

Spelthorne Borough Council



ENVIRONMENTAL PROTECTION ACT 1990, PART 2A – SECTION 78B

WRITTEN RECORD OF DETERMINATION OF CONTAMINATED LAND

Determination reference No: **SBC/D/2**

In accordance with Part 2A of the Environmental Protection Act 1990 and the Guidance set out in DEFRA's Circular 01/2006, Spelthorne Borough Council has identified the land at:

The open space at Denman Drive, Ashford, TW15, the OS national grid reference of its centre is 507650, 170690, which is identified within the red boundary on the plan in Figure 1 below.

as being **CONTAMINATED LAND**, as defined by section 78A(2) of the Environmental Protection Act 1990. This is because:

Spelthorne Borough Council has identified the presence of a contamination source, a pathway, and a receptor with respect to the current use of the land. The Council is satisfied that as a result of this pollution linkage a significant possibility of significant harm exists, with no suitable and sufficient risk management arrangements in place to prevent such harm.

A summary of the basis on which this determination has been made is set out in Schedule one to this record.

Dated 27 May 2011

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Lee O'Neil
Head of Environmental Health & Building Control

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Figure 1: Open space at Denman Drive, Ashford, TW15, the OS national grid reference of its centre is 507650, 170690



SCHEDULE 1

1.0 Description of the significant pollution linkages

Pollutants: Complex cyanide in shallow surface soils

Pathways: Oral
Direct soil and dust ingestion

Receptor: Assessment based on a four to eleven old year female child, having an exposure frequency of one hour per day spent playing on the open space over 180 days per year.

The open space is generally used by children unsupervised and older than four years of age. An ingestion dose of 1g has been used as this is based on an older child no longer exhibiting mouthing behaviour.

In combination the source-pathway-receptor linkage is considered to represent a Significant Pollution Linkage, indicative of a Significant Possibility of Significant Harm to Human Health.

2.0 Summary of the evidence upon which the determination is based

Shallow Soil Results (0.18m – 0.7m):

Complex Cyanide (mg/kg)	13,653	5,998	109	5,398	19,084
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Part IIA Site Specific Assessment Criterion:

Complex Cyanide	(Acute Risk)	5,700 mg/kg
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3.0 Site History

The open land being determined forms part of a private residential housing estate comprising Denman Drive, Mayfield Avenue and Caroline Court. The scope of the investigation included all areas of public open space, residential properties and commercial properties at the estate.

The land determined extends to approximately 45m x 30m, and is J shaped in plan, comprising an area of communal grassed open space in the centre of the housing estate. The land was referenced during the investigation as Zone 107b.

The estate, covering an area of 5.7 hectares, is situated in Ashford, Surrey. It was formerly a gravel pit (extending up to 350m by 200m), which was excavated between 1929 and 1934. Permission was first granted in 1949 to deposit waste in the former gravel pit. Permission was granted to a number of companies to deposit refuse in the 1950s and early 1960s. In May 1961 planning permission was granted on appeal for housing development on the gravel pit site.

4.0 Summary of the Site Investigation and Risk Assessment on which determination is based.

The site has been subject to a comprehensive investigation carried out over four phases.

Phase 1

A preliminary investigation in 2005 carried out by Spelthorne Borough Council following a complaint by a local resident about hydrocarbon staining on their child's clothing following play at the central public open space area.

This phase of investigation comprised of an initial desk study and 48 shallow soil samples from 30 locations around the central public open space. A total of 8 soil were collected from Zone 107b and analysed for selected inorganic and organic contaminants. The investigation did not consider soil pH and analysis of cyanide levels were also not within the scope of the investigation.

The results of the soil sampling revealed some elevated levels of determinands when considered against published generic assessment criteria. The conclusion of the investigation was that a detailed investigation across the whole estate was appropriate, to include ground gas and groundwater assessment.

Phase 2

In June 2006, Hyder Consulting (UK) Ltd, on behalf of Spelthorne Borough Council, carried out a more detailed investigation to characterise the nature and extent of contamination present. Samples were taken from 35 gardens and areas of public open space across the estate and fifteen boreholes installed for ground gas and water quality monitoring. A total of 218 soil samples were submitted for analysis.

In the second phase of investigation, one of the three cable percussion boreholes, C1, was undertaken to 8.10m below ground level (bgl) in the south of zone 107b. A window sampler borehole, O1, was also located in the north of zone 107b, taken to 5.0m bgl. Both locations were installed as groundwater and gas monitoring wells. Three soil samples were collected from each borehole. Cyanide levels were analysed as free cyanide, total cyanide and thiocyanate. The sample from borehole O1 (0.4 – 0.6m bgl), an odorous dark blue to black clay layer, recorded a pH of 1.2, free cyanide of 57 mg/kg and total cyanide of 26,000 mg/kg.

Elevated contaminant concentrations, in comparison with published generic assessment criteria were encountered in both residential gardens and public open

spaces at the estate. A determination of whether the site or parts of the site are contaminated land as identified under Part IIA of the Environmental Protection Act could not be applied at this stage. Further work was recommended by Hyder Consulting to justify whether a “significant possibility of significant harm” was present on the site.

Phase 3

Within this phase, Atkins Ltd were commissioned to carry out further investigation and undertake human health risk assessment in relation to six sub zones of the former landfill site, including 34 dwellings and 3 areas of public open space. The fieldwork in February 2009 comprised 45 hand auger exploratory locations, 26 window sampler locations, installation of 6 soil vapour monitoring wells, one round of groundwater sampling, one round of ground gas monitoring and four trial pits adjacent to property foundations. The scope of the investigation also included a ground gas risk assessment. A total of 115 soil samples and 12 groundwater samples were analysed for selected contaminants.

Three of the window sampler boreholes (WS227, WS228 and VW305) were located within Zone 107b, one of which was installed as a soil vapour monitoring well. The boreholes were advanced to 2.50m bgl. Two soil samples were collected from each window sample location. A soil vapour sample was collected from VW305 and analysed for volatile Total Petroleum Hydrocarbons (TPHs), BTEX (Benzene, Toluene, Ethylene and Xylene) and Volatile Organic Compound analyses. Hydrogen cyanide gas/ vapour was sampled on a soda lime tube. The sample taken from O1 reported hydrogen cyanide concentrations below the method detection limit. Elevated total cyanide was found in the shallow sample (0.5m) at WS228, at 4,300 mg/kg. No free or complex cyanide analysis was undertaken on samples from these three locations.

The review concluded that the concentrations of cyanide within the soils at the residential properties were considered unlikely to result in significant potential of significant harm (SPOSH). In connection with the open space at Zone 107b the elevated levels of cyanides (total, free and thiocyanate) in combination with the very low pH (at 1.2) were considered indicative that there may be significant contamination at this location.

Phase 4

The objective of the Phase 4 investigation was to increase certainty of the risk to human health in connection with contaminants at a handful of residential properties and two areas of open space. The exploratory locations in Zone 107b centred around the former Phase 2 O1 location to provide further data on the strata with elevated cyanide and low pH. The Phase 4 investigation as a whole involved 8 window sampler boreholes drilled to a maximum of 3.0m and 35 hand auger trial holes to a maximum depth of 0.85m.

In Zone 107b, a total of three window sampler boreholes (WS421 – WS423) and six hand auger trial holes (HA424 – HA429) were excavated. These exploratory locations were targeted to identify the extent of a shallow layer of black sand, and blue/ green ash and clinker made ground with tarry odours. This material was

found in WS421, WS422, HA426, HA427 and HA428 from depths of around 180mm to 800/900mm.

A total of five soil samples were analysed for pH and cyanide levels from the black sand/ ash layer encountered within this phase investigation:

Location	Depth of Black Sand	Sample(s)	Contaminant Levels
WS421	0.20 – 0.35m	WS421 (0.25m)	pH 5.4 Free cyanide 42 mg/kg Complex cyanide 13,653 mg/kg
HA427	0.18 – 0.5m	HA427 (0.2m)	pH 3.0 Free cyanide 25 mg/kg Complex cyanide 5998 mg/kg
HA428	0.35m – 0.8m	HA428 (0.4m)	pH 4.0 Free cyanide 28 mg/kg Complex cyanide 109 mg/kg
		HA428 (0.5m)	pH 3.3 Free cyanide 32 mg/kg Complex cyanide 5398 mg/kg
		HA428 (0.7m)	pH 2.2 Free cyanide 273 mg/kg Complex cyanide 19,084 mg/kg

The Council engaged WCA Environment, to derive and recommend Part 2A assessment criteria for recreational use of open spaces for free cyanide and complex cyanide. Soils concentrations below these Part 2A screening criteria mean that the criteria for contaminated land under Part 2A is unlikely to be met.

The site-specific assessment criteria for the 'open space' land use was developed using a scenario of an unsupervised female child visiting the site on a regular basis (1 hour at a time, 180 days per year) and playing in the predominantly grassed areas which also contain patches of exposed soil. This scenario is considered plausible given the close proximity of the site to residential housing. The receptor for this scenario is a female child (lower bodyweight than male and therefore more sensitive) aged 4-11 years old. The Part IIA site-specific assessment criteria for public open spaces, including Zone 107b, for cyanide is as follows:

Contaminant	Part 2A Cc (mg.kg ⁻¹ dry weight soil)
Free Cyanide	170
Complex Cyanide	5,700

Statistical analysis of soil contaminant concentrations for the open space areas was undertaken to derive representative concentrations based on balance of probability (i.e. 51% confidence level) of representing the true mean concentration; this is acknowledged to be a relatively conservative approach for Part 2A risk assessment. Statistical assessment has been made of sample depth ranges 0-0.3m and 0-0.6m for non-volatile contaminants (such as cyanides) as being representative of shallow and shallow-medium depth soils to which exposure is most likely to occur as children are most likely to ingest or have dermal contact with near surface soil.

The soils in Zone 107b to which children using this area of open space are most likely to be exposed are considered unlikely to pose a significant possibility of significant harm due to chronic (i.e. long term) exposure to cyanides (free and complex). However, complex cyanide is present at highly elevated concentrations in shallow soils and WCA Environment advised that it could pose a significant risk to health due to acute exposure (i.e. one-off ingestion of a 1g of soil). The samples taken from 0.2m depth at HA427 and WS421 exceed the assessment criteria for acute risk with concentrations of 5998 mg/kg and 13,653 mg/kg, respectively. Peak concentrations up to 19,000 mg/kg of complex cyanide have been encountered in the same strata at a greater depth of 0.7m. A much lower than expected soil pH was also measured in a number of soil samples from Zone 107b, the lowest pH being 1.2, which is very acidic and would have a damaging effect on skin. The human health risk assessment by the consultants therefore considered that areas of the soil in Zone 107b could pose a significant possibility of significant harm. On this basis the Council has determined the land at Zone 107b to be Contaminated Land as defined under Part IIA of the Environmental Protection Act 1990.

5.0 COMPLIANCE WITH THE STATUTORY GUIDANCE (CHAPTERS A & B)

Statutory Guidance Chapter	What it Refers To?	Compliance Comments
A.9 – A.21	Risk assessment	The initial investigation by the Local Authority and subsequent investigations and assessment by Hyder Consulting Ltd, Atkins Ltd, Leap Environmental and WCA Environment lead to the production of reports that are in general accordance with these sections of the statutory guidance. Consultation was also carried out with the HPA. Para A.11 - A contaminant, pathway and receptors have been identified for the site
A.23	Significant Harm	The Significant Possibility of Significant Harm (SPOSH) is to a receptor type in Table A, human beings, and the harm of death, disease or serious injury is within the description of harm specified for that type of receptor in Table A.
A.25 – A.26	Current use	The site has been assessed on its current use - for play by children who live in the surrounding houses. The site is a grassed open space, some small patches of exposed soil and four mature trees.
A.27 – A.32	Significant Possibility of Significant Harm (SPOSH)	The Interpretative Report – Human Health Risk Assessment for Denman Drive by WCA Environmental sets out the reasons why the levels of cyanide are considered to meet the definition of SPOSH, in accordance with Table B of the statutory guidance. The nature and degree of harm, susceptibility of the receptors and timescale within which the harm might occur have been taken into account in the risk assessment. The investigations and reports are considered to be (i) scientifically based; (ii) authoritative; (iii) relevant; and (iv) appropriate to Part 2A
B.32 – B.36	Physical extent of the land	The decision to determine the whole of the open space has been based on: i) the variability of made ground at the site due to the site history of piecemeal landfilling under limited controls in the 1950s/60s ii) the smallest parcel of land under one title
B.37 – B.41	Making the 'Determination'	The Local Authority is considered to have taken into account all relevant and available evidence and to have taken appropriate scientific and technical assessment of this evidence. The site is determined on the grounds that there is a significant possibility of significant harm being caused
B.45 – B.49	Determining SPOSH	The Local Authority has used site specific assessment criteria based on an acute exposure scenario and representing a Critical Concentration for cyanide. As detailed in section B.49 there is no known contrary evidence to the determination of the land.
B.52	Record of Determination	This document forms a written record of the land being determined as contaminated land in accordance with section B.52.

6.0 REFERENCES

Site Specific Information, Reports and Documents

Phase 1

- “Preliminary Investigation” Report, Spelthorne Borough Council, 2006

Phase 2

- “Desk Study” Report, Ref 0001-GD00939-GDR-02, Hyder Consulting (UK) Ltd, April 2006
- “Site Investigation Design Report”, Ref 002-GD00915-GDR-013-Final, Hyder Consulting (UK) Ltd, April 2006
- “Technical and Statistical Review of Contamination Assessment Reports”, Ref 44407486, URS Corporation, October 2006
- “Site Investigation Factual Report”, Ref 004-GD00939-GDR-02, Hyder Consulting (UK) Ltd, October 2007
- “Site Investigation Interpretative Report”, Ref 0005-GD00939-GDR-02, Hyder Consulting (UK) Ltd, December 2007

Phase 3

- “Initial Structural Appraisal of Sulphate Data Supplied by Client with Comment on Site Wide Sulphate Levels and Potential Paths for Gas Ingress through the Foundations”, Ref 5059196.1525.001 Issue 1, December 2007
- “Task 1 – Review of Available Data”, Ref D1a, Atkins Ltd, January 2008
- “Phase 3 Site Investigation Final Factual Report”, Ref 5059196/ GTG.2007511/ Denman Drive/ R002rev1, Atkins Ltd, July 2009
- “Phase 3 Site Investigation Final Interpretative Report”, Ref 5059196/ 2007511/ Denman Drive/ R003rev1, Atkins Ltd, July 2009

Phase 4

- “Factual Report on a Site Investigation at Denman Drive, Ashford”, Ref LP 00194, Leap Environmental Ltd, May 2010
- “Interpretative Report – Human Health Risk Assessment for Denman Drive”, Ref P0199, WCA Environment, December 2010

Primary Legislation

- Environmental Protection Act 1990, Part 2A

Statutory Guidance

- Circular 01/2006 Environmental Protection Act 1990: Part 2A, Contaminated Land. DEFRA, September 2006

Procedural Guidance

- Professional Practice Note: The determination of contaminated land; deciding what is an 'unacceptable intake'. Chartered Institute of Environmental Health, May 2006
- Local Authority Guide to the Application of Part 2A of the Environmental Protection Act 1990. Chartered Institute of Environmental Health, July 2001
- Applying the Definition of contaminated land under Part 2A of the EPA 1990. DEFRA, July 2008
- Improvements to Contaminated Land Guidance: Outcomes of the 'Way Forward'. DEFRA, July 2008

General Technical Guidance

- Guidance on Comparing Soil Contamination Data with a Critical Concentration. CL:AIRE, May 2008
- Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination, R&D Technical Report P5 006/TR, Environment Agency 2000;
- CLR Report No. 4: Sampling Strategies for Contaminated Land, DoE 1994
- BS ISO 10381-1:2002 Soil Quality – Sampling – BSI 2002 Part 1: Guidance on the Design of Sampling Programmes; Part 2: Guidance on Sampling Techniques and Part 3: Guidance on Guidance on safety. 2005 - Part 5: Guidance on the investigation of soil contamination of urban and industrial sites.
- TOX 6 Lead "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans". DEFRA/Environment Agency, March 2002
- Science report: SC050021/TOX 1 "Contaminants in soil: updated collation of toxicological data and intake values for humans: Inorganic arsenic". Environment Agency, May 2009.
- Science Report SC050021/SR2 "Human health toxicological assessment of contaminants in soil". Environment Agency, 2009
- Science Report SC050021/SR3 "Updated technical background to the CLEA model". Environment Agency, 2009
- Science Report SC050021/SR4 "CLEA Software (Version 1.04) Handbook". Environment Agency, 2009
- Science Report SC050021/SR7 "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values". Environment Agency, 2008