

Objection to the application by Whitemoss Landfill Ltd on the grounds of risks to public health

(Arrow 2)

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SUMMARY

Whitemoss Landfill Ltd claims that the health and amenity of the local population will be protected and that there will be no significant or unacceptable risk to human health as a result of the extension.

These claims are not well founded and are not supported by either a robust analysis or by the academic literature. The Health Protection Agency (HPA; now Public Health England, PHE) concluded in its 2011 review of the literature that “Detailed site-specific risk assessment should remain an important part of the permitting and management process”. We agree with the Inspector’s statement that potential health impacts have not been quantified by the applicant or described in terms of their significance. The applicant has not only failed to define an “acceptable” level of risk or impact but has also failed to provide evidence that no unacceptable impact will occur.

An increasing body of evidence shows that contaminants in hazardous waste landfill sites cannot be adequately controlled to protect human health. There is no evidence in the application that the applicant has considered this literature or addressed the concerns raised.

Studies show an increased risk of birth defects of between 7% and 33% within 2–3 kilometers of landfill sites and the most recent systematic review of the literature in 2013 by Mattiello et al. concludes that these effects are “likely to be real”. There is evidence of an increase in respiratory disease and low birth weight. Studies also suggest an increased risk of cancer, diabetes, and heart attack.

The evidence presented below and by others in this public examination is legitimate and scientifically justifiable grounds for concern about the risks to residents associated with the continued operation of this site. The ARROW submission on perception of risk shows how these concerns constitute in themselves real health effects. This matter should be given significant weight in the determination of this application.

Furthermore, the residents of Skelmersdale have had to endure the cumulative impacts of many landfill sites, together with the operation of the Whitemoss site for much longer than was originally promised. Any extension would effectively postpone for at least another generation¹ the possibility of final restoration of the site. The anxiety and blight associated with further operation of the hazardous waste site over this extended period represents an unacceptable impact and we recommend that the application be refused.

¹ The evidence suggests that it may be much longer than this, given the difficulty of obtaining sufficient waste at the bottom of the waste hierarchy and the historic difficulties of complying with the conditions of the term consents on the site.

MAIN TEXT

Policy obligations

The correct approach to risks associated with waste management must take proper account of the precautionary principle as this provides the foundation for the underpinning European legislation, as described in the preamble to the Waste Framework Directive:²

“30. In order to implement the precautionary principle and the principle of preventive action enshrined in Article 174(2) of the Treaty, it is necessary to set general environmental objectives for the management of waste within the Community”.

The Directive continues:

“By virtue of those principles, it is for the Community and the Member States to establish *a framework to prevent, reduce and, in so far as is possible, eliminate from the outset the sources of pollution or nuisance by adopting measures whereby recognised risks are eliminated*” (our emphasis).

Furthermore Article 13 of the Directive specifically requires that:

“Member States shall take the necessary measures *to ensure that waste management is carried out without endangering human health, without harming the environment and, in particular:*
(a) *without risk to water, air, soil, plants or animals;*
(b) *without causing a nuisance through noise or odours;* and
(c) *without adversely affecting the countryside or places of special interest*”
(our emphasis)

We note that Policy DM2 of the Joint Lancashire Minerals and Waste Plan is not consistent with the obligations of the Directive as it fails to ensure that “recognised risks are eliminated”. Rather it requires that “demonstrable harm can be eliminated *or* reduced to acceptable levels” (our emphasis).

Similarly in relation to odour (§2.2.12-3) the Plan does not require that waste is managed “without causing a nuisance through noise or odours” but talks only of reduction and control.

² European Union, 2008. DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain directives.

It is clear that the more stringent requirements of the Directive should take precedence in these cases.

Whitemoss Landfill Ltd's claims

Whitemoss Landfill Ltd claims in its application that criteria will be developed to ensure that "Amenity, health, economic well-being and safety of population is protected".³

Whitemoss Landfill Ltd also claims: "This assessment of the potential impacts on health addresses the potential impact of the proposed development on the health of residents living and working in the vicinity of Whitemoss Landfill Site. The potential impact on the mental and social wellbeing of the residents as a result of the perception of health impacts associated with the site also are assessed."

Whitemoss Landfill Ltd states: "It is concluded that there is no significant risk to human health as a result of the continued disposal of hazardous waste at the site."⁴

These claims are not well founded and are not supported by either a robust analysis or by the academic literature. The Health Protection Agency (HPA; now Public Health England, PHE) concluded in its 2011 review of the literature that "Detailed site-specific risk assessment should remain an important part of the permitting and management process".⁵

Furthermore, we agree with the Inspector's statement in her Rule 8 letter: "ES Chapter 7 considers impacts on health but the approach used has not attempted to quantify potential health impacts... Impacts on health are not described in terms of their significance, nor have descriptors of impacts in terms of magnitude, extent and duration, been included."⁶

³ Whitemoss Landfill Ltd, 2013. APPENDIX ES O: LANDSCAPE CHARACTER AND VISUAL IMPACT ASSESSMENT REPORT FOR A DEVELOPMENT CONSENT ORDER APPLICATION BY WHITEMOSS LANDFILL LIMITED. December. 4.18. <http://bit.ly/1iQCRaf>

⁴ Whitemoss Landfill, 2013. APPENDIX ES I: AN ASSESSMENT OF THE POTENTIAL IMPACTS ON HEALTH AS A RESULT OF THE DEVELOPMENT OF THE WESTERN LANDFILL AREA AND ASSOCIATED INFRASTRUCTURE AT WHITEMOSS LANDFILL, LANCASHIRE. December. 5.16. <http://www.whitemoss-consultation.co.uk/wp-content/uploads/2012/12/3.11-ES-Appendix-ESI.pdf.pdf>

⁵ HPA, 2011. Impact on Health of Emissions from Landfill Sites (RCE-18). <http://www.hpa.org.uk/Publications/Radiation/DocumentsOfTheHPA/RCE18ImpactonHealthofEmissionsfromLandfillSites/>

⁶ Planning Inspectorate, 2014. Planning Act 2008 (as amended) – Section 89 and The Infrastructure Planning (Examination Procedure) Rules 2010 (as amended) – Rule 8: Application by Whitemoss Landfill Limited for an order granting development consent for Whitemoss Landfill. 30 May. 3.8–3.9. <http://bit.ly/UBd2WM>

We would add that contrary to the applicant's claim that "it has been demonstrated that the sources [of contaminants] can be adequately controlled so that there is no unacceptable impact on human health",⁷ the applicant not only fails to define what is an acceptable impact, but also fails to provide evidence that no unacceptable impact will occur.

The Health Risk Assessment (HRA) prepared by the applicant does not cite a single reference and certainly does not include site-specific health research on Whitemoss Landfill. There is, however, an extensive evidence base demonstrating that the contaminants in landfill sites cannot be adequately controlled over the periods necessary to protect human health. This is demonstrated by the findings of the studies considered below.

Having failed to follow the advice from HPA/PHE about the need for detailed site-specific assessments, the applicant relies on the HPA's comment that "well-managed" modern landfill sites do not pose a risk and effectively defers consideration of the health issues to the permit stage. This is not reassuring, as the evidence, which includes the service of five enforcement notices and a successful prosecution, shows that Whitemoss is not a "well-managed" site.

Furthermore a "well-managed" site would clearly have followed the advice of HPA/PHE in relation to the need for additional investigations and reviews of issues such as perception of risk, community anxiety and stress, and risk management measures in the event of an accident – something the applicant has failed to do (see Alan Watson's submission on the perception of risk).

⁷ Whitemoss Landfill, 2013. APPENDIX ES I: AN ASSESSMENT OF THE POTENTIAL IMPACTS ON HEALTH AS A RESULT OF THE DEVELOPMENT OF THE WESTERN LANDFILL AREA AND ASSOCIATED INFRASTRUCTURE AT WHITEMOSS LANDFILL, LANCASHIRE. December. HS5. <http://www.whitemoss-consultation.co.uk/wp-content/uploads/2012/12/3.11-ES-Appendix-ESI.pdf.pdf>

Literature review

Epidemiological evidence can demonstrate associations, but not prove causation. However, the “Bradford Hill criteria” (otherwise known as “Hill's criteria for causation”) are a group of minimal conditions necessary to provide adequate evidence of a causal relationship between an incidence and a consequence and can be applied to the literature in this case. The International Agency for Research on Cancer (IARC) uses a similar approach to rank risks.⁸

Applying these criteria to the extensive literature on the adverse impacts of hazardous waste landfill presents a compelling case that the operation of these facilities causes real harm to human health. The evidence is particularly compelling in relation to the relationship between hazardous waste landfill sites and birth defects. The most recent and comprehensive systematic review of the literature on the health effects of landfill (Mattiello et al, 2013) confirms, “It is reasonable to conclude that the risk of congenital anomalies is likely to be real”.

Human health effects associated with landfill sites

Birth defects and low birth weight:

The evidence associating birth defects and hazardous waste landfills is particularly compelling (and is significantly stronger than for municipal wastes).

The most recent and comprehensive systematic review of the literature on the health effects of landfill (Mattiello et al, 2013) confirms, “It is reasonable to conclude that the risk of congenital anomalies is likely to be real”. This conclusion was based on a comprehensive review of the literature including most of the following studies:

- The EUROHAZCON study detected an increase in risk of non-chromosomal birth defects in people living at less than 3 km from landfills containing hazardous waste (Dolk et al, 1998). A statistically significant increased risk was found in the subgroups of neural tube defects, malformations of the heart, and anomalies of great arteries and veins. Adjustment for socioeconomic status did not change the findings.⁹

⁸ IARC, 2006. Preamble to the IARC Monographs: Scientific Review and Evaluation. <http://monographs.iarc.fr/ENG/Preamble/currentb6evalrationale0706.php>

⁹ Dolk H et al, 1998. Risk of congenital anomalies near hazardous-waste landfill sites in Europe: the EUROHAZCON study. *The Lancet* 352:423–427.

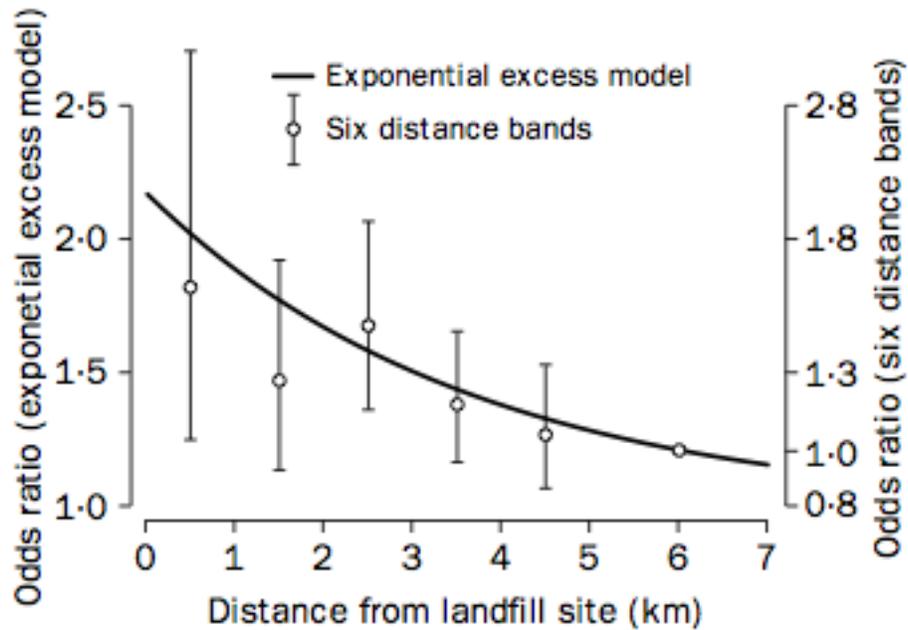


Figure: Odds ratios for congenital anomalies with distance from landfill sites (Dolk et al.1998)
 Note: Different scales are needed for the two models because the baseline differs: circle at 6 km represents 5–7 km baseline (odds ratio=1.0, righthand scale) for logistic regression of six distance bands; solid curve at this point represents estimated risk 6 km from site relative to risk infinitely far from site (odds ratio=1.22, lefthand scale).

This study (Dolk et al. 1998) demonstrated an increased risk of a wide range of birth defects:

Congenital anomaly	Number of cases	Odds ratio (95% CI)
Neural-tube defects	130	1.86 (1.24–2.79)
Hydrocephaly	32	1.06 (0.44–2.59)
Other central-nervous-system defects	23	1.03 (0.36–2.94)
Malformations of cardiac chambers and connections	45	0.91 (0.42–1.97)
Malformations of cardiac septa	248	1.49 (1.09–2.04)
Malformations of valves and other heart malformations	109	1.17 (0.73–1.88)
Anomalies of great arteries and veins	63	1.81 (1.02–3.20)
Cleft palate	38	1.63 (0.77–3.41)
Cleft lip with or without cleft palate	72	1.18 (0.66–2.12)
Tracheo-oesophageal fistula, oesophageal atresia and stenosis	25	2.25 (0.96–5.26)
Digestive system and upper alimentary tract	59	0.98 (0.49–1.93)
Atresia and stenosis of rectum and anal canal	20	1.02 (0.33–3.15)
Hypospadias	45	1.96 (0.98–3.92)
External genitalia (female + indeterminate)	10	0.89 (0.18–4.53)
Renal abnormalities	75	1.30 (0.73–2.31)
Urinary-tract abnormalities	69	1.14 (0.62–2.11)
Limb reduction defects	41	1.27 (0.61–2.62)
Exomphalos	12	0.26 (0.03–2.19)
Gastroschisis	13	3.19 (0.95–10.77)
Skin and other integument abnormalities	30	1.92 (0.78–4.73)
Syndromes, presumed de-novo mutations	29	1.48 (0.63–3.49)
Multiple anomalies	84	1.21 (0.71–2.06)

Table: Odds ratios for congenital anomalies among residents within 3 km of a hazardous-waste landfill site

- The EUROHAZCON study found a small, non-statistically significant increase in the risk of low birth weight within 3 km of hazardous waste landfill sites.¹⁰
- A systematic review of the peer-reviewed literature (Porta et al, 2009) found that for populations living within two kilometers of landfills there was “limited evidence of congenital anomalies and low birth weight with excess

¹⁰ Morgan OW et al, 2004. Risk of low birth weight near EUROHAZCON hazardous waste landfill sites in England. Arch Environ Health 59(3):149-51.

risk of 2% and 6%, respectively”. The excess risk was higher when sites dealing with toxic wastes were considered.¹¹ Epidemiology does not lend itself to proving causal relationships with absolute certainty because people are exposed to many toxic and pathogenic agents and it is not possible to claim that any disease arises from a certain exposure. Epidemiological studies can, however, point to associations, which may be stronger or weaker, depending on the study design and the conditions in which the research was carried out. However, the authors of this review concluded that there was “limited evidence” of a causal relationship in the landfill studies considered. They defined such limited evidence as “when a positive association was observed between exposure and disease for which a causal interpretation is considered to be credible, but chance, bias, or confounding could not be ruled out with reasonable confidence”.

- A study carried out in Washington State (Kuehn et al, 2007) found an increased risk of birth defects in urban populations living within 5 miles of a landfill site. Within the 5 mile radius, the risk increased with closer proximity.¹²
- Elliot et al (2001) found an increased risk of certain types of birth defects, as well as low birth weight, associated with residence within 2 km of landfill sites in Great Britain.¹³
- A 1992 study (Geschwind et al, 1992) by researchers at Yale University and the New York State Dept of Health on 590 inactive (completed) landfill sites containing hazardous waste found that pregnant women living within a mile of the dumps had a 12% greater risk of bearing children with major birth defects, compared with people living further than a mile from the dumps. Among the 590 sites studied, 90 were ranked as high risk because there was evidence that chemicals had migrated off the sites. The study found that women living within a mile of these sites had a 63% greater chance of bearing a child with a major birth defect, compared with women living further than a mile from all of the 90 sites.¹⁴
- A 9-fold increased rate of the birth defect gastroschisis, in which the baby is born with its intestines outside its body, was found in exposed populations after a landfill site at Nant-y-Gwyddon in Wales opened, compared with the same populations measured prior to the opening of the

¹¹ Porta D et al, 2009. Systematic review of epidemiological studies on health effects associated with management of solid waste. *Environmental Health* 2009, 8:60. doi:10.1186/1476-069X-8-60. Free full access: <http://www.ehjournal.net/content/8/1/60>

¹² Kuehn CM et al, 2007. Risk of malformations associated with residential proximity to hazardous waste sites in Washington State. *Environmental Research* 103 (2007):405–412.

¹³ Elliott P et al, 2001. Risk of adverse birth outcomes in populations living near landfill sites. *BMJ* 323:363–363.

¹⁴ Geschwind SA et al, 1992. Risk of congenital malformations associated with proximity to hazardous waste sites. *Am J Epidemiol* 135(11):1197-207.

site.¹⁵ This (Fielder et al, 2000) was a small study with low statistical power, but the findings are supported by the UK national study performed by Elliot et al (2001).¹⁶

- An increased risk of low birth weight was found in babies born to women living near a municipal solid waste landfill site in Montreal, Quebec.¹⁷

Genotoxicity (damage to DNA):

- The EUROHAZCON study carried out in five countries (Belgium, Denmark, France, Italy, and the UK) found a 33% higher risk of chromosomal anomalies in people who lived close to hazardous waste sites (0–3 km) than in those who lived further away, even after adjustment for confounding by maternal age and socio-economic status.¹⁸

Birth defects and respiratory disease:

- The systematic review of the peer-reviewed literature on health effects associated with the disposal of solid waste in landfill and incinerators by Mattiello et al (2013) concluded, “the risks of congenital anomalies and hospitalization due to respiratory disease are likely to be real nearby special [hazardous] waste landfills”.¹⁹

Respiratory disease:

- A study conducted in New York State found that living near a hazardous waste site increased the risk of respiratory disease – namely asthma and infectious respiratory disease – in children. Household income and other confounders were controlled for.²⁰

Cancer:

- A study carried out in Montreal, Canada found increased risk of cancers of

¹⁵ Fielder, HMP et al, 2000. Assessment of impact on health of residents living near the Nant-y-Gwyddon landfill site: retrospective analysis. *BMJ* 320(7226):19–23. Free full text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC27248/>

¹⁶ Elliott P et al, 2001. Risk of adverse birth outcomes in populations living near landfill sites. *BMJ* 323:363–363.

¹⁷ Goldberg MS et al, 1995. Low birth weight and preterm births among infants born to women living near a municipal solid waste landfill site in Montreal, Quebec. *Environ Res* 69(1):37-50.

¹⁸ Vrijheid M et al, 2002. Chromosomal congenital anomalies and residence near hazardous waste landfill sites. *The Lancet* 359(9303):320-322.

¹⁹ Mattiello A et al, 2013. Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: a systematic review. *Int J Public Health* 58:725–735.

²⁰ Ma J et al, 2007. Asthma and infectious respiratory disease in children – correlation to residence near hazardous waste sites. *Paediatric Respiratory Reviews* 8:292–298.

the stomach; liver and intrahepatic bile ducts; prostate; and trachea, bronchus, and lung in men living near the site. Among women, rates of stomach and cervical cancer were elevated.²¹

- A study carried out in Italy found a modest non-statistically significant increase in mortality from cancer of the kidney and larynx, as well as non-Hodgkin's lymphoma, in men living within 3 km of a landfill site, a waste incinerator, and an oil refinery. A significant decrease of mortality rates from cancer of the larynx was found in men as the distance from the sites increased.²²
- A Brazilian study found that for landfill sites in operation, there was an increased but non-statistically significant risk of bladder and liver cancer and death due to congenital malformation.²³

Diabetes:

- A study conducted in New York State found that even after controlling for major confounders (household income, smoking, diet, and exercise), there was a statistically significant increase in the rate of hospitalization for diabetes among the population residing in ZIP codes containing hazardous waste sites.²⁴

Heart attack:

- Populations living near hazardous waste landfill sites contaminated with persistent organic pollutants (POPs) in New York State had an increased risk of development of coronary heart disease and heart attack.²⁵

²¹ Goldberg MS et al, 1995. Incidence of cancer among persons living near a municipal solid waste landfill site in Montreal, Québec. *Arch Environ Health*. 50(6):416-24.

²² Michelozzi P et al, 1998. Small area study of mortality among people living near multiple sources of air pollution. *Occup Environ Med* 55:611–615.

²³ Gouveia N and do Prado, RR, 2010. Health risks in areas close to urban solid waste landfill sites. *Rev Saúde Pública* 2010;44(5):1–8. http://www.scielo.org/pdf/rsp/v44n5/en_1633.pdf

²⁴ Kouznetsova, M et al, 2007. Increased rate of hospitalization for diabetes and residential proximity of hazardous waste sites. *Environ Health Perspect* 115(1): 75–79. Free full text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1797837/>

²⁵ Sergeev AV and Carpenter DO, 2005. Hospitalization rates for coronary heart disease in relation to residence near areas contaminated with persistent organic pollutants and other pollutants. *Environ Health Perspect*. Jun 2005; 113(6): 756–761. Free full text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257602/>

Health Protection Agency report not reassuring

The Health Protection Agency (HPA), subsequently Public Health England (PHE), published advice in 2011 by Macklin, Kibble and Pollitt, entitled, "Impact on health of emissions from landfill sites",²⁶ which stated:

"After considering the current information on landfill sites, including the results of a number of epidemiological studies, the detailed monitoring study by the EA and advice sought from the COT, the HPA concludes that a well-managed modern landfill site does not pose a significant risk to human health".

PHE has responded to Whitemoss Landfill Ltd's planning application by reiterating this advice.²⁷ However, it is clear that the HPA has not reviewed the submission with care as it failed to note that the approach adopted by Whitemoss does not follow the recommendation given by HPA at the scoping stage.²⁸

Furthermore the evidence relied upon by HPA in this conclusion relates largely to municipal waste and not hazardous waste landfill sites. This is clear from the COT advice, which confirms:

"The results of this research may not necessarily apply to hazardous waste sites or those which accepted both hazardous and municipal waste (co-disposal sites)."²⁹

The Environment Agency studies referenced in the conclusion to the HPA report relate exclusively to municipal waste sites.

In the case of Whitemoss, furthermore, there is evidence in the Environment Agency files, in the form of five enforcement notices, that Whitemoss is not well managed.³⁰ J Routledge & Sons was prosecuted in 2006 for breaching permit conditions relating to odour.³¹

²⁶ Health Protection Agency, 2011. Impact on health of emissions from landfill sites. July. http://www.hpa.org.uk/webc/hpawebfile/hpaweb_c/1309969974126

²⁷ Public Health England, 2013. Letter from Allister Gittins of PHE to Leslie Heasman of MJCA, Baddesley Colliery Offices. 13 Sept. <http://infrastructure.planningportal.gov.uk/wp-content/ipc/uploads/projects/WS010003/2.%20Post-Submission/Application%20Documents/Reports/4.14%20CR%20Appendix%20CONSM.pdf>

²⁸ Appendix ESH WL/WL/SPS/1616/01/ES page 21

²⁹ COT add "we are informed that hazardous waste is unlikely to degrade biologically to generate significant quantities of gaseous emissions and that emissions are likely to vary according to what is deposited in the site.

³⁰ Extracts from Environment Agency Whitemoss enforcement notices:

- June 2003 Routledge was served with a section 42 non-compliance notice by the Environment Agency following an audit. Among the issues raised were the lack of up-to-date monitoring reports. In particular, the operators were unaware whether they were complying with limits set on heavy metal contamination.

The HPA report therefore cannot be taken as reassurance in relation to the Whitemoss (or any other hazardous waste) site. It is an in-house report which, unlike the papers cited in this document, has not been through the rigorous system of evaluation known as peer-reviewed publication. It is also out of date – the most recent peer-reviewed paper included was dated 2009.

Moreover, there are significant flaws in the report and some are so serious that it is doubtful whether it would pass peer review and qualify for publication in a peer-reviewed journal. We note, for example:

- The report cherry-picks evidence in failing to consider important papers reviewed in this document and in the comprehensive and peer-reviewed Porta systematic review (2009).³² Macklin cites the Porta review's conclusion that there was "inadequate" evidence of an increased risk of cancer near landfills, while completely *omitting* the same review's conclusion that for populations living within two kilometers of landfills there was evidence of increased rates of birth defects and low birth weight.
- The report is outdated and does not consider the recent findings of the comprehensive systematic Mattiello review (2013), which concluded, "the risks of congenital anomalies and hospitalization due to respiratory disease are likely to be real nearby special [hazardous] waste landfills."³³

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- Notice 1 December 2004 - "Emissions to the air have been found to be offensive outside the site boundary. The site is not taking all appropriate measures to prevent or where it is not practicable, to reduce, odorous omissions"
 - Notice 2 (No date on it but actions were to be completed by 31/01/06) "Emissions to the air have been found to be offensive outside the site boundary. The site is not taking all appropriate measures to prevent or where it is not practicable, to reduce, odorous omissions"
 - Notice 3 (No date on it but actions were to be completed by 31/05/06) – "Emissions of landfill gas to air, from the installation have resulted from poor design, construction and maintenance of the gas extraction system. The site is not taking all appropriate measures to prevent or where it is not practicable, to reduce, odorous omissions" This was as a result of a 'Gas System Audit on 9th March 2006
 - Notice 4 - (No date signed on it but actions were to be completed by 05/05/06) - "Levels of landfill gas in external borehole BH36 has exceeded trigger levels. Landfill gas detected above background levels in perimeter borehole."

³¹ Whitemoss Landfill Ltd., 2013. APPENDIX CONST: CORRESPONDENCE WITH THE ENVIRONMENT AGENCY REGARDING GEOLOGICAL, HYDROGEOLOGICAL AND HYDROLOGICAL ISSUES. December. http://infrastructure.planningportal.gov.uk/wp-content/uploads/2013/12/appendices_cons_t_cons_ac.pdf

³² Porta D et al, 2009. Systematic review of epidemiological studies on health effects associated with management of solid waste. *Environmental Health* 2009, 8:60. doi:10.1186/1476-069X-8-60. Free full access: <http://www.ehjournal.net/content/8/1/60>

³³ Mattiello A et al, 2013. Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: a systematic review. *Int J Public Health* 58:725–735.

The HPA report relies heavily on a study (Elliott, 2001) by the Small Area Health Statistics Unit (SAHSU) at Imperial College.³⁴ The HPA concedes that the study “found a small increase in congenital anomalies in populations living close to landfill sites,” but downplays the finding by adding that “the increase (1% higher than the reference population for all sites but 7% around hazardous waste sites) was much smaller than had been reported in the EUROHAZCON study.”

The HPA authors appear to imply that the smaller effect found by the SAHSU researchers compared with that found by the EUROHAZCON researchers casts doubt on the EUROHAZCON team’s findings. But this is not valid. The Committee on Toxicity commented that the EUROHAZCON study was “well conducted” but, more fundamentally, the two studies surveyed different populations. It is more accurate to say that based on the EUROHAZCON and SAHSU findings, there is an increased risk of birth defects for people living near hazardous waste sites such as Whitemoss Landfill, averaging somewhere between 7% and 33%.

The SAHSU researchers also found an increased risk of low and very low birth weight in populations living near landfill sites but this was not reported in the HPA advice.

Endocrine disruption

A large and ever-increasing body of scientific research shows that certain chemicals are endocrine disruptors at extremely low doses,³⁵ such as those that populations living near landfill sites could be exposed to. Endocrine disruption is the disturbance of the body’s hormonal system. Such disruption can lead to serious health problems, including birth defects, reproductive disorders, and cancer. The breakdown of plastics in landfills will give rise to endocrine disrupting chemicals, which will be included in the leachate and toxic dust and gases that will inevitably migrate off the site.

The toxic effects of endocrine disruptive chemicals (EDCs) at very low doses over time cannot be predicted by their effects at the higher doses considered in safety assessments by regulatory agencies.³⁶ Therefore it is not valid for Whitemoss Landfill to claim that the levels of chemicals that people living near Whitemoss will be exposed to will not pose a significant risk to health. This is especially true given the cumulative effect of the 13 landfill sites within a 3-mile

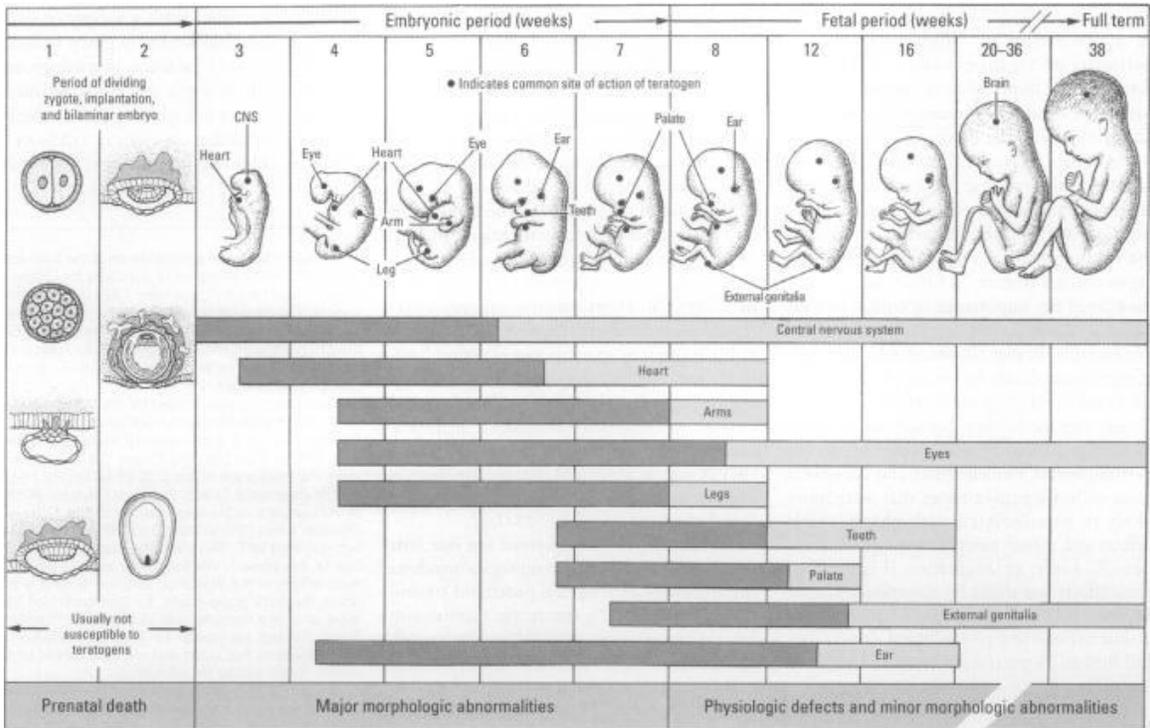
³⁴ Elliott P et al, 2001. Risk of adverse birth outcomes in populations living near landfill sites. *BMJ* 323:363–363.

³⁵ Vom Saal FS et al, 2007. Chapel Hill bisphenol A expert panel consensus statement: integration of mechanisms, effects in animals and potential to impact human health at current levels of exposure. *Reprod Toxicol* 24(2):131-138.

³⁶ Vandenberg LN et al, 2012. Hormones and endocrine-disrupting chemicals: Low-dose effects and nonmonotonic dose responses. *Endocr Rev* 33(3): 378-455.

radius of Skelmersdale (please see the evidence given by Del Ellis and Nicola Escott).

Endocrine disruption provides a plausible hypothesis for the mechanism of the congenital anomalies and for the development of the health impacts listed by Dolk et al in the table above. Even very small exposure to hormone mimicking chemicals during crucial developmental windows of the very early stages of fetal development can perturb the normal development stages and lead to congenital anomalies – particularly “mid-line defects” such as cleft palate, hypospadias and gastroschisis:



Conclusion

Epidemiological evidence can demonstrate associations, but not prove causation. However the “Bradford Hill criteria” (otherwise known as “Hill's criteria for causation”) are a group of minimal conditions necessary to provide adequate evidence of a causal relationship between an incidence and a consequence and can be applied to the literature in this case. The International Agency for Research on Cancer (IARC) uses a similar approach to rank risks.³⁷

Applying these criteria to the extensive literature on the adverse impacts of hazardous waste landfill presents a compelling case that the operation of these facilities causes real harm to human health. The evidence is particularly compelling in relation to the relationship between hazardous waste landfill sites and birth defects. The most recent and comprehensive systematic review of the literature on the health effects of landfill (Mattiello et al, 2013) confirms, “It is reasonable to conclude that the risk of congenital anomalies is likely to be real”.

The evidence presents is legitimate and scientifically justifiable grounds for concern about the risks to residents associated with the continued operation of this site. The ARROW submission on perception of risk shows how these concerns are themselves real health effects. This matter should be given significant weight in the determination of this application.

Furthermore the residents of Skelmersdale have had to endure the cumulative impacts of many landfill sites together with the operation of the Whitemoss site for much longer than was originally promised. Any extension would effectively postpone for at least another generation³⁸ the possibility of final restoration of the site. This anxiety associated with operation over this extended period represents an unacceptable impact and we recommend that the application should be refused.

³⁷ IARC, 2006. Preamble to the IARC Monographs: Scientific Review and Evaluation. <http://monographs.iarc.fr/ENG/Preamble/currentb6evalrationale0706.php>

³⁸ The evidence suggests that it may be much longer than this given the difficulty in obtaining sufficient waste at the bottom of the waste hierarchy and the historic difficulties of complying with the conditions of the term consents on the site.

ARROW Northwest
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