BAM Construction Limited
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Date	19/02/21
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Subject **Grouting monitoring procedure statement**

During the grouting works carried out by CSL, Buro Happold (BH) identified a number of assets that required monitoring throughout this period: movement and vibration magnitude for Forge Lane Bridge (FLB) and Joe Mercer Way (JMW) crib wall, borehole water depths and River Medlock water clarity. The items for monitoring were developed from the Buro Happold Groundwater Risk Assessment (GWRA), the Remediation Strategy and the EA Approval letter provided 2nd October 2020. All of the stated requirements were met by BAM during the works, with the results recorded and published to BIM360 daily and notifications issued to the relevant consultant and T&T as follows:

Forge Lane Bridge and Crib Wall:

- Vibration monitoring apparatus was utilised to record the magnitude of vibration pulses within the ground at the asset face. Limits for the allowable magnitude were agreed through GIA with the asset owners prior to works commencing. No breach of these limits due to the grouting works operations occurred. All results were recorded in the following link: https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.-uyR6U9kQjKt3xiidHghhQ
- Movement of assets was determined by setting base targets onto the structure of FLB and Crib Wall. These targets were shot twice daily. No movement of either structure was recorded over the grouting period. All results are recorded on the following links:
- https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.SL5Ur6PlRRW2jC9xCxl01g/documents/urn:adsk.wipprod:dm.lineage:0r5NQDKXTRSSnD8Vw1dVBA
- https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.SL5Ur6PlRRW2jC9xCxl01g/documents/urn:adsk.wipprod:dm.lineage:muhH8sD7Tvqy00kqkJ7ecw
- All results were issued to GIA and T&T daily

Borehole water depths:

Following the installation of 9No boreholes by others prior to BAM possession of the site, on checking their functionality it was clear some remediation of these installations was necessary in order to recommission before grouting works could commence, the works required were as follows: wells BH19/05 and BH19/13 were re-drilled, boreholes BH19/02A, BH19/03,

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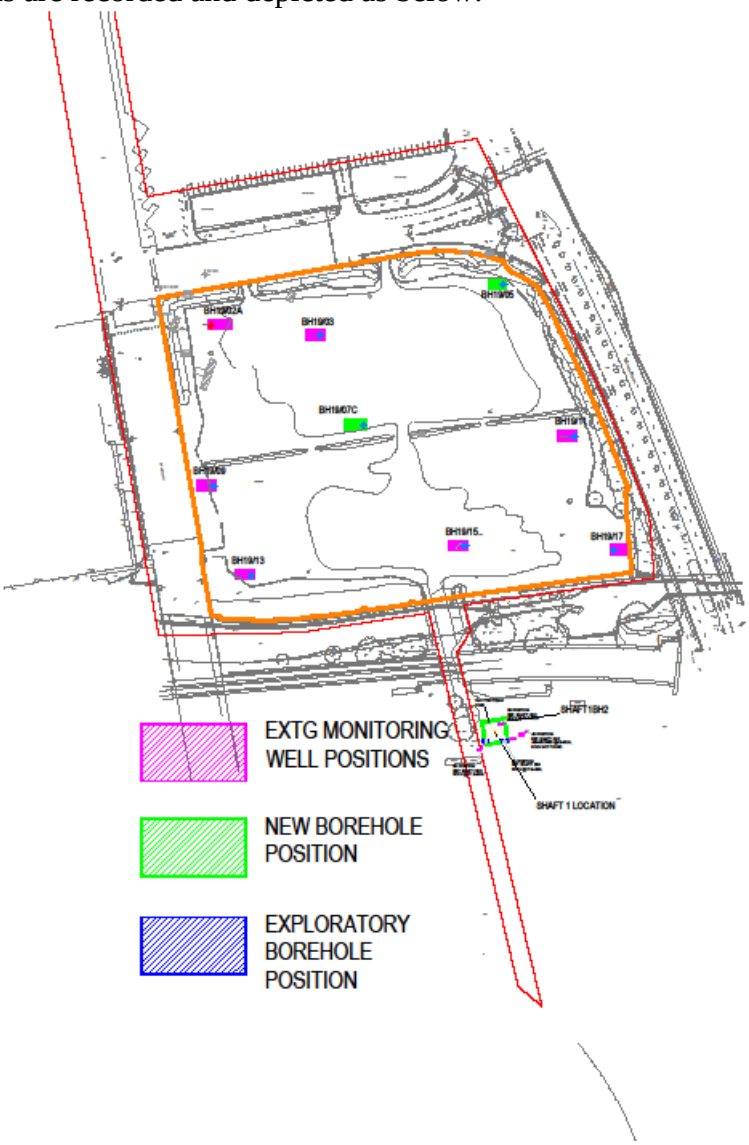
BH19/07C, BH19/09, BH19/11, BH19/15 and BH19/17 were flushed out and depth checked. Once functioning correctly, the levels within the boreholes were monitored daily for 4 weeks before grouting works commenced in order to set baseline readings, then, on commencement of grouting operations until 5/2/21 2No samples per day were taken, reducing thereafter to 1No sample per day to 19/2/21, the following were carried out:

- Borehole depth readings recorded once per day results recorded on following link: https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.1P34LQz2QvisnyX3UO1wpw/documents/urn:adsk.wipprod:dm.lineage:qV9dkepRQg6wGidFaSZF6Q
- Water levels within the boreholes recorded twice daily, results included in the above link
- All results were issued to BH and T&T daily and no adverse comments were returned during the grouting period

Borehole locations are recorded and depicted as below:



Borehole water clarity

The monitoring of borehole water clarity did not form part of the overall strategy for testing, however, BAM carried out daily inspections of the installations to provide early indication of any changes to the water before it caused wider issues. On occasion, small changes were

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detected and the relevant affected borehole had additional monitoring carried out to plot any worsening. All such occurrences stabilised quickly, therefore not causing ongoing concern. Photographic results of the surveys are recorded on the following link:

- https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.1P34LQz2QvisnyX3UO1wpw/documents/urn:adsk.wipprod:dm.lineage:UUcLGQtcRy-nr5JKIWBYmg

River Medlock water clarity

- The water clarity was inspected twice daily, the results are recorded in daily folders as per the following link: https://docs.b360.autodesk.com/projects/77a9bc7a-8da8-41d3-ac16-b1928cf4e76b/folders/urn:adsk.wipprod:fs.folder:co.n2dFKJz7Tb6r3liSNmKH6w
- No adverse observations were witnessed
- All results were issued to BH (Francesca Gould) and T&T and no adverse comments were returned during the grouting period

Yours sincerely

D Hanlon

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