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Highways England: A303 Amesbury to Berwick Down Project, Development Consent Order Application Scheme Ref: TR010025

Comments on Highways England's Deadline 4 Submission REP4-036: 8.31 Comments on any further information requested by the ExA and received to Deadline 3

Prepared by Dr. G.M. Reeves for the **Stonehenge Alliance Ref. 2001870**

Introduction

The following comments are made in respect of Highways England's comments on the Environment Agency's response to first **Written Question DCO.1.23: Article 7 Limits of Deviation**:

12.1.2. *Matter raised by the Environment Agency*

1.1.1.1 DCO.1.23 - Article 7 Limits of Deviation
It is noted that Limits of Deviation to the vertical and lateral alignment of the tunnel are to be set by the DCO to allow for changes in the currently proposed design during detailed design by the contractor. The Bored Tunnel Limits of Deviation Plan (TR010025-2.16 Rev P02) submitted with the DCO application indicates an upper limit for the crown of the tunnel at 70 mAOD at the lowest point of the tunnel - beneath Stonehenge Bottom - and no lower limit to its vertical alignment. The groundwater risk assessment to date (most recently updated in Implications of 2018 Ground Investigations to the Groundwater Risk Assessment, P04. AECOM, Mace, WSP, April 2019) has assessed the impacts of an alignment where the crown, at its lowest point – beneath Stonehenge Bottom – is 55 mAOD. This assessment places the tunnel beneath the expected elevation of the Whitway Rock which acts as a preferential flow horizon (although the presence of these and exact location has not been confirmed to date). Due to the risk of the tunnel impeding flow along this horizon should its alignment, design or construction methodology change, it is essential that any changes to the detailed design are adequately risk assessed.

Highways England's response
The Applicant notes that a response to the theoretical presence of the Whitway Rock has been provided to the Environment Agency in the response to Written Representation 23.2.2-23.2.6 issued at deadline 3 [REP3-013].

Response by Stonehenge Alliance

As of July 19th 2019, an inadequate understanding of present groundwater conditions exists along the proposed A303 road and Stonehenge tunnel route.

The groundwater conditions and any sound prediction of changes are significantly incomplete in and around the route of the proposed A303 Stonehenge tunnel and associated highway works.

This is demonstrated by the continuance of drilling of a considerable number of further boreholes by Highways England contractors, together with the current situation of incomplete instrumentation and monitoring of existing observation boreholes.

The Whitway Rock (known to the east of the Salisbury area and in the SW of the Devizes BGS 1:50,000 geological map as the Stockbridge Rock) has not been identified in either phase of the site investigation work for the proposed Highways England A303 Stonehenge road and tunnel scheme.

The Stockbridge Rock is referred to by Mortimore et al (2017, page 8):

"*It is also possible that the hardground equates with the British Geological Survey Stockbridge Rock Member mapped on the Salisbury Sheet (Hopson, 2005). The Stockbridge Rock Member is a hard bed several metres below Barrois' sponge bed. It is localised within a part of the Wessex basin controlled by syn-sedimentary faulting/folding along the line the Winchester-Dean Hill anticline (Fig. 2).*"

This significant hard 5 metre thick limestone horizon, commonly lying some 5 or so metres below the Seaford/Newhaven Chalk horizons boundary, appears to act as an "underdrain" to the upper unconfined Chalk aquifer horizons in this area.

The background to the Wessex Basin Groundwater Model and associated work, adopted by Highways England and the Environment Agency, is detailed by Soley et al. (2012). It is stated that the initial work carried out in advance of the Wessex Basin and associated groundwater modelling activities prior to 2012 was informed by a comprehensive 3-D ground model of all these areas, carried out by the British Geological Survey (BGS).
Using groundwater modelling nodes (as utilised in ModFlow software, and similar) with 250m spacings, only about 15 data points are established to predict groundwater conditions along the tunnel line.
This poor level of detail is totally inappropriate and insufficient to investigate the complexity of groundwater movement, recharge, flow and discharges at the necessary scale and detail requirements of the 3.3km long tunnel.
The creation of any degree of groundwater barrier, as a result of tunnel construction, could affect local private abstractors, and even the discharge of the Blick Mead/Amesbury Abbey springs to the east.
It is highly likely that the Blick Mead and nearby Amesbury Abbey spring system arises from a sub-crop of the Whitway Rock to the west of Countess Roundabout.
There is therefore grave concern about long term effects due to potential changes in horizontal and vertical permeabilities of such zones as the Whitway Rock, the overlying Upper Seaford Chalk/Newhaven Beds, and fracture systems which control groundwater flow southwards below Stonehenge Bottom, respectively.
It is therefore essential that additional, deeper, targetted and cored borehole drilling is carried out, especially to the east of Stonehenge Bottom, as far as Countess Roundabout. This would enable proper investigation of geological and hydrogeological conditions at depth, below the proposed tunnel soffit level. Such boreholes would assess the presence or absence of the Whitway rock in the area of the Scheme and if present, its hydrogeological significance, especially in the eastern section of the Chalk that is likely to be affected by tunnel construction and operations.

GM Reeves 17.07.19

References

Soley, R. W. N., T. Power, R. N. Mortimore, P. Shaw, J. Dottridge, G. Bryan and I. Colley, "Modelling the hydrogeology and managed aquifer system of the Chalk across Southern England" *Geological Society, London, Special Publications* v.364, April 2012, pp.129-154.

BGS 1:50,000 Sheets 282, Devizes, and 298, Salisbury, and Sheet Memoirs.