

26 November 2012
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Attention: Nigel Donovan

Re: Soil Sampling for Auckland Council at the Three Kings Managed Fill site.

Job Reference FES0092.024

Dear Nigel,

Attached are the results of the soil sampling and analysis carried out on 16th November following the random soil sampling of the fill deposited at the Winstone Aggregates Three Kings solid waste disposal site.

The biannual sampling was undertaken to satisfy Condition 25 of the Consent Number 36221/36222/37770/R/LUC/2009/743.

Work Programme

Winstone Aggregates Limited personnel directed Focus Environmental Services Limited personnel to the active fill deposit area of the site. Two composite samples (Com 01 made up of SS01 to SS04) and (Com 02 made up of SS05 to SS08) were taken from across the active fill area of the site. These discrete samples used to form composite samples were retained on cold hold for further analysis if required pending the results of the composite sampling. All samples were taken in accordance with Ministry for the Environment contaminated site guidelines and internationally recognised procedures. These cover the method of sample recovery, handling and cleaning of sampling equipment. Soil samples will be sent under full chain of custody documentation to an IANZ accredited laboratory and analysed for a combination of:

- Total Recoverable Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc.
- Total Recoverable Cyanide.
- Organo-Chlorine Pesticides.
- Poly-Aromatic Hydrocarbons.
- Total Petroleum Hydrocarbons.
- BTEX.

Sampling and Analysis Plan and Sampling Method

Samples were collected by Focus Environmental Services Limited personnel using a stainless steel hand trowel and a freshly gloved hand. Samples were taken in accordance with Ministry for the Environment contaminated site guidelines and internationally recognised procedures. These cover the method of sample recovery, handling and cleaning of sampling equipment. Soil samples were sent under full chain of custody documentation to an IANZ accredited laboratory and analysed for a combination of:

- Total Recoverable Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc.
- Total Recoverable Cyanide.
- Organo-Chlorine Pesticides.
- Poly-Aromatic Hydrocarbons.
- Total Petroleum Hydrocarbons.
- BTEX.

Field Sampling Quality Assurance

Clean, latex gloves were worn when handling each sample. Samples were stored in laboratory cleaned glass jars and immediately placed in an iced cooler. The samples were transported under chain of custody documentation to an IANZ accredited laboratory for analysis.

Laboratory Quality Assurance

Routine laboratory quality assurance procedures include analysis of laboratory blanks and spiked samples. Soil sample analyses were carried out using industry standard methods as follows:

- TPH Oil Industry Profile + Poly-Aromatic Hydrocarbons - Sonication DCM extraction, SPE cleanup (if required), GC-FID & GS-MS analysis. US EPA 8015B/MfE Petroleum Industry Guidelines.
- Total Recoverable Metals - nitric acid digestion- ICP-MS analysis (USEPA 200.2).
- Organo-chlorine pesticides - Sonication extraction, SPE cleanup dual column GC-ECD analysis (modified US EPA 8082).
- Total Cyanide Distillation - Distillation of sample as received APHA 4500-CN- C & E 21st ed 2005.
- BTEX - Solvent extraction, Headspace GC-MS analysis US EPA 8260B.

Table 1: Fill Acceptance Criteria for Waste Disposal.

Parameter	Fill >2m depth from finished level (mg/kg)
Arsenic	100
Boron	260
Cadmium	7.5
Chromium	400
Copper	325
Lead	250
Mercury	0.75
Nickel	320
Zinc	1160
Cyanide	25
BaP equiv.²	2.15
DDT(total)	12
Aldrin	12
Dieldrin	6
Benzene	1 ³
TEX(total)⁴	20
C₇ - C₉	300
C₁₀ - C₁₄	300
C₁₅ - C₃₆	5600

Notes:

1. All Results are in mg/kg.
2. Includes group of 7 compounds with equivalence factors that contribute to BaP (eq).
3. To meet MfE Guidelines (1999) for residential land use all pathways.
4. Sum of Toluene, Ethyl Benzene and Xylenes.

Results

Table 2: Laboratory Analysis Results (mg/kg).

Parameter	Com 01	Com02
Arsenic	2	3
Boron	<20	<20
Cadmium	<0.10	<0.10
Chromium	35	21
Copper	21	17
Lead	16.9	22
Mercury	<0.10	<0.10
Nickel	31	15
Zinc	49	42
Cyanide	<0.10	<0.10
BaP equiv.	0.26	0.56
DDT(total)	<0.010	<0.011
Aldrin	<0.010	<0.011
Dieldrin	<0.010	<0.011
Benzene	<0.06	<0.05
TEX(total)	<0.11	<0.10
C ₇ - C ₉	<10	<10
C ₁₀ - C ₁₄	<20	<20
C ₁₅ - C ₃₆	<40	<40

Results in **bold** exceed the Managed Fill acceptance criteria for the Three Kings Managed Fill Disposal site.

Comment on Results

The concentrations of all parameters tested as listed in the sites acceptance criteria from the two composite samples taken on the 16th November 2012 were all below the site acceptance criteria for fills being deposited on site. The second biannual sampling event will be scheduled for April 2013.

Attachments:

Laboratory Analysis Reports
Figure 1 Site Sampling Plan

Thank you for the opportunity to work with you and we look forward to being of further assistance. Please contact David O'Reilly on (09) 6220179 or Cell (027) 5567995.

Yours sincerely,

David O'Reilly
Environmental Consultant
Focus Environmental Services Limited