RISLEY III LANDFILL SITE ASSESSMENT

Resource Planning Team
ADAS Statutory Group
WOLVERHAMPTON

ADAS Job No: 09/96
MAFF Ref: EL 06/10397
LUPU Com: W01828

ASSESSMENT OF RISLEY III LANDFILL SITE

1.0 INTRODUCTION

1.1 ADAS Statutory, Wolverhampton have been commissioned by MAFF's Land Use Planning Unit, to undertake an assessment of the restoration standard on land at Risley III Landfill Site.

1.2 The Risley III Landfill site is situated to the north east of Warrington, immediately north west of junction 11 of the M62 Motorway.

1.3 The survey was undertaken by ADAS Statutory in May and June 1996. Soils were examined using a Dutch soil auger on a 50 metre grid at a detailed scale of 1:5000. Soil pits were dug to ascertain details on characteristics such as subsoil structure and compaction. Map 1 shows the location of auger borings and soil pits and details of the soil notes can be found at Appendix 1.

2.0 SUMMARY

2.1 A detailed survey was undertaken by ADAS Statutory on the restored land, covering some 25.5 hectares at Risley III, in order to investigate soil depth, compaction and drainage status.

2.2 Condition 4 of the planning permission specifies topsoil to be 300 mm and subsoil 450mm. An assessment of soil depth by ADAS Statutory identified significant variation within 50 metres, some 18.7 hectares of Risley III were shown to have little or no topsoil.

2.3 Mixing of topsoil and subsoil was observed within the soil profile, and a large amount of foreign material was noted to be present in many profiles.

2.4 Much of the soil was compacted and in some places was difficult to auger to depth. Soil pit examination identified coarse platy subsoil structures.

2.5 An area suffering from subsidence had recently been treated with imported soil. This imported soil was contaminated with foreign non soil making material and is not suitable for topsoil restoration.

2.6 In some areas, particularly towards the southern boundary of the site, Juncus species were present within the grass sward, indicative of wet conditions and likely to be associated with the compaction of the subsoil.

2.7 Across the site poor grass growth was observed around the gas vents.

3.0 SITE HISTORY AND INFORMATION

3.1 Risley Landfill Site is currently being worked and progressively restored. The Risley III phase was worked and restored from the late 1980's to the early 1990's, during this time the site was owned and restoration undertaken by Wimpey. In October 1991 the site was acquired by UK Waste. (Appendix 3, photograph 1).

3.2 Following an aftercare meeting with Mr A Lea, Minerals Planning Officer with Cheshire County Council, on 11 April 1996, there was some doubt that the completed restoration of Risley III complied with condition 4 of the planning permission.

Condition 4 states that:-

'Upon completion of tipping to the agreed levels in each phase, the waste material shall be covered with a layer of clay, a minimum thickness of 500mm, followed by a layer of subsoil, a minimum thickness of 450 mm, followed by a layer of topsoil, a minimum thickness of 300 mm. Thereafter the areas shall be prepared and seeded to the satisfaction of the local planning authority'.

3.3 A survey was undertaken by ADAS Statutory in order to identify:-

- depths of reinstated topsoil and subsoil across the site
- the extent of soil compaction across the site
- the drainage status of the site
- the limitations for improvement on the site

4.0 DEPTHS OF REINSTATED TOPSOIL AND SUBSOIL

4.1 Topsoil is defined as material at the top of the soil profile characterised by darker colours, higher organic matter content and greater biological activity than the underlying subsoil. Photographs 2a and 2b show the topsoil and subsoil materials found at the Risley III site, and Appendix 2 details the results of laboratory analyses carried out on topsoil and subsoil materials.

4.2 Across most of the Risley III Landfill site topsoils are of a medium clay loam or sandy clay loam texture. Sandy loam topsoil textures are present in the south of the site close to the environmental management compound.

4.3 Under condition 4 of the planning permission the specified depth for topsoil was to be at least 300m. ADAS Statutory identified a wide variation in depth from little or no topsoil to a topsoil of up to 65cm depth. Map 2 shows the variation in topsoil depth.

4.4 Several areas were identified where topsoil depth was 10cm or less. (Map 2, Appendix 3, photographs 3, 4 and 6).

These are:

- an extensive area located in the north east of the site, south of the pond and proposed woodland area (auger borings 9-11, 17-20, 27-28)
- an area around auger borings 35, 43 and 48
- several areas along the western boundary of the site (auger borings 23, 31, 32, 45, 50, 62 and 63)

4.5 A shallow depth or absence of topsoil can significantly reduce the moisture holding and nutrient retention capacity of the soil profile and will result in an increased risk of structural damage, adversely affecting workability. The absence of topsoil may also cause increased soil wetness limitations and erosion risk.

4.6 Overdeep topsoils between 35 to 65cm were identified in three areas across the site;

- an extensive area down the centre of the site
- two smaller areas to the north and east, (auger borings 15 and 16, 36-38, 44, 49, 54).

This soil depth does not meet that specified in the planning permission.

4.7 Between these two extremes the topsoil depth across the majority of the site falls between 10 and 38 cm, and only a limited and very patchy area could be identified as having soil depths from 28 to 35 cm which complies with the condition 4 specification of the planning permission. A soil reaching the

specified standard is described by soil pit 5 (Appendix 1 and Appendix 3, photograph 7).

4.8 Subsoil material across the majority of the site has either a heavy clay loam or clay texture. The subsoils were gleyed or displayed ochreous mottling, indicating impedance to water movement through the soil. Widespread compaction was identified, particularly in the upper subsoil, (i.e. to depths of around 50 to 60cm).

4.9 In the majority of cases subsoil depths across the site were found to comply with the 450mm required in condition 4 of the planning permission.

4.10 In a number of auger borings mixing of topsoil and subsoil material was found to have occurred. Soil mixing in the topsoil had produced patches of heavier and poorly structured material close to the surface, which would give rise to workability problems (Appendix 3, photograph 8).

5.0 SOIL COMPACTION

5.1 The structural characteristics of soil strongly influences permeability and the capacity of a soil to store water available to plant roots. Soil structure therefore, plays an important role in determining soil wetness status and droughtiness risk.

5.2 The trafficking, handling and storage of soils associated with disturbance and particularly with the process of land restoration, frequently causes smearing, slaking and in particular compaction of soil structural units.

5.3 The process of compaction can create slowly permeable layers in materials that are permeable under natural conditions. A feature of many disturbed soils and found across the Risley III Landfill site is deep compaction, often extending below 40 cm in the soil profile, (Appendix 3, photographs 3, 5, and 6), and in all of the soil profiles examined at Risley III, the subsoils were found to be very slowly permeable where soil compaction was encountered.

5.4 Soil structure was generally described as massive across the Risley III site, with coarse platy structures identified, (Appendix 3, photograph 9), particularly in the subsoil of the area of subsidence (auger borings 46-49, 51-54 and 57-60). The present soil structural development is the result of poor soil handling and reinstatement during soil stripping and restoration.

5.5 The area suffering from subsidence and recently re-engineered by UK Waste was examined and topsoil depths found to be very inconsistent, ranging from 57cm around auger boring 54 to only 25cm at auger boring 53.

5.6 In general, topsoil depth was in compliance or in excess of the 300mm required on this re-engineered section of the site, however, the great variation in depth would certainly limit the agricultural potential of the land.

5.7 Overall subsoils depths across this area comply with condition 4, but the subsoils are very compact.

5.8 In addition to the variation in topsoil depth, the imported "screened" material used for the topsoil in the area was found to be of very poor quality with a high volume of foreign material incorporated in it, (Appendix 3, photographs 10a, 10b, 11a, and 11b).

5.9 The replaced topsoil material also showed evidence of a high degree of surface trafficking by machinery, (Appendix 3, photograph 12).

6.0 DRAINAGE STATUS

6.1 The drainage status of the Risley III site was assessed by examination of soil profile pits and the identification of gleyed horizons, very slowly permeable layers and poor soil structure.

6.2 The majority of the soil profiles examined across the site displayed a poor drainage status, due to the poor handling and replacement of the soils and subsequent compaction. Pits 1, 2 and 4 display the gley colours characteristic of a poor drainage status, (Appendix 3, photographs 3, 4 and 6).

6.3 Support of poor drainage was supplied by the observation, particularly in areas across the south of the site, of Juncus species in the vegetation cover. Juncus is tolerant and indicative of very wet soil conditions.

7.0 OTHER OBSERVATIONS

7.1 Areas around each of the gas vents across the Risley III Landfill site were displaying short and yellowed grass growth in comparison to the rest of the survey area. This is likely to indicate a problem with gas leakage around these venting sites.

7.2 It was observed during the survey that the area of existing woodland as described on the restoration plan in the east of the site had been removed.

8.0 LIMITATIONS FOR IMPROVEMENT AND FUTURE MANAGEMENT

8.1 In the short term, the soil compaction within the soil profile needs to be addressed; alleviation of the compaction would lead to an initial improvement in drainage status and to some extent soil structure.

8.2 Although heavy subsoiling equipment can penetrate to a depth of 50cm or more it is often ineffective in many situations and compaction can be a long term feature.

8.3 Management of compaction within the subsoil is required and it is recommended that the use of subsoiling equipment is further investigated.

8.4 Increasing the topsoil depth to comply with the planning permission specifications before any adequate measures are taken to ameliorate the subsoil condition would not lead to any benefit in overall soil quality or workability and in the long term could cause further deterioration of the drainage status of the soils.

9.0 CONCLUSIONS

9.1 ADAS Statutory have examined the soils at Risley III landfill site and found them to be:

- very variable in their topsoil depth and generally lacking the specified topsoil depth
- very compacted in the upper subsoil
- of poor drainage status

9.2 From this study it is concluded that over the majority of the Risley III site, the criteria laid down at Condition 4 of the planning permission have not been complied with.

MAP 1

Location Of Auger Borings And Soil Pits

MAP 2

Topsoil Depths

APPENDIX 1

Soil Notes and Pit descriptions

RISLEY 3 LANDFILL SITE : SOIL NOTES

Auger Boring	Texture	Depth	Matrix Colour	Mottle Colour	Mottle Abundance	Comment
1	MCL	27	25Y4/1	10YR5/6	C	
	C	60	75YR4/2			
2	MCL	65	25Y4/1	10YR5/6	C	Topsoil overdeep
	C	70	25YR4/2			slightly heavier 0-15cm
3	MCL	23	10YR4/1	10YR5/6	C	
	HCL	35	5YR4/2			
	C	45	25YR4/2			DA 45cm - stone
4	MCL	27	25Y4/1	10YR5/6	C	
	C	60	75YR4/2			
5	MCL	15	10YR3/2			Shallow topsoil
	HCL/SCL	35	75YR4/4	25YR6/2	C	
	HCL	80+	75YR3/2	5YR5/4 mixed with 75YR4/4		
6	MCL	27	10YR4/1	10YR4-5/6	C	
	HCL	70+	10YR4/2	75YR4/6	C	From 50cm incr in sand. Some SCL textures
7	MCL	32	10YR4/2			
	HCL	80	75YR4/2	10YR4/6	C below 60 cm	
8	MCL	35	10YR4/1	75YR4/6	C	
	HCL	75	75YR4/3	10YR5/8	C below 65 cm	
9	C	65	5YR5/2			No topsoil. mn concretions
10	OCL	10	25YR3/1			Shallow organic topsoil
	C	50	10YR5/4	10YR5/6	C	
	C	60	75YR4/3			
11	HCL	38	75YR4/1	10YR5/6	M	
	C	60	75YR5/1	10YR5/6	M	Mixed
12	MCL	25	10YR4/1-2			
	HCL/SCL	40	75YR5/3	75YR5/8	C	
	HCL	80	75YR4/4			
13	SCL/MCL	10	75YR4/3	75YR4-5/6		Shallow topsoil; from 60cm bands of dark material . Strong gas smell. At 75 into rubbish - No CAP.
	HCL	60	75YR3/2			
14	MCL	20	10YR4/2	75YR4/6	C	DA 62cm (stones)
	HCL	62	75YR4/2	75YR4/6	C	
15	MCL	37	10YR4/1-4/2	75YR4/6	C from surface	
	HCL	75	75YR4/2	75YR4/6	C	Compaction

16	MCL	48	10YR4/1-4/2	75YR4/6	C	Many mottles 35-48cm
	HCL	75	75YR4/2	75YR4/6	C	
17	MCL	10	10YR4/1-4/2	75YR4/6	C	Shallow topsoil
	HCL	48	75YR4/6	10YR5/1	M	Mixed
	MCL	75	10YR4/1	75YR4/6	C	Mottles incr. with depth (includi mn)
18	HCL	10	10YR2/1			Shallow topsoil root mat
	HCL/C)	30	10YR4/1	10YR5/6	C)	) mixed soil
	MCL)	45	10YR4/1	10YR5/6	C)	)
	C	70	5YR4/3	mn		
19	PL	10	10YR2/1			
	MCL	29/35	5YR5/4	75YR56	C	
	SCL/C/MS	70		10YR5/1		Mixed horizon
20	PL	10	10YR2/1	75YR5/8	M	Shallow topsoil
	C	50+	10YR5/1-2			
21	MCL	35	10YR4/1	10YR4/6	C	
	MCL	47	10YR4/1	75YR5-4/6	C	
	HCL	55	25Y4-5/1	10YR5/6	M	
	C	70+	10YR5/1-2	75YR5/8	M	Clay mixed with HCL subsoil
22	MCL	18	10YR4/2			Shallow topsoil
	HCL	80	75YR4/2	10YR5/6	F	Cap not reached. Compacted
23	MCL	8	10YR4/2	10YR5/6		Shallow topsoil, grass short
	HCL	78	75YR4/3	75YR5/6-61	C	DA 78cm CAP?
24	MCL	28	10YR4/2	10YR5/6	F	
	HCL	55	75YR4/2	75YR5/6	C	
	HCL	80	75YR4/3	75YR5/8	C	Cap at 80cm
25	MCL	21	10YR4/2	10YR5/6	F	
	HCL	65	75YR4/3	75YR5/8	C	mn below 40cm
	C	75	75YR4/3	75YR5/8-61	C	Cap at 75cm
26	MCL	23	10YR4/1	10YR5/6	F	Mottles increase with depth of
	HCL	75	75YR4/3	75YR4/6	C	(75YR5/8) Cap at 75 cm.
27	HCL	40	10YR4/1	10YR5/6	M	Mixing, compacted
	C	75	10YR5/6			
28	MCL	30	75YR4/2			
	HCL	60	10YR4/1	10YR5/6	M	Topsoil material?
29	MCL	27	10YR4/1	10YR5/6	C	
	MCL	75	10YR4/1	10YR5/6	M	
30	MCL	20	10YR3/2			
	HCL	55	75YR4/3	75YR5-4/6	C	
	SCL	66	10YR5/3	75YR5/6	C	
	HCL	70+	75YR4/4	75YR4/6	C	

31	MCL	8	10YR3/2			Shallow topsoil
	HCL	80	75YR4/2	75YR5/8 75YR7/1	C	Compacted
32	MCL	8	10YR3/2-4/1			Shallow topsoil
	HCL	35	10YR4/1	10YR5/4,5/8	C	
	MCL	45	10YR4/1			
	HCL	80	10YR4/1	10YR5/8	C	
33	SCL	30	10YR3/1			
	HCL	80	75YR4/2			Moist below 60cm
34	MCL/SCL	35	10YR4/1			Gritty
	HCL	85	75YR4/2			Cap at 85cm
35	MCL	2	10YR3/2			
	HCL	45	75YR4/2			
	HCL	65	10YR4/1	10YR5/8	C	
	MSL	70	10YR2/1			
	HCL	75	10YR5/2,5/8			
36	MCL	55	10YR4/1	10YR5/6	M	Overdeep topsoil
	C	70	5YR4/3			dry compacted
37	MCL	35	10YR3/2			
	HCL	60	25YR4/2	10YR5/6		) Mixed
	C	70+	25YR/2	75YR5/8C		)
			75YR4/4	75YR5/8	C	)
				75YR5/6	C	
38	MCL	47	10YR4/1		C	
	MCL	75	10YR4/1	10YR5/3,5/6		
39	MCL	26	10YR3/2	10YR5/6	C from 20cm	
	HCL	75	75YR4/3	75YR5/8	M	Cap at 75 cm
40	MCL	18	10YR3/1			
	C	80	05YR4/2	75YR5/6	F	
41	MSL	55	10YR2/1			Overdeep topsoil
	HCL	80	75YR4/3	25Y5/2 75YR4-5/6	C	
42	MSL	37	10YR2/1			
	HCL	65	75YR4/3	75YR5/6	C	DA65cm
43	MCL	10	10YR3/1			Shallow topsoil
	HCL	55	75YR4/3			
	HCL	75	10YR4/1			
	C	75+				
44	MCL	60	10YR4/1	10YR5/6	C	Overdeep topsoil
	HCL	80	75YR4/1			
45	MCL	10	10YR4/1	10YR5/6	M	Shallow topsoil
	C	50	75YR4/2	mn concreting 75YR5/6	M	DA 50cm-stone

46	MCL	33	10YR4/1	10YR5/6	M	
	HCL	80	5YR4/2			
47	MCL	38	10YR3/1			10% stones >2cm
	HCL	70	75YR4/3			19% total stones
						10cm topsoil put onto previous profile
48	HCL	35	10YR4/1			Mixed with MCL and organics
	HCL	60	754/4	57YR5/6	C	DA 60cm. Compacted
49	MSL	45	10YR2/1-3/1			15% stones >2cm
	HCL	70	75YR4/4			gritty 23% total stones
						very compact at 45cm
50	MCL	10	10YR2/1			Shallow topsoil
	C	60	75YR5/3	75YR5/8	C	Compacted
	C	70	75YR4/2			
51	MSL	38	10YR4/1	10YR5/6	M	Thin veneer of organic matter 38
	HCL	75	75YR4/2	mn		39cm. Compacted
52	MSL	38	10YR3/2			
	SCL	50	5YR4/3			
	HCL	60	5YR4/2			DA 60cm. Compacted
53	MCL	25	10YR3/2			Topsoil mixed with brick & rubbl
	HCL	70+	75YR4/3			compacted
54	MSL	57	10YR2/1-3/1			Very gritty overdeep topsoil. DA
	HCL	60	75YR4/3			60cm
55	PL	30	10YR2/1			
	HCL	80+	5YR4/2			Compacted
56	PL	20	10YR2/1			
	C	30	75YR4/3			Compacted
	HCL	47	10YR4/1	10YR5/6	C	
	C	80	75YR5/4	75YR5/8	C	
57	SCL	55	5YR3/1	10YR5/6	C	
	HCL	80	75YR4/2			
58	MCL	27	10YR5/1			
	SCL	45	5YR4/3			
	HCL	70+	5YT4/2			
59	SCL	40	10YR3/2			Stony. Topsoil mixed with HCL
	HCL	75	75YR4/3			
60						Too stony to auger 18% stones > 30% total stones
61	MSL	25	10YR3/1			
	MCL	40	75YR4/2			
	HCL/C	75	10YR4/1	10YR5/6	C	

62	MCL	6	10YR3/1			Shallow topsoil mixing of top. So
	HCL	80+	10YR5/2	75YR5/6	C	and subsoil to 40cm. Compacted
63a	MCL	10	10YR4/1			Shallow topsoil
	HCL	45	10YR5/2	75YR5/6	C	
	SCL	60	75YR4/3	75YR5/6	C	
	HCL	80+	5YR5/3	75YR5/8	C	
64	MSL	40	10YR2/1			
	HCL	55	75YR4/3	75YR5/8	C	
	HCL	75	75YR4/2			
65	SCL	38	10YR3/1			
	HCL	75	75YR4/3	10YR5/1		
65A	MSL	36	10YR3/1			
	HCL	75	75YR4/2	75YR4/6	C	Common mottles to 48cm. Few below 48cm
66	SCL	35	10YR3/1			
	HCL	75	75YR4/2	75YR5/6	F/C	
67	MCL	12	10YR3/1			Shallow topsoil
	HCL	75	75YR4/3-2	75YR6/8	C	
68	MCL	35	10YR4/2			
	MSL	40	75YR4/3			
	HCL	58	10YR4/3	10YR5/1, 5/6	C	Sandy lenses. DA 58 cm
69	MSL	23	10YR2/1			Shallow topsoil
	HCL	80	75YR4/3	75YR5-4/6	F	
70	MSL	37	10YR2/1			Rubbish. (Imported topsoil?)
	HCL	65	75YR4/2			Moist, Cap at 70 cm
	C	70	75YR4/2			
71	MSL	40	10YR3/1			
	HCL	75	75YR4/3	10YR5/1	F	
72	SCL/MSL	35	10YR3/1			
	HCL	75	75YR4/2			
73	MSL	16	10YR3/1			Shallow topsoil
	MCL	45	10YR4/1	10YR5/6		
	HCL	75	75YR4/3			
74	HCL	23	75YR4/2			
	SCL	29	75YR4/3			
	HCL	75	75YR4/2			
75	MSL	73	10YR3/1			Overdeep topsoil
	HCL	75	75YR4/4			Compacted
76	MSL	20	10YR3/1			
	MCL	39	10YR3/1	75YR4/6	C	
	HCL	75	75YR4/2	10YR5/1	C	

77	MSL	18	10YR3/1			Juncus. Shallow topsoil
	MCL	40	10YR4/2	10YR5/6	F	Compact from 50cm
	HCL	65	75YR4/3	75YR5/8	C	Cap at 65cm
78	SCL	16	10YR3/1			Shallow topsoil
	HCL	75	75YR4/3	75YR5/8	C	
79	HCL	25	10YR4/1	10YR5/6	C	
	HCL	75	10YR4/2			
80	MSL	38	75YR4/3			Compact
	MCL	50	75YR4/1			
	HCL	75	75YR4/2	10YR5/1	F	
81	MSL	6	10YR3/1			Shallow topsoil
	SCL	20	75YR4/3			20+cm imp (brick)
82	MSL	28	10YR3/1			
	SCL	48	75YR4/2	75YR4/6	F	
	HCL	75	75YR4/2	10YR5/1	C	
83	MSL	18	10YR3/1			Shallow topsoil
	HCL	75	75YR4/3	75YR5/8-6/1	F	
84	MCL	16	10YR4/1			DA 50cm
	LMS	26	75YR4/6			Compaction of subsoil on cap
	HCL	50	75YR4/3	75YR5/6	C	
85	HCL	10	10YR4/1	10YR5/6	C	
	HCL	53	75YR4/2			Gritty

Abbreviations

DA - difficult to auger
incr - increase
mn - manganese
C - common
M - many
F - few

Soil textures:

MCL - medium clay loam
C - clay
HCL - heavy clay loam
OCL - organic clay loam
SCL - sandy clay loam
PL - peaty loam
MS - medium sand
MSL - medium sandy loam

PIT DESCRIPTIONS

PIT 1 (Appendix 3, photograph 3)

0-10cm	Black 10YR21, stoneless, peaty loam. Many fine fibrous roots.
10-29/35cm	Reddish brown 05YR5/4, medium clay loam, with common strong brown 75YR5/6 and grey 10YR5/1 mottles. Massive structure, firm consistence, low porosity, few fine fibrous roots.
29/35-70cm	Grey 10YR5/1, mixed sandy clay loam, sand and clay with many 55PB mottles. Massive structure.

PIT 2 (Appendix 3, photograph 4)

0-10cm	Very dark grey 10YR3/1, heavy clay loam, with common strong brown 75YR5/6 mottles. Common roots.
	Brown 75YR4/3 clay, mixed with medium clay loam and foreign material (brick). Massive structure, extremely firm consistence, very low porosity, few fine fibrous roots.

PIT 3 (Appendix 3, photograph 5)

0-26cm	Very dark grey 10YR3/1, sandy clay loam. High incorporation of foreign material.
26-38cm	Brown 75YR4/4 medium sandy loam, banded with overlying sandy clay loam
38-80cm	Brown 75YR4/3 heavy clay loam. Coarse platy structure very firm, very low porosity.

PIT 4 (Appendix 3, photograph 6)

0-70cm	Brown 75YR4/3 with common many strong brown 75YR5/6 and grey 10YR5/6 mottles. Massive structure, extremely firm, very low porosity. Rare roots. Water at 70cm. Soil profile is slightly less compact below 40cm.

PIT 5 (Appendix 3, photograph 7)

0-30cm	Dark grey, 10YR4/1, medium clay loam, with common yellowish brown, 10YR5/6 mottles, moderately developed, small subangular blocky to granular structure, friable consistence. Common fine fibrous roots to 15cm. Few fine fibrous roots (15-30cm)

30-45cm	Brown 75YR4/2 heavy clay loam, with common brown 75YR5/6 to strong brown 75YR5/6 mottles. Massive structure, extremely firm consistence, very low porosity. One or two roots.

PIT 6 (Appendix 3, photograph 8)

0-42cm	Very dark grey 10YR3/1 medium sandy loam. Common roots (to 15cm), few roots (15-42cm). Abundant foreign material (brick, wire).
42-80cm	Brown 75YR4/3 medium/heavy clay loam with many yellowish brown 10YR5/6 mottles. Coarse subangular blocky to prismatic structure, extremely firm consistence, very low porosity. Few roots, which ped faces

APPENDIX 2

Topsoil and subsoil analytical tables

ADAS
FOOD, FARMING, LAND & LEISURE

S Hunter
ADAS
WOLVERHAMPTON

ADAS WOLVERHAMPTON
WOODTHORNE
WERGS ROAD
WOLVERHAMPTON
WV6 8TQ
TEL: (01902) 754190
FAX: (01902) 743602
DDI: (01902) ...

ANALYTICAL CHEMISTRY DEPARTMENT

CERTIFICATE OF ANALYSIS

Lab sample no: 96213877 Date received: 14/06/96

Batch number: 01716314

Your reference: P IT 6 Topsoil

Sample type : Soil (agricultural)

Determination	Result	Units
2000-600 µm (Coarse Sand)	5	%
600-212 µm (Medium Sand)	34	%
212-63 µm (Fine Sand)	24	%
63-20 µm (Coarse Silt)	9	%
20 - 2 µm (Fine Silt)	13	%
<2 µm (Clay)	15	%
Organic Matter	6.26	%

K. Henderson.

Signed: K Henderson CChem. FRSC Reported: 22/06/96 at 00:56
Head of Operations

ADAS
FOOD, FARMING, LAND & LEISURE

S Hunter
ADAS
WOLVERHAMPTON

ADAS WOLVERHAMPTON
WOODTHORNE
WERGS ROAD
WOLVERHAMPTON
WV6 8TQ
TEL: (01902) 754190
FAX: (01902) 743602
DDI: (01902) .....

ANALYTICAL CHEMISTRY DEPARTMENT

CERTIFICATE OF ANALYSIS

Lab sample no: 96213878 Date received: 14/06/96

Batch number: 01716314

Your reference: P IT 6 Subsoil

Sample type : Soil (agricultural)

Determination	Result	Units
2000-600 µm (Coarse Sand)	4	%
600-212 µm (Medium Sand)	17	%
212-63 µm (Fine Sand)	19	%
63-20 µm (Coarse Silt)	11	%
20 - 2 µm (Fine Silt)	23	%
<2 µm (Clay)	26	%
Organic Matter	0.99	%

K. Henderson.

Signed: K Henderson CChem. FRSC
Head of Operations

Reported: 22/06/96 at 00:56

Photograph 1

RISLEY III LANDFILL SITE

Showing the restored Risley III phase in the foreground, including the recently re-engineered area of subsidence. To the left can be seen the progressive restoration of Risley IV.

Photograph 2a

An example of darker topsoil material which displays good structural development.

Photograph 2b

Topsoil material (left) contrasted with the heavier, gleyed and poorly structured subsoil material found across the site.

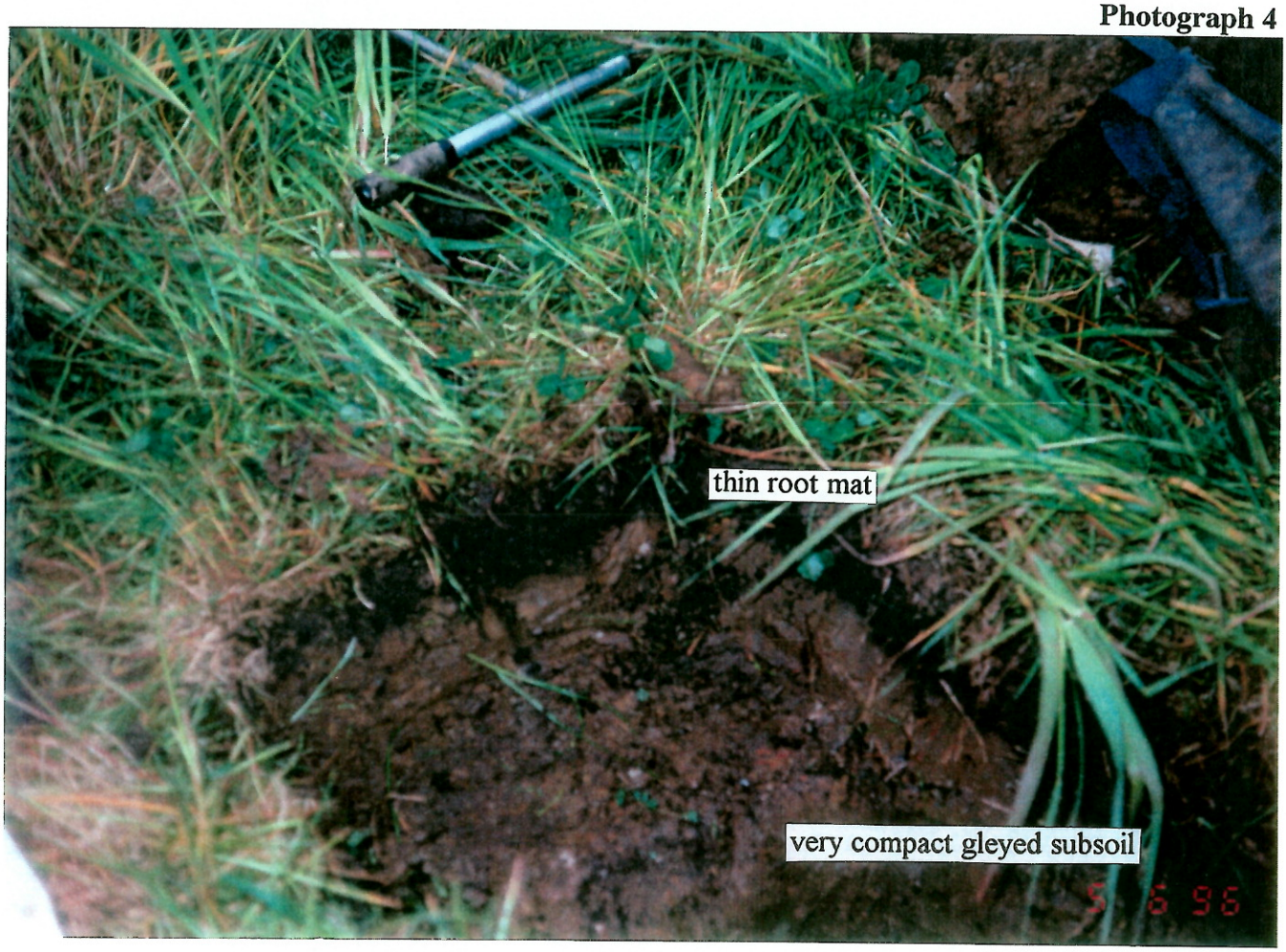
Photograph 3

PIT 1

Severely compacted, restored profile.

Heavily gleyed and mixed material underlies a thin peaty topsoil layer.

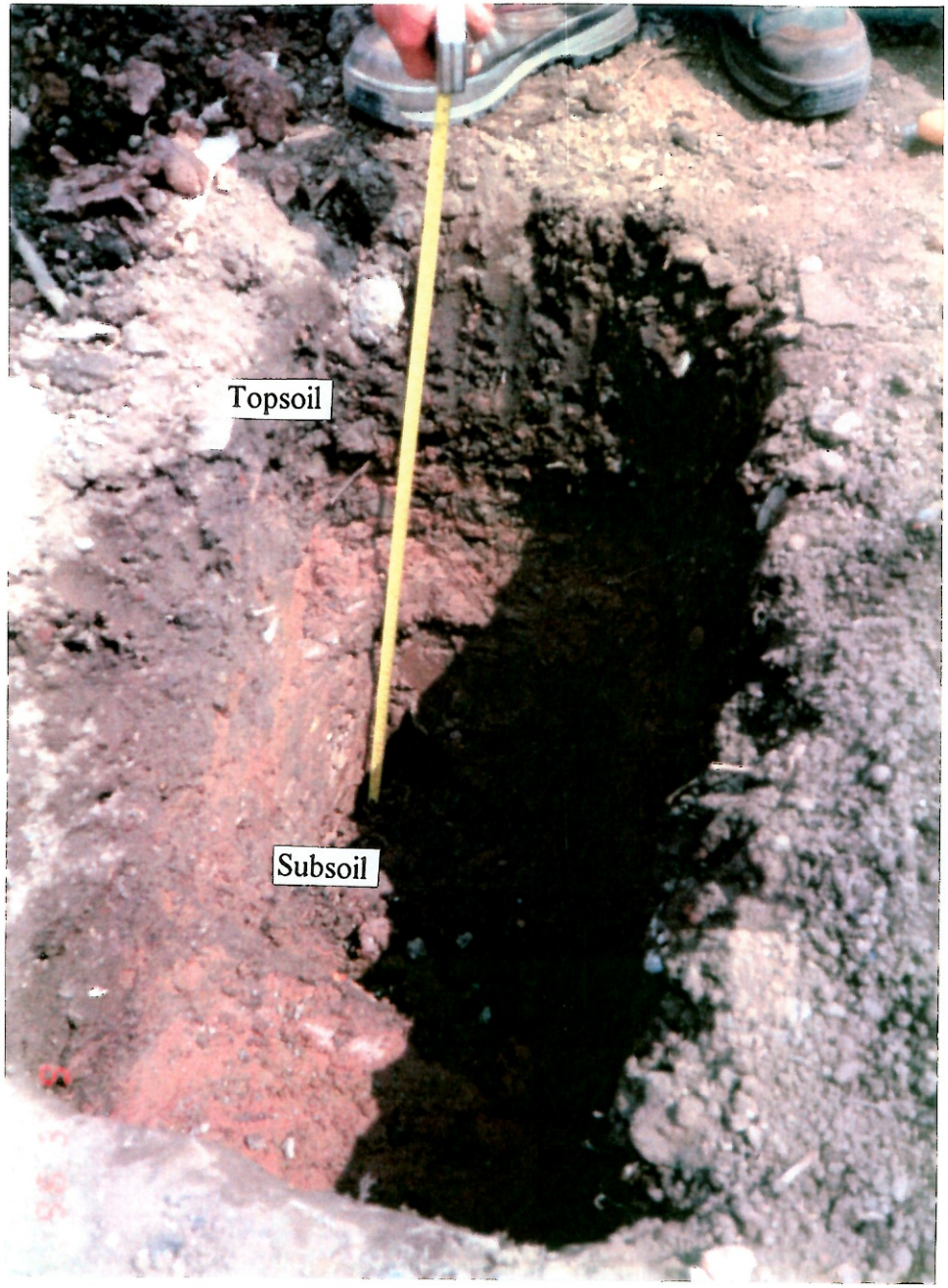
Photograph 4

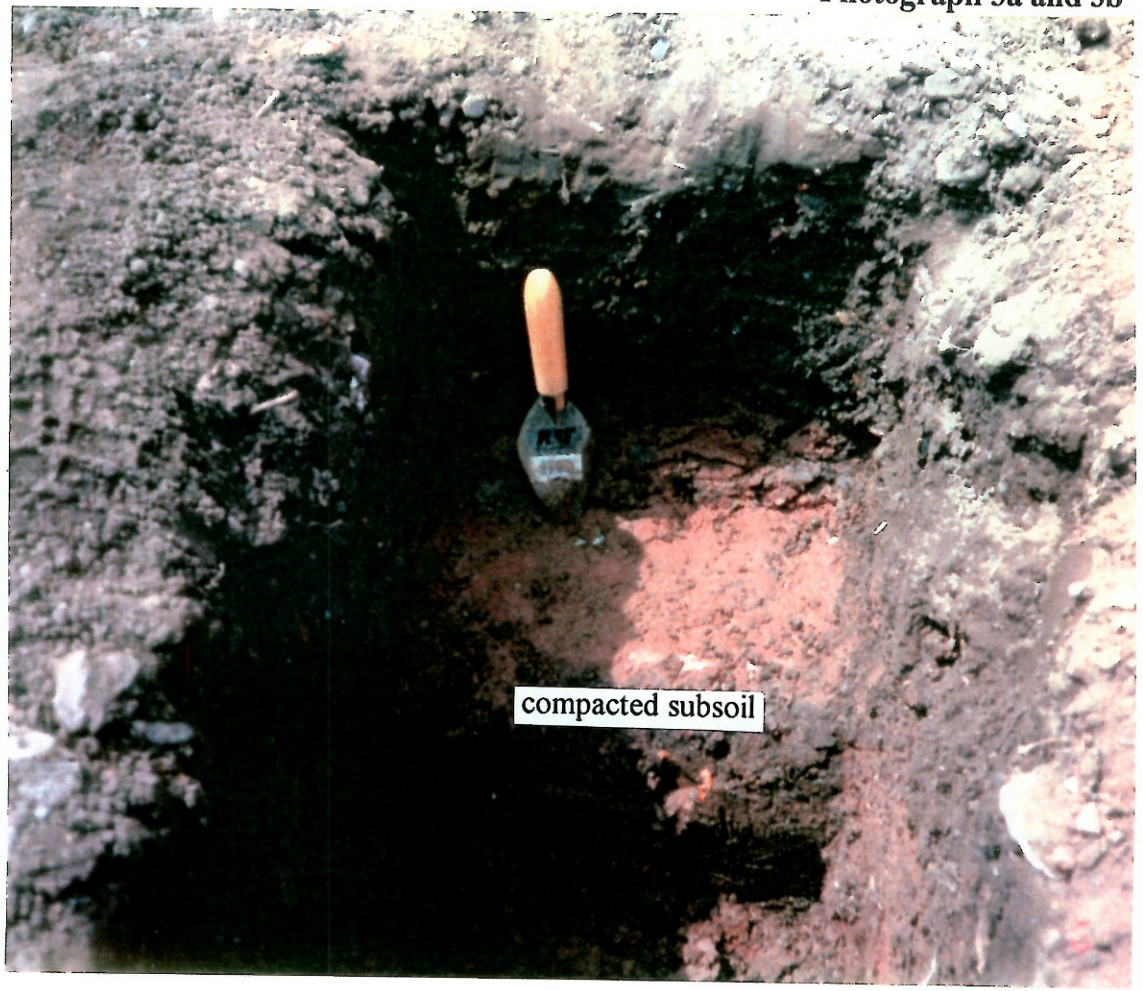


PIT 2

Thin 10cm root mat onto subsoil material. The subsoil material is very mixed (numerous brick fragments were identified), and compacted.

Photograph 5a and 5b



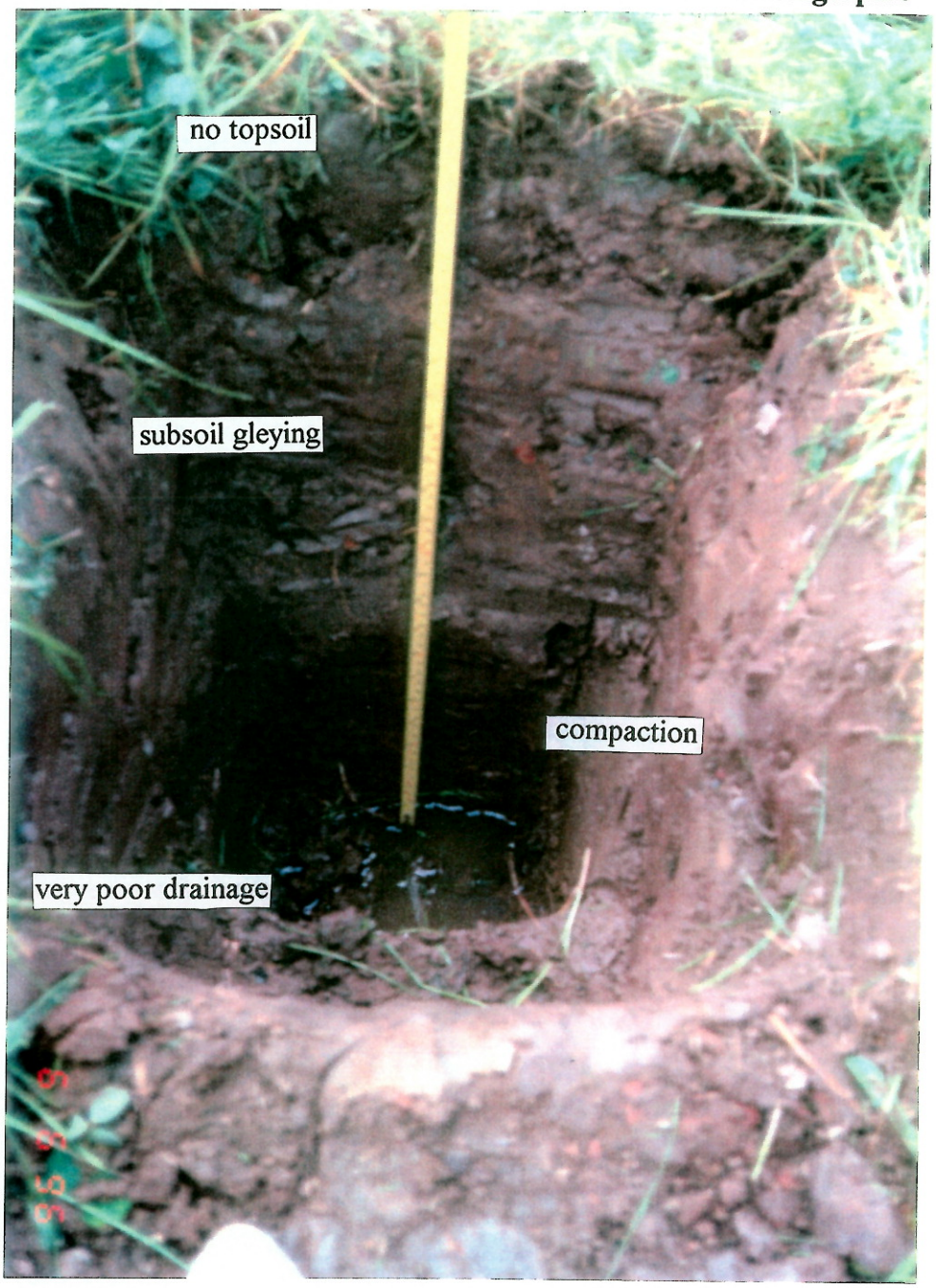


PIT 3

The restored profile showing the imported soil material. The 'screened' topsoil incorporated a high percentage of rubbish.

The subsoil is severely compacted.

Photograph 6



PIT 4

Identifying a lack of topsoil material. Limited root penetration into the subsoil material and the gley coloration indicate the severity of the soil compaction.

Photograph 7

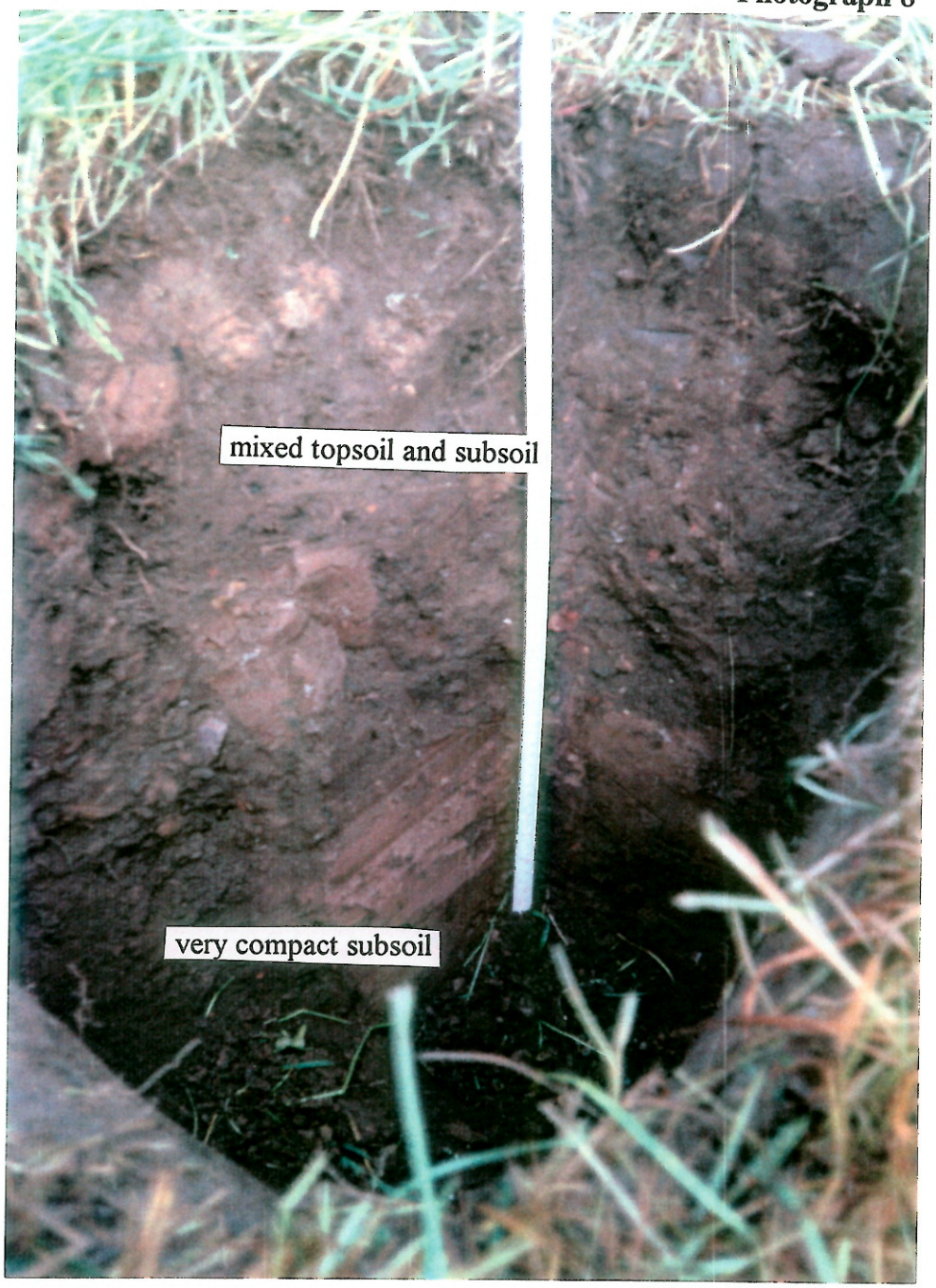
PIT 5

An example of better restoration.

30cm of a medium clay loam topsoil texture, overlies a heavier subsoil material.

The subsoil material is compacted, however, note the lack of roots through the profile.

Photograph 8



PIT 6

Poor restoration. Topsoil and subsoil materials are mixed and incorporated with other non soil making material (brick, wire).

The soil is severely compacted.

The photograph clearly shows the subsoil material at the surface of the restored profile.

Photograph 9

Strong platy structures in the compacted subsoils.

Photographs 10a and 10b

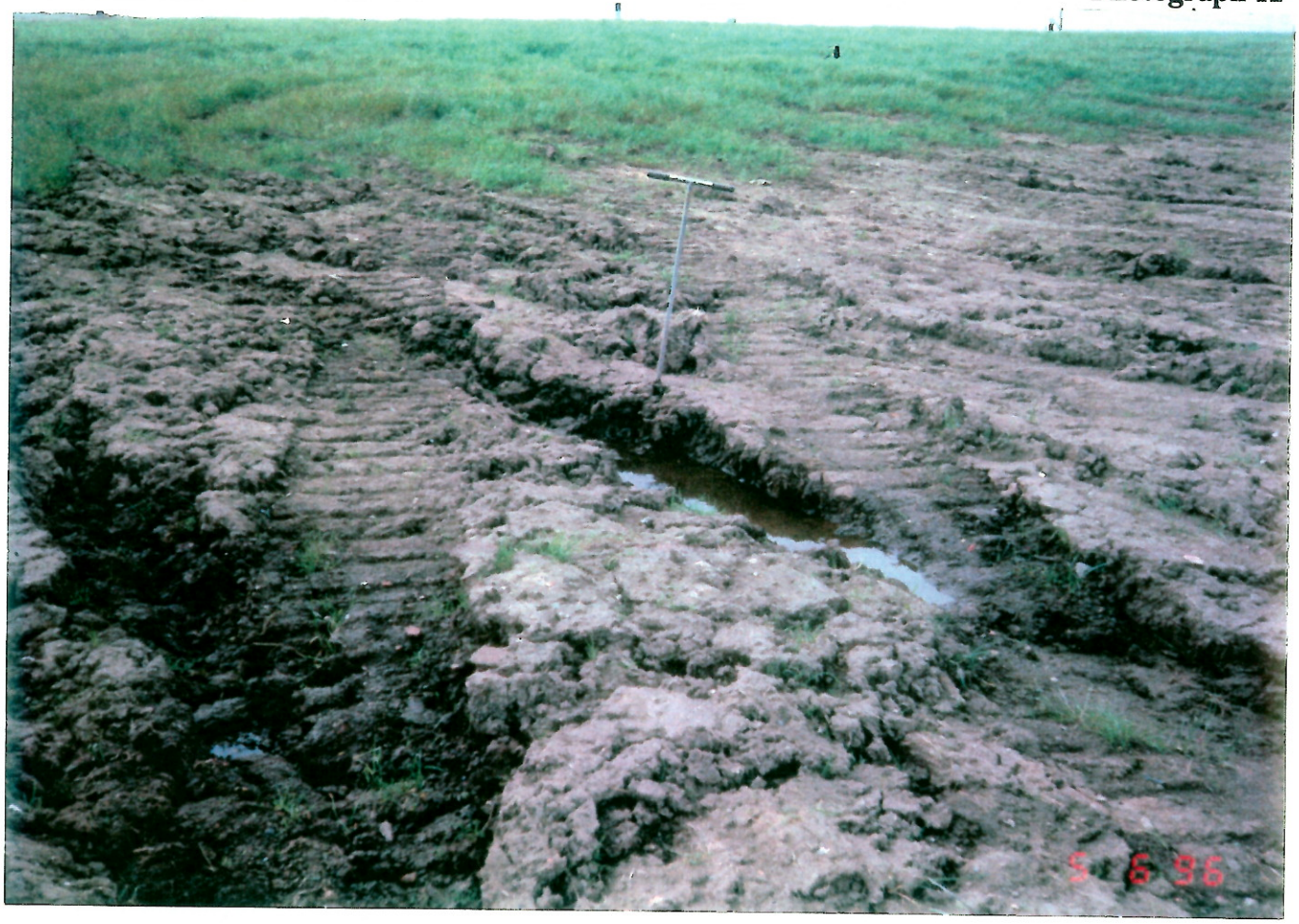
a

The area of subsidence recently re-engineered and raised with imported material.

Photographs 11a and 11b

Screened topsoil material (a and b).

Photograph 12



Trafficking of topsoil material.