Developing auditable sample tracking for CBR recovery in the United Kingdom

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Abstract

A critical requirement in remediation operations following chemical, biological and radiological (CBR) contamination is the collection of samples to inform decision making. These may be taken for characterisation or assurance that remediation has resulted in acceptable residual levels of contamination. Auditability through this process is vital, ensuring the risk of misattribution and data loss is minimised.

We present the adoption of a 'cradle-to-grave' approach to sample tracking and identification. We consider human factors surrounding sample collection, taking an approach to mitigate errors in a number of plausible circumstances such as sample transposition.

Our approach ensures that samples can be correctly correlated with laboratory test results. This is particularly beneficial when multiple agencies are involved in operations and conducting analysis.

The developed process heavily involves a database created in-house with a graphical user interface to assign identifiers and track samples during an operation, through the result reporting and data visualisation. This approach, including a full process and database addresses accurate labelling, tracking of analysis, laboratory interoperability and sample attribution.

Requirement

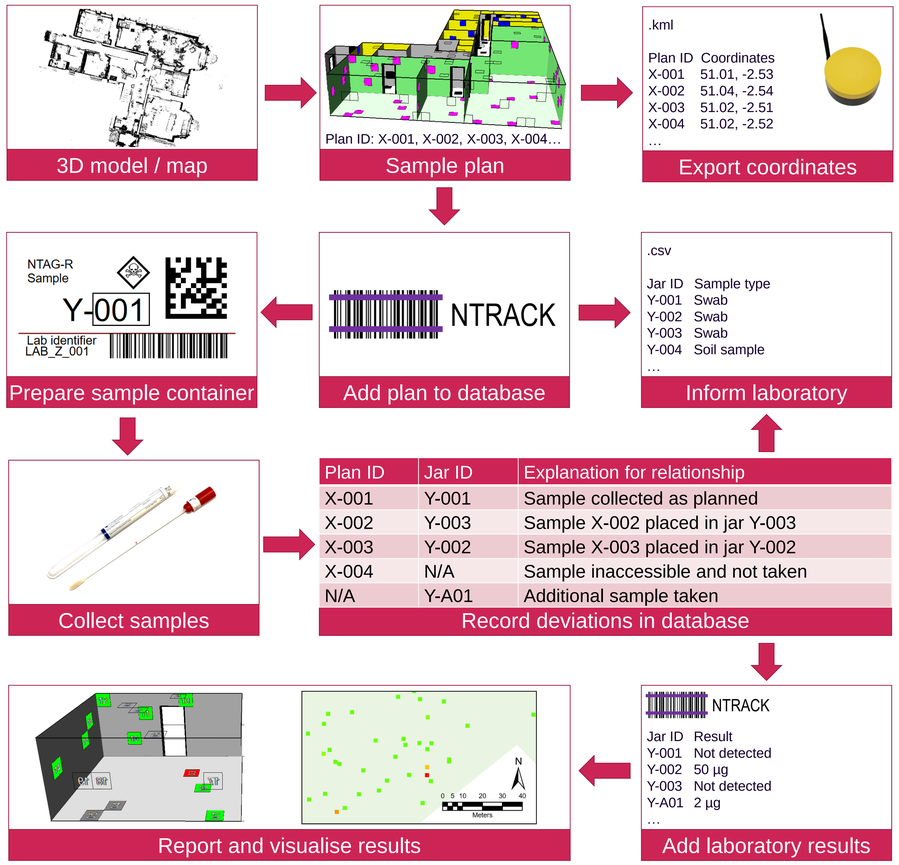
For environmental remediation samples, there is a need to identify ways to:

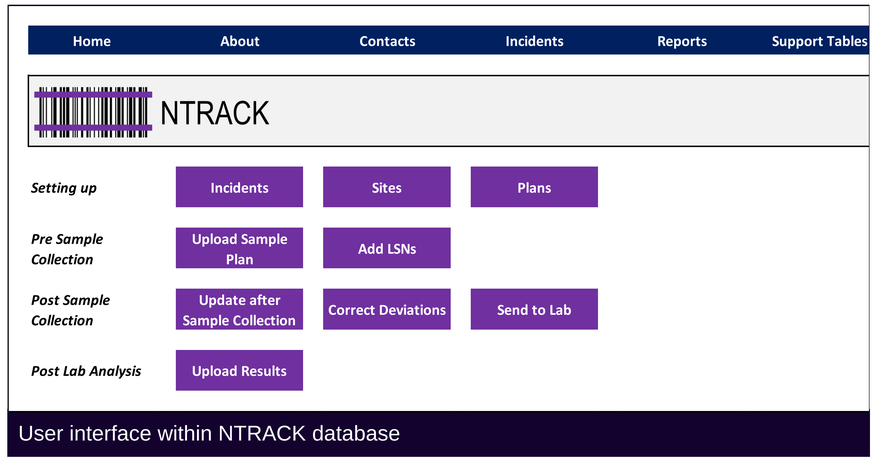
- Accurately label and identify samples.
- Track their progress and other data including results in a robust manner.
- Interoperate with analytical laboratories across organisations.
- Easily locate and define sample locations.
- Maintain auditable records of sample results used in decision making.

NTAG-R Remediation Planning Cell

The National Technical Advisory Group for CBR Recovery (NTAG-R) provides authoritative technical advice on the requirements and capabilities needed to conduct CBR recovery operations.

In the event of a CBR incident requiring recovery, an NTAG-R Remediation Planning Cell will be established to directly support in the planning of recovery operations. A critical requirement for remediation is the collection of samples from contaminated sites, either for site characterisation or for post-remediation assurance that contamination is below acceptable levels. There is therefore a need for a thought-out and defensible end-to-end workflow, from sample plan creation to post-analysis reporting, considering sample identification & tracking throughout.





User interface within NTRACK database

NTRACK database

We are developing a C# and Microsoft SQL database with a webpage interface that can be deployed to secure servers. This improves upon previous systems, introducing the ability to customise access tiers, record edits, minimise data loss through regular back-up and maximise auditability.

Improving auditability in sample tracking during operations was a primary goal in this work, considered at all stages in the process. Minimising the need for manual data manipulation allows audit of the source of final results.

Sample identification

A significant challenge in sample audit is the identification and recording of how collection proceeded over the hotline. This step includes the largest propensity for errors. Four scenarios were identified surrounding this step that could result in sample misattribution: samples being placed in the incorrect jar, samples not being collected, extra samples being taken and differing sample types being collected. A sample labelling system was introduced which could be used to account for these discrepancies.

The labelling system involved two identifiers. The first identifier, 'Plan ID' contains a code related to the specific sample plan followed by sequential numbering. The second identifier, 'Jar ID' also contains a code specific to a plan but different to the Plan ID, followed by sequential numbering. The Plan ID was correlated to the locations in the sample plan whereas the Jar ID is correlated to specific jars, labelled prior to collection. This allowed for discrepancies to be recorded by recording each of these IDs and comparing where they differed.

Interoperability

It was necessary to ensure integration of the database with operational procedures, such as geolocation approaches and those followed by analytical laboratories.

The database was designed so that sample identifiers and locations could be directly uploaded from the export given by the sample plan generation approach used. This minimises time burden that would be introduced should data need preparing, additionally minimising the risk of human error in this process. Similarly, laboratory submissions and results can be exported and imported using formats agreed with individual laboratories.

Acknowledgements

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