TECHNICAL NOTE

Job Name:	Redevelopment of the Former VW Garage, Comet Way, Hatfield
Job No:	332610303
Note No:	TN002
Date:	19/10/2023
Prepared By:	O Belson
Subject:	**Objection - Condition 8 – Foundation Piling Depths**

1. Introduction

1.1. Stantec UK Ltd (Stantec) has been commissioned by New Ways Construction Limited (New Ways) to assist in the discharge of condition 8 of Welwyn Hatfield District Council planning application 6/2020/3222/MAJ for the redevelopment of the former VW Garage on Comet Way, Hatfield (the 'site').

1.2. Formerly, Stantec provided Phase 1[1] and Phase 2[2] land contamination assessments for the site to assist in the planning application.

2. Planning Background

2.1. New Ways and their representatives have submitted various documents in discharge of Condition 8 under application references 6/2022/1730/COND and 6/2022/2300/COND. Condition 8 states:

"Piling/other foundation designs using penetrative methods must not be carried out other than with the written consent of the local planning authority. REASON: To ensure that the development will not exacerbate the bromate and bromide groundwater pollution beneath the site, in accordance with Policies R2 and R7 of the Welwyn Hatfield District Plan 2005, Policies SP 10 and SADM 18 of the Welwyn Hatfield Borough Council Draft Local Plan Proposed Submission August 2016, and the National Planning Policy Framework."

2.2. Submissions in discharge of Condition 8 submitted under application 6/2022/1730/COND include the proposed Foundation Plan, Pile Setting out General Arrangements, Pile Sheets and a cover letter.

2.3. Submission in discharge of Condition 8 under reference 6/2022/2300/COND comprise Piling Method Statement 20220930-RDB-Condition 08 Compliance, Comet Way Planning Compliance_ Ltr_2020_3222_MAJ_02122022.

2.4. A number of responses from statutory consultees for the site, the Environment Agency and Affinity Water, are also filed ultimately raising objection as the proposed piling depths are shown to penetrate fully through the sand and gravels of the Lowestoft Formation and come close to or be fully penetrating the confining layer of the Diamicton Till of the Lowestoft Formation and entering the lower Kesgrave Catchment Subgroup granular stratigraphy, which is in continuity with the underlying Upper Chalk Principal Aquifer.

[1] Ground Conditions Assessment (Phase 1): Contamination & Land Stability. Report reference 47179/3501/R001, dated 29 April 2020.
[2] Phase 2 Ground Investigation Report. Report reference 47179/3502/r1, dated 18 August 2020.

2.5. It is understood that the piling contractor commenced works on-site without formal discharge of condition 8.

3. Analysis of Piling Depths

3.1. Information provided by New Ways to Stantec from the piling contractor has been reviewed with respect to the recorded ground conditions at the site. A benchmark level of the base of the Lowestoft Formation is assumed to be at 60m above Ordnance Datum (AOD) based upon the two Stantec boreholes recording the base of the Lowestoft Formation at 59.73 and 59.83m AOD. Any piles terminating at a deeper depth is almost certainly penetrating the Kesgrave Catchment Subgroup aquifer that is in continuity with the Upper Chalk Principal Aquifer. The groundwater within the Principal Aquifer is known to be contaminated with, and regularly monitored for, bromate and bromide and is subject to containment and mitigation efforts.

3.2. A spreadsheet analysing the constructed depths of the piles, as provided by the Piling Contractor, is presented in Appendix A where the recorded pile termination depths have been colour coded red, amber or green based upon their proximity to the assumed base of the Lowestoft Formation:

a) **Red**: Terminating less than, or equal to, 61m AOD, indicating that the pile may have terminated within the Kesgrave Catchment Subgroup or have left less than a metre of Lowestoft Formation Diamicton Till separating the lower and upper aquifers.

b) **Amber**: Terminating between 61.1 and 61.9m AOD, indicatively not penetrating the Kesgrave Catchment Subgroup but only between 1 and 2m of Lowestoft Formation Diamicton Till is present as a confining layer.

c) **Green**: Terminating at greater than, or equal to, 62m AOD, indicating that there is greater than 2m of Lowestoft Formation Diamicton Till present as a confining layer.

3.3. Based on the information provided the analysis identifies that 25.8% of the installed piles are classed as **Red**, 20.6% are classed as **Amber**, and the remaining 53.6% are classed as **Green**. It is therefore considered that a number of the piles are likely to have marginally penetrated the Kesgrave Catchment Subgroup or less than a clearance beneath the base of the piles and the base of the Lowestoft Formation (46.4%).

3.4. It is concluded that the Lowestoft Formation Diamicton Till is likely to have been penetrated by piling operations through to the underlying Principal Aquifer by approximately one quarter of the piles constructed.

3.5. The method employed to install the piles was Continuous Flight Auger (CFA). CFA piling is a non-displacement method that uses a hollow stemmed continuous flight auger to excavate the pile bore and fill the bore with cement or grout. The auger is introduced into the ground by rotary methods at a speed and pitch that minimises soil displacement. The soil retained on the auger flights supports the sides of the borehole. On achieving the required depth, wet concrete is introduced under pressure via the hollow stem into the base of the borehole. The auger is withdrawn at a controlled rate whilst maintaining the concrete, or grout, at a positive pressure. Spoil is withdrawn from the hole on the auger flights and the concrete fills the hole under the auger head, the positive pressure forcing it into contact with the surrounding soil. The wet concrete in the hole is maintained at a positive hydrostatic pressure that supports the hole during the time taken for the concrete to cure. Once the complete auger string has been removed from the hole, the spoil arisings are cleared away and a reinforcing cage can, if required, be introduced into the wet concrete in the pile. Given that the concrete is introduced under pressure as the auger is withdrawn from the hole there is no 'void' formed, whilst also inhibiting the creating of any additional contaminant pathways along the soil-concrete interface.

3.6. As such the use of CFA piling is likely to have mitigated potential cross stratigraphic contamination and provided a reasonable seal between the geological units and preventing mixing of the shallow aquifer within the sand and gravels of the Lowestoft Formation and the deeper aquifer of the Kesgrave Catchment Subgroup/Upper Chalk by either upward or downwards migration of groundwater.

4. Groundwater

4.1. Groundwater levels supplied by the Environment Agency from monitoring of their referenced borehole PGWU2011, located approximately 50m to the north of the site along Comet Way indicates that resting groundwater level varied between 59 and 61m AOD between October 2022 and July 2023. This data indicates that whilst the Diamicton Till of the Lowestoft Formation acts as a potentially confining layer, the deep groundwater is not under pressurised conditions in the site location, as the piezometric head is only 1m greater than the assumed based of the Lowestoft Formation.

4.2. The base of the sand and gravels of the Lowestoft Formation, based on the two Stantec boreholes CP01 and CP02, is shown to lie at approximately 66-67m AOD on-site. On the evidence available, even if a pathway existed between the two aquifers, it is not considered probable for the groundwater within the deeper aquifer to rise to such an elevation to impact upon the aquifer within the sand and gravels of the Lowestoft Formation.

4.3. It is concluded that it is unlikely, or not theoretically probable, that bromate/bromide impacted groundwater in the Kesgrave Catchment Subgroup/Upper Chalk aquifer has risen into the aquifer within the sand and gravels of the Lowestoft Formation given the differences in elevation and the recorded fluctuations in the piezometric head of the EA monitoring well.

5. Discussion and Conclusion

5.1. Piling has been undertaken without prior discharge of precommencement condition 8. The piling records show that the reasons for the objections by the EA and Affinity Water are well founded and that the piling works undertaken has likely penetrated through base of the Diamicton Till of the Lowestoft Formation into the Principal Aquifer formed by the Kesgrave Catchment Subgroup and the underlying Upper Chalk.

5.2. The chief concern of the objection is the interruption or disturbance of the Principal Aquifer and the potential for bromate/bromide contamination within the aquifer to impact the upper aquifer within the sand and gravels of the Lowestoft Formation. However, groundwater monitoring data, the borehole records for the site and the adopted piling technique demonstrate that this scenario is improbable.

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Approved
332610303/ 3501/TN002	01	19/10/23	O Belson	J Hallier	O Belson

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Appendix A - Pile Schedule, Comet Way, Hatfield

PILE SCHEDULE FOR BEARING PILES
Pile Schedule Ref: KPL207 Location:
Comet Way, Hatfield, AL10 9TF

Pile Nos.	Pile Platform Level (PPL) mOD	Pile Cut off Level mOD	Pile Depth Adopted m	Base Depth of Pile mAOD	Pile Nos.	Pile Platform Level (PPL) mOD	Pile Cut off Level mOD	Pile Depth Adopted m	Base Depth of Pile mAOD
C1P1	76.000	74.015	15.0	61.000	P8	76.000	75.155	11.0	65.000
C1P2	76.000	74.015	15.5	60.500	P9	76.000	75.155	14.0	62.000
C1P3	76.000	74.015	15.0	61.000	P10	76.000	75.155	14.0	62.000
C1P4	76.000	74.015	15.5	60.500	P11	76.000	75.155	14.0	62.000
C1P5	76.000	74.015	15.5	60.500	P12	76.000	75.155	14.0	62.000
C1P6	76.000	74.015	16.0	60.000	P13	76.000	75.155	14.5	61.500
C1P7	76.000	74.015	14.0	62.000	P14	76.000	75.155	14.5	61.500
C1P8	76.000	74.015	14.0	62.000	P15	76.000	75.155	14.0	62.000
C1P9	76.000	74.015	14.0	62.000	P16	76.000	75.155	14.0	62.000
C1P10	76.000	74.015	14.0	62.000	P17	76.000	75.155	14.0	62.000
C1P11	76.000	74.015	14.0	62.000	P18	76.000	75.155	6.5	69.500
C1P12	76.000	74.015	14.5	61.500	P19	76.000	75.155	15.5	60.500
C2P1	76.000	74.015	14.5	61.500	P20	76.000	75.155	15.5	60.500
C2P2	76.000	74.015	14.0	62.000	P21a	76.000	75.155	14.0	62.000
C2P3	76.000	74.015	14.0	62.000	P21b	76.000	75.155	14.0	62.000
C2P4	76.000	74.015	14.5	61.500	P22	76.000	75.155	14.0	62.000
C2P5	76.000	74.015	14.5	61.500	P23	76.000	75.155	14.0	62.000
C2P6	76.000	74.015	14.0	62.000	P24	76.000	75.155	14.0	62.000
C2P7	76.000	74.015	15.0	61.000	P25	76.000	75.155	14.0	62.000
C2P8	76.000	74.015	14.5	61.500	P26	76.000	75.155	14.0	62.000
C2P9	76.000	74.015	14.0	62.000	P27	76.000	75.155	14.0	62.000
C2P10	76.000	74.015	15.0	61.000	P28	76.000	75.155	14.0	62.000
C2P11	76.000	74.015	14.5	61.500	P29	76.000	75.155	14.0	62.000
C2P12	76.000	74.015	14.5	61.500	P30	76.000	75.155	14.5	61.500
C2P13	76.000	74.015	15.0	61.000	P31	76.000	75.155	14.5	61.500
C2P14	76.000	74.015	14.5	61.500	P32	76.000	75.155	15.5	60.500
C2P15	76.000	74.015	14.5	61.500	P33	76.000	75.155	15.5	60.500
C2P16	76.000	74.015	15.0	61.000	P34	76.000	75.155	15.5	60.500
C2P17	76.000	74.015	15.5	60.500	P35	76.000	75.155	15.5	60.500
C2P18	76.000	74.015	15.5	60.500	P36	76.000	75.155	14.0	62.000
C3P1	76.000	74.015	14.5	61.500	P37	76.000	75.155	12.0	64.000
C3P2	76.000	74.015	14.5	61.500	P38	76.000	75.155	14.5	61.500
C3P3	76.000	74.015	15.0	61.000	P39	76.000	75.155	14.5	61.500
C3P4	76.000	74.015	15.5	60.500	P40	76.000	75.155	15.0	61.000
C3P5	76.000	74.015	14.0	62.000	P41	76.000	75.155	15.0	61.000
C3P6	76.000	74.015	14.5	61.500	P42	76.000	75.155	14.0	62.000
C3P7	76.000	74.015	15.0	61.000	P43	76.000	75.155	14.0	62.000
C3P8	76.000	74.015	15.5	60.500	P44	76.000	75.155	14.0	62.000
C3P9	76.000	74.015	14.0	62.000	P45	76.000	75.155	14.0	62.000
C3P10	76.000	74.015	14.5	61.500	P46	76.000	75.155	14.0	62.000
C3P11	76.000	74.015	15.0	61.000	P47	76.000	75.155	14.0	62.000
C3P12	76.000	74.015	15.0	61.000	P48	76.000	75.155	14.0	62.000
C3P13	76.000	74.015	14.5	61.500	P49	76.000	75.155	14.0	62.000
C3P14	76.000	74.015	15.0	61.000	P50	76.000	75.155	14.0	62.000
C3P15	76.000	74.015	14.5	61.500	P51	76.000	75.155	12.0	64.000
C3P16	76.000	74.015	15.0	61.000	P52	76.000	75.155	14.0	62.000
C3P17	76.000	74.015	14.0	62.000	P53	76.000	75.155	14.0	62.000
C3P18	76.000	74.015	14.5	61.500	P54	76.000	75.155	15.0	61.000
C3P19	76.000	74.015	14.0	62.000	P55	76.000	75.155	15.0	61.000
C3P20	76.000	74.015	14.0	62.000	P56	76.000	75.155	15.0	61.000
C4P1	76.000	75.055	15.5	60.500	P57	76.000	75.155	15.0	61.000
C4P2	76.000	75.055	15.0	61.000	P58	76.000	75.155	15.0	61.000
C4P3	76.000	75.055	14.5	61.500	P59	76.000	75.155	15.0	61.000
C4P4	76.000	75.055	14.5	61.500	P60	76.000	75.155	14.0	62.000
C4P5	76.000	75.055	14.0	62.000	P61	76.000	75.155	14.0	62.000
C4P6	76.000	75.055	14.0	62.000	P62	76.000	75.155	14.0	62.000
C4P7	76.000	75.055	14.0	62.000	P63	76.000	75.155	14.0	62.000
C4P8	76.000	75.055	14.0	62.000	P64	76.000	75.155	15.0	61.000
C4P9	76.000	75.055	15.0	61.000	P65	76.000	75.155	15.0	61.000
P1	76.000	75.155	14.0	62.000	P66	76.000	75.155	15.0	61.000
P2	76.000	75.155	14.0	62.000	P67	76.000	75.155	15.5	60.500
P3	76.000	75.155	14.0	62.000	P68	76.000	75.155	15.5	60.500
P4	76.000	75.155	14.0	62.000	P69	76.000	75.155	15.5	60.500
P5	76.000	75.155	14.0	62.000	P70	76.000	75.155	14.0	62.000
P6	76.000	75.155	14.0	62.000	P71	76.000	75.155	14.0	62.000
P7	76.000	75.155	11.0	65.000	P72	76.000	75.155	14.0	62.000

Min AOD of Pile toe 60.000

	BH1	BH2	BH3
IFA depth of separating clay Diamicton	15.5	15.5*	15.5#
* - sandy from 13.00	60.62	60.580	60.6
# - only 3.5m thick	CP01	CP02	
PBA/Stantec Depth of Confining Clay (m bgl	16.4	16.100	
PBA/Stantec Depth of Confining Clay (m AO	59.73	59.830	

Red	Highly probable extended through to Principal Aquifer (Kesgrave Catchment Group)
Amber	Within identified 2m clearance of base of the Lowestoft Clay confining layer
Green	Shallower than 2m clearance of base of Lowestoft Clay confiing layer

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P73	76.000	75.155	14.0	62.000	P141	76.000	75.155	14.5	61.500
P74	76.000	75.155	14.5	61.500	P142	76.000	75.155	14.0	62.000
P75	76.000	75.155	14.5	61.500	P143	76.000	75.155	14.0	62.000
P76	76.000	75.155	14.5	61.500	P144	76.000	75.155	14.0	62.000
P77	76.000	75.155	15.0	61.000	P145	76.000	75.155	14.0	62.000
P78	76.000	75.155	15.0	61.000	P146	76.000	75.155	14.0	62.000
P79	76.000	75.155	15.0	61.000	P147	76.000	75.155	14.0	62.000
P80	76.000	75.155	14.0	62.000	P148	76.000	75.155	14.0	62.000
P81	76.000	75.155	14.0	62.000	P149	76.000	75.155	14.0	62.000
P82	76.000	75.155	15.0	61.000	P150	76.000	75.155	14.0	62.000
P83	76.000	75.155	15.0	61.000	P151	76.000	75.155	14.0	62.000
P84	76.000	75.155	14.0	62.000	P152	76.000	75.155	14.0	62.000
P85	76.000	75.155	14.0	62.000	P153	76.000	75.155	14.0	62.000
P86	76.000	75.155	14.0	62.000	P154	76.000	75.155	14.0	62.000
P87	76.000	75.155	14.0	62.000	P155	76.000	75.155	14.0	62.000
P88	76.000	75.155	14.0	62.000	P156	76.000	75.155	14.0	62.000
P89	76.000	75.155	14.0	62.000	P157	76.000	75.155	6.5	69.500
P90	76.000	75.155	14.0	62.000	P158	76.000	75.155	6.5	69.500
P91	76.000	75.155	14.0	62.000	P159	76.000	75.155	7.5	68.500
P94	76.000	75.155	14.0	62.000	P160	76.000	75.155	14.0	62.000
P95	76.000	75.155	14.0	62.000	P161	76.000	75.155	14.0	62.000
P96	76.000	75.155	14.0	62.000	P162	76.000	75.155	14.0	62.000
P97	76.000	75.155	14.0	62.000	P163	76.000	75.155	14.0	62.000
P98	76.000	75.155	14.0	62.000	P164	76.000	75.155	14.0	62.000
P99	76.000	75.155	11.0	65.000	P165	76.000	75.155	14.0	62.000
P100	76.000	75.155	14.0	62.000	P166	76.000	75.155	14.0	62.000
P101	76.000	75.155	14.5	61.500	P167	76.000	75.155	14.0	62.000
P102	76.000	75.155	14.5	61.500	P168	76.000	75.155	14.0	62.000
P103	76.000	75.155	14.5	61.500	P169	76.000	75.155	14.0	62.000
P104	76.000	75.155	12.5	63.500	P170	76.000	75.155	14.0	62.000
P105	76.000	75.155	14.0	62.000	P171	76.000	75.155	14.0	62.000
P106	76.000	75.155	14.0	62.000	P172	76.000	75.155	14.0	62.000
P107	76.000	75.155	11.0	65.000	P173	76.000	75.155	14.0	62.000
P108	76.000	75.155	14.5	61.500	P174	76.000	75.155	14.0	62.000
P109	76.000	75.155	14.5	61.500	P175	76.000	75.155	14.0	62.000
P110	76.000	75.155	14.5	61.500	P176	76.000	75.155	14.0	62.000
P111	76.000	75.155	14.5	61.500	P177	76.000	75.155	12.0	64.000
P112	76.000	75.155	14.5	61.500	P178	76.000	75.155	12.0	64.000
P113	76.000	75.155	14.5	61.500	P179	76.000	75.155	13.0	63.000
P114	76.000	75.155	14.5	61.500	P180	76.000	75.155	13.0	63.000
P115	76.000	75.155	14.5	61.500	P181	76.000	75.155	14.0	62.000
P116	76.000	75.155	14.5	61.500	CBP1	76.000	74.165	16.0	60.000
P117	76.000	75.155	14.0	62.000	CBP2	76.000	74.165	16.0	60.000
P118	76.000	75.155	14.0	62.000	CBP3	76.000	74.165	16.0	60.000
P119	76.000	75.155	14.0	62.000	CBP4	76.000	74.165	16.0	60.000
P120	76.000	75.155	14.0	62.000	CBP5	76.000	74.165	15.5	60.500
P121	76.000	75.155	14.0	62.000	CBP6	76.000	74.165	16.0	60.000
P122	76.000	75.155	14.0	62.000	CBP7	76.000	74.165	16.0	60.000
P123	76.000	75.155	15.0	61.000	CBP8	76.000	74.165	16.0	60.000
P124	76.000	75.155	15.0	61.000	CBP9	76.000	74.165	16.0	60.000
P125	76.000	75.155	14.5	61.500					
P126	76.000	75.155	14.5	61.500					
P127	76.000	75.155	14.5	61.500					
P128	76.000	75.155	15.5	60.500					
P129	76.000	75.155	15.5	60.500					
P130	76.000	75.155	14.5	61.500					
P131	76.000	75.155	14.5	61.500					
P132	76.000	75.155	14.5	61.500					
P133	76.000	75.155	15.0	61.000					
P134	76.000	75.155	15.0	61.000					
P135	76.000	75.155	15.0	61.000					
P136	76.000	75.155	14.5	61.500					
P137	76.000	75.155	14.5	61.500					
P138	76.000	75.155	14.5	61.500					
P139	76.000	75.155	14.5	61.500					
P140	76.000	75.155	14.5	61.500					

Min AOD of Pile toe 60.500

	BH1	BH2	BH3
IFA depth of separating clay Diamicton	15.5	15.5*	15.5#
* - sandy from 13.00	60.62	60.580	60.6
# - only 3.5m thick	CP01	CP02	
PBA/Stantec Depth of Confining Clay (m bgl	16.4	16.100	
PBA/Stantec Depth of Confining Clay (m AO	59.73	59.830	

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Amber	Within identified 2m clearance of base of the Lowestoft Clay confining layer
Green	Shallower than 2m clearance of base of Lowestoft Clay confiing layer