Spiked Samples

A submitted field sample was spiked by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples were analysed for each batch where samples were analysed for organic chemicals of concern.

Certified Reference Standards

A reference standard of known (certified) concentration was analysed along with a batch of samples. The Certified Reference Standard (CRS) or Laboratory Control Spike provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

Surrogate Standard/Spikes

These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are spiked into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques before sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Laboratory Blank

Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The testing laboratory conducted an assessment of the laboratory QC program, internally, however the results were also independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPD's within the NEPM acceptance criteria of ±30%. Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery; although dependent on the type of analyte tested, concentrations of analytes and sample matrix; should normally range from about 70-130%. Method (laboratory) blanks should return analyte concentrations as 'not detected'.

7. Basis for Contamination Assessment

7.1 Relevant Guidelines

The framework for the contamination assessment made by GHD was constructed on guidelines, "made or approved", by the NSW EPA (now the Department of Environment and Conservation (DEC)) under Section 105 of the *Contaminated Land Management Act 1997*. These include the following.

- NSW EPA (1994), "*Contaminated Sites: Guidelines for Assessing Service Station Sites*", December 1994, NSW EPA.
- NSW EPA (1995), "*Contaminated Sites: Sampling Design Guidelines*", September 1995, NSW EPA.
- NSW EPA (1997), "*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*", November 1997, NSW EPA.
- NSW EPA (1998), "*Contaminated Sites: Guidelines for NSW Site Auditor Scheme*", June 1998, NSW EPA.
- NSW EPA (1999), "*Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*", April 1999, NSW EPA.
- NSW EPA (1999), "*Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*", May 1999, NSW EPA.
- NEPM (1999), "*National Environment Protection (Assessment of Site Contamination) Measure*", National Environment Protection Council (NEPC).
- ANZECC (2000), "*National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality*", October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

7.2 Soil Assessment Criteria

The assessment criteria (thresholds) against which the project analytical data is compared have been taken from those guidelines made or approved by the NSW EPA (above).

7.2.1 Health-based Criteria

Health-based soil investigation levels (HILs) are provided for a range of different exposure settings, which are based on the nature of the use(s) for which the land is currently used and/or its approved use(s). The majority of the site is currently vacant and will be developed for rail purposes therefore the site will be assessed against exposure setting F (HIL F) as published in NSW EPA (1998) Guidelines for the NSW Site Auditor Scheme - commercial / industrial.

For some contaminants (including TPH) for which no HIL is presented in NSW EPA (1998), "*Guidelines for the NSW Site Auditor Scheme*", reference is made to the sensitive land use threshold provided in the NSW EPA (1994), "*Guidelines for Assessing Service Station Sites*".

There are currently no national or NSW guidelines for asbestos in soil. Enhealth (who were previously known as NEHF) are currently considering guidelines for asbestos in a non-occupational environment, including asbestos in soil. The NSW EPA has advised that asbestos is a human health issue and not an environmental issue. On the advice of the NSW Department of Health, the NSW EPA (now DEC) has advised NSW Site Auditors (Site Auditors Meeting 1 March 2000) that "no asbestos in the soil at the surface is permitted". Therefore the threshold criteria for asbestos will be the detection of any asbestos in soils.

7.2.2 Provisional Phytotoxicity Based Investigation Levels

Consideration of the Phytotoxicity Based Investigation Levels (PBILs) presented in the guidelines is generally not required for commercial and industrial properties.

7.2.3 Application of Guidelines

When comparing specific layers or bodies of material against the HIL criteria, the data set is separated to ensure that only materials of similar composition are included for comparison. For example, when calculating the 95%UCL_{avg} (Upper Confidence Limit of the arithmetic average contaminant concentration) for a particular contaminant concentration in a given volume of material for the purposes of comparison against the relevant site criteria, only the data for the samples collected for that particular material is used in the calculation. This is known as a homogenous sample population.

It is important to note that the 95% UCL_{avg} concentration is only calculated on soil material within the same strata and described as material of similar composition.

Table 7.1 provides a summary of the investigation levels used to assess soil contamination levels at the site.

Table 7.1 Soil Investigation Criteria

Parameter	Health-Based Criteria (HIL F[A]) mg/kg
Arsenic	500
Cadmium	100
Chromium (III)	60%
Chromium (VI)	500
Copper	5,000
Lead	1,500
Nickel	3,000
Zinc	35,000
Mercury (inorganic)	75
TPH C_6-C_9 TPH C_{10}-C_{36}	65[B] 1,000[B]
Benzene	1[B]
Toluene	130[B]
Ethyl Benzene	50[B]
Total Xylenes	25[B]
PAHs (total)	100
Benzo(a)pyrene	5
PCBs (Total)	50

Note: All units in mg/kg unless otherwise noted.

(A) Health-based Investigation Levels HIL (F) – Commercial / Industrial - Guidelines for the NSW Site Auditor Scheme (NSW EPA, 1998).

(B) Threshold Concentrations for Sensitive Land Use – in the "Guidelines for Assessing Service Station Sites" (NSW EPA, 1994).