# $CO_2$ mine gas best practice in site investigation and risk assessment within local authorities

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Riaghaltas na h-Alba

Report prepared by a team from RSK Geosciences as follows:
Dr. Tom Henman
Michael Lawson
Dr. Jo Wilding
Joyce Saddington

RSK Environment Ltd.
65 Sussex Street
Glasgow
G41 1DX

The opinions expressed in this report are those of the authors.

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Report commissioned by:

Building Standards Division
Directorate for Local Government and Housing
Denholm House
Almondvale Business Park
Livingston
EH54 6GA

Tel: 0300 244 4000
e-mail: buildingstandards@gov.scot
web: www.gov.scot/policies/building-standards/



This report is published electronically to limit the use of paper, but a hardcopy will be provided on request to Building Standards Division.

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# Executive Summary

1. This research project follows on from and implements some of the findings of a 2019 Scottish Government research project on the prevalence of carbon dioxide ($CO_2$) mine gas derived from disused coal mines and the implications for residential buildings.

2. The aim of the project is to collate current practice and provide a summary assessment of options to deliver a standardised 'good practice' approach to risk assessment, reporting, mitigation and verification of mitigation measures for mine gas. The proposed good practice approach should consider interdepartmental relationships between Environmental Health officers (EHO)/ Contaminated Land officers (CLO), Planning, and Building Standards staff with the aim of achieving a scientifically robust and consistent approach to the risks posed by mine gas to development.

3. This work has been supported and informed by engagement with the 23 local authorities located within coal or oil shale mining affected areas of Scotland. In an initial consultation phase, an online survey was sent to 130 participants from the 23 local authorities by email in December 2020. This was followed by detailed engagement interviews with staff from six local authorities undertaken in January and February 2021.

4. Detailed analysis of the consultation findings was undertaken to examine all aspects of the current regulation of potential risks from mine gas to development under the planning and building standards regimes. Areas of good practice, and areas where there are potential gaps, that could be improved were identified.

5. A review and update of the report findings was commissioned in December 2023 in light of additional industry and regulatory guidance published since the report was originally drafted in February 2021.

6. A proposed process has been developed for good practice to be adopted across all 23 local authorities affected by coal/ oil shale mine gas risk. This focuses on:

    a. Agreed roles and responsibilities and good working relationships between all disciplines involved with regular dialogue occurring.

    b. Use of an effective and consistent method of screening applications for mine gas based on access to Coal Authority and relevant local authority (LA)-held data and with reference to the decision tool contained in the CL:AIRE 2021 good practice guidance.

    c. Use of a shared document management system and data held in Geographical Information Systems (GIS) to facilitate information sharing and avoiding the duplication of effort.

    d. Peer reviews of reports submitted under planning should also consider Building Warrant requirements in terms of complying with mandatory standard 3.1 in relation to harmful and dangerous substances.

e. Review of BS8485 design reports and verification reports should be undertaken with input from both EHO/ CLO and Building Standards officers.

7. A process flow chart describing the good practice process was developed. This is supported by an example template for LA peer review of mine gas related reports. The draft process and supporting materials were issued to staff from the six local authorities from the detailed consultation phase for comment. The responses received were broadly supportive and where improvements were suggested, the process and supporting materials were updated accordingly. In updating this report subsequently, the flow chart has also been evaluated with regard to information within the CL:AIRE 2021 good practice guide with minor amendments being made.

8. Additional recommendations identified over the course of the research include:

   a. The Building Standards Technical Handbooks, last updated in June 2023, need to be updated to cover mine gas (and ground gas more generally) and associated reporting. A number of local authority consultees expressed the view during the consultations that this should be undertaken as a matter of urgency.

   b. Additional training of EHO/ CLO and Building Standards on mine gas issues and peer review of reports in relation to mine gas issues should be undertaken to increase staff competency in peer reviews of submitted reports.

   c. In the absence of an update to PAN 33 or Scotland-wide supplementary planning guidance, the EPS (2019) guidance and/ or LA-specific guidance should be updated to cover mine gas issues specifically.

# Glossary

### Abbreviations

| | |
|---|---|
| BGS | British Geological Survey |
| BSD | Building Standards Division (Scottish Government) |
| CA | The Coal Authority |
| CCNP | Construction Compliance and Notification Plan |
| CIRIA | Construction Industry Research and Information Association |
| CL:AIRE | Contaminated Land: Applications in Real Environments |
| CLO | Contaminated Land Officer |
| $CO_2$ | Carbon dioxide |
| CS | Characteristic Situation[1] |
| EHO | Environmental Health Officer |
| GIS | Geographical Information System |
| GPVS | Gas Protection Verification Accreditation Scheme |
| IMT | Incident Management Team (Gorebridge) |
| LA | Local Authorities |
| PA | Planning Authority |
| NPF | National Planning Framework |
| NQMS | National Quality Mark Scheme for land contamination |
| PAN | Planning Advice Note |
| RoGEP | Register of Ground Engineering Professionals |
| RS | Remediation strategy |
| RMS | Remediation method statement |
| SI | Site investigation |
| SiLC | Specialist in Land Condition |
| SG | Scottish Government |
| SoBRA | Society of Brownfield Risk Assessment |
| SQP | Suitably Qualified Person |

[1] ground gas regime that informs the design of gas protective measures from the refined conceptual site model after an adequate site investigation (BS8485)

# 1. Context

## Project background

1.1 The current research project follows on from and implements some of the findings of a previous research project on the prevalence of carbon dioxide ($CO_2$) derived from disused mineral (coal) mines and the implications for residential buildings. This project was delivered by RSKW (part of RSK Environment Ltd.) and the report 'Research project to investigate prevalence of $CO_2$ from disused mineral mines and the implications for residential buildings' was published by the Scottish Government in September 2019 (SG, 2019a).

1.2 The 2019 research report arose following a number of cases of ill health recorded in April 2014 affecting some residents in the former mining area of Gorebridge, Midlothian. An Incident Management Team (IMT) was set up by NHS Lothian to investigate the cases. It was discovered that the residents had been suffering from health issues related to $CO_2$ exposure. Radiocarbon analysis indicated that the $CO_2$ was derived from a geological origin indicating that old coal mines were the root cause. Recommendations were made by the IMT to the Scottish Government, some of which relate to Building Regulations.

1.3 The 2019 research report identified a number of options for further consideration to address the issues raised in the Gorebridge IMT report and those gathered in evidence during stakeholder and expert consultation in the previous research project. The specific items to be taken forward within the current research project, are:

- *'Option 4: Improve co-ordination and communication between planning, Building Standards and Environmental Health Officer / Contaminated Land Officer or similar (EHO/ CLO) staff in some local authorities and provide additional budget for training or external specialist support where needed.*

*Option 4 will in turn support Option 1:*

- *Option 1: The use and enforcement of model planning conditions as well as changes to Scottish Planning and Building Standards and guidance to cover adequate assessment of mine gas (including worst-case conditions) should be considered.'*

1.4 The 2019 research report identified that current standards and guidance documents were limited in their coverage of specific factors relating to mine gas risks associated with development, as opposed to other sources of ground gas. Furthermore, the 2019 research report identified that EHO/ CLO staff felt they had a lack of experience and expertise in relation to the potential risks posed by $CO_2$ mine gas.

1.5 Of those participants in the 2019 research project, there was a general consensus that submissions in relation to ground gas (which typically include mine gas in affected areas) were highly variable and often failed to consider temporal and/ or cumulative effects. During a stakeholder workshop held as part of the 2019 research project, some attendees felt their local authority required more of a joined-up approach on these issues within departments. In others, they felt they already had this in place. There were some concerns raised on communication relating to planning conditions, gas risk assessments and mitigation measures between Planning, Environmental Health and Building Standards departments within local authorities.

**Project requirements**

1.6 The research project requirements were set out in the contract award letter issued by the Building Standards Division (BSD), Scottish Government, to RSK on 9 December 2020, and a subsequent update to the research project prior to publishing was set out in meetings and correspondence during November and December 2023.

1.7 The remit of the project, as established by BSD, relates to $CO_2$ (coal) mine gas only and the associated potential risks to development. The Gorebridge IMT report uses the term 'mine gas' within their report when discussing just carbon dioxide. Within this project, the focus has been on $CO_2$ from mine workings, but we have also considered the related issues from coal mine gas generally. Furthermore, the authors recognise that some of the issues under consideration may have a wider bearing on the regulation of other sources of ground gas and land contamination of which mine gas is a sub-set.

1.8 This report considers the regulation of risks of mine gas to development associated with former coal workings. The findings may also be relevant to mine gas from other types of mining, e.g. oil shale or mineral mines, as well as wider ground gas/ land contamination issues. Consideration of risks under current use (for example under Part IIA of the Environmental Protection Act 1990) is out with the scope of this project. This issue was considered within the scope of the 2019 research report (SG, 2019a)

1.9 The project comprises three main stages:

- Stage 1 - Project Start Up
- Stage 2 – Stakeholder engagement
  - Stage 2a/b: Online survey with 23 Local Authorities (LAs) and analysis of findings
  - Stage 2c/d: Detailed stakeholder engagement comprising interviews with up to eight local authorities and analysis of findings
  - Stage 2e: Interim reporting

- Stage 3 – Review of findings with LAs and final reporting

1.10 The following sections sets out the main requirements of each project stage.

1.11 The final project output was to document our findings and further options for consideration/research, as detailed in this report. In addition, there has been a further stage completed to review and update the report in December 2023 in advance of publication.

**Stage 1: Project start up**

1.12 In Stage 1 a project inception meeting was attended to define, clarify, and agree the project scope, objectives and delivery deadlines. The relevant stakeholder organisations, i.e. the 23 LAs previously identified to be located within coal mining affected areas of Scotland (SG, 2019a), were also agreed at this time. Stakeholders within these LAs were identified to be staff in Environmental Health/ Contaminated land officer (CLO) roles and in Planning/ Development Management and Building Standards departments.

**Stage 2: Stakeholder engagement**

1.13 In Stage 2 an online survey was developed to seek views from the stakeholders on a range of relevant issues. The issues included how the different stakeholders engage internally to share information and seek specialist advise on mine gas issues, the technical guidance they refer to and how mine gas issues are regulated under the planning application and building warrant application processes.

1.14 For this task a request was sent out by email to one or more contacts within each of the three disciplines (Environmental Health, Planning, Building Standards). This contained a link to an online survey comprising 30 questions.

1.15 Based on the findings of the online survey, interviews were planned with up to eight LAs, where possible with representatives from all three disciplines. The first aim of this stage was to understand in more detail how the internal relationships work in the context of regulating the potential risks from mine gas to development and any limitations; the second aim was to identify evidence of common practice, good practice, and any gaps with regards to the regulation of development where there are potential risks associated with mine gas.

1.16 Following the completion of the stakeholder engagement and analysis of the findings, an interim report was produced (this report).

**Stage 3: Review of findings and reporting**

1.17 Following on from Stage 2 and the preparation of the interim report, Section 5 of the interim report, alongside Annex C and Annex D, were issued to all participants in the detailed engagement interviews to seek their feedback. This comprised the six LAs involved in the detailed consultation phase.

1.18 Comments received from the LAs were collated and incorporated into the final report where considered relevant to do so. A summary of the feedback is included as Annex E to the report.

1.19 Following this a final report has been prepared considering comments made on the interim report and associated Annexes from LAs, where appropriate.

**Legislative context**

1.20 The regulation of land contamination issues in relation to proposed development, which includes risks associated with mine gas, is overseen by LAs through Planning and Building Standards. In order to provide context of the various roles, we set out below the key elements of the Planning and Building Standards systems in Scotland at national and local levels as they operate in the development of sites and individual properties.

1.21 Following this, an outline of the roles of Environmental Health Officers (EHO) and Contaminated Land Officers (CLO) are discussed. Environmental Health is used generically to be the discipline within which the EHO/ CLO (or similar role) is typically found. However, it is acknowledged that the role of the EHO/ CLO may sit within differing departments or sections depending on the LA. The officer title for this role may also vary. The term EHO/ CLO is used in relation to any officer that performs a technical role in relation to review and assessment of information relating to land contamination issues, including mine gas.

1.22 The key elements presented are specific to the current research project.

**Planning regime**

1.23 The planning system in Scotland is overseen by the SG who is responsible for the development of legislation and national planning policy (SG, 2019b).

1.24 The primary responsibility for the delivery of planning services in Scotland lies with the 32 local planning authorities (PAs) and the two national park authorities: the Cairngorms and Loch Lomond and the Trossachs.

1.25 Planning permission primarily relates to the siting, appearance and use of the proposed building or other development. This includes considering the effect the proposed development may have on neighbouring properties and the surrounding environment.

1.26 The main primary legislation setting the structure of the planning system is the Town and Country Planning (Scotland) Act 1997. The 1997 Act has been amended by the Planning (Scotland) Act 2019, introducing a broad range of changes to the Scottish planning system.

1.27 Scotland's fourth National Planning Framework (NPF4) was adopted and published on 13 February 2023. NPF4 replaces NPF3, it includes national planning policy and

also replaces Scottish Planning Policy (SPP). Together the national planning framework and local development plans (prepared by planning authorities) now form the statutory development plan. Section 25 of the Act sets out that decisions on planning applications are to be made in accordance with the development plan, unless there are material considerations that indicate otherwise.

1.28 Circulars, guidance and Planning Advice Notes (PANs) provide advice on planning matters.

1.29 The authors note that PAN 33, Development of contaminated land, was prepared in 2000 and re-published by the Scottish Government in 2017 (SG, 2017). PAN 33 (SG, 2017) is particularly relevant as it covers land contamination and related issues including 'flammable and toxic gases'. PAN 33 is therefore directly relevant to the regulation of mine gas risks associated with development.

1.30 PAN 33 also states that one of the key principles adopted by SG is the 'suitable for use' approach and identifies land contamination as a material planning consideration. The "suitable for use" approach consists of three elements:

1. ensuring that land is suitable for its current use -identifying land where contamination is causing unacceptable risks to human health and the environment

2. ensuring that land is made suitable for any new use, as planning permission is given for that new use

3. limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought

PAN 33 says that risks need to be assessed on a site by site basis. It is the responsibility of the developer to undertake an adequate risk assessment of a site, and to propose measures to ensure that these risks are appropriately addressed. PAN 33 also includes extracts from Model Planning Conditions, the addendum to circular 4/1998, The Use of Conditions in Planning Permissions.

1.31 A number of PAs have published their own supplementary planning guidance on land contamination issues (to accompany PAN 33). Environmental Protection Scotland (EPS) also published updated guidance 'Land contamination and development: Guidance for assessing and addressing land contamination issues to meet the requirements of Contaminated Land regulators in Scotland' in August 2019 (EPS, 2019).

1.32 Both the local planning authority and Building Standards have the role of ensuring that developments are 'suitable for use', taking into account specialist advice if necessary. In terms of land contamination, to ensure that land is made suitable for

the proposed new use, planning authorities should require that applications include suitable provision for site assessment and where applicable, remediation measures.

1.33 When considering a planning application, a planning officer will need to consider, with specialist advice (from within the authority or externally), whether or not the developer has adequately identified and assessed the sources of contamination and put forward a suitable remediation scheme for the proposed use. SEPA has a role as a statutory consultee in the planning process for elements such as contamination risks to the water environment and flooding but does not have a role in the regulation of mine gas risks. Planning permission may be granted on the condition that development will not be permitted to start until a site investigation (SI) and assessment has been carried out and that the development itself will incorporate measures shown in the assessment to be necessary (mitigation or remediation). Pre-commencement planning conditions are normally included to this effect; some LAs require submission of a desk study and SI interpretive report in advance of granting planning permission.

1.34 Where applicable, a remediation strategy (RS) / remediation method statement (RMS) is commonly required under a planning condition. In the context of CO2 mine gas, where mitigation or remediation is required, this typically involves the installation and verification of gas protection measures to buildings.

1.35 The Coal Authority (CA) is a statutory consultee on planning applications for development within an area of coal working or former or proposed coal working notified by the CA to the planning authority[1]. The CA is not a consultee for Building Warrant applications.

1.36 Mine stabilisation works, i.e. grouting of former workings, may also be required to mitigate geotechnical risks, e.g. settlement or subsidence, and this has the potential to affect mine gas risks. Drilling into workings and mine grouting as permitted activities regulated by the CA.

**Building Standards**

1.37 Building Standards relates to the design and construction of the proposed development, with the Building Regulations requiring minimum standards to be met. This includes ensuring buildings are safe, efficient, and sustainable.

1.38 Responsibility for the Building Standards system in Scotland sits with BSD under the Scottish Government's Directorate for Local Government and Communities.

1.39 Under The Building (Scotland) Act 2003, Scottish Ministers may make building regulations for purposes including "securing the health, safety, welfare and

[1] Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, Regulation 25, Schedule 5(7)

convenience of persons in or about buildings". These regulations were published as The Building (Scotland) Regulations 2004 (as amended).

1.40 The Scottish Government publishes several documents covering procedural and technical guidance which are reviewed on a regular basis. They also conduct any necessary research and consult on changes to the building regulations and associated Technical Handbook guidance on behalf of the Scottish Ministers.

1.41 Information on the Building Standards system is available via the Building Standards website. The latest versions, the 'Technical Handbook 2023: Domestic' and 'Technical Handbook 2023: Non-domestic' (SG, 2023) were updated in 2023, for use from 5 June 2023. These documents do not provide any information on ground gases, including mine gas, although radon is covered specifically. The equivalent document in England titled 'Approved Document C – Site preparation and resistance to contaminants and moisture' was reviewed and updated in 2013. This includes references to ground gas risk throughout the document with a small section covering methane and other ground gases.

1.42 Although the Building Standards system is overseen by BSD, the regulations are enforced at a local authority level. Local authorities are also appointed as building standards verifiers tasked with granting building warrants when they are satisfied proposed work meets building regulations and accepting completion certificates where completed works also comply. The Building (Scotland) Regulations 2004 implement building standards that are required to be met in the completed building so that there will be no threat to the building or the health of the people in and around it due to the presence of harmful or dangerous substances (mandatory standard 3.1). This is the standard which would apply to ground gas/ mine gas. Mandatory standard 3.2 relates to the emission and containment of radon gas.

1.43 When applying for a building warrant, design details are required to be submitted. In the context of the current research project these relate to site investigation reports (relating to land contamination and including mine gas where relevant), foundation design and gas protection measures, where applicable. These submissions are assessed by, or via, the Building Standards department to check the proposed work complies with the Building Regulations before issue of the building warrant.

1.44 Any changes to the design covered by the building warrant require the applicant to apply for an amendment to the building warrant. In the context of the current research project these amendments relate to changes in foundation design that may alter the previously submitted mine gas risk assessment. In turn, changes to the risk assessment may have implications for the design of gas protection measures.

**Environmental Health/ Public Protection**

1.45 Within this report the term 'Environmental Health' is used in the broadest sense of the term for the discipline that has the technical expertise in land contamination assessments, including ground gas. This may include Environmental Health Officers (EHO), Contaminated Land Officers (CLO), 'Geotechnical' staff, Public Protection

staff or similar. Some LAs, particularly the larger ones, have a number of EHO/ CLOs that specialise in land contamination issues; whereas in other cases an EHO will have a wider role covering issues such as air quality, noise and nuisance, permitting etc. as well as land contamination issues.

1.46 In some LAs this role is based in the Planning Department or in some cases in development and regeneration departments. More commonly, the role(s) may sit within a wider Environmental Health/ Services or Public Protection Department. We are not aware of any instances where the Environmental Health discipline is based in the Building Standards department (except where this department is combined with planning).

1.47 The Environmental Health discipline typically provides scientific and technical support to Planning and/ or Building Standards with regards to land contamination, including mine gas risk assessment. Environmental Health is not responsible for enforcing any element of the development control process. Some departments engage external peer review support for one or more type of report submitted through the development control process.

**Relevant technical standards and guidance**

1.48 The 2019 research report (Section 6; SG, 2019a) provided a detailed appraisal of existing technical standards relating to ground gas assessment and mitigation, which remains current. Key references referred to in the 2019 report include:

- British Standard (BSI, 2019), BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- British Standard (BSI, 2013), BS 8576:2013 Guidance on investigations of ground gas
- CIRIA (2014), C735, Good practice on the testing and verification of protection systems for buildings against hazardous ground gases.
- CIRIA, (2007), C665, Assessing risks posed by hazardous ground gases to buildings
- Chartered Institute of Environmental Health, (CIEH, 2008), The Local Authority Guide to Ground Gas (currently out of print).

1.49 Subsequent to the production of the 2019 research report and the initial data gathering and consultation phase of this research project, key technical guidance documents relating to mine gas risk assessment have been published. These fill some of the previously identified gaps in available data and guidance with regards to mine gas risk assessment and the review of submitted reports. While the assessment of the research project's consultations has been undertaken on the basis of information available at the time (December 2020-January 2021), comment is given

where the more recent guidance may have a direct impact on the consultant responses and subsequent recommendations on good practice within local authorities.

1.50 Key documents published since this report was originally drafted in 2021 comprise:

- Land Contamination Risk Management, LCRM, originally published in October 2020 by the Environment Agency in October 2020 and last updated in July 2023 (EA, 2023).
- CL:AIRE (2021) Good practice for risk assessment for coal mine gas emissions, published in October 2021, and
- NHBC (2023) NF94 Hazardous ground gas, an essential guide for housebuilders, published in May 2023.

1.51 LCRM provides overarching guidance for the assessment and management of land contamination. Although developed for England and Wales and not currently formally adopted for use within Scotland due to an ongoing review of certain divergences in regulatory policy and terminology, SEPA has stated that they consider it to present good practice guidance on the approach to the assessment of potential land contamination constraints. This guidance can be used where it is demonstrated to be appropriate for site specifics and relevant regulatory regimes, such as planning and building control.

1.52 The CL:AIRE (2021) Good practice for risk assessment for coal mine gas emissions is the most pertinent guidance document to have been produced . The document is intended to 'be regarded as essential reading towards understanding coal mine gas risk assessment' and is intended to supplement BS8485:2015+ A1:2019 (BSi, 2019). It highlights the Gorebridge incident as a contributing factor to the need for additional guidance on mine gas assessment, as well as the recommendations of the 2019 Scottish Government research project on mine gas risk. The intended audience is those involved in commissioning and undertaking coal mine gas risk assessments to support proposed development, and local authority officers involved in regulating development management through the planning or building control regimes. It is therefore directly relevant to the regulation of mine gas risk for development in Scotland.

1.53 CL:AIRE (2021) considers a number of factors relevant specifically to coal mine gas risk assessment, including those related to the history and methods of mining; sources of mine gas, migration pathways and barriers; and effects of changing groundwater levels. It highlights that research into previous incidents involving mine gas show that uncontrolled mine gas emissions that pose a significant risk to development are generally associated with one of the following scenarios:

- A point source emission from a specific abandoned mine entry affecting a few square metres of ground (mainly bulk advection).

- A localised emission where gas has escaped from a specific mine entry and migrated along shallow, permeable migration pathways affecting a few tens of square metres of ground, or

- An extended area emission where gas is migrating to the surface through the permeable ground overlying an extensive area of shallow, gassy mine workings directly beneath the permeable strata (or via fault zone from deeper strata).

1.54 The guidance states that deep workings do not generally pose a significant risk of gas emissions through the overlying strata unless they are connected to the surface by shafts, boreholes, etc. The risk of mine gas emissions from permanently flooded workings is significantly reduced. Based on this, the guidance presents an overall mine gas risk assessment process, including data requirements relevant to each assessment stage and a risk zoning approach. It also includes advice on the detailed assessment of gas monitoring data and other suitable lines of evidence.

1.55 Other aspects of the guidance are as follows:

- Mine gas risk assessments and mitigation design should be carried out by 'competent persons' based on qualifications and experience/ proven track record. Relevant qualifications include chartership with an appropriate organisation and additional accreditation such as SoBRA, SQP, SiLC or RoGEP. A proven track record means a regulator or consultant who regularly deals with the technical aspects of mine gas. For example, someone with knowledge and experience of the development planning regime or someone who regularly deals with the technical aspects of land contamination.

- That it is essential to understand the different methods of working coal and the effect this has on the likely presence of a mine gas hazard being present below a site and the risk of emissions into buildings.

- Development of a robust and visual mine gas-specific conceptual site model (CSM) is a vital part of mine gas risk assessment. To aid this, the guidance includes detailed discussion on mine gas sources, migration pathways and barriers, as well as the effect of changing groundwater levels on gas risks. This should be refined continually through the assessment process.

- To aid risk assessment, a decision support tool is provided, which utilises data available from the Coal Authority and site-specific geological and hydrogeological data to categorise sites from 'no mine gas risk' through to 'high risk' zones. Moderate and high risk zone sites require detailed mine gas risk assessment, including suitable site investigation and use of a multiple lines of evidence approach to risk assessment. The report highlights that coal mine gas risk assessment using the gas screening values and 'points system' as presented in BS8485:2015+A1:2019 (BSi, 2019) on their own is unlikely to be appropriate where there is a risk of mine gas emissions and should be used with extreme caution.

- The guidance highlights how to identify and manage current and future uncertainties in the assessment, including climate change and other reasonably foreseeable events. These are noted to be a requirement of LCRM (EA, 2023) as well as the National Quality Mark Scheme for land contamination (NQMS).

- The effects of foundations and other below ground infrastructure on migration pathways and the integrity of low permeability 'barrier' layers should be considered within the mine gas risk assessment, and if amended subsequently in the design process, the gas risk assessment should be reviewed and updated.

- It is highlighted that it is vital that site investigation boreholes should be decommissioned and sealed in a manner that prevents them acting as pathways for mine gas into buildings.

- Case studies are included to illustrate key issues under discussion.

1.56 The NHBC published guidance document NF94 (2023) Hazardous ground gas, and essential guide for housebuilders in May 2023. The document, aimed at residential housing developers, supersedes previous NHBC guidance released in 2007, and contains a concise yet detailed account of the NHBC's expectations with regards to ground gas risk assessment, including mine gas. NF94 presents the whole process of ground gas risk assessment (including mine gas), and gas mitigation design and verification. It should be noted that NF94 is a research and advisory publication and not a prescriptive standard.

1.57 The report highlights the following key elements:

- Competent professionals must be employed to advise on ground gas. This includes professional membership and accreditations such as chartered status, SiLC, and SoBRA accreditation.

- Ground investigation and gas monitoring should be targeted to specific development hazards as outlined in a robust CSM. Investigation methods should inform a 'lines of evidence' approach to assessing ground gas risk. Gas monitoring should be reliable, incorporate potential 'worst case' conditions, and support further quantitative risk assessment methods.

- Risk assessments should be robust and repeatable. A range of tools and approaches are available the assessment of sites affected by low, moderate and high gas hazards. The installation of ground gas membranes is not a suitable replacement for poor investigation and assessment practice.

- Gas protection design is not just about adding up points in BS8485:2015+ A1:2019 (BSi, 2019). Design reports should provide the rationale and justification for the full scope of gas protection measures. The specification of materials within gas protection design should be undertaken by the designer and include consideration of the material suitability in construction and context of the wider development design.

- Installation of gas protection should be undertaken by competent professionals in accordance with the design. Measures should be verified to prove their effectiveness and reported. Following installation, gas protection measures must be protected from damage.

1.58 With respect to mine gas specifically, this is considered within NF94 Section 1.4.6 'Identification of high-risk scenarios' and links back to the relevant guidance provided in CL:AIRE (2021).

**Mine gas related reports supporting development applications**

1.59 There are up to six types of reports relating to mine gas assessment and mitigation that may be submitted to support a planning or building warrant application, which are briefly explained below. Report terminology varies between guidance documents and consultants, and reports combining one or more elements may be prepared.

**Desk study/ preliminary investigation**

1.60 The objective is to provide information on past and current uses of the site and surrounding area, along with the nature of any hazards and physical constraints. An initial conceptual model is developed, and a preliminary qualitative risk assessment completed to identify and assess potential pollutant linkages. A pollutant linkage comprises a source (a contaminant or pollutant in or under the land that has the potential to cause harm or pollution) and a receptor, linked by means of a pathway. The pathway is a route by which a receptor is or could be affected by a contaminant or pollutant. The pollutant linkages inform the design of the intrusive investigation. In the context of this report, the source is mine gas. The receptors are residents/ other site occupiers and building structures, and pathways are the means by which gas can migrate from depth to near surface and ingress into buildings. All three elements need to be in place for the pollutant linkage to be complete and a potential risk to be realised.

**Site investigation**

1.61 The objective is to obtain data on the nature and extent of contamination, the geology, geochemistry, soil, hydrogeology, and hydrology of a site. The intrusive works provide data to review the initial conceptual model and to update the risk assessment based on those findings. The investigations provide data for the selection and design of remedial works, if required.

**Detailed ground gas risk assessment**

1.62 The objective is to further assess risks presented by either ground gas/ mine gas to a proposed development through the additional assessment of ground conditions, soil permeability, the nature of ground gas sources and their generation potential and interpretation of ground gas data undertaking further interpretation of multiple lines of evidence in order to present a detailed assessment of gas risk at a development site. The need for a detailed ground gas risk assessment is dependent on the overall risk

level and site complexity. For example, the 2021 CL:AIRE guidance states that a detailed ground gas risk assessment must be undertaken for sites classified as ‘high’ or ‘moderate’ risk zones in relation to mine gas. Use of the empirical approach in BS 8485 comprising simple derivation of a site Characteristic Situation is not appropriate when mine gas risk is present at a site.

**Remediation strategy or remediation method statement**

1.63 The objective is to identify remediation options, complete an evaluation of options if required and select the final remediation option in relation to each pollutant linkage identified as being complete following the intrusive site investigation. The remediation strategy should include a verification plan, setting out details of how data will be collected and assessed to demonstrate remediation objectives have been met. In relation to gas protection measures the information required relates to the building type and gas protection score (points), setting out how this will be achieved.

**Design report for gas protection measures**

1.64 A design report should present the detailed design and specification of the gas protection measures as detailed in BS8485:2015 + A1:2019 (BSI, 2019). This is normally required in relation to the building warrant application as it relates to the design and construction phase of the development. A design report may not necessarily be required in relation to any planning condition, due to the detailed technical nature of the report. However, design reports may be submitted in relation to an application to discharge planning conditions relating to remediation.

1.65 Table 8 of BS8485 (BSI, 2019) sets out the information to be included in the design, installation and verification reports relating to ground gas protection measures. A verification plan for the installation of the membrane should be part of the detailed design. This report may replace the need for a detailed remediation strategy if gas protection measures are the only remediation (mitigation) measure required at a development.

1.66 The design report, where gas protection measures are required, should form part of the approved plans that accompany the building warrant issued.

**Verification report**

1.67 The report should present evidence to show that remediation has been successful. In relation to mine gas this will be directly related to presenting an accurate description of the measures actually applied and present the evidence gathered to confirm that installed measures are suitable for purpose.

# 2. Objectives

**Aim of the research**

2.1 The aim of the research project is, through engagement with the 23 LAs located within coal mining affected areas of Scotland, to collate current practice and provide a summary assessment of options to deliver a standardised 'good practice' approach to risk assessment, reporting, mitigation and verification of mitigation measures.

2.2 The underlying aim of this project (and the related 2019 Scottish Government research project) is to improve the consistency of regulation to help avoid a recurrence of the Gorebridge incident at other localities.

2.3 The proposed good practice approach should consider interdepartmental relationships between the EHO/ CLO, Planning, and Building Standards with the aim of achieving a scientifically robust and consistent approach to the risks posed by coal mine gas to development.

2.4 This 'good practice guide' is intended to specifically relate to the process under the Planning and Building Standards regimes by which potential risks from mine gas to development are assessed and mitigated effectively, as opposed to guidance on the technical aspects themselves, which is covered elsewhere.

2.5 Whilst this report specifically covers mine gas – focusing specifically on coal and oil shale mining sites - the authors note that there is overlap between this and regulation of the risks from ground gases from other sources and wider land contamination issues.

**Objectives of the research**

2.6 The objectives of the current research project, as detailed in the tender Schedule 2 – Specification, are to:

- build a picture of the current processes applied, as part of statutory permissions, to assess and mitigate risk from mine gas within mining affected local authority areas.
- identify examples of current good practice which can potentially be applied Scotland wide.
- seek input on such recommendations from mining affected local authority areas.
- offer a proposal setting out options to implement a standardised risk assessment and mitigation protocol for implementation/adoption.

# 3. Initial Stakeholder Engagement

### Identification of stakeholders

3.1 The key stakeholders for this project were identified by BSD to be EHO/ CLO, Planning and Building Standards staff in the 23 LAs affected by coal mining issues.

3.2 Contacts for the stakeholder engagement were identified based on the engagement previously undertaken as part of the 2019 research project, those supplied by SG or those already known to RSK.

### Initial stakeholder engagement methodology

3.3 The first stage of the stakeholder engagement involved the development of an online survey to seek views from the stakeholders on a range of issues to the aims and objectives of the project. The survey questions are shown in Annex A and the survey was generated in SurveyMonkey. The questions covered details about the respondent, questions specific to the planning and building standards approach to mine gas issues, and about participation in more detailed stakeholder engagement.

3.4 A total of 130 requests were sent by email to LA contacts on 11 December 2020 in all 23 relevant LAs. Of these, thirty-five requests were sent to Building Standards officers, 44 to EHO/ CLOs and 51 to Planning officers. As such for some LAs, multiple contacts within a department were sent a request to complete the survey. The covering email recommended that recipients co-ordinate with colleagues in their department to complete a single survey response, where applicable. Recipients were advised the survey findings would remain confidential and would only be used as a whole dataset, without publishing individual responses.

3.5 The online survey deadline was extended at the start of January 2021 with a reminder sent by email to all those who had not completed the online survey on 7 January. The survey was closed at 17:00 on Tuesday 12 January 2021.

### Detailed survey findings

3.6 The survey findings are presented factually in the remainder of this section by topic area, identifying which question has been used in the data analysis. Note Questions 4 to 7 related to contact details to support the detailed consultation phase so the responses for these are not presented. Question 26 was a yes/no response in relation to examples of good practice, which were discussed further in the detailed engagement if a respondent answered yes.

### Response rates [Q1 to Q3]

3.7 One or more responses were received from 21 of the 23 LAs (91%), with two LAs not responding. West Dunbartonshire Council answered that they did not respond to the

survey as they were not sure if it was appropriate to do so given that mine gas is not of particular relevance in the LA area. They did comment that they do encounter many of the issues being considered in relation to ground gas risks relating to non-mining sources. The remaining outstanding authority, Clackmannanshire Council, was followed up on but no response was forthcoming.

3.8 A total of 46 responses were received out of a maximum of 69 (i.e. three departmental responses per LA), equivalent to a 67% response rate overall. Two officers from the same planning department at one LA responded to the survey. To avoid data bias, the first survey response received was included and the second survey response excluded. It is not considered the exclusion of this single duplicate response will alter the overall findings of the survey.

3.9 A total of 45 responses were therefore taken forward to the data analysis.

3.10 A summary of the responses received by respondent's role is presented in Table 3-1. Eight respondents identified themselves with a different officer title/ job role to the four options presented, with three of the 'Others' being directly relating to the EHO/ CLO role, three being directly related to the Building Standards officer role and two with a job title that covers more than one discipline (e.g. Building Standards and Planning).

**Table 3-1. Responses received by respondent role**

| **Officer role** | **Responses (count)** | **Responses (%)** |
|---|---|---|
| Building Standards Officer | 14 | 31 |
| Contaminated Land Officer | 7 | 16 |
| Environmental Health Officer | 5 | 11 |
| Planning Officer | 11 | 24 |
| Other (please specify) | 8 | 18 |
| **Total** | **45** | **100** |

3.11 The highest number of responses were received from Building Standards (36% of responses) and Environmental Health (or its equivalent) (31% of responses). Three respondents identified themselves with a different department to the three options presented. These included Development & Regeneration, Protective Services (Building Standards, Environmental Health, Trading Standards) and Enterprise and Communities. A summary of the respondents' department is presented in Table 3-2.

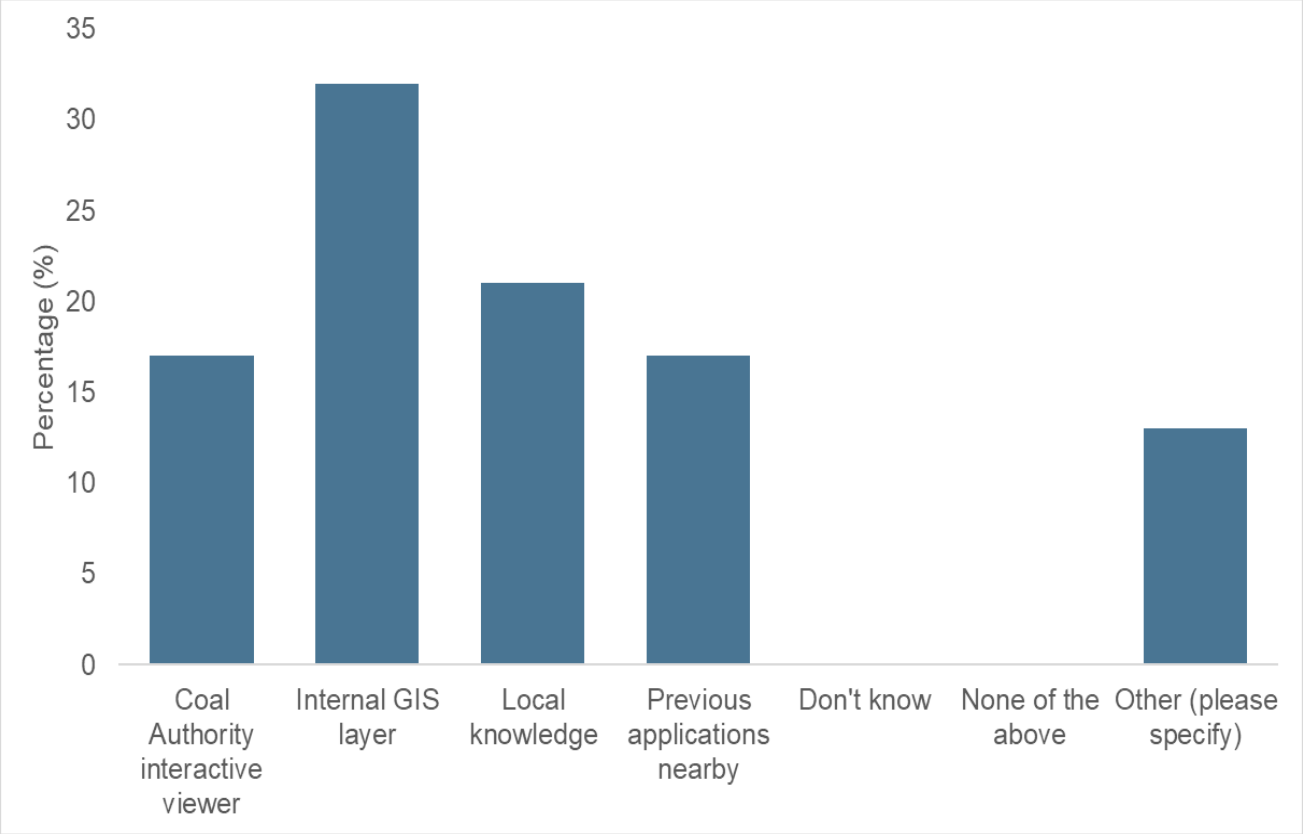
**Table 3-2. Responses received by respondent department**

| **Department** | **Responses (count)** | **Responses (%)** |
|---|---|---|
| Environmental Health/ Public Protection | 14 | 31 |
| Planning | 12 | 27 |
| Building Standards | 16 | 36 |
| Other (please specify) | 3 | 7 |
| **Total** | **45** | **100** |

**Identifying if there is a potential mine gas issue to 'screen' applications for review [Q8, Q9)**

3.12 Respondents selected one or more options, which are presented in Figure 3-1 relating to how they identified if the proposed development was in an area with potential mine gas issues.

**Figure 3-1. How do you identify if the proposed development is in an area with potential mine gas issues so as to 'screen' applications for review?**




3.13 The dominant method (32% of respondents) was through the use of an internal Geographical Information System (GIS). Other responses included local knowledge (21%) and previous applications nearby (17%). Only 17% of respondents stated they used the CA interactive viewer, which is publicly available albeit at a lower resolution. There were no responses for 'Don't know' or 'None of the above'.

3.14 Of the 13% who provided additional responses under an 'Other' data source to the four options listed, these included historical maps, the contaminated land inspection strategy prepared under Part IIA of the Environmental Protection Act 1990, areas of mineral instability, consultation with colleagues, radon maps and site investigation report(s) submitted by the applicant.

3.15 Participants (all disciplines) were additionally asked in Q9 if they consulted with the CA when the proposed development is in a Development High Risk Area. A Development High Risk Area is defined by the CA as being where coal mining risks are present at shallow depth which are likely to affect new development. High Risk

Areas represent 15% of the coalfield areas UK-wide. The CA is a statutory consultee on planning applications for development within the defined coal mining areas of England, Scotland and Wales (CA, 2017). This applies to both Development High Risk and Low Risk Areas.

3.16 Responses are presented in Table 3-3 by respondent department. Only 31% of respondents stated they always consult with the CA and 38% of respondents stated they never consult with the CA. It is noted that there is no requirement for the CA to be consulted as part of the building warrant application process, but the CA is a statutory consultee under planning for coal mining reporting areas. Eight, out of 12, respondents from a Planning department stated they always consulted with the CA. This is likely to be a reflection of planning applications that fall within a Development High Risk Area. Respondents who stated rarely and usually may have limited development within a Development High Risk Area.

**Table 3-2. Consultation with the CA**

| Department | Don't know | Never | Rarely | Sometimes | Usually | Always | Total |
|---|---|---|---|---|---|---|---|
| **Building Standards** | 0 | 10 | 0 | 2 | 0 | 4 | 16 |
| **Environmental Health / Public Protection** | 3 | 5 | 2 | 1 | 1 | 2 | 14 |
| **Planning** | 1 | 0 | 1 | 0 | 2 | 8 | 12 |
| **Other** | 0 | 2 | 1 | 0 | 0 | 0 | 3 |
| **TOTAL** | 4 | 17 | 4 | 3 | 3 | 14 | 45 |
| **%** | 9 | 38 | 9 | 7 | 7 | 31 | 100 |

**Interdepartmental relationships – taking the lead, LA frameworks and degree of departmental interaction [Q10, Q11, Q17]**

3.17 Participants were initially asked which service (i.e. department or discipline) in their LA has the overall lead on dealing with sites where $CO_2$ mine gas is assessed as likely to be present. A single respondent did not know, which could equally be interpreted as none having an overall lead. The results are presented in Table 3-4.

3.18 An equal 31% of respondents identified Environmental Health (or its equivalent) or all three departments as having the overall lead. This may reflect the breadth of technical knowledge held by the EHO/ CLO role, but also that expertise may be found in each department at those LAs.

3.19 Only two respondents (5%), from different LAs, identified no single overall department taking the lead: One stating ‘All of the above’ which could equate to ‘None’ with the other naming a specific department. For both these LAs a differing departmental response was received for this question from the respondents.

3.20 When evaluating individual responses, it was apparent that responses were not consistent across the responding LA. Of the 15 LAs where more than one department responded to the survey, nine answered differently and six agreed regarding the department with the overall lead.

**Table 3-3. Overall LA lead for mine gas issues**

| Department with overall lead | Responses (count) | Responses (%) |
|---|---|---|
| Building Standards | 5 | 11 |
| Environmental Health / Public Protection | 14 | 31 |
| Planning | 9 | 20 |
| All of the above | 14 | 31 |
| None | 2 | 4 |
| Don't know | 1 | 2 |
| Total | 45 | 100 |

3.21 Participants were subsequently asked if their LA had an existing framework (formalised or informal) for regulating the risk of $CO_2$ mine gas on a development site. Forty-nine percent of respondents stated there was an existing framework. Twenty nine percent of respondents stated they did not know if there was or was not. The survey results are presented in Table 3-5.

3.22 When analysing multiple responses from the same LA (i.e. responses from each department at the same LA) it was apparent for 11 LAs that there were conflicting responses regarding if there was an existing framework.

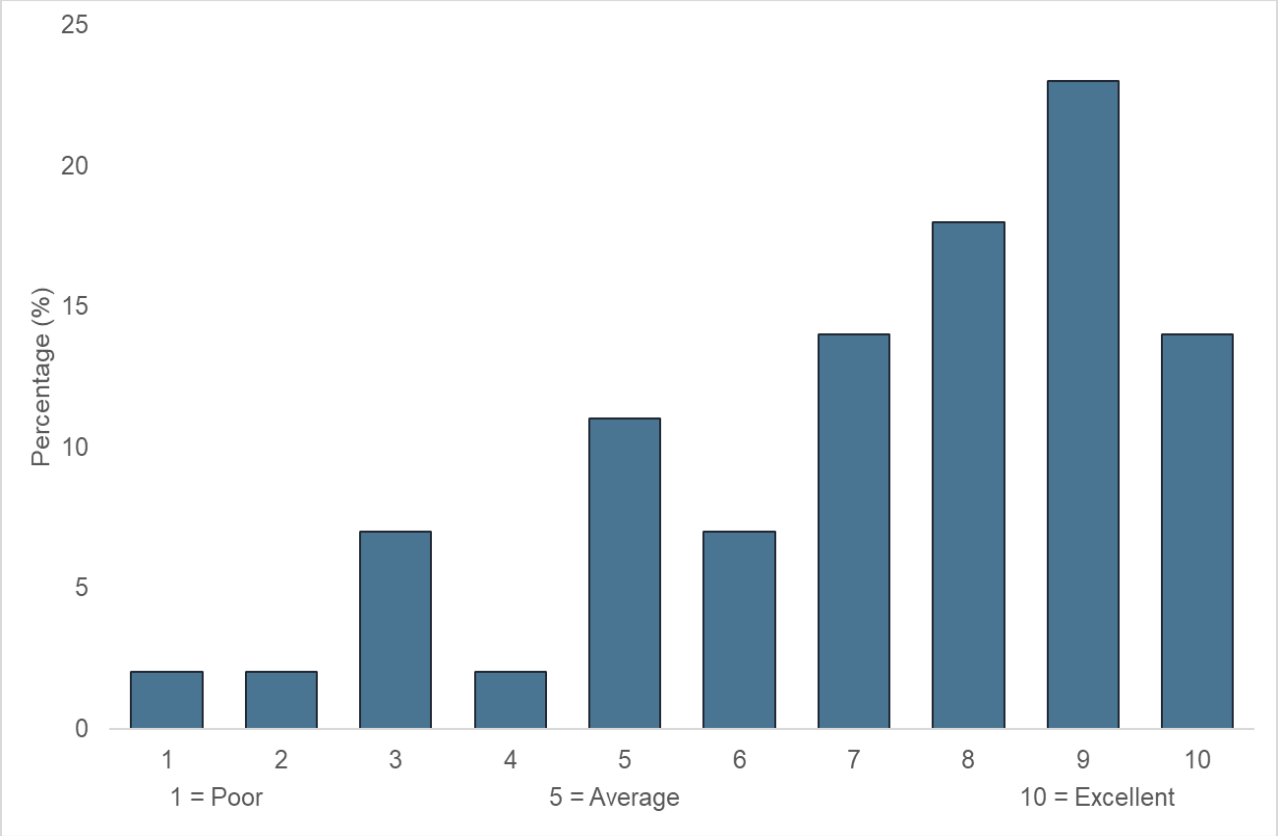
**Table 3-4. Existing 'framework' for regulating mine gas issues**

| By department | Don't know | No | Yes | Total |
|---|---|---|---|---|
| Building Standards | 4 | 2 | 9 | 15 |
| Environmental Health / Public Protection | 3 | 5 | 6 | 14 |
| Planning | 4 | 2 | 5 | 11 |
| Other | 2 | 1 | 2 | 5 |
| Total | 13 | 10 | 22 | 45 |
| % of respondents | 29 | 22 | 49 | 100 |

3.23 Participants were additionally asked about their view of the relationship between Planning and Building Standards (see Figure 3-2). Respondents were asked to rank the degree of interaction between the two departments on a scale of 1 (poor) to 10 (excellent). The responses include those from the EHO/ CLO respondents who may have an external view of the relationship between Planning and Building Standards departments (unless sited within them).

3.24 Thirty-four respondents (76%) rated the degree of interaction as a 6 or above, i.e. above average. Of these, seventeen respondents (37%) rated the degree of interaction as a 9 or 10, i.e. excellent. Only two respondents (4%) rated the degree of interaction as 'poor' (a 1 or 2). The remaining 20% of respondents rated the degree of interaction as between 3 and 5, i.e. average.

**Figure 3-2 Relationship between Planning and Building Standards – Degree of Interaction**



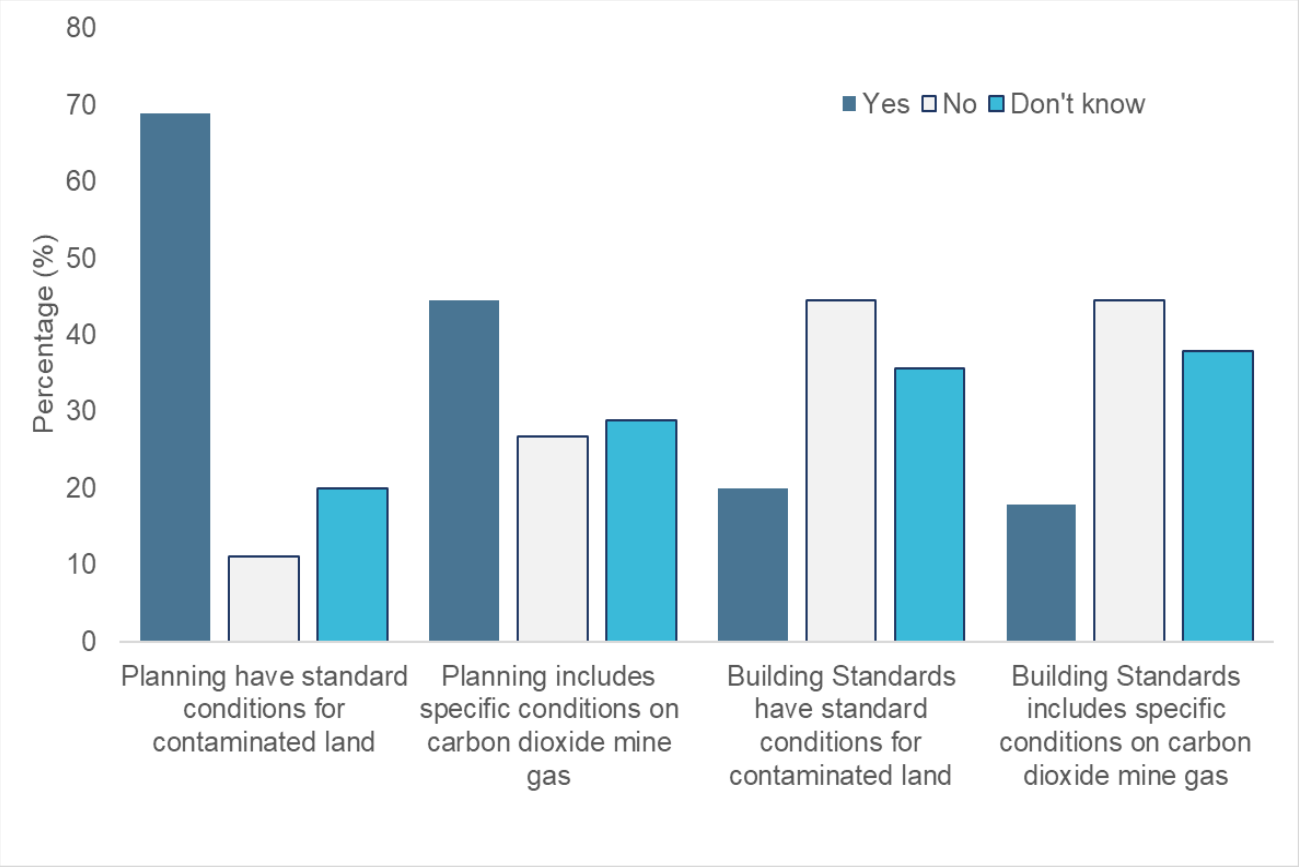

**Planning and building warrant conditions, and verification of remedial measures [Q12, Q13, Q14, Q15, Q16]**

3.25 Participants were asked four questions relating to the use of ‘standard’ land contamination planning conditions, building warrant conditions or mine gas ‘specific’ conditions. The results are presented in Figure 3-3.

3.26 Sixty-nine percent of respondents stated standard planning conditions for land contamination were used at their LA, with only 11% responding ‘No’ (not used) and 20% as ‘Don’t know’. Specific mine gas related conditions were stated to be used in planning by 44% of respondents, with 27% responding ‘No’ (not used) and 29% as ‘Don’t know’.

3.27 With regard to whether Building Standards have standard conditions on mine gas, the responses were 20% for ‘Yes’, 44% for ‘No’ and 36% for 'Don’t know’. The equivalent responses for Building Standards including specific conditions on $CO_2$ mine gas were similar at 18%, 44% and 38%, respectively,

**Figure 3-3. Use of standard and specific planning and building warrant conditions**

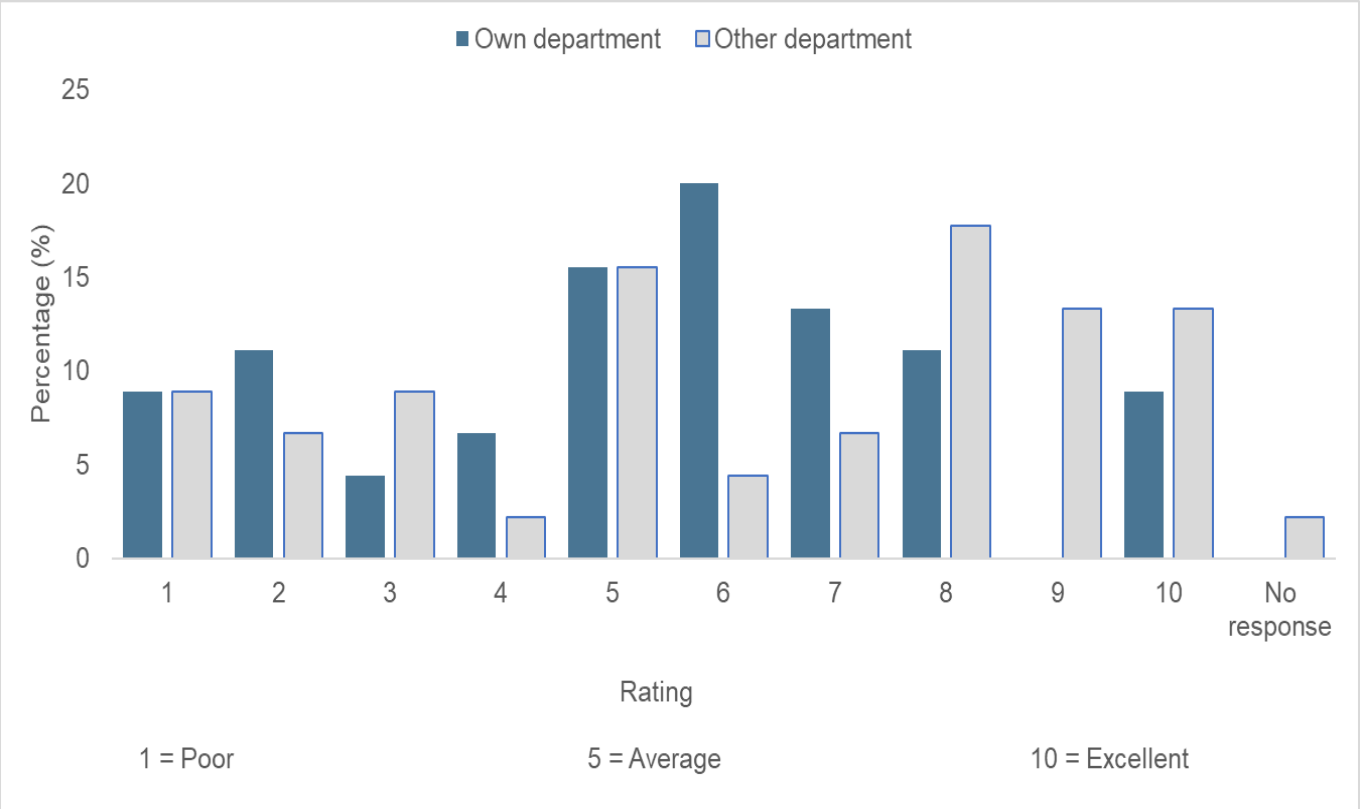



3.28 Following on from the questions relating to the use of standard or specific conditions, participants were asked about verification of remediation for mine gas (Q16), i.e. the incorporation of gas protection measures into development. The majority of respondents (67%) stated they required a verification report prepared by a suitably qualified consultant or installer to be submitted. Three respondents from three different disciplines (6%) stated verification included a site visit with officer assessment in addition to a verification report. Only one of the three respondents was in Building Standards. The three respondents were from three different LAs.

**Staff capability [Q18, Q19, Q20]**

3.29 Participants were asked two questions about staff capability in relation to mine gas risk assessment and mitigation design report review on a scale of 1 (poor) to 10 (excellent). Here there was a broad range of responses received. It is acknowledged that questions about perceived capability will be subjective. The results for both questions are presented in Figure 3-4.

**Figure 3-4 Perception of staff capability within respondent's department and other**




3.30 The first question related to capability within the respondent's own department. Four respondents (9%) rated staff capability within their department as 10 (excellent), and four respondents (9%) rated staff capability within their department as 1 (poor). Forty-seven percent of respondents rated staff capability between 1 and 5 (i.e. poor to average) and 53 percent rated staff capability between 6 and 10 (average to excellent). The majority rated staff capability to broadly be average.

3.31 The second question related to if the capability for undertaking critical review of mine gas risk assessment and mitigation design reports did not sit within their department, what was their perception of staff capability in the other department. Responses to this question may be more subjective than the first question where respondents will have a better understanding of their own departmental capability.

3.32 Six respondents (13%) rated staff capability within another department as 10 (excellent), and four respondents (9%) rated staff capability within another department as 1 (poor). Forty-two percent of respondents rated staff capability in another department between 1 and 5 (i.e. poor to average). Fifty-six percent staff capability in another department between 6 and 10 (average to excellent). One respondent did not submit a response to this question.

**External peer review support [Q21, Q22, Q23, Q24]**

3.33 Twenty four percent of respondents have engaged external peer review support for critical review of mine gas related reports.

3.34 Of those that have engaged external peer review support, only 11% stated this to be ‘always’.

3.35 Sixty two percent had not engaged external support, and 13% did not know whether this had been done. With the exception of four LAs the responses of either yes or no were consistent across all respondents at the same LA. This is suggestive that at those four LAs, some departments may seek external peer review support while others do not, and this is not known by the other department.

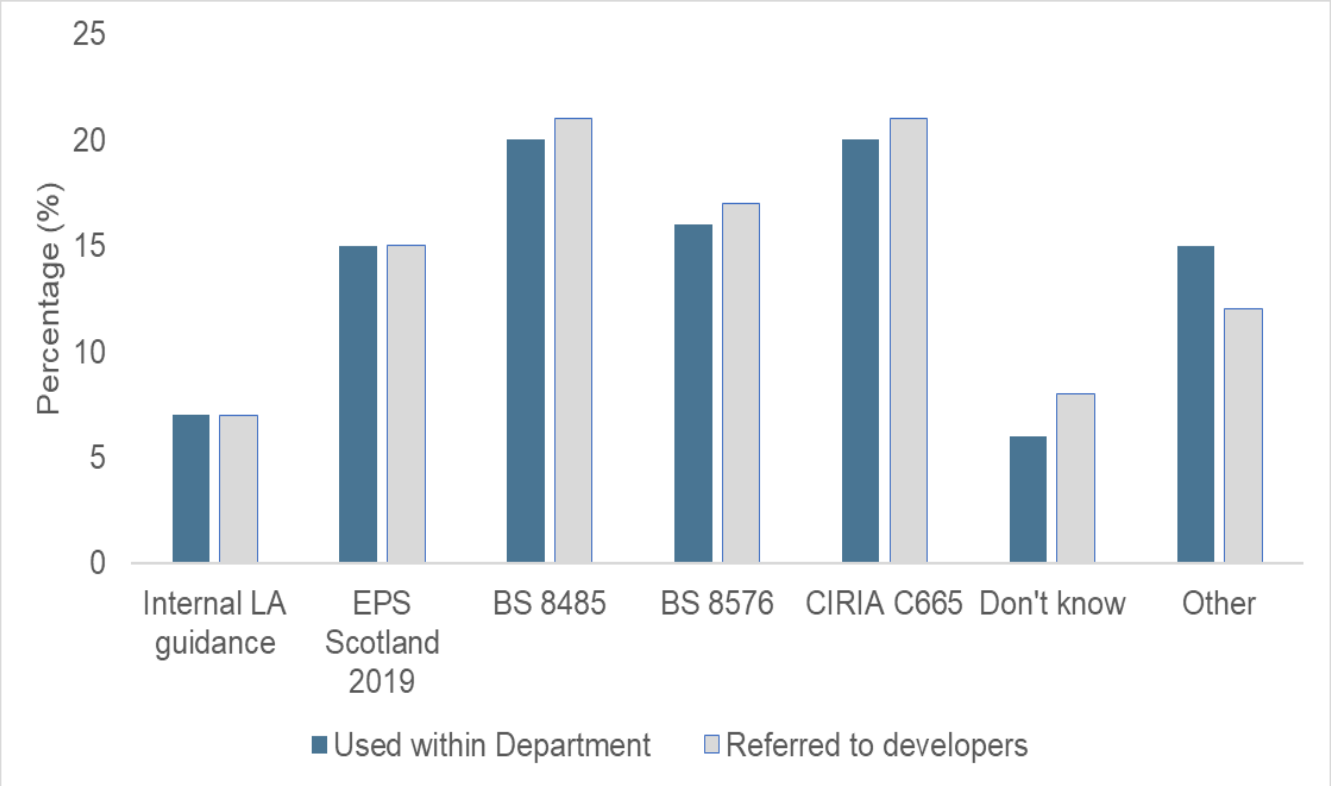
3.36 The reasons given for not engaging external support (respondents could tick all that applied) were sufficient capability in-house (23 responses), financial constraints (11 responses), mine gas issues rarely encountered (26 responses) or other (unspecified; 18 responses).

3.37 Responses in relation to the benefit of the external support on a scale of 1 (poor) to 10 (excellent) were fairly evenly split across poor, average and excellent (31, 24 and 20%, respectively).

**Publications and guidance [Q25, Q26]**

3.38 Participants were asked two questions about relevant publications and guidance that (i) they routinely used themselves and (ii) they refer developers to, in relation to mine gas. Five key documents were presented as options, alongside ‘Don’t Know’ and ‘Other’. Participants could tick all that applied. The results are presented in Figure 3-5 with broadly similar responses between the two questions.

**Figure 3-5. Publications and guidance referred to for internal use or to developers (more than one option could be selected)**



3.39 Here the responses will likely be a reflection of the department a respondent works in and the information developers will require from that department.

3.40 Internal LA guidance was used by only small number (7%) of respondents with the same number stating they had local authority specific supplementary guidance they referred externally to developers. Use within department and developers were referred to the EPS 'Land contamination and development guidance' (EPS, 2019) by 15% respondents each.

3.41 Respondents working in Environmental Health referred internally to the most guidance documents, with selections dominated by BS8576 (BSI, 2013) on investigations for ground gas (16% of responses), BS8485:2015 + A1:2019 (BSI, 2019) ((20% of responses) and CIRIA (2007) C665 for assessing risks posed by hazardous ground gases (20% of responses). When considering BS8485 (BSI, 2019) relating to the design of protective measures, only six Building Standards officers responded that they routinely used this document with five responding that they refer to CIRIA (2007) C665.

3.42 Other documents referred to internally or externally (15 and 12% responses for internal use and referrals, respectively) included Building Standards Technical Handbook by four Building Standards respondents, CIRIA (1995) R151 Interpreting measurements of gas in the ground: methane and associated hazards to construction, CIRIA (2019) C758D Abandoned mine workings manual and CL:AIRE TB17 on ground gas monitoring (Card et al, 2012).

3.43 'Don't know' was selected by 15% of respondents for internal use and 12% for referrals.

**Training [Q28]**

3.44 Participants were asked if they felt that they needed specific training on mine gas issues to regulate this issue effectively. Seventy eight percent responded yes. One respondent selected not applicable and the remaining 20% expressing no need for training in this area.

**Relevant data from LA consultation during previous research project**

3.45 Written submissions in relation to the 2019 research project (SG, 2019) were reviewed to supplement the above survey findings. These mainly related to EHO/ CLO staff with one response from a planning department. Key points from this that are relevant to the current study are as follows:

- Changes to legislation may lead to more permitted development where no planning permission is necessary, leading to major delays at building warrant stage. Extensions to properties where the existing property has no remediation in place are also of concern.

- Technical bulletins are required for raising awareness of mine workings issues as well as Guidance / Technical bulletins on best practice for ground gas protection system design specifications (i.e., material specifications, foundation schematics etc) and how to verify their installation.

- Local Authority contaminated land staff are not necessarily qualified to understand foundation design drawings and we often have to work with our colleagues in Building Standards to ensure submitted drawings show the correct details. Builders or their agents often submit drawings that do not conform to the remedial action. We are also only a consultee in the development management process, and we have to ensure our recommended model planning conditions are acceptable from a planning perspective. One of the things we are trying to achieve in Scotland is consistency of regulation between local authorities so that developers can expect similar standards to be accepted irrespective of the location of their proposed site.

- Suitable training courses for practitioners and regulators are required. Training / awareness on ground gas risk and protection should be targeted to contaminated land officers, environmental health officers, building standards officers, planning officers, consultancy assessors and developers.

- As one of a very small number of people in Scotland who has attended the CL:AIRE Membrane Verification course, I am in the uncomfortable position of being unable to accept at face value any verification reporting I have reviewed (visual / photographic inspection is no verification at all). Gas membranes also have to survive the installation process, which means every worker on site needs to understand the importance of their continued integrity. Examples of accidental subsequent penetration of membranes are commonplace.

- A register / list of approved expert consultants would be helpful to all LAs in selecting appropriately qualified expertise at short notice.

- There should be a requirement for Building Standards staff or another body, to undertake spot checks of gas measures as they are going in rather than relying entirely on self-certification. Unfortunately, most Building Standards staff or CLOs are not trained in such matters and so additional resourcing and training would be required to achieve this for LAs. In England I understand that LAs pay NHBC to do this for them however this I do not believe happens in Scotland.

- Verification is risk-based. Where there is no obvious source of gas production such as landfill or shallow mining, or where there is a well-ventilated sub-floor, or where a cast in-situ floor slab has been used, it may be possible to be pragmatic about the risk from ground gas. Responsibility for safe development rests with the developer.

- Something that is rarely done properly is the decommissioning of existing site-investigation boreholes which risks leaving a preferential pathway for ground gas.

- It is easy to fit ground gas protection badly. Good integrity across the whole floor area in average weather conditions on a building site is difficult to achieve, and few installers are suitably trained. Even at the design stage, mistakes are made relating to the specification of gas protection because this is new for many house builders.

**Key findings of the survey and commentary**

3.46 The key findings from the online survey, relating to the objectives of the research project, are discussed below.

3.47 An excellent response rate was received overall with responses received from all but one of the 23 target LAs. Forty-five individual responses were taken forward with good representation from all three discipline areas.

3.48 An internal GIS is the most common method to identify if the proposed development is in an area with potential mine gas issues. Responses would suggest not all LAs have an internal GIS as only 32% of respondents used these when screening applications for review. Other comments indicated that some LAs request a desk study report to accompany all new build (non-householder) developments. In such cases, reliance is assumed to be placed on the findings of the submitted report. The resources used to screen applications suggested varying levels of understanding, and consistency, in how to identify applications where there may be mine gas risks. This was identified as a possible weakness in processes to be taken forward to the detailed consultation stage.

3.49 The publicly available CA interactive viewer was only consulted by 17% of respondents. Some internal GIS datasets may incorporate this for screening of sites, but this percentage is considered to be low. The CA interactive viewer provides an easily accessible interactive map presenting (amongst others) the boundaries of Development High Risk Areas, mine entries and potential zones of influence, surface mining and past shallow coal mining workings. These, combined with an understanding of ground conditions, are key to understanding if there is a potential need to incorporate mine gas issues during the development process, and hence to 'screen' applications for further consideration of this issue.

3.50 Consultation with the CA by Planning officers was also lower than expected, with only eight out of 12 respondents in this department stating they did always consult when the proposed development is in a Development High Risk Area. This is surprising when the CA is a statutory consultee for planning application in all Development High Risk Areas (CA, 2017). The response rate may reflect the prevalence or otherwise within the LA boundary of Development High Risk Areas.

3.51 The department taking the overall lead varied across LAs but was dominated by Environmental Health if there was an overall lead department. This was in line with expectations that the technical and scientific expertise that would typically sit within that department.

3.52 The majority of respondents (75%) rarely or never employed external peer review support, although 16% ‘usually’ or ‘always’ do so. Responses on the value of external peer review varied widely suggesting there is a need to improve the consistency and quality of this, as well as to provide an approved register of suitably qualified and experienced consultants.

3.53 A large proportion of LAs (49%) had an existing framework (formalised or not) when managing the development process when mine gas is a potential issue. However, a significant number of respondents did not know, which could be indicative of the absence of a consistent approach to mine gas issues. The majority of respondents (76%) scored their interdepartmental relationship and degree of interaction as being better than average, which is positive. A good working relationship is likely to lead to a consistent, effective and efficient regulatory approach.

3.54 A large proportion (69%) of respondents stated ‘standard’ planning conditions for land contamination were used at their authority. This will achieve consistency in ensuring relevant reports are submitted that should incorporate consideration of mine gas risks although the standard wording of planning conditions is likely to vary across LAs. Specific planning conditions relating to mine gas risk are used by some LAs, and this was identified to be explored further in the detailed engagement.

3.55 When verifying remediation, reliance is almost entirely placed on the submission of a verification report complying with BS8485 (BSI, 2019)/ CIRIA (2014) C735. Therefore, the content of that verification report, and the technical capability of those peer reviewing the report content will be fundamental to ensuring appropriate mitigation measures have been implemented at the development. Site visits are not routinely undertaken by any department/discipline when considering all LAs who responded. Only three respondents stated they undertook a site visit, with a single Building Standards officer stating this. Verification of gas protection measures (or lack of) was identified as an area of concern in the 2019 research project (SG, 2019).

3.56 Based on the number of EHO/ CLO respondents (13), and this department typically taking the lead on mine gas related issues, the number of respondents routinely using BS8485 (BSI, 2019) and BS8576 (BSI, 2013) indicates a clear understanding of available guidance.

3.57 The limited use of BS8485 (BSI, 2019) by Building Standards officers could be a reflection of reliance on the technical expertise of the EHO/ CLO when reviewing reports. However, this may be of concern in that the EHO/ CLO’s expertise often does not extend to detailed design of gas protection measures.

3.58 The limited use of EPS (2019) contaminated land guidance is surprising, either internally or for referral to developers. However, this may be a reflection of the absence of any reference to mine gas, although the guide does discuss ground / permanent gases. The guidance is intended to help developers, agents, consultants and regulators in their evaluation and management of land contamination. It provides

an opportunity for a consistent approach across Scotland, including mine gas impacted areas.

3.59 Training of LA staff on mine gas issues, for effective regulation is considered to be required by the majority of respondents. This is considered likely to be a reflection of the complexity of the area of mine gas risk assessment, or that mine gas issues are encountered infrequently.

# 4. Detailed stakeholder engagement

**Methodology**

4.1 At the outset of the project, it was intended to broadly identify two sub-groups of LAs to take forward to the detailed consultation:

- Group 1: Local authorities with clear evidence (documented or informal) of working relationships between the EHO/ CLO, Planning and Building Standards. These relationships will be present but may not successfully 'manage' internal dialogue to achieve a consistent and co-ordinated approach to managing the presence of $CO_2$ mine gas on a site.

- Group 2: Local authorities without any clear or regular working relationship between the EHO/ CLO, Planning and Building Standards. Relationships may be absent, but this does not necessarily mean that there is or will be a failure to manage the presence of $CO_2$ mine gas on a site. Expertise may be present in each of the three departments but with little or no interaction.

4.2 Based on the findings of the online survey, LAs did not always clearly fall into one of the two groups. Responses to Q11, specifically about having an existing framework, was found to vary between respondents at the same LA.

4.3 LAs where one or more respondents indicated they did not wish to participate in detailed consultation (Q30) were not considered for detailed engagement. LAs responding positively to Q30 were therefore broadly assigned to one of the two groups based on Q10, 11 and 17, which focused on working relationships between departments.

4.4 Eight LAs were contacted, with one declining due to current resourcing issues and a second contact not responding despite a number of attempts to engage. Six LAs were therefore taken forward to the detailed engagement. These were:

- Fife Council
- Falkirk Council
- Midlothian Council
- Renfrewshire Council
- Stirling Council
- Glasgow City Council (CLO only)

4.5 Following identification of the six LAs to take forward for detailed stakeholder engagement, a series of nine questions were developed for this phase. The

questions for discussion were developed around the requirements of the research project in the tender Schedule 2 – Specification document and analysis of the online survey responses received. The detailed consultation questions are presented in Annex B.

4.6 Virtual conferencing (Microsoft Teams) was used to facilitate the discussion around the questions, which were led by the RSK project team. With the exception of one LA, there were representatives from all three disciplines on each call. With the agreement of participants, the meetings were recorded for reference purposes. This was on the understanding that discussions were undertaken in confidence and responses are not attributed to individual participants or an individual LA and that recordings and notes would not be made available as part of the study.

4.7 Key findings are discussed in the following sections that cover:

- Interdepartmental relationships, roles and responsibilities (for identifying sites and reviewing of mine-gas related reports) and factors affecting them.
- Identification / screening of sites for mine gas including data sources used.
- Document management and information sharing.
- Specific planning conditions for land contamination and mine gas.
- Building warrant application requirements and mine gas, and how they are linked with planning applications.
- Peer review of reports – roles and responsibilities, technical capability.
- Processes in place to ensure that an amendment to the building warrant for the foundation design does not provide a risk of creating pathways for mine gas, and that decommissioning of gas monitoring well installations occurs.
- The role of site inspections in verification of remediation to mitigate the risks from mine gas.
- The need to supplement guidance or technical standards relating to the assessment and mitigation of mine gas risks to development.
- Examples of good practice or areas of improvement in the processes discussed.

**A. Interdepartmental relationships, roles, and responsibilities –**

**Working relationships**

4.8 None of the LAs had a formal written procedure in place identifying specific roles and responsibilities across the three disciplines for the regulation of mine gas risk to

development, or wider land contamination issues. This did not preclude effective working relationships between disciplines, which were present at a number of the LAs interviewed.

4.9 Key elements to achieving effective working relationships were trust between colleagues, relationships established over time and the ease with which officers were able to communicate and share information.

4.10 Disciplines being based in the same department (e.g. EHO/ CLO based in a Planning Department) was identified as being of benefit in some LAs. However, no LA identified the separation of disciplines into differing departments or sections within the LA, as being detrimental to having an effective working relationship. Having the same Head of Service across one or more disciplines was not seen as directly relevant to achieving an effective working relationship.

4.11 In one LA with an effective working relationship across all three disciples, all parties agreed this was a direct reflection of the relationship of the EHO/ CLO to either Planning or Building Standards. At this LA it was accepted there was limited direct communication between Planning and Building Standards, but EHO/ CLO facilitated the relationship as a central point of contact. However, in some other LAs consulted, while there is a strong relationship between Planning and EHO/ CLO, this is less so for EHO/ CLO and Building Standards who sometimes operate largely independently.

4.12 A good awareness of mine gas related issues by all three disciplines was identified as important where relationships were effective. This awareness related to the ground conditions (e.g. shallow workings) that were associated with potential mine gas risks, the consequences of not having effective means of regulating development where mine gas is an issue and in relation to the reports submitted as part of the development control process. This awareness was cited by a number of LAs to be directly related to an understanding of the Gorebridge incident and the findings of the resulting IMT report.

4.13 Within LAs where there is a good interdepartmental relationship in place (as agreed by all participants), this was effective where all parties understood which discipline took responsibility for identifying sites where there may be a potential mine gas issue (see Sections 4.20 to 4.33) and for reviewing submitted reports (see Sections 4.16 to 4.19). This effective relationship was supported by shared document management systems, discussed further in Section 4.34 to 4.43.

4.14 In LAs where there was a good level of interdisciplinary working, the EHO/ CLO at some of those LAs had provided internal training to other departments / officers in relation to land contamination. This enabled all those involved to have a better understanding of the subject and reporting requirements, which in turn facilitated effective communication with applicants and their consultants.

4.15 One LA had proactively held regular knowledge dissemination meetings relating to land contamination with some of the more prominent developers in their area. This

was considered to have been beneficial in achieving compliance with reporting requirements and the content of submitted reports.

**Roles and responsibilities for reviewing of submitted reports**

4.16 In all but one LA the EHO/ CLO normally, but not always, took the lead in reviewing the majority of reports. Where the EHO/ CLO consistently took the lead, the exception to this was for review of design reports for gas protection measures. The peer reviewing of reports is discussed further in Sections 4.49 to 4.59.

4.17 The exception to the EHO/ CLO taking the lead was one LA where individual Building Standards officers would make a judgement regarding their own level of technical competency in relation to the submitted report. Consultation with the EHO/ CLO was only undertaken if the Building Standards officer considered this necessary. This approach resulted in potential duplication of the review process and potentially leading to differing review comments being provided to the applicant and their consultant.

4.18 In relation to mine gas, suitability of use under planning is required to be considered under PAN 33 as part of the planning process, which identifies land contamination as a material planning consideration. Building standards mandatory standard 3.1 requires that buildings must be designed and constructed in such a way that there will not be a threat to the building or the health of people in or around the building due to the presence of harmful or dangerous substances. The assessment and mitigation in relation to mine gas should be comparable as it draws on the same underlying technical standards, guidance and codes of practice as referenced above.

4.19 In LAs with an effective interdepartmental, or interdisciplinary, relationship it was clear to all disciplines who took the lead in reviewing all types of submitted reports. This led to consistency in reviewing of reports and comments made in relation to the proposed development.

**B. Identification/ screening of sites where there is a potential mine gas issue**

**Key findings identified**

4.20 One of the key elements to effective regulation of potential mine gas issues is the early and accurate identification of developments where there is the potential for mine gas issues, irrespective of who undertakes or leads on that identification.

4.21 With a planning application typically preceding a building warrant application, the identification of sites potentially affected by mine gas normally falls in the first instance to the Planning department. It was evident from discussions that roles and responsibilities were more clearly defined between Planning and the EHO/ CLO, than between Building Standards and the EHO/ CLO. The roles, responsibilities and approach were the same for any land contamination issue and were not specific to mine gas.

4.22 From the consultation undertaken there appears to be at least three methods in place to 'screen' planning applications for potential mine gas issues before deciding who needs to be consulted:

- Selection of specific applications by Planning Dept. staff for review by EHO/ CLO staff based on GIS data, local knowledge etc.
- Review of weekly lists of planning applications by EHO/ CLO staff to select relevant applications for peer review.
- Planning departments consulted the EHO/ CLO on all non-householder applications, with the EHO/ CLO undertaking the identification and confirming when further information (i.e. submission of reports) should be obtained from the applicant.
- Mandatory submission of desk study / SI reports for all planning applications and peer review of these in advance of determining the application.

4.23 As per the first two items above, some Planning departments initially identified sites potentially affected by mine gas (or other contaminants) for which they requested further input from the EHO/ CLO on. Depending on the data source(s) used by planning when taking this approach (see Figure 3-1) this could lead to sites where there is a potential mine gas issue not being identified to the EHO/ CLO for further consultation. Where the same, comprehensive data sources are shared between the two departments, the identification of sites driven by planning was effective.

4.24 In the case of the fourth item above in Section 4.22, the onus is placed on the applicant to identify if there is a potential mine gas issue. The submitted report (desk study and/or SI report) is then subjected to review. This does still rely on an understanding of mine gas risk assessment to ensure the assessment and conclusions are appropriate and is also potentially more onerous in time and cost for internal or external peer review resources.

4.25 With a building warrant application, the identification of sites was influenced by the interdisciplinary relationship and the overall approach to both applications at the LA. At LAs where effective interdisciplinary relations were present, there was evidence of a technical, scientific and consistent approach to identifying such sites across all disciplines. Once a site had been identified during the planning application this identification was shared with Building Standards (normally through a shared document control system) and the process of identification was not repeated at the time of a building warrant application.

4.26 Where the interdisciplinary working was less effective at a LA, the identification of sites was undertaken separately by Building Standards with limited oversight of decisions that may have already been undertaken by Planning and/or the EHO/ CLO.

4.27 Building Standards, in the absence of GIS, relied on:

- circulation of a ‘weekly list’ of building warrant applications to the EHO/ CLO with reliance on them to identify sites. The ‘weekly list’ includes new applications and amendment applications. The EHO/ CLO will then undertake the identification process using a GIS or the CA interactive viewer.

- building standards officer judgement, followed by consultation with the EHO/ CLO

- building standards officer judgement only.

4.28 A shared GIS enables all disciplines to access the same data sources (GIS layer(s)) directly relating to ground conditions assisting in the identification of where mine gas may be a potential issue. These may include CA and British Geological Survey (BGS) data, as well as layers created by LA staff to detail local knowledge. One LA had been particularly proactive in adding data on mineshafts and shallow workings from sources other than the CA.

4.29 The shared GIS is also used for identifying potentially contaminated land unrelated to mine gas. If used effectively, sites can easily and consistently be identified on receipt of a planning or building warrant application. Potential development constraints can be identified, and can feed into the screening process for applications, or when reviewing submitted reports. In some LAs the GIS is inter-related with the LA data management software solution, identifying constraints to the development within a defined distance from the application site that may require further consideration.

4.30 However, understanding the GIS data sources available, and those which would support identification of mine gas sites, is key. The person(s) responsible for the management of the LA GIS data sources should be clearly identifiable, as should the age and provenance of the data sources. This was identified as a data gap at one LA where a GIS was used and shared across disciplines, but no discipline appeared to have ownership of the GIS following reductions in headcount.

4.31 One important finding related to two LAs who accessed limited data sources as part of the identification process, prior to internal consultation with the EHO/ CLO. These were LAs where mine gas issues were not considered to be routinely encountered (although there were noted to be Development High Risk Areas within their areas). Non-householder developments on greenfield sites were considered not to be of concern; a conclusion based on identification of contamination associated with past potentially contaminative activities at a site rather than on the underlying geology. Therefore, applications passed to the EHO/ CLO for additional technical input may fail to include all sites with potential mine gas issues.

4.32 Local Authorities who appear to be identifying sites effectively where there is a potential mine gas issue, are achieving this by: accessing a GIS with appropriate data sources; routinely using the CA interactive viewer to identify sites; or putting the onus on applicants to demonstrate through desk study/ SI reports whether or not this is an issue requiring assessment.

4.33 The identification of sites was undertaken only once at the planning application stage, with the findings being shared with (or accessible by) Building Standards. All disciplines at these LAs had a clear understanding of the risk drivers for developments where there may be a mine gas issue.

**Document management and information sharing**

4.34 Some but not all of those LAs with clear evidence of effective working relationships between the EHO/ CLO, Planning and Building Standards also had shared document management systems. Where there was an effective working relationship, but no shared document management system, reports and peer reviews were proactively shared and stored separately by each discipline. Such shared systems used by LAs are commercially available and those referred to included Oracle and Northgate M3PP.

4.35 These systems have modules for each discipline, linked through a property gazetteer. When all disciplines have access to each other's modules, they can readily access submitted reports and comments made in relation to those reports. In addition, all parties can view related documents for the planning or building warrant application. This enables more efficient working and consistency between departments.

4.36 Building Standards officers, on receipt of a building warrant application, are able to check that (i) a planning application has been made, (ii) what relevant information has already been submitted and when (e.g. report versions) and (iii) what comments have been made in relation to those reports. This can avoid duplicating reviews and can ensure that the approach to regulation and enforcement in relation to potential mine gas risks is considered during the development control process.

4.37 In LAs where there was no shared document management system, staff from different disciplines have to work harder to share relevant information. In some of these LAs sharing submitted reports, and review comments in respect of those reports, was ad-hoc and often not undertaken. In the absence of clear roles and responsibilities, combined with shared document management systems, the same report could be reviewed by different officers with differing interpretation and comments presented to the applicant.

**C. Specific planning conditions for land contamination**

**Key findings identified**

4.38 The detailed engagement focused on developments where planning permission is required, with only limited discussion relating to householder permitted development rights. However, concern was raised by some consultees that this places a greater onus on the building warrant process with the shorter timescales for processing applications not typically compatible with those for undertaking ground gas monitoring and assessment.

4.39 The use of standard (generic) and mine gas specific planning conditions were considered as part of the online survey (see Section 3.5 to 3.26). Standard conditions require the submission of reports (see Section 1.50 to 1.56) relating to land contamination in the broadest sense, commencing with a desk-based review of potential constraints to development, through to intrusive site works and risk assessment, remediation and verification.

4.40 During the detailed engagement no LA stated they routinely used mine gas specific conditions. However, bespoke planning conditions were used by one LA specifically in relation to a geographic area where minimum gas protection measures were requested on all new build developments (equivalent to Characteristic Situation 2 under BS8485 (BSI, 2019)). A full intrusive site investigation and mine gas risk assessment were still required by that LA, irrespective of the mandatory requirement for gas protection measures in the defined geographic area.

4.41 One LA applied standard land contamination planning conditions to all non-householder new build developments. This is broadly comparable to the approach taken by another LA (not taken forward to detailed consultation) where a desk study and/or SI is required prior to determining the planning or building warrant application for all residential development.

4.42 None of the consultees felt that mine gas specific planning conditions were required except in very specific circumstances. Standard planning conditions, provided it was clear to the applicant what was required in relation to those conditions, were adequate to cover mine gas related issues. A number of the consultees commented that the current trend is toward simplifying the use of generic conditions and Planning departments are often resistant to application-specific conditions. At least one consultee felt that standardising planning conditions across all local authorities in Scotland would be beneficial in terms of consistency and creating a level playing field for all stakeholders.

4.43 A key point (discussed further in Sections 4.71 to 4.74) related to the LA being able to provide supporting guidance documents to the applicant/ consultant in relation to what was specifically required in relation to mine gas. This discussion primarily focused on the decommissioning of gas monitoring well installations. CL:AIRE (2021) guidance document good practice for risk assessment for coal mine gas emissions does fulfil this need and includes detailed guidance on site investigation and risk assessment, as well as the importance of decommissioning site investigation monitoring wells.

**Building warrant application requirements and mine gas**

4.44 In relation to building warrant applications, the detailed engagement focused on new developments, with only limited discussion relating to extensions or other minor works. Reports evidencing compliance, at the design stage, with mandatory standard 3.1 are submitted in advance of the building warrant being granted.

4.45 Local Authorities varied in the reports required to support a building warrant application, with the majority routinely requiring a desk study, and SI and remediation strategy reports as relevant. One LA focused more on the submission of geotechnical reports rather than geo-environmental reports where mine gas (and land contamination) would be considered.

4.46 Where there were effective interdisciplinary relationships and the sharing of reports, the relevant information relating to mandatory standard 3.1 that had already been submitted in connection with the planning application was accessed by Building Standards at the time of the application. Where a LA did not have shared document management systems, the reports were requested again by Building Standards. Two Building Standards departments requested the submission of a desk study to accompany the building warrant application as a default.

4.47 In a number of the LAs consulted there is no formal check on receipt of a Building Warrant application that there is a linked planning application.

4.48 It was acknowledged by a number of LA consultees that if Building Standards relied on previously submitted reports (i.e. to Planning) these may no longer be current if time has elapsed or if assumptions made about building design had changed.

**Peer review of reports**

4.49 The discipline reviewing reports varied depending on the relationship between Planning, the EHO/ CLO and Building Standards. No Planning Department took responsibility for reviewing submitted reports, always delegating this to the EHO/ CLO. In LAs where there was a good level of interdisciplinary working, responsibility for reviewing the majority of submitted reports was allocated to the EHO/ CLO by either Planning or Building Standards. Where there was a lower level of interdisciplinary working, the Building Standards officer made the decision if reports were delegated to the EHO/ CLO to review or reviewed internally.

4.50 For at least two LAs the EHO/ CLO reviewed each report in accordance with a structured review template, summarising the data presented and identifying any aspects that required further clarification. Where the EHO/ CLO reviewed the submitted report, they would advise Planning of the suitability of the submitted reports in relation to the planning application or appended planning conditions to the Decision Notice. This review would be electronically filed, associated with the planning application and property gazetteer reference. The report and review would be accessible to Building Standards as, and when, a building warrant application was made.

4.51 One LA sought external peer review for all submitted reports and other LAs are known to do this also. This was to ensure consistency in the reviews and the required level of technical expertise to review those reports.

4.52 During some interviews, the EHO/ CLO was specifically asked, when reviewing reports, if mine gas migration to existing off-site receptors was specifically

considered. This included consideration by the environmental consultant within the submitted report, and also consideration by the EHO/ CLO reviewing the submitted report. The consideration of off-site receptors was rarely seen in reports. The impact of a development, through the development itself or preparatory enabling works, on gas migration is not a frequent occurrence. However, when this occurs the potential risks can be significant. The previous report (SG, 2019a) also identified that off-site gas migration was an area currently lacking in detail within a risk assessment.

4.53 In LAs where there were gaps in interdisciplinary working, in some cases Building Standards would request review of relevant reports by the EHO/ CLO. In others, reports were accepted by Building Standards without review or were reviewed by the Building Standards officer if they considered it was within their level of competency.

4.54 Design reports and associated drawings prepared to detail proposed gas protection measures in accordance with BS8485 (BSI, 2019) reports were specifically discussed with all LAs consulted. Such reports can be complex, require an understanding of foundation and building design and how this interacts with mitigation needed of identified mine gas risks.

4.55 It was found that design reports were not consistently requested or submitted when gas protection measures were identified as being required. This may be due to a lack of awareness of applicants and their consultants in relation to BS8485 (BSI, 2019).

4.56 The detailed engagement interviews also identified there was inconsistency and uncertainty within a number of LAs regarding the discipline taking responsibility for the review of design reports.

4.57 In some LAs the EHO/ CLO felt competent to review design reports up to a certain complexity (e.g. standard building details, Characteristic Situation 2 only), whereas others felt that this should be the role of Building Standards due to their greater understanding of foundation and building design. One LA stated that if the reports were complex, they sought external peer review of the report.

4.58 However, not all Building Standards officers interviewed felt they had sufficient competency to review design reports. In some LAs if design reports were submitted, they were not reviewed in detail, with reliance placed on the applicant's design engineer to have appropriately designed and specified gas protection measures, installation and verification plans.

4.59 Verification reports demonstrating that the gas protection measures have been installed and verified appropriately were consistently required and reviewed in many LAs in relation to discharge of relevant planning conditions. One LA Planning department did not always ensure a verification report was submitted and did not proactively monitor compliance with planning conditions in this regard, which would appear to be a gap in regulation of mine gas risk.

**The role of site inspections in verification of remediation to mitigate the risks from mine gas**

4.60 With respect to Building Standards there were differing views with two LA departments stating that they did not routinely require the submission of a verification report, relying instead on officer inspections. This is in contrast to the initial consultation which indicated reliance on the verification report, sometimes supplemented by site inspections. Some consultees also felt that verification reports couldn't be used as supporting evidence for a Completion Certificate submission. This is possibly because verification reports are not covered within the technical handbooks.

4.61 Where there was a good level of interdisciplinary working, the reports submitted, and reviews of those reports, were shared between Planning and Building Standards. In LAs where there were gaps in interdisciplinary working, verification reports were not routinely shared between departments. This can lead to reports being required to be submitted twice, and the applicant potentially being presented with differing or conflicting comments on the report.

**Processes in place to ensure that an amendment to the building warrant for the foundation design does not provide a risk of creating pathways for mine gas**

4.62 Foundation design is not always known, or may be incomplete, at the time of the planning application and submission of the mine gas risk assessment (contained within a SI report) and related remediation strategy. Changes to foundation design may have implications for the previous prepared and approved SI report and remediation strategy via the creation of preferential gas migration pathways. Furthermore, mine grouting/ stabilisation works at a site may alter the ground gas regime, the implications of which may not have been considered fully at the time of preparing the SI report and/or remediation strategy. This was specifically cited by one LA where, following consultation, the CA required specific ground stabilisation works. This then had resulting implications for the ground/ mine gas risk assessment prepared on the basis of no ground stabilisation works.

4.63 Foundation design changes can occur before the building warrant application is made or during construction (i.e. after issue of the Building Warrant). It is noted that significant changes to foundation design are not common but can have significant implications in relation to gas migration when they do occur (such as cited in the Gorebridge IMT report).

4.64 Such design changes should come to light during the building warrant application process. However, it is also possible that an amendment to the foundation design is only identified by Building Standards at the time of the Completion Certificate submission. The onus is on the applicant for the Completion Certificate to ensure mandatory standard 3.1 has been satisfactorily complied with. The LA verifier will make reasonable enquiry to that effect.

4.65 All LAs consulted agreed that identifying foundation amendments in relation to potential mine gas risks could be missed as was identified as a factor in the Gorebridge incident. Identifying such amendments is important to ensure that any implications for the mine gas risk assessment are considered and any changes required to the design of gas protection measures have been identified and appropriately designed (or redesigned). On receipt of an application to amend a building warrant, the Building Standards officer would need to be aware of the potential implications for mine gas issues previously identified, and action that accordingly. If the EHO/ CLO was consulted on all amendment applications, it would be time consuming to cross reference these with previous applications where mine gas issues had been identified. This is where the design reports and verification reports should ensure that gas protection measures have been designed and installed appropriately.

**D. Decommissioning of gas monitoring well installations or other boreholes**

**Key Issues identified**

4.66 Gas monitoring wells, installed as part of intrusive site works for geo-environmental, geotechnical or mining purposes, can create preferential pathways for gas migration from workings at depth to the surface or near surface, and from there to ingress into buildings. This was identified as a factor in the Gorebridge incident and cited in the Gorebridge IMT report.

4.67 It is therefore good practice for the decommissioning and sealing of gas monitoring wells to be discussed in the remediation strategy with evidence of this having been completed being presented in the verification report.

4.68 However, guidance documents discussing this in relation to gas migration are very limited. Those LAs that sought decommissioning on a site-specific basis stated that it was often hard to justify this to an applicant and their consultant without guidance to refer them to setting out the rationale for this. SEPA (undated) and Environment Agency (2012) guidance on decommissioning redundant boreholes and wells are focused on the protection of groundwater only.

4.69 Decommissioning of monitoring wells was routinely required by two LAs when it was identified the monitoring wells could act as a preferential pathway for gas migration. Others were unaware of this good practice approach in relation to mine gas, with one LA stating in the absence of supporting guidance it was regularly very difficult to persuade applicants and their consultants of the need for decommissioning. If decommissioning was undertaken or proposed to be undertaken, several LAs cited the difficulty of locating all monitoring wells and hence a failure of the developer to be able to undertake complete decommissioning across a site. The CL:AIRE (2021) Good practice for risk assessment for coal mine gas emissions has since been published and includes reference to the need for decommissioning of site investigation wells in the watch note of Section 12.2 on site investigation and

reiterates this within its key conclusions and recommendations. This should hopefully provide sufficient weight to persuade applicants of the need to decommission wells.

4.70 No LAs required decommissioning as part of a mine gas specific planning condition. This was required as part of the remediation strategy, with supporting evidence provided in the Verification report.

**E. The need to supplement guidance or technical standards relating to the assessment and mitigation of mine gas risks to development**

**Key issues identified**

4.71 Consultees were asked about whether they felt there was a need to update existing land contamination technical guidance, supplementary planning guidance or the Building Standards technical handbooks (domestic and non-domestic; SG, 2020b) in relation to mine gas issues. It is noted that the more recent June 2023 editions of the Building Standards technical handbooks still do not include any guidance or reference to mine gas (or ground gas).

4.72 Additional technical guidance is required in relation to mine gas risk assessment. This issue was not considered in detail as it was covered in the 2019 research report (SG, 2019). As noted previously, the CL:AIRE (2021) Good practice for risk assessment for coal mine gas emissions has since been published and includes detailed guidance specific to mine gas investigation and risk assessment.

4.73 Where a LA used the EPS (2019) 'Land contamination and development guidance' there was a consensus that additional sections relating to mine gas would be beneficial to all parties involved in the development process. Currently guidance on mine gas risk assessment, and on decommissioning of gas monitoring well installations was agreed by all LAs consulted to be limited. Where a LA had internal Supplementary Planning Guidance prepared relating to land contamination, it was agreed these could benefit from the inclusion of mine gas. However, it is noted that support may be needed for LAs to draft relevant sections and ensure consistency in the approach across Scotland.

4.74 All LA consultees agreed unanimously that additions to the two Building Standards technical handbooks were required in relation to mine gas (and ground gas). With regard to mandatory standard 3.1 some were of the view that the technical handbooks are not adequate given that they do not mention mine gas or even ground gas. Some consultees commented that the lack of specific reference to ground gas in the technical handbooks has led to push back from developers when more information is requested in support of a building warrant. With 2023 updates to the technical handbooks continuing to omit mine gas and ground gas, this issue persists.

4.75 As a minimum some consultees felt that the technical handbooks should refer to key technical standards and guidance, e.g. BS8485 (BSI, 2019), CIRIA (2007, 2014) C665 and C735. Clarity on what is required for verification to support acceptance of the completion certificate, including the value and importance of the independent

verification report required to comply with BS8485 (BSI, 2019) / CIRIA C735 (2014). The consultees acknowledged that there was a balance to be achieved between being overly prescriptive and ensuring the required information was submitted in relation to mandatory standard 3.1.

**Examples of good practice or areas of improvement in the processes discussed**

4.76 In summary, areas of good practice identified in the detailed consultation phase are as follows:

- Clearly defined roles and responsibilities, in relation to mine gas and development control. Understanding of each other's roles and overlapping areas of technical capability leads to effective regulation.
- One of the key elements to effective regulation of potential mine gas issues is the early and accurate identification of developments where there is the potential for mine gas issues. The shared GIS is also used for identifying potentially contaminated land unrelated to mine gas.
- Relevant datasets that are up to date and held in shared GIS are used to identify/ screen sites, and all officers are aware which are applicable to understanding potential mine gas issues.
- A shared document management system leads to effective regulation of mine gas issues.
- Linking Building Warrant applications to planning applications supports the consistency of regulation and avoids duplication of effort.
- Peer review of all submitted reports, with the exception of design reports, (using a structured review template) is led by the EHO/ CLO.
- Where needed, relevant planning conditions are agreed between the Planning Officer and the EHO/ CLO.

4.77 Areas for improvement identified are:

- Reports that cover suitability for use and mandatory standard 3.1 should only be subject to peer review by one discipline, with consistent comments being returned to the applicant/ developer.
- Consideration of off-site receptors is an area currently lacking in detail within mine gas risk assessments.
- There is a lack of awareness, and technical capability, in some LAs in relation to peer review of design reports for gas protection measures.

- Decommissioning of gas monitoring wells is poorly understood by applicants/ developers/ consultants. There is a lack of technical guidance with regards to decommissioning requirements.

- Additional technical guidance is required in relation to mine gas risk assessment.

- Planning guidance and Building Standards technical handbooks require additional information on mine gas risk assessment.

- The use of radon maps for the identification of potential mine gas issues is not considered to be a suitable line of evidence.

# 5. Proposal for good practice for processing applications

### Introduction

5.1 A key output of the current research project is to develop a recommended approach to good practice with the aim of achieving a scientifically robust and consistent approach to the risks posed by mine gas to development under both planning and building standards regimes. LAs may find that some, or all of the good practice approach can be adopted.

5.2 The good practice approach developed relates specifically to new development in coal mining affected areas, and the appropriate assessment and mitigation of risks relating to mine gas. It does not consider other mine related risks such as unsealed mine entries or subsidence. There may be further coal mining related risks that should be considered over and beyond mine gas, which are not covered by the proposed good practice approach.

5.3 It is acknowledged that it is the responsibility of the developer to undertake an adequate risk assessment of a site, and to propose measures to ensure that these risks are appropriately addressed. However, the proposed good practice approach, including technical peer review of submitted reports, is recommended to improve the consistency of regulation to help avoid a recurrence of the Gorebridge incident at other localities.

5.4 The proposed good practice approach has been written on the assumption the proposed updates to the 2023 Building Standards Technical Handbooks recommended in Section 6 are completed.

5.5 The principles of the good practice approach presented may have wider applicability to the regulation of ground gas from other sources and wider land contamination issues, although it has been developed specifically in the context of $CO_2$ mine gas.

5.6 Annex C presents a flow chart setting out a proposed process for good practice in the regulation of mine gas risk to development under planning and building standards. The process presented in the flowchart (see Note 9) occurs in parallel to consultation with the CA as a statutory consultee under the planning regime. The flow chart is focused towards non-householder applications. Applications for small domestic extensions to existing buildings are not specifically covered but some of the principles may be relevant to such applications. For householder extensions, consideration should be given to available information on existing gas protection measures at the property.

5.7 Based on the findings of the consultation undertaken in this and the previous project (SG, 2019a), EHO/ CLO are identified as the discipline with the greatest expertise in

the area of mine gas risk assessment. Building Standards officers typically have the greater expertise in reviewing detailed design drawings and specifications.

5.8 On this basis, this good practice approach assumes that the EHO/ CLO would lead on 'screening' sites for mine gas and in undertaking peer review of desk study and SI reports assessing mine gas risks to development. Building Standards officers would typically lead the review of design reports for gas protection measures, possibly with support from EHO/ CLO. Verification reports are likely to be reviewed by both EHO/ CLO and Building Standards officers (where submitted as part of the supporting evidence for a Completion Certificate submission).

5.9 As noted in the findings of the consultation, there are differences in some local authorities in terms of where this expertise may lie, and it is acknowledged that the roles and responsibilities proposed on Annex C and discussed in Section 5 may be a simplification.

5.10 The process described does not specifically cover consultation with the CA, which is likely to be occurring in parallel as they are a statutory consultee for all developments in areas of former or proposed coal workings. Although CA comments are focused primarily on geotechnical risks, there may be relevant information on mine gas provided. Also, mitigation undertaken to address geotechnical risks, e.g. grouting of shallow workings or sealing of mine entries, will have implications for the assessment and mitigation of mine gas risks. The two processes therefore need to be linked.

5.11 Each of the key stages is discussed in detail below.

**Receipt of planning application – screening for mine gas risks**

5.12 On receipt of a planning application, initial validation checks are undertaken by Planning/ Development Management officers. Some local authorities require desk studies and/ or site investigation reports for all sites under local plans or supplementary planning guidance therefore the screening step is not required.

5.13 Screening of applications for mine gas should be undertaken alongside potential land contamination risks in a consistent manner. The identification of sites with potential mine gas (or land contamination) issues is undertaken by either Planning or the EHO/ CLO. The designated person responsible for the screening is clearly identified and known to all disciplines. Where the screening is undertaken by Planning staff, input from the EHO/ CLO and/or any Minerals Officers, is likely to be valuable due to their technical expertise and local knowledge.

5.14 The datasets used for the screening are relevant and up to date. In relation to mine gas these include, as a minimum, Coal Mining Reporting Areas and Development High Risk Areas, which are publicly available on the CA interactive viewer, and relevant local information held by the LA. The Coal Mining Reporting Area is the entire coalfield area, made up of Development High Risk and Development Low Risk areas. A Development Low Risk Area (85% of the coalfield area, UK-wide) is the part of the Coal Mining Reporting Area which contains no recorded coal mining legacy

risks to the surface (CA, 2021). The Development High Risk Area (15% of the coalfield area, UK-wide) is the part of the Coal Mining Reporting Area where coal mining risks are present at shallow depth which are likely to affect new development (CA, 2021). Consideration of mine gas issues is needed for both Development High Risk and Development Low Risk areas. Reference to the CL:AIRE 2021 good practice guide's decision tool can be made for screening of sites for mine gas risk.

5.15 Table 5-1 summarises key information relevant to screening of planning applications for mine gas risk.

**Table 5-1. Data relevant to screening of planning applications for mine gas risk**

| Data type | Source | Implication |
|---|---|---|
| Site within a CA coal mining reporting area | GIS layer or CA interactive viewer | Mine gas issues do need to be considered at desk study stage as a minimum. CA consultation required |
| Site within a CA development high risk area | GIS layer or CA interactive viewer | Potentially higher risk may need more detailed assessment. CA will require a CMRA |
| Mine entries on site or within 50 m[1] of site boundary | GIS layer, LA data or CA interactive viewer | Potentially higher risk, likely to need more detailed assessment. Mine entries likely to be subject to investigation and possibly treatment |
| Past or probable shallow[2] coal workings on site or within 50 m[1] of site boundary | GIS layer, LA data or CA interactive viewer | Potentially higher risk, likely to need more detailed assessment. Shallow workings may need to be grouted to address stability issues |
| Previous or alleged mine gas incident on site or within 500 m[3] of site boundary that required CA investigation and action | LA knowledge, CA data/ CA consultants' reports | Potentially higher risk, likely to need more detailed assessment to understand causes |
| Notes<br>[1] 50 m is taken as a pragmatic distance and that viewable on a GIS layer<br>[2] Areas where the CA believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).<br>[3] 500 m is that reported in a CA Consultants Report | | |

5.16 A decision record should be kept of the outcome of the screening, such as on the planning application record or shared document management system.

**Submission and review of desk study and site investigation report**

5.17 The good practice approach presented recommends that a desk study report should always be submitted prior to the decision being made as to whether to grant planning permission. Where the site is located in a Coal Mining Reporting Area, the desk

study report should always incorporate a Consultants Coal Mining Report procured from the CA with the findings interpreted in the report. The Consultants Coal Mining Report provides additional information over and beyond a CA CON29M report, which is intended for conveyancing only. Additional information from the CA may be relevant including details of mine entries, mine abandonment plans and gas or groundwater monitoring data. Information from the Desk Study and CA consultant's coal mining report should always be considered against the CL:AIRE 2021 good practice guide's decision tool to apply a risk zone to the site.

5.18 Where the desk study report identifies the potential for mine gas risks to the proposed development, an SI report incorporating a mine gas risk assessment shall be required before development commences. This should apply irrespective of development type, e.g. residential, public amenity, commercial etc.

5.19 The SI report should preferably be submitted prior to the decision being made on whether to grant planning permission. This is because the SI report and associated mine gas risk assessment need to be able to demonstrate that the risks can be suitably mitigated for the proposed development prior to planning permission being granted. Land contamination (including mine gas) is noted to be a material planning consideration. Also, the peer review may identify the need for further site investigation or monitoring which can be time consuming.

5.20 Reports submitted are peer reviewed by the CLO/EHO against current and relevant standards and technical guidance. Depending on the complexity of the mine gas / land contamination issues identified in the desk study/ site investigation report, external peer review support may be required. The report(s) is either a) accepted and recommendations regarding relevant planning conditions to include are made by the CLO/EHO to Planning or b) subject to on-going review until review comments have been addressed to the satisfaction of the CLO/EHO.

5.21 The findings of the review(s) are documented and retained on a shared document management system, and directly linked to a property gazetteer. The shared document management system is accessible to all three disciplines (Planning, EHO/ CLO and Building Standards). Where applicable, acceptance of the report(s) leads to discharge of the relevant planning condition (or part thereof).

5.22 The peer review of submitted reports should follow a structured and clearly documented process. The review should consider suitability for use under PAN 33 and the recommendations of supplementary guidance (e.g. EPS). This could include publications by the Scottish Government. And specific LAs. The EPS (2019) guidance is also of value in this regard. Suggested key elements and a proposed format for the peer review process in relation to all report types to support the good practice recommendations, are presented in Annex D.

5.23 For efficiency purposes it is recommended that the peer reviews of reports also consider Building Warrant requirements in terms of complying with mandatory standard 3.1 in relation to harmful and dangerous substances.

5.24 The peer review considers if a remediation strategy is required before the application can be determined, or if submission of the remediation strategy report can be conditioned. Recommendations are made for relevant planning conditions to be agreed between the Planning Officer and the EHO/ CLO.

**Planning decision and setting conditions**

5.25 Where the decision is made by the LA to grant planning permission, the planning conditions should be attached to the Decision Notice to address the remaining requirements in relation to mine gas. Standard conditions used for assessment and remediation of land contamination risks are likely to be suitable to encompass mine gas risks on many sites. These reflect the report(s) submitted prior to the decision on whether to grant planning permission, and the further submissions required. Such conditions would normally require the submission of a SI report if not required at the application stage, and where applicable, a remediation strategy including a verification plan, and a verification report.

5.26 Where there are specific considerations for mine gas on a particular development the use of bespoke planning conditions should be considered. Examples could include the impact of mine grouting or decommissioning of boreholes. Where development-specific conditions are required, there should be input from EHO/ CLO staff to agree the appropriate wording.

5.27 Where the peer review, if undertaken in advance of the decision to grant planning permission, indicates that mine gas risks cannot be suitably mitigated for the proposed development then the application should be refused. An example would be for Characteristic Situation 4 (CS4). BS8485 (BSI, 2019) states that 'residential buildings should not be built on CS4 or higher [risk] sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.'

**Submission and review of remediation strategy**

5.28 The remediation strategy, if identified as being required, is typically submitted after the granting of planning permission. If the remediation strategy has been prepared in advance of the grant of planning permission, it may be reviewed earlier in the development control process.

5.29 Where applicable, the report will describe measures to be taken to decommission boreholes that could represent a preferential pathway for mine gas to migrate to the surface or into permeable strata.

5.30 The submitted report is peer reviewed by the CLO/EHO, in the context of the previously reviewed desk study and SI reports. Depending on the complexity of the remediation being proposed, external peer review support may be required. The report is either a) accepted and recommendations regarding relevant planning

conditions to include are made by the CLO/EHO to Planning or b) subject to on-going review until review comments have been addressed to the satisfaction of the CLO/EHO. The findings of the review(s) are documented and retained on a shared document management system, and directly linked to a property gazetteer. Where applicable, acceptance of the report leads to discharge of the relevant planning application (or part thereof).

5.31 The peer review follows a structured and clearly documented process. Suggested key elements of the peer review process in relation to all report types are presented in Annex D. The key elements of the report types requiring peer review are those that would be expected to be presented in a report prepared by a suitably qualified geo-environmental consultant where mine gas is a potential issue. The review should consider suitability for use under PAN 33 and mandatory standard 3.1 in relation to harmful and dangerous substances.

**Aspects specific to building warrant applications**

5.32 On receipt of a building warrant application, a check should be made by Building Standards for an existing planning application and its status. These applications should be linked.

5.33 If mine gas-related reports have been submitted directly in connection with the building warrant application, they should be cross referenced with those previously submitted earlier in connection with the linked planning application. Where there is a shared document management system, directly linked to a property gazetteer, all previous documents and correspondence can be viewed. Checks are made with the CLO/EHO in relation to reports directly relevant to mandatory standard 3.1 have previously been submitted. Such reports will additionally consider mandatory standard 3.2 for radon gas. These checks should identify if the previously submitted reports are considered to be sufficiently up to date at the time of the building warrant application.

5.34 If there is no linked planning application, the initial Building Standards application validation checks should include screening for potential land contamination risks, including mine gas. The datasets used in the screening are those used by planning and/or the CLO/EHO to screen a planning application submission. Table 5-2 summarises key information relevant to screening of building warrant applications for mine gas risk.

5.35 Screening of building warrant applications for mine gas should be undertaken alongside potential land contamination risks in a consistent manner. The identification of sites with potential mine gas (or land contamination) issues is undertaken by either Building Standards or the EHO/ CLO. The designated person responsible for the screening is clearly identified and known to all disciplines. Where the screening is undertaken by Planning staff, input from the EHO/ CLO and/or any Minerals Officers, is likely to be valuable due to their technical expertise and local knowledge.

**Table 5-2. Data relevant to screening of building warrant applications for mine gas risk**

| Data type | Source | Implication |
|---|---|---|
| Site within a CA coal mining reporting area | GIS layer or CA interactive viewer | Mine gas issues do need to be considered at desk study stage as a minimum. CA consultation required. |
| Site within a CA development high risk area | GIS layer or CA interactive viewer | Potentially higher risk may need more detailed assessment. CA will require a CMRA |
| Mine entries on site or within 50 m of site boundary[1] | GIS layer, LA data or CA interactive viewer | Potentially higher risk, likely to need more detailed assessment. Mine entries likely to be subject to investigation and possibly treatment |
| Past or probable shallow coal workings[2] on site or within 50 m of site boundary[1] | GIS layer, LA data or CA interactive viewer | Potentially higher risk, likely to need more detailed assessment. Shallow workings may need to be grouted to address stability issues |
| Previous or alleged mine gas incident on site or within 500 m of site boundary that required CA investigation and action[3] | LA knowledge, CA data/ CA consultants' reports | Potentially higher risk, likely to need more detailed assessment to understand causes |
| Grouting / consolidation works completed as part of the planning application or previously by others | Planning application, CA comments/ conditions, LA knowledge | Grouting of mine workings / shafts undertaken onsite can have implications for the mine gas regime and may have taken place prior to a building warrant application |
| Existing buildings on site have gas protection measures installed | GIS layer, LA data or knowledge | Potentially higher risk, likely to need more detailed assessment. Extensions likely to need gas protection measures to tie into existing measures |
| Foundation type – vibro-stone columns. Piled foundations | Building warrant application and associated drawings | Potentially higher risk, likely to need more detailed assessment to determine whether foundation type could create preferential, pathways for migration from mine workings to surface or into permeable strata |
| Deep drainage | Building warrant application and associated drawings | Potentially higher risk, likely to need more detailed assessment to determine whether drainage could create preferential, pathways for migration from mine workings to surface or lateral migration |

| Data type | Source | Implication |
|---|---|---|
| Notes<br>[1] 50 m is taken as a pragmatic distance and that viewable on a GIS layer<br>[2] Areas where the CA believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).<br>[3] 500 m is that reported in a CA Consultants Report | | |

5.36 The criteria for needing a desk study, SI report and remediation strategy to address mine gas issues should be the same as for a planning application. Peer review of these reports should be undertaken desk study by the CLO/EHO as detailed above, seeking external peer review if required.

**Review of design report for gas protection measures**

5.37 Where gas protection measures are required for the development and outlined in the remediation strategy, the detailed design and specification of the protection measures should be recorded in a design report. For standard construction details or lower risk sites there may be sufficient information in the remediation strategy report. Information in the remediation strategy should, however, include that required in BS8485 (BSI, 2019) in relation to a design report, but does not necessarily need to be presented as a standalone report. However, for non-standard construction details for a CS2 site or for higher risk sites (CS3 or above), it is recommended that a design report should be submitted.

5.38 The design report is specific to the design and construction of the gas protection measures and how these tie into the detailed design of the proposed buildings. The design report will additionally provide a verification plan for the installation of the gas protection measures in accordance with BS8485 (BSI, 2019) and CIRIA C735 (CIRIA, 2014). BS8485 (BSI, 2019) makes reference to C735 in relation to verification. The reports are therefore directly applicable to address mandatory standard 3.1 for a building warrant. They may also need to be considered as part of discharge of relevant planning conditions and this is likely to need to be agreed on a case by case basis between the EHO/ CLO and Planning officer.

5.39 The report is reviewed by the CLO/EHO or building standards officer, depending on the technical complexity of the gas protection measures and the technical competency of either discipline. Depending on the complexity of the gas protection measures external peer review support may be required. Examples of this include complex ventilation calculations or non-standard design of gas protection measures. The discipline reviewing the report should do so in the context of the previously reviewed (and accepted) desk study, SI and remediation strategy reports.

5.40 The design report (and associated drawings) is either a) accepted by the designated reviewer and recommendations are made to Planning or Building Standards or b) subject to on-going review until review comments have been addressed to the

satisfaction of the reviewer. The findings of the review(s) are documented and retained on a shared document management system, and directly linked to a property gazetteer.

**Building warrant approval**

5.41 Building warrant approval is granted following acceptance of the relevant reports, each of which have been subject to peer review by the designated officer(s) at the LA.

5.42 Applications for amendments to the building warrant, which have potential implications for mine gas risks or the previously agreed design of gas protection measures, are considered (see Annex D). The CLO/EHO is consulted on the amendment application, following the same review process of submitted reports as for the original application.

**Installation and verification of gas protection measures**

5.43 The installation and verification of the approved gas protection measures is undertaken by an independent party on behalf of the developer, to inform the verification report. The third party may hold accreditation under the CL:AIRE Gas Protection Verification Accreditation Scheme (GPVS). The scheme applies to both the practical installation of the gas mitigation measures and to the verification reporting process. The GPVS is not mandatory but seeks to raise standards in membrane inspection, verification and reporting. Use of the scheme is intended to provide all stakeholders involved in land contamination management with confidence that risks associated with ground gases have been adequately managed.

5.44 Independent checks may be undertaken by Building Standards officers, depending on the approach taken by the LA, and as set out in the Construction Compliance and Notification Plan (CCNP).

**Review of verification report**

5.45 A verification report is submitted by, or on behalf of, the developer/ applicant as part of an application to discharge relevant planning conditions.

5.46 The Relevant Person signing and submitting the building warrant Completion Certificate should have a copy of the verification report and have satisfied themselves of its adequacy. The verification report should provide the evidence that the proposed gas protection measures have been installed appropriately. In relation to the building warrant, the verification report should ideally accompany the completion certificate, although there is no legal requirement for this. It would however be beneficial if the Building Standards Technical Handbooks were to be updated to make specific reference to the importance of ground gas verification reports.

5.47 The submitted verification report in connection with the planning application is peer reviewed by the CLO/EHO, in the context of the previously reviewed remediation strategy and/ or design report, where applicable. Depending on the complexity of the gas protection measures being verified, external peer review support may be required. Where applicable, the report will include measures taken to decommission boreholes that could represent a preferential pathway for mine gas to migrate to the surface or into permeable strata.

5.48 The report is either a) accepted and recommendations regarding discharging relevant planning conditions are made by the CLO/EHO to Planning or b) subject to on-going review until review comments have been addressed to the satisfaction of the CLO/EHO. The findings of the review(s) are documented and retained on a shared document management system, and directly linked to a property gazetteer. If the verification report is not considered adequate in relation to gas protection measures and planning conditions, it is good practice that this opinion is shared with Building Standards prior to Building Standards accepting the Completion Certificate.

5.49 All disciplines are in agreement of the acceptability of the verification report in relation to suitability for use under PAN 33 and mandatory standard 3.1 in relation to harmful and dangerous substances. Where applicable, acceptance of the report leads to discharge of the relevant planning application (or part thereof).

**Acceptance of building warrant completion certificate**

5.50 Following acceptance by the CLO/EHO and/or Building Standards of the verification report, the Completion Certificate is accepted by Building Standards. Acceptance of gas protection measures may be for individual plot(s), with an overarching verification report submitted in relation to the entire site/ or specific phases once development is completed. If using the peer review template in Annex D, relevant review points within Table 2d can be used to support a peer review of gas protection measures as the sample principles apply.

# 6. Conclusions and recommendations

### Key findings

6.1 The initial and detailed consultation undertaken in this project with local authority officers in Planning and Building Standards and in EHO/ CLO roles has revealed the following key findings.

6.2 There is a good level of awareness of issues relating to mine gas risk to development following the Gorebridge incident and the 2019 research report (SG, 2019a), which is important for effective regulation in this area.

6.3 All of the local authorities consulted have processes in place for assessing mine gas issues for specific planning and building warrant applications. These are generally not formal written procedures but they have typically developed over time. Written procedures for interdisciplinary working are not necessarily considered to be required.

6.4 Key elements to an effective working relationship between disciplines were found to be trust between colleagues, relationships established over time and the ease with which officers were able to communicate and share information. It was found that there are usually strong links between Planning and EHO/ CLO staff but sometimes weaker links between these disciplines and Building Standards staff who tend to operate more independently.

6.5 With a planning application typically preceding a building warrant application, the identification of sites potentially affected by mine gas normally falls in the first instance to the Planning department.

6.6 Some LAs have a process for ‘screening’ applications for mine gas (and other land contamination related issues). The approaches adopted included selection of specific applications by Planning Department staff for review by EHO/ CLO staff; review of weekly lists of planning applications by EHO/ CLO staff; or consulting with EHO/ CLO staff on all non-householder applications. Depending on the data source(s) used when ‘screening sites’, the first two approaches could lead to sites where there is a potential mine gas issue not being identified.

6.7 Other LAs have taken the decision to require desk study reports for all planning applications, which are then peer reviewed (internally or externally) to make sure mine gas issues have been addressed. This reduces the likelihood of mine gas issues not being identified but is potentially more onerous in time and cost for peer review resources.

6.8 Where the interdisciplinary working was less effective at a LA, the ‘screening’ of sites was undertaken separately by Building Standards with limited oversight of decisions that may have already been undertaken by Planning and/or the EHO/ CLO. This

leads to potential inconsistency between requirements for the two regimes as well as potential duplication of effort to screen applications and peer review reports. A shared document management system, linked to a property gazetteer, and accessible by all disciplines is preferable for effective sharing of resources and efficient regulation.

6.9 There is a clear understanding of relevant technical guidance for peer review of mine gas related reports (e.g. BS8576, BS8485, CIRIA C665) particularly amongst EHO/ CLO staff leading reviews of relevant reports. Use and knowledge of BS8485 (BSI, 2019) by Building Standards officers is more limited. This represents a potential gap, particularly in those LAs where Building Standards officers review remediation strategies, design reports and verification reports independently of the EHO/ CLO resource. It should be noted that the CL:AIRE 2021 good practice guidance would now be considered among the relevant technical guidance noted above but knowledge and awareness of this cannot be commented on.

6.10 Standard planning conditions used by individual LAs (as informed by PAN 33), were considered to be adequate to achieve effective regulation of mine gas issues in most cases. Where specific mine gas planning conditions were required, these were already in use by a small number of LAs. A number of the consultees commented that the current trend is toward simplifying the use of generic conditions and Planning Departments can be resistant to application-specific conditions.

6.11 Verification was identified as the weakest part of the regulatory process. At least one LA consulted was not proactively requesting verification reports to discharge outstanding planning conditions, and other LAs are concerned about the quality of such reports when received. The implication is that the mine gas protection measures may not have been installed appropriately and there will be a residual risk to site occupiers and building structures. There were differences of opinion amongst LAs as to whether reliance should be placed on verification reports, site inspections or a combination of the two to support acceptance of completion certificates for building warrants.

6.12 Responses on the value of external peer reviews varied widely suggesting there is a need to improve the consistency and quality of this.

6.13 Training of LA staff on mine gas issues, for effective regulation was considered to be required by the majority of respondents. Training is required specifically in relation to BS8485 (BSI, 2019) design reports to ensure they are reviewed by an officer with the appropriate technical competency and specialism. CL:AIRE has been offering training on the mine gas guidance since its publication.

6.14 Although it is good practice for the decommissioning and sealing of gas monitoring wells to form part of the remediation strategy, not all LAs consulted are managing to regulate this effectively; in some cases the issue is not being considered during peer review of remediation strategy and verification reports, while in others cases developers are not complying with the requirement. Supporting guidance on

decommissioning of monitoring wells to address gas migration pathways would also be beneficial as well as raising awareness of this issue to all parties. This is noted to have been included within the CL:AIRE 2021 good practice guidance and also the NHBC NF94 (2023) guidance report for housebuilders.

6.15 Where a design change is made to building foundations that could have implications for the mine gas risk assessment, this should be covered under an Application for Amendment to the Building Warrant. The consultation revealed that this change should be identified at that point as needing further peer review to assess the implications for mine gas risk assessment and mitigation. However, gaps in the screening process discussed above could lead to this being missed.

6.16 There was consensus that updating the EPS (2019) 'Land contamination and development guidance', and where relevant LA-specific Supplementary Planning Guidance that has been published, to cover mine gas specifically would be beneficial to all parties involved in the development process.

6.17 The LA consultees agreed unanimously that additions to the two Building Standards technical handbooks (SG, 2023) were required in relation to mine gas (and ground gas more generally). Some consultees commented that the lack of specific reference to ground gas in the technical handbooks has led to push back from developers when more information is requested in support of a building warrant, such as a verification report. The consultees acknowledged that there was a balance to be achieved between being overly prescriptive and ensuring the required information was submitted in relation to mandatory standard 3.1.

**Proposal for good practice for processing applications**

6.18 A proposed process has been developed for good practice in the regulation of mine gas risk to development under planning and building standards. This takes account of the findings of the consultation with respect to areas of current good practice and areas for improvement.

6.19 It is acknowledged that it is the responsibility of the developer to undertake an adequate risk assessment of a site, and to propose measures to ensure that these risks are appropriately addressed. However, the proposed good practice approach, including technical peer review of submitted reports, is recommended to improve the consistency of regulation to help avoid a recurrence of the Gorebridge incident at other localities across Scotland.

6.20 The process is supported by the flowchart in Annex C. The flow chart identifies when engagement between disciplines should be undertaken to achieve effective, efficient and consistent regulation. Suggested key elements and a proposed format for the peer review process in relation to all report types to support the good practice recommendations, are presented in Annex D.

6.21 Key elements of the process to be adopted by local authorities include:

- Agreed roles and responsibilities and good working relationships between all disciplines involved with regular dialogue occurring.
- Use of a shared document management system and GIS to facilitate information sharing and avoiding the duplication of effort.
- Use of an effective and consistent method of screening applications for mine gas based on access to CA and relevant LA-held data, and with reference to the CL:AIRE 2021 good practice guide's decision tool.
- Peer reviews of reports submitted under planning should also consider Building Warrant requirements in terms of complying with mandatory standard 3.1 in relation to harmful and dangerous substances.
- Review of design reports and verification reports is undertaken through input from both EHO/ CLO and Building Standards officers.
- Identification of where specialist external resources for peer review may be required, and
- Where key elements such as decommissioning of monitoring wells should be considered.

**Additional recommendations**

6.22 The following additional recommendations are made:

- The previous mine gas research report (SG, 2019a) recommended that PAN 33 should be updated to make reference to key issues relating to mine gas and relevant standards and guidance to be followed. In the absence of an update to PAN 33, the EPS (2019) guidance and LA-specific guidance should be updated to cover mine gas issues specifically.
- The Building Standards Technical Handbooks (domestic and non-domestic) need to be updated to cover mine gas (and wider ground gas issues). This was a recommendation of the 2019 research report (SG, 2019a) but has not yet been acted upon.
- Additional training of EHO/ CLO and Building Standards on mine gas issues should be undertaken to increase competency in peer reviews of submitted reports.
- An approved register should be developed of suitably qualified and experienced consultants to undertake external peer review of mine gas related reports, for

example through the Scotland Excel engineering and technical consultancy framework.

6.23 With respect to the Building Standards Technical Handbooks (domestic and non-domestic, the following sections are considered to require updating:

- Section 3.1.3 on hazard identification should include reference to both ground gas and mine gas, with examples of land likely to be impacted (e.g. development over coal working or areas of non-coal mining, CA Development High Risk Areas, proximity to mine shafts etc.)

- Table 3.1 ‘Possible contaminants and actions’ should be updated to include an entry for permanent gases with specific reference to mine gas.

- Section 3.1.6 ‘Risk management techniques’ should be updated in relation to gas mitigation measures in building design or ground enabling works.

- Reference should be made to decommissioning of gas monitoring wells, that could represent a preferential pathway for mine gas to migrate to the surface or into permeable strata.

- Additional section relating to the importance of verification reporting in relation to land contamination and ground gas protection measures.

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# Annex A Online survey questions

Question 1. Which local authority do you work for?

Question 2. What is your role?

- Building Standards Officer
- Contaminated Land Officer
- Environmental Health Officer
- Planning Officer
- Other (please specify)

Question 3. Which department do you work for?

- Building Standards
- Environmental Health / Public Protection
- Planning
- Other (please specify)

Question 4. Please provide your full name

Question 5. What is your email address?

Question 6. Please provide a work phone number

Question 7. Are you able to participate in Microsoft Teams meetings?

- Yes
- No

Question 8. How do you identify if the proposed development is in an area with potential mine gas issues so as to ‘screen’ applications for review? - Please tick all that apply.

- Coal Authority interactive viewer
- Internal GIS layer
- Local knowledge
- Previous applications nearby
- Don't know
- None of the above
- Other (please specify)

Question 9. Do you consultant with the Coal Authority when the proposed development is in a Coal Authority Development High Risk Area

- Always
- Usually
- Sometimes
- Rarely
- Never
- Don't know

Question 10. Which local authority service in your authority i.e. planning, environmental health or building standards has the overall lead on dealing with sites where $CO_2$ mine gas is assessed as likely to be present?

- Building Standards
- Environmental Health / Public Protection
- Planning
- All of the above
- None
- Don't know

Question 11. Does your local authority have an existing framework (formalised or informal) for regulating the risk of $CO_2$ mine gas on a development site?

- Yes
- No
- Don't know

Question 12. Does the planning department at your local authority include standard conditions on planning permission regarding land contamination assessment, remediation and verification that would encompass mine gas risks to development?

- Yes
- No
- Don't know

Question 13. Does the planning department at your local authority ever include specific conditions on planning permission regarding $CO_2$ mine gas investigation and mitigation?

- Yes
- No
- Don't know

Question 14. Does the building standards department at your local authority include standard conditions on building warrants regarding land contamination assessment, remediation and verification that would encompass mine gas risks to development?

- Yes
- No
- Don't know

Question 15. Does the building standards department at your local authority ever include specific conditions on building warrants in relation to $CO_2$ mine gas investigation and mitigation?

- Yes
- No
- Don't know

Question 16. Where conditions (planning or building warrant) have been included and remediation is identified as being required in relation to $CO_2$ mine gas issues, what

verification do you require to demonstrate compliance with that condition? - Please tick all that apply

- Site visit with officer assessment
- Verification report prepared by a suitably qualified consultant or installer
- Don't know
- Other (please specify)

Question 17. Relationship between planning and building standards

On a scale of 1 (poor) to 10 (excellent) - how would you characterise the degree of interaction between the planning and building standards teams in your local authority?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Please add any specific comments to support your answer, if you wish to do so.

Question 18. Staff capability for undertaking critical reviews of mine gas related reports

On a scale of 1 (poor) to 10 (excellent) how would you characterise the capability within your department for undertaking critical review of mine gas risk assessment and mitigation design reports?

- 1
- 2
- 3

- 4
- 5
- 6
- 7
- 8
- 9
- 10

Please add any specific comments to support your answer, if you wish to do so.

Question 19. If the capability for undertaking critical review of mine gas risk assessment and mitigation design reports doesn’t sit in your department, in your view which department does it sit in?

- Building Standards
- Environmental Health/Public Protection
- Planning
- Don't know
- None

Question 20. On a scale of 1 (poor) to 10 (excellent) how would you characterise the capability within other departments within your local authority for undertaking critical review of mine gas risk assessment and mitigation design reports?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

- 9
- 10

Please add any specific comments to support your answer, if you wish to do so.

Question 21. Use of external peer review support

Do you employ external peer review support, e.g. other local authority EHOs/ CLOs, external consultants, for critical reviews of mine gas related reports?

- Yes
- No
- Don't know

Question 22. If No, which of these apply? Please tick all that apply. If other please explain why

- Have sufficient capability in-house
- Financial constraints
- Mine gas issues rarely encountered
- Other (please explain why)

Question 23. If yes, how often do you use this type of support?

- Always
- Usually
- Sometimes
- Rarely
- Never

Question 24. How beneficial have you found this external peer review support on a scale of 1 (poor) to 10 (excellent)?

- 1
- 2
- 3
- 4

- 5
- 6
- 7
- 8
- 9
- 10

Please add any specific comments to support your answer, if you wish to do so.

Question 25. What relevant publications and guidance are routinely used by your department when reviewing reports relating to mine gas? Please tick all that apply.

- Internal local authority guidance
- Environmental Protection Scotland Land Contamination and Development guidance (2019)
- BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)
- CIRIA C665 Assessing risks posed by hazardous ground gases to buildings
- Don't know
- Other (please specify what other sources you use)

Question 26. What relevant publications and guidance that are routinely referred by your department to developers in relation to developments potential affected by mine gas? Please tick all that apply.

- Internal local authority guidance
- Environmental Protection Scotland Land Contamination and Development guidance (2019)
- BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)
- CIRIA C665 Assessing risks posed by hazardous ground gases to buildings

- Don't know
- Other (please specify what)

Question 27. Do you have any examples of good practice with regards to the Planning and Building Standards approach to developments where there are potential risks associated with mine gas that you would be willing to share at a later date?

- Yes
- No

Question 28. Training needs

Do you feel that you need specific training on mine gas issues to regulate this issue effectively?

- Yes
- No
- Not applicable (if not applicable please explain why not)

If not applicable, please explain why.

Question 29. Would you like to provide any additional information?

Question 30. Would you consider taking part in more detailed consultation as part of this project?

- Yes
- No
- If No - please explain why not

## Annex B Detailed engagement questions

Local authority:

Names of participants:

| | | | | | |
|---|---|---|---|---|---|
| Planning (P): | | Building standards (BS): | | EHO/ CLO*: | |

Date of interview:

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 1 | With respect to applications for developments that may be affected by mine gas, tell us about how the relationships between the different parties work?<br>[each party to answer in turn]<br><br>What does/ does not* make them effective? | P: | Factors that may be relevant:<br>• Good working relationships<br>• Multi-disciplinary departments<br>• Openness/ transparency<br>• Trust<br>• Formal written procedure<br>• Electronic records<br><br>Any thoughts on opportunities to improve communication or working relationships between departments? | |
| | | BS: | | |
| | | EHO/ CLO: | | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 2 | What information is routinely (proactively) shared between the three parties (i.e. Env Health, Planning and Building Standards)? | P: | Examples could include<br>• GIS layers<br>• CA data<br>• CA consultee responses<br>• Submitted reports<br>• Decision Notices | |
| | | BS: | Do you all use the same database for recording data against a property gazetteer? Do you each have access to the other departments database? | |
| | If information is <u>not</u> proactively shared, but you have access to each other's departmental database, do you routinely check what information is held for a property by another department? | EHO/ CLO: | Who (proactively) shares that information with the other parties and when is it shared?<br><br>How is this information shared and is that sharing recorded?<br><br>Any ideas for how the information sharing could be improved? | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 3 | On receipt of a Building Warrant application what is the process for checking whether there is a related planning application?<br><br>For linked applications who leads the review of SI reports etc.? Does building standards rely on reviews already done on behalf of planning? | BS: | How do you check the related submission?<br>• Shared database<br>• Email / phone / conversation.<br><br>Possible actions after checking:<br>• Agree a co-ordinated response if both applications have been submitted?<br><br>• Share reports and the review of those reports (see Q4 also)?<br><br>• Record this (how?) for future reference if only one application has been made? | |
| | | P: | | |
| | | EHO/ CLO comment: | | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 4 | If a report is submitted to accompany either application, who reviews that report? – see report types | 1. Desk studies / site investigations? P/ CLO/ BS*<br><br>2. Remediation method statement / strategy (RMS)? P/ CLO/ BS*<br><br>3. Design reports (DR - BS 8485) and drawings for gas protection measures? P/ CLO/ BS*<br><br>4. Verification reports (VR)? P/ CLO/ BS* | Do you require the same report to be submitted for each application, or do you advise the applicant the LA has already received / reviewed the relevant report?<br><br>If you receive a report directly do you check if it has already been submitted and reviewed by another department?<br><br>How does the person reviewing the report share their findings between department (if they do so)? | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 5 | What processes are in place to ensure that where an amendment to the building warrant for the foundation design does not provide a risk of creating pathways for mine gas previously not considered.?<br><br>How do planning, environmental health and building standards coordinate to ensure this does not happen? | P: | When reviewing the reports (desk study & SI, RMS, DR, VR) do you consider implications for mine gas migration to <u>existing</u> off-site receptors in relation to a proposed new-build development (noting Building Standards condition 3.1)<br><br>Do you require evidence that all monitoring boreholes that represent possible pathways for gas migration will be sealed before development?<br>• If so how do require / condition this?<br>• If so how do you evidence compliance with this?<br>• Do you share this evidence with other departments? | |
| | | BS: | | |
| | | EHO/ CLO: | | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 6 | **Conditions**<br><br>[depending on response to online survey]<br><br>In your experience, do you consider <u>generic</u> land contamination planning or building warrant conditions cover potential mine gas risks sufficiently? | P: | What are your individual views on the benefits of standardised planning conditions or building warrant requirements <u>specific</u> to mine gas?<br><br>If you use mine gas specific conditions, would you be willing to share a copy with us? | |
| | | BS: | | |
| | | EHO/ CLO: | | |

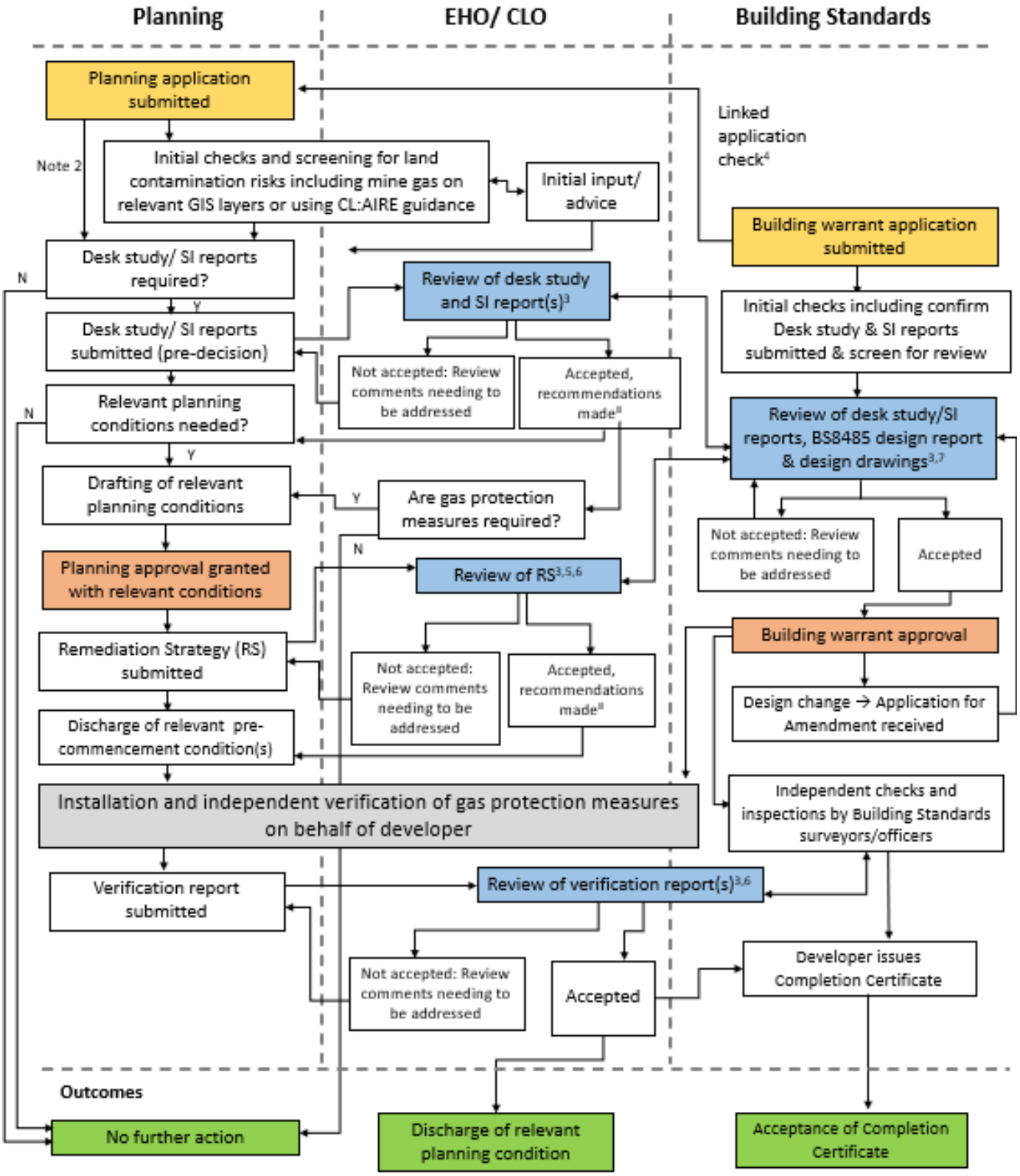
| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 7 | Can you tell us about any cases where problems were encountered during the design or verification stage relating to appropriate assessment or mitigation of mine gas risks?<br><br>What are your reviews on relying exclusively on submitted verification reports to evidence compliance? | P: | In which type of report? | |
| | | BS: | | |
| | | EHO/ CLO: | | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 8 | Supplementary questions (time permitting) | P: In your opinion does your LA contaminated land guidance or the EPS guide need to be revised to address mine gas issues specifically? | BS – if yes, in what level of detail?<br><br>EHO / CLO – if supplementary guidance is required, what sort of level of detail / content are you looking for (if you have any opinion)? | |
| | | BS: In your opinion does the Building standards technical handbook need to be revised to cover ground/ mine gas issues specifically? | | |
| | | EHO/ CLO: In your opinion is supplementary technical guidance required to address mine gas issues specifically?<br>Have you read or reviewed the draft CL:AIRE technical note recently issued for consultation? | | |

| Q | Question | Responses | Sub-question/ discussion points | Responses |
|---|---|---|---|---|
| 9 | Do you have anything else to add on good practice with regards to the Planning and Building Standards approach to developments where there are potential risks associated with mine gas.<br><br>Any other areas for improvement? | P: | | |
| | | BS: | | |
| | | EHO/ CLO: | | |

## Annex C Recommended process flowchart for good practice in the regulation of mine gas risk to development under planning and building standards

This flowchart illustrates good practice in review of information relevant to the regulation of mine gas risk to development and shows the interactions between planning departments, EHO/ CLO and Building Standards officers. It is intended to apply to non-householder applications (but see Note 1 below). The flowchart summarises examples of good practice discussed in the main body of the report.



Accompanying notes:

1. Although the flow chart is not designed for simpler householder applications, some of the principles may be applicable.
2. Some local authorities require desk studies and/ or site investigation reports for all sites under local plans or supplementary planning guidance therefore the screening step is not required.
3. Peer reviews of relevant reports potentially supported by specialist external resource to undertake peer reviews if capability not held within local authority.
4. Linked applications preferably facilitated through shared document management system/ GIS. A linked Building Warrant application is likely to be submitted at a later date to the planning application.
5. Note submission of the RS may also occur before the planning application is decided.
6. Where applicable RS and verification report to include decommissioning of monitoring wells and effects of mine grouting works.
7. Review of BS8485 design report led by Building Standards but may be supported by EHO/ CLO.
8. EHO/ CLO may make recommendations for relevant planning conditions to be included.
9. The whole process occurs in parallel to consultation with the Coal Authority as a statutory consultee under the planning regime.

## Annex D Template for peer review of mine gas related reports

**Table 1a: Report and site details**

| | | | | | |
|---|---|---|---|---|---|
| Review reference: | | | | | |
| Site name: | | Planning ref: | | Building standards ref: | |
| Site area (ha.): | | Grid reference: | | Site address: | |
| Date of review: | | Reviewed by: | | Approved by: | |
| Summary of development: | | | | | |
| Review/ check requested: | Planning ☐ Building Standards ☐<br>Has planning permission been granted? Yes ☐ No ☐ | | | | |
| Report 1 | | | | | |
| Report title: | | | | Report date: | |
| Report type: | Desk study/ PRA ☐ SI report ☐ Remedial strategy ☐ Design report ☐<br>Verification report ☐ Other ☐ | | | Report author: | |
| Report 2 | | | | | |
| Report title: | | | | Report date: | |

| | | | |
|---|---|---|---|
| Report type: | Desk study/ PRA ☐ SI report ☐ Remedial strategy ☐ Design report ☐ Verification report ☐ Other ☐ | Report author: | |

**Table 2a: Detailed peer review findings – Desk study (mine gas)**

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Does the report cover the whole site?[1] | Yes ☐ No ☐ | |
| Scope of works completed: | Review of site history ☐ Review of environmental setting ☐ LA/SEPA consultation? ☐ Site reconnaissance ☐ Initial conceptual site model (CSM) development ☐ Preliminary Risk Assessment (PRA) ☐ | |
| Current use: | | |
| Summary of historical map review<br>On-site: | | |
| Adjacent land: | | |

[1] Compared to red line boundary of planning application, where applicable

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Are there any previous investigations that have been reviewed? | Yes ☐ No ☐ If Yes: | |
| Geology and hydrogeology<br>Superficial deposits (including details of permeability): | | |
| Bedrock (including fractures): | | |
| Groundwater (and depths): | | |
| Is the site in a Coal Authority (CA) coal mining reporting area? | Yes ☐ No ☐ N/A ☐ | |
| Is the site in a CA development high risk area (DHRA)? | Yes ☐ No ☐ N/A ☐ | |
| Has the CA responded as a statutory consultee for a DHRA? | Yes ☐ No ☐ N/A ☐ | |
| Is a CA Consultants Coal Mining Report (or similar) included and the findings discussed? (note that a Consultants Report provides greater detail than a CON29M report) | Yes ☐ No ☐ N/A ☐ | |
| Are there mine shafts/ entries on site or within 50m of the site boundary? | Yes ☐ No ☐ N/A ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Are there shallow workings on site or within 50m of the site boundary? | Yes ☐ No ☐ N/A ☐ | |
| Depth to coal seams and workings known? | Yes ☐ No ☐ N/A ☐ | |
| Are workings flooded or likely to be flooded? | Yes ☐ No ☐ N/A ☐ | |
| Faults or other potential pathways connecting surface to deeper unflooded workings? | Yes ☐ No ☐ Unknown ☐ | |
| For sites in former coal mining areas, has a Coal Authority report been ordered and has the CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions decision tool been applied? | Yes ☐ No ☐ N/A ☐ | |
| Has a Coal Mining Risk Assessment (CMRA) been submitted (and reviewed as part of the desk study)? | Submitted: Yes ☐ No ☐ N/A ☐<br>Reviewed and discussed: Yes ☐ No ☐ N/A ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Any proposed (or likely) credible future changes that could impact on mine gas risk (e.g. water levels, grouting etc.)? | Yes ☐ No ☐ Unknown ☐ | |
| Is the site in an area of non-coal mining or quarrying? | Yes ☐ No ☐ Unknown ☐ | |
| Site reconnaissance observations (evidence of past coal mining identified)? | Yes ☐ No ☐ Unknown ☐ | |
| Any additional relevant information reviewed or commented on in Desk Study review relating to mine gas? | Yes ☐ No ☐ | |
| Has a preliminary CSM been included and has mine gas been specifically included in it? | Yes ☐ No ☐<br>Schematic CSM provided? Yes ☐ No ☐ | |
| Does the preliminary CSM include any design/ construction aspects that could influence mine gas risk e.g. foundations, drainage, grouting ? | Yes ☐ No ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Are the receptors identified appropriate (e.g. buildings and persons using the buildings, including off-site)? | | |
| Summary of report conclusions for mine gas: | | |
| Is further data collection e.g. SI recommended in the report? | Yes ☐ No ☐ | |
| Review summary: | | |
| Is the desk study of sufficient extent and scope with respect to considering ground conditions and mine gas? | | Yes ☐ No ☐ |
| Summary of review points requiring further consideration: | 1.<br>2. | |

**Table 2b: Detailed peer review findings – Site investigations (mine gas)**

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Does the report cover the whole site?[1] | Yes ☐ No ☐ | |
| Scope of works completed: | Objectives ☐ Initial CSM ☐ Scope of works/ methodology ☐ Factual data ☐ Mine gas GQRA ☐ Refined CSM ☐ DQRA ☐ | |
| Site investigation review | | |
| Summary of SI scope: | | |
| Sufficient number of boreholes to determine if workings present at shallow depth <30m? (note probable unrecorded workings <30m deep is presented in a CA Consultants Report) | Yes ☐ No ☐ | |
| Summary of mine gas monitoring scope (proposed and actual): | | |
| Ground conditions encountered (including workings): | | |

[1] Compared to red line boundary of planning application

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Gas monitoring well design: | | |
| Strata monitoring wells response zone installed in: | | |
| Do response zones span multiple strata or worked seams and surrounding strata? | Yes ☐ No ☐ | |
| Groundwater monitoring undertaken (details and depths): | | |
| Gas monitoring (scope and dates):<br>Have all proposed monitoring rounds been completed?<br>Continuous or spot monitoring (or both) | Yes ☐ No ☐<br>Continuous ☐ Spot ☐ Both ☐ | |
| Are any response zones flooded or partial flooded at the time of monitoring (details of which/when): | Fully Yes ☐ No ☐<br>Partially Yes ☐ No ☐ | |
| Is all mine gas related factual data presented in appendices? | SI logs ☐ Monitoring data ☐ Reports or other outputs ☐ | |
| Has gas sampling/ monitoring equipment has been calibrated appropriately? | Yes ☐ No ☐ Unknown ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Has an appropriate level of investigation been undertaken in relation to mine gas, as identified within the desk study? | Yes ☐ No ☐ | |
| Have appropriate figures been presented e.g. geological cross section/ ground model? | Yes ☐ No ☐ | |
| Risk assessment review | | |
| Is the mine gas / ground gas assessment consistent with BS8485:2015+A1:2019 and the CSM?[1] | Yes ☐ No ☐ | |
| Has the CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions decision tool been applied risk? | Yes ☐ No ☐ | |
| Has depleted oxygen been discussed? | Yes ☐ No ☐ N/A ☐ | |

[1] Note the use of the empirical approach in BS8485 to derive a characteristic situation based on gas screening values should be used with caution on sites affected by mine gas

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Are the recorded gas concentrations concluded to be due to mine gas (or other ground gas sources)? | Yes ☐ No ☐ | |
| For a mine gas detailed quantitative risk assessment (DQRA) have appropriate input parameters been selected and referenced and their use fully justified? | Yes ☐ No ☐ N/A ☐ | |
| Are there any data gaps, uncertainties or issues which are stated to require clarification? | Yes ☐ No ☐ | |
| Report conclusions | | |
| Are the revisions to the CSM appropriate to the outcomes of the mine gas risk assessment and the development proposals?<br>Has an updated/refined schematic CSM been presented? | Yes ☐ No ☐<br>Yes ☐ No ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Are gas protection measures proposed? | Yes ☐ No ☐ N/A ☐ | |
| Does the CSM sufficiently consider any proposed ground stabilisation/ grouting works and their implications? | Yes ☐ No ☐ N/A ☐ | |
| Does the CSM consider off-site receptors (e.g. if enabling works alter ground conditions/ migration pathways)? | Yes ☐ No ☐ N/A ☐ | |
| Have data gaps/ uncertainties been considered appropriately (e.g. credible future changes)? | Yes ☐ No ☐ | |
| Are there any other issues relevant to the mine gas risk assessment such that additional clarification is required? | Yes ☐ No ☐ | |
| Summary of report conclusions for mine gas: | | |
| Is further data collection e.g. supplementary SI or gas monitoring recommended in the report? | Yes ☐ No ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Review summary: | | |
| Is the SI and risk assessment of sufficient extent and scope with respect to considering ground conditions and mine gas? | | Yes ☐ No ☐ |
| Summary of review points requiring further consideration: | 1.<br>2. | |

**Table 2c: Detailed peer review findings – Remediation strategy (mine gas)**

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Does the report cover the whole site?[1] | Yes ☐ No ☐ | |
| Have there been any design changes to the development (e.g. foundations) since the desk study/ SI reports? | Yes ☐ No ☐ | |
| Have all mine gas linkages requiring remediation/ mitigation been identified? | Yes ☐ No ☐ | |
| Have gas protection measures been designed in accordance with BS8485 (noting correct building type and gas protection score)? | Yes ☐ No ☐ | |
| Has appropriate verification and validation testing of gas protection measures been recommended[2]? | Yes ☐ No ☐ | |

[1] Compared to red line boundary of planning application, where applicable

[2] in accordance with CIRIA C735

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Have the impacts to off-site receptors been considered during remedial actions for mine gas, and are controls required? | Yes ☐ No ☐ N/A ☐ | |
| Are there other issues which are stated to needed to be considered in relation to mine gas? | Yes ☐ No ☐ N/A ☐ | |
| Where there are existing monitoring wells that could represent gas migration pathways, does the report discuss decommissioning of monitoring wells to seal gas migration pathways?<br>Is the proposed decommissioning (and verification) of monitoring wells appropriate? | Yes ☐ No ☐<br>Yes ☐ No ☐ N/A ☐ | |
| Is a foundation works risk assessment required to avoid the creation of preferential pathways for gas migration during development? | Yes ☐ No ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Where this report includes detailed design of gas protection measures (i.e. that required in BS8485) are the detailed drawings and appropriate to the CS? | Yes ☐ No ☐ | |
| Does the report state that a stand alone design report (and associated drawings) in accordance with BS8485 will be prepared? | Yes ☐ No ☐ | |
| Summary of report conclusions for mine gas: | | |
| Review summary: | | |
| Is the report sufficient to demonstrate that all identified mine gas pollutant linkages will be mitigated to ensure the site is suitable for its proposed end use and addresses mandatory standard 3.1? | | Yes ☐ No ☐ |
| Summary of review points requiring further consideration: | 1.<br>2. | |

**Table 2d: Detailed peer review findings – Verification report (mine gas)**

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Does the report cover the whole site?[1] | Yes ☐ No ☐ | |
| Has the verification report for the gas protection measures been prepared by a Specialist under the Gas Protection Verification Scheme (GPVS)? | Yes ☐ No ☐ | |
| Have there been any relevant design changes to the development (e.g. foundations) since the remediation strategy? | Yes ☐ No ☐ Unknown ☐ | |
| Have the ground gas protection measures been installed and verified in accordance with the Remediation Strategy and CIRIA C735? | Yes ☐ No ☐ | |

[1] Red line boundary of planning application, where applicable

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Have any other relevant remediation activities been undertaken and verified in accordance with the Remediation Strategy? | Yes ☐ No ☐ | |
| Have any unexpected contamination/ made ground/ coal mining features been identified during earthworks and has this been dealt with appropriately? | Yes ☐ No ☐ Unknown ☐ | |
| Has appropriate evidence been presented for decommissioning of monitoring wells? | Yes ☐ No ☐ N/A ☐ | |
| Is there a requirement for long-term monitoring and/ or future verification work? | Yes ☐ No ☐ N/A ☐ | |
| Are there other issues which need to be considered in relation to mine gas? | Yes ☐ No ☐ N/A ☐ | |
| Is there a revised / updated CSM confirming that all identified mine gas pollutant linkages have been addressed, that the site is suitable for use? | Yes ☐ No ☐ | |

| **Report author, title, reference and date:** | | |
|---|---|---|
| **Aspect** | **Information in report** | **Review comments** |
| Summary of report conclusions for mine gas: | | |
| Review summary: | | |
| Is the report sufficient to demonstrate that all identified mine gas pollutant linkages have been mitigated to ensure the site is suitable for its proposed end use and addresses mandatory standard 3.1? | | Yes ☐ No ☐ |
| Summary of review points requiring further consideration: | 1.<br>2. | |

**Table 3: Summary peer review findings**

Following the review, it is considered the following to apply: -

| **Summary** | **Applicable** |
|---|---|
| **Planning regime** | |
| The investigations, assessments and/or remedial strategy presented are considered sufficient to support that no mitigation measures for mine gas are needed. | √ or n/a* |
| The investigations, assessments and/or remedial strategy are considered sufficient to progress development; post-works verification reporting should be provided once works are complete. | √ or n/a* |
| Further information/ submissions are required. | √ or n/a* |
| Can the further assessment or remediation required be conditioned? | √ or n/a* |
| Can the following relevant planning conditions be discharged? | √ or n/a* |
| *Quote condition No. and full detail here* | √ or n/a* |
| *Quote condition No. and full detail here* | √ or n/a* |
| **Building standards (see notes below)** | |
| Confirmation the proposals show compliance with mandatory standards 3.1 and 3.2^ | √ or n/a* |
| More information is required to demonstrate compliance with mandatory standards 3.1 and 3.2^ – please refer to summary of review points requiring further consideration in detailed peer review table above | √ or n/a* |

* delete as applicable; ^ review relates to design phase only; construction and verification are dealt with through completion certificate(s)

Notes for Building standards:

‘**Standard 3.1**: Every building must be designed and constructed in such a way that there will not be a threat to the building or the health of people in or around the building due to the presence of harmful or dangerous substances.’

‘**Standard 3.2**: Every building must be designed and constructed in such a way that there will not be a threat to the health of people in or around the building due to the emission and containment of radon gas.*’*

## Annex E LA Consultation on interim report

| | |
|---|---|
| Name: | |
| Local Authority: | |
| Job Title: | |
| Department or discipline (e.g. Env Health or similar, Building Standards, Planning): | |

Comments in relation to Section 5 and Annex C:

Note: If any part of Section 5 is not relevant to your discipline, please state N/A

Section 5 (5.10 onwards) discusses each of the key stages in Annex C in detail. Annex C presents a flow chart setting out the proposed process for good practice in the regulation of mine gas risk to development under planning and building standards. The process described does not specifically cover consultation with the Coal Authority, which is likely to be occurring in parallel as they are a statutory consultee for all developments in areas of former or proposed coal workings.

**Post consultation notes – Not every respondent commented on every question and only comments directly relevant to the questions are presented.**

**Affirmative comments (e.g. agree) are not presented.**

**Comments were broadly supportive of the proposed good practice approach and peer review template.**

**Receipt of planning applications – screening of sites (5.10 to 5.14, including Table 5-1)**

Respondent 1: Please provide clarification that the terms 'Reporting Area' and 'Development Low Risk Area' are used interchangeably, for the avoidance of doubt (as the planners like to say).

We don't have Coal Authority Mine entries, Past or probable or Previous incident layers in our GIS, except zoomed out beyond 1:25,000 scale which makes it difficult to interpret accurately.

Respondent 3: Agree, it would be expected that planners would undertake the bulk of screening by reviewing Coal Authority GIS layers and also internal GIS layers where applicable.

Respondent 4: Initial screening of all planning applications should be carried out by Planning and not Environmental Health as they receive and log all applications.

I think it important that other mine-related risks are addressed as part of this screening process to limit duplication of work at a later date, to ensure developers are made aware of all mining risks to be dealt with as part of the development and to prevent perhaps more significant mining risks being overlooked at this stage in favour of mine gas.

Respondent 5: Consider that the Coal Authority should provide more details of records of mine gas or potential risk of mine gas as part of their standard CON29M reports as it would highlight the need for applicants/developers to consider mine gas risks at an early stage of development as standard practice in areas of historical mining.

Respondent 7: All applications are screened for coal mining issues using CA information. Contamination assessments are required for all applications for a new building.

5.22 Agree. But in reality we often get RS submitted after site works have commenced on site…..

**Submission and review of desk study and site investigation report (5.15 to 5.22)**

Respondent 1: Although a desk study/SI/geotechnical report may be submitted for planning applications and maybe available on a shared document management system, Building Standards would not usually review these reports part of an initial planning application. The is no requirement to do so and quite separate processes. The Annex C flowchart appears to indicate a “linked application check” at the “Planning application submitted” stage. Appreciated this may be referring to when a BW application is submitted and at this point Building Standard may check back to see if a previous planning application.

Respondent 2: (Might I suggest ‘SI’ is written ‘site investigation’ or in fact I prefer ‘ground investigation’.). Typo at 5.19: it should read ‘discharge of the relevant planning condition’ (not application).

I agree with all of 5.23. (I would like to think that ‘model’ conditions cover all eventualities with advice being offered on how to achieve discharge of conditions; agreeing model wording took a long time first time around! However, I appreciate this is best practice, so 5.24 is fine as well.)

Respondent 4: Advice should be provided on how to approach extensions on existing sites (which may or may not have mine gas protection measures installed).

Submission of a desk study prior to a planning permission decision will cause delays in determination and have implications for Planning Performance Indicators.

IT systems required to ensure linking of reports to address gazetteers, document sharing systems etc may take some time and budget to provide at LAs who do not currently have such systems available.

In general, specific training and guidance for officers peer reviewing mine-related risks reports is considered necessary to ensure risks are appropriately identified and dealt with as part of the site development.

It would be useful for uniformity of approach, if standard conditions could be drafted for LAs in conjunction with the CA rather than individual LAs coming up with their own conditions. The CA have previously suggested the standard contaminated land planning conditions are not appropriate for dealing with mining issues.

Respondent 5: 5.21 As part of the peer review process the CL Team would consider a development site for both aspects of Planning & BS considerations at the same time and issue our review response to both allocated Planning Officer & Building Standards Surveyor (when known).

Respondent 7: In general the procedures adopted in [our LA] follow those suggested in the document with the exception of requiring a desk study prior to approval. Normally information on contamination, if not submitted with the application, is required using conditions unless there is a very strong reason (known mine gas issues/ landfill site/ gas works) to require this prior to granting permission.

**Planning decision and setting conditions (5.23 to 5.25)**

Respondent 2: I agree with all of 5.23. (I would like to think that 'model' conditions cover all eventualities with advice being offered on how to achieve discharge of conditions; agreeing model wording took a long time first time around! However, I appreciate this is best practice, so 5.24 is fine as well.)

Respondent 5: 5.24 Currently not a specific CL planning condition for gas remedial measures – any mine gas risk assessments or remedial measures and validation would be dealt with under the above conditions.

5.25/5.26 Agree – but we very rarely get Phase 1/2/3/4 reports submitted before a planning application is granted (usually granted with conditions attached) so identification of a Characteristic Situation CS4 is unlikely to be identified at an earlier stage of the planning process.

Respondent 7: Standard contaminated conditions are applied to every application for a new building. These conditions are worded in a very general way and the detailed/ specific issues are addressed through the peer review process. Conditions are not discharged until all issues have been adequately addressed.

**Submission and review of remediation strategy (5.26 to 5.29)**

Respondent 5: 5.26 – as per comments in 5.25

5.27 Agree – But this information is not something we regularly get submitted as part of submitted remedial strategies.

5.28 CL Team peer review procedures as per our comments in 5.19 & 5.20

5.29 The CL Team complete general peer reviews of submitted Phase 1/2/3 & 4 reports not detailed technical reviews. As CLOs we are not expert technical reviewers. The responsibility for accurate and appropriate detailed risk assessments and remedial designs for any contamination risks (including mine gas) lies with the developer/representative consultants/architects/contractors.

**Aspects specific to building warrant applications (5.30 to 5.34, including Table 5-2)**

Respondent 1: Upon receipt of a BW application and commencement of assessment against the standards, regardless if there has been a linked Planning application with relevant SI's and Contaminated land Team input, we would ask for copies of SI's/reports to be provided as part of the BW submission. These would still form part of the BW application and provide audit trails etc.

Respondent 2: Table 5-2: should there be an additional line in the table covering any grouting of mine workings that has been carried out on site (including whether a pre-mixed cement grout was used or they just poured dry materials into the hole)?

Keeping a database of properties where gas protection measures have been installed is something we keep saying we should do but have not consistently managed to achieve.

Respondent 4: Screening of Building Warrant applications should be carried out by Building Standards rather than Environmental Health as they are dealing with all incoming warrant applications.

Respondent 5: As a matter of urgency, I strongly recommend that the BS Mandatory Technical Guidance should be revised to include all mine gas along with radon gas.

Table 5.2 – Should include a line/column regarding mine consolidation works and potential impact of mine gas migration.

Also consideration of mine shaft location accuracy – 20m distance potentially not conservative enough - confirmation if indicated mine shafts has been accurately located by ground investigation or if indicative position.

Respondent 7: Contamination assessments are required for all building warrant applications for new buildings, large extensions or on sites where previous remedial measures have been required (such as a conservatory on a site where gas protection measures were required).

**Review of design report for gas protection measures (5.35 to 5.38)**

Respondent 1: Regarding 5.38, Building Standard case officer may be able to review gas protection measures (if common typical proposals) without need to consult with Planning or Contaminated Land Team. This 5.38 clause states: "The findings of the review(s) are documented and retained on a shared document management system, and directly linked to a property gazetteer." Would suggest the clearing or approval of protection measures is not specifically highlighted to planning/contaminated land team. The approved details/drawings would form part of the approval package associated with the building Warrant.

Respondent 2: This is not really my area of expertise. Only this morning I had to query a verification report that stated 'passive ventilation layer' in the text but appeared to show no provision in the design drawings or photographs. We EHO/ CLO are not qualified to interpret foundation design drawings.

Respondent 6: It is acknowledged that this section of the document notes that a stand alone design report should be submitted for CS3 or above. I have no objection to this proposal. It is assumed that a key purpose of this distinction is to raise the importance of the design report to relevant parties, e.g. developers.

Respondent 4: Section 5.37 is ambiguous in terms of who is responsible for reviewing the report. I think the principle of the types and number of protection measures to be installed should be agreed with EH but anything more technical than that should be reviewed by BS due to their in depth buildings knowledge.

Respondent 5: Not the CLOs area of expertise. As CLOs we are not expert technical reviewers. The responsibility for accurate and appropriate detailed risk assessments and remedial designs for any contamination risks (including mine gas) lies with the developer/representative consultants/architects/contractors.

**Building warrant approval (5.39 to 5.40)**

Respondent 1: Agree…..consultation with Contaminated Land team unlikely if the amendment is only for change to detailing. Would likely only consult again if further risks or change in contamination to the land was identified. This is unlikely and usually the SI/reports for the initial BW application covers all identified risks on site.

Respondent 5: 5.40 Generally, the CL Team would not be informed of any amendments to BWA that might have impact on potential mine gas risks. If there has been a foundation design change that may impact proposed remedial measures then it would be the responsibility of the developer/applicant/representative consultant/architect to the review the design change, ensure there is no significant mine gas impact, amend remedial measures if required and inform Building Standards and CL Team of the change.

**Installation and verification of gas protection measures (5.41 to 5.42)**

Respondent 1: Protection measures likely to be/should be highlighted on the BW Construction Compliance Notification Plan (CCNP) so reasonable enquiry is required to confirm installation is as per approved BW details etc. Building Standards officer could maybe sample inspect first protection measures on site If not too specialised or (more commonly) agree with site management that suitable "sign-off" evidence/verification will be provided from specific installers or site engineer for each installation.

**Review of verification report (5.43 to 5.47)**

Respondent 1: Not aware of any Approved Certifiers of Constructions schemes available in Scotland for covering gas protection measures. Common certifiers of construction consist of Electricians (SELECT scheme) and plumbers and similar for drainage, heating and plumbing (SNIPEF scheme). Issuers of these certificates unlikely to need to view/be concerned with verification reports for gas protection measures.

On receipt of verification reports/evidence, Building Standards unlikely to refer to Contaminated Land Team/Planning. No requirement to do so within BS legislation/procedures. Therefore in this regard I am unsure how Planning/Contaminated Land team co-ordinate process to be passed verification report or ensure this has happened.

Respondent 2: Just to note that, in Scotland, verification rarely if ever meets the requirements of [CIRIA] C735. It would be difficult for the local authority to insist on full compliance, because that would result in no development work ever being completed.

Respondent 3: Agree. Borehole decommissioning could be included here.

Respondent 4: I think the majority of officers reviewing verification reports would require guidance and training to ensure they are able to carry out this task competently.

Respondent 5: Agree that reports should include measures to decommission boreholes. However in our experience, it would be very difficult for Falkirk Council to insist on full compliance to C735, without mandatory statutory guidance/regulations in relation to mine gas issues being enforceable.

**Acceptance of building warrant completion certificate (5.48)**

| |
|---|
| Respondent 1: As above….we have no process/procedure to pass verification reports to Contaminated Land. If Building Standards officer review of report/evidence appears acceptable and covers for the protection measures as approved and proposed, Completion Certificates can be accepted. |

Comments in relation to Annex D – peer review template:

Note: We assume comments in relation to Annex D will primarily be made by an EHO/ CLO (or similar), or a Building Standards Officer if they technically review any of the submitted reports.

Please state the peer review question number in Annex D that relates to the table and detail your comment in relation to that question (or state if it is an additional peer review question you are suggesting).

**Table 2a: Detailed peer review findings – Desk study (mine gas)**

| |
|---|
| Respondent 2: Point 1: yes, spot on! (It's amazing how often the coal report is for an adjacent or nearby site.)<br><br>Point 24: also very important (see comments in relation to Table 5-2 above).<br><br>Respondent 4: I do not have comment on any of the templates specifically but would note that this creates a significant amount of extra work for the officers dealing with relevant applications. In addition, I think guidance for officers on what should be expected to satisfy each of the various sections of the tables would be essential (for example what constitutes 'adequate evidence', 'appropriate', 'sufficient' etc in each case).<br><br>Respondent 5: CL Team would rarely get Phase 1 report that would detail Points 8. to 18. Sometimes receive separate CMRA Report that covers some of the points but not detailed mine gas risk assessment. |

**Table 2b: Detailed peer review findings – Site investigations (mine gas)**

Respondent 2: Point 4: where does definition of shallow workings as <30 m depth come from?

Point 7: ground gas should be measured in wells that are not intended for groundwater testing.

Point 9a: always check to see if the response zone was flooded.

Point 24: again very important (future grouting must not be dealt with in isolation).

Respondent 6: In regard of Q13. I often find the data is presented in pdf format. There may be scope to note in this section, if the data can be provided in a format to support its interrogation / analysis, e.g. excel. Highlighting this within Table 2b may play a small part in supporting the timeous review of submissions.

In regard of Q7. The sealing of the well can be of key importance. There may be some value in bringing this out in Q7 or another question within this table.

Respondent 5: Point 5. Very rarely get mine gas monitoring boreholes. Usually shallow boreholes within superficial soils are monitored for ground gas. Cost implications for monitoring both mine gas and ground gas in differing strata. Would need clear and precise regulatory guidance and BS Technical Handbook updated to enforce this requirement.

Perhaps monitoring for mine gas should be included as mandatory as part of any mine consolidation works and include pre- grouting, during grouting and post grouting monitoring to determine impact of any consolidation works on mine gas migration and appropriate gas remedial measures to be incorporated into proposed buildings. Appropriate decommissioning of boreholes could be linked to this too if relevant.

**Table 2c: Detailed peer review findings – Remediation strategy (mine gas)**

Respondent 1: Generally Building Standards will review site investigations/geotechnical reports and establish what Characteristic Situation has been identified and the protection measures that have been proposed (if any). Details/plans of protection measures would then be assessed that they are suitable and in accordance with relevant standards (typically BS 8485 and radon guidance etc). Table 2c appears to cover general process.

Respondent 2: Point 8a: Perhaps re-word to recommend verification of decommissioning, which is not routinely requested at present.

Respondent 6: Footnote 4 doesn't appear to be detailed. Presented in question 13.

Respondent 5: We are not routinely made aware of any foundation design changes that would impact mine gas risk. Please refer to comments in 5.39 to 5.40.

**Table 2d: Detailed peer review findings – Verification report (mine gas)**

Respondent 1: Common ways to establish if protection measure have been suitably constructed would be by individual plot "sign-offs" by specialist contractors or site engineer (and maybe inspection by BS case officer if simple designs). A general/final verification report may not be produced/available until site is completed, so require specific evidence for each plot requiring completion certificate acceptance.

Respondent 2: Point 1: On some larger sites, the developer will ask the local authority to accept phased verification and sign-off of individual sets of plots. This can usually be accommodated, but requires extra vigilance on the part of the council to ensure all requirements are met.

Point 3: see comment in relation to 5.43 to 5.47 above.

Respondent 5: Point 2. – We are not routinely made aware of any foundation design changes that would impact mine gas risk. Please refer to comments in 5.39 to 5.40.

Point 3. Agree that verification should be completed in accordance with CIRIA C735 and other relevant technical guidance, etc. However in our experience, we don't always get information submitted in accordance C735 and it would be very difficult for Falkirk Council to insist on full compliance to C735, without mandatory statutory guidance/regulations specifically in relation to mine gas issues being enforceable.

Points 4 to 11. Detailed review points but in reality as above comments….

Also in small scale development such as extensions – what would be the advice from you/Government on appropriate verification of installation of gas remedial measures? Ideally would be a specialist certified under GPVS scheme but in reality this could prove economically prohibitive for small development and often it is the builder/contractor who verifies with photographic record and written certification. I can't think of many sites in which a certified specialist has verified gas remedial measures. Perhaps this is something that the private sector consultants and contractors should push for and raise awareness of necessity to clients. We currently cannot enforce this requirement easily or practically.

Table 3 Mandatory BS Technical Standard 3.1/3.2 needs updated ASAP to include consideration of all mine gases.

**Extra comments**

**Comments in relation to Annex C – process flowchart:**

Respondent 2: Please note: the CLO/EHO doesn't discharge planning conditions (central column), they can only make recommendations to the planning department (and building control).

I feel this diagram is over-complicated and would benefit from reflecting the phased approach (desk study, ground investigation, remedial action, verification) consistently across all three columns.

Respondent 5: Please note: The Contaminated Land Team (SCLO and CLOs) don't discharge planning conditions (central column), we only make recommendations to Development Management (Planning & Building Standards) that the planning or building warrant application can be purified in relation to general contaminated land conditions .

The flowchart is very detailed and perhaps over-complicated and would benefit from reflecting the phased approach (desk study, ground investigation, remedial action, verification) consistently across all three columns. The Contaminated Land Team's review process is similar for both Planning and Building Standards consultations and could be linked between all three columns. We don't review BS8485 design reports and drawings in significant detail as not our area of expertise. In addition we regularly don't receive Phase 1, 2, 3 or 4 reports prior to planning applications being approved (usually subject to conditions attached including CL conditions (as detailed in comments section of 5.23 to 5.25).



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Any enquiries regarding this publication should be sent to us at

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