLE NO.	AREA SURVEYED DESCRIPTION	AREA SURVEYED ROOM NO.	QTY (M^3)	MATERIAL	ASBESTOS TYPE	POSITION	CONDITION	ACCESSIBILITY	EXISTING PROTECTION	FRIABILITY	ASBESTOS CONTENT	TOTAL POINTS	RISK ASSESSMENT CATEGORY	RELATED COLOUR PHOTOGRAPH
WE0263/13	SO38950	Wall and roof cladding	Saw stores	≈ 400	A	C	0	1	4	4 bolt fixed	0	1	10	C	N/A
WE0263/14	SO38951	Corrugated cladding to pitch of roofing	MC Shop	≈ 200	A	C	0	1	0	4	0	1	6	D	N/A
WE0263/15	SO38952	Wall and roof cladding	Hut adjacent to saw stores	≈ 13	A	C	0	1	0	4	0	1	6	D	N/A
WE0263/16	SO38953	Wall cladding	Main stores	≈ 600	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/17	SO38954	Roof Cladding	Compressor house	≈ 55	A	C	0	1	0	4	0	1	6	D	N/A
					A. Asbestos board greater than 1000kg/m³ B. Asbestos board less than 1000kg/m³ C. Sprayed asbestos D. Asbestos insulation lagging E. Supalux F. Plasterboard G. No asbestos H. Other asbestos	A. Brown (Amosite) B. Blue (Crocidolite) C. White (Chrysotile) D. Other E No asbestos detected	External - 0 Internal - 1 Heating - 2	Good - 0 Fair - 1 Poor - 4	Limited - 0 Medium - 1 High - 4	Rigid cover -0 Flexible cover -2 Uncovered - 4	Low - 0 Medium - 1 High - 4	Low - 1 Medium - 2 High - 3		Cat A - is a high risk situation requiring immediate action Cat B - is a high risk situation requiring action ASAP Cat C - is a medium risk situation requiring regular inspection and maintenance Cat D - is a low risk situation	

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SURVEY RECORD AND RISK ASSESSMENT SHEET

LOCATION (BUILDING): Air Products – Acrefair, Wrexham	CLIENT: GEG Manufacturing Europe	DATE OF SURVEY: 31/07/00	SURVEYED: GKT/ME

JOB NO.	TEST SAMPLE NO.	AREA SURVEYED DESCRIPTION	ROOM NO.	QTY (M^3)	MATERIAL	ASBESTOS TYPE	POSITION	CONDITION	ACCESSIBILITY	EXISTING PROTECTION	FRIABILITY	ASBESTOS CONTENT	TOTAL POINTS	RISK ASSESSMENT CATEGORY	RELATED COLOUR PHOTOGRAPH
WE0263/18	SO38955	Wall and roof cladding	Shot blast	≈ 200	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/19	SO38956	Wall cladding	Shop 1/2	≈ 250	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/20*	SO38597	Wall and roof cladding external	Shop 2	≈ 4000	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/21	*SO38958	Downpipe	Shop 4	≈ 12m x 100 mmØ	A	C	1	1	1	2	0	1	6	D	N/A
WE0263/22	SO38959	Wall and roof cladding	Shop 3	≈ 3000	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/23	SO38960	Wall cladding	Shop 5	≈ 100	A	C	0	1	1	4	0	1	7	D	N/A
WE0263/24	SO38961	Roof cladding	Lockers/ toilets	≈ 250	A	C	0	1	0	4	0	1	6	D	N/A
					A. Asbestos board greater than 1000kg/m^3 B. Asbestos board less than 1000kg/m^3 C. Sprayed asbestos D. Asbestos insulation lagging E. Supalux F. Plasterboard G. No asbestos H. Other asbestos	A. Brown (Amosite) B. Blue (Crocidolite) C. White (Chrysotile) D. Other E. No asbestos detected	External - 0 Internal - 1 Heating - 2	Good - 0 Fair - 1 Poor - 4	Limited - 0 Medium - 1 High - 4	Rigid cover -0 Flexible cover -2 Uncovered - 4	Low - 0 Medium - 1 High - 4	Low - 1 Medium - 2 High - 3		Cat A - is a high risk situation requiring immediate action Cat B - is a high risk situation requiring action ASAP Cat C - is a medium risk situation requiring regular inspection and maintenance Cat D - is a low risk situation	

Signed: ..... Sampler

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* Downpipes also present in Shop 2, both internally and externally.

7 FINDINGS

Inspection of Air Products, Acrefair, revealed asbestos to be present at the time of survey, in the form of:

- Nail fixed amosite (brown) asbestos insulation boarding, found as cladding to the structural beams in room 114 on the first floor of the office block, see Appendix B.

  This material was seen to be in a fair condition and unsealed. It is recommended that the boarding be encapsulated with a suitable fire retardant paint in due course.

  Risk Assessment Rating: Category C

  This same cladding was also noted to be present to the structural beams on the ground floor, located directly beneath room 114.

  Again encapsulation of the boarding is recommended in due course.

  It should be noted, that any future disturbance of this boarding, will result in the release of significant airborne asbestos fibre concentrations.

- Nail fixed chrysotile (white) asbestos cement, found as the base panelling to laboratory 25 fume cupboard.

  This panelling was found to be in a fair condition and unsealed.

  Due to the hard cementitious nature of the material, the panelling is unlikely to present a significant risk, unless abraded or machined tooled.

  It is recommended that the panelling be encapsulated with a suitable elastomeric paint sealant in due course.

  Risk Assessment Rating: Category C

- Nail fixed amosite (brown) asbestos insulation boarding, found as a panel to the wall to the rear of Laboratory 25 fume cupboard.

  The panel was seen to be in a fair condition and unsealed.

  It is recommended that a coat of a suitable fire retardant paint, be applied in due course.

  Risk Assessment Rating: Category C

- Chrysotile (white) asbestos containing Durasteel panelling, found forming the casing to the laboratory 25 storage cabinet.

  This panelling was found to be in a fair condition and paint sealed.

  It is recommended that a further coat of a suitable fire retardant paint be applied in due course.

Risk Assessment Rating: Category C

- A chrysotile (white) asbestos rope, found as a seal to the kitchen redundant oven.

  The rope was found to be in a fair condition and unsealed.

  This material is unlikely to present a risk in its current undisturbed state.

  It is recommended that the rope be removed under damp conditions by a licensed asbestos removal contractor in due course.

  Risk Assessment Rating: Category C

- Nail fixed amosite (brown) asbestos insulation boarding, found as ceiling cladding to the external boiler house.

  The panelling was seen to be damaged and exposed, and its removal under fully controlled conditions is recommended to be undertaken in due course.

  Risk Assessment Rating: Category B

- A chrysotile (white) asbestos rope, found as a seal to the boilerhouse boiler burner.

  The rope was found to be in a fair condition and unsealed.

  It is recommended that the exposed material be encapsulated with a suitable heat resistant paint in due course.

  Risk Assessment Rating: Category C

- Bolt fixed amosite (brown) asbestos insulation boarding, found as wall partitioning (double skin) in the Coppersmith Shop.

  The panelling was seen to be damaged in a couple of areas and, it is recommended that the material be removed under fully controlled conditions by a licensed asbestos removal contractor in due course.

  Risk Assessment Rating: Category C

- Bolt fixed chrysotile (white) and crocidolite (blue) asbestos cement, found as wall cladding to the Degrease Facility.

  The panelling was found to contain a minor proportion (1 – 15%) of chrysotile fibres and a trace (< 1%) of crocidolite fibres. The risks associated with the material are low unless it is machine tooled or badly broken.

  It is recommended that the internal cladding be encapsulated with a suitable fire retardant paint in due course.

  Risk Assessment Rating: Category C

It is understood from Air Products Plc, that the asbestos cement roofing to the Degrease Facility has been replaced recently with non-asbestos substitute cement corrugated sheeting.

Samples for confirmation of asbestos have therefore not been undertaken.

Others

All remaining asbestos installations identified during the survey, were those of:

- Corrugated asbestos cement panels found extensively throughout the site, as wall and roof cladding (Including roof edging and ridge panelling) to the buildings shown in Appendix B.

  The corrugated panels have been found to contain a minor proportion (1-15%) of chrysotile (white) asbestos fibres.

  The panels were generally seen to be in a good condition, however, it is recommended that the internal face of the cladding, be encapsulated with a suitable fire retardant paint in due course.

  In some areas of the factory, the corrugated panels have already been effectively sealed over internally, with a non-asbestos fibre board lining.

- In addition to the above, chrysotile (white) asbestos cement box gutters and downpipes have also been noted to be present, which were seen to be in a fair condition and present a minimal risk unless badly damaged or machine tooled.

  The extent of these installations, can be seen illustrated in Appendix B.

  Risk Assessment Rating: Category D

- Chrysotile (white) asbestos cloth, found present as a sock to the air intake fan of all heater units throughout the factory. In addition to the sock, chrysotile (white) asbestos gasketting was also seen to be present to the heater unit burners (see colour key code and location plans in Appendix B for specific locations).

  These materials were seen to be in a fair condition and are unlikely to present a risk in their current undisturbed state.

Future removal of the gasketting and cloth products, should be carried out with the use of fibre suppressant techniques. The materials should then be sealed within two layers of 1000 gauge polythene prior to their disposal as asbestos waste.

8 RECOMMENDATIONS

In light of the asbestos installations noted during the survey and in conjunction with the risk assessments, the following recommendations are made:

1. If asbestos materials are to remain it is important that they are managed properly.

   This should include a register of locations being kept (as provided by this report) and a maintenance system set up which requires that anybody carrying out work in the building should consult this register to ensure that the planned work will not disturb any encapsulated asbestos.

   The register should be updated as and when any asbestos is removed or treated and, the condition of the encapsulated asbestos assessed by visual examination (if possible) on a six monthly basis.

2. Label all asbestos installations as containing asbestos and highlight the need to consult the register before carrying out any work which may disturb it.

3. It is recommended that the following installations be encapsulated with a suitable elastomeric paint sealant in due course:

   - The cladding to the structural beams on the ground and first floors of the office block.
   - The panelling to the base of laboratory 25 fume cupboard, including the rear wall panel.
   - The Durasteel storage cabinet in laboratory 25.
   - The exposed rope to the external boilerhouse boiler burner.
   - All internal corrugated wall and roof cladding installations throughout the site.

   Prior to encapsulation, any exposed or damaged/flaking material, shall be vacuumed off with a HEPA filtered vacuum cleaner and suitably repaired where necessary. It is recommended that these works be undertaken by a licensed asbestos removal contractor.

4. It is recommended in the near future, that the following installations be removed by a licensed asbestos removal contractor under fully controlled conditions:

   - The ceiling cladding to the external boiler house.
   - The wall partitioning to the Coppersmith Shop.

The above installations shall be removed adopting the following control principles:

Pre-cleaning of the work areas may be necessary if forming the enclosure may itself disturb asbestos and cause airborne release. Enclosures may use parts of the existing building or be self supporting structures.

The enclosures will be supported by a framework of clean, planed 50 mm x 50 mm timber, to which the 1000 gauge polythene sheeting will be securely fixed internally, with spray glue, adhesive tape and, if necessary, polyurethane expanding foam. There should be no creases or folds, which are likely to trap asbestos.

Walls, ceilings and floors must be impervious. If any surface is rough, damaged or friable it must shall be sheeted over with 1000 gauge polythene. Polythene can be covered with hardboard to minimise slipping, then be disposed of as contaminated waste. Windows or other openings should be sealed accordingly.

Holes in the ceilings and walls which allow pipework etc. to pass, which cannot be adequately sealed with polythene and adhesive tape, shall be sealed with expanding foam.

Electrical equipment/lights within the working areas, shall be isolated and sealed off with 1000 gauge polythene and adhesive tape, after thoroughly being cleaned.

The enclosures shall be held under negative pressure throughout the removal works which shall be sufficient to ensure at least 6 No. complete air changes per hour for the enclosure.

Entry to and from the enclosures shall be via 3 stage airlock systems which shall be used for the decontamination of personnel, equipment and waste.

The airlocks will consist of three chambers constructed of 250 micron polythene sheet sealed onto a timber or metal framework by 75 mm polycloth adhesive tape.

The size of the chambers will be a minimum of 600 mm x 600 mm on plan and a minimum of 1.85m in height.

The chambers will inter-connect via a cut oval opening in the polythene sheet, over which is hung a flap of polythene extending a minimum of 100 mm beyond the opening.

The flaps will be positioned on the enclosure side of the airlock chamber and will be suitably weighted at the bottom of the outer flap. Wherever possible, the airlocks should be constructed directly on to the hygiene facility.

Warning signs complying with the current Safety Signs Regulations will be fixed to the enclosure at appropriate points to prevent unauthorised access and indicating the nature of the hazard.

The enclosures shall undergo a smoke test to be witnessed by the clients independent analyst, to ensure that no leaks exist. If any leaks are detected these should be sealed immediately. Only on completion of a successful smoke test, will works be allowed to commence.

The asbestos cladding will be thoroughly soaked with an approved wetting agent (30-330 Dampstrip or similar) by appropriate methods prior to removal.

All asbestos cladding will be carefully de-nailed/unscrewed and lowered to floor level, whereupon the asbestos will be effectively wrapped and sealed.

Once the first panel has been removed, the remainder shall be sprayed from the rear and then frequently during removal to keep the exposure level to fibres as low as possible.

If voids to adjacent areas are exposed on removing boards, then these must be sealed immediately prior to continuing.

If the sections of board are too big to handle, then they should be scored and broken.

All fixing points shall be cleaned out either by drilling or using a wire brush.

The transport and disposal of asbestos waste shall be notified to the appropriate waste disposal authority in accordance with the Special Waste Regulations 1996.

Throughout the removal works. the client's independent analyst (RPS Consultants) shall carry out leakage air tests to demonstrate that the enclosures are sound and that adjacent areas have not become contaminated.

All surfaces within working enclosures will be cleaned by use of an 'H' type filtration vacuum (complying with BS 5415) and damp cloths, using clean water.

Upon completion of the works, the enclosures shall be expected to pass a detailed visual inspection to be carried out by the client's analyst. The area should be free of any form of residual dust or debris.

Upon completion of a successful visual inspection of the area, RPS Consultants shall carry out active disturbance air testing to ensure that the areas are fit for reoccupation. Only when the air test shows levels to be below the clearance indicator level of 0.010 fibres per millilitre of air, can the enclosures be removed.

All operatives involved in the removal exercise shall wear suitable and sufficient personal and respiratory protective equipment during the works.

A suitable and sufficient decontamination unit shall be provided to site for the safe decontamination of personnel.

5. It is recommended that the rope seal found to the kitchen redundant oven, be removed in the near future as detailed below:

During the removal works, the operatives involved will be equipped with appropriate Personal and Respiratory Protective Equipment.

The rope shall be carefully removed under damp conditions using hand tools and, be double wrapped in 1000 gauge visqueen or sealed within two asbestos waste bags. A HEPA filtered vacuum cleaner will also be utilised during the removal work, positioning the nozzle as close to the rope as possible to intercept any released fibres.

The transport and disposal of asbestos waste shall be notified to the appropriate waste disposal authority in accordance with the Special Waste Regulations 1996.

NB. Any future removal of gasketting, rope (including cement separators in switchgear) and cloth products should be carried out adopting the control principles detailed above.

Should any refurbishment work be required in the future, then an assessment should be made of the likelihood of disturbance of any asbestos materials in the building. If asbestos is likely to be disturbed, it is advised that a licensed asbestos removal contractor be employed to remove the asbestos prior to the commencement of the refurbishment.

To conclude, it is recommended that any proposed works of whatever nature, be discussed with RPS Consultants to assess the levels of risk connected.

9 RISK ASSESSMENT

The risk assessment system which has been adopted, concentrates solely on the likelihood of fibre release from asbestos based materials which may subsequently be available for inhalation by building occupants. This is the singular most important factor in assessing the risk potential.

In some situations it may be useful to undertake measurement of atmospheric fibre concentrations; however, these levels are prone to large variations dependent upon conditions, and may well be below the concentration measurable using optical microscopic methods but still above local background environmental levels.

Although recommendations which are issued will vary according to the situation, it is desirable that some standardisation of action is achieved. It is therefore proposed that the following guide-lines are adopted.

9.1 Priority Rating Recommendation and Comments

9.1.1 Category A. 17+

It is likely in situations with such a high rating that persons are currently being exposed to some level of asbestos fibre contamination.

This exposure will vary according to location conditions - for example, the intensity of use of a heating system or the nature of air flow and movement around a damaged ceiling. It may be possible to clarify the exposure level by use of atmospheric fibre counts. However, the concentrations involved are likely to be low in comparison with occupational exposure limits. Due to the potential exposure, areas or situations which fall into this category should be regarded as a matter for concern.

In most circumstances, immediate plans for removal of the asbestos concerned should be implemented, or at least the rapid sealing of the affected area.

9.1.2 Category B. 13-16 inclusive

Situations within this category are potentially hazardous and still warrant remediation in the short term in that any slight deterioration in one of a number of contributory factors will result in unacceptable deterioration within a short passage of time. In these situations, it is therefore necessary for the asbestos to be removed on a programmed basis, but within a specified timescale.

It is recommended that the maximum period should be 1 year and that, in the meantime, emergency repair and sealing operations should be undertaken where any deterioration or damage occurs.

9.1.3 Category C. 8-12 inclusive

Situations within this category do not pose any imminent risk and the likelihood of fibre release is low under existing conditions. It is recommended that material falling within this category should be regularly assessed to monitor the condition as potential deterioration will occur with passage of time.

It is recommended that situations within this category should be inspected on a 6 monthly basis to ascertain any change in circumstances, requiring reassessment of priority rating into Category B.

9.1.4 Category D. Less than 8

Situations within this category are of low priority. The situation should be assessed on the basis of a 2 year inspection cycle to ascertain any change in category.

APPENDIX A

CERTIFICATES OF ANALYSIS

2251

RPS CONSULTANTS
SAFETY AND ENVIRONMENT

21 Bridge Road
Woolston
Warrington
Cheshire
WA1 4AT

Tel: 01925 831000
Fax: 01925 831231
Email: rpswa@rpsplc.co.uk

Certificate of Analysis

Client:	Nicholas Lodge	**Ref. No:**	N28681	**Issue:**	1
	Safety, Health and Environmental Controller	**Order No:**			
	GEG Manufacturing Europe	**Date Received:**	09/08/00		
	Air Products PLC	**Date Tested:**	31/08/00		
	Acrefair	**Date Reported:**	31/08/00		
	Wrexham				

Attention: Nicholas Lodge

Description: Analysis of Bulk Samples

Site: Air Products, Acrefair – Wrexham

Bulk identification of material - Specification RPSEG/A1

Sample Number	Description	Result
S038938	Grey Board	Amosite (Brown) Asbestos, 15-50%
S038939	Grey/Brown Cement	Chrysotile (White) Asbestos, 1-15%
S038940	Grey Board	Amosite (Brown) Asbestos, 15-50%
S038941	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038942	Yellow/White Rope	Chrysotile (White) Asbestos, 100%

Certificate Comments

Method : Polarising microscopy with dispersion staining. (MDHS 77) "Asbestos in Bulk Materials".

Sampling : Sampled by RPS Consultants

Testing House : 21 Bridge Road, Warrington.

Disclaimer : Estimated percentage asbestos content and bulk density are outside the scope of the company's UKAS accreditation.

Tested By:
Gary Turnock
Asbestos Manager

Reviewed By:
Laurence Stear
Asbestos Quality Manager

(Authorised Signatory On Behalf Or Authority of RPS Consultants Limited)

UKAS TESTING
2251

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Email: rpswa@rpsplc.co.uk

Certificate of Analysis

Client:	Nicholas Lodge Safety, Health and Environmental Controller GEG Manufacturing Europe Air Products PLC Acrefair Wrexham	**Ref. No:** **Order No:** **Date Received:** **Date Tested:** **Date Reported:**	N28681 09/08/00 31/08/00 31/08/00	**Issue:**	1

Attention: Nicholas Lodge

Description: Analysis of Bulk Samples

Site: Air Products, Acrefair – Wrexham

Bulk identification of material - Specification RPSEG/A1

Sample Number	Description	Result
S038943	Grey Board	Amosite (Brown) Asbestos, 15-50%
S038944	Grey/White Rope	Chrysotile (White) Asbestos, 100%
S038945	Orange/Brown Board	No Asbestos Detected
S038946	Grey Board	Amosite (Brown) Asbestos, 15-50%
S038947	Grey Cement	Chrysotile (White) Asbestos, 1-15% Crocidolite (Blue) Asbestos, <1%

Certificate Comments

Method : Polarising microscopy with dispersion staining. (MDHS 77) "Asbestos in Bulk Materials".

Sampling : Sampled by RPS Consultants

Testing House : 21 Bridge Road, Warrington.

Disclaimer : Estimated percentage asbestos content and bulk density are outside the scope of the company's UKAS accreditation.

Tested By:
Gary Turnock
Asbestos Manager

Reviewed By:
Laurence Stear
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Certificate of Analysis

Client: Nicholas Lodge
Safety, Health and Environmental Controller
GEG Manufacturing Europe
Air Products PLC
Acrefair
Wrexham

Ref. No: N28681
Order No:
Date Received: 09/08/00
Date Tested: 31/08/00
Date Reported: 31/08/00

Issue: 1

Attention: Nicholas Lodge

Description: Analysis of Bulk Samples

Site: Air Products, Acrefair – Wrexham

Bulk identification of material - Specification RPSEG/A1

Sample Number	Description	Result
S038948	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038949	Brown Board	No Asbestos Detected
S038950	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038951	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038952	Grey Cement	Chrysotile (White) Asbestos, 1-15%

Certificate Comments

Method : Polarising microscopy with dispersion staining. (MDHS 77) "Asbestos in Bulk Materials".

Sampling : Sampled by RPS Consultants

Testing House : 21 Bridge Road, Warrington.

Disclaimer : Estimated percentage asbestos content and bulk density are outside the scope of the company's UKAS accreditation.

Tested By:
Gary Turnock
Asbestos Manager

Reviewed By:
Laurence Stear
Asbestos Quality Manager

(Authorised Signatory On Behalf Or Authority of RPS Consultants Limited)

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Certificate of Analysis

Client: Nicholas Lodge
Safety, Health and Environmental Controller
GEG Manufacturing Europe
Air Products PLC
Acrefair
Wrexham

Ref. No: N28681
Order No:
Date Received: 09/08/00
Date Tested: 31/08/00
Date Reported: 31/08/00

Issue: 1

Attention: Nicholas Lodge

Description: Analysis of Bulk Samples

Site: Air Products, Acrefair – Wrexham

Bulk identification of material - Specification RPSEG/A1

Sample Number	Description	Result
S038953	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038954	Grey/Brown Cement	Chrysotile (White) Asbestos, 1-15%
S038955	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038956	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038957	Grey Cement	Chrysotile (White) Asbestos, 1-15%

Certificate Comments

Method : Polarising microscopy with dispersion staining. (MDHS 77) "Asbestos in Bulk Materials".

Sampling : Sampled by RPS Consultants

Testing House : 21 Bridge Road, Warrington.

Disclaimer : Estimated percentage asbestos content and bulk density are outside the scope of the company's UKAS accreditation.

Tested By:
Gary Turnock
Asbestos Manager

Reviewed By:
Laurence Stear
Asbestos Quality Manager

(Authorised Signatory On Behalf Or Authority of RPS Consultants Limited)

RPS CONSULTANTS
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2251

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WA1 4AT

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Certificate of Analysis

Client: Nicholas Lodge
Safety, Health and Environmental Controller
GEG Manufacturing Europe
Air Products PLC
Acrefair
Wrexham

Ref. No: N28681
Order No:
Date Received: 09/08/00
Date Tested: 31/08/00
Date Reported: 31/08/00

Issue: 1

Attention: Nicholas Lodge

Description: Analysis of Bulk Samples

Site: Air Products, Acrefair – Wrexham

Bulk identification of material - Specification RPSEG/A1

Sample Number	Description	Result
S038958	Grey Cement	Chrysotile (White) Asbestos, 1-15%
S038959	Grey/Brown Cement	Chrysotile (White) Asbestos, 1-15%
S038960	Grey Cement	Chrysotile (White) Asbestos. 1-15%
S038961	Grey Cement	Chrysotile (White) Asbestos, 1-15%

Certificate Comments

Method : Polarising microscopy with dispersion staining. (MDHS 77) "Asbestos in Bulk Materials".

Sampling : Sampled by RPS Consultants

Testing House : 21 Bridge Road, Warrington.

Disclaimer : Estimated percentage asbestos content and bulk density are outside the scope of the company's UKAS accreditation.

Tested By:
Gary Turnock
Asbestos Manager

Reviewed By:
Laurence Stear
Asbestos Quality Manager

(Authorised Signatory On Behalf Or Authority of RPS Consultants Limited)

APPENDIX B

SAMPLE LOCATIONS

11. If any installation is found to be in a poor condition giving a potential for the release of airborne asbestos fibres, then RPS Consultants will inform the person in charge of the premises as to the safe treatment of the material.

materials shall be pre-wetted before taking a sample using either a Stanley knife and/or a pair of pliers.

The sample area will be immediately sealed with PVA solution and covered with adhesive tape to give an airtight seal.

Textured Coatings etc. — A sample of textured coating covering an area of approximately 10m² shall be collected for analysis. The area shall be pre-wetted before taking the sample using a Stanley knife.

The sample area shall be immediately sealed with a PVA solution.

Non Asbestos Materials Samples will be taken from each surface of each area surveyed, i.e. walls, floors, ceilings, doors and partitions in order to obtain a "positive" "negative" with regard to asbestos. Where there is considerable commonality of materials, one sample of each material will be taken and a note made in the report.

3. Surfaces onto which dust or debris may fall, will be covered with an impervious sheet before the sample is taken (unless the surface itself is impervious) and be cleaned afterwards by a dustless method such as a damp cloth which is then double wrapped within two self-sealing bags. This package will then be disposed of as asbestos waste.

4. All sampling equipment will be cleaned between samples with wet wipes to prevent cross contamination.

5. All samples will be double wrapped within two self sealing polythene bags to prevent any possible chance of fibre release.

6. Air testing carried out in the past has shown that fibre levels given off during asbestos sampling of the above nature typically gives results below the clearance indicator level of 0.010 fibres per millilitre of air.

7. In the unlikely event that any spillage's should occur, then a HEPA filtered vacuum cleaner will be at hand along with a fibre suppressant spray canister for the immediate containment and clean up of the spillage. Any remaining debris will be cleared up under damp conditions and disposed of as asbestos waste in the appropriate way. A reassurance air test could then be carried out in accordance with MDHS 39/4.

8. Once the sample area has been reinstated to a safe condition, a unique sample number label with the client name and date will be attached to the location.

9. The asbestos survey record and risk assessment sheet is to be completed for each sample location.

10. Personnel carrying out the sampling will wear appropriate respiratory and protective equipment at the time of sampling only.

TRADE EFFLUENT DISCHARGE CONSENT

Dŵr Cymru
Welsh Water

DWR CYMRU CYFYNGEDIG

WATER INDUSTRY ACT 1991

NOTICE OF DIRECTION VARYING A CONSENT
TO DISCHARGE TRADE EFFLUENT
FROM TRADE PREMISES INTO A PUBLIC SEWER

TO: Air Products PLC, Llangollen Road, Acrefair, Wrexham LL14 3HW.

1. Consent ("The Consent") to discharge trade effluent into the public sewer subject to conditions was issued by DWR CYMRU CYFYNGEDIG ("The Undertaker") (or its predecessor) on the **25th day of June 1992** from trade premises at: **Air Products PLC, Llangollen Road, Acrefair, Wrexham, LL14 3HW.**
2. Except in so far as they are varied by this direction the conditions and provisions of the consent and the previous directions shall remain in force and shall apply to the discharge.

The undertaker hereby gives notice of its directions that the conditions attached to the consent as varied with effect the 1st **day of January 2008** by:-

(i) The revocation of the conditions contained and any previous directions, and
(ii)The substitution for those conditions of the following conditions:-

(1) The public sewer(s) into which the trade effluent may be discharged is **229mm** more particularly identified by means of a line(s) coloured RED drawn on the plan attached hereto and marked "B".

(2) The discharge of trade effluent shall be made at the point marked "X" on the said plan and the said trade effluent shall enter into the public sewer shown on the said plan at the point marked "Y" thereon and nor otherwise. Further, no connection, linkage, conduit, pipe, channel or other communication whatsoever shall be made to the said sewer between the said points "X" and "Y" (without the prior approval in writing of the Undertaker).

(3) The trade effluent to be discharged shall consist solely that which is specified in the Application and derived (exclusively) from the **manufacture of cryogenic storage vessels**.

(4) Without prejudice to condition 3 above, the nature and/or composition of the trade effluent which may be discharged is as specified in the FIRST SCHEDULE hereto.

(5) The trade effluent shall not include any of the substances or properties listed in the SECOND SCHEDULE hereto in concentration greater than stated therein.

(6) The maximum quantity of trade effluent discharged on any day (being any continuous 24 hour period) shall not exceed **20 cubic metres**. wa 14

(7) The highest rate at which trade effluent may be discharged shall not exceed **2 cubic metres per hour**. wa 14

(8) The trade effluent shall only be discharged into the public sewer(s) from 0.00 hours to 2400 hours (on the following days each week, namely Monday to Sunday).

(9) No uncontaminated condensing water shall be discharged.

(10) There shall be eliminated from the trade effluent before it is discharged the matters listed below :

a) Effluent with a temperature in excess of 43° Celsius (110° Fahrenheit) ;
b) Calcium Carbide ;
c) Petroleum Spirit within the meaning of Section 111 of the Water Industry Act 1928, save otherwise permitted herein :
d) Other material forming a constituent of the trade effluent, whether along or in combination with other materials, specified hereby as that which is explosive ;
e) Any other substance forming a constituent of the trade effluent which is hereby specified as that which is likely to injure the sewers or to interfere with the free flow of their contents or to affect prejudicially the treatment and disposal of their contents.
f) Any other substance forming a constituent of the trade effluent which is specified as that which in its pure state or in combination with other materials in the contents of the sewer(s) ("the sewage") is capable of producing toxic or flammable vapours.

(11) No trade effluent shall be discharged the pH value of which is **less than 5 or greater than 10.** no change

(12) No trade effluent shall be discharged the nature or composition of which includes a matter, substance, property or matters, substances or properties which would constitute the trade effluent as Special Category Effluent within the meaning of Section 138 of the Water Industry Act 1991.

(13) The Occupier shall give to the Undertaker prior written notice of any change in the process of manufacture, materials, or other circumstances howsoever arising capable of altering the nature and/or composition of the trade effluent. No new substances or properties shall be discharged until the Undertaker has agreed thereto, either with or without imposing a limit and thereafter the said substance(s) and/or property(ies) shall be deemed incorporated into the SECOND SCHEDULE.

(14) An inspection chamber or manhole shall be provided and maintained by the Occupier in a suitable position and/or at the point(s) marked "X" on the plan annexed hereto in connection with each pipe through which the trade effluent is discharged and such inspection chamber or manhole shall be constructed and maintained in accordance with the Undertaker's reasonable requirements as from time to time notified in writing to the occupier so as to enable a person readily at any time to take samples of the trade effluent being discharged.

(15) A notch gauge, continuous recorder or some other apparatus suitable and adequate to the Undertaker for measuring and automatically recording the volume and rate of trade effluent so discharged shall be provided, such apparatus to be tested and maintained in accordance with the Undertaker's reasonable requirements as from time to time notified in writing to the Occupier.

(16) Apparatus capable of accurately determining, measuring and recording the nature and/or composition of the trade effluent discharged shall be provided, such apparatus to be tested and maintained in accordance with the Undertaker's reasonable requirements as from time to time notified in writing to the Occupier.

(17) The Occupier shall keep records of the volume, rate, nature and/or composition of the trade effluent discharged into the sewer(s) at all times available for inspection by any authorised officer of the Undertaker and copes of such records shall be sent to the Undertaker on demand.

(18) (a) The Occupier shall pay to the Undertaker charges for the reception, conveyance, treatment and disposal of the trade effluent and the costs of sampling, measuring and/or analysis of the same under the Undertaker's trade effluent's functions, which charges shall be determined as set out below, and all sums payable under this condition shall be payable upon demand;

(b) The charges under (a) above shall be calculated in accordance with Undertaker's Scheme of Charges as from time to time amended;

(c) For the avoidance of doubt, the charge shall be payable by any person who is or was the Occupier of the said trade premises during the period of discharge of the trade effluent or at the time payment is due.

(19) If the notch gauge, meter, recorder or other apparatus ceases to record or is suspected of not recording and/or measuring accurately, the quantity of trade effluent discharged into the sewer(s) during the period from the date and/or time at which the records were last accepted by the Undertaker as being correct up to the date when the notch gauge, meter, recorder or other apparatus again registers accurately shall for the purpose of any payment to be made under these conditions be based on the average daily volume of trade effluent discharged during the preceding period over which the records were last accepted by the Undertaker as being accurate or during the month immediately after the notch, gauge, meter, recorder or other apparatus or means of measurement and recording has been accurate whichever is the higher.

YOUR RIGHT OF APPEAL

Any person aggrieved by :-

The refusal of a Sewage Undertaker to give consent for which application has been made to the Undertaker under Section 119 of the Water Industry Act 1991; or any condition attached by a Sewage Undertaker to such consent may appeal to the Director General of Water Services.

On an appeal in respect of a refusal to give consent, the Director may give the necessary consent either unconditionally or subject to such conditions as he thinks fit to impose.

On an appeal in respect of a condition the Director may take into review all the conditions whether appealed against or not and may substitute for them any other set of conditions (whether more or less favourable to the Appellant) or annul any of the conditions and may include provision as to the charges to be made in pursuance of any condition attached to a consent for any period before the determination of the appeal. On any appeal the Director may give direction that the trade effluent shall not be discharged until a specified date.

FAILURE TO COMPLY WITH CONDITIONS.

If in the case of any trade premises a condition is contravened, the Occupier of the premises will be guilty of an offence and liable on conviction by a Magistrates' Court to a fine not exceeding the statutory maximum or on conviction by the Crown Court to an unlimited fine.

DATED 16th **day of** January **2008**

For and on behalf of the Company A. R Andrews

Designation: Waterway Regulation Manager

Address of Division:

Northern Division
Dinas Depot
Llanwnda
Caernarfon
Gwynedd
LL54 5UD

FIRST SCHEDULE

Effluent derived from the **manufacture of cryogenic storage vessels**

Water (including such elements, compounds and organisms normally present in water at trace or harmless levels and not exceeding such levels that as may be imposed by regulations for the time being regulating the quality drinking water)

SECOND SCHEDULE.

PART A (Applicable to spot samples.)

(1) Total suspended solids of the trade effluent shall not exceed 1000 milligrams per litre.

(2) The chemical oxygen demand of the trade effluent after one hour quiescent settlement shall not exceed 1500 milligrams per litre.

(3) Toxic metals and their compounds shall not exceed the following concentrations (expressed as milligrams per Litre of the metal):-

	Total soluble and insoluble compounds
Copper	2.0
Zinc	2.0
Lead	2.0
Chromium	2.0
Nickel	2.0

PART B (Applicable to 24 hour composite samples.)

(1) Total suspended solids of the trade effluent shall not exceed 1000 milligrams per litre.

(2) The chemical oxygen demand of the trade effluent after one hour quiescent settlement shall not exceed 1500 milligrams per litre.

(3) Toxic metals and their compounds shall not exceed the following concentrations (expressed as milligrams per Litre of the metal):-

	Total soluble and insoluble compounds
Copper	2.0
Zinc	2.0
Lead	2.0
Chromium	2.0
Nickel	2.0

THIRD SCHEDULE

(1) Not applicable.

DŴR CYMRU
WELSH WATER

Sample Analysis Report

C L Price, Works Engineer
Air Products Plc
Acrefair
Wrexham
Wrexham County Borough
LL14 3HW

Sampling Point No -	705208	**Location -**	AIR PRODUCTS PLC, ACREFAIR
Date Sampled -	07/09/2009	**Time Taken -**	10:30
Originator -	TREATMENT	**Purpose -**	CHARGING/CONSENT MONITORING
Laboratory -	BRIDGEND	**Lab Ref No -**	T 3180252
Sampler -	ND01	**Samplers Comments -**	
Type -	COMMERCIALLY R	**No Results -**	3

Sample Results

Code	Determinand Name	Units	Result	Limit	
61	PH VALUE	PH UNITS	9.1	5	GT
61	PH VALUE	PH UNITS	9.1	10	
91	CHEMICAL OXYGEN DEMA	MG/L	281	1500	
135	SUSPENDED SOLIDS 105	MG/L	312	1000	

LT - Less Than **GT - Greater Than**

Comments -

pass.

Signed -

Gillespie

12 October 2009

AIR CONDITIONING DETAILS

S	Equipment	Description of technical object	Valid To	PlPl
☐	100572179	6202 - CLAMP METER	31.12.9999	0651
☐	**100572180**	**6203 - CLAMP METER**	**31.12.9999**	**0651**
☐	100572181	6206 - CLAMP METER	31.12.9999	0651
☐	**100572182**	**6208 - CLAMP METER**	**31.12.9999**	**0651**
☐	100572183	6209 - CLAMP METER	31.12.9999	0651
☐	**100572184**	**6306 - MULTIMETER (AVO)**	**31.12.9999**	**0651**
☐	100572185	6313 - MULTIMETER	31.12.9999	0651
☐	**100572186**	**6314 - MULTIMETER**	**31.12.9999**	**0651**
☐	100572187	6316 - MULTIMETER	31.12.9999	0651
☐	**100572189**	**6318 - MULTIMETER**	**31.12.9999**	**0651**
☐	100572190	6319 - MULTIMETER	31.12.9999	0651
☐	**100572191**	**6401 - POTENTIOMETER**	**31.12.9999**	**0651**
☐	100572192	7701 - MICROWAVE TESTER	31.12.9999	0651
☐	**100572193**	**7801 - PAC 500**	**31.12.9999**	**0651**
☐	100572194	8002 - PAT TESTER	31.12.9999	0651
☐	**100572195**	**8103 - CONTINUITY TESTER**	**31.12.9999**	**0651**
☐	100572196	8202 - THERMOMETER	31.12.9999	0651
☐	**100572197**	**8302 - TORQUE WRENCH**	**31.12.9999**	**0651**
☐	100572198	8303 - TORQUE WRENCH	31.12.9999	0651
☐	**100572199**	**8401 - VOLTAGE/CURRENT CALIBRATOR**	**31.12.9999**	**0651**
☐	100572200	8402 - TIME MICROCAL	31.12.9999	0651
☐	**100572201**	**8501 - ISO POWER SUPPLY**	**31.12.9999**	**0651**
☐	100572202	8601 - EARTH LOOP TESTER	31.12.9999	0651
☐	**100572203**	**8701 - DRUCKS**	**31.12.9999**	**0651**
☐	100572204	8702 - PRESSURE METER	31.12.9999	0651
☐	**100572206**	**3/001 - WRITTEN SCHEME LOGBOOK 3/001**	**31.12.9999**	**0651**
☐	100572207	3/002 - WRITTEN SCHEME LOGBOOK 3/002	31.12.9999	0651
☐	**100572208**	**3/003 - WRITTEN SCHEME LOGBOOK 3/003**	**31.12.9999**	**0651**
☐	100572209	3/004 - WRITTEN SCHEME LOGBOOK 3/004	31.12.9999	0651
☐	**100572210**	**3/005 - WRITTEN SCHEME LOGBOOK 3/005**	**31.12.9999**	**0651**
☐	100572212	AC006 - COMPRESSOR - TYRES	31.12.9999	0651
☐	**100572213**	**AC007 - COMP SHOP AIR**	**31.12.9999**	**0651**
☐	100572214	AC008 - COMPRESSOR BREATHING AIR	31.12.9999	0651
☐	**100572215**	**AC009 - COMPRESSOR-ROTARY SCREW**	**31.12.9999**	**0651**
☐	100572216	AC010 - COMPRESSOR BOOSTER	31.12.9999	0651
☐	**100572217**	**AC011 - COMPRESSOR 10bar**	**31.12.9999**	**0651**
☐	100572219	AC013 - COMPRESSOR SHOP AIR 100PSI	31.12.9999	0651
☐	**100572220**	**AC014 - COMPRESSOR SHOTBLAST**	**31.12.9999**	**0651**
☐	100572221	AD001 - AUTOMATIC DOOR	31.12.9999	0651
☒	**100572222**	**AF01 - AC SYSTEM IT**	**31.12.9999**	**0651**
☒	100572223	AF02 - AC SYSTEM IT	31.12.9999	0651
☒	**100572224**	**AF03 - AC SYSTEM HR**	**31.12.9999**	**0651**
☒	100572225	AF04 - AC SYSTEM TSD LAB	31.12.9999	0651
☒	**100572226**	**AF05 - AC SYSTEM BUTTERLEY**	**31.12.9999**	**0651**
☒	100572227	AF06 - AC SYSTEM DESIGN OFFICE	31.12.9999	0651
☒	**100572228**	**AF07 - AC SYSTEM PROJECTS OFFICE**	**31.12.9999**	**0651**
☒	100572229	AF08 - AC SYSTEM PLANNING	31.12.9999	0651
☒	**100572230**	**AF09 - AC SYSTEM A EVANS**	**31.12.9999**	**0651**
☒	100572231	AF10 - AC SYSTEM HUGHES ROOM	31.12.9999	0651
☒	**100572232**	**AF11 - AC SYSTEM G MORRIS**	**31.12.9999**	**0651**
☒	100572233	AF12 - AC SYSTEM IT	31.12.9999	0651
☒	**100572234**	**AF13 - AC SYSTEM J BUTLER**	**31.12.9999**	**0651**
☒	100572235	AF14 - AC SYSTEM PLANNING	31.12.9999	0651
☒	**100572236**	**AF15 - AC SYSTEM MAINT**	**31.12.9999**	**0651**
☒	100572237	AF16 - AC SYSTEM D WATSON	31.12.9999	0651
☒	**100572238**	**AF17 - AC SYSTEM M EVANS**	**31.12.9999**	**0651**
☒	100572239	AF18 - AC SYSTEM M KILCOYNES	31.12.9999	0651
☒	**100572240**	**AF19 - AC SYSTEM TSD SPARE**	**31.12.9999**	**0651**
☒	100572241	AF20 - AC SYSTEM P BYGATE	31.12.9999	0651
☒	**100572242**	**AF23 - AC SYSTEM D PAGE**	**31.12.9999**	**0651**

AF= Air Conditioning

1 of 3

S	Equipment	Description of technical object	Valid To	PlPl
X	100572243	AF24 - AC SYSTEM TSD LAB	31.12.9999	0651
X	**100572244**	**AF25 - AC SYSTEM TSD**	**31.12.9999**	**0651**
X	100572245	AF26 - AC SYSTEM S POWELL	31.12.9999	0651
X	**100572246**	**AF27 - AC SYSTEM N BELL**	**31.12.9999**	**0651**
X	100572247	AF28 - AC SYSTEM J P EDWARDS	31.12.9999	0651
X	**100572250**	**AF31 - AC SYSTEM IT TRAINING**	**31.12.9999**	**0651**
	100572251	APFC01 - PORTABLE JIB CRANE 75KG	31.12.9999	0651
	100572252	**APMG01 - GANTRY CRANE 500 KG**	**31.12.9999**	**0651**
	100572253	AR001 - AIR RECEIVER 48 HORIZ. (SOUTH)	31.12.9999	0651
	100572254	**AR002 - AIR RECEIVER 42 HORIZ. (EAST)**	**31.12.9999**	**0651**
	100572256	AR004 - AIR RECEIVER 66 HORIZ. (NORTH)	31.12.9999	0651
	100572257	**AR011 - AIR RECEIVER 18 VERTICAL (T.RIG)**	**31.12.9999**	**0651**
	100572258	AR023 - AIR RECEIVER (T.RIG)	31.12.9999	0651
	100572259	**AR025 - AIR RECEIVER (B.A.) (WEST)**	**31.12.9999**	**0651**
	100572260	AR026 - AIR RECEIVER 13BAR SYSYTEM	31.12.9999	0651
	100572261	**AR027 - AIR RECEIVER 13BAR SYSYTEM**	**31.12.9999**	**0651**
	100572262	AR028 - AIR RECEIVER AO FILTER	31.12.9999	0651
	100572263	**AR029 - AIR RECEIVER AA FILTER**	**31.12.9999**	**0651**
	100572264	AR030 - AIR RECEIVER DRYER	31.12.9999	0651
	100572265	**AR031 - AIR RECEIVER DRYER**	**31.12.9999**	**0651**
	100572266	AR032 - AIR RECEIVER AR FILTER	31.12.9999	0651
	100572267	**AR033 - AIR RECEIVER ACS FILTER**	**31.12.9999**	**0651**
	100572268	AR034 - AIR RECEIVER	31.12.9999	0651
	100572270	**AR40 - FILTER VESSEL 50 BAR**	**31.12.9999**	**0651**
	100572271	AR41 - FILTER VESSEL 50 BAR	31.12.9999	0651
	100572272	**AR42 - PORTABLE FILTER VESSEL 50BAR**	**31.12.9999**	**0651**
	100572273	AR43 - PORTABLE FILTER VESSEL 50BAR	31.12.9999	0651
	100572274	**AR44 - OIL SEP AC13 (SMALL SHOP AIR)**	**31.12.9999**	**0651**
	100572275	AR45 - SEP VESSEL AC14 (G.DENVER)	31.12.9999	0651
	100572276	**AS001 - ALUMINIUM CUT OFF SAW**	**31.12.9999**	**0651**
	100572277	AS002 - ALUMINIUM CUT OFF SAW	31.12.9999	0651
	100572278	**BA001 - BREATHING APPARATUS**	**31.12.9999**	**0651**
	100572279	BA002 - BREATHING APPARATUS	31.12.9999	0651
	100572280	**BA003 - BREATHING APPARATUS**	**31.12.9999**	**0651**
	100572281	BA004 - BREATHING APPARATUS	31.12.9999	0651
	100572282	**BA005 - BREATHING APPARATUS**	**31.12.9999**	**0651**
	100572283	BA006 - BREATHING APPARATUS	31.12.9999	0651
	100572284	**BA007 - BREATHING APPARATUS**	**31.12.9999**	**0651**
	100572285	BA008 - BREATHING APPARATUS	31.12.9999	0651
	100572286	**BC001 - BACK CHIPPER PORTABLE**	**31.12.9999**	**0651**
	100572287	BC002 - BACK CHIPPER PORTABLE	31.12.9999	0651
	100572288	**BC003 - BACK CHIPPER PORTABLE**	**31.12.9999**	**0651**
	100572300	C001 - O/HD CRANE 5 TON	31.12.9999	0651
	100572301	**C002 - O/HD CRANE 10 TNNE**	**31.12.9999**	**0651**
	100572302	C003 - O/HD CRANE 25/5 TON	31.12.9999	0651
	100572303	**C004 - MANUAL O/HD CRANE 1 TON**	**31.12.9999**	**0651**
	100572304	C006 - MANUAL O/HD CRANE 1 TON	31.12.9999	0651
	100572305	**C008 - O/HD CRANE 3 TON**	**31.12.9999**	**0651**
	100572306	C011 - O/HD CRANE 25/5 TONS	31.12.9999	0651
	100572307	**C012 - O/HD CRANE 3 TON**	**31.12.9999**	**0651**
	100572308	C016 - O/HD CRANE 10 TNE	31.12.9999	0651
	100572309	**C017 - O/HD CRANE 15/5 T**	**31.12.9999**	**0651**
	100572310	C020 - O/HD CRANE 10 TNE	31.12.9999	0651
	100572311	**C021 - O/HD CRANE 5 T**	**31.12.9999**	**0651**
	100572312	C025 - O/HD CRANE 2 TON	31.12.9999	0651
	100572313	**C026 - WALL JIB CRANE 4CWT/204 KG**	**31.12.9999**	**0651**
	100572314	C028 - MANUAL PORTABLE JIB CRANE	31.12.9999	0651
	100572315	**C033 - MOBILE CRANE 25 TON**	**31.12.9999**	**0651**
	100572316	C039 - O/HD CRANE 25 TNE	31.12.9999	0651
	100572318	**C041 - O/HD CRANE 3.2TNE**	**31.12.9999**	**0651**

Add

5 off systems in Shop 4 offices

Add

2 off systems in substations A + B

S	Equipment	Description of technical object	Valid To	PlPl
	100572319	C042 - WALL JIB CRANE 1 TON	31.12.9999	0651
	100572320	**C043 - WALL JIB CRANE 500 KG**	**31.12.9999**	**0651**
	100572321	C100 - O/HD CRANE 20 TONNE	31.12.9999	0651
	100572322	**C103 - O/HD CRANE 25 TONNE**	**31.12.9999**	**0651**
	100572323	C104 - PELLOBY CRANE 6.3 TNE	31.12.9999	0651
	100572324	**C105 - O/HD CRANE 5 TON**	**31.12.9999**	**0651**
	100572325	C106 - PYTHON CRANE 10 CWT	31.12.9999	0651
	100572326	**C108 - OVERHEAD CRANE 3.2 TONNES**	**31.12.9999**	**0651**
	100572327	C109 - JIB CRANE 250 KG	31.12.9999	0651
	100572328	**C110 - JIB CRANE 250 KG**	**31.12.9999**	**0651**
	100572329	C111 - JIB CRANE 250 KG	31.12.9999	0651
	100572330	**C112 - PILLAR JIB CRANE 1 TONNE**	**31.12.9999**	**0651**
	100572331	C120 - WALL JIB CRANE 250 KG	31.12.9999	0651
	100572332	**C201 - RUNWAY BEAM 2 TON**	**31.12.9999**	**0651**
	100572333	CA01 - COMBUSTION EFFICIENCY ANALYSER	31.12.9999	0651
	100572334	**CB006 - CHAIN BLOCK 20 CWT**	**31.12.9999**	**0651**
	100572335	CB011 - CHAIN BLOCK 10 CWT	31.12.9999	0651
	100572336	**CB013 - CHAIN BLOCK 2 TNE**	**31.12.9999**	**0651**
	100572337	CP001 - COOLANT PUMP	31.12.9999	0651
	100572340	**DG001 - CAUSTIC TANK**	**31.12.9999**	**0651**
	100572341	DG002 - BLUE GOLD TANK	31.12.9999	0651
	100572342	**DG003 - ALKALI TANK**	**31.12.9999**	**0651**
	100572354	DS001 - DIESEL STORAGE TANK	31.12.9999	0651
	100572355	**EF001 - ELECTRIC FURNACE**	**31.12.9999**	**0651**
	100572359	EF005 - WELDING ROD OVEN HEATER	31.12.9999	0651
	100572360	**EF006 - WELDING ROD OVEN HEATER**	**31.12.9999**	**0651**
	100572361	EF008 - HEATED FLUX HOPPER	31.12.9999	0651
	100572362	**EF009 - FLUX HOPPER**	**31.12.9999**	**0651**
	100572363	EF010 - WELDING ROD OVEN	31.12.9999	0651
	100572364	**EF011 - WELDING ROD OVEN**	**31.12.9999**	**0651**
	100572365	EH002 - ELECTRICAL HOIST 1 TONNE	31.12.9999	0651
	100572366	**EH003 - ELECTRICAL HOIST 2 TON**	**31.12.9999**	**0651**
	100572367	EH011 - ELECTRICAL HOIST 10 CWT	31.12.9999	0651
	100572368	**EH012 - ELECTRICAL HOIST 10 CWT**	**31.12.9999**	**0651**
	100572369	EH013 - ELECTRICAL HOIST 1 TN	31.12.9999	0651
	100572370	**EH014 - ELECTRICAL HOIST 2 TON**	**31.12.9999**	**0651**
	100572371	EH016 - MANUAL HOIST 500 KG	31.12.9999	0651
	100572372	**EH017 - ELECTRICAL HOIST 250 KG**	**31.12.9999**	**0651**
	100572373	EH018 - ELECTRICAL HOIST 1 TNE	31.12.9999	0651
	100572374	**EH019 - ELECTRICAL HOIST 500 KG**	**31.12.9999**	**0651**
	100572375	EH021 - ELECTRICAL HOIST 1 TONNE	31.12.9999	0651
	100572376	**EH022 - ELEC HOIST 500 KG**	**31.12.9999**	**0651**
	100572377	EH100 - ELEC HOIST 250 KG	31.12.9999	0651
	100572378	**EH101 - ELEC HOIST 250 KG**	**31.12.9999**	**0651**
	100572379	EH102 - ELEC HOIST 250 KG	31.12.9999	0651
	100572380	**EH103 - ELEC HOIST 250 KG**	**31.12.9999**	**0651**
	100572381	EH104 - ELEC HOIST 250 KG	31.12.9999	0651
	100572382	**EH105 - ELEC HOIST 250 KG**	**31.12.9999**	**0651**
	100572383	EH106 - ELEC HOIST 250 KG	31.12.9999	0651
	100572384	**EH107 - ELEC HOIST 250 KG**	**31.12.9999**	**0651**
	100572385	EH108 - ELEC HOIST 1 TNE	31.12.9999	0651
	100572386	**EP002 - EDGE PREPPER BEVELLING MACHINE**	**31.12.9999**	**0651**
	100572387	EP003 - EDGE PREPPER BEVELLING MACHINE	31.12.9999	0651
	100572388	**EP004 - EDGE PREPPER BEVELLING MACHINE**	**31.12.9999**	**0651**
	100572391	ET003 - ELECTRIC TRUCK	31.12.9999	0651
	100572392	**FE001 - FUME EXTRACTOR**	**31.12.9999**	**0651**
	100572393	FE002 - FUME EXTRACTOR	31.12.9999	0651
	100572394	**FE003 - FUME EXTRACTOR**	**31.12.9999**	**0651**
	100572395	FE004 - FUME EXTRACTOR	31.12.9999	0651
	100572396	**FE005 - FUME EXTRACTOR**	**31.12.9999**	**0651**