The Coal Authority

Environment Agency

Mining and Groundwater Constraints for Sustainable Development and Drainage Systems (North East England only)

Guidance

Disclaimer

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Contents

1 Introduction

The mining and groundwater constraints screening tool (the screening tool) has been created through a partnership between the Environment Agency and the Coal Authority. Its geographical coverage at the current time is limited to the coalfield in North East England.

This screening tool seeks to raise awareness of a variety of mining and groundwater constraints in order that sustainable development and drainage systems may be achieved.

There have been examples where mining and groundwater have not been sufficiently assessed before commencing development works. This has in turn led to sites experiencing groundwater flooding, prolonged flood duration and has the potential for sustainable drainage systems (SuDS) not functioning as intended. For example, infiltration type SuDS which have not considered the potential for high mine water (for example groundwater within mine workings) levels occurring and preventing infiltration now or in the future. To meet current planning policy requirements and for sustainable development purposes, all new developments should have a design lifespan of up to 100 years (although some commercial developments have up to 60, or 75, year design life) to account for potential political and environmental changes.

This screening tool has been introduced to provide developers and competent authorities with a better understanding of the drainage implications they will need to consider within new development proposals, and if necessary to seek pre-consultation advice
The screening tool is currently in use by the local authorities, in the Environment Agency's North East Area boundary, on the coalfield and by Northumbrian Water Group as part of a year's trial; to be reviewed March 2019. The current screening tool has been modified and improved throughout its development stages, being trialled by Northumberland County and Gateshead Borough Council's and incorporating the suggestions and requirements of all the other local authorities, received following its launch. A summary of the frequently asked questions that have arisen during the trial to date are provided at the end of the document.

2 Background

Within the Environment Agency's North East area, there have been issues of groundwater flooding occurring. This has been seen in locations across the whole of the North East Area where infiltration into the ground has been increased due to changing rainfall patterns, human activity, or where groundwater levels have recovered following the cessation of mining operations.

Large areas of North East England have been undermined by coal mine workings. When the mines were active, mine water pumping artificially lowered groundwater levels changing the natural drainage patterns and providing man made drainage pathways. Following the closure of the mines and cessation of pumping, mine water and groundwater levels are now recovering, or have already recovered, to the pre-mining position.

In some areas with specific geology and a high water table, infiltration based sustainable drainage systems (SuDS) (or any SUDs with a component of infiltration) may not work and could result in groundwater flooding risks. Additionally, such issues may not occur immediately, but may take many years to manifest themselves as mine water levels continue to rise. For that reason, it is now

necessary to consider the potential future spatial pattern of mine water and groundwater levels and the potential pollution impacts.

The large network of mining beneath the North East has also resulted in some areas where mine water is close to surface, being controlled by either surface discharges or being actively controlled by Coal Authority pumping sites. Infiltration SuDS in some of these areas could have a detrimental impact on the amount and quality of water entering mine workings resulting in increased mine water pollution, flooding risks at new discharge locations, or impacts on mine water pumping infrastructure.

3 The screening tool

To provide better information on this, the Environment Agency (North East area) and the Coal Authority have combined their data and knowledge to create a spatial screening tool for the local authorities and others to use in strategic planning, development planning, urban drainage, and engineering.

This screening tool comprises:

- spatially mapped categories (the “constraints map”)
- two accompanying documents:
    - mining block fact sheets
    - this guidance document explaining the need for the screening tool and how to use it

The constraints map is made available on the Coal Authority’s Interactive Map Viewer.

The guidance document includes the process flow chart and category examples. Together, these identify what developers need to consider in their design proposals to ensure they can provide sustainable drainage systems.

To ensure the screening tool is not too conservative, or overly prohibitive, a number of constraints were not included or assessed. These constraints are: surface coal mining (opencast mines), mine entries and probable shallow mine workings. Layers of these constraints are available on the Coal Authority’s Interactive Map Viewer. Developers should consider and review this additional available information as they may reclassify their site’s category obtained from the screening tools constraints map.

4 Political setting

The development of the screening tool is aligned with the new and emerging political thinking, steer and legislative framework.

Whilst the screening tool can be used for many purposes it was developed following a flood incident, as an informative tool to inform the design of urban development and drainage schemes, ensuring acceptable mitigation measures are adopted and sustainable development. It should be used with the SuDS Manual (CIRIA C753, 2015) and the Drainage Hierarchy.

The National Planning Policy Framework 2018 requires:

- local authorities to ensure that flood risk is not increased elsewhere when determining any planning applications for major development and where appropriate, applications should be supported by a site-specific flood-risk assessment

- all major developments incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

    - take account of advice from the lead local flood authority
    - adopt appropriate proposed minimum operational standards
    - have maintenance arrangements in place for lifetime of the development

- Defra 25 year Plan - government policy
- This plan aims to reduce risks of harm from environmental hazards – people, environment and economy relating to flooding, drought and erosion including:

    - Making sure everyone is able to access the information they need to assess the risks
    - Making sure that decisions on land use including development reflect the level of current and future flood risk

- The Drainage Hierarchy and SuDS Manual, CIRIA guidance

Sustainable Drainage Systems (SuDS) are designed to mimic the natural drainage of surface water, typically managing rainfall close to where it falls. Surface water flows are then slowed down and discharged at a controlled rate before it enters a watercourse. They can also store water, allow it to soak into the ground or enable evaporation from surface. SuDS offer a wide range of benefits, as they can:

- manage flood risk
- maintain and improve water quality
- maintain and increase biodiversity
- provide amenity and green open spaces

- maintain groundwater recharge though infiltration

SuDS features include; filter strips and swales, filter drains and permeable surfaces, infiltration devices and basins and ponds.

Whilst small scale or minor developments are often exempted from regulatory control, it is recommended that developers use the toolkit described in this guidance, as it should protect them from any potential future liability.

All development incorporating drainage proposals should consider the location of discharge as a hierarchy and the Planning Policy Guidance (PPG) states that: "Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration)
2. to a surface water body
3. to a surface water sewer, highway drain, or another drainage system
4. to a combined sewer

- The option within the hierarchy that the screening tool addresses is the first one- into the ground (infiltration). The SuDS Manual states that infiltration is the preferred option but only 'where safe and acceptable to do so' (Table B4 of Appendix B of the SuDS Manual). The screening tool will help determine where is safe and suitable to infiltrate water. It should identify that in mining areas a 1m unsaturated zone, or 1m below the base of the SuDS infiltration surface, may not necessarily be an acceptable measure to mitigate either the flood risk or the pollution risk or the impact on the Coal Authority's assets.

Environment Agency context

- The Environment Agency's national and local screening level for providing specific advice for planning and permitting consultations is set very high and as such only the highest environmentally sensitive (risks to controlled waters only) and most complex sites/ developments will be seen and site specific advice given. This decision has been taken by the Environment Agency to address imbalances between available resource and workload. Recognising this, the screening tool including the Constraints Map has been developed to assist developers and competent authorities to manage groundwater and mine water constraints in their area and to enable developments to be futureproofed.

5 Understanding the tool and what you need to consider

5.1 Overview of constraints

This section describes the constraints which form the basis of the tool. In developing the tool we gave consideration to the Source-Pathway-Receptor (SPR) method of forming conceptual models. For certain constraints we looked at, it is apparent that they would typically be considered as a source, a pathway, or a receptor.

The specific constraints which form the basis of the mapped categories included in the screening tool are:

- on the coalfield area
- shallow mine water present
- shallow mine workings present
- controlling outflow nearby

Each of these constraints are described in more detail below.

5.2 On the coalfield area

If your site lies within the coalfield, then it is possible that the approach you take to design site drainage will be no different from anywhere else. However, there are still some factors to consider.

Deep drainage boreholes (>30m) might be considered as a possible method to inject surface drainage into the ground. The potential problem with this is that it may increase either the peak flows, or mean flows into, and through the mine workings. Consequences of such changes could include:

- increasing coal mine derived pollutant loadings at the point where the mine water discharges
- increasing the rate of rise of mine water levels
- ground stability issues

It is also worth being aware that mined coalfield areas can bring surprises. Your site may, at the outset, appear not to be associated with any other constraints listed below. However, when you investigate the ground conditions, you may discover that the site is actually affected by shallow mine water, or shallow mine workings. The shallow mine water could be a perched water level, lying high above the regional level. Unrecorded shallow mine workings are not uncommon, especially in the vicinity of coal seam outcrops.

Your site may also contain examples of other mining features which may form pathways, such as mine entries (shafts, or adits), geological fault lines, opencast backfill, or high walls. All of these should be taken into account when designing drainage schemes.

If your site lies on a part of the coalfield where Coal Measures are concealed under other rock strata, then the focus of your investigations would rightfully be on those shallower strata. For example, there may be coal mines at depth below sandstone, or limestone aquifers. In some areas of the United Kingdom such aquifer rocks are prone to coal mine related fissuring. This coal mine related fissuring along with weathering processes could increase the natural fissuring within the aquifer rock. Since fissures are near surface features, they have potential to affect site drainage systems.

5.3 Shallow mine water present

Shallow mine water is an important constraint to consider as there can be various implications for drainage.

In terms of the SPR method, shallow mine water might be considered to be either, or both, a source and a receptor.

The presence of mine water at shallow depths below surface, and associated saturated ground conditions, could limit the effectiveness of infiltration type SuDS (including any SuDS which have an infiltration component). In the worst case, the mine water level may rise sufficiently in response to rainfall events, or seasonal changes, that it becomes artesian. This could lead to groundwater flooding events. The source of the flood water would be the mine water, and the pathway would be the installed infiltration SuDS acting with a reverse, upwards flow.

The actual depth below surface at which shallow mine water becomes an issue will vary according to site specific geological conditions.

In low lying areas especially, artesian pressure may exist in mine workings underlying a site. Those workings could be at any depth. The artesian pressure may be held by overlying, confining strata, so there will be no apparent seepages or discharges of the mine water to surface. If a site development disturbs the ground such that new pathways are created, then an artesian flow of mine water can commence. Since mine water typically contains iron this can give the mine water an orange colour, and iron rich deposits will build up. So developments which suffer from artesian mine water will not only have unsightly SuDS features with orange staining, but will also find the SuDS are rendered ineffective as they become clogged by iron deposits and may be impacted by groundwater/ mine water flooding.

Shallow, or artesian, mine water can also occur as relatively localised, perched bodies of water. This could occur, for example where a single seam of coal has been worked in isolation from deeper seams. The isolated, flooded, coal workings could easily have a much higher potentiometric head (also known as piezometric head and is the water level under pressure) than a deeper, underlying, more widely interconnected, block of mine workings.

Rising mine water levels are occurring in various areas. Following the cessation of deep coal mining, dewatering pumps are typically switched off, and the water is allowed to rebound, or recover, to natural conditions (or to a new natural due to mine workings and entries) and, ultimately, to surface. The timescale for recovery can vary from months to decades. The implication for developments is that shallow mine water may arrive years after construction, and begin to cause the issues described.

In some areas mine water levels are actively controlled by pumped abstractions by the Coal Authority. This is normally being done to prevent the mine water level rising to a level where it may cause an environmental pollution problem. As a consequence this pumping will control groundwater levels. To minimise ongoing pumping costs, mine water levels would typically be held a few meters below the critical level. Other organisations may also pump mine water, and be retaining an artificially low mine water and groundwater level. Their reasons include, for example, water supply into canals, and using the mine water to provide space heating, or cooling, for buildings.

It is important to consider that over the design lifetime of any site drainage system, the pumping regime associated with mine water may change, or cease. Consequently, both mine and groundwater levels may rise. The Coal Authority looks for opportunities to decrease its pumping costs, where possible, by creating new engineered gravity-fed discharges. This will be subject to risk assessment and through a consultative process with the EA and other stakeholders. The transition from active pumping to gravity discharge will mean that there is a period of rising water levels, although this will often be on the scale of a few meters. Change in control from active pumping to gravity could also result in changing the rate of flow and direction in which the mine water flows. In addition to such planned transitions, it is also possible that unplanned changes occur, for example due to major failure of pumping infrastructure, and can lead to lengthy periods of time when water levels rise. Funding for ongoing pumping by the Coal Authority in perpetuity is not guaranteed (it is not a statutory activity). Such changes in pumping mean that shallow mine water may occur at certain locations in the future.

5.4 Shallow mine workings present

Shallow mine workings are an important constraint to consider as there can be various implications for drainage.

In terms of the SPR method, shallow mine workings might be considered to be a pathway. Shallow mine workings are the main zones where rainfall and surface water infiltrate into the workings.

Installing infiltration SuDS over shallow mine workings may increase either the peak flows, or mean flows into, and through the mine workings. Increases could potentially arise from any infiltration SuDS, where the proposed discharge to ground is greater than greenfield infiltration rate, or where current infiltration rate is less than that proposed (in terms of greening when developing brownfield sites). Consequences of such changes could include:

- increasing coal mine derived pollutant loadings at the point where the mine water discharges
- increasing the rate of rise of mine water levels
- ground stability issues

These potential consequences of increased infiltration are very similar to those associated with proposed deep drainage boreholes (see above), where a new pathway for infiltration is engineered. Any mine entries (shafts, or adits) at the site would also provide potential pathways, and, again, the same set of issues. The ground stability issues associated with such shafts include:

- filled shafts - increased infiltration could cause the washing out of fine material from the shaft fill, leading to shaft instability at some future time

- void (unfilled) shafts - increased infiltration could cause the washing out of mortar in brick linings, leading to shaft instability at some future time

In regard to ground stability, risks should already be the subject of the site's Coal Mining Risk Assessment. Stability risks are commonly addressed by, for example, injecting grout to seal mine voids. However, it is not always appropriate to fully seal the voids. There may be an active flow path for mine water as it travels under the site towards its eventual discharge location. If the flow path becomes blocked, then the water level may rise and cause either shallow mine water or artesian mine water discharge to occur.

5.5 Controlling outflow nearby

The Coal Authority manages mine water at various sites, commonly referred to as mine water treatment schemes. A controlling outflow is considered to be an outflow of mine water which provides control of the water levels across a mine water block. Controlling outflows may be:

- pumped
- gravity-fed
- gravity-fed, with subsequent pumping to a treatment area

Additionally, they may also be:

- treated, or
- un-treated
- current, or
- predicted

In terms of the SPR method, a controlling outflow might be considered to be a receptor.

Although it is not a statutory activity, the Coal Authority is funded by central government to pump and treat mine water. The Coal Authority continues to look for ways to decrease the ongoing cost of both pumping and treatment.

If a development site installs a drainage system which increases either the peak flows, or mean flows into, and through the mine workings, consequences of such changes to controlling outflows could include:

- additional flows causing increased pumping costs
- higher flows exceed the pumping capacity, requiring additional capital expenditure to upgrade pumps
- higher flows exceed the hydraulic capacity of the treatment scheme, thus reducing treatment performance, or requiring capital expenditure to upgrade
- increasing pollutant loadings into a treatment scheme, thus reducing treatment performance, increasing sludge production and handling costs, or requiring capital expenditure to upgrade

- Impacts to Controlling Outflows could potentially be caused by sites anywhere across its mine water block. However, in practical terms, the closer a development site is to a controlling outflow, the higher the likelihood that there will be some form of negative impact from additional water infiltrating to ground.

6 Constraints Category Mapping

6.1 Overview

This section introduces the way we have mapped the constraints to form the spatially mapped categories which form the constraints map element of the screening tool. We will explain how we have quantified the constraints, and devised the categories. Also, several conceptual examples for the categories are provided.

In general, a relatively conservative approach has been applied in the selection of criteria. This means that the mapping data has a tendency more towards a worst case rather than the most likely situation. However, as described above, various constraints can occur with a wide range of time and place.

A key illustration of our conservative approach is provided by the handling of water levels. We know that there is significant potential for levels to rise in the future in areas which are currently either rising, or controlled by pumping. So we have created a set of water level contours representing the current and future situation (after levels are eventually fully recovered). The future water levels are more conservative than the current water levels, since they are more likely to highlight a potential constraint for a site's drainage. Future water levels have been calculated based on review and interpretation of existing data and knowledge and may be subject to change.

6.2 Definitions for constraints used for category mapping

The following definitions have been applied to the constraints for the purpose of creating the categorised constraints map.

6.2.1 On the coalfield area

For the purpose of mapping, the coalfield area is defined as being where mine water blocks can be delineated.

This is a different definition from that applied to create the coal mining reporting area dataset (which can be viewed in the Coal Authority's Interactive Map Viewer). In particular, the mine water block boundaries have not been extended outward by a precautionary buffer zone, as has been done for the coal mining reporting area. In practice this means that whilst the majority of the worked coalfield of North East England is covered by the category mapping, there are a small minority of peripheral, small, isolated workings which are not covered. Therefore, it is possible for a site to be within the coal mining reporting area, but not have been allocated a specific category. However, it is still possible to determine the effective category for such a site, by using the datasets available on the Interactive Map Viewer, augmented with any site investigation results.

Offshore coal workings, under the sea bed, have been excluded from the mine water blocks for this exercise, as they are not deemed relevant. Therefore, the eastern boundaries of the coastal mining blocks have been modified to align with the coastline.

6.2.2 Shallow mine water present

For the purpose of mapping, we have defined this as the mine water level being less than 10 m depth below surface. This also includes artesian conditions where the potentiometric (pressure) head lies above the ground surface.

Since recovered mine water levels typically show seasonal rise and fall, we selected the 95%ile values (with units of meters Above Ordnance Datum, m AOD) to represent relatively wet winter situations. For areas with ongoing rising levels, the maximum value was selected. Contouring (in m AOD) was applied across mine water blocks to reveal existing, current mine water table gradients. Next, the future water level contours were created (in m AOD). This was done by using the likely future locations for controlling outflows, together with available information on the gradients. The final step was to use readily available surface topography data (in m AOD) to determine the future mine water level as depth below surface. Where this depth is <10 m below surface, the Shallow Mine Water constraint is present.

Further details of the contouring methodology, and any data limitations are provided in the mine water block fact sheets and should be considered during site specific assessments.

Vertical accuracy is limited primarily by the assumptions of future water table gradients, rather than the surface topography data.

6.2.3 Shallow mine workings present

This constraint uses a pre-existing Coal Authority dataset for recorded past shallow coal mine workings. This dataset can be viewed in the Interactive Map Viewer, where it is named ‘past shallow coal mine workings’.

Shallow mining is usually defined as less than 30 metres depth below surface.

For clarity, the dataset used for this constraint does not include unrecorded mine workings, even where they are thought to probably exist.

6.2.4 Controlling outflow nearby

For the purpose of mapping, we have defined this constraint as there being a controlling outflow less than 1 km away.

The 1 km value has been selected as we considered this to represent a proximity to developments which is most likely to potentially cause issues for controlling outflows. However, it remains possible that impacts to controlling outflows could occur across the full extent of a mine water block.

Controlling outflows include:

- current Coal Authority operated pumping stations
- current gravity fed discharges
- future gravity fed discharges

Controlling outflows are considered to be those discharges which form the main mine drainage on the scale of each mine water block.

There are large numbers of very small discharges which only drain localised, or isolated workings. These have not been selected as controlling outflows. Therefore, it is possible that your site will be near to a minor discharge, not classed here as a controlling outflow, but which could still be affected by development.

We determined the locations for the future controlling outflows by considering the topography, and the current, or expected mine water gradient.

Each controlling outflow identified has a 1km radius circular buffer zone plotted around it.

Further information about controlling outflows is contained in the fact sheets for each mine water block, and should be considered during site specific assessments.

6.3 Category mapping

The constraints are combined together spatially to create the following mapped categories.

Category	Criteria description
A	Off the coalfield
B	On the coalfield area
C1	On the coalfield area with one, or both of: shallow mine workings, and nearby controlling outflow
C2	On the coalfield area with shallow mine water
D	On the coalfield area with shallow mine water, and one, or both of: shallow mine workings, and nearby controlling outflow

An alternative way to visualise these categories is given in the matrix table, below.

Category	On the coalfield area [within mapped extent of mine water blocks]	shallow mine water present, [<10 m below surface, including artesian]	one, or both of: shallow mine workings [usually <30 m below surface], and nearby controlling outflow [<1 km from site]
A	-	-	-
B	Yes	-	-
C1	Yes	-	Yes
C2	Yes	Yes	-
D	Yes	Yes	Yes

The reason that the shallow mine workings (pathway) and nearby controlling outflow (receptor) are grouped together in this way is as follows. The presence of a potential pathway, or receptor, or both, indicates that **off-site** drainage risks may be present, warranting further investigation. Conversely, the presence of shallow mine water has **on-site** drainage risks as its primary focus for further assessment. By on-site, we are referring to the possibility that shallow mine water conditions will lead to poor functioning of infiltration type SuDS, and also potential groundwater flooding to the development site.

This differentiation between on-site and off-site risks also leads to different actions, as explained below.

6.4 Coverage of category/constraints maps

The overview maps below show the extent of the mine water blocks (Figure 1), and the resulting category or constraints map (Figure 2), both for the North East England coalfield region.

You can find out both the category, and the mine water block for your site at the Coal Authority's Interactive Map Viewer:

http://mapapps2.bgs.ac.uk/coalauthority/home.html

First, zoom the map into your site. Next, under the "Planning" theme, turn on the layer labelled "NE Mining and Groundwater Constraints". Then, click on the map. The results will indicate both the category, and the name of the mining block.

Further information about each mine water block is available as a fact sheet for each block and should be considered during site specific assessments. These are available at the following webpage:

www.gov.uk/guidance/mining-and-groundwater-constraints-for-development

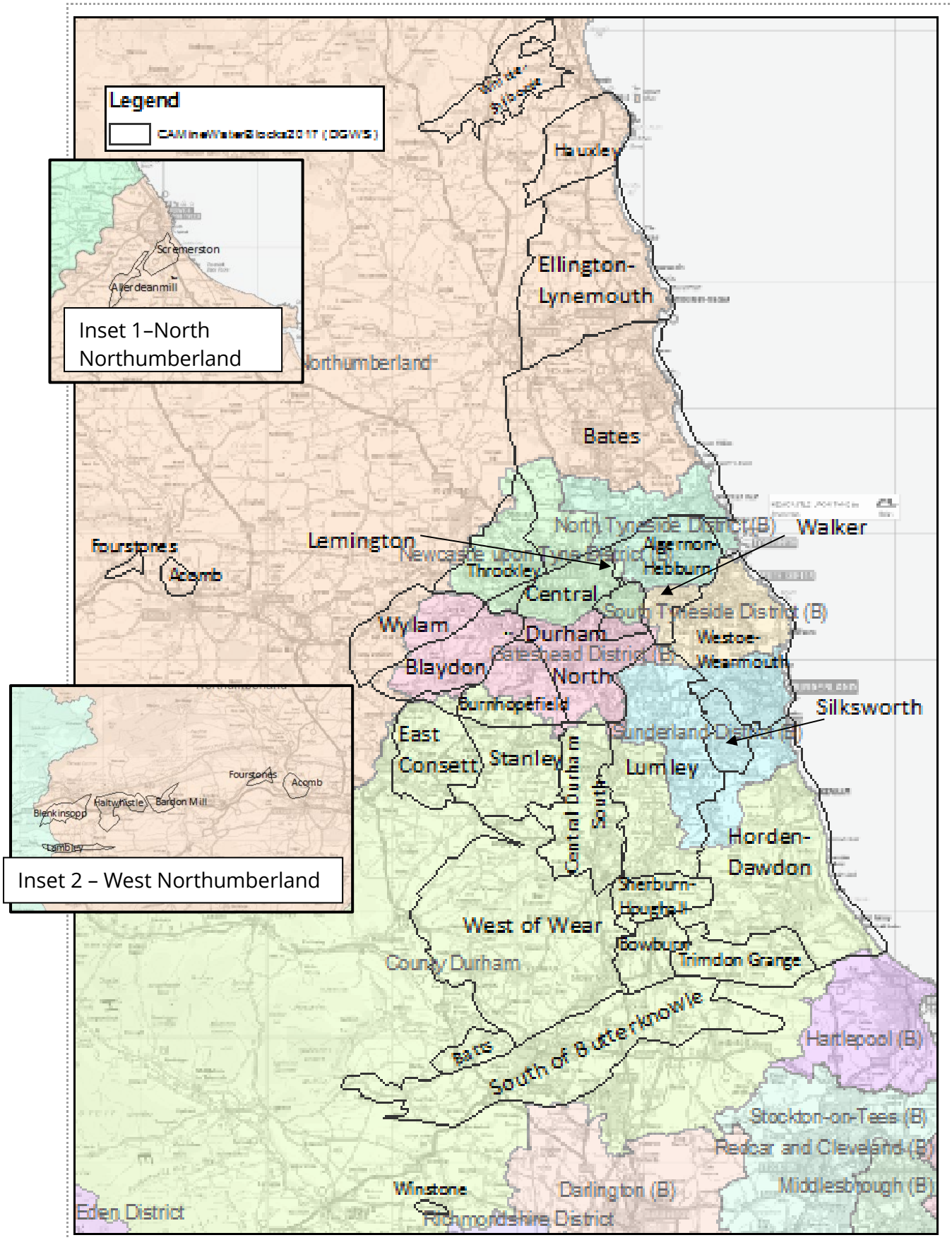


Figure 1. Extent of Coalfield and Mining Blocks 2017, (by permission of the Coal Authority)

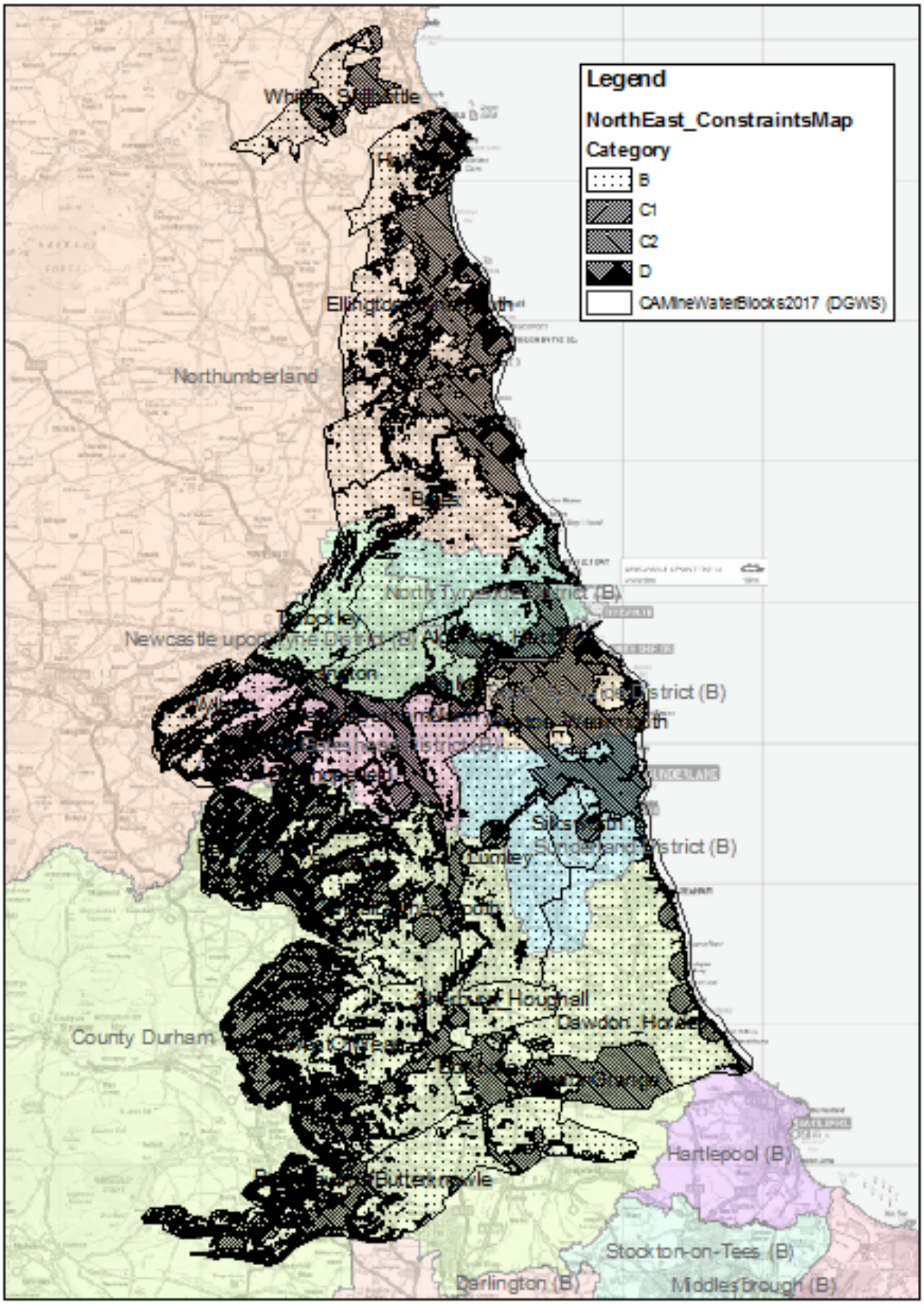


Figure 2: Mining and Groundwater Constraints Map for Sustainable Development and Drainage Systems

6.5 Category modifications

It is important to utilise all available site specific information to determine the effective category for the development. In practice this means modifying the category shown on the map to take account of additional mining features. Such additional features, or constraints, may be identified either at a desk study phase, or during ground investigations.

Some datasets provided by the Coal Authority on its Interactive Map Viewer can be used to identify recorded mining features, which may act as pathways. Unrecorded mining features are, of course, not included in available datasets, and these cannot be identified through desk study alone. Hence, ground investigation is needed to identify the presence of any additional constraints such as formerly unrecorded mine entries, mine workings, and so on.

The table below explains how you should modify the mapped categories depending which extra mining features are found on your site.

Mapped Category	Additional Mining Features found to be present on site	Modified, Effective Category
A	Within Coal Mining Reporting Area[1]	B
B	Any potential pathway including: Unrecorded Shallow Coal Mine Workings Mine Entry[1] Coal Seam Outcrop[1] Surface Mining[1] (opencast backfill / high wall) Fissures / Breaklines[1] Geological Fault	C1
B	Shallow Mine Water	C2
B	Minor discharge of mine water connected to workings underlying the site	C1
C1	Shallow Mine Water	D
C2	Any potential pathway including: Unrecorded Shallow Coal Mine Workings Mine Entry[1] Coal Seam Outcrop[1] Surface Mining[1] (opencast backfill / high wall) Fissures / Breaklines[1] Geological Fault	D
C2	Minor discharge of mine water connected to workings underlying the site	D

[1] Data layer can be viewed on Interactive Map Viewer to allow recorded mining features to be identified during desk study, but additional unrecorded mining features may be found during ground investigation at site

You should note that, based on the table above, it is possible for your site to begin with a mapped Category A, or B, and ultimately be modified to a Category D if you find both shallow mine water and one of the pathway features.

6.6 Category examples

We have prepared various example scenarios to aid you in the development of the conceptual understanding of the potential risk/constraint at your site. For each category, there follows one or more scenarios. Each scenario comprises a conceptual cross section diagram, and a listing of the relevant considerations. Note that whilst we cannot represent every possible situation, the examples are intended to provide a useful reference for you to create your site specific conceptual model.

Key to category example schematic diagrams:

	**Rainfall**
	**Infiltration**
	Contaminated water (by flow through the mine workings)
	Mine workings
	Mine water piezometric surface
	**Flooded adit**
	**Unflooded adit**
	**Site or drainage borehole**

	**Flooded shaft**
	**Unflooded shaft**
	Ground surface
	**Surface water**
	**Permeable material such as alluvial sand**
	**Lower permeability material such as clay**

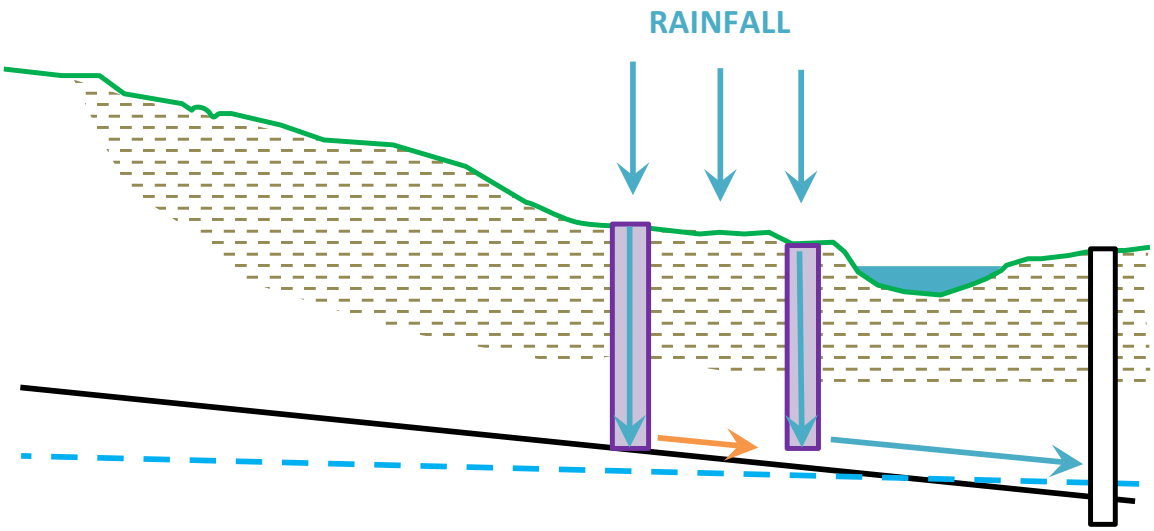
Example Situation - Category B

Criteria for Category B - all the following are met:

Mine water level >10m below surface (i.e. NOT Shallow)
Mine workings >30m below surface (i.e. NOT Shallow)
Controlling Outflows >1km from the site (i.e. NOT nearby)

Example 1

Deep borehole infiltration is being used and drilled to the mine workings
Infiltration boreholes in to the mine workings and Coal Measures strata (e.g. sandstone)
Mine workings >30m deep
Mine water level >10m
No controlling outflows within 1km



Potential risks or impacts

Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate
The water infiltrated could discharge in to a different surface water (catchment)
Rising mine water could decrease the amount of current infiltration (reduce the rate of infiltration and even reduce the storage and attenuating capacity)
Mine water could be controlled >1km from the site and be impacted by the infiltration
Directing water through dry mine workings could mobilise pollutants and cause pollution

Material considerations:

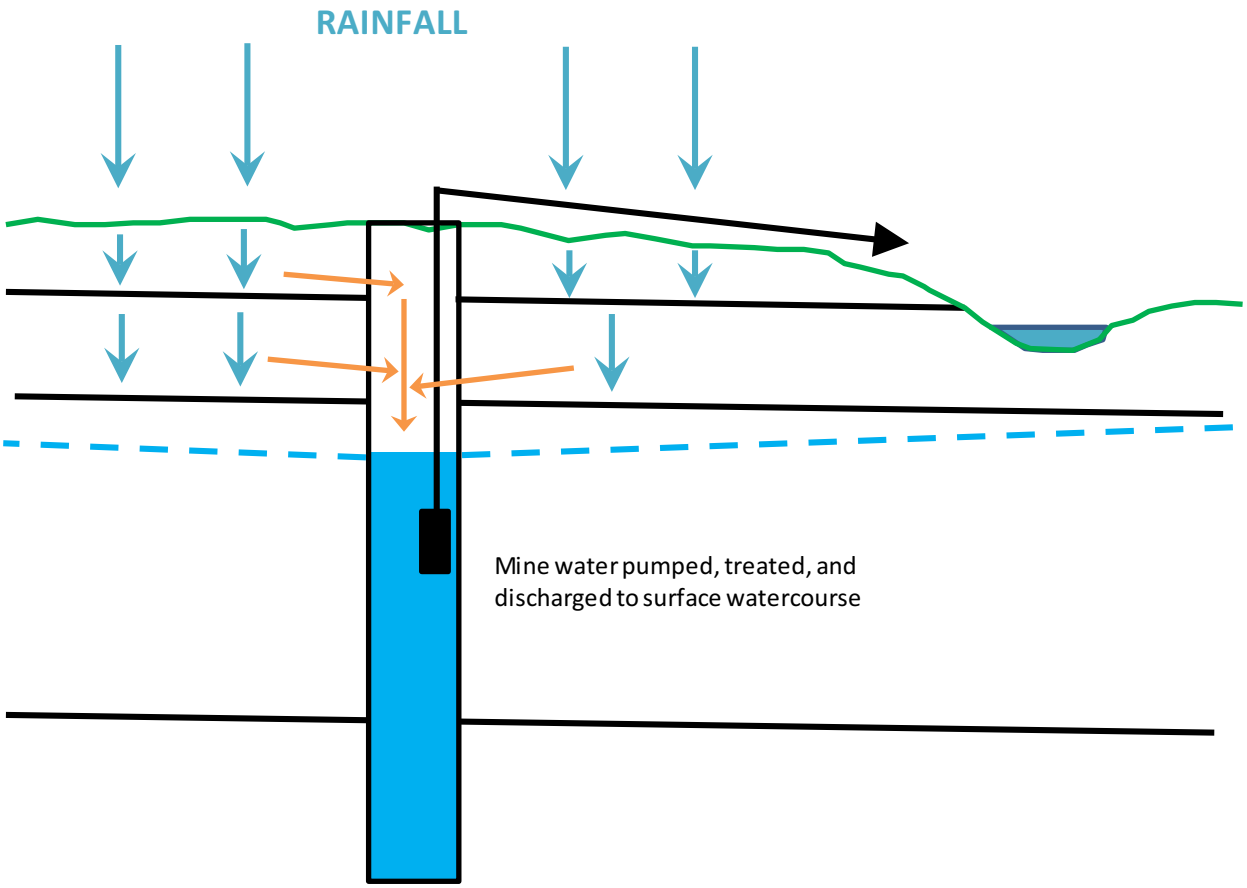
The current mine water level could already be at this level
The current mine water level could be deeper and rising alternatively the future mine water level could be higher
This could be a current or future controlling outflow
Locating unrecorded shallow mine workings during site works, would make this a Category C1, and if shallow mine water is also found it would become a Category D

Example Situations - Category C1

Criteria for Category C1 - all the following are met:

Mine water level >10m below surface (i.e. NOT Shallow)
plus one, or both of :
Shallow Mine Workings (<30m below surface) &/ Controlling Outflow nearby (<1km)

Example 1
Pumping shaft is the Controlling Outflow
Mine water being maintained by pumping and deeper than 10m
Shallow mine workings present
Infiltration SuDS being used, or SuDS rely on some infiltration



Potential risks or impacts
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate
The water infiltrated could discharge in to a different surface water (catchment)
Directing water through dry mine workings could mobilise pollutants and cause pollution

Material Considerations:
The current mine water level could be deeper and rising
The current mine water level could already be at this level
This could be a current or future controlling outflow
If a Category C1 encounters shallow mine water then it would become a Category D
Future site works (e.g. grouting shallow mine workings) could impede infiltration and groundwater flow

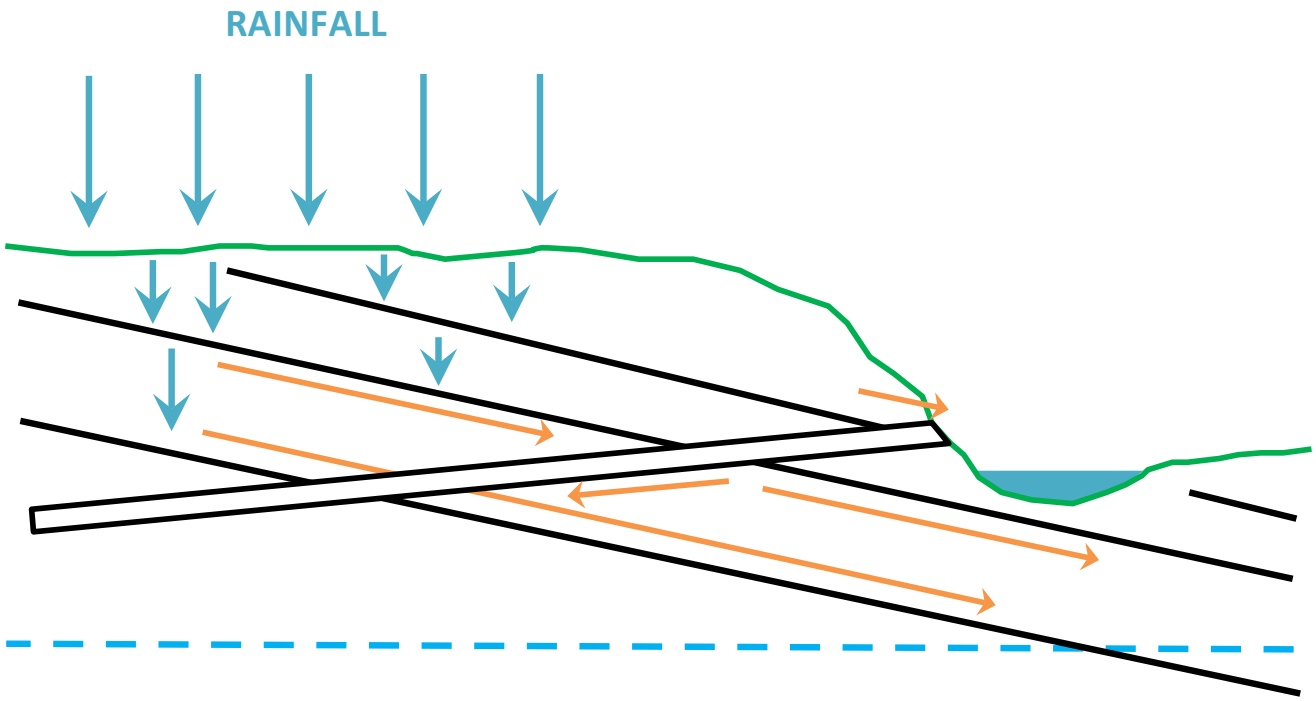
Example 2

Shallow mine workings present

Mine water is deeper than 10m

Increased infiltration could change the rate of the rising mine water (make it quicker)

Infiltration SuDS being used, or SuDS rely on some infiltration



Potential risks or impacts

Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged

Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate

The water infiltrated could discharge in to a different surface water (catchment)

Water pathway could pick up pollution from the mine workings before discharges

Infiltration could increase the rate of recovery of the rising mine water, or increase the mine water water level

Increased infiltration could result in a new mine water discharge at surface

Mine water could be controlled >1km from the site and still be impacted by the infiltration

Future site works (e.g. grouting shallow mine workings) could impede infiltration

Directing water through dry mine workings could mobilise pollutants and cause pollution

Material Considerations:

The current mine water level could be deeper and rising

The current mine water level could already be at this level

The site is not within 1km of a current or predicted future controlling outflow

This could be a current or future controlling outflow

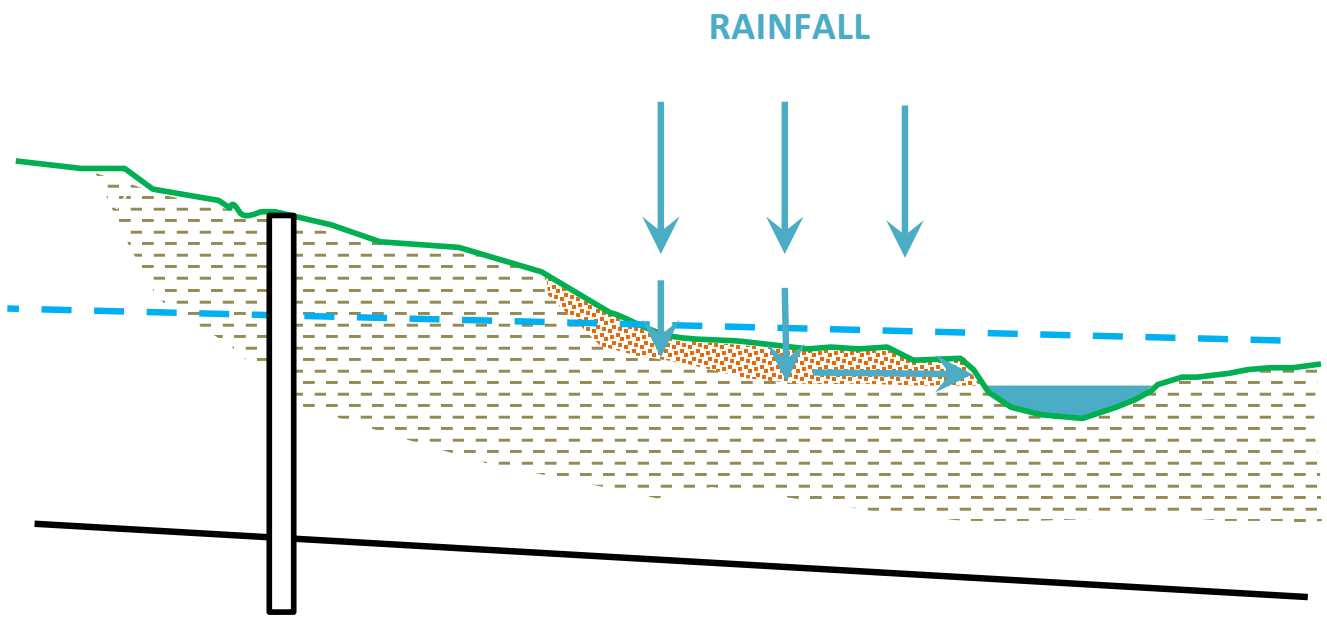
Example Situation - Category C2

Criteria for Category C2 - all the following are met:

Shallow Mine Water <10m below surface, possibly with artesian pressure
Mine workings >30m below surface (i.e. NOT Shallow)
Controlling Outflows >1km from the site (i.e. NOT nearby)

Example 1

Infiltration SuDS being used, or SuDS rely on some infiltration
Deep borehole infiltration is not being used
Mine workings >30m deep
Piezometric head <10m and potentially artesian



Potential risks or impacts

Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate
The water infiltrated could discharge in to a different surface water (catchment)
Increased infiltration could result in a new mine water discharge at surface
Mine water could upwell in to the base of the pond / SuDS etc, if there is a pathway
Mine water could be controlled >1km from the site and the asset could be impacted by the infiltration
Future site works (e.g. boreholes) create a pathway to/from the mine workings
Directing water through dry mine workings could mobilise pollutants and cause pollution

Material Considerations:

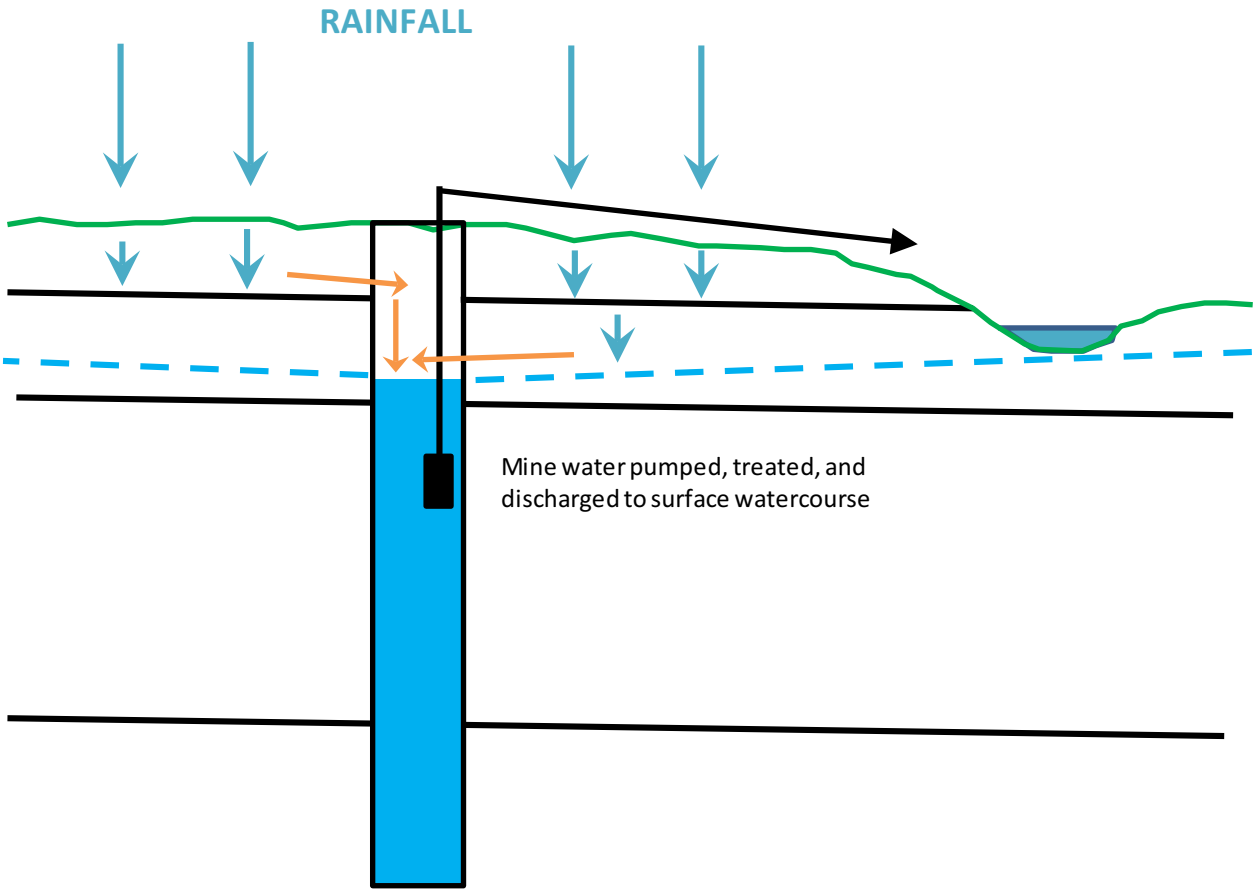
The current mine water level could be deeper and rising
The current mine water level could already be at this level
Infiltration could increase the rate of recovery of the rising mine water, or increase the mine water level
This could be a current or future controlling outflow
If unrecorded mine workings are located during site works, it would make this a Category D
If other mining feature pathways (mine entries etc) are identified it would make this a Category D

Example Situations - Category D

Criteria for Category D - all the following are met:

Shallow Mine Water <10m below surface, possibly with artesian pressure
plus one, or both of :
Shallow Mine Workings (<30m below surface) &/ Controlling Outflow nearby (<1km)

Example 1
Pumping shaft is the Controlling Outflow
Shallow mine water being maintained by pumping
Shallow mine workings present
Infiltration SuDS being used, or SuDS rely on some infiltration

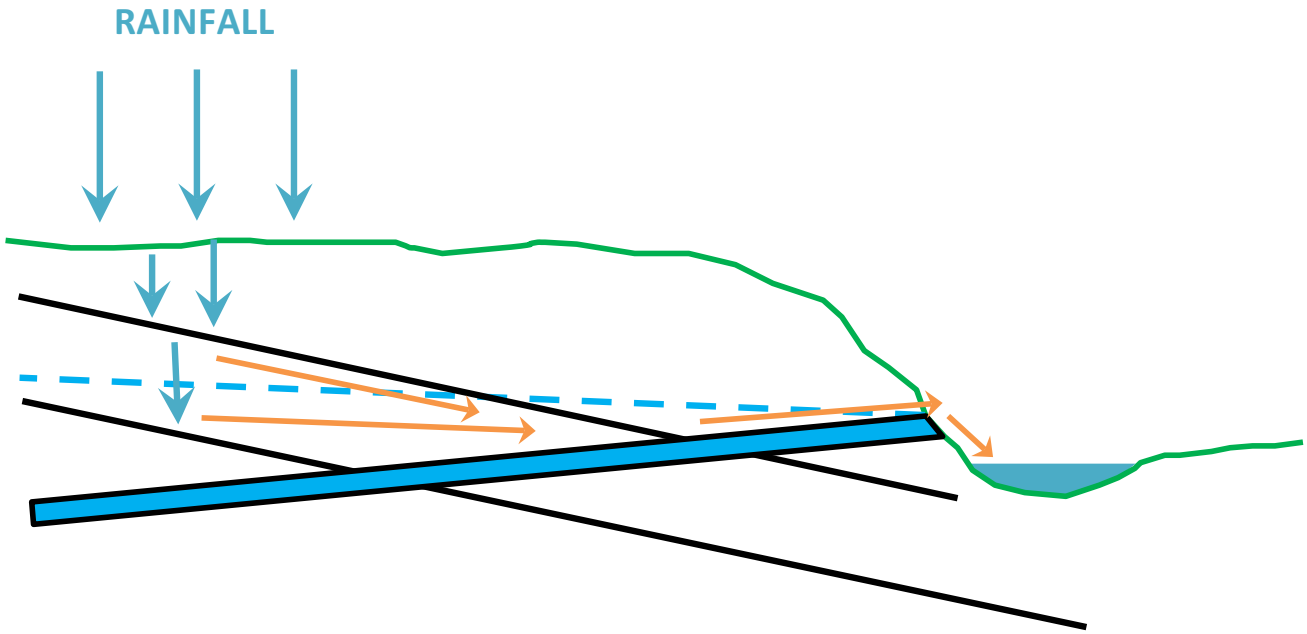


Potential risks or impacts
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate
The water infiltrated could discharge in to a different surface water (catchment)
Directing water through dry mine workings could mobilise pollutants and cause pollution

Material considerations:
The current mine water level could be deeper and rising
The current mine water level could already be at this level
This could be a current or future controlling outflow
If the mine water level is deeper than 10m, this could be a Category C1 example

Example 2

A 'natural' gravity discharge is the Controlling Outflow (treated or untreated to a surface water course)
Shallow mine water being maintained by the discharge
Shallow mine workings present
Infiltration SuDS being used, or SuDS rely on some infiltration



Potential risks or impacts

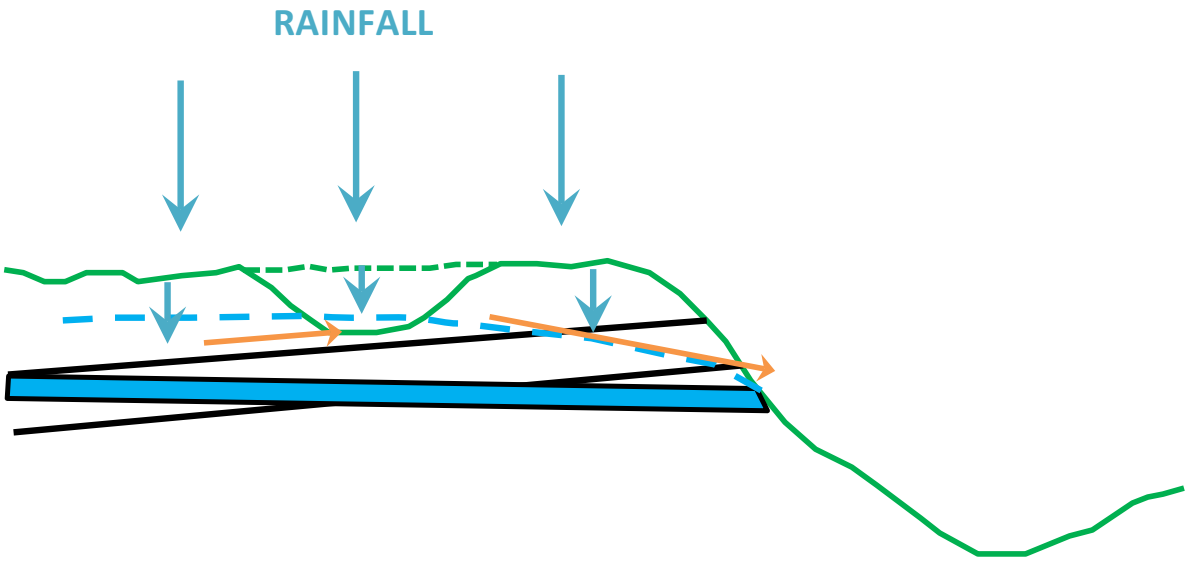
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could increase the amount being discharged
Increased amount of infiltration (either annual total (m3/a) and / or instantaneous amount (l/s)) could make the mine water quality deteriorate
Directing water through dry mine workings could mobilise pollutants and cause pollution

Material considerations:

The current mine water level could be deeper and rising
The current mine water level could already be at this level
This could be a current or future controlling outflow
If the mine water level is deeper than 10m, this could be a Category C1 example

Example 3

A 'natural' gravity discharge is the Controlling Outfall (treated or untreated to a surface water course)
Shallow mine water being maintained by the discharge
Shallow mine workings present
Infiltration SuDS being used, or SuDS rely on some infiltration
SuDS intersect shallow mine water, or mine water pathway (e.g. fractures, workings, boreholes)



Potential risks or impacts

Increased amount of infiltration could increase the amount being discharged
Discharge could upwell in to the base of the pond / SuDS etc
Water pathway could pick up pollution from the mine workings before discharges
Directing water through dry mine workings could mobilise pollutants and cause pollution
The issues could be via 'indirect' connections to the mining system (e.g. fractures)

Material Considerations

The current mine water level could be deeper and rising
The current mine water level could already be at this level
This could be a current of future controlling outflow
If the mine water level is deeper than 10m, this could be a Category C1 example

7 How to use the screening tool

The action which a site developer needs to take depends on the category in which the site is located. We have provided a simple summary table below, followed by a more comprehensive flow chart diagram.

Category[1]	Criteria description	Action summary[2]
A	Off the coalfield	Available SuDS guidance and best practice for assessing pollution and flood risk should be followed. Groundwater should always be considered when designing drainage schemes.
B	On the coalfield area	Specific requirements for deep ground works or deep drainage boreholes.
C1	On the coalfield area with one, or both of: shallow mine workings, and nearby controlling outflow	Deep ground works or deep drainage boreholes require pre-application consultation with the Coal Authority (Permissions team).
C2	On the coalfield area with shallow mine water	SuDS may not work, developer must suggest alternative methodologies or undertake detailed hydrogeological risk assessment, or investigation, that require pre-application consultation with the Lead Local Flood Authority (LLFA).
D	On the coalfield area with shallow mine water, and one, or both of: shallow mine workings, and nearby controlling outflow	SuDS may not work, developer must suggest alternative methodologies or undertake detailed hydrogeological risk assessment, or investigation, that will require pre-application consultation with the Coal Authority (Permissions team) and the Lead Local Flood Authority (LLFA).

[1] Use the effective (modified) category if this differs from the mapped category according to the Interactive Map Viewer

[2] An additional action, applicable to categories B to D, is to consider the information contained in the relevant mine water block fact sheet during site specific assessments.

Notes:

1. This screening tool is for major developments. Major development is as defined in The Town and Country Planning (Development Management Procedure) (England) Order 2015.
2. *SuDS guidance documents: Policy Guidance: Drainage Hierarchy. Best Practice Technical Guidance: CIRIA Manual, Buildling Regulation Guidance 2010 (March 2015).
and flood risk standing advice to Local Authorities about vulnerable properties on Gov.uk https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
3. This process only relates to drainage and mine water. There is a separate process for sites with potential stability or safety issues related to past coal mining.
4. Any proposal that impacts on Coal Authority property (including mine workings and mine entries) will require pre-application consultation with the Coal Authority Permissions Dept.
5. Categories B, C1,C2 and D are all on the coalfield.
6. Refer to the Category Example document for further clarification.
7. An additional action, applicable to categories B to D, is to consider the information contained in the relevant mine water block fact sheet during site specific assessments

Decision: What category?

Category A
Off the coalfield

Yes

Action:
Follow SuDS Guidance* and best practice for assessing pollution and flood risk on controlled waters (including groundwater).

Reason:
To provide a fully justified risk assessment to support sustainable development.

No

Category B
No shallow mine workings, no nearby controlling outflow, or shallow mine water

Yes

Question:
Are deep drainage boreholes (>30m deep) proposed?

Yes

Impact/ Reason:
Anthropogenic infiltration drainage schemes may result in flooding and pollution away form the proposed development and may impact mine waters and assests operated by the Coal Authority.

Action:
Infiltration rates of the development should be assessed and compared to greenfield or predevelopment rates. Consider impacts of the development and suitability of the subsurface coalfield environment in terms of quantity, routing of water and the pollution risk.
Follow SuDS Guidance* and best practice for assessing pollution and flood risk on controlled waters (including groundwater).

Developer must undertake:
Site specific flood and drainage assessment The assessment needs to consider current / future mine water and ground water data.
Statutory consultation with the Lead Local Flood Agency regarding flood risk.
Pre application discussions with the Environment Authority required regarding Environmental Permitting Regulations, where infiltration is directed to unsaturated coal measures strata.
Contact the Environment Agency though the customer enquiries process as groundwater / mine water level data may be available and can be provided on request
If the proposal impacts Coal Authority property it will require pre-application consultation with the Coal Authority Permissions Department.

No

Action:
No Specific Consultation.
Consider impacts of proposal and suitability of the subsurface coalfield environment
Follow SuDS Guidance* and best practice for assessing pollution and flood risk on controlled waters (including groundwater)

Reason:
To provide a fully justified risk assessment to support sustainable development.

No

Category C1
Shallow mine workings and/or controlling outflow

Yes

Question:
are deep drainage boreholes (>30m) proposed?

No

Impact:
SuDS that change the current infiltration rate, volume or location may impact on Coal Authority mine workings or other infrastructure.

Action:
Infiltration rates of the development should be assessed and compared to greenfield or predevelopment rates. Consider impacts of the development and suitability of the subsurface coalfield environment in terms of quantity, routing of water and the pollution risk.

Developer must undertake:
Pre-application consultation with Coal Authority, through their Permissions process.
Site specific flood and drainage assessment. The assessment needs to consider current / future mine water and ground water data.
Contact the Environment Agency though the customer enquiries process as groundwater / mine water level data may be available and can be provided on request

Reason:
Rising mine waters now or in the future may reduce the infiltration rate and efficiciency of the infiltration SuDS over the design life of the drainage scheme.

Yes

No

Category C2
Shallow mine water

Yes

Question:
Is there hydraulic connection to the mine workings ie a mine entry, pathway or borehole including

Yes

Impact/ Reason:
Infiltration SuDS may not work currently now or in the future. All SuDS could be impacted by mine water.

Action:
Developer should demonstrate that the proposed SuDs would work via a detailed hydrogeological risk assessment or suggest alternative methodologies

Developer must undertake:
Pre-application consultation with Coal Authority, through their Permissions process.
Pre-consultation with Lead Local Flood Authority for drainage proposals other than drainage to network.
Contact the Environment Agency though the customer enquiries process as groundwater / mine water level data may be available

No

Action:
No Specific Consultation.
Consider impacts of proposal and suitability of the subsurface coalfield environment
Follow SuDS Guidance* and best practice for assessing pollution and flood risk on controlled waters (including groundwater)

Reason:
To provide a fully justified risk assessment to support sustainable development.

No

Category D
Meets the criteria for both C1 and C2

Yes

You will see that the actions may involve you liaising with any, or all of, in this order:

- Local Planning Authority
- Lead Local Flood Authority
- Coal Authority
- Environment Agency

For each defined mine water block (mapped as categories B to D) the relevant fact sheet should be referred to during your site specific assessments, and also prior to commencing consultations.

Although the new screening tool is raising awareness of the mining and groundwater constraints, it is not considered necessary to introduce new risk assessment processes or for the information to be compiled into an additional standalone report. Rather, the constraints can be addressed using existing risk assessment procedures. Many of the pre-existing risk assessments undertaken in the development process should already contain a groundwater component and therefore it is expected that the new screening tool information will feed into and enhance these assessments.

Flood Risk Assessments (FRAs) and Environmental Risk Assessments (ERAs) should already consider groundwater – these should now also consider the additional information that the Constraints Map and fact sheets provide. In producing the above assessments the developer will have a written understanding of the risks from the development and should summarise these as a conceptual model. The conceptual model is an illustration summarising the potential: source, pathway and receptor linkages (SPR) and associated flood and pollution risks to and from the development.

8 Data and resources

8.1 Assistance with groundwater risk assessments

Further information regarding the conceptual modelling process can be found on Gov.uk. Specifically, we recommend the following templates, and guidance:

- Environmental Setting and Installation Design - ESID template
- Hydrogeological Risk Assessment - HRA template
- Groundwater risk assessments - Guidance

Note: these templates and guidance are specific for landfill and or activities requiring a permit under the Environmental Permitting Regulations, but the groundwater risk assessment process is essentially the same.

8.2 Coal Authority data

The Coal Authority holds environmental monitoring data for many of the blocks covered by the Constraints Map. The Coal Authority's data has been considered within the screening tool. Datasets are typically available under license and are chargeable according to the specific use of the data. Types of data which may be of interest to developers, and their consultant advisors, may include:

- Mine Water Level time series data
- Mine Water Flow Rate time series data
- Water Level contours (current situation, or future estimated situation, both in mAOD) for use in GIS
- Mine Water Treatment Schemes – Coal Authority site locations for use in GIS (available as either points, or boundary polygons, both of which are covered by Open Government Licence)
- Mine Water Discharge points - for use in GIS (note this is NOT the same as Controlling Outflows)
- Mine Water Heat Recovery Access Agreements boundaries - for use in GIS

Please make your requests for data to:
datasolutions@coal.gov.uk

The location of the Coal Authority's monitoring points are included in the following dataset, available for free downloading:
https://data.gov.uk/dataset/ac561055-3bac-4dd4-9e30-3f66bbc2896a/environmental-monitoring-points

The Coal Authority's Interactive Map Viewer allows a variety of GIS datasets to be viewed:
http://mapapps2.bgs.ac.uk/coalauthority/home.html

Further information is available on the Coal Authority's webpages, for example:
https://www.gov.uk/guidance/using-coal-mining-information

8.3 Environment Agency Data

Groundwater and mine water level data is available from the Environment Agency and can be made available upon request though the Freedom of Information process. The Environment Agency level data, where available, has already been assessed in terms of the SPR approach as it has been used in the creation of the Constraints Map. Therefore, you may not need to obtain the raw data to make your informed assessment. However, if for completeness you require the raw data, please note that it is important to request information and data within the entire mining block associated with the development rather than just data within a standard radius from the development as the relevant monitoring point(s) could be a considerable distance from the development and may not identify all the SPR linkages.

9 Competent authorities – contact information

Local councils

Development enquiries
In the early stages of new development, it is recommended that the relevant local authority is contacted for planning and drainage advice as this is their regulatory remit. The local authority has copies of the screening tool and can provide the relevant information for your site, on request. The Development Management and Lead Local Flood departments may also hold detailed information for the local area so that site specific and cumulative impacts can be assessed. Furthermore, the planning department may have local policies within local plans, strategic flood risk assessments, surface water management plans etc which will need to be considered as part of the development process.

Registered provider name	Telephone	Web address
Durham County Council	0191 383 3000	www.durham.gov.uk
Gateshead Metropolitan Borough Council	0191 433 3000	www.gateshead.gov.uk
Newcastle upon Tyne City Council	0161 234 5000	www.newcastle.gov.uk
North Tyneside Council	0845 200 0101	www.northtyneside.gov.uk
Northumberland County Council	0845 600 6400	www.northumberland.gov.uk
South Tyneside Council	0191 427 1717	www.southtyneside.info
Sunderland City Council	0191 520 5555	www.sunderland.gov.uk

Groundwater flooding
Groundwater flooding incidents should be reported to the Lead Local Flood Authority. They will investigate and consult other competent authorities as required. This may include the Coal Authority for public safety risks or the Environment Agency for pollution risks.

The Coal Authority

Planning
The Coal Authority is a statutory consultee on planning applications that could be impacted by stability or safety issues related to coal mining. Developments on the coalfield should undertake a Coal Mining Risk Assessment.

https://www.gov.uk/guidance/planning-applications-coal-mining-risk-assessments

Coal Mining Risk Assessments are intended to consider the potential for the emission of mine water and mine gases from mining features, in addition to the primary focus on ground stability risks. However, the interaction of sustainable drainage with mining, and groundwater features has not been included. Further information regarding the Coal Authority's planning remit is available on the Coal Authority website (www.gov.uk/coalauthority). There is also supporting guidance for developers at Resources for Developers: Risk-Based Approach to Development Management.

Permitting
Separate to the Coal Authority's role as a statutory consultee on planning applications, a Coal Authority Permit is required for any activities that intersect with coal seams or coal mining legacy features.

Under the Coal Industry Act 1994 any intrusive activities, including initial site investigation boreholes, and/or any subsequent treatment of coal mine workings/coal mine entries for ground stability purposes require the prior written permission of the Coal Authority, since such activities can have serious public safety implications. Failure to obtain a permit will result in trespass, with the potential for court action.

Developers should contact the Coal Authority's permitting service for permission to enter or disturb coal mine entries and coal seams.

Email: licensing&permissions@coal.gov.uk
Tel: 01623 637 339

Application forms for a Coal Authority Permit and further guidance can be obtained from the Coal Authority's website at: www.gov.uk/get-a-permit-to-deal-with-a-coal-mine-on-your-property

You should also contact the Permissions team for any pre-application discussions concerning the use of this screening tool.

Furthermore, the Coal Authority has adopted policies for development affected by mine entries and for drilling and piling in coalfield areas, which are available to view at:

- Development and Mine Entries Policy - https://www.gov.uk/government/publications/building-on-or-within-the-influencing-distance-of-mine-entries

- Drilling and Piling Near Coal Policy - https://www.gov.uk/government/publications/guidance-on-managing-the-risk-of-hazardous-gases

Mine water
The Coal Authority do not have specific responsibilities for mine waters however they are funded to manage this legacy in certain cases. Mine Water outbreaks will be assessed on a case by case basis form a public safety point of view.

Data requests
The Coal Authority's data has been considered within the screening tool and you can view the constraints map data freely on the interactive viewer.

However, should you require the raw data to undertake further assessment, this can be requested. See the section above on Coal Authority data.

Environment Agency

Planning
The Environment Agency has a more specific role as statutory consultee on planning applications as part of the Development Management Procedure Order 2015. The Environment Agency are a statutory consultee on some of the following categories: Issues related to cemeteries, development requiring EIA, groundwater protection for potentially contaminating development, pollution from land contamination, mineral extraction and non mains drainage. The North East Area planning department can be contacted via email at: planning.nane@environment-agency.gov.uk.

Data requests
The Environment Agency's data has been considered within the screening tool, however should you require the raw data to undertake further assessment, this can be requested via the customer enquiry team using northeast-newcastle@environment-agency.gov.uk. A shapefile of the constraints map can be provided under an open government licence upon request to the customer enquiry team using northeast-newcastle@environment-agency.gov.uk.

Pollution incidents
The Environment Agency has a statutory role in terms of pollution of controlled waters and will investigate pollution incidents, such as mine water breakouts. Instances of groundwater flooding should be directed to the Lead Local Flood Authority. Instances of surface water pollution should be reported to the Environment Agency's 24 hour Incident Hotline (Telephone: 0800 80 70 60).

10 Glossary

Artesian – Water possessing enough pressure (or head) that it's effective level lies above the surface of the ground is artesian. Such artesian water may be contained (or confined) in the subsurface by an overlying impermeable layer of strata. If the impermeable confining layer is breached, by for example a borehole, then artesian flow to surface will commence. Artesian flow can continue until either the pressure drops, or the pathway is sealed. Artesian conditions may not be present when a borehole is installed, but may develop at a later date due to rising water levels.

Coalfield [geological definition] – The area of land where coal deposits occur in the subsurface geological strata. The coalfield is sometimes divided into the exposed coalfield where coal outcrops reach the surface, and also concealed coalfield where other younger rocks lie on top of the coal bearing strata. Another division can be into the worked coalfield, and the unworked coalfield. Note that the Coal Authority holds a dataset for the Coal Mining Reporting Area which is based on the outer boundary of the worked coalfield, but is extended further outward by a precautionary buffer zone.

Coalfield [constraints mapping definition] - the area of land where mine water blocks can be delineated.

Deep drainage borehole – Boreholes designed and installed to directly infiltrate drainage water into the ground. In this context "deep" is considered as >30m below surface.

GIS - Geographic Information System – software used to view and analyse spatially mapped data, and its attributes

LLFA – Lead Local Flood Authority

mAOD – meters Above Ordnance Datum; unit of measurement for elevation. It is approximately equivalent to saying "meters above sea level". It allows comparison of ground, or water, levels across a wide area by using the same (or absolute) datum level. This contrasts with expressing a water level with units of meters below ground level [m bgl], in which case the datum level is variable (or relative).

Major development – a term as defined in The Town and Country Planning (Development Management Procedure) (England) Order 2015.

Mine entry – an access point, or portal, into an underground mine. Generally these will either be a shaft, or an adit. A shaft is often vertical, but can be steeply inclined. Adits can be horizontal (often termed a "level") or inclined up or down. Dimensions vary greatly up to a few meters diameter. Many local name variants exist, for example levels intended to drain mine water are known as "water levels", "day levels", "soughs" etc. A mine entry may be referred to as "treated", or "sealed" but this is usually in regard to public safety, and does not mean that the entry cannot act as a pathway for water.

Mine water - defined here as a type of groundwater found either within, or flowing from mine workings. It is often, but not always, typified by elevated mineral content. Iron is a common constituent which causes unsightly orange water, staining, and deposits.

Mine water block – defined here as a set of flooded collieries which are sufficiently well interconnected that they exhibit a continuous gradient of water level across their area. Blocks can be completely isolated from neighbours, typically separated by very wide unworked pillars of coal, or faulted zones. Or there may be hydraulic connections between neighbouring blocks which do not permit sufficient flows for the water levels to equalise.

Mine water treatment scheme – a scheme operated and maintained to treat water to lower pollutant concentrations to allow its discharge to a receiving water body. Schemes can be remedial, treating long-standing gravity fed discharges, or preventative, pumping and treating water prior to it reaching surface. Treatment varies from passive, harnessing only natural processes, to active, utilising addition of power, chemicals, or both. In some cases the mine water quality is good enough that no treatment is required beyond dilution and dispersion in the receiving water; hence some schemes consist only of a pumping station, or an engineered gravity discharge (such as a drain from a shaft, or artesian borehole).

Potentiometric / Piezometric level (or head) – the pressure which a body of water posseses. This is the primary control over the maximum elevation that the water can potentially rise to (without mechanical pumping).

SPR - Source-Pathway-Receptor - a method of forming a conceptual model.

SuDS – Sustainable Drainage System - there are a wide variety of SuDS components (lined, unlined etc). Many types of components will incorporate infiltration to ground and it is these that are the focus of this screening tool.

11 Further information

The following further information has been compiled by staff at the Environment Agency, and the Coal Authority, following a series of workshops with a variety of stakeholders.

Q. Will the constraints mapping be extended to coalfields in other parts of England, and Scotland, and Wales?
A. Decision on extending this to potentially provide full national coalfield coverage is dependent on feedback received from users.

Q. Is the level of risk increasing when changing from category A to D?
A. No. The categories are intended to raise awareness that there may be sources, pathways, or receptors present. These constraints need to be considered by a site specific risk assessment.

Q. Is this tool a statutory requirement?
A. No. The tool is aimed at raising awareness of potential drainage issues across coalfield areas, and to promote, and facilitate best practice.

Q. What about other types of mining?
A. Other types of mining are not explicitly included by the mapping. For example non-coal mines which extracted fireclay, ironstone, limestone, sandstone, metals etc would not be included. However, if the other mineral was extracted in close association with the coal, then it could be included. Even if there is no coal present, we would advise that essentially the same principles apply to designing drainage in any mined area. Extending this for non-coal mining is a possibility for the future, but will need some further consideration as the assessment and data available is not the same.

Q. What about areas of the coalfield which are not assigned a category?
A. The interactive map viewer may show your site to be within the Coal Mining Reporting Area, but not be covered by the North East Constraints Map categories. This is due to the reporting area having a wider buffer than the Constraints Map, and also due to the Constraints Map not explicitly covering very small isolated mine workings where it isn't practical to delineate mine water blocks. In such cases, you are advised to assume a category B applies, but that further investigations may mean the effective category changes to any of the others.

Q. My site is an area mapped as category B, but although it doesn't have shallow mine workings, there are mine entries (shafts/adits) present – Do these affect the category?
A. Yes. You should consider any mine entries to provide potential pathways, in a similar way to shallow mine workings. So you would proceed on the basis of your site having an effective category C1.

Q. My site is an area mapped as category B, and the Interactive map viewer shows that there are Probable Shallow Coal Mine Workings – Do these affect the category?

A. Possibly. The probable shallow mine workings layer indicates that there is a good chance that your ground investigation will identify actual, albeit unrecorded, shallow mine workings; in which case the effective category will be C1. Conversely, if unrecorded shallow mine workings are demonstrated to not be present, the category remains as B.

Q. Is there a specific timescale associated with the future contours?
A. No. The timescale is not specified; rather it is our view on what mine water levels could eventually look like, following full recovery, and cessation of pumping. In many cases, where water levels are rising the Coal Authority will have monitoring data which can potentially be used to project forwards over the recovery period.

Q. Why not simply bar the use of infiltration type SuDS over shallow mine workings, in a similar way to contaminated land?
A. We would rather a proportionate risk based approach is applied to development of drainage at sites with shallow coal mine workings. Cases where the peak and mean infiltration can be the same, or decreased, by development would normally be considered beneficial to the overall management of coalfield mine waters. Proposals for development involving increasing either peak, or mean infiltration rates to mine workings could be seen as a disbenefit.

Q. Can mine workings be used for storage of flood waters?
A. There may be examples where mine workings can be used for this purpose, subject to careful risk assessment and design, and obtaining all the necessary permissions. To date, the Coal Authority is not aware of any of its workings being used in this way.

Q. Can my development site discharge water to mine workings via an existing mine shaft on a temporary basis during the construction phase?
A. Such an activity may be possible, but would need the permission of both the Coal Authority, and the environmental regulator.

Q. My site crosses a boundary of two or more categories, so what should I do?
A. This simply means you have a range of constraints varying spatially across your site. Your risk assessments should take this variation into account.

Q. Isn't this already covered by Coal Mining Risk Assessments?
A. No. The focus of Coal Mining Risk Assessments (CMRA) is on ground stability risks. Additionally, they are already intended to consider the potential for the emission of mine water and mine gases from mining features. However, the interaction of sustainable drainage with mining, and groundwater features has not been specifically included. It may be that at some future date CMRA's will be expected to also consider groundwater aspects.

Q. Could there be cumulative impacts from multiple minor developments, which may be overlooked given the principal focus on major developments?
A. Yes, cumulative impacts from minor developments are a possibility, but in general this is considered to present less of a problem overall than major developments. Ideally, there would be oversight of minor developments, but it is not currently clear how, or by who, this could be achieved.

Q. How do I find out if my site is in the vicinity of a site pumping groundwater to make use of its heating, or cooling, capacity?

A. The Environment Agency can provide information on licenced groundwater abstractions, including those pumping mine water. The Coal Authority issues Mine Water Heat Recovery Access Agreements to interested organisations, and the associated GIS boundary data can be made available on request. Note that closed loop ground source heating schemes are not regulated by the Environment Agency, but would require a Coal Authority permission to be granted for installing the borehole array into, or through, coal bearing strata.

The following FAQs were collated following workshops held to launch the new screening tool.

1. **How will the maps and guidance be made available?**
   - The outputs from the project are available as a GIS layer with accompanying guidance documents (Guidance, screening flow chart, category examples, mining block fact sheets).

   These have been provided to local authorities and Northumbrian Water Limited.
   - They will also be made available via the Coal Authority's interactive map viewer and gov.uk pages.

2. **Are the Coal Authority mine water treatment schemes included on the maps?**
   - No. Requests may be made to the Coal Authority for spatial data showing the boundaries of its Mine Water Treatment Schemes for use in GIS. In the future it is possible that this dataset, and others, will be made available to view via the Interactive Map Viewer.

3. **Does the constraints mapping account for changes due to climate change?**
   - Yes. The future contouring we undertook would not be significantly modified by climate change factors.

4. **Under Section 19 of the Flood and Water Management Act 2010, Lead Local Flood Authorities (LLFA) are required to investigate flooding incidents. What is the reporting mechanism for mine water breakouts?**
   - The Coal Authority will investigate each issue on an individual basis, predominately from a public safety point of view.
   - The Environment Agency has a remit in terms of groundwater quality and will investigate breakouts of pollution of controlled waters.

5. **What information is freely available?**
   - Environment Agency monitoring data is available under the Freedom of Information Act. The quality data is generally open data and available on gov.uk and the level data is available upon request under a conditional licence. It is important to ask for the right data – for example data in an entire mining block as opposed to data within a radial search area. This monitoring data has been considered within the constraints map so it may not be necessary to request it separately.
   - Monitoring data is available from the Coal Authority, subject to a data use licence, and payment of an appropriate fee.

6. **How often will the process and data be reviewed?**

- Maps are licenced for 3 years so the information will be reviewed following this or if new information comes to light.
- This year is a pilot year and supporting documents and guidance are open to change. There will be a workshop with LAs and NWL to review how these are working in October.
- Any updates in knowledge would also be included in mining reports which can be requested from the Coal Authority.

It should be noted that the maps are modelled on the worst case scenario, e.g. no pumping.

7. **If this year (2018-19) is considered as a pilot for the project, can the information provided be used now to feed into policies with a long life, for example SFRAs?**
   - Yes. For example, many LAs have referenced information within strategic planning and policy documents.

8. **Are there different considerations for different types of development? E.g. housing vs waste vs minerals?**
   - No. The tool has been tailored for general developments but the principles should be the same.
   - Environment Agency is a statutory consultee for minerals and waste.

9. **Are there still knowledge gaps when LLFAs use the tool?**
   - Yes. Currently there is no groundwater flood risk aspect included under planning process.
   - Need for clarification from Department for Communities and Local Government.

10. **Should the Coal Authority be consulted on some planning applications such as geothermal borehole?**
    - Yes. As the Coal Authority own the mine workings these developments would need to be permitted.
    - There are also issues which need to be resolved by the Environment Agency around geothermal permits and licences.

11. **If LLFAs need to assess quality of submissions, will there be further training for them and developers?**
    - Hydrogeological training was requested last year from the Environment Agency and there are presently plans to run training courses in 2018-19 in 'Intro to Hydrogeology', 'Controlled Waters Risk Assessments' and 'Land Contamination/Site Investigation Risk Assessment' for local authorities. This is still under development and will be subject to demand and availability.
    - No specific training planned for consultants however a drop-in session was held by the project team when the Constraints Map and screening tool were launched in May 2018. The Environment Agency also held a conference in June 2018 'Changing Hydrogeology of the North East' for developers and consultants which introduced the tool and an understanding of the issues in the area.
    - Regular tweets will also be posted throughout the pilot year to signpost people in information and raise awareness

12. Will the supporting information be published with the online map?

- Yes, via the Coal Authority Interactive Map Viewer, and associated gov.uk webpages.

13. Should LLFA's be directing people to this information and the Coal Authority?

- Yes. It is also recommended that for further assessments data requests focus on all data present within the relevant mining block and not just a radial search area as this may not be sufficient to pick up potential pathways.

14. How accurately can we pinpoint where future outbreaks may occur?

- It is considered that outbreaks could be pinpointed quite accurately however there may be data gaps which cannot be accounted for at this stage. Conversely, discharges occurring due to changes in flow paths in isolated mines are not predictable.

15. Are the Coal Authority under pressure in terms of driving down costs?

- Yes. The Coal Authority and the Environment Agency are working together to realise efficiencies wherever possible whilst protecting the environment.

12 References

(CIRIA C753 © CIRIA 2015) Woods Ballard, B, Wilson, Udale-Clarke, H, Illman, S, Scott, T, Ashley, R, Kellagher, R. The SuDS Manual – V6, version 5 including errata 2016
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