



## 1. Introduction

To date the application of soil evidence in criminal cases has been largely under-utilised. The SoilFit project is funded through the EPSRC Crime Initiative to investigate the potential of advanced analytical methods in providing soil forensic intelligence and evidence to police investigations. Combining advanced soil fingerprinting methods, with spatially referenced soil databases, and rigorous statistical approaches, will potentially provide new tools for investigating officers.

## 2. Project Objectives

- To test the potential of advanced soil fingerprinting methods in distinguishing soils
- To build an analytical soil database containing modern fingerprinting methods
- To develop a 'decision support' tool to facilitate choice of appropriate soil analyses
- To develop software for statistical based 'soil comparison' to help identify unknown soil evidence, link to existing databases and develop a combined GIS tool to refine search areas in crime investigation

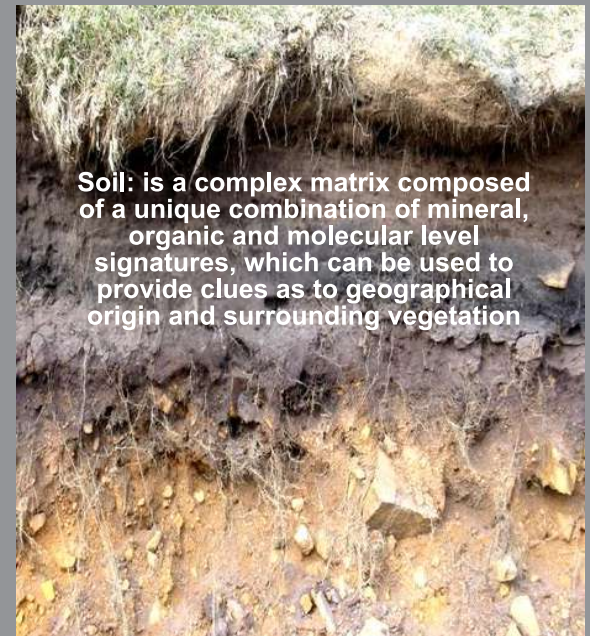
## 3. Soil Fingerprinting Methods

It is the complex nature of soil, and our ability to characterise soil components in detail, that provides powerful evidential value. Traditionally soil forensic examination has included soil colour, mineral particle examination, and identification of pollen spores. Fingerprinting methods will complement those already existing.

Soil profiling methods are numerous and include:

- Fourier Transform Infra-Red (FTIR) spectroscopy: providing an overall chemical signature of the organic and mineral components of soil
- X-Ray Powder Diffraction (XRPD) and QEMSCAN: characterising the mineral component, and providing clues to the underlying geology of a soil
- Plant biomarkers: providing clues as to the overlying vegetation and land-use history of a soil
- Microbial community (bacterial and fungal) profiles: providing a very responsive indicator of soil type, land-use, and environmental condition

Integrating data from these detailed analytical methods in a robust statistical manner, and determining under what circumstances each method is most appropriate, offers powerful potential in increasing the application of soil evidence for police investigation



## 4. End-user Outcomes:

- Decision Support Tool to guide appropriate analytical approaches depending on sample size and condition
- Soil Comparison Tool linked to a state-of-the-art analytical soil database, allowing prediction of the most likely soil type/land-use of an unknown sample
- Geographical Information Systems Tool to map most probable sample origin in order to narrow search areas in crime investigation

