

Home Counties North Regional Group

Newsletter Issue 16



Introduction and Welcome

From the Newsletter Editor, Zuzana Lednarova FGS

Newsletter Issue No. 16 of the Home Counties North Regional Group

Welcome to the first Newsletter of 2022! I'm hoping you have all had a great end to 2021, and a great fresh start to 2022. This new year is filled with many positives, and great new opportunities – starting with the easing of the covid rules, finally. This means we will go forward in arranging face to face evening lectures, and also hopefully more events.

I am pleased to present to you the Newsletter Issue No. 16, which includes some key dates for our future events, and also very interesting articles for you to enjoy.

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Chair's Report February 2022

John Wong FGS, Home Counties North Regional Group

Dear Home Counties North Regional Group Members,

Belated Happy New Year to you and your families. I hope you are all well and safe.

Covid restrictions have now been downgraded from mandatory rules to advisory guidance leaving to personal choice such things as the wearing of face masks, I heard some Members have been tested positive this week despite being fully vaccinated; I wish them well and a speedy recovery.

The next Home Counties North Regional Group lecture on Zoom will be on 16th February 2022, when Dr Andy Gibson, will talk on Debris Flows: Forensics, Cascades and New Techniques for Investigation. This was originally scheduled for October 2021 and later cancelled because Dr Andy Gibson was unavailable.

The Group is gradually returning to normality from 2nd March with an in-person lecture in Amphill arranged by Adrian Marsh and presented by Brian Kerr, entitled Assessing Natural Capital: A pathway to a better countryside, or an environmental dead-end.

The in-person lecture which was arranged to take place in April 2020 at Ware, was cancelled due to lockdown, has now been rebooked for 4th April 2022 at the same museum venue in Ware; the title of the lecture is Microbes to Marrows and more (Evolution of Plants), presented by Jane Tubb.

I have been investigating suitable and feasible venues for in-person lecture in addition to those proposed in Newsletter issue 14. From north to south they are Kettering, Northampton, Aylesbury, Harrow, Enfield, Romford, Isle of Dogs in east London. Other venues will be considered as well. I am fully aware that majority of our members have not had a lecture organised in their home counties/boroughs for nearly 10 years; no doubt you would feel you are missing out when we scale down the lectures on Zoom, so I am keen to roll out in-person lectures at venues nearer to your homes. Some of our members are already in their retirement for a long time, they do not drive and some of them prefer not to venture too far away from their homes for health reasons, we shall maintain some lectures on Zoom for their benefit.

Burlington House is not yet fully returned to normal opening for visitors, the staff are currently working a few days at home as well as at Burlington House. I look forward to

facilitating geology workshops again as soon as I can book a suitable room there; and, of course, new field trips and visits to roll out will follow.

I would like to roll out pilot post-field trip workshops for the benefit of those Members who are unable to attend a field trip because of either no access to transport or distance being too far for them to attend. The post-field trip workshops can take place in any town/village depending on enough people requesting one. Because you might like to see the geology of a field trip area but are unable to attend for whatever reasons, it would be my pleasure to bring post-field trip workshop to you, e.g., examining the rock specimens and discussing the stratigraphy.

Our Newsletter Editor, Committee Member Zuzana (Suzie) Lednarova is leaving the Committee after the next (2022) Home Counties North Regional Group annual general meeting, so that she can concentrate with her work in Bristol and offshore. Suzie said when her employment becomes more office-based in the future, she would be happy to join the Committee again. Suzie has been a resourceful Member of the Committee and her contribution will be missed. In Newsletter issue 7 May 2020 Notes from the Chair, I wrote – ‘Zuzana Lednarova, who was co-opted onto the HCNRG Committee in the summer of 2019, has kindly agreed to be the HC.NRG Newsletter Editor; she will be relocated to a new job in the west country in the latter part of April 2020 and I wish her every success in her career and my big thank you to her for being a supportive, resourceful and committed committee member.’

Whenever you submit your articles for the Newsletter, all will get published in the next Newsletter to be produced.

Home Counties North Regional Group will not participate in the 2022 Geological Early Career Award because no candidate has applied, the same applies to the School Geology Challenge competition and our group will not facilitate the regional heats this time.

The Geology Quiz social will take place on a weekend afternoon in the spring of this year at High Wycombe, Committee Member/Treasurer Mick McCullough is the organiser and Quiz Master. Mick will let us know when he has booked a suitable date.

A small number of our members have been made redundant in 2021, some of them have since found new employment within their professions, others have moved on to take up non-geoscience-orientated jobs, and some are still unemployed. Our employment search and introduction assistance programme set up nine months ago, it is still ongoing, despite not many members having contacted us (Rudy Domzalski, Adrian Marsh, and I) directly. We are here to assist and support.

The Committee and I thank Soil Consultants Limited and Director Stuart Wagstaff (past Home Counties North Regional Group Chair) and for continuing to maintain their sponsorship in 2022, we are deeply appreciated their generosity and support to our group.

We thank you for your participation in our two recent surveys (Zoom lecture start times, and preference of in-person lectures versus lectures on Zoom), and your support to all the Home Counties North Regional Group events.

My thanks to every Committee Member for their teamwork and contributions to deliver the Home Counties North Regional Group events in 2021 and to date.

I wish all of you good health, successful in progressing with your chosen professional geoscience careers, and that you achieve all the tasks on your to-do lists with high satisfaction.

Let's all enjoy, engage, discover, discuss, and promote geoscience more.

Take care and stay safe everyone.

All the best wishes,

John Wong FGS Chair Home Counties North Regional Group

Article 1: In search of the perfect Chiltern sinkhole

Adrian Marsh FGS CGel

Having lived in the Chilterns for 40 years, much of this time with a family dog requiring long walks, I think that I have become somewhat obsessed with finding the perfect sinkhole, or doline / swallow-hole if you prefer. Perhaps this is because I was brought up in an area of Surrey underlain by London Clay Formation and its Claygate Member where surface water stayed on the surface.

On moving to the River Misbourne valley in the 1980s, I was amazed when I first witnessed the 'river', in reality a small stream at the best of times, dry up. The clue of course was in the second half of its name ...bourne. This name derives from the Anglo-Saxon word "bourne", meaning stream, flowing from a spring, a stream or brook in which water flows only seasonally. Further investigations revealed that the source of the Misbourne is generally taken to be Mobwell pond just north of Great Missenden and that it only flows when groundwater in the underlying chalk breaches the surface. If there were such a thing as a normal year in the life of the Misbourne catchment, it would consist of late summer conditions when the groundwater can in places be up to at least 10m below the dry river bed. Autumn and winter rain falling on the interfluvial plateau and infiltrating down into the chalk aquifer takes time to travel down to the valley bottom. It can be March or April before flow is restored to the river.

Up on the interfluvial plateau around the Chalfonts region there is an important secondary, perched hydrogeological regime involving pre-Anglian, paleo-Thames River Terrace Deposits (Westland Green, Satwell, Beaconsfield and Gerrards Cross Gravels) overlying Lambeth Group outliers on the Seaford Chalk Formation and its underlying Lewes Nodular Chalk Formation. This is where sinkholes can be seen most easily.

Natural dissolution of chalk has created a family of features with essentially a continuum in scale from millimetre wide discontinuity widening within the chalk, through metre amplitude scale 'saw-tooth' profiling of the sub-crop beneath cover soils, to large scale sinkholes penetrating down for many tens of metres. These features are widespread across the Chalfonts area. In terms of their recognition in the field, the sinkholes fall into three broad categories:

- Active ephemeral stream flow sinkholes – see Plates 1 & 2, and Plate 4
- Depressions over collapsed infill deposits – see Plate 3
- Concealed chalk dissolution related features



Plates 1 & 2: A 20m diam. depression over a sinkhole, with contemporary flow into the ground



Plate 3: A fresh(ish) collapsed infill pit

Plate 4: A large sinkhole at the end of a dry stream bed in summer

Lambeth Group outliers stretch along either side the Misbourne interfluvial plateau from Denham north westwards to Little Chalfont and Gore Hill, just south of Old Amersham. Perhaps the best place to see sinkholes within this locality is Hodgemoor Woods, a Forestry Commission mixed woodland with public access and a large free car park off Bottrells Lane (SU 968938).

The local geology of the Hodgemoor area is summarised in Table 1 and in the outline map in Figure 1 and consists of:

Period		Formation	Beds
Recent/Pleistocene		Various Alluvium, Head and Loess deposits	
Pleistocene		Westland Green Gravel	
Palaeogene	Lambeth Group	Reading Formation	CLSSG Facies CSGR Facies
		Upnor Formation	
Cretaceous	White Chalk	Seaford Chalk Formation	Cuckmere Beds Belle Tout Beds
		Lewes Nodular Chalk Formation	

Table 1: Geological succession

Recent work by the British Geological Survey (Farrant et al, 2018) has differentiated two facies sub-divisions with the Reading Formation locally:

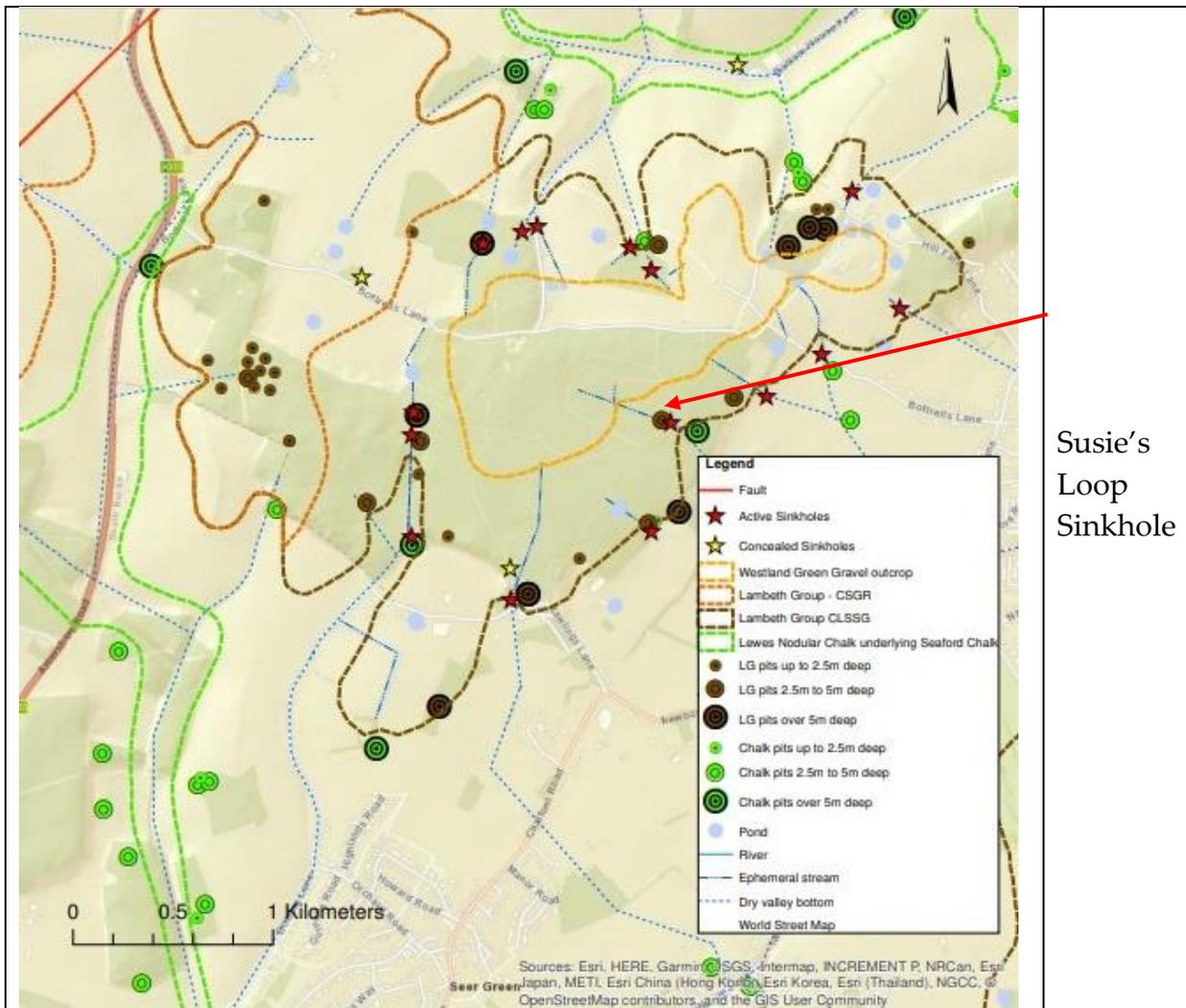
- CLSSG Facies: Clay-Silt-Sand-Gravel
- CSGR Facies: Clay-Sand-Gravel

These facies can be recognised from a combination of field observations and publicly available aerial photography/LiDAR surveys with:

- The CLSSG Facies being overall a somewhat finer grained assemblage of beds compared with the CSGR Facies
- The CLSSG Facies supporting a higher density of ponds and ephemeral streams
- The CSGR Facies having a higher density of depressions over collapsed infill deposits

Within Hodgemoor Woods and the associated Hales Wood and Highfield Grove wood, CLSSG Facies are present across the eastern and central parts of the woods, with CSGR Facies in the west, as illustrated in Figure 1. This is reflected in the distribution of historic shallow mineral workings, with brick clay pits generally confined to the east and sand pits to the west, although within the CLSSG Facies there are zones where a basal reddish brown fine-medium sand outcrops and has been worked. Chalk workings are also scattered around the area located just below the feather edge of the Lambeth Group. The chalk immediately below the Lambeth Group comprises the Cuckmere Beds of the Seaford Chalk Formation, with its lower boundary with the underlying Belle Tout Beds thought to be at c. 120 to 110mOD following the gentle dip slope south eastwards. The unconformity between the Chalk and Lambeth Group comprises a palaeo-surface with significant relief with thin Upnor Formation locally exposed in a few pits, or apparently absent. The upper boundary of the Lambeth Group with the

Westland Green Gravel also exhibits some relief, with the ephemeral stream spring points in the vicinity of this boundary being influenced by this. The overall pattern of ephemeral streams and their dry valley continuation below the sinkhole/infiltration point is shown in Figure 1.



Susie's
Loop
Sinkhole

Figure 1: Outline geological map of Hodgemoor Woods outlier

Note: The Beaconsfield Gravel outcrop at the bottom of the map is not shown

Within this geological setting, my 'perfect' sinkhole, marked in Figure 1 (at SU 974936), is located beside 'Susie's Loop', a name derived from the Hodgemoor Riding Association's map of bridle paths and permitted trails. Susie's Loop Sinkhole, see Plates 5 & 6, is fed from two main springs draining out of the base of the Westland Green Gravel and is located close to the feather edge of the Lambeth Group.



Plate 5 & 6: Susie's Loop feeder stream and debris filled sinkhole

The feeder stream has eroded a mini valley upstream from the contemporary sinkhole, with a cross section consisting of three parts of increasingly steeper slopes with depth. Relatively gently inclined upper slopes, in places up to 100m across, give way to a much steeper V-shaped valley bottom rarely more than 10m to 20m wide and up to 2m deep, in the base of which is the current stream channel. The stream terminates in the sinkhole whose floor is over 2m below the surrounding ground level. This sinkhole, which has two distinct zones of infiltration, is around 30m in diameter at its rim with an irregular plan shape indicating that some clay may have been extracted from its sides in the past.

The feeder stream rises c. 220m upstream of the sinkhole, with the eroded V-shaped valley reach stretching for c. 160m above the sinkhole. The implication of this valley geometry is that of the order of 1000m³ of eroded ground has washed into the contemporary sinkhole. This in turn gives some indication of the large scale of underground dissolution cavities within the chalk.

These plateau level ephemeral streams and associated sinkholes have had a significant influence on shaping the landscape. The springs that feed these streams typically emerge from relative low points, e.g. infilled depressions and channels, at the base of the palaeo-Thames terrace gravels. The streams subsequently disappear down well-formed sinkholes or less distinct infiltration depressions, through any superficial soils and Tertiary strata into the underling chalk. Upstream of the sinkhole, the degree and depth to which an incised valley/channel forms varies, however downstream of the sinkhole there is almost always a continuation of a 'dry' valley bottom. These dry valleys have several sets of preferred orientations, which are related to underlying geological structural features. It seems reasonable to assume that over the course of the Quaternary, the plateau level streams have been a significant contributor to tributary valley erosion. This fluvial erosion will have progressively washed out and incised the channels progressively upslope, thereby reducing the Tertiary and superficial soil cover over the chalk, and ultimately creating a new sinkhole. Downslope of the contemporary sinkhole one would expect to find possibly quite a long line of spaced-out cavities

penetrating down through the chalk most of which are concealed at the surface being infilled with later sediments, but which could still be open cavities at depth. An example of this type of concealed sinkhole appears to be present in the Bottom House Farm Lane 'dry' valley network that drains to the north of Hodgemoor Woods.

Reference:

Farrant, A., Cripps, C., Kendall, R., Thompson, J. and Woods, M. 2018. Geology of the Misbourne and Chess catchments. Hertfordshire and North London Chalk Conference, Environment Agency, 2018.

Acknowledgement:

Most of the fieldwork undertaken by me in preparing this article was carried out along public rights of way and on publicly accessible woodland and open spaces. However, I am grateful for the generous land access permissions granted by several local landowners to their private land.

Article 2: Report on lecture by Dr Charlotte Adams - Decarbonising Heat with Disused Mines on 24th November 2021

Adrian Marsh FGS CGeol

Charlotte is the Principal Manager for Mine Water Heat in the Innovation Team at The Coal Authority. A geologist/hydrogeologist by training, she gained her PhD from Newcastle University in 1999 on treating the polluted discharges flowing from historically abandoned lead-zinc mines in the North Pennines. Latterly she worked on coal mines designing low cost ways to treat mine water when it reaches the surface. This work sparked her interest in the potential of using mine water for heat and she spent 11 years at Durham University undertaking geothermal research. Charlotte remains an advisor to Durham Energy Institute and has been promoting the geothermal potential of the UK for over a decade. Her informative Zoom talk to HNCRCG reflected her broad knowledge and understanding of the theory and practices of harnessing heat from disused mines.

The UK has over 23,000 disused coal mines formed following the extraction of 17 billion tonnes of coal over the past two centuries. The coal has long since been mined, traded, and burned yet the voids that remain following its removal offer many opportunities for supplying resources. No longer viewed as a liability, the disused mining infrastructure is now seen as an asset of strategic national importance that could help to decarbonise heat demands whilst offering a host of other opportunities.

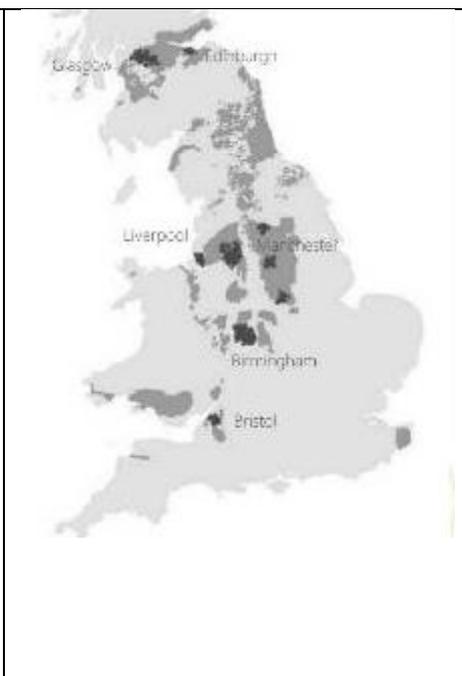
Interesting statistics on Britain's coalfields:

Most of the former mines were no deeper than 200-300m, with the deepest mine being 1.4km

Mines were extensively pumped to dewater the workings. Since abandonment, water tables have largely recovered, although a substantial pumping programme continues to control pollution of surface/groundwater from many mines

The ambient temperature in abandoned mines ranges from 10-21°C in shallow mines up to 40°C at 1.4km

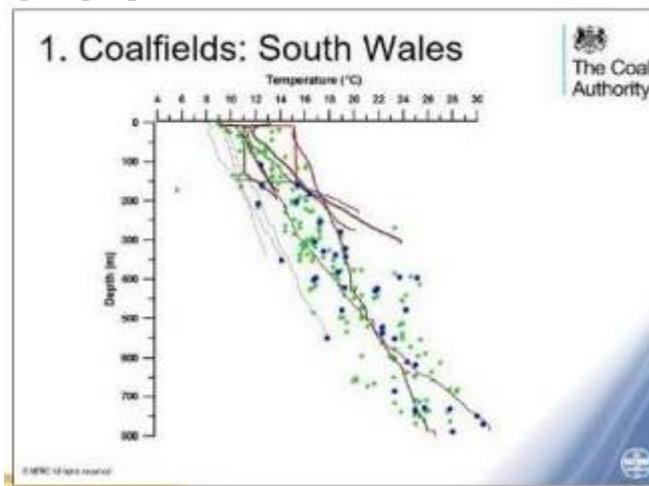
25% homes and business are located within coalfields, and 9 out of 10 of the largest urban areas (by geographical size) are in coalfields



One of the legacies from our coal mining past is that currently 122 million m³ of mine water must be treated per annum, as part of the Coal Authority's remit. This water consists of 34% fresh, 38% brackish and 28% hypersaline. Hence, the CA already manages a large network of pumping stations and associated treatment plants, and indeed the Ochre recovered from these plants has an economic value for use in, for instance, pigments and soil improvers.

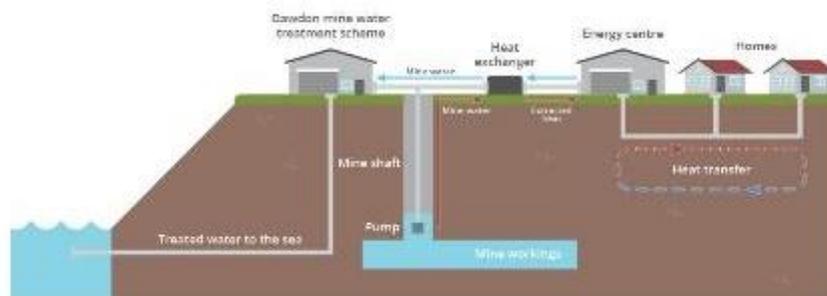
Where this water is pumped from depth in abandoned mines it is warm, and the CA calculated

that of the order of 100MW of energy is 'going to waste' from their pumping activities. Furthermore, pumped water temperatures remain stable throughout the year, as the source of this geothermal heat ultimately comes from the nuclear decay in the Earth's core. Within the depth range affected by historic mining, studies have shown that incoming groundwater temperatures equilibrate with the pertaining geothermal gradient rock temperatures sufficiently quickly to maintain the steady temperatures in the pumped abstraction wells. However, when assessing the potential of an area for geothermal heat, each mine has a unique set of characteristics that take account of the original geology, methods and zones of mining, e.g. pillar and stall, and latterly longwall extraction, degree of post-extraction collapse and subsidence, and hydrogeological regime. Investigations of potential sites can take several years to complete, depending upon the availability and accuracy of surviving mine plans, ground investigation data, and pumping records.



Research undertaken in the 1970s has provided valuable data on the geothermal gradient. The CA's practical implementation of mine heat schemes is gathering pace, with a number of schemes under development such as that at the former Dawdon Mine at Seaham in Durham where there is an existing mine water treatment plant. Here the water is pumped from an existing shaft and passed through a heat exchange before entering the water treatment plant. The heat exchange feeds into an 'Energy Centre' that manages the distribution of heat into the nearby Seaham Garden Village housing development properties, as illustrated below.

Extracting heat from mine water - Offtake



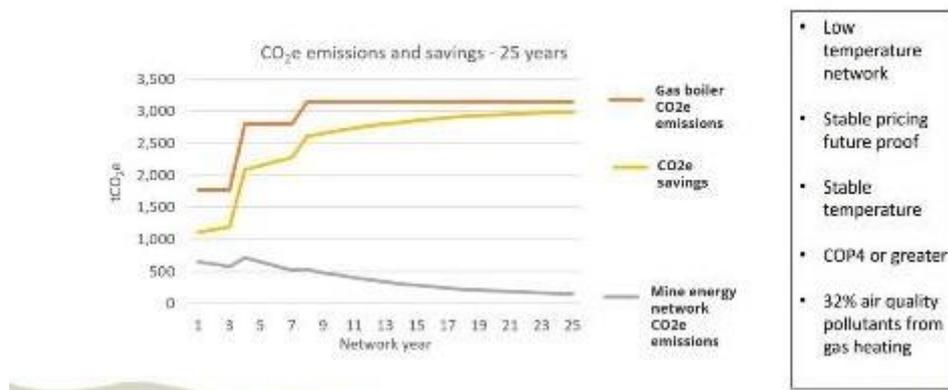
Seaham Garden Village



At Seaham, the treated mine water is discharged into the sea. More commonly, it is envisaged that the warm water abstraction will be via boreholes, rather than existing shafts (many of which have been infilled), and that once it passes through the heat exchange water will be reinjected into the mine at a location remote from the abstraction point(s). This approach is being used to expand the Gateshead town centre heat network to serve an additional 1000 new homes.

Mine water heat is now an established form of low-carbon energy suitable for community network schemes. The heat network manager can set prices to individual users to be at a discount to other forms of energy supply to encourage take up, and these should not be subject to the substantial price fluctuations of international or national market forces that affect fossil fuels.

Sustainability



The higher CapEx involved in community mine heat schemes is more than made up for in the longer term performance of both operational costs and GHG emissions, over traditional gas boilers.

Charlotte's team are involved in ongoing R&D into mine energy, with interest in its applications coming from several sources including using mine heat in horticulture, through to using mines as a heat sink to help cool data centres.

In summing up her talk, Charlotte stressed the importance of Partnership Working:

- The North East has become a focus for mine water heat
- CA has 1 operational project, 4 more underway

- Support from BEIS, North East Local Enterprise Partnership, Academic Institutions including British Geological Survey and Durham University's Durham Energy Institute, Environment Agency, Local Authorities, and the Mine Energy Task Force
- A Mine Energy White Paper commissioned by the North East Local Enterprise Partnership was published in May 2021
- Growing media attention

The lecture was followed by a lively Q&A session, with contributors located across Britain.

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Future Events

We have 3 future lectures planned for our members. This includes the first lecture, which will be held over Zoom, on Wednesday 16th February. The next two lectures are planned to be held face to face.

Please see below for the planned lectures:

- Wednesday 16th February 2022
Dr Andy Gibson - 'Debris Flows: Forensics, Cascades and New Techniques for Investigation'.
Zoom meeting starting at 7:00pm

- Wednesday 2nd March 2022
Brian Kerr - 'Assessing Natural Capital: A pathway to a better countryside, or an environmental dead-end'.
In-person meeting at Redborne Upper School, Ampthill
Starting at 6:30 for 7:00pm

- Monday 4th April 2022
Jane Tubb - 'The Evolution of Plants'.
In-person meeting at Ware Museum
Starting at 6:30 for 7:00pm

Closing Note – Thank You

Zuzana Lednarova FGS

Thank you for taking the time to read this mini newsletter.

It is with my great apologies that we have not provided an earlier newsletter to our members. This newsletter has been issued to primarily advise you of our future plans in order to become more interactive with our members, especially as we are bringing back face to face lectures in the Home Counties North Regional areas. We hope to see you there!

Additionally, as you have read in the Chair's Report, from John Wong, I will no longer be the Newsletter Editor for the time being. I would like to thank the committee members for their support and for giving me this opportunity as the Newsletter Editor – I really enjoyed reading your articles, and also providing my own articles. It has been a pleasure! Therefore, I would also like to thank you all, the members, for your continued interaction with us and providing some articles.

With that being said, the Newsletters will still go on! Therefore, please continue to send in your articles so they can be published in the next issue. I will still continue to read the newsletter, and will also provide an article here and there, to share my experiences with you all.

As a final note, thank you all, and I hope you've enjoyed this mini newsletter.