



## Environmental Protection Act 1990 Section 78B

### Record of the Determination that the Land known as 'New Years Green Lane Landfill Site' is Contaminated Land

In accordance with Part 2A of the Environmental Protection Act 1990 the London Borough of Hillingdon has determined that the land at: The former '**New Years Green Lane Landfill Site**'

National Grid Reference: 506286 E and 188274 N:

Is Contaminated Land as defined by Section 78A (2) of the Environmental Protection Act 1990, because:

The London Borough of Hillingdon has identified the presence of a contamination source, a pathway and receptor with respect to the current use of the land. The London Borough of Hillingdon is satisfied that the pollution of controlled waters is being caused. The London Borough of Hillingdon is also satisfied there is a significant possibility of significant harm being caused from landfill gas with no suitable and sufficient risk management arrangements in place to prevent such harm (as defined in Table B2 of the Statutory Guidance to Part 2A).

A summary of the basis on which this determination has been made is set out in the following schedule to this record

Signed

Dated

26<sup>th</sup> May 2011

Peggy Law  
Consumer Protection Manager  
Planning, Environment, Education and Community Services



INVESTOR IN PEOPLE

Environmental Protection Unit  
Planning, Environment, Education and Community  
Services  
T.01895 250155 F.01895 277443  
London Borough of Hillingdon,  
3S/02, Civic Centre, High Street, Uxbridge, UB8 1UW

# Schedule of Determination

**London Borough of Hillingdon**

**Environmental Protection Act 1990, Part 2A – Section 78B**

**Record of Determination of the Land at the Former Landfill Site at New Years Green Lane, Harefield, Middlesex**

## 1. Introduction and Site Location

Paragraph B.52 of the Statutory Guidance (DEFRA Circular 01/2006) requires local authorities to prepare a written record of determination that particular land is contaminated land for the purposes of Part 2A of the Environmental Protection Act 1990. This document outlines why the London Borough of Hillingdon, 'the Council' has determined that the land at the New Years Green Lane Former Landfill site is 'Contaminated Land'.

The Council owned site now known as New Years Green Landfill is located at Grid Ref 506286 E and 188274 N approximately 2 km south east of Harefield as shown edged red on the attached plan, Figure 1. The site extends for an area of over 70 Ha and is currently used for rough grazing. Formerly the site was used as a sand and gravel quarry which was in-filled with domestic waste during the 1960s and 1970s. Following tipping by the Greater London Council the site was capped to make it suitable for its current use. There are three residential buildings and a Civic Amenity Centre situated at the site boundary and three farms surround it. The waste appears to extend under the Civic Amenity Centre land. Highway Farm is also partially tipped. The site geology identified through the various investigation boreholes comprises of a clay topsoil cover over the waste. Under the waste lie the sands, gravels and clays of the Reading Formation and below this is the Upper Chalk. Although no details of the construction and previous operation of the site are available, it is understood that the chalk was not to be exposed during the mineral extraction and a 6ft thickness of overburden was to be placed prior to tipping. The Reading formation contains clay but is not generally regarded as a competent geological barrier. It is described as a Secondary Aquifer by the Environment Agency, 'EA'. It may retard but is unlikely to completely prevent the passage of contaminated liquids into the chalk aquifer beneath. There is evidence of perched waters within the fill material above the Reading formation and a known principal aquifer is in the underlying chalk. The majority of the site overlies the outer source protection zone for the Ickenham Public Water Supply with a small part of the site overlying the inner source protection zone. It is assumed that there is a potential for contamination to overlie the inner source protection zone because there is little information regarding the nature and location of tipped material. The New Years Green Bourne runs through the site in a culvert from an ephemeral pond to the north of the site entering the Colne/Grand Union system to the West at Dews Farm. The River Pinn and River Colne are over 700m from the site and there is no indication of a connection between contamination on site and of these two rivers.

## 2. Description of the Significant Pollutant Linkages

**Table 1 Significant Pollutant Linkages**

Linkage ID <sup>1</sup>	Contaminant	Migration and Exposure pathways	Receptor	Comment
1	Ammonia (NH <sub>3</sub> as N)	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(a) linkage
2	Ammonium (as NH <sub>4</sub> )	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(a) linkage
3	Benzene	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(c) linkage
4	Calcium	Leaching from contaminated fill	Groundwater (SPZ 1)	
5	Chlorobenzene	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(c) linkage
6	1,1-Dichloroethane (1,1-DCE)	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(c) linkage
7	Iron	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(a) linkage
8	Magnesium	Leaching from contaminated fill	Groundwater (SPZ 1)	
9	Mecoprop	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(c) linkage
10	Potassium	Leaching from contaminated fill	Groundwater (SPZ 1)	
11	Sulphate	Leaching from contaminated fill	Groundwater (SPZ 1)	
12	TPH >C6-C40	Leaching from contaminated fill	Groundwater (SPZ 1)	Regulation 3(c) linkage
13	Ammonia (NH <sub>3</sub> as N)	Migration of leachate into Culvert	Surface Waters	
14	Ammonium (as NH <sub>4</sub> )	Migration of leachate into Culvert	Surface Waters	
15	Chloride	Migration of leachate into Culvert	Surface Waters	
16	Sodium	Migration of leachate into Culvert	Surface Waters	
17	Sulphate	Migration of leachate into Culvert	Surface Waters	
18	TPH C6 – C40	Migration of leachate into Culvert	Surface Waters	
19	Methane	Migration to buildings (inhalation)	Humans (asphyxiant)	
20	Carbon Dioxide	Migration to buildings (inhalation)	Humans (asphyxiant)	
21	Methane	Migration to buildings and ignition of gas	Buildings (explosion hazard)	

<sup>1</sup> There are different numbers referenced in the original Conceptual Model in the Atkins Report (2006)

Table 1 – Twenty one significant pollutant linkages (SPLs) have been identified by the Council. The SPLs which form the basis of this determination have been grouped according to the exposure pathway as shown in the Table 1 as required by paragraph B52(a) of the statutory Guidance to Part 2A. The linkages specific to Regulations 3(a) and 3(c) are indicated because they are required for designation as a Special Site. The other linkages part of the evidence to determine the site as Contaminated Land.

### **3. Physical Extent of the Land**

The extent of the 'Contaminated Land' has been decided upon by the Council as the area marked as Red on Figure 1 as appended to this record of determination (following Page 17).

Guidance on the considerations that are relevant to determining the extent of contaminated land can be found in paragraphs B32 – B36 of DEFRA Circular 01/2006. Highway Farm and the Civic Amenity Site have not been included in the area of determination. The greater part of any contamination source is thought to be located at New Years Green Landfill Site as shown on Figure 1. Highway Farm was a lesser part of the old landfill area and was remediated to a suitable for use standard under the planning regime in 2006. Investigations by consultants to the owners of Highway Farm in 2003 and subsequent groundwater monitoring from 2006 to 2010 confirmed that the ammonia concentrations were higher in the monitoring boreholes outside of Highway Farm next to New Years Green Landfill. This indicated that the predominant source of groundwater contamination was most likely New Years Green Landfill to the immediate north of Highway Farm. The Civic Amenity Site is currently subject to a planning permission for redevelopment. The three residential properties surrounding the landfill are not included as they do not appear to be located on landfill although the landfill extends to the edge of their gardens.

The area of determination is defined as recommended by the Environment Agency in their Detailed Advice of 2008. The land determined is the area of land where it is established that there is the presence of significant pollutants in the landfill leachate and high levels of landfill gas (B32(a)).

### **4. Summary of the evidence on which the determination is based (B.52 (b))**

The landfill was considered as a potential source of ammonia pollution at the public water supply borehole as far back as 1985. Pollution by ammonia in the New Years Bourne was first brought to the Council's attention by the National Rivers Authority on 15 June 1995. The Council was informed by the Environment Agency, 'EA' of the closure of the Ickenham Public Water Supply Borehole by the Three Valleys Water Company, 'TVWC' due to pollution levels on 21 May 1997. The ammonia had been treated at the public supply but

the treatment system failed due to iron concentrations within the groundwater. The EA also again indicated that the landfill was known to cause pollution in the watercourse which runs in a culvert below the site. The Council also found high ammonia levels in the watercourse, part of the New Years Green Bourne Stream. The landfill was seen by the EA as the main potential source of water contamination. The site was forthwith investigated by the EA and the Council, and an assessment was made under Part IIA.

Since 1997 the EA and the Council have carried out contamination investigations and monitoring work on the landfill site, and within the groundwater regime in the area. There is only a little recent information on water quality at the public supply, 'PWS' when the boreholes were pumped for a short period. A number of site investigation reports are available for the landfill site assessing both gas and water issues. The determination is based on a number of reports that are listed below (references 1 to 10).

The EA agreed with the Council to carry out a detailed inspection of the site following the Council's request under B28-B29 of the Statutory Guidance. There are two Part IIA reviews of the site dated May 2004 (Enviros Consulting Limited) and December 2006 (Atkins). These reports were followed by formal detailed advice from the EA received on 6 August 2008. The views of the Agency provided in the detailed advice were confirmed in a letter to the council dated 15 December 2010.

As a separate matter landfill gas has been monitored at the site from 2005 by SLR Consultants for health and safety reasons rather than as a Part IIA investigation. The site investigations and reviews are listed below with brief summaries.

#### **Site Investigation Reports by Consultants for the Council and Environment Agency (EA)**

- Symonds Travers Morgan for the National Rivers Authority (now the EA) – Investigation of Ammonia pollution at Ickenham Public Water Supply Source, Hillingdon – November, 1997 (ref1).
- Aspinwall & Co for the EA – Investigation of Water Pollution from New Years Green Lane Landfill Site, Ickenham – March 1999 (ref 2).
- Enviros for LBH - Environmental Monitoring at New Years Green Lane Landfill Site, Ickenham March, 2001 (ref 3).
- Enviros for LBH - Environmental Monitoring at New Years Green Lane Landfill Site, Ickenham, June, 2002 (ref 4).
- Site Investigation (November 2003) and Groundwater Monitoring (2003 to 2010) carried out by Waterman Environmental for the Dogs Trust at Highway Farm (ref 5).

- Envirosearch for LBH - New Years Green Lane Landfill Site – Gas Risk Assessment – July, 2002 / SLR Consultants for LBH - Yearly Landfill Gas Monitoring Reports for New Years Green Landfill (2005 to 2009) (ref 6).

### **Part 2A Assessment Reports for the Environment Agency**

- Envirosearch for the EA – Critical Review of New Years Green Landfill - May 2004 (ref 7).
- Atkins for the EA – Final Interpretative Report, New Years Green Landfill, Hillingdon - B20 (a) and B20 (b) Part IIA Detailed Inspection 2006 (ref 8).

### **Site Specific Advice of the Environment Agency**

- Detailed Advice to the London Borough of Hillingdon with a covering letter dated 6 August 2008 (Groundwater & Contaminated Land Team, Environment Agency) (ref 9).

### **Remediation Options Report for the Council**

- Atkins for LBH - New Years Green Landfill - Outline Remediation Options Appraisal February 2011 (ref 10)

### **Summary of the Site Investigation Reports**

#### **Initial Investigation (ref 1)**

#### **Investigation of Ammonia Pollution at Ickenham Public Supply Source 1995**

The NRA commissioned the report due to concerns about ammonia levels at Ickenham. Correspondence from 1977 to 1988 with the Three Valleys Water Company on the ammonia pollution at Ickenham was summarised in the report. The report collated background information on the Ickenham PWS including borehole logs, adits, pumping rates and water quality. Data was presented on a regional hydro-geological setting. This report was the first report on the groundwater contamination in the area and involved the drilling of 2 deep groundwater boreholes south of the site. Water samples were taken from these boreholes and at the 3 pumped PWS boreholes, and 7 surface water sites including the landfill culvert and a nearby ditch. The hydrogeology and hydrochemistry were assessed in detail. The hydro-chemical interpretation of the surface waters and groundwater was concluded to consistently suggest the landfill to be the main source of pollution to the Ickenham Public Water Supply. Concerns were that rising groundwater

levels might increase the ammonia levels by mixing with the landfill leachate. The report suggested the landfill as the most significant source of groundwater pollution but also mentioned other potential sources. It was indicated that there may be other landfill sites up-gradient of the supply and a ditch that may be contributing to the problem. The report made recommendations regarding appropriate actions to protect groundwater resources, including the investigation of the design and extent of the waste in the New Years Green Landfill Site, and the extent of the groundwater contaminated plume. The report outlined remediation options and gave recommendations for further investigations including more intrusive work as there were only 2 monitoring boreholes.

### **The Main Intrusive Site Investigation (ref 2) Investigation of Water Pollution from New Years Green Lane Landfill Site, Ickenham 1999**

The investigation involved the completion of the drilling and sampling of 12 leachate monitoring boreholes in the waste and five groundwater monitoring boreholes in the chalk. The report provided an interpretation of the waste thickness, and levels and quality of leachate, groundwater, surface water and landfill gas. No solid soil samples were tested for contamination, the contamination and water quality tests were specifically of leachate and groundwater samples.

The testing of the leachate samples showed high levels of ammoniacal nitrogen up to 509 mg/l. The results of the groundwater testing confirmed that ammoniacal nitrogen concentrations in the groundwater were at concentrations up to 37 mg/l (as N). A tritium analysis of the leachate and groundwater was carried out and confirmed that landfill leachate was affecting the groundwater as obtained from boreholes adjacent and to the south of the site.

The role of the culvert and surface water contamination in the Bourne Stream were considered in more detail in this report. It appeared that low flow conditions produced high levels of ammonia in the stream with a peak of 170 mg/l in 1995. When the flow is high there appeared to be no impact. Landfill gas levels were found to be high at most of the monitoring boreholes. Methane and Carbon Dioxide levels were found up to 61% and 30% respectively.

A 'Groundwater Impact Assessment' was provided which gave a refinement of the existing Gerrard's Cross GPZ model in the area of the source, and a risk assessment for the Ickenham PWS. The risk assessment gave predictions for future groundwater quality. The public water supply was only pumped for a short period and no conclusions were drawn on the groundwater monitoring at the supply boreholes.

Eleven remedial options were provided including actions at the landfill site, and treatment at the water supply boreholes. A period of two years further monitoring was recommended for the site to identify the most beneficial of the above remedial options for the landfill site

including the culvert and New Years Bourne. There was now an established monitoring network for landfill leachate, surface water, groundwater and landfill gas.

### **Monitoring Work 1 (ref 3 and 4)**

#### **Environmental Monitoring at New Years Green Lane Landfill Site (Years 2000-2001 and 2001-2002)**

The monitoring over a two year period used the existing network. The results obtained over a two year period indicated that there had been little overall change since the 1998 investigations as reported in 1999. The landfill continued to have an effect on groundwater and surface water quality. Data from a CCTV survey of the culvert was provided and some data from test pumping at the Ickenham PWS was also carried out. The culvert survey indicated that there were no blockages or impediments to flow and no leachate ingress was confirmed. It was noted that the weather conditions were dry with little flow in or out of the culvert. The pumping at the PWS boreholes was only 3 weeks and the volume pumped was low compared to the operation in 1995. Therefore although no contamination was found the conclusions were viewed with caution. The report also concluded that the groundwater flow regime had been modified with groundwater flowing in a south westerly rather than southerly direction now.

Landfill gas was still found to be at high levels and the risk to local properties was as a consequence deemed high with no off site monitoring wells and control measures in place.

### **Monitoring Work 2 (refs 7 and 8)**

#### **Part 2A Assessment Reports for the Environment Agency dated 2004 (Enviros and 2006 (Atkins) / Additional monitoring at groundwater boreholes on Highway Farm**

The reports by Enviros and Atkins both contain monitoring information that is used in the assessment below of the evidence upon which the determination is based. The monitoring work is limited but includes groundwater, surface water, leachate and gas monitoring. It was undertaken with regard to the B29 request for the Agency to inspect the site. The reports are essentially a B20 (a) and B20 (b) Part 2A detailed inspection. The leachate and groundwater were analysed for a range of compounds including some List 1 and List 2 compounds.

The monitoring at 8 wells by Enviros in 2004 confirmed that the leachate was still significantly contaminated and ammonia levels remained high. The leachate was found to contain some list 1 compounds including organhalogen compounds (including 1,1 dichloroethane, chlorobenzene and Mecoprop), cadmium and hydrocarbons. Seven groundwater boreholes were monitored. The groundwater in the chalk was found to contain organhalogen compounds (including 1,1 dichloroethane, chlorobenzene and Mecoprop) and some TPH compounds. Three surface water samples and landfill gas levels were monitored during the site work.

Groundwater monitoring has been carried out by the Waterman Environmental for the Dogs Trusts at Highway Farm, as the Trust own the land and are required by agreement

with the Council to monitor groundwater boreholes within their land. Data is available from 2006 to 2010 and the results were assessed against the Water Supply (Water Quality) Regulations 2000, 'WSR'. The WSR are exceeded for a number of compounds. Of particular relevance to the determination is the presence of ammonia (as NH<sub>4</sub>) in the groundwater during most monitoring rounds. The levels are significant varying considerably with a maximum of 31.9 mg/l. Levels in 2010 were from 2.15 mg/l up to 16.7 mg/l. All of the boreholes are south of the New Years Green Landfill Site. This data again supports the formal determination of the site as 'Contaminated Land'. Prior to this monitoring work a site investigation was undertaken by the Waterman Environmental at Highway Farm. This established the monitoring boreholes and provided a ground investigation. It was concluded that the landfill in the area did not pose a risk to the underlying aquifer or other receptors. However some gasworks waste was indicated to be an exception to this and remediation work involving the removal of these hydrocarbon hotspots was undertaken during the redevelopment works. The ammonia levels found in the groundwater were thought to be from the larger part of New Years Green Lane Landfill to the north. After considering the information on Highway Farm (ref 5) including details of the remediation works to make the land suitable for use it was decided not to include this land in the area of determination as shown on Figure 1.

#### **Landfill Gas - Intrusive Investigations and Risk Assessment Gas Risk Assessment (Enviros 2002) / Yearly Landfill Gas Monitoring (SLR Consultants 2005 to 2011) (ref 6)**

The work for the 2002 report involved two phases of intrusive investigation. Phase 1 involved soil probing and the installation of 8 gas monitoring standpipes to 3 metres depth near sensitive properties. Landfill gas levels were significant when monitored. A second phase of investigation involved soil probing, trial pitting and the installation of a further 8 standpipes. The trial pitting confirmed that waste extended to the edge of three residential properties and the 'Civic Amenity Site'. The standpipes were monitored for landfill gas and the results used to inform the risk assessment for the site. Subject to on-going monitoring the category of risk was reduced at some of the receptors after the Phase 2 work. Consultants advised the Council to monitor the site to enable any worsening trends to be identified. An action plan was advised in the event of rising gas concentrations. With continued monitoring the risks remained moderate at two properties and high at the Civic Amenity Centre. The work has established a network of 16 monitoring standpipes near to properties deemed to be at risk from landfill gas migration. In 2011 there are currently 14 of these standpipes left on the site

From 2005 to 2011 the site has been monitored quarterly for landfill gas by the Council. There are a series of yearly reports for this work. There are now a total of 36 monitoring standpipes on the site as two further phases of installing standpipes were undertaken in 2006 and 2009. The network is mainly surrounding or within the grounds of the Civic Amenity Site and the two nearest Bungalows. High landfill gas readings are found on a regular basis at the Civic Amenity Site. Limited site investigations at the Civic Amenity Site confirm that there is landfill beneath the site. The risk assessment as of 2011 has not

deteriorated from the initial 2002 risk assessment by Enviro prior to the monitoring by SLR Consultants (ref 6). However the risk does remain significant and monitoring continues at the site in 2011 for health and safety reasons.

### **Additional Information - Summary of the Outline Remediation Options Report for the Council dated 2011 (ref 10)**

The options report provided an assessment of the remediation options for the site currently available and updated the remediation options assessment by Aspinwall & Co in 1999. The report provided an initial screen of the options and then followed the guidance in CLR11 for scoring remediation options to give total scores for the preferred options. The preferred remediation options are listed and scored. It is indicated that no one solution will provide sufficient management of all the high risk PPLs to controlled waters. Further monitoring and risk assessment is recommended. Following the determination of the site this is proposed to be carried out prior to the implementation of the necessary remediation measures.

The report also provided a screening of the contaminants present in controlled waters using the revised Water Framework Directive Environmental Quality Standards (Directive 2008/105/EC) as incorporated into the Environment Agency guidelines in 2010.

### **5. Summary of assessment of the evidence on which the determination is based (B.52 (c))**

#### **Part 2A Assessment Reports for the Environment Agency dated 2004 (Enviro) and 2006 (Atkins) and Detailed Advice of the Environment Agency to the Council dated 2008 (ref 7, 8 and 9)**

**Detailed Advice of the EA** - Following the site investigations from 1995 to 2002 it was decided by the Council to inspect the site under Part IIA. As a consequence of the site being a potential 'Special Site' the Council wrote to the Environment Agency, 'EA' on 30 October 2002 requesting the EA to inspect the site on the Council's behalf. The EA duly agreed to inspect the site on 11 November 2002.

Enviro carried out the first assessment for the EA and provided a 'B20 Detailed Inspection' report in May 2004. The EA confirmed by a letter of 21 July 2004 that it considered the site a 'Special Site' should it be determined as 'Contaminated Land'. It was recommended by the EA that the site should be designated under Regulations 3(a) and 3(c) of the Contaminated Land (England) Regulations 2006 (SI 2006 No 1380), 'the Regulations'. It was indicated that the site may also fall under Regulation 3(b).

The EA considered that some further characterisation of the site was required to establish all of the potential pollutant linkages and confirm the significant linkages. As a consequence the Atkins carried out a second detailed inspection of the site for the EA. A report was provided in December 2006. An initial potential pollutant linkage table was

drawn up on the basis of the previous investigations and sufficient additional work to confirm these within the context of the contaminated land legislation was undertaken. A description of the work undertaken may be found in the final interpretive report (Atkins, 2006).

The EA confirmed 21 pollutant linkages at the site to the Council by a letter dated 6 August 2008 and summary document, 'Detailed advice to the London Borough of Hillingdon New Years Green Landfill'. The detailed advice recommended that the site should be determined 'Contaminated Land' under Paragraph 78A (2) (b) (Pollution of Controlled Waters) of Part IIA, and designated a 'Special Site' under Regulations 3(a) and 3(c) of the Regulations. It was also advised that determination under Paragraph 78A (2) (a) due to risks from landfill gas may be appropriate although monitoring did not indicate that critical concentrations had been reached. This Council continues to monitor the site and may need to specify remediation actions in the form of monitoring or otherwise in the future.

The Council has now considered the detailed advice of the Environment Agency dated August 2008 and reconfirmed in December 2010 in addition to the two detailed inspection reports by the Agency's consultants from 2004 and 2006.

## **6. Contaminated Land Determination**

### **(i) Pollution of Controlled Waters**

The evidence for the pollution of controlled waters is within the site investigations and monitoring reports listed above. The data has undergone a Level 1 analysis using generic guidelines advised by the EA. These include drinking Water Standards, Environmental Quality Standards and substances limited by Groundwater Directive 80/68/EEC and Groundwater Regulations 1998.

#### **Source (Landfill Leachate)**

The source of contamination has been confirmed in the landfill leachate. Although the solid waste was not assessed in the reports there is sufficient monitoring data for the landfill leachate to confirm that there is a source of contamination in the leachate head within the solid waste of the landfill. There is a high probability that these contaminants are still present in the landfill leachate. Contamination in the leachate includes:

The investigations confirm the presence, in the leachate, of the following substances defined in List 1 of the List of substances determined for the purpose of the EC Groundwater Directive (80/68/EEC).

- Organohalogen; dichloroethane, dichlorobenzene, chlorobenzene and Mecoprop,
- Mercury,

- Cadmium,
- Mineral oils and hydrocarbons; TPH in the C6 to C40 range, Benzene, xylene, acenaphthrene, naphthalene, phenanthrene, dibenzofuran, flourene, isopropylbenzene, methylnaphthalene and trimethylbenzene,

The following substances are defined in List 2 of the Groundwater Directive

- Nitrosodiphenylamine,
- Dimethylphenol,
- Ammoniacal nitrogen

The Groundwater Directive 80/68/EEC and Groundwater Regulations 1998 state that we must prevent discharges of List 1 substances into groundwater and limit the discharge of List 2 substances to avoid pollution.

Concentrations of the following substances are limited by the Drinking Water and Environmental Quality Standards and deterioration of baseline groundwater quality to those standards is unacceptable.

- Metals; iron, calcium, magnesium, sodium
- Sulphate,
- Chloride,

## **Pathways**

The main controlled water receptor under consideration is the principal chalk aquifer which is used by the public water supply borehole at Ickenham. Also considered are the secondary A aquifer and the Bourne Stream.

The exposure pathways to the secondary and principal aquifers include migration of landfill leachate vertically down to the major chalk aquifer through the sandy, gravely and clayey horizons of the Reading Beds (Secondary Aquifer) after leaching from the waste. Although an overburden was due to be placed over the chalk prior to tipping this cannot be confirmed. There also may be preferential pathways created by the drains and culverts. Due to the presence of contamination in the major aquifer including ammonia which is consistently found it appears that this is a pathway is present.

## **Receptors (Groundwater)**

In the groundwater of the Principal Aquifer contaminants have been found. The presence in the groundwater of the following substances below exceeding the groundwater requirements and standards is confirmed:

- Ammoniacal nitrogen
- Dichloroethene
- Chlorobenzene
- Mecoprop
- TPH (C10-C40)
- Benzene
- Iron, magnesium, sodium, calcium,
- Sulphate
- Chloride

**Conclusion** - The work done by Atkins and earlier consultants (as referenced below) has provided sufficient evidence to demonstrate that contamination within the landfill site is adversely affecting controlled waters.

A source pathway receptor pollutant linkage has been established for controlled waters specifically the groundwater in the chalk aquifer below the site. This comprises pollutant linkages 1 to 12 in Table 1 above.

As regards surface waters ammonia has been identified intermittently at high levels within the Bourne Stream. The linkages 13 to 18 in Table 1 above have been included as part of the determination as they should be included in the remediation work. This may include works to the culvert which could be affecting the stream and shallow aquifer.

Note: If there are changes to assessment standards such as the Environmental Quality Standards then the chemical data for the site will be screened against the new standards. Of note are the recently published revised Water Framework Directive Environmental Quality Standards (Directive 2008/105/EC).

## **(ii) Significant Possibility of Significant Harm**

### **Source**

Carbon dioxide and methane in the body of the landfill have both been identified in gas monitoring results from all of the site investigation and monitoring reports.

### **Pathway**

Migration from the landfill mass via; the made ground, sand and gravels or chalk below the base of the landfill; man made pathways such as the culvert buried services, drains, sewers.

### **Receptors**

On the boundary of the landfill there are three residential properties and a Civic Amenity Site. The Civic Amenity site is upon land that appears to be built on made ground or even the landfill, and a pathway is likely from the bulk of the landfill. The residential properties are not on landfill. There are two farm properties adjacent to the site, one being Highway Farm is on landfill.

The main danger from methane and carbon dioxide is once they have collected in any of the buildings around the site. There they pose a threat either via asphyxiation of residents or via the ignition of methane. The gas risk assessment from 2002 confirmed moderate to high risks to surrounding properties. The site has been monitored and risk assessed for landfill gas from 2005 to 2011. This is the way the landfill gas risk has been managed to identify trends in gas production in order to take early remedial actions as necessary.

**Conclusion** - Due to the evidence of consistently high levels of gas still present in the landfill it is considered that the site represents a significant possibility of significant harm from landfill gas as defined in Table B (2) of Annex 3 to the Statutory Guidance. This comprises 3 significant pollutant linkages numbered 19, 20 and 21 in Table 1 above. Monitoring is continuing to manage the risk and the Council may continue to specify remediation action in the form of the ongoing 'monitoring actions' to keep the situation under review.

## **7. Proposed Special Site Designation following Contaminated Land Determination**

The Council has considered the evidence of the pollution of controlled waters with respect to Regulation 3 Contaminated Land (England) Regulations 2006 taking into account the detailed advice of the Environment Agency dated August 2008. It is considered by the Council that New Years Green Landfill Site is a Special Site under Regulations 3(a) and 3(c) as advised by the Agency. This is explained below.

1. Regulation 3 (a) – Under regulation 3(a), controlled waters which are, or are intended to be, used for the supply of drinking water for human consumption are being affected by the land to the extent that changes in the treatment process are required. New Years Green lies up-gradient of several such abstractions and overlies part of the inner and outer source protection zones for Ickenham, a borehole that has long had problems with contamination and is at present out of use due to a change in the nature of the contamination in the local aquifer. After changing the treatment process to cope with increasing levels of ammonia, the increased concentration of iron in the groundwater will require additional treatment to make it suitable for supply. It is this subsequent change in the treatment process that causes the failure under Regulation 3(a). The contamination emanating from New Years Green Landfill site is considered to be substantially responsible for this failure. The Ickenham abstraction is still licensed and intended to be used for supply.

2. Regulation 3(c) of the Regulations requires a particular type of contamination in a specified aquifer (underground strata comprised of specified formations of rocks). The chalk aquifer below the site is listed in paragraph 2 of schedule 1 of the regulations. Of the contaminants identified, only a few contaminants found in both the landfill leachate and the chalk groundwater samples are listed in paragraph 1 of schedule 1. These are Hydrocarbons (TPH C6 to C40) and Benzene, and Organohalogens (Chlorobenzene, Dichloroethene DCE and Mecoprop).

Contaminant	Family or group as defined for paragraph 1 of schedule 1 of Regulation 3(c).
TPH C6 to C40	Hydrocarbon
Benzene	Hydrocarbon
DCE (Dichloroethene)	Organohalogen
Mecoprop	Organohalogen
Chlorobenzene	Organohalogen

## **8. Summary of how the relevant requirements of Chapters A and B of the Statutory Guidance have been met (B52 (d))**

### **Risk Assessment**

Paragraph A.11 Contaminants, pathways and receptors have been identified for the site.

Paragraphs A.17 and A.19 Twenty one significant pollutant linkages have been identified at the site resulting in the pollution of controlled waters and the significant possibility of significant harm from landfill gas to nearby residential properties.

### **Pollution of controlled waters**

Paragraphs A.36, A.37 and A.39. Monitoring data shows that contaminants are present in the landfill leachate at high concentrations and continue to enter the aquifer below the site. This is the source that continues to enter controlled waters. Contaminants have been found to be dissolved in the groundwater of the chalk aquifer.

### **Significant possibility of significant harm**

Paragraphs A.27 to A30. A gas risk assessment was undertaken in 2002 and identified high risks to residential and commercial sites. High levels of gas within the adjacent landfill indicate a significant source and potential degree of harm to the receptors. The receptors are susceptible as they are not protected by any gas mitigation measures. It is not

considered that the current use of the land will cease and residential properties will remain at the boundary.

### **Determining whether the land appears to be contaminated land**

Paragraph B.31. The London Borough of Hillingdon has determined the land to be contaminated land. This decision relies on the detailed advice regarding controlled waters by the Environment Agency as based on their Critical Review and subsequent 'B20(a) and B20(b) Part IIA Detailed Inspection'.

### **Physical extent of the Land**

Paragraph B.32 to B36. The land has been determined in extent as the area advised by the Environment Agency and justified above in the text to this record of determination.

### **Making the Determination**

Paragraph B.38. The site is determined on the grounds that

1. The pollution of controlled waters is being caused, and;
2. There is a significant possibility of significant harm from landfill gas

Paragraph B.39. The London Borough of Hillingdon have taken all relevant and available information into account from the initial investigations in November 1995 to the final detailed advice from the Agency in 2008 and latest landfill gas and groundwater monitoring in 2010.

Paragraph B40. The significant pollutant linkages are detailed above in Table 1.

Paragraph B41. Additive/synergistic effects are not thought relevant in this case.

Para B.43. The Environment Agency has been involved with the investigations at the site since 1995. The London Borough of Hillingdon has consulted with the Agency at the site since 1997. A formal request was made to the Agency to inspect the site on the Council's behalf under Part IIA as a potential Special Site and agreed in November 2002. The Agency provided their final detailed advice in August 2008 and the Council has had regard to their advice in the final determination.

Paragraph B.45. The site has been assessed for landfill gas levels from 1999 to 2011. A scientific and technical assessment of the risks arising from this pollutant linkage has been carried out by the Council. The assessment work in 2002 and in subsequent yearly monitoring reports indicates a risk from landfill gas. No risk management measures are in place such as gas protection on buildings, barriers or venting trenches. Perimeter monitoring is used to manage the risk by identifying trends and necessary actions however it is considered on the balance of probabilities that there remains a significant possibility of significant harm due to the high levels of gas within the landfill site.

Paragraph B.50. A scientific and technical assessment of all of the relevant and available evidence from 1995 to 2011 has been carried out by the Council having regard to the detailed advice of the Environment Agency. The Council is satisfied that, on the balance of probabilities potential pollutants are present in the landfill site (contaminated fill and leachate) and these potential pollutants are entering controlled waters (groundwater) by the pathways identified in the pollutant linkages.

## **References**

The Site Investigation Reports and Site Assessment Reports from 1995 to 2011 are listed in Paragraph 4 above.

Detailed Advice to the London Borough of Hillingdon with a covering letter dated 6 August 2008 (Groundwater & Contaminated Land Team, Environment Agency) (ref 9).

Part 2A of the Environmental Protection Act 1990

The Contaminated Land (England) Regulations 2006

Statutory Guidance (DEFRA) - Circular 01/2006 Environmental Protection Act 1990: Part 2A Contaminated Land September 2006

Contaminated Land Inspection Strategy for the London Borough of Hillingdon (July 2001) and Contaminated Land Inspection Strategy Review (November 2007)

CIEH – Local authority Guide to the Application of Part 2A of the Environmental Protection act 1990 (July 2001)

The following appended map known as Figure 1 shows the area of the land at New Years Green Lane Landfill Site that has been determined by the London Borough of Hillingdon to be Contaminated Land.

