APP/M1900/W/21/3278097
WITNESS STATEMENT

Bromate contamination significant to
The proposed quarrying activity at the Hatfield Aerodrome

By:	Michael Hartung - Member of Ellenbrook Area Residents Association
Date:	17 October, 2021
Use:	Appeal **APP/M1900/W/21/3278097** (Nov. 2021) on rejection of proposed quarrying activity, Hatfield Aerodrome
Witness called by:	Ellenbrook Area Residents Association (EARA) and Smallford Residents Associations (SRA)

Bromate Contamination

1. Background

1.1 Ellenbrook Fields lays over an area which is contaminated by bromate, a known carcinogen, which occurred as a result of a major pollution disaster discovered in approx. 2000. The pollution originated as a result of a major chemical spill at Steetly Chemical Factory, Sandridge, some 20 years previously, resulting in a bromate plume which has travelled underground all the way from Sandridge to Broxbourne, part of which is underneath Ellenbrook Fields, map (007). The plume has travelled approximately 20 km. This contamination is considered by the experts to be the worst ground water contamination event in Europe. History of events (050)

1.2 The spillage was not commonly known about by the general public or by the Residents Associations until much later, post the date when the local mineral plan was adopted in March 2007.

1.3 The World Health Organisation (WHO) states that bromate levels should be below 10 µg/l in our drinking water.

1.4 Bromate and bromide (which is a precursor to bromate) has been detected around the proposed dig site in levels greater than expected. Bromate levels are over 1000 µg/l on Ellenbrook Fields quite close to the quarry.

1.5 There is only one reference to the bromate in the Local Mineral Plan as follows:

"The proposed site lies over an area contaminated with a plume of Bromate. A more robust risk assessment may be required at this site in order to determine the risk of impact on the Three Valleys Water source at the public water source at Bishops Rise."

Clearly the magnitude of the bromate contamination was not taken into account when the Local Minerals Plan was drawn up.

1.6 A remediation plan to deal with the bromate pollution was established 10 years ago and managed by the Environment Agency (EA), but unfortunately the remediation plan has failed to significantly reduce the levels of bromate within the area. A voluntary new remediation statement was signed in September 2020 and the actions in the statement are waiting to be addressed.

1.7 We quote from a 2017 Affinity - Aquifer Remediation at HATF for Bromate Licence Report 2017 report which says

"During the period from January 2017 to December 2017, a further 258kg of bromate and 623kg of bromide were permanently removed from the Chalk aquifer at HATF, bringing the totals removed to 5038kg of bromate and 12,137kg of bromide.

The continuously high concentrations of bromate and bromide observed within the monitoring network, the large volumes already permanently removed from the aquifer and the rapid increase in concentrations when the abstraction ceases, even for short periods, indicate that there must be a significant continuing source of both contaminants upstream.

This report by Affinity clearly demonstrates the difficulties managing the bromate. As residents' associations we are really concerned that despite this huge amount of remediation work, at significant cost, and at the loss of millions of gallons of water, the bromate shows no sign of being eradicated.

1.8 The EA have set three conditions in their response regarding quarrying on Ellenbrook Fields These conditions are:

1. No mineral is extracted from within the existing plume of bromate and bromide groundwater pollution.

2. Any activities close to the plume must not change the existing hydrogeological flow regime.

3. Any activities close to the plume must not interfere with the remediation of the bromate and bromide pollution.

1.9 We do not believe that these conditions will be met and will cover these in this witness statement

2. Issues

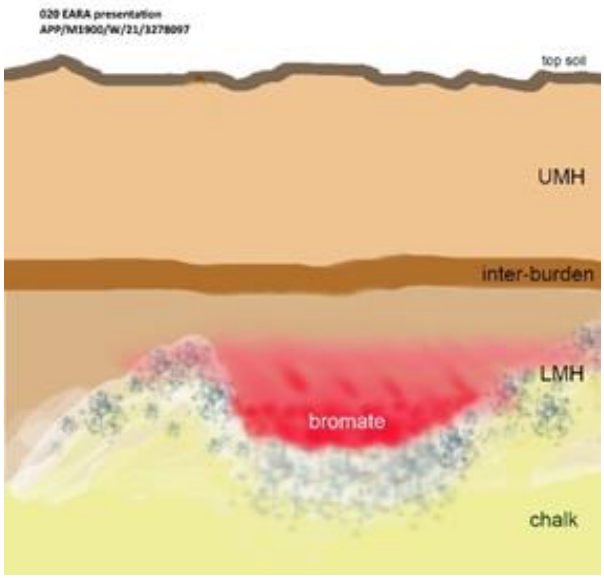
2.1 <u>Closeness of the plume to the dig site</u>

2.2 It is universally agreed that there is bromate & bromide contamination in the lower groundwater to the N.W. of the Brett quarry site and in and around Ellenbrook Fields. (027a, 027b)

But interested parties don't agree on its spread under the proposed quarry site, the time it will take to spread, and its intensity in the aquifer groundwater.

2.3 Diagram below shows a cross section of the land on Ellenbrook Fields showing topsoil, upper mineral horizon (dry sand and gravel), inter burden (clay barrier), lower mineral horizon (wet sand and gravel), and chalk.

It is believed that the bromate (in red) exists in the lower mineral horizon and the chalk aquifer.



2.4 The HERTFORDSHIRE MINERALS LOCAL PLAN states that:

"The site lies over an area contaminated with a plume of Bromate which is found in the lower horizon of the sand and gravel resource. Proposals will require an extensive plan of groundwater level and quality monitoring before, during and after the working to protect the water supply. The Bromate plume will need to be assessed and shown that it will not be spread either vertically or laterally as a result of proposed works. This is of particular importance for proposals which extend below the water table or into the lower mineral horizon."

We do not believe that the actions as detailed in the Hertfordshire Minerals Local Plan have been carried out satisfactorily, that is, the groundwater level and quality monitoring has not been carried out on the actual dig site, only on the periphery; the bromate plume has not been shown that it will not be spread either vertically or laterally as a result of quarrying – it merely has a plan to manage it if it does spread. The fact that the plan specifically states that this is of particular importance for quarrying that extends into the lower mineral horizon seems to be being completely ignored.

2.5 We know that the plume is less than 100m distance from the N.W. perimeter from data collected by EA borehole 201 (006) and that it's over 1000µg/l in nearby Ellenbrook Fields (021, 023).
The migration of the plume is caused by a number of reasons, one being rainfall up stream of the plume, and the pumping rate at Bishops Rise dragging it away from its natural path in order to protect Essendon water supply.

2.6 The plume's movement and development over the years is observed from early work carried out by the UCL student Ciara Fitzpatrick. In her thesis it appears to increase from the Sandridge source back in 2000 (fig 4.11) when it was a relatively narrow shape and developing during the next two decades

into a wide area right across Hertfordshire to the New North River near Ware, polluting water receptors on its path (007). Projecting forward in time the data suggests it will spread even wider, especially over the lifetime of the quarry's 32 years, but albeit at a lower saturation level. We understand from the Remediation Planning Inspector version of the plume's boundaries that 0.5µg/l depicts the edge of the plume. (011)

2.7 As we've said, the site is very close to the bromate plume, less than 100m, map (006). Although a rough outline of the plume has been identified, clearly the bromate does not travel in straight lines and does not recognise map boundaries and its location has been determined by the available borehole readings. The bromate will travel through fissures and potentially could be anywhere. We would argue therefore that there is no absolute way to prove that the quarry site is not in fact over the bromate plume. The EA would argue that the borehole data that is available provides sufficient data to give reasonable assurance that bromate is not under the dig site, but we would argue that there is too much uncertainty about how bromate can spread underground to take the risk. If it is proven that the land is contaminated, then no quarrying can take place.

2.8 It is vital that full up-to-date data covering the whole site is available, not just boreholes around the edge of the dig site, and that this data is interpreted by independent experts to ensure the safety of the public and indeed the public water supply. It is not acceptable that boreholes are not available across the entire dig site. It is also not acceptable that where boreholes were available for example borehole BH107, there is no up to date information available for that borehole. The last reading supplied was in 2015. This borehole is in the middle of the dig site. Data should be made available for this location along with other new locations across the entire dig site as recommended by Dr Rivett, an independent hydrogeologist. There are four boreholes at BH107 location and can be seen on picture (014). Why is there no information available from any of these boreholes?

2.9 Throughout this whole planning application, EARA & SRA have repeatedly asked for data which has either been very slow in forthcoming, or has never materialised, or has been provided in varying unit measures designed to confuse.

2.10 Monitoring was also promised by Simon Tracy, Brett Aggregates at the planning application DCC on 18th December 2019 and so far as we are aware has not been implemented to date in 2021. (015)

2.11 It is clear from the following picture of BH108 taken on 03/10/2021 that no monitoring has recently taken place at this location.

2.12 It is obvious that test boreholes in the centre of the site would have been an asset and should have been installed prior to any application, these boreholes would provide proof if bromate is or isn't under the site.

2.13 In 2019 a chart showing borehole readings was provided by SLR. This chart is shown as Appendix 1 in this document. This chart is misleading as it shows mg instead of the conventional units used in µg, which 1000 times different from the units used by the WHO.

2.14 Table 1 shows an extract of some of the readings. These readings clearly show bromate over 0.5µg/l

Table 1

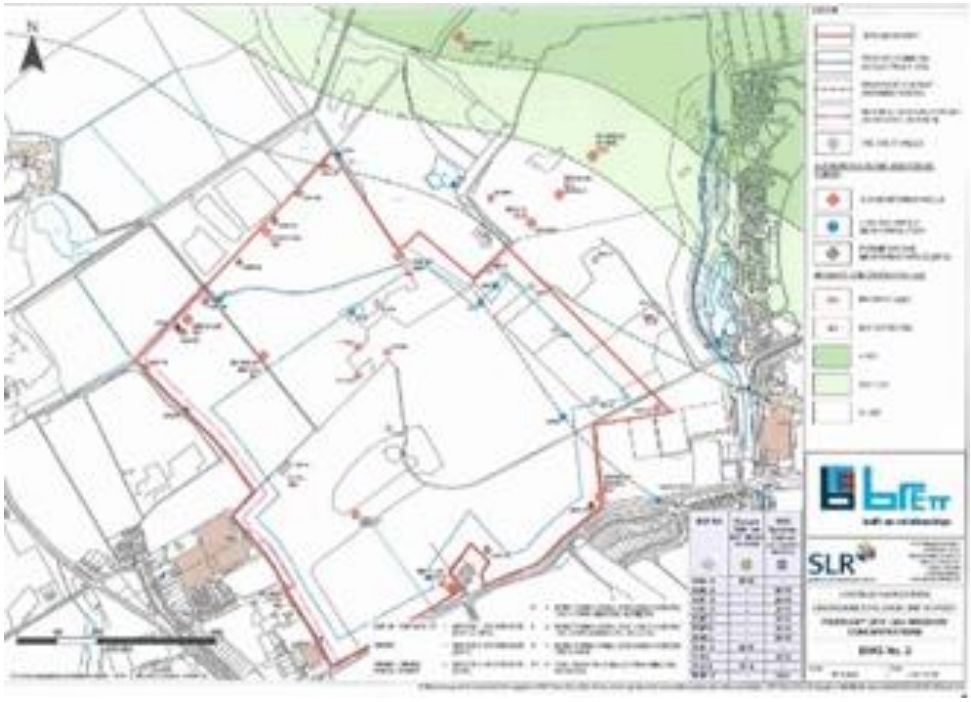
Extract from Bromate and Bromide Data V1_dated 28 January 2020_received by HCC from SLR 29th January 2020.

Note, the original dataset from SLR showed units in mg/l and this extract reflects the normal unit of measurement in µg/l as used by WHO. Readings highlighted in yellow depict Bromate data in µg/l > 0.5µg/l on boreholes within the perimeter of the site. Note Borehole BH108 is actually outside the site perimeter but was also shown as ND on the SLR map and is close to the perimeter with high readings.

Borehole chalk	Feb 2019	May 2019	Aug 2019	Nov 2019	Shown on above SLR Map
103	0.5	0.5	1.4	1	ND
104	2.5	2.5	2.7	2.5	ND
106	0.5	0.5	7.4	0.5	ND
108	227.3	194	196.1	214.9	ND
301	2.9	0.5	2.4	1.4	ND
LMH					
104	0.5	1.1	1.5	1.2	ND
107	?	?	?	?	No data>2015
108	0.5	18.7	20.9	22.5	ND
301	0.5	0.5	1.1	0.5	ND

"ND" = not detected on SLR map

2.15 On a map provided by SLR, February 2019, LMA bromate concentrations, DWG No2, April 2019, localised plume contours show the modelled southern plume boundary in relation to the quarry site.

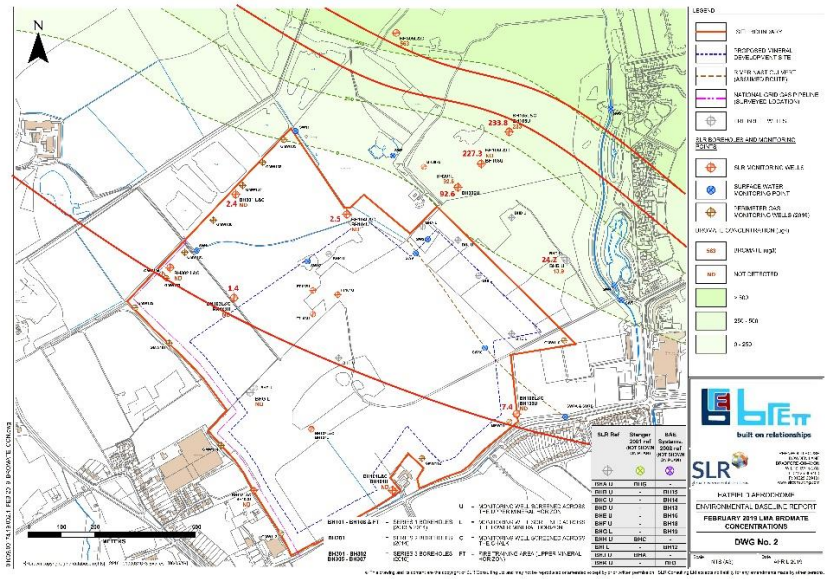


This map shows the plume skirting the quarry site and infers that there is no bromate beneath the proposed working area.

However, the borehole data taken in 2019 provided by SLR as shown in Appendix 1 and the Table 1 extract above clearly shows that bromate was present at boreholes surrounding the dig site. The quarterly figures for bromate in chalk and LMH are over 0.5µg/l which according to the inspector are within the plume boundaries.

The information on the SLR map does not correlate with the information on the dataset also provided by SLR for example borehole 104 at the very edge of the dig site shows readings for each date in 2019, but the map says none detected. Similarly for boreholes 301 and 103.

2.16 We believe that a more accurate representation of the plume is shown in the following map.



We have interpreted our own revised map showing the red lines 0 – 250µg/l from the centre of the map, to 250 - 500µg/l, and > 500µg/l of bromate. These readings are taken from SLR data chart 2019.

There is only one active borehole actually on the dig site (BHG) which has had one reading showing the presence of bromate in October 16 (005). There is another borehole BH107 which is located in the S.W corner but unfortunately test samples from BH107 ceased in 2015, even though it is a prime borehole. A depth chart shows it is at an ideal depth of 23.2m and therefore we cannot understand why testing has stopped. It is vital that full up to date data covering the whole site is available and that this data is interpreted by independent experts to ensure the safety of the public and indeed the public water supply.

BH107s & PW1/2 flow test cluster (014).

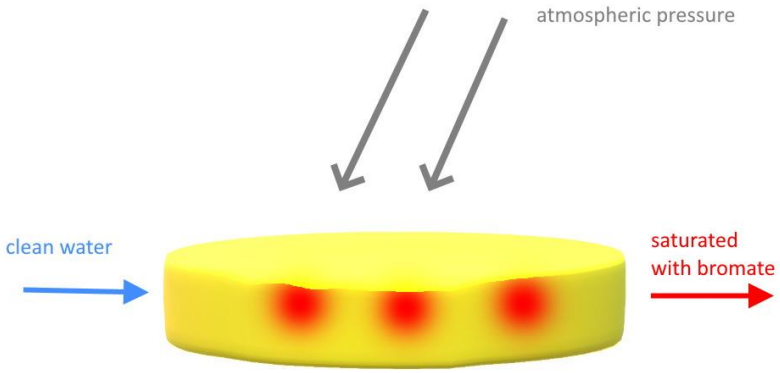
2.17 An independent review of this moving plume may suggest that the increased pumping rate at BR has somewhat spread or flattened the plume and in the future that influence may increase the contamination beneath the quarry site.

2.18 A conceptual idea of the plume

2.19 When Peter Robe Consultant for Brett and Project Manager was asked by Councillors at HCC. DCC. Dec 2019 planning meeting if the plume was static or moving, he was unable to answer the question. (033).

2.20 The idea that the plume is moving and yet static can be easily understood by analogy of a sponge that is impregnated with salt and drip fed with clean water. The sponge would leach salty water and taste of salt for a long time. The rate of the flow is set by the drip frequency.
The plume flows from West to East saturated with bromate, the gravel in the LMH aquifer acts as storage or sponge – in this case static – and not moving.

This picture demonstrates how the plume flow is operating.



2.21 We believe that the EA's first condition "No mineral is extracted from within the existing plume of bromate and bromide groundwater pollution" cannot be guaranteed and will not be met and therefore quarrying should not be allowed on Ellenbrook Fields.

2.22 Bromide

2.23 Bromide (a precursor to bromate) is also present on the site. The pollution is being regulated under Part 2a of the Environmental Protection Act 1990. As part of this legal process, a Planning Inspector's Report on a Public Inquiry held in 2007 found that:

- whilst there is some uncertainty over the precise extent of the plume, measurements suggest that concentration contours of 0.5 µg/l bromate, and 125 µg/l bromide are broadly coincident.
- bromate does not occur naturally in soil or water.
- background levels of bromide in groundwater, in the Hatfield Area, are 50-100 µg/l.

2.24 This statement clearly shows the correlation between bromate and bromide and that the readings on Ellenbrook Fields are far higher than the norm in Hatfield area.

"The Planning Inspector took the view that any concentrations at or above 125 µg/l bromide are within the plume of pollution. This is below the 500 µg/l Required Concentration Standard featured in the Remediation Notices dated 2009 and 2019 served on the parties responsible for the pollution. Bromide does not have a UK Drinking Water Standard. It is difficult to define the bromide plume boundary caused by pollution from the Contaminated Land Special Site because bromide occurs naturally in groundwater and in road-grit-salts." Information from the planning inspector report 2007 (011).

2.25 Bromide above the 125 µg/l is clearly present on the site. The inquiry planning inspector was clear that there is a correlation between the bromide and bromate, and that the presence of bromide indicates the presence of bromate, but the EA and Brett are choosing to ignore this scientific relationship as determined by the inquiry inspector stating that the bromide may be present for other reasons. We have challenged the EA regarding this, but they were not able to say categorically what has caused these very elevated bromide readings. The suggestion that the high bromide readings are due to road salts seems extraordinary given that there are no roads near the site.

2.26 The applicants/EAs own figures show extremely high concentrations of bromide, at BH302 of 2280µg/l in N.W. of quarry site, and all around the perimeter of the site. Normal background levels in Hatfield are 50-100µg/l bromide. These high levels are shown on SLR chart Appendix 1 and map (042).

Again, this lack of investigation leads us to believe the site is at high risk of being already or becoming further polluted by bromate.

Information on bromide inside the site (042)

2.27 We have data for peripheral boreholes around the edge of the proposed quarry, this shows sporadic bromate levels greater than 2µg/l as shown in document (005) However, bromide is consistently high on these boreholes, and originates back from the source at Sandridge. The planning inspectors report suggests that a concentration contours of 0.5µg/l bromate, and 125µg/l bromide are broadly coincident and there at least 14 boreholes around the site showing greater than 125µg/l bromide, this would suggest that there is likely to be bromate present too (042).

2.28 <u>Difficulties to eradicate</u>

2.29 Bromate is extremely difficult to eradicate. Once it is in the chalk aquifer it can take decades to remove, as shown by the failure of the initial EA remediation plan. The remediation plan is now entering its second 10-year term with very

little improvement in the bromate pollution to show from the first 10 years, and millions of gallons of water wasted at Bishops Rise scavenging station in the process.

2.30 The following are extracts from a speech made by Dr Bryan Lovell, OBE, CGeol, a geologist based at the University of Cambridge regarding the pollution impact on a proposed quarry at Bengeo.

"The problem with the chalk aquifer is this: very quick pollution, very slow decontamination"

"Monitoring of pollution as it takes place is not the main issue: pollution must be prevented from the word go".

2.31 Health implications

2.32 Bromate is a known carcinogen, but very little research is available to understand the health implications for the local population. Potential exposure to this deadly product is an unacceptable risk for residents who have already been exposed to this pre-2000. Residents were drinking water from Bishops Rise with bromate in it for potentially 20 years – this assumes it travelled there after the factory was closed down in 1980. Cancer rates in Hatfield need to be examined as a result of this as very little research information is available on this topic. Information from the New Jersey Department of Health and Senior Services shows that bromate may be a carcinogen to humans as it has been shown to cause kidney, thyroid and gastrointestinal cancer in animals. (003).

2.33 National Planning Policy Framework 2021.

2.34 Quarrying on land contaminated by bromate & bromide is covered by the National Planning Policy Framework 2021. We believe that the application for the quarry does not comply with the framework as described below.

Extracts from the NPPF are shown in italics.

Ground conditions and pollution
"Planning policies and decisions should ensure that: a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination".

2.35 When the Local Mineral Plan was drawn up, clearly the bromate risk was not fully considered as there is only one reference to the bromate as follows:

"The proposed site lies over an area contaminated with a plume of Bromate.

A more robust risk assessment may be required at this site in order to determine the risk of impact on the Three Valleys Water source at the public water source at Bishops Rise."

Clearly the magnitude of the bromate contamination was not taken into account when the Local Minerals Plan was drawn up and the planning decision did not fully take into account the risks arising from contamination. To suggest in the Mineral Plan that a more robust risk assessment MAY need to be undertaken is a major understatement.

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

2.36 We have yet to see an independent site investigation report prepared by a competent person. Apart from reports provided by SLR in support of their application to quarry and responses by EA to the application, no independent site investigation reports have been provided. This is quite staggering considering that the pollution is considered to be the worst pollution event in Europe.

Planning policies and decisions should contribute to and enhance the natural and local environment by

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

2.37 This application is at high risk of contributing to water pollution, and definitely will not help to improve water quality

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

2.38 Brett, Affinity Water and Hertfordshire County Council have completely failed to publicly acknowledge the fact that bromate is a known carcinogen and therefore a threat to health if it gets into the drinking water. Affinity Water uses the phrase "blending the water" to describe their operations in Hertfordshire which is a euphemism for diluting polluted water to bring it below WHO guidelines for us to drink.

In considering proposals for mineral extraction, minerals planning authorities should:

b) ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality.

2.39 There does not appear to be any recognition of the fact that there has been mineral extraction in the area for decades and that this proposed quarry is next door to another quarry and therefore has a major cumulative impact on the area.

2.40 Method of working

2.41 Other local quarries do not operate using such a risky method. Brett intends to dig down to the lower mineral horizon which is more likely to disturb the bromate and potentially cause it to change direction. Cemex, the neighbouring quarry operator, only dig down to the upper mineral horizon taking a much lower risk approach.

2.42 The GWMP is designed to monitor and control operations and mitigate the risk of bromate contamination while the quarry is in operation. However, it cannot prevent excavation disturbance to the Lower Aquifer or LMH mineral layer, this is because LMH is hydrologically connected to the Chalk some 100m in depth. No buttresses or clay walls or boundaries can reach down and protect this delicate Aquifer.

Removal of vast amounts of sand & gravel is like digging a sandcastle on the beach where the void quickly fills up with sea water. This "drawdown effect" in quarry terms means the bromate laden water from the nearby plume will be drawn into the quarry dig site.

If the bromate laden ground water from the de-watered lower LMH enters the lower mineral lagoon (LML) it will be impossible to remove and breaks MLP policy "not be spread vertically or laterally" potentially infecting other surface ground waters due to cross contamination.

2.43 Affinity Water and their statement of case

2.44 Extracts from Affinity Water's statement of case are of great concern to us.

We cannot understand why Affinity Water are not opposed to the quarry application when they write the following statements in their statement of case. Of particular concern are those highlighted in bold.

Extracts from Affinity Water SOC:

"Since May 2000, we have not used the groundwater abstraction source at HATF for public supply due to the concentration of bromate in the Chalk groundwater. We operate several other abstraction points in the vicinity which are of relevance. These are ESSE, ROES, TYTT and NORM. ***The bromate pollution and the actions dealing with it, all have an impact on our operations at these sites.*** *You should be aware that the proposed*

mineral extraction site is located within an Environment Agency defined groundwater Source Protection Zone 3 (SPZ) corresponding to a number of these sources, whilst being in or bordering one or more ***SPZ 2 zones****"*

"1) Revision of the potential risks caused by the proposed new method of extraction from dry Upper Mineral Horizon (UMH) and wet Lower Mineral Horizon (LMH).
Potential risks may include:

- ***Cross contamination between the LMH/Chalk and the UMH aquifer***
- ***Extreme scenarios influencing the migration of the bromate plume***
- ***Alteration of LMH aquifer storage and its influence on surrounding groundwater levels"***

2) ***Proposal for additional groundwater level and water quality monitoring to align with the renewed quarry plan in:***

- ***Both UMH and LMH pre-, post- and during operation***
- ***Extreme scenarios that consider the new extraction method and triggers associated with this.***

3) ***Reviewing the cumulative impact of the recharge lagoons operated by both CEMEX and Brett quarries, and the control mechanisms in place to ensure this does not exacerbate groundwater flood risk in the area.***

2.45 Brett's own statement of case concludes that there is a risk that pumping groundwater from the Lower Mineral Horizon would intercept the bromate plume potentially causing the plume to spread. The SoC went on to add that measures are incorporated into the design and operation of the site so that this risk would not be significant.

2.46 As described above, Brett are also acknowledging there is a risk which requires measures to manage it.

We would argue that the risk is significant regardless of the measures to manage it because the impact is so severe. Once bromate is detected on the site it is too late and clearly Affinity Water are also concerned about the risk having referred to it in their Statement of Case. We are assuming that the agreement between Brett and Affinity Water includes a financial penalty to offset any costs if bromate were to spread and impact on other public water resources. We would argue that it is not appropriate that a financial agreement overrides a risk involving a major pollutant.

2.47 We are not confident that the ground water management plan will manage the risks described above in particular the cross contamination between the lower and upper mineral horizons. We would concur with Affinity Water's

proposal for additional monitoring to take place pre operation and cannot understand why the EA are not recommending this.

2.48 We also cannot understand why there is not a joint review of the potential impact of two quarries operating side by side in such a vulnerable area of land polluted with a carcinogen. The review should be looking into both the impact of quarrying on the bromate plume and the potential effect on the groundwater flood risk.

2.49 HCC Reason 4 for refusal

2.50 HCC Application No: 5/0394-16 (CM0961) - Refused by HCC on 22/1/2016 - extracted from rejection document point 4 dated 6/1/2021:

Reason 4 states:
"The lower aquifer to the north of the application site is contaminated by bromate. The application proposes the extraction of sand and gravels from within the lower aquifer in close proximity to groundwater contaminated by bromate.

There is a high level of local concern that extracting mineral from within the lower aquifer could:

1. extend the bromate contamination within the mineral workings
2. reduce the effectiveness of the measures in place to remediate the bromate contamination
3. and potentially lead to contamination of boreholes used for the public drinking water supply at Essendon.

It has not been demonstrated to the satisfaction of the Mineral Planning Authority that the risks to the water environment from the mineral working are acceptable; and, that all routes to possible contamination have been appropriately investigated; and, that all necessary mitigation against all risks has been included in the proposal; and, that the proposed mitigation will be effective.
The proposal would thereby be contrary to the provisions of the Hertfordshire Minerals Local Plan (Policy 17(iv)) which does not permit mineral development resulting in negative quantitative and/or qualitative impact on the water environment, and to the provisions of the NPPF (Paragraph 170) for conserving and enhancing the natural environment, and to Policy R7 (Protection of Ground and Surface Water) of the Welwyn Hatfield District Plan (adopted 2005)."

2.51 EARA and SRA are in complete agreement with HCC reason 4 refusal of this planning application. We believe that we have demonstrated that there is a high risk that the quarrying could extend the bromate contamination within the mineral workings if in fact it is not already present.

We also believe that due to the failure of the first 10-year remediation plan that Ellenbrook Fields should not be quarried on to ensure that there is no risk of reducing the effectiveness of the measures in place to remediate the bromate contamination.

Finally, we believe that there remains a significant risk that the boreholes used to supply public drinking water at Essendon may potentially be contaminated if the plume is disturbed by quarrying.

3. Conclusion

In light of the fact that:

- No one can absolutely guarantee that bromate is not under the dig site
- The proposed quarry is too close to the known bromate plume
- That the health effects on the local population are unknown as a result of drinking bromate laden drinking water pre-2000
- The bromate plume still exists and the plan to remove some of the bromate at BR by treating it with ferrous chloride and converting it to bromide have failed. The plume is being pulled South because of its influence, but at the same time spreading into the quarry area.
- There are clearly numerous risks associated with managing the bromate and that once the site is polluted it is too late
- The first EA remediation has failed to eradicate the bromate pollution

We do not believe that any quarrying should be considered on Ellenbrook Fields until the bromate is completely eradicated.

Appendix 1 SLR borehole readings page 1, lower mineral horizon & chalk

Hatfield Road Quarry – Bromate and Bromide Groundwater Quality (Aug 2013 – Nov 2019)

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0006	<0.0005	<0.0005			<0.0005	0.0005	0.0005		<0.0005	0.0005	<0.0005	<0.0005	<0.0005
BH103	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH104	CHK	Bromate (mg/L)	0.01	0	0	0	0	0.0011	0.0018	0.0039	0.0042	0.0031	0.0031	0.0032	0	0.0031	0.0027	0	0.0022	0		0.0029	0.0028	0.0026	0.0023	0.0025	0.0025	0.0027	0.0025
BH105	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	0.13	0.1205	0.6243	0.1166	0.1541	0.118	0.1383	0.0697	0.1631	0.102	0.1955	0.1344	0.2077	0.1886	0.1737	0.2042	0.0996	0.1021	0.1786	0.1751	0.0934	0.1774
BH106	CHK	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH107	CHK	Bromate (mg/L)	0.01					<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005															
BH108	CHK	Bromate (mg/L)	0.01					0.26	0.2826	0.2913	0.3222	0.3226	0.2846	0.3135	<0.0005	0.3027	0.2659	0.2758	0.2785	0.2748	0.257	0.2493	0.235	0.2146	0.2299	0.2273	0.184	0.1961	0.2149
BH201	CHK	Bromate (mg/L)	0.01															<0.0005	0.0012	0.0006	<0.0005	0.0025	0.0018	0.0007	0.0008	0.0029	<0.0005	0.0024	0.0014
BH302	CHK	Bromate (mg/L)	0.01															0.0005	0.0005	0.0005	0.0005	0.004	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
BH305	CHK	Bromate (mg/L)	0.01															0.4107		0.5198	0.5487	0.4862	0.4777	0.4387			0.5345	0.4774	0.5343

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH8	LMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1	0.0072	0.0033	0.0133	0.0108	0.0102	0.0106	0.015	0.017	0.0108	0.0178	0.0253	<0.0005	0.0234	0.0293	0.0262	0.028	0.0241	0.0101	0.0139	0.0233	0.0231	0.0242
BH9	LMH	Bromate (mg/L)	0.01			<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	0.0024	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH101	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	0.0047	<0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH103	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005								
BH104	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005	<0.0005	0.0021	0.0018	0.0009	0.0019	0.0019	<0.0005	<0.0005	0.0015	0.0008	0.0001	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	0.0008	<0.0005	0.0011	0.0015	0.0012
BH105	LMH	Bromate (mg/L)	0.01	0.33	0.12	0.29	0.29	0.18	0.3106	0.2786	0.2997	0.3018	0.2954	0.3072	0.1998	0.2983	0.2769	0.2715		0.2478	0.238	0.2327	0.2359	0.104	0.2403	0.2338	0.2169	0.0745	0.1912
BH106	LMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005		<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0059	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH107	LMH	Bromate (mg/L)	0.01					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005																
BH108	LMH	Bromate (mg/L)	0.01					0.0073	0.0045	0.0048	0.049	0.0057	0.0014	0.0374	<0.0005	0.0575	0.0414	0.0409	0.0204	0.0224	0.0102	<0.0005	<0.0005	<0.0005	0.0013	<0.0005	0.0187	0.0208	0.0225
BH201 L (S)	LMH	Bromate (mg/L)	0.01					0.11	0.1542	0.12	0.1259	0.1309	0.1123	0.122	0.116	0.1299	0.1188	0.1163	0.1123	0.0762	0.1005	0.1032	0.1102	0.1702	0.0954	0.0926	0.0814	0.0408	0.0764
BH201 L (D)	LMH	Bromate (mg/L)	0.01					0.09	0.0869	0.0865	0.086	0.0897	0.0781	0.077	0.065	0.0818	0.0769	0.0838					0.0702	0.0841					
BH301	LMH	Bromate (mg/L)	0.01															0.0033	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.0011	<0.0005
BH302	LMH	Bromate (mg/L)	0.01															0.0005	0.0005	0.0005	0.0005	0.0035	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
BH305	LMH	Bromate (mg/L)	0.01															0.5574		0.5794	0.6231	0.6089	0.4543	0.5693	0.6025	0.5631	0.5313	0.4889	0.5166

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH101	CHK	Bromide (mg/L)	-	0.12	0.11	0.098	0.086	0.158	0.15	0.148	0.064	0.142	0.135	0.145	0.138	0.135	0.124	0.134	0.105	0.145	0.145	0.171	0.144	0.152	0.138	0.149	0.135	0.137	0.157
BH102	CHK	Bromide (mg/L)	-	0.055	0.1	0.1	0.078	0.142		0.089	0.083	0.083	0.076	0.075	0.068	0.064	0.057	0.071			0.061	0.065	0.063		0.061	0.052	0.061	0.079	0.061
BH103	CHK	Bromide (mg/L)	-	0.44	0.38	0.34	0.38	0.357		0.37	0.411	0.405	0.372	0.394	0.412	0.149	0.342	0.047	0.343	0.099	0.393	0.369	0.372	0.393	0.332	0.411	0.408	0.054	0.442
BH104	CHK	Bromide (mg/L)	-	0.26	0.32	0	0.18	0.18	0.19	0.262	0.371	0.34	0.295	0.344	0.083	0.33	0.314	0.112	0.332	0.146		0.305	0.354	0.334	0.35	0.354	0.346	0.34	0.381
BH105	CHK	Bromide (mg/L)	-	0.81	0.1	0.4	0.38	0.48	0.455	0.218	0.499	0.508	0.468	0.538	0.17	0.399	0.555	0.71	0.484	0.71	0.655	0.551	0.669	0.192	0.605	0.655	0.654	0.376	0.632
BH106	CHK	Bromide (mg/L)	-	0.054	0.059	<0.05	<0.05	0.05		0.054	0.062	0.055	0.049	0.05	0.028	0.054	0.051	0.047	0.044	0.044	0.039	0.201	0.00	0.055	0.033	0.036	0.041	0.052	0.04
BH107	CHK	Bromide (mg/L)	-					0.182		0.107	0.209	0.104	0.149	0.142															
BH108	CHK	Bromide (mg/L)	-					1.06	1.095	0.929	0.966	0.938	0.899	0.954	0.095	0.881	0.825	0.876	0.742	0.805	0.769	0.8	0.736	0.718	0.723	0.768	0.715	0.626	0.68
BH201	CHK	Bromide (mg/L)	-															0.95	0.678	0.832	0.81	0.89	0.459	1.396	0.663	0.65	0.31	0.434	0.578
BH302	CHK	Bromide (mg/L)	-															0.239	1.463	0.227	1.744	1.858	1.733	1.998	1.977	1.898	1.717	1.058	1.716
BH305	CHK	Bromide (mg/L)	-															1.377		1.265	1.177	1.186	1.191	1.176			1.145	0.916	1.016

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BH8	LMH	Bromide (mg/L)	-		0.35	0.3	0.39	0.325	0.31	0.4	0.328	0.418	0.384	0.364	0.359	0.366	0.347	0.404	0.295	0.362	0.352	0.302	0.326	0.331	0.242	0.283	0.359	0.357	0.404
BH9	LMH	Bromide (mg/L)	-			<0.05	0.11	0.118		0.088	0.084	0.139	0.15	0.132	0.094	0.072	0.143	0.207			0.166		0.102	0.086	0.067	0.13	0.143	0.179	0.197
BH101	LMH	Bromide (mg/L)	-	0.12	<0.05	<0.05	0.0059	0.172	0.17	0.106	0.153	0.104	0.127	0.267	0.059	0.119	0.124	0.135		0.081	0.081	0.0169	0.068	0.078	0.061	0.102	0.085	0.084	0.08
BH102	LMH	Bromide (mg/L)	-	0.09	0.1	0.062	0.13	0.13		0.117	0.091	0.119	0.12	0.087	0.13	0.14	0.144	0.14			0.126	0.151	0.186		0.118	0.165	0.153	0.139	0.133
BH103	LMH	Bromide (mg/L)	-	1.2	0.37	0.35	0.38	0.294		0.93	1.002	0.884	0.832	0.771	0.837	0.548	0.845	0.97	0.919	0.836	0.81	1.040	0.990	<0.005	0.993	1.048	1.058	1.005	0.987
BH104	LMH	Bromide (mg/L)	-	0.21	0.11	0.051	0.11	0.146	0.15	0.257	0.22	0.271	0.247	0.251	0.096	0.112	0.243	0.166	0.172	0.241	0.09	0.097	0.106	0.146	0.204	0.122	0.191	0.225	0.242
BH105	LMH	Bromide (mg/L)	-	1.1	0.62	0.14	0.60	0.819	1.047	0.83	0.991	0.91	0.869	1.001	0.092	0.915	0.84	0.893		0.789	0.775	0.788	0.808	0.858	0.773	0.794	0.778	0	0.484
BH106	LMH	Bromide (mg/L)	-	0.17	0.18	0.13	0.21	0.23		0.234	0.252	0.263	0.239	0.255	0.264	0.244	0.234	0.263	0.238	0.297	0.31	0.318	0.294	0.276	0.261	0.309	0.24	0.221	0.295
BH107	LMH	Bromide (mg/L)	-					0.189	0.204	0.191	0.196	0.193	0.189																
BH108	LMH	Bromide (mg/L)	-					0.2	0.16	0.188	0.337	0.36	0.11	0.265	0.104	0.357	0.267	0.3	0.204	0.24	0.217	0.408	0.128	0.127	0.157	0.198	0.187	0.219	0.251
BH201 L (S)	LMH	Bromide (mg/L)	-					0.5	0.569	0.573	0.611	0.554	0.549	0.08	0.542	0.556	0.528	1.585	0.494	0.367	0.514	0.548	0.488	0.488	0.469	0.498	0.475	0.254	0.483
BH201 L (D)	LMH	Bromide (mg/L)	-					0.37	0.383	0.397	0.421	0.416	0.359	0.391	0.323	0.373	0.384	0.409					0.378	0.371					
BH301	LMH	Bromide (mg/L)	-															0.45	0.445	0.452	0.49	0.319	0.272	0.453	0.41	0.215	0.16	0.188	0.283
BH302	LMH	Bromide (mg/L)	-															1.794	0.887	1.079	1.478	1.875	1.963	1.821	1.976	2.28	2.223	2.052	1.994
BH305	LMH	Bromide (mg/L)	-															1.336		1.437	1.396	1.581	1.346	1.389	1.338	1.397	1.364	1.223	1.279

Appendix 1 SLR borehole readings page 2, upper mineral horizon

Hatfield Road Quarry – Bromate and Bromide Groundwater Quality (Aug 2013 – Nov 2019)

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BHA	UMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1						<0.0005	<0.0005				<0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BHC	UMH	Bromate (mg/L)	0.01		<0.1	<0.1	<0.1						<0.0005	0.0006				<0.0005					<0.0005						
BHD	UMH	Bromate (mg/L)	0.01		<0.1	<0.1												<0.0005					<0.0005	<0.0005					
BHE	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0112	<0.0005
BHF	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005				<0.0005											
BHH	UMH	Bromate (mg/L)	0.01			<0.1	<0.1						<0.0005	<0.0005															
BHJ	UMH	Bromate (mg/L)	0.01				<0.1						<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005										
BHK	UMH	Bromate (mg/L)	0.01				<0.1						<0.0005	<0.0005	<0.0005														
BH101	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH102	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH103	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH104	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH105	UMHX	Bromate (mg/L)	0.01					<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0073	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH106	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1	<0.0005			0.0021	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	0.0054	0.0014	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH107	UMH	Bromate (mg/L)	0.01					<0.0005			<0.0005	<0.0005	<0.0005	<0.0005															
BH108	UMH	Bromate (mg/L)	0.01					<0.0005			0.0129	<0.0005	<0.0005	<0.0005	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	DRY	<0.0005	0.0008	<0.0005
FT101	UMH	Bromate (mg/L)	0.01	<0.1									<0.0005					<0.0005					<0.0005	<0.0005				
FT102	UMH	Bromate (mg/L)	0.01	<0.1	<0.1	<0.1	<0.1			<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005												
FT103	UMH	Bromate (mg/L)	0.01	<0.1									<0.0005																
BH306	UMH	Bromate (mg/L)	0.01															<0.0005	<0.0005	0.0008	0.0007		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
BH307	UMH	Bromate (mg/L)	0.01															<0.0005	<0.0005	<0.0005	<0.0005		<0.0005						
GMW101	UMH	Bromate (mg/L)	0.01																				<0.0005						
GMW102	UMH	Bromate (mg/L)	0.01																				0.0068						
GMW103	UMH	Bromate (mg/L)	0.01																				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
GMW103 L	UMH	Bromate (mg/L)	0.01																				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
GMW104	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005	0.0052		<0.0005	<0.0005					
GMW105	UMH	Bromate (mg/L)	0.01																				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005
GMW106	UMH	Bromate (mg/L)	0.01																				<0.0005						
GMW107	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005
GMW108	UMH	Bromate (mg/L)	0.01																				<0.0005						
GMW109	UMH	Bromate (mg/L)	0.01															<0.0005		<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
GMW110	UMH	Bromate (mg/L)	0.01																				<0.0005	<0.0005					<0.0005
GMW111	UMH	Bromate (mg/L)	0.01																				<0.0005	<0.0005					
GMW112	UMH	Bromate (mg/L)	0.01																					<0.0005					
GMW113	UMH	Bromate (mg/L)	0.01															<0.0005					<0.0005	<0.0005					
GMW114	UMH	Bromate (mg/L)	0.01															<0.0005					<0.0005	<0.0005					

Borehole	Zone	Analysis	DWS	Aug-13	Nov-13	Feb-14	May-14	Jun-14	Jul-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15	Jan-16	Apr-16	Aug-16	Nov-16	Feb-17	May-17	Nov-17	Feb-18	May-18	Aug-18	Nov-18	Feb-19	May-19	Aug-19	Nov-19
BHA	UMH	Bromide (mg/L)	-		0.1	0.21	<0.05						0.073	0.11				0.108					0.057	0.133	0.169	0.084	0.091	0.084	0.091
BHC	UMH	Bromide (mg/L)	-		0.15	0.68	0.14						0.158	0.181				0.129					0.128						
BHD	UMH	Bromide (mg/L)	-		<0.05	0.28												0.26					0.189	0.189					
BHE	UMH	Bromide (mg/L)	-			<0.05	<0.05						0.073	0.061	0.111	0.11	0.098	0.088	0.075	0.074	0.082	0.0093	0.125	0.091	0.065	0.088	0.063	0.08	0.096
BHF	UMH	Bromide (mg/L)	-			0.055	0.066						0.057	0.058				0.064											
BHH	UMH	Bromide (mg/L)	-			<0.05	<0.05						0.055	0.079															
BHJ	UMH	Bromide (mg/L)	-				0.15						0.126	<0.005		0.184	0.21	0.227	0.204										
BHK	UMH	Bromide (mg/L)	-				0.091						0.106	0.119	0.014														
BH101	UMH	Bromide (mg/L)	-	0.099	0.13	<0.05	0.15	0.203			0.08	0.077	0.105	0.113	0.093	0.098	0.112	0.121				0.096	0.072	0.12	0.093	0.086	0.08	0.086	0.14
BH102	UMH	Bromide (mg/L)	-	0.096	0.079	0.074	0.072	0.147			0.114	0.086	0.066	0.061	0.079	0.113	0.078	0.058	0.058	0.072	0.091	0.088	0.129		0.08	0.126	0.118	0.107	0.132
BH103	UMH	Bromide (mg/L)	-	0.053	<0.05	<0.05	<0.05	0.05			0.072	0.045	0.039	0.044	0.059	0.052	0.1	0.05				0.049	0.051	0.03	0.063	0.035	0.038	1.019	0.041
BH104	UMH	Bromide (mg/L)	-	0.071	0.088	0.3	0.15	0.199			0.058	0.113	0.116	0.102	0.034	0.062	0.05	0.106				0.07	0.077	0.084	0.064	0.054	0.068	0.087	0.081
BH105	UMHX	Bromide (mg/L)	-					0.202			0.161	0.169	0.59	0.14	0.185	0.194	0.344	0.138	0.126	0.156	0.115	0.096	0.161	0.112	0.152	0.088	0.104	0.115	0.12
BH106	UMH	Bromide (mg/L)	-	0.052	<0.05	0.063	0.052	0.17			0.074	0.071	0.059	0.063	0.042	0.096	0.076		0.057	0.069	0.054	0.102	0.035	0.056	0.046	0.057	0.059	0.069	0.055
BH107	UMH	Bromide (mg/L)	-					0.164			0.069	0.15	0.153	0.162															
BH108	UMH	Bromide (mg/L)	-					0.14			0.184	0.113	0.084	0.093	0.105	0.145	0.115	0.158	0.119	0.134	0.104	0.372	0.151	0.082	0.109	DRY	0.099	0.1	0.136
FT101	UMH	Bromide (mg/L)	-	0.07									0.043					0.047					0.042	0.032					
FT102	UMH	Bromide (mg/L)	-	<0.05	<0.05	<0.05	<0.05			0.033			0.042	0.041	0.031	0.034	0.029												
FT103	UMH	Bromide (mg/L)	-	<0.05									0.047																
BH306	UMH	Bromide (mg/L)	-															0.077	0.1	0.113	0.109		0.16	0.108	0.096	0.087	0.081	0.091	0.087
BH307	UMH	Bromide (mg/L)	-															0.133	0.128	0.131	0.138		0.162						
GMW101	UMH	Bromide (mg/L)	-																				0.043						
GMW102	UMH	Bromide (mg/L)	-																				0.054						
GMW103	UMH	Bromide (mg/L)	-																				<0.005	2.097	1.038	1.4	1.155	0.094	1.176
GMW103 L	UMH	Bromide (mg/L)	-																				0.163	0.153	0.138	0.381	0.196	0.029	0.062
GMW104	UMH	Bromide (mg/L)	-															0.08		0.12	0.288		0.078	0.053					
GMW105	UMH	Bromide (mg/L)	-																				0.207	0.223	0.062	0.116	0.122		0.065
GMW106	UMH	Bromide (mg/L)	-																				0.08						
GMW107	UMH	Bromide (mg/L)	-															0.367		0.279			0.167	0.205	0.208	0.162	0.18	0.223	0.307
GMW108	UMH	Bromide (mg/L)	-																				0.116						
GMW109	UMH	Bromide (mg/L)	-															0.288		0.2			0.107	0.142	0.174	0.074	0.182	0.436	0.358
GMW110	UMH	Bromide (mg/L)	-																				0.059	0.063					0.079
GMW111	UMH	Bromide (mg/L)	-																				0.057	0.054					
GMW112	UMH	Bromide (mg/L)	-																					0.028					
GMW113	UMH	Bromide (mg/L)	-															0.084					0.066	0.058					
GMW114	UMH	Bromide (mg/L)	-															0.04					0.01	0.077					

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