



<b>PROJECT TITLE:</b>	EfW CHP Facility, North Yard, Devonport Blackies Wood: Site-Specific Human Health Risk Assessment (Soil Contamination)
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<b>SITE ADDRESS:</b>	Devonport, Plymouth
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<b>PROJECT REFERENCE:</b>	D123356	<b>DATE ISSUED:</b>	10th May 2011
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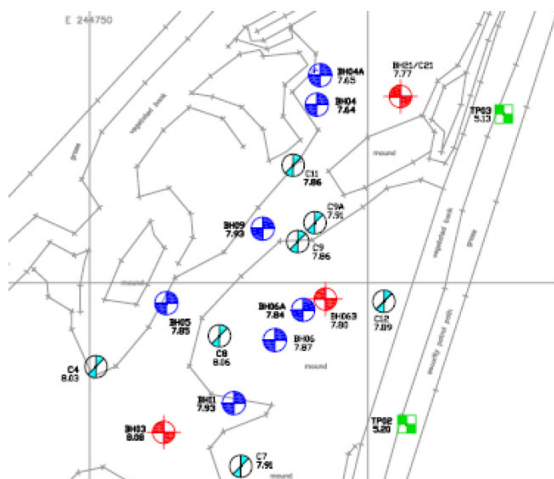
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<b>OVERVIEW</b>
<p>This document presents a formal record of a site-specific human health risk assessment (using CLEA vs1.06) undertaken for an area of woodland land adjacent to the proposed EfW CHP facility, but within the planning application boundary, that will be managed for its ecological and landscape interest and will become accessible to the public.</p> <p>The following documents have been used in the preparation of this risk assessment:</p> <ul style="list-style-type: none"> <li>• Geotechnics ‘Ground Investigation at Proposed Energy from Waste Plant, Devonport, Plymouth’ Factual Report for MVV Umwlet GmbH Reference PE100380 August 2010</li> <li>• Environmental Science Group ‘Blackies Wood, HMNB Devonport, Plymouth, Devon Phase I Land Quality Assessment’ for HMNB Devonport Reference ESG/05/033/F November 2005</li> </ul> <p>The Geotechnics report presents factual data following a ground investigation undertaken at the site. Geochemical laboratory data from this report has been used in this risk assessment.</p> <p>The Environmental Science Group Phase I report identified that Blackies Wood historically was a quarry followed by allotments. The area was also historically characterised by an ‘incinerator area’ and rail sidings. In 1993, Blackies Wood was subject to an extensive ordnance clearance operation when over 35,000 pieces of ordnance were removed. These originated from extensive WWII bombings that were buried in the area for safety reasons.</p> <p>This risk assessment does not include for an assessment of risk from historical buried ordnance at the site.</p>

<b>METHODOLOGY</b>
<p>A review of the Geotechnics report revealed that a number of exploratory holes were undertaken in the area of the proposed nature reserve. Given that the nature reserve represents a specific portion of the site, with a different exposure scenario to the wider site area, an averaging area was demarked. This area included all of the exploratory holes undertaken north of an east-west line immediately south of BH03 and just north of the large mound of gravel and stone chippings located in the centre of the site. This averaging area is shown in Figure 1.</p>

**METHODOLOGY (Continued....)**

**Figure 1** Averaging Area



Of the exploratory holes within the averaging area nine soil samples had been submitted by Geotechnics for UKAS and MCERTS accredited laboratory testing to include heavy metals (nine samples), inorganics (four samples), speciated hydrocarbons (nine samples), speciated polycyclic aromatic hydrocarbons (seven samples), volatile organic compounds (four samples), semi-volatile organic compounds (four samples), polychlorinated biphenyls (two samples) and tributyltin (nine samples). One sample from TP02 at 1 m depth identified Chrysotile asbestos. The samples were recovered from a range of depths between 1 m and 5 m. For the purpose of this assessment, all samples have been considered, even though some are located at depth.

A screening assessment was carried out to define the critical contaminants. This screening assessment used URS Scott Wilson Generic Assessment Criteria (GAC) that have been derived in house using the Environment Agency's CLEA v1.06 software, together with toxicological and chemical parameter

information from various sources including the Environment Agency, Land Quality Management/Chartered Institute of Environment Health (LQM/CIHE) and Contaminated Land Applications In Real Environments (CL:AIRE). The screening assessment considered that if the contaminant concentrations reported in the nine samples were acceptable when compared against the GAC derived for the CLEA default residential with plant uptake land use scenario, then it could be concluded with a high level of confidence that the soils would be acceptable with respect to isolated short term visits. This is because the residential exposure scenario assumes a daily exposure that would be far higher than exposure through infrequent visits. Due to the number of contaminants analysed by the laboratory, particularly in the case of the volatile organic and semi volatile organic compounds, only those contaminants recorded above the laboratory limit of detection have been considered in the assessment.

The soil data has been subjected to a statistical assessment in accordance with CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration' (May 2008). For this assessment, URS Scott Wilson have used their in-house Statistical Calculator Version 10 (October 2010) to carry out the assessment.

**Table 1** Site Specific Assumptions

Parameter	Residential Default	Site Specific	Justification
Soil Organic Matter Content	6.0%	1.0%	1% represents a more conservative assumption
Age Class	1 to 6 (Ages 0 to 6 years)	1 to 6 (Ages 0 to 6 years)	Critical receptor a female child aged 0 to 6 years assumed
Exposure Frequency	365 Days/Year	91 Days Year	91 days assumed (quarter of a year) based on age of child and likelihood of child visiting area.
Occupancy Period	1 Hour/Day	1.5 Hour/Day	This assumes that the receptor could be in the amenity space for up to 1.5 hours a day which is considered reasonable for a child of ages 0 to 6 years.

Once the critical contaminants had been identified a site specific risk assessment was carried out using the CLEA vs 1.06 software. To derive screening values that would be protective of human health of visitors to the amenity space, the default residential land use as defined in Environment Agency document 'Updated Technical Background to the CLEA Model' reference SC050021/SR3 and dated August 2008 has been modified in CLEA version 1.06.

The values derived consider an exposure scenario that would typically occur for a female child of 0 to 6 years that might visit the site for up to 1.5 hours on 91 days in any one year. This was considered a reasonable assumption based on the age of the child and likelihood of the child being unsupervised. A child of this age is considered the critical receptor due to

lower body weight and hence higher potential impact of any contaminant uptake.

The exposure routes considered appropriate are direct dermal contact, direct soil and dust ingestion, outdoor inhalation of dusts and outdoor inhalation of vapours.

Table 1 presents the default residential parameters used in the CLEA model together with the modified values that take due account of a revised exposure scenario. All other inputs if not mentioned should be assumed unchanged from the default. The CLEA model was run to generate site specific assessment criteria to be sufficiently protective of the human health of visitors to the site.

## INTERPRETATION

From the initial screening exercise undertaken to generate the list of contaminants of concern the following were found to exceed the residential with plant uptake default values and hence were considered to be the contaminants of concern: Chromium, Lead, Mercury, Benzo(a)anthracene, and Benzo(a)pyrene. Site specific assessment criteria were therefore generated for these contaminants.

Within the pool of nine samples one sample from BH4 (4 m) recorded a detection of Carbazole (0.28 mg/kg). Given that this represented an isolated detection no statistical analysis was carried out. Furthermore, there are no URS Scott Wilson GAC that cover this determinand. Given the depth of this sample and its isolated occurrence this was not considered to be significant.

The CLEA model was then run on the basis of the site specific inputs detailed in Table 1 for the contaminants of concern. The Site Specific Assessment Criteria derived were:

- Chromium III =  $6.56 \times 10^4$  mg/kg
- Chromium VI =  $2.75 \times 10^2$  mg/kg
- Lead =  $8.02 \times 10^2$  mg/kg
- Mercury Elemental =  $7.91 \times 10^3$  mg/kg
- Mercury Inorganic =  $8.73 \times 10^2$  mg/kg
- Mercury Methyl =  $6.20 \times 10^1$  mg/kg
- Benzo(a)anthracene =  $3.82 \times 10^1$  mg/kg
- Benzo(a)pyrene = 5.56 mg/kg

The laboratory data did not allow for any speciation of Chromium or Mercury and so in the interests of being conservative the lowest site specific assessment criteria value was adopted. A summary of the results of the assessment is provided in Table 2.

**Table 2** Summary Statistics and Assessment

Determinand	No. of samples (No. above detection limits)	Recorded Concentration (mg/kg)				SSAC (mg/kg)	Reject Ho (Y/N)	Evidence Level	Significant (Y/N)
		Min	Max	Mean	UCL95				
Chromium	9 (9)	7.0	48.0	23.7	31.3	$2.75 \times 10^2$	Y	0.995	N
Lead	9 (9)	17.0	990.0	214.3	653.1	$8.02 \times 10^2$	Y	0.990	N
Mercury	9 (9)	0.07	5.2	0.9	3.3	$6.20 \times 10^1$	Y	0.990	N
Benzo(a)anthracene	7 (6)	0.1	4.8	1.3	4.2	$3.82 \times 10^1$	Y	0.990	N
Benzo(a)pyrene	7 (6)	0.1	6.2	1.4	5.0	5.56	Y	0.990	N

Based on the soil quality data from the nine soil samples and the assessment assumptions, there is not considered to be a significant risk to human health.

Asbestos was identified in one sample at 1 m depth in TP2 and the Environmental Science Group report refers to some tipped asbestos at the surface. Asbestos contained within the soil profile below suitable cover is not considered likely to pose a risk if the soils remain undisturbed. Any asbestos at the surface should be identified, delineated and disposed of in accordance with statutory legislation.

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