

### Analysis of soil to determine waste acceptance criteria and disposal options

#### Background to Waste Management

Increasingly, legislative and advisory bodies are demanding accurate, accredited analysis of a wide variety of materials to assess their physical and chemical characteristics prior to disposal or effective management. Relevant documentation includes, but is not limited to:

*'Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance Procedures'*  
Environment Agency, April 2005

*'The Criteria and Procedures for the Acceptance of Waste at Landfills (Scotland) Direction'* Scottish Government Act 2005

*'Using Soil Guideline Values'* Science Report: SC050021/SGV Introduction

*'Characterisation of Waste – Leaching – Compliance Test for Leaching of Granular Waste Materials and Sludges'*. BS EN 12457-3:2002

Material analysis is of importance to a wide variety of industry sectors, e.g. land re-development, building, transport and manufacturing. Materials can include soil, building debris, road scrapings, non-consolidated material from brown field sites etc.

Effective, accurate and accredited analysis of material increases confidence for both the client and the advisory/monitoring body that the best practicable disposal or management route is taken for the waste material in question. Benefits include speed of processing of disposal requests, cost savings for operators and ensuring environmental best practice is adhered to.



Increasingly, end-users require accurate analysis of physical, organic and inorganic parameters (e.g. particle size distribution, density, polycyclic aromatic hydrocarbons, BTEX, heavy metals, pH). The analysis of a wide range of materials, often in complex matrices, for both physical and chemical parameters requires specialist instrumentation and expertise. At Macaulay Scientific Consulting Ltd, we benefit from over 70 years of accumulated knowledge dedicated to the study of soils, land use and the environment. With a team of experienced analytical scientists and state-of-the-art instrumentation we have exceptional multi-disciplinary analysis capabilities and the flexibility to tackle a wide range of environmental samples.

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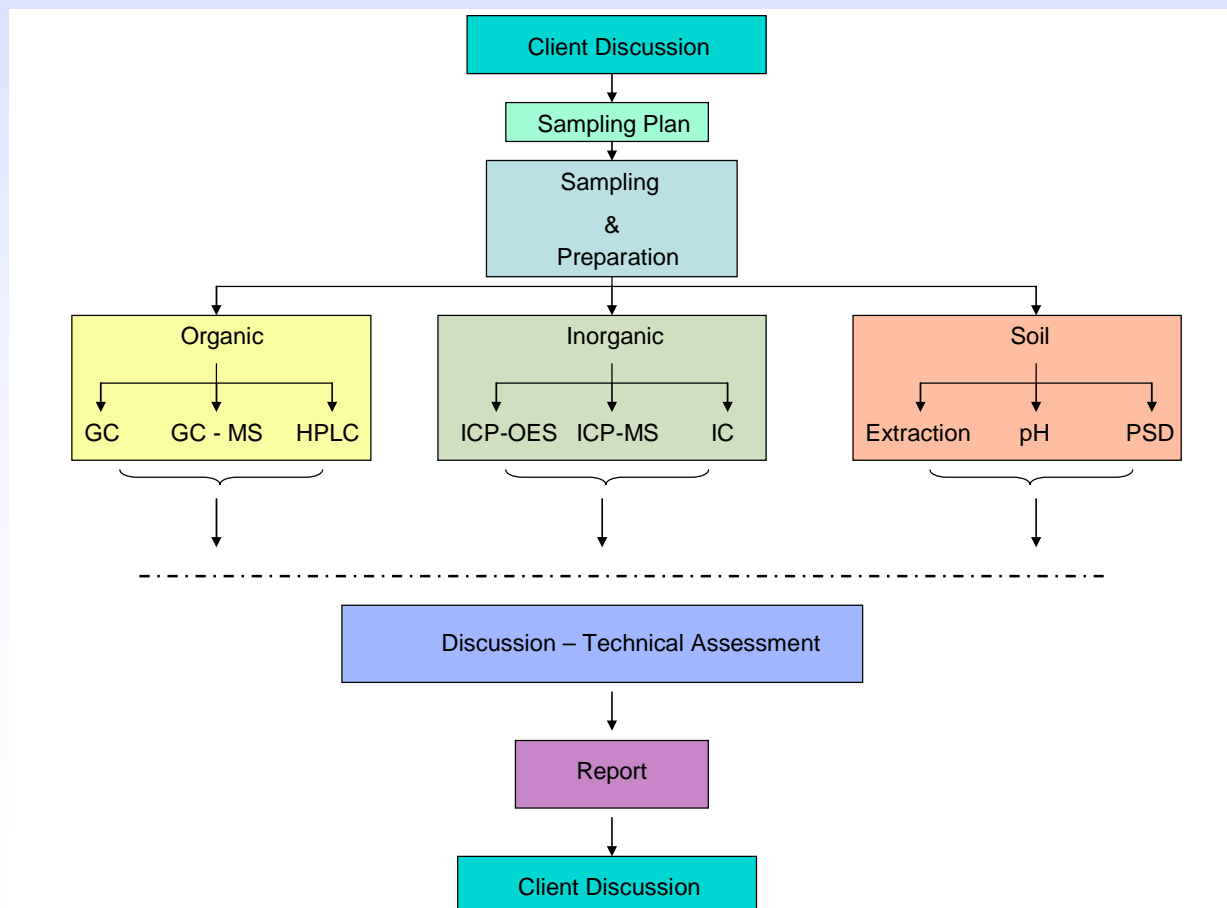


## The Challenge

A client required advice on disposal options of soil scrapings from a development site, specifically, what disposal options were available and the most appropriate compliance analyses and methodology to use.

Initial discussions with Macaulay Scientific Consulting Ltd were used to develop a representative sampling strategy to ensure full consideration of both depth and distribution of the material. After sample collection the samples were processed through a series of preparation procedures tailored to meet the analytical requirements (See Fig 1). A full suite of both organic and inorganic analyses were then conducted in full accordance with identified appropriate legislation

Figure 1: Typical decision making tree describing various analysis protocols.



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## Analytical Data

Typical data is shown below tabulated against the relevant acceptance criteria for leachates Combined release at L:S = 10:1 (mg/kg DM)

Sample Identity	Pit			Waste Acceptance Criteria
	A	A	A	
Depth	1	2	3	Inert waste landfill
TOC	256	84	206	
TDS	812	297	853	4000
F	< 5	6.2	6.8	10
Cl	18	38	29	800
SO4	34	12	21	1000
Phenol Index	< 1	< 1	< 1	1
As	0.08	0.07	0.03	0.5
Ba	1.23	1.89	2.19	20
Cd	< 0.01	< 0.01	< 0.01	0.04
Cr	0.03	0.04	0.09	0.5
Cu	0.97	0.22	0.29	2
Hg	< 0.01	< 0.01	< 0.01	0.01
Mo	< 0.03	< 0.02	< 0.02	0.5
Ni	0.05	0.03	0.09	0.4
Pb	0.78	0.59	0.19	0.5
Sb	< 0.01	< 0.01	< 0.01	0.06
Se	< 0.02	< 0.02	< 0.02	0.1
Zn	0.63	0.09	0.29	4

Results for Soil Samples (mg kg DM) where R = Residential, A = Allotments & C = Commercial (Soil Guideline Values, Environment Agency)

Sample Identity	Pit			Soil Guideline Values		
	A	A	A	R	A	C
Depth	1	2	3			
As	3.54	9.56	11.23	32	43	640
Cd	0.38	0.09	0.07	10	1.8	230
Cr	37.56	22.79	27.12			
Cu	129.5	29.53	35.48			
Hg	0.08	0.09	0.11	1	26	26
Ni	178	159	89.52	130	230	1800
Pb	126.8	45.61	49.81			
Se	0.13	0.19	0.22	350	120	13000
Zn	249.3	148.9	78.21			

Sample identity	Pit		
	A	A	A
Depth	1	2	3
pH at L/S 2:1	7.89	7.23	7.03
pH at L/S 8:1	7.98	7.46	7.12
Conductivity at L/S 2:1 (mS/cm)	387	172	138
Conductivity at L/S 8:1 (mS/cm)	125	34.8	40.8

Data are compared against advisory values where applicable and any issues highlighted for further discussion with the regulatory bodies. Remediation strategies or disposal options can be discussed based on the needs of the clients, best practice and cost.

## **Conclusion**

Adherence to legislative codes and good environmental practice requires accurate unambiguous material characterisation. Macaulay Scientific Consulting Ltd can provide a suite of analytical services designed to comply with current advisory requirements, thus ensuring best practices can be adopted for client specific scenarios and environmental regulations are adhered to with minimum costs.

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