



Position Statement on the impact of HS2 on the Chilterns' chalk aquifer and its chalk streams

Buckinghamshire Council and Chilterns Conservation Board

Date: 5/5/2021

(Updated 19/8/2021 to reflect initial responses from HS2 Ltd on 19/7/2021, to the questions raised [plus a subsequent question].

Buckinghamshire Council and the Chilterns Conservation Board have serious concerns about the potential impacts of HS2's tunnelling operations on Buckinghamshire's aquifer and chalk streams.

Background

Only 200 chalk streams are known globally, 85% of which are found in the UK in southern and eastern England. Nine of these iconic rivers are located in the Chilterns and are one of the reasons for the Chilterns being designated an Area of Outstanding Natural Beauty.

Our chalk streams emerge from the chalk aquifer, so the very pure water is rich in minerals and remains at a fairly constant temperature year-round. In Buckinghamshire these include the well-known south running streams such as the Misbourne, Bulbourne and Chess which drop into the Thames, as well as the lesser known streams emerging at the foot of the escarpment flowing north, for example Wendover Brook.

Key species are associated with chalk streams, many of which have conservation status in their own right due to the level of threat they are under, such as Bullhead, Brown Trout, Water Crowfoot, Otter and Water Vole.

Chalk streams are also a Priority Habitat and have been identified as being one of the most threatened habitats and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). Latterly the former UK BAP was succeeded by the UK Post-2010 Biodiversity Framework (2012).

Concerns regarding the potential impacts of tunnelling on the chalk aquifer and chalk streams are not new, but remain unresolved. For example, concerns were raised by Buckinghamshire Council, the Chilterns Conservation Board and others at the petitioning stage as the HS2 Act passed through Parliament.

While several safeguards were introduced in the final Act, these largely comprise protective provisions for the water companies. In addition, measures are set out in the Code of Construction Practice and the Chiltern/Wycombe Local Environmental Management Plan, but these are effectively just a plan, monitor and react position.

We are therefore seeking answers to the questions and concerns below. This has become particularly urgent given that HS2 Ltd is expected to apply any time now to the Environment Agency for consent to begin tunnelling operations.

Furthermore, the Judges' decision in the recent tribunal *Green vs High Speed Two (HS2) Ltd* (4 March 2021), makes clear that the impact of tunnelling and drilling on the chalk aquifer is of huge public interest and the public should be given access to the data and should be consulted. We are also therefore seeking full disclosure and a public consultation.

Concerns

Buckinghamshire Council and the Chilterns Conservation Board have a number of key concerns and questions that remain unanswered relating to HS2's tunnelling operations.

These include:

1. Pollution - how will HS2 Ltd mitigate against polluting the Chilterns' chalk aquifer and its chalk streams by its tunnelling operations and railway construction?

Contamination of the aquifer and chalk streams by pollutants is likely, either directly from the tunnelling process or afterwards where unclean waters enter chalk streams from drains, new road layouts, track beds, and viaducts etc.

Tunnelling by the two Tunnel Boring Machines (TBMs) grinding through the chalk, will create a liquid slurry to be pumped back through the tunnel. However, we are concerned that pollutants and sediment will be carried through the aquifer, impacting on both our chalk streams and on water abstracted for drinking water.

Potential pollutants include: substances such as oils and greases, which affect invertebrates' and fishes' ability to breathe; salt, which is toxic at low densities to many key species; litter; and fine sediments, which can cause de-oxygenation of water and swamp clean gravels leading to losses of fish, key plant species and invertebrates.

These effects will be further compounded by loss of natural water by infiltrating surfaces, such as through the construction of hard standings, road and engineering structures, car parks, ground stabilisation membranes, and the potential adding of non chalk stream waters into chalk streams through new drainage channels, ditches and culverts.

Response from HS2 Ltd 19/7/2021

HS2 Ltd is employing approaches to construction, such as the selection of Tunnel Boring Machine (TBM) type, specification of materials and targeted ground treatment, to ensure that risks to groundwater quality in the Chalk aquifer as a result of construction of the railway are reduced as far as possible. All construction methods have been developed over a number of years under the scrutiny of the Environment Agency and Affinity Water, focusing in detail on all risks to water quality and the wider environment such as the Chalk streams. The risk assessments that have been prepared are the culmination of this analysis and there is a bespoke risk assessment for each of HS2's major assets which considers the specific construction methods and local hydrological conditions. These approaches are supplemented by very detailed and flexible monitoring plans to ensure that any unforeseen effects are identified early and can be rectified. With these methodologies and controls in place the risk of polluting the Chalk aquifer and surface waters is considered to be low, and this conclusion is supported by the independent analysis and review carried out by the organisations mentioned above.

It is incorrect to say that Affinity Water will be abstracting more water from a source near Watford as a result of the perceived risk from turbidity generated by construction. Affinity Water will not be abstracting additional water from their sources as a result of HS2's activities. The licence variation you refer to enables them to pump at a higher rate during periods of peak demand, but still within their current annual abstraction limit. This additional flexibility is required in the event of periods of high demand coinciding with the planned outage of another of their sources during piling for the Colne Valley Viaduct. It does not reflect wider concerns about water quality impacts on the aquifer or a need to abstract water from the aquifer above current licensed levels.

2. Abstraction - will HS2 Ltd's tunnelling operations result in increasing levels of water abstraction from the Chilterns' chalk streams and, if so, what measures are being taken to protect the Chilterns' chalk streams and drinking water supplies?

Of particular concern, is the huge volume of water required for tunnelling. While precise volumes have still not been fully determined, latest figures estimate that the Tunnel Boring Machines will require up to 10 million litres of water a day. Although some water will be recycled, this is the equivalent of four days water supply for the whole of the population of Amersham. It is still unclear how much water will be required – the average daily rate and also expected maximum rates – where the water required will come from. We also want to know how the contaminated waste water will be processed and disposed of.

A great deal of campaigning in recent years has resulted in a reduction to the levels of water abstraction that have been damaging our chalk streams. We are now extremely concerned at the prospect of HS2 Ltd's water requirements reversing these reductions and decreasing water flow in our chalk streams. This could have a devastating impact on our precious chalk streams and potentially impact on the availability of drinking water.

Response from HS2 Ltd 19/7/2021

The volume of water required for HS2 operations in the Colne Valley will come from Thames Water via a network link with Affinity Water – there will not be any water abstracted from the Colne Valley aquifer specifically for HS2 with the exception of a small amount for the office facilities and this will come from within the existing licence volume. Water requirement for tunnelling is calculated to be 8.1Mm³ over the duration of tunnel construction. Of this requirement 2.6Mm³ will come from mains water. The remainder of the demand will come from the recycling of the mains water. As you identify, the demand profile will vary during the course of construction, from zero to approximately 3,200 cubic metres of water per day. As has been stated previously, there will be no increase in abstraction from the chalk aquifer in order to accommodate HS2's demand, so there will be no related impact on Chalk streams and drinking water supplies.

3. Impact on river flow – what assessments have been made of the risk of HS2 Ltd's tunnelling operations impacting on groundwater flow?

The geology of the chalk the Tunnel Boring Machines will be boring through is known to be deeply fractured. The capacity to cause major disruption to flows within the aquifer and to surrounding water bodies is therefore significant.

We have not seen any evidence to indicate that HS2 Ltd has sufficient information on the very complex geology to accurately model the tunnelling's impact and develop mitigation plans. therefore remain unclear. Both the Rivers Chess and Misbourne are already on a knife edge in terms of flow rates.

Response from HS2 Ltd 19/7/2021

The presence of tunnels within the Chalk aquifer will affect the flow of groundwater immediately adjacent to them. Groundwater will flow around the tunnels in response to the regional hydraulic gradient, but this effect will have a negligible impact on the volume of groundwater through the aquifer or the discharge of groundwater to rivers. This is because the tunnels are orientated approximately parallel to the groundwater flow direction, will be located at depth within the aquifer and, most significantly, due to the small scale of the tunnels in relation to the size of the aquifer system as a whole. No mitigation for the minor, localised groundwater flow impacts that are envisaged at depth is required.

4. Impact on the River Misbourne - has HS2 Ltd accurately modelled the impact of tunnelling operations on the flow of the River Misbourne?

Not only is the chalk bedrock fractured, but the River Misbourne is “perched” – the river-bed is above the water table - and so is particularly fragile. As the TBMs tunnel a mere 20m beneath the river at Chalfont St. Giles and Shardeloes Lake below Little Missenden, disturbance to the riverbed may cause water to drain away, leading to permanent damage to this rare chalk stream habitat and loss of wildlife.

It is our view that HS2 Ltd’s mitigation plan for the River Misbourne - in the event of damage – is totally inadequate. The ‘plan’ appears to simply focus on monitoring and developing a mitigation plan to deal with the damage once it happens. This is likely to be too little, too late.

The loss of a chalk stream and the rich diversity of wildlife that it supports does not align with HS2 Ltd’s commitment to causing ‘no net loss’ of biodiversity.

Response from HS2 Ltd 19/7/2021

See the above answer. Tunnelling will not impede the discharge of groundwater to the River Misbourne; there is no mechanism by which that would occur. Similarly, the tunnelling technique to be employed in the competent Chalk at depth beneath the river will not lead to any significant risk of loss of flow from the river. For these reasons there has not been any modelling of river flows. Maintaining the integrity of the surrounding Chalk, and rapid grouting of any voids immediately around the outside of the tunnel segments, is central to the tunnelling approach and settlement has been modelled as being between 10 and 30mm in the competent chalk at 18m depth below the river. This competent chalk is overlain by soft weathered chalk and alluvium at shallow depths and so there is no risk of fractures opening in the river bed.

5. Impact on Weston Turville Reservoir - what plans are in place to mitigate for the loss of water in the Wendover area?

In addition to the issues raised by the main tunnelling process, we are concerned that the ‘cut and fill’ tunnel further north - through the side of Bacombe Hill, south of Wendover - may intercept and divert water from springs that feed the Wendover Arm of the Grand Union Canal (GUC) and the Weston Turville Reservoir Site of Special Scientific Interest (SSSI). The Wendover Arm of the GUC supplies water to irrigate the main GUC. If additional water is required from elsewhere to maintain levels in the canal, this could result in increased water abstraction in the Bulbourne valley with detrimental impacts to the River Bulbourne, a chalk stream which is already suffering from the effects of over-abstraction.

Response from HS2 Ltd 19/7/2021

We are currently undertaking a detailed risk assessment of the potential impact on water supply to Weston Turville Reservoir SSSI. To support this we have been monitoring spring flows and measuring groundwater levels for some time, and have recently completed a pumping test that will help us to understand the hydrogeological setting of the Wendover Green Tunnel and the Wendover North Cutting. These datasets are being used to calibrate a 3d, time-variant, groundwater model of the Wendover Brook catchment so that we can accurately predict the impact of railway construction on seasonal flows into the reservoir. Once we understand the potential impact on flows we will determine the potential impact on the ecology of the reservoir and its surrounding wetlands. To this end, we have undertaken ecological surveys to establish the sensitivity of the ecosystems to changes in flow and changes in water levels. We are in regular

contact with the Environment Agency, Natural England and the Berks, Bucks and Oxon Wildlife Trust on this.

We expect to be able to show that, whilst there will be a change in the flow regime of Wendover Brook, it will not be significant in the context of the water budget of the reservoir and its surrounding wetlands. Several other streams flow into the reservoir, and flows in these are to be insignificantly impacted by railway construction, and these should provide ample flow to sustain the dependent ecosystems. These ecosystems are also not considered by our ecologists to be sensitive to small changes in flow.

We are also considering the unlikely outcome that the actual conditions during tunnel construction and excavation of the cutting prove to be not as expected, and that a significant part of the water supply to the reservoir is interrupted. We are drawing up plans to mitigate this eventuality but all feasible solutions appear likely to be unsustainable and not cost-beneficial. This is the basis of the application we are making to the Environment Agency for derogation from Regulation 19 of the Water Framework Directive Regulations (formerly Article 4.7 of the Water Framework Directive) such that the Secretary of State may consider that continuing construction of the railway is in the nation's best interests.

6. Longer term damage - does HS2 accept that longer lasting damage is likely to be caused by the tunnelling operations and will it accept responsibility for such damage?

Potential long term damage includes:

Changes to water temperature – a key characteristic of chalk streams is their stable water temperature. Water added to chalk stream systems that changes the temperature of the water - even if only by a degree or two - has a significant effect on the ability of the water to hold dissolved oxygen. This can have negative consequences for invertebrates which form the base of the food chain as well as the fish, birds and mammals which feed on them.

Introduction of non-locally native and invasive species – this is likely either by accidental deposition from plant and machinery, or from landscaping works where species are introduced which might be “native” but not locally so. Or, as is often the case, they can be accidentally introduced through tree and aquatic plants from nurseries.

Response from HS2 Ltd 19/7/2021

The presence of the completed tunnels will cause no long-term impact on the Chalk aquifer and its dependent water features. Consideration of this has been part of the assessment that the Environment Agency has undertaken as part of the regulatory process. HS2 has committed to monitoring the water environment in this area for up to 30 years after construction is complete.

7. Monitoring – what measures are being put in place to monitor tunnelling operations and to mitigate negative impacts if they occur?

Given the significant public interest in HS2 Ltd’s operations and concerns regarding the chalk aquifer, we believe that monitoring of the tunnelling operations and its impacts needs to be carried out independently of HS2 Ltd.

Response from HS2 Ltd 19/7/2021

Intensive monitoring requirements and protocols are in place in order to assess any impacts from tunnelling or associated activities such as the construction of the ventilation shafts. These include monitoring of groundwater levels groundwater quality in up to 88 boreholes along the route of the tunnel, including using data loggers. River flow and river quality are monitored focussing on the two points where the tunnel passes under the river. The monitoring plan includes the communication of issues and the agreement of any required corrective actions with regulatory

bodies. The detail of the monitoring regime is too extensive to describe as part of this correspondence, but can be shared if requested. The requirement for temporary possession of land is not contrary to HS2's position that there will not be a loss of flow but is in place to allow rapid mitigation in the unlikely event that an effect is identified. This is part of HS2's approach to demonstrate that it can implement mitigation if it is required – we would no doubt be criticised if we were not prepared for such action.

8. Environmental standards - what measures are in place to ensure that the tunnelling operations cause no net loss of biodiversity and uphold the highest environmental standards, as set out in the Environmental Statement?

HS2 committed to no net loss of biodiversity in their Environmental Statement. We would like to know what measures HS2 are putting in place to ensure tunnelling operations do not result in a net loss of biodiversity, bearing in mind all the concerns raised above.

In conclusion, we are urgently seeking answers to the above questions before tunnelling operations commence, to ensure that we and Buckinghamshire's residents are fully informed of the likely impacts, and HS2 has plans in place to mitigate impacts.

Response from HS2 Ltd 19/7/2021

It would be useful if you could elaborate on what loss of biodiversity you envisage as a result of tunnelling? As stated, we do not envisage any adverse impact on river flows so their ecological health will be unaffected. All aspects of HS2 Ltd's approach to the tunnelling and associated environmental protection is designed to fully comply with our commitments as set out in the Environmental Statement. Align has prepared a series of environmental management plans as alluded to on the public presentation.

9. What arrangements are in place for independent evaluation, monitoring and reporting of the tunnelling operations with regards to pollution, impact on river flows, abstraction levels?

Dr Steve Hobbs described the review of Align's procedures by HS2, EA and Affinity Water and the reporting process should problems arise. Please confirm these procedures and provide contact details for each organisation.

Response from HS2 Ltd 19/7/2021

Construction and environment monitoring data (groundwater and surface water quality, level and flow) are provided to the Environment Agency and Affinity Water on a daily or weekly basis (depending upon the activity) to allow independent evaluation and comparison of the data to trigger levels that have been based on pre-construction baseline monitoring data. In addition, a weekly construction progress and planning meeting is held so that those organisations are aware of activities. We also prepare a monthly environmental monitoring report which is discussed at a monthly meeting with both organisations. These organisations are fully independent of HS2 Ltd and in order to comply with statutory requirements and their own obligations will hold HS2 Ltd to the highest standards of construction and environmental management. Most notably they will be assessing HS2 Ltd's compliance with the conditions attached to the consents that they have granted in addition to the undertakings and assurances required by the HS2 Act.

Please contact the Environment Agency and Affinity Water for further details of their interaction with HS2 Ltd. If you would like our contacts at these organisations we would be happy to share these.

Notes for Editors:

- Since HS2 was approved by the Government in 2012, Buckinghamshire Council and the Chilterns Conservation Board argued that the route should not pass right through the middle of the protected landscape of the Chilterns AONB. Over the past eleven years they have worked together along with the HS2 Review Group and other partners to secure the best possible outcome for the environment despite the Government's decision to proceed with the project.
- Both the Council and the Chilterns Conservation Board have limited powers, with no formal role in the decision making, and are therefore unable to stop the High Speed 2 Railway Project from progressing, however they do uphold the right to question, challenge and call out HS2 Ltd and its contractors where they have concerns about impacts that could, and should, be avoided.
- Buckinghamshire Council cannot refuse work that has been permitted through the HS2 Act, however they can refuse the detail of those works. A refusal of such works is called a Section 17 and a recent example of this was seen last week when the Council refused to approve lorry route applications from HS2 Ltd.
- [The Chilterns Conservation Board](#) is an independent public body set up following the passing of the Countryside and Rights of Way Act 2000, to conserve and enhance the natural beauty and increase awareness and understanding of the Chilterns Area of Outstanding Natural Beauty (AONB). The Board, which also aims to foster the social and economic wellbeing of local communities, employs a staff team of 24 that works in partnership with local authorities, voluntary organisations, businesses, local communities and others who live and work in the Chilterns.
- The Chilterns Area of Outstanding Natural Beauty (AONB) was designated in 1965 and covers 833 sq kms (326 sq Miles) stretching from Goring, in Oxfordshire, to near Hitchin, in Hertfordshire. A home and workplace for over 80,000 people, the Chilterns AONB is the third largest AONB in England and is designated as one of the finest landscapes in the country.

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