CONESTOGA-ROVERS & ASSOCIATES (EUROPE) LTD

PROJECT SUMMARY

Environmental Forensics: Biological Methods Pollutant Source Tracing

KEY PROJECT ELEMENTS

- DNA FINGERPRINTING
- FORENSICS
- BACTERIOPHAGES
- POLLUTANT SOURCE TRACKING

CRA have undertaken numerous projects requiring environmental forensics for a wide range of clients. Two examples of the use of microbiological techniques as forensic tools are provided below:

Contamination Source Tracking using Bacteriophages for Hydrogeologic Tracing
GAP EnviroMicrobial Services, a division of Conestoga-Rovers & Associates, have performed several hydrogeologic tracing studies using bacteriophages to determine the most likely source of contamination. Bacteriophages, viruses specifically affecting bacteria, are cultured under laboratory conditions and released into the groundwater flow upstream of the suspected pollutant source(s). Groundwater samples are then taken and analysed to quantify the bacteriophage levels present to allow profiling of groundwater flows and identification of potential pathways between suspected sources and the impacted receptors. Quantitative determination of bacteriophages is determined by inoculation of susceptible host bacterial cultures with the water samples. The concentration of bacteriophage present in the water sample is determined indirectly by the impact on the host bacterial growth under laboratory conditions. Following initial profiling of groundwater flow characteristics, differentiation between potential pollutant sources is made by the application of different bacteriophages to each potential source and monitoring their transport in the groundwater system.

Bacterial Contamination Source Tracking using DNA Fingerprinting and Standard Microbiological Analysis
GAP EnviroMicrobial Services were commissioned to investigate the source of repeated microbial contamination problems impacting on a drinking water distribution system supplying four large towns. GAP EnviroMicrobial Services established 9 monitoring points across the network, taking daily samples over the course of 1 year. Through standard microbial culturing techniques and DNA fingerprinting using their bespoke rep-PCR protocol, GAP EnviroMicrobial Services identified the source of the pollution. Following further investigations the need for various improvements to the water off-take controls on the distribution network were identified. CRA went on to build a chloramination system to protect the distribution system against future microbiological contamination issues.