

12 March 2014

Position Statement: Marlpool Drive, Redditch

Worcestershire Regulatory Services (WRS) on behalf of Redditch Borough Council (RBC) have completed a Contaminated Land investigation and remediation project in Marlpool Drive, Redditch as a result of landfill gas problems.

Background

A number of houses in Marlpool Drive, Redditch are situated on a former landfill site. The site was historically used for the extraction of clay for the adjacent Ferney Hill brickworks which resulted in a large depression, known as Aspen Hollow. Planning permission was granted in 1962 to the owners Ferney Hill brickworks for the infilling of 'marle hole'. The permission stipulated that no industrial, liquid or combustible material or household refuse shall be tipped on site. Evidence from planning records indicates that Birmingham City Council confirmed they were granted permission in February 1963 for the exclusive rights to deposit material in 'marle hole', then owned by Ferney Hill Brickworks Ltd (SKM, Apr 2010).

The depression was subsequently infilled with some 10m of screened dust, residue from incinerated household refuse, industrial boiler ash and clinker, hardcore and soil. The waste was covered with approximately 2.5m to 3m of clay fill. Tipping operations were complete by December 1970 (SKM, Apr 2010).

Tarmac Homes Midlands Ltd bought the site and developed it with permission granted by Redditch Borough Council (Application reference number 86/35) for residential development of 20 detached and 14 semi-detached properties in 1986 with the properties being completed by the end of that year. Subsequently a further detached property (32a Marlpool Drive) was built in 2005 (SKM, Apr 2010).

The residential properties were constructed on a raft foundation supported off vibro replacement stone columns, which are considered likely to penetrate the full depth of the waste. Gas protection measures within properties incorporated a very basic means of passive gas dispersion installed beneath the floor slabs. This was intended to direct gas accumulating in the voids of the coarse gravel stone blanket to the perimeter of the house via a minimum of four plastic vent pipes (SKM, Apr 2010).

Investigations

During May 1990, following a planning application to construct an extension on a property within the site, 5 shallow gas monitoring wells were sunk to depths of 1.5m to 3m bgl. In two of the wells elevated levels of CH₄ were recorded at 3% and 10%. The consulting engineers acting on behalf of the owners of the property advised RBC in a letter 'The existing property including the garage is founded on 22 pressure points of vibro flotation placed by GKN Keller Foundations.'

Following this during 1990-91, remedial works were undertaken by NHBC to a number of properties where methane was detected within the cavity walls.

Following the discovery of elevated concentrations of methane at the site, RBC instigated further site investigations, summarised as follows:

Industrial Research Laboratories. 1991. *Marlpool Drive.* This report contained information on the waste deposition from planning records indicating that the authorised waste comprised: screened dust from household refuse, residues from household refuse, ash from the British Electric Authority, brick hardcore, industrial boiler ash and clinker.

Industrial Research Laboratories. May, 1991. *Assessment of Gas Emissions from Marlpool Drive, Redditch.* This investigation included the installation of 7 monitoring boreholes to determine the area affected by gas emissions and extent of lateral migration, and additionally internal monitoring was undertaken. Monitoring of gas vents of all properties were undertaken on 14 occasions.

Industrial Research Laboratories. October, 1991. *Assessment of Landfill Gas Emissions from Additional Boreholes at Marlpool Drive, Redditch.* This investigation included the installation of two new boreholes outside of the area of the original landfill in order to assess the possibility of off site migration. Each borehole was monitored on 6 different occasions and no significant levels of landfill gas were recorded.

Industrial Research Laboratories. March, 1994. *Installation of Additional Monitoring Stand pipes and Central Venting Boreholes at Marlpool Drive, Redditch. SI/93/051955.* This investigation included the installation of a further 5 monitoring boreholes and 4 venting boreholes.

Site investigation prior to extension at no 40 Marlpool Drive, August 1994. 2 trial pits were excavated to 1m bgl and 6 gas spikes to a further metre from base of pits recorded concentrations of methane between 0 to 46.6% and carbon dioxide between 0 and 26.2%.

Site investigation prior to extension at no 50 Marlpool Drive, 1996. A total 15 spike surveys were taken to 1m bgl recording concentrations between 0 and 2% CH₄ and between 0.4 and 2.5% CO₂.

Site investigation prior to construction of no 32a Marlpool Drive, Dec 2005. Two boreholes were drilled within footprint of the proposed property to 4m bgl and gas monitoring pipes installed. They were monitored once with one pipe recording negligible results and the other pipe recorded 28.1% CH₄ and 24.5% CO₂.

RBC returned to site to undertake gas monitoring in July 2008 and a number of replacement boreholes were drilled and gas monitoring pipes installed. In 2009 SKM Enviros consultants were commissioned by Redditch Borough Council, to undertake a gas risk assessment at the site.

SKM Enviros. March, 2010. *Marlpool Drive Internal Gas Surveys.* This letter report included results of internal gas surveys and external vent monitoring of 24 of the 35 properties on Marlpool Drive and monitoring results from 5 boreholes also undertaken in February 2010.

SKM Enviros. April, 2010. *Marlpool Drive Gas Risk Assessment.* The scope of this report was to review and assess all of the available information on ground conditions and the soils gas regime including all of the reports summarised above; identify the foundation details of the properties constructed on site; identification and assessment of potential gas migration pathways into residential properties; formation of a conceptual site model; site specific quantitative assessment of the gas risk; and recommendations for further phases of work. It also included assessment of internal gas surveys undertaken on 10 properties in 2009.

This investigation identified a potential risk to human health and property, but further work was required to determine whether or not the risk was significant.

SKM Enviros. July, 2011. *Marlpool Drive, Redditch Report on Further Assessment Actions.* This further assessment commissioned by WRS included; tracer gas surveys to test the effectiveness of the underfloor gas dispersion systems and locate gas ingress points within buildings; internal gas

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surveys of 8 properties not previously surveyed; installation of 2 additional monitoring wells; and real time monitoring for a set period of time of two boreholes and underfloor vents at 2 properties to better understand the gas regime. The objective was to confirm pollutant linkages (see below) and improve confidence in assessing if the site required determination as Contaminated land and consideration for remediation.

The investigation concluded that landfill gas posed a significant risk of harm to human health and property at 18 out of the 35 properties. Recommendations were to carry out appropriate remediation to these 18 properties on an urgent basis.

Local Authority action under Contaminated Land Regime

Redditch Borough Council identified the site as a priority for detailed inspection under Part 2A of the Environmental Protection Act 1990. Worcestershire Regulatory Services (WRS)* became the lead regulatory authority for this site in June 2010.

Significant Pollutant Linkages

In accordance to the definition of 'Contaminated Land' within Part 2A of the Environmental Protection Act 1990, a Significant Pollutant Linkage i.e. a source, a pathway and a receptor must be demonstrated. Evidence of the existence of the SPL's detailed below has been gathered during the investigations outlined above.

Source	Pathway	Receptors
Landfill Waste - Methane	Vertical migration via stone columns, accumulation beneath building perimeter, ingress via cracks and service entries, accumulation leading to fire and/or explosion risk	Occupants of residential properties; Residential Properties
Landfill Waste - Methane	Vertical migration via stone columns, accumulation beneath building perimeter and venting through underfloor vents leading to fire and/or explosion risk	Occupants of residential properties; Residential Properties
Landfill Waste – Carbon Dioxide	Vertical migration via stone columns, accumulation beneath building perimeter, ingress via cracks and service entries, accumulation in confined spaces and inhalation leading to asphyxiation risk and toxic effect	Occupants of residential properties

Contaminants identified

Methane

Methane can, if accumulated at sufficient levels, and in the presence of oxygen and an ignition source, give rise to risk of fire and explosion. The lower explosive limit (LEL) of methane is 5% v/v (per volume of air) and the upper limit is 15% v/v (CIRIA C665). Above 15% v/v methane is no longer flammable and therefore explosive because of the reduced level of oxygen.

For an explosion to occur there must be an accumulation of methane, sufficient oxygen for a flame to burn and an ignition source. This can be anything from the firing of a central heating boiler or gas hob to the lighting of a match or a discarded lit cigarette.

Carbon Dioxide

Symptoms of excess carbon dioxide will vary from shortness of breath, dizziness and nausea at relatively low levels (3 to 6% v/v) through to unconsciousness and asphyxiation at extremely high levels (6 to 20% v/v) causing fatality above 22% v/v (CIRIA C665).

Determination

Following the investigations undertaken in 2010/11 Redditch Borough Council was satisfied that as a result of the pollutant linkages a Significant Possibility of Significant Harm existed, with no suitable and sufficient risk management arrangements in place to prevent such harm.

On 15 July 2011 RBC exercised its powers under Part 2A of the Environmental Protection Act 1990 to determine that the land upon which the following 16 properties are built is Contaminated Land and to carry out urgent remediation works:

39 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
41 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
43 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
45 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
47 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
49 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
51 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
52 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
53 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
54 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
56 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
58 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
60 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
62 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
64 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
66 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX

Following clearance of the sub floor vents and monitoring of landfill gases from the vents and internally a further two properties were determined as Contaminated Land by RBC on 9th May 2012 under Part 2A of the Environmental Protection Act 1990 as follows:

37 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
68 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX

Remediation

A remediation statement was produced by RBC in July 2011 for the 16 determined properties, outlining the contaminants present, significant pollutant linkages as outlined above and the remedial action required for each affected property.

A successful application was made by WRS on behalf of RBC to DEFRA for funding of urgent remediation works to the 16 properties under the Capital Projects Contaminated Land Grant. £194,000 was awarded to WRS/RBC for these works on 25 July 2011.

Remedial works to retrofit each building with a positive (active) system utilising the existing gas dispersal system beneath each property began in October 2011. This involved the installation of a single 100mm outlet Positive Pressurisation Unit (PPU), designed to prevent gas migrating into the properties.

The PPU operates by taking clean fresh air and introducing it below the floor slab. This acts to dilute and disperse any accumulating landfill gas and, by producing a net positive pressure, creates and maintains a clean air blanket below the structure.

Remedial works commenced on 10 October 2011 and final installation was completed on 13th January 2012.

Following determination of a further 2 properties in May 2012 an additional remediation statement was produced by RBC. A second application was made by WRS on behalf of RBC to DEFRA for funding of urgent remediation works to the properties under the Capital Projects Contaminated Land

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Grant. £24,230 was awarded to WRS/RBC for these works on 19 July 2012. Remedial works, as described above, were commenced on 16th July 2012 and completed on 27th July 2012.

Verification of active (positive) systems

Following installation of the PPU at each affected property a two week period of continuous monitoring was undertaken to ensure the installed units were working as designed and concentrations of gas levels during falling atmospheric pressure events have been reduced to acceptable levels.

This verification process was completed on 17th August 2012 and WRS/RBC appointed consultants have confirmed gas concentrations below all properties are within acceptable levels. Remedial verification reports were produced by the consultants commissioned to undertake the remedial works for each of the properties above in addition to a final project verification report.

Servicing and Maintenance Contracts

Following installation of the PPU's if any fault or power cut occurs, specialist contractors Prestige Air Technology will alert WRS to follow up the issue with the occupier or home owner. If there is a fault, they will attend and fix the problem.

RBC have agreed to cover and put in place the Service and Maintenance contract for 20 years from installation.

Electricity costs

Redditch Borough Council has agreed to contribute the sum of £110 for each PPU as a flat rate contribution to the occupier (in this case specifically the bill payer) on the anniversary of the installation of the unit until such time as the liability issue has been resolved.

Non Determined Properties

For the following 17 remaining properties built above the former landfill site no further works or investigation are proposed:

22 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
24 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
26 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
28 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
30 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
32 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
32A MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
34 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
35 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
36 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
38 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
40 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
42 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
44 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
46 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
48 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX
50 MARLPOOL DRIVE, REDDITCH, WORCESTERSHIRE B97 4RX

WRS are satisfied that the above properties are not at significant risk of significant harm as a result of landfill gas and therefore do not meet the statutory definition of Contaminated Land as outlined in Part 2A of the Environmental Protection Act 1990. This was confirmed to the residents of those properties in a letter from WRS dated 03 October 2011.

Liability under the Contaminated Land Regime

Liability for remediation under the Contaminated Land Regime requires the 'appropriate person' to be identified. For the properties identified as Contaminated Land this has been determined by WRS as the original house builder, Tarmac Homes (Midland) Ltd, who were taken over some time ago by Jim 5 Limited, part of the Taylor Wimpey Group.

References

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- DEFRA Circular 01/2006. *Environmental Protection Act 1990: Part 2A. Contaminated Land*. Sep, 2006.
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- Redditch Borough Council. *Remediation Statement RS01*. July, 2011.
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