



## **Risk Assessment**

### **Emissions to air from the former Bayer site at Hauxton, Cambridgeshire**

#### **Non Technical Summary**

The Health Protection Agency - Centre for Radiation, Chemical and Environmental Hazards (CRCE) have reviewed the latest volatile organic compound (VOC) monitoring data collected at the Hauxton site perimeter between 14 April 2011 and 12 May 2011. This data has been considered in relation to potential toxicological effects from emissions due to the remediation work at the former Bayer site in Hauxton.

It is important to make a distinction between concerns about odour and any toxicological effect from exposure to chemicals. The role of CRCE is to produce interpretation of results in relation to potential toxicological effects. Some background information about odours has been provided as odours appear to be the main concern to members of the public, but the monitoring results are not relevant to the assessment of odours. The human nose is very sensitive to odours, and many substances that are perceived as odorous are usually present at levels below which there is a direct toxicological effect. Odours can cause nuisance amongst the population possibly leading to stress and anxiety. Some people may experience symptoms such as nausea, headaches or dizziness, as a reaction to odours even when the substances that cause those smells are themselves not harmful to health. It cannot be excluded that some symptoms expressed by residents may be as a result of their reaction to particular odours and all efforts should be taken to reduce off-site odours to as low as is reasonably practical.

The data provided to the HPA have been compared to available health based air quality guidelines and standards or assessment levels for the individual VOCs identified. Where the concentrations in air are shown to be lower than appropriate standards it may be assessed that the risk to health is minimal.

It should be noted that for this most recent 28 day period the diffusion tubes used to monitor the levels of VOCs present were different from the tubes used previously at the site. On this occasion Unicarb diffusion tubes (that use a carbon based sorbent material designed for capturing ultravolatile VOCs) were deployed and used in error, rather than the preferred Tenax tubes (which use a polymeric sorbent and are more suitable to compounds with a lower volatility). A three month comparison study between the Unicarb and Tenax tubes, completed at the site during 2010, indicated that both tubes were likely to capture the most frequently identified compounds, although the Tenax tubes recorded slightly higher concentrations. It is understood that future monitoring shall be undertaken using Tenax monitoring tubes as used in the monitoring from Month 1 to 14.

However, the latest results do not alter the HPA assessment that VOC emissions from the site are not of concern toxicologically and are therefore very unlikely to pose a risk to the health of nearby residents.

# Background

## Site

The former Bayer CropScience site near Hauxton, South Cambridgeshire, was previously used for the production of agrochemicals including pesticides and herbicides, which over time have contaminated the soil and groundwater. Due to the risk posed to the groundwater and nearby watercourses, the site was determined as Contaminated Land in 2003 by South Cambridgeshire District Council (SCDC) under Part 2A of the Environmental Protection Act 1990 and designated a Special Site for regulation by the Environment Agency (EA). The site requires remediation as it cannot be left in its contaminated state as it poses a potential threat to the Riddy Brook and River Cam. The remediation work is being carried out under an Environmental Permit issued by the EA and planning consent by SCDC.

During the remediation process contaminated soils are being excavated for remediation/treatment and contaminants previously trapped in the ground may be emitted into the air. An assessment of the contaminants on site suggests that the emissions may include a range of chemicals classed as volatile organic compounds (VOCs). Some VOCs have odorant properties i.e. have a smell, whereas other VOCs do not smell. The conditions imposed by the Environmental Permit require environmental monitoring, including air quality monitoring to take place. Air quality monitoring has been carried out both onsite and at the site boundary to monitor VOC concentrations.

## Monitoring

Air quality monitoring has been carried out on site since 18 February 2010, one month before the start of the remediation. The air quality sampling is carried out under the terms of the Environmental Permit by the remediation contractor, Vertase, and subsequent analysis of the sampling tubes has been undertaken by a third party accredited laboratory. The monitoring was undertaken at a number of locations at the perimeter of the site as shown on the accompanying map. VOCs present in air are trapped onto absorbent material within sample tubes over a 28 day period. The sample tubes are then analysed for the amount of VOC that has been absorbed. These amounts are then converted to concentrations of the VOCs in air. The highest concentrations of the top ten VOCs detected are provided on the South Cambridgeshire District Council website. Similar air quality monitoring has been carried out over 24 hour periods to identify the average VOC levels over a shorter term to highlight any temporary peaks in the VOC level.

Sixteen sets of monthly monitoring results have been provided; this document provides an update from the 28 day monitoring obtained during month 15, as described in Table 1. Data includes results from two off-site locations, one in Church Road, Hauxton and another on Queen's Drive, Harston.<sup>1</sup>

---

<sup>1</sup> The results for Queens Close were generated using Tenax diffusion tubes.

**Table 1: 28 day sampling periods around Hauxton remediation works**

<b>Sample name</b>	<b>Date of sampling</b>
Baseline (pre-works)	18/2/10 - 18/3/10
Month 1	18/3/10 - 15/4/10
Month 2	15/4/10 - 13/5/10
Month 3	13/5/10 – 10/6/10
Month 4	10/6/10 – 8/7/10
Month 5	8/7/10 – 5/8/10
Month 6	5/8/10 - 3/9/10
Month 7	3/9/10 – 30/9/10
Month 8	30/09/10 – 28/10/10
Month 9	28/10/10 – 25/11/10
Month 10	25/11/10 - 21/12/10
Month 11	21/12/10 - 20/01/11
Month 12	20/01/11 - 17/02/11
Month 13	17/02/11 - 17/03/11
Month 14	17/03/11 – 14/04/11
Month 15	14/04/11 – 12/05/11

## Scope

The Centre for Radiation, Chemical and Environmental Hazards (CRCE), of the Health Protection Agency (HPA) have been asked to review the monthly and 24 hour air quality monitoring results, and assess them with respect to potential risks to human health. All interpretations contained in this document are based on the monitoring results supplied to CRCE by the site regulators up to the 12 June 2011.

It is important to make a distinction between concerns about odour and any toxicological effect from exposure to chemicals. The role of CRCE is to produce interpretation of results in relation to potential toxicological effects. Some background information about odours has been provided as odours appear to be the main concern to members of the public, but the monitoring results provided are not relevant to the assessment of odours.

The human nose is very sensitive to odours, and many substances that are perceived as odorous are usually present at levels below which there is a direct toxicological effect.

Odours can cause nuisance amongst the population possibly leading to stress and anxiety. Some people may experience symptoms such as nausea, headaches or dizziness, as a reaction to odours even when the substances that cause those smells are themselves not harmful to health. It cannot be excluded that some resident's symptoms may be as a result of their reaction to particular odours and all efforts should be taken to reduce off-site odours to as low as is reasonably practical.

Odours often consist of a mixture of substances. Each chemical substance may be detected analytically, however this cannot be translated into what odour is perceived. Odour nuisance will depend upon the frequency and duration of odour perception; therefore the EA and LA are monitoring nuisance complaints. An odour diary is available to download from the South Cambridgeshire District Council (SCDC) web site, or people can ring the Environment Agency's hotline on 0800 80 70 60 to report odour problems.

## Methodology

### Air quality standards and assessment levels

The data provided to the HPA have been compared to available health based air quality guidelines and standards or assessment levels for the individual VOCs identified. Where the concentrations in air are shown to be lower than appropriate standards it may be assessed that the risk to health is minimal. There are a variety of health based standards and assessment levels that have been calculated by a number of organisations. The hierarchy of standards and assessment levels is shown below:

- World Health Organisation air quality guidelines
- European air quality standards
- UK air quality standards
- Other UK air quality assessment levels
- National air quality assessment levels (other than UK)
- Comparison with standard of a different VOC from similar family

### Units conversion

In order to be able to compare monitoring results with standards the concentrations need to be derived in the same unit of measurement. The air quality monitoring results are provided in parts per billion (ppb), and some air quality standards are expressed in micrograms per cubic metre. Therefore these need to be converted using the equation shown in box 1:

#### Box 1: Conversion of concentration Y in micrograms per cubic metre to X parts per billion

$$X \text{ ppb} = (Y \text{ } \mu\text{g}/\text{m}^3) * (24.45) / (\text{molecular weight of VOC})$$

## Air quality monitoring results and discussion

Table 2 shows a summary of the highest VOC concentrations from the monitoring results from Month 15 compared to the health based standard or assessment level, and the sample location. Full copies of the air quality monitoring results are available on the South Cambridgeshire District Council website.

**Table 2: Summary of results from Month 14 monitoring**

Volatile organic compound	Air quality standard (ppb)	Concentration (ppb)	Monitoring Location
Tetrachloroethylene	37 WHO Air quality guideline [long term average]	1.89	W
Undecane	No standard available	1.23	Queens Close
Heptane, 2,2,4,6,6 - pentamethyl	No standard available	3.67	Queens Close

Table 2 shows a summary of the monitoring results from the samples collected between 14/04/11 and 12/05/11 (Month 15).

Tetrachloroethylene has a World Health Organisation (WHO) health based guideline. The long-term average WHO air quality guideline level for tetrachloroethylene is 37 ppb (250 micrograms per cubic metre)<sup>1</sup>. The monitoring showed a maximum tetrachloroethylene concentration of 1.89ppb, which is lower than the WHO standard.

Undecane and pentamethylheptane were found at maximum concentrations of 1.23ppb and 3.67ppb respectively. There are no WHO, European or UK air quality standard for these substances. The United States National Institute for Occupational Safety and Health (NIOSH) has produced a recommended occupational exposure limit (REL) for a chemical (nonane) structurally similar to undecane and pentamethylheptane. This REL represents an acceptable time-weighted average concentration for up to a 10-hour workday exposure to nonane during a 40-hour work week. The concentrations of undecane and pentamethylheptane detected at the site boundary is many orders of magnitude lower than the exposure limit for nonane (200,000 ppb)<sup>2</sup>. As such exposure to these levels of undecane and pentamethylheptane would not be expected to produce any adverse effects.

Many other VOCs were detected at very low levels around the site perimeter; however all of these were below a concentration of 1 ppb.

## Conclusions

Overall, and accounting for the fact that Unicarb diffusion tubes were used for monitoring purposes rather than the preferred Tenax tubes, these results do not alter the HPAs opinion that the VOC emissions from the site are not of concern toxicologically and are therefore very unlikely to pose a risk to health, in the short or long-term, of nearby residents.

The HPA shall assess future monitoring results to continually review the risk to public health from the site's remediation.

## References

1) WHO (2000) Air quality guidelines for Europe; second edition Copenhagen,WHO Regional Office for Europe, 2000 (WHO regional publications. European series; No 91).  
[http://www.euro.who.int/\\_data/assets/pdf\\_file/0005/74732/E71922.pdf](http://www.euro.who.int/_data/assets/pdf_file/0005/74732/E71922.pdf)

2) United States Center for Disease Control and Prevention (2010) NIOSH Pocket Guide to Chemical Hazards  
<http://www.cdc.gov/niosh/npg/>

Appendix – Map of monitoring locations

