

Board Meeting
25 June, 2014

Director of Public Health & Health Policy

UPDATE ON ACTION ON CARBON DIOXIDE INCIDENT IN GOREBRIDGE

This paper aims to summarise the key points in the full paper.

The relevant paragraph in the full paper is referenced against each point.

<ul style="list-style-type: none">• There is an ongoing, multi-agency investigation into potentially harmful carbon dioxide levels in a discrete group of local authority houses in Gorebridge.	3.4
<ul style="list-style-type: none">• The Incident Management Team identified immediate actions to reduce and monitor the risks to public health.	3.5
<ul style="list-style-type: none">• The Incident Management Team has identified the criteria against which longer term options for the affected housing should be assessed.	3.6
<ul style="list-style-type: none">• The Incident Management Team recommends that the Care for People Group works with the local population to address short and longer term housing and care needs.	3.6

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13 June 2014
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UPDATE ON ACTION ON CARBON DIOXIDE INCIDENT IN GOREBRIDGE

1 Purpose of the Report

- 1.1 The purpose of this report is to update the Board on ongoing multi-agency work in relation to the carbon dioxide incident in Gorebridge. Any member wishing additional information should contact the Executive Lead in advance of the meeting.

2 Recommendations

- 2.1 The Board is recommended to support ongoing multi-agency action, as detailed in Appendix 1, 'Incident Management Team Interim Report on Carbon Dioxide Incident in Newbyres Crescent, Gorebridge'.

3 Discussion of Key Issues

- 3.1 In late March 2014, NHS Lothian's Health Protection Team was alerted of concerns about carbon dioxide levels in Gorebridge. During a consultative teleconference with Midlothian Council, it was identified the addresses of interest were residential properties owned by Midlothian Council and occupied by Midlothian Council tenants.
- 3.2 A multi-agency Problem Assessment Group was convened on 2/4/2014 and converted into an Incident Management Team, with a further four meetings since held. The role of the Incident Management Team is to consider issues relating to the maintenance and protection of public health, not to apportion responsibility for the exact cause that lead to the situation. The Incident Management Team has obtained copies of relevant investigation and background reports from Midlothian Council, as well as independent expert advice, with a focus on residents' health risk and the long-term risk of recurrence of exposure.
- 3.3 The potential health effects of high-level exposure to carbon dioxide include: headaches; vertigo; poor memory and inability to concentrate; difficulty sleeping; tinnitus, double vision, photophobia, loss of eye movement and related sight difficulties; personality changes.
- 3.4 From reports obtained, it was shown that ongoing investigations by Midlothian Council from September 2013 (first in conjunction with the Coal Authority and then Fairhurst) had identified potentially harmful levels of carbon dioxide in several properties, with families being evacuated and rehoused. After reviewing other residents' clinical records, the Incident Management Team identified several who had contacted their General Practitioners, NHS 24 and Accident and Emergency departments, with symptoms including headaches, sore throats and nausea. On the basis of these findings, the Incident Management Team concluded there was significant risk to public health.

- 3.5 The Incident Management Team recommended the following to Midlothian Council:
- Alerting local General Practitioners to the incident and providing them with current guidance on the management of patients who suffer carbon dioxide poisoning.
 - The provision of adequate and appropriate information to residents.
 - Putting in place a dedicated 24-hour response team with the means to evacuate and rehouse residents if necessary.
 - Putting in place adequate monitoring of mine gases in all the newly built houses in the estate.
 - Putting in place alarm warning systems to alert residents when the levels of carbon dioxide go up.
 - Responding to residents' and general public inquiries and concerns.
- 3.6 The Incident Management recognised that whatever solutions are devised to address residents' exposure to potentially harmful gases, substantial engineering work will be required that will necessitate planning for residents to leave their homes. The Incident Management Team recommends that Midlothian Council and NHS Lothian plan this together, utilising the expertise of the Care for People group and the Joint Health Improvement Partnership. The plan should be made in such a way that affected children can attend school and residents who require care or support from the Council continue to receive it in suitable, alternative domestic environments. The Incident Management Team views this as needing to be undertaken as soon as practicable to limit the potential mental health effects on the residents.

4 Key Risks

- 4.1 The key risks are to the short and long term physical and mental health of affected residents if appropriate, timeous action is not taken.

5 Risk Register

- 5.1 There are no new implications for NHS Lothian's Risk Register.

6 Impact on Inequality, Including Health Inequalities

- 6.1 Appropriate action is being undertaken.

7 Involving People

- 7.1 Appropriate action is being undertaken.

8 Resource Implications

- 8.1 There are currently no new resource implications; however, this is an ongoing situation.

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List of Appendices

Appendix 1: Incident Management Team Interim Report on Carbon Dioxide Incident in Newbyres Crescent, Gorebridge

NHS Lothian
Incident Management Team (IMT)
Interim Report on
Carbon Dioxide Incident in Newbyres Crescent, Gorebridge
12/06/2014

1. Introduction

On 26 March 2014, NHS Lothian's Health Protection Team received a phone call from a Midlothian General Practitioner (Newbyres Medical Centre) who had seen patients in the previous couple of days who had presented to the surgery with concerns about carbon dioxide (CO₂) levels in their houses in Newbyres Crescent, Gorebridge. Their reported symptoms included nausea and headache. The General Practitioner also reported that another family from Newbyres Crescent had attended out of hours on 25 March 2014 reporting similar symptoms. The General Practitioner was concerned that they were likely to see higher numbers of residents presenting with symptoms and they had learnt that recently residents had been evacuated from the area.

A further call was received on 27 March 2014 from a doctor at the Royal Hospital for Sick Children (RHSC) requesting advice regarding a patient who was due to see them for routine tertiary care for a non-related condition but had phoned them with concerns about carbon dioxide.

Incident Management Team Response

Following notification to NHS Lothian's Health Protection Team, a consultative teleconference was held between the Team and the housing department of Midlothian Council. It was identified that the addresses of interest were residential properties built and owned by Midlothian Council and occupied by Midlothian Council tenants. On realising that the problem was likely to be a wide environmental public health issue a multi-agency Problem Assessment Group (PAG) with representation from NHS Lothian, Scottish Environment Health Protection Agency (SEPA), Health Protection Scotland (HPS) and Midlothian Environment Health was convened on 2 April 2014. Given the potential of significant risk to public health, the PAG immediately turned into an Incident Management Team (IMT). Since then four further IMT meetings have been held. Fairhurst (consultants for Midlothian Council on the matter) and the Housing department of Midlothian Council attended by invitation to provide the IMT with relevant information. Representatives of Scottish Government (Health and Social Care Directorate) attend IMT meetings as observers.

The remit of the IMT, as derived from the Scottish Government guidance on managing public health incidents, is:

- Reduce to a minimum the number of cases of illness by promptly recognising the incident, defining how cases have been exposed to the implicated hazard,

identifying and controlling the source of that exposure, and preventing secondary exposure

- Minimise mortality and illness by ensuring optimum health care for those affected
- Inform the patients, actually or potentially exposed groups, staff, clinical and management colleagues, public, their representatives and the media of the health risks associated with the incident and how to minimise these risks
- Collect information which will be of use in better understanding the nature and origin of the incident and on how best to prevent and manage future incidents

From the outset the IMT recognised that it is not its role to apportion responsibility or fault for the exact cause that has lead to the situation occurring. This responsibility lies with the relevant official statutory agencies who have defined responsibilities for regulating situations involving hazards associated with old mine workings and for ensuring that appropriate precautionary measures are taken to control any such hazards and prevent the public from being exposed to these in a built environment setting. The NHS Board and IMT do not lead on these statutory responsibilities and functions. The IMT is limited by its remit to considering issues relating to the maintenance and protection of public health.

2. Background

Carbon dioxide is a colourless, odourless, tasteless gas which is heavier than air and so can accumulate in basements and ground floor areas of houses. Carbon dioxide is toxic in high concentrations due to the fact that it reduces the amount of oxygen in air. Acute high-level carbon dioxide exposure in the presence of low-level oxygen can produce significant persistent adverse health effects, including: headaches; attacks of vertigo; poor memory and ability to concentrate; difficulty sleeping; tinnitus; double vision; photophobia; loss of eye movement; visual field defects; enlargement of blind spots; deficient dark adaptation; and personality changes. Parts per million is a measure of the concentration of carbon dioxide expressed as a proportion (fraction) of its volume in the gas sampled. Prolonged low-level carbon dioxide exposure (<30,000 parts per million) in the presence of normal oxygen can produce relatively modest short-term effects in healthy, young adults. Prolonged exposure to high levels have been found to cause alterations in bone metabolism and related blood calcium concentrations, which may be associated with renal calcification at carbon dioxide concentrations ranging from 3000 to 150,000 parts per million. The lowest no observed effect level for carbon dioxide is 1000 parts per million. Exposure to high levels of carbon dioxide may reduce oxygen levels in the blood leading to symptoms of illness. Very high exposures can ultimately prove fatal.

The severity of physical symptoms will vary depending on age, general health, level of physical activity, the concentration of carbon dioxide in the air and how long people are exposed to it. Some people may experience more severe symptoms if exposed to increased carbon dioxide (and lowered oxygen levels). Those likely to be affected include people with poor cardiac health (heart failure, high blood pressure, etc.) or poor respiratory health due to illnesses such as asthma, Chronic Obstructive Pulmonary Disease (COPD), or other conditions that increase the risk of breathlessness.

Another sign of possible increased carbon dioxide levels may be abnormal behaviour by pet animals (especially cats or dogs) walking at floor level. Signs of unusual behaviour, especially tiredness, weakness, fitting or unusual drowsiness in normally active pets may be an early sign of problems.

3. Investigations

In pursuit of its primary objective of protecting public health, the IMT has been conducting systematic investigations using the source-pathway-receptor model to address Health Risk Assessment and to identify appropriate Health Risk Management options for action by the respective member agencies. This includes:

- Obtaining copies of relevant investigation and background reports provided by Midlothian Council.
- Obtaining independent expert advice to inform its decisions and taking action to minimise the impact on the residents' health and well-being.

The priority of the IMT is the safety of the residents. The IMT investigations and risk assessments have focused on health risk to the residents of carbon dioxide and other gas exposure and the long term risk of recurrence of the gases. In addition, the IMT assessed the potential impact of the incident on the health of the residents while the investigations are on-going, up to the point at which the situation is resolved and the residents are re-housed in ambient air conditions.

Household risk

The problem of carbon dioxide at Newbyres Crescent was established by Midlothian Council in September 2013. Two families, from house numbers 87 and 89, had sought medical advice following concern about gas leaks/effects of gas in their homes. At that time the gas was thought to be carbon monoxide. Carbon monoxide was checked for in the residences and was found to be absent. However, Scientific Services City of Edinburgh Council, Public Analyst to Midlothian Council, identified the properties as having elevated carbon dioxide levels.

The Coal Authority investigated and monitored carbon dioxide in the properties (numbers 87 and 89), in November 2013 and found levels of carbon dioxide in excess of 20,000 parts per million. The Coal Authority then recommended immediate evacuation of the residents owing to the very high levels. The families were evacuated from the houses at that point. However, the Coal Authority then indicated that they were withdrawing from further investigations for their own reasons and communicated this in writing to Midlothian Council. Midlothian Council then obtained advice from external consultants, Fairhurst.

The nature of the incident resulted in all the properties in the new build being checked, initially internally and then externally with drills into the cavity walls. In February-March 2014, Fairhurst Consultants found high levels in a further three properties, numbers, 4, 6 and 30. These properties were evacuated and the residents re-housed. The affected houses are part of a group of 64 recently built properties (approximately five years ago) around Newbyres Crescent in Gorebridge, Midlothian.

As part of the investigations, the IMT reviewed clinical records of residents who have attended their General Practitioners, NHS 24 and Accident and Emergency Departments. Residents from two of the properties made contact with healthcare services in September 2013 and a further 12 contacted the services during February-March 2014. The most common complaints were concerns about carbon dioxide headache, sore throat, cough and nausea. On the basis of these findings the IMT concluded that there was significant risk to public health and therefore interim measures to safeguard the health of the residents had to be put in place while investigations were ongoing.

The Long Term Risk to the Residents

As part of the Risk Assessment process, in order to determine the potential for the long term effects of exposure to underground gases in the affected houses, the IMT is currently gathering and assessing information on relevant matters including e.g.: the geology, hydrogeology, building and construction, coal mining, climate change and the impact of previous work done in the area and adjacent areas (including the Network Rail project). This evidence gathering exercise involves consideration of previous reports, relevant literature and taking advice from independent expert advisors.

4. Risk Management

Immediate Risk Management

The IMT recommended measures to Midlothian Council that were aimed at minimising the acute risk to residents and ensuring that the situation remains under close surveillance. The recommended measures were:

- Alerting local General Practitioners to the incident and providing them with current guidance on the management of patients who suffer carbon dioxide poisoning for use if they were contacted by patients.
- The provision of adequate and appropriate information to residents. The IMT reviewed the leaflet to the residents and provided additional information on signs of ill health and symptoms associated with carbon dioxide.
- Putting in place a dedicated 24-hour response team with the means to evacuate and re-house residents if needed.
- Putting in place adequate monitoring of mine gases in all the newly built houses in the estate. The IMT has noted that there is significant discrepancy between the alarms being triggered at 2000 parts per million levels and the recordings from gas clam monitors. The IMT has also observed from the alarm response reports that the alarms were only audible in 50% of the twenty call outs and that the residents only discovered them going off accidentally for the rest of the times they went off. The IMT has been working to verify that the devices are effective. This work is still in progress.
- Putting in place alarm warning systems to alert residents when the levels of carbon dioxide go up.
- Responding to inquiries and concerns of the residents and general public.

Intermediate Risk Management

The IMT recognised that whatever solutions are devised to address residents' exposure to potentially harmful gases such as carbon dioxide substantial engineering work will be required and that these will require planning for residents to leave their home. The IMT recommends that Midlothian Council and NHS Lothian plan this together, utilising the expertise of the Care for People group and the Joint Health Improvement Partnership. The plan should be made in such a way that the children of affected residents are able to attend school and other residents who require care or support from the Council continue to get it from a suitable, alternative domestic environment. The IMT views this as needing to be undertaken as soon as practicable to limit the potential mental health effects on the residents.

Long Term Risk Management

Investigations of the options for the future of the site and the housing development are currently being explored by Midlothian Council with advice from their consultants, Fairhurst. The IMT understands that the Council will consider a shortlist of options and will identify their preferred option based on the Council's decision criteria. The IMT understands that Midlothian Council will share their views on the recommended option/s with the IMT.

The IMT will then consider the Council's views and assess these against criteria based on a health protection risk management perspective and come to its own conclusion about a preferred option. The Council will then be advised of the final IMT view. To guarantee non-recurrence of release of gases into houses on this site, the IMT will base its own assessment of the options presented using the criteria listed in the table below.

Criteria for option appraisal of potential solutions

i) Criterion		Assessment			
		Zero	Low	Medium	High
Public Health utility of the solution	Probability of guaranteed interruption of Source-Pathway-Receptor linkage				
	Risk of solution breakdown and recurrence of Source-Pathway-Receptor linkage				
	Probability of requirements for ongoing monitoring of: a) carbon dioxide gas levels b) Population health				
Strength of evidence for effectiveness of the solution	Strength of evidence-base on effectiveness of the proposed solution: e.g. <ul style="list-style-type: none">• Peer reviewed / published scientific trials = high• Recognised expert opinion = medium• Commercial opinion = low• None = zero				
Technical or management dependency of solution	Level of dependency on ongoing support to monitor the integrity of the solution (e.g. equipment / hardware, people, requirement for ongoing maintenance, technical				

	complexity etc, etc.)				
Timescale	The probability that the solution could be completed within a reasonably rapid timescale, ideally within a year or preferably less, to reduce the chronic stress associated with living in an area subject to an ongoing hazard and investigation.				
ii) Criterion		Costs			
Economic Factors	Total estimated cost of actual solution over total lifetime – <u>excluding</u> replacement / modification costs (capital spend)				
	Total estimated costs of actual solution over total lifetime – <u>including</u> replacement / modification costs (capital spend)				
	Total costs of any ongoing maintenance, equipment replacement, monitoring systems, etc etc. (current spend)				
iii) Other items					

Communication

Midlothian Council is keeping affected families and public updated on developments in the situation. The Council's Communications Team manage information that goes out to the public and only consults with the Chair of the IMT and NHS Lothian Communication Team if the contents contained health issues. The Council also maintained communication with the residents and the public through face to face meetings, on social media, the Council's website, press statements and telephone contact as appropriate.

Environmental Health staff and other Midlothian Council staff keep regular contact with the residents to monitor and deal with issue that arise from the residents.

NHS Lothian Communication Team keeps contact with Midlothian Council and the Scottish Government Communication Teams if there are significant developments.

NHS Lothian informs local General Practitioners of the situation and provided them with guidance on how to manage patients affected by carbon dioxide. The Director of Public Health and Health Policy attended and participated in briefing sessions for the Midlothian Councillors and will do so for Members of the Scottish Parliament, Members of Parliament and Members of the European Parliament. .

5. Interim Findings

Although the IMT has a number of continuing concerns about the robustness or the monitoring regimes for the gases (see 4. Risk Management, bullet point 4), the presence of a 24-hour council response to alarms with arrangements for rehousing of residents and the provision of appropriate information to residents and their General Practitioners continue to provide some reassurance on the safety of the residents. The IMT nonetheless recommends that the Council maintain a relatively precautionary approach to responding to situations where there is any doubt or concerns about the health of residents or the levels of carbon dioxide being detected.

The IMT is continuing to gather information on the sources and pathways of the carbon dioxide to satisfy itself that the investigation of the coal mine gases have been sufficiently exhaustive and to clarify the likelihood and plausibility of alternative possible explanations.

The IMT will review options brought forward by the Council for a long term solution to the situation. Any long term solution should include warranted remediation measures for affected land and properties combined with a high probability that the measures taken will reliably interrupt the existing source-pathway-receptor linkage in the long term.

The IMT is of the view that there is a clear need to rehouse the residents in a different location within a short timescale that will protect public health. This approach will minimise disruption to people's lives while these investigations and remedial action are considered and implemented.