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Date: 4th March 2020

Bellway Homes Ltd - East Midlands
3, Romulus Court
Meridian East
Meridian Business Park
Braunstone Town
Leicester
LE19 1YG

Attention of Dave Stockton

Dear Dave,

Re: Ashland Road, Sutton in Ashfield

Introduction

The following should be read in conjunction with the GRM Development Solutions Ltd (GRM) Site Appraisal Report (ref: GRM/5946/f.1), dated December 2012, and the GRM Gas Monitoring Completion Letter Report (ref: P5946 DWH1) dated 7th January 2013.

The existing reports are to be issued to the Local Authority as part of the planning process. Due to the age of the reports, GRM has undertaken a review of them to determine whether any subsequent changes in guidance has resulted in the geotechnical and environmental recommendations requiring amendments.

This Letter Report contains details of the findings of the review.

Environmental Elements

Soil Contamination

Human Health

The chemical analysis of the topsoil concluded that, with the exception of an isolated slightly elevated concentration of benzo(a)pyrene in the area of TP2 (1.2mg/kg), the concentrations of contaminants were below the relevant Tier 1 Assessment Criteria (TAC) used at the time of reporting. Whilst elevated, the isolated concentration of benzo(a)pyrene was not considered to represent a significant risk of significant harm to end users and so remediation was not necessary.

Comparison of the concentrations of contaminants against the current TAC, which are enclosed for reference, concludes that the concentrations of all contaminants, including the previous identified slightly elevated concentration of benzo(a)pyrene in the area of TP2, are below the relevant TAC, thus remediation is still not required.

Controlled Waters

In the absence of made ground, and as a precautionary measure, the topsoil was subjected to soil leachate analysis, and samples of groundwater were also subjected to chemical analysis to confirm the risk to controlled waters. With the exception of a concentration of lead in the soil sample from TP21 (10µg/l), the concentrations of contaminants in the soil leachates were below the relevant guidance used at the time (i.e. UKDWS). Similarly, with the exception of elevated concentrations of arsenic (47.6µg/l), copper (167µg/l) and nickel (25.8 µg/l) in the sample from WS1 and copper (34.5µg/l), the concentrations of contaminants in the groundwater were also below the relevant UKDWS. As the elevated concentrations of lead in the soil leachate were not present in groundwater, and the elevated concentrations of arsenic, copper and nickel in the groundwater were not present in the soil leachates, and there was no obvious source of contamination at the site, it was considered that there was no risk to groundwater.

Comparison of the concentrations of the contaminants against the current UKDWS, which have not changed significantly and are enclosed for reference, concludes that, with the exception of the concentrations of copper (now below the UKDWS of 2000µg/l or 2mg/l), the same concentrations of contaminants in the soil leachate or groundwater are still elevated. Based on this, and the fact that the site setting has not changed, the original assessment of the risk to controlled waters is still considered appropriate.

Ground Gas

A gas monitoring programme and associated risk assessment, based on the guidance in CIRIA C665, was undertaken as part of the original assessment, this concluding that gas protection measures for carbon dioxide and methane were not required for the site. However, the site was in an area that required the provision of basic radon protection.

The current guidance for the design of a gas monitoring programme is BS8576:2013. The original gas monitoring programme comprised six monitoring visits over a period of three months, which is in line with current guidance for the site setting.

The current guidance for the ground gas risk assessment is BS8485:2015+A1:2019 *Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Qhg), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

As methane concentrations were consistently below the monitor's lower limit of detection a default methane concentration of 0.1%v/v has been used in the following assessment. The recorded flow rate was generally zero, although it did fluctuate on occasion, the maximum recorded flow being 2l/hr. To follow a conservative approach a flow of 2l/hr has been used in the following assessment.

Using the maximum flow rate of 2l/hr and the default methane concentration of 0.1%v/v a Qhg of 0.0023l/hr has been calculated for methane. Using the maximum flow rate of 2l/hr and the maximum carbon dioxide concentration of 3.4%v/v, a Qhg of 0.068l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.068l/hr.

Therefore, as the maximum concentration of methane is <1%v/v, the maximum concentration of carbon dioxide is <5%, and the GSV is <0.07l/hr, the site has been assessed as 'Characteristic Situation 1' as outlined in BS8485:2015+A1:2019, for which gas protection measures are not required for carbon dioxide and methane.

The site still requires the provision of basic radon protection, which would comprise a radon resistant membrane, sealed at all joints and penetrations and extended across the cavities.

Based on the above, the conclusion of the original ground gas risk assessment is considered to be still valid.

Geotechnical Elements

The relevant guidance for the geotechnical elements of the site has not changed significantly since the issue of the report and so it is considered that the geotechnical recommendations made in the report are still applicable.

Conclusion

Following a review of the original Site Appraisal Report in line with current guidance, it is considered that the recommendations previously made for geotechnical and environmental elements are still applicable.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised please do not hesitate to contact us.

Yours sincerely,
for GRM Development Solutions Ltd



Matthew Tomkins BSc (Hons) PGDip FGS
Acting Principal Engineering Geologist

Enc: GRM TAC and UKDWS

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	37	37	37
^a Cadmium	22	22	22
^b Chromium III	910	910	910
^a Chromium VI	21	21	21
^a Lead	200	200	200
^{b/c} Mercury	40	40	40
^b Selenium	250	250	250
^b Nickel	180	180	180
^b Phenols	280	550	1100
^b Copper	2400	2400	2400
^b Zinc	3700	3700	3700
^d Cyanide	34	34	34
^a Benzene	0.20	0.33	0.87
^b Toluene	130	290	660
^b Ethylbenzene	47	110	260
^b <i>o</i> - xylene	60	140	330
^b <i>m</i> - xylene	59	140	320
^b <i>p</i> - xylene	56	130	310
Non Genotoxic PAHs			
^b Acenaphthene	210	510	1100
^b Acenaphthylene	170	420	920
^b Anthracene	2400	5400	11000
^b Fluoranthene	280	560	890
^b Fluorene	170	400	860
^b Naphthalene	2.3	5.6	13
^b Phenanthrene	95	220	440
^b Pyrene	620	1200	2000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
^b C5-C6	42	78	160
^b C6-C8	100	230	530
^b C8-C10	27	65	150
^b C10-C12	130	330	760
^b C12-C16	1100	2400	4300
^b C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	70	140	300
^b C7-8 (toluene)	130	290	660
^b C8-C10	34	83	190
^b C10-C12	74	180	380
^b C12-C16	140	330	660
^b C16-C21	260	540	930
^b C21-C35	1100	1500	1700

Notes

- a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016

GRM Controlled Waters Tier 1 Assessment Criteria

Table 1a

UKDWS			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Parameter	Concentration	Units		
Acrylamide	0.1	µg/l	-	
Aluminium	200	µgAl/l	-	
Ammonium	0.5	mgNH ₄ /l	0.2 as N	0.021 unionised as N
Antimony	5	µgSb/l	-	
Arsenic	10	µgAs/l	50 (dissolved)	25 (dissolved)
Benzene	1	µg/l	10	8
Boron	1	mgB/l	750 [#]	-
Bromate	10	µgBrO ₃ /l	-	
Cadmium	5	µgCd/l	See Table 2b	0.2
Chromium	50	µgCr/l	-	
Chromium (III)	-	µg/l	4.7	-
Chromium (VI)	-	µg/l	3.4	0.6
Chloride (i)	250	mgCl/l	188mg/l [#]	
Conductivity (i)	2500	µS/cm at 20°C	-	
Copper(ii)	2	mg/l	1	3.76 (where DOC <1mg/l)
Cyanide	50	µgCN/l	1	1
1, 2 dichloroethane	3	µg/l	10	
Dichloromethane	-	µg/l	20	20
Epichlorohydrin	0.1	µg/l	-	
Fluoride	1.5	mgF/l	1mg/l [#]	
Hydrogen ion	10	pH value	-	
Iron	200	µgFe/l	1000 (dissolved)	1000 (dissolved)
Lead (ii)	10	µgPb/l	1.2 (dissolved & bioavailable)	1.3
Manganese	50	µgMn/l	130 (bioavailable)	-
Mercury	1	µgHg/l	0.07 (dissolved)	0.07 (dissolved)
Mineral Oil (TPH)	10	µg/l	5000 (total) ****	5000 (total) ****
Nickel (ii)	20	µgNi/l	4 (dissolved & bioavailable)	8.6
Nitrate (iii)	50	mgNO ₃ /l	-	
Nitrite (iii)	0.5	mgNO ₂ /l	-	
Phenol	0.5	µg/l	7.7	7.7
Polycyclic Aromatic Hydrocarbons (vii) *	0.1	µg/l	-	
Fluoranthene	-	µg/l	0.0063	0.0063
Naphthalene	-	µg/l	2	2
Benzo(a)pyrene	0.01	µg/l	0.00017	0.00017
Benzo(b)fluoranthene	-	µg/l	-	
Benzo(k)fluoranthene	-	µg/l	-	
Benzo(g,h,i)perylene	-	µg/l	-	
Indeno(1,2,3-cd)pyrene	-	µg/l	-	
Anthracene	-	µg/l	0.1	0.1
Selenium	10	µgSe/l	7.5	-
Sodium	200	mgNa/l	150mg/l [#]	-
Sulphate (i)	250	mgSO ₄ /l	188mg/l [#]	-
Tetrachloroethene and Trichloroethene (viii)	10	µg/l	10	10
Tetrachloroethane	-	µg/l	140	-
Tetrachloromethane	3	µg/l	12	12
Toluene	700***	µg/l	74	74
Xylene	500***	µg/l	30 [†]	30 [†]
Ethylbenzene	300***	µg/l	20**	20**
1,1,1-Trichloroethane	-	µg/l	100 [†]	100 [†]
Trichlorobenzenes	-	µg/l	0.4	0.4
Trichloromethane	-	µg/l	2.5	2.5
Tributyltin	-	µg/l	0.0002	0.0002
Vinyl chloride	0.5	µg/l	-	-
Carbon Tetrachloride	-	µg/l	12	12
Zinc	5000	µg/l	10.9 (dissolved & bioavailable) + background concentration	6.8 (dissolved & bioavailable) + 1.1

Table 1b

Pesticides			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Aldrin	0.03	µg/l	-	
Dieldrin	0.03	µg/l	-	
Heptachlor	0.03	µg/l	-	
Heptachlor epoxide	0.03	µg/l	-	
other pesticides	0.1	µg/l	-	
Cyclodiene pesticides: Sum of Aldrin, Dieldrin, Endrin & Isodrin	-	µg/l	0.01 (sum)	0.005
DDT total	-		0.025	0.025
Pesticides: Total (vi)	0.5	µg/l	-	-

Table 2

EQS for Hardness Related Substances*						
Substance	EQS Type	EQS (µg/l) for hardness classes (mg/l CaCO ₃)				
		Class 1: <40	Class 2: 40-50	Class 3: 50-100	Class 4: 100-200	Class 5: >200
Cadmium (dissolved)	Annual average	<0.08	0.08	0.09	0.15	0.25

Reference

* The Water Framework Directive (Standards and Classification) Directions (England and Wales) Directions 2015

** Provisional EQS Value

*** WHO Drinking Water Standard

**** EA PPG3

[†] The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 - Now Withdrawn

[#] Groundwater Drinking Water Protected Zones Only

Ambient Background Concentrations for dissolved zinc in freshwaters in England and Wales (to be used in conjunction with Table 1a)	
<i>Catchment/Group of catchments (ii)</i>	<i>ABC (µg/l)</i>
Tyne	4.8
Tees	4.1
Ouse, Humber	2.9
Nene	4.0
Great Ouse	3.1
River Stour	3.0
Blackwater/Chelmer	3.6
Lee	3.3
Thames	2.0
Test	2.0
Avon/Hants	3.1
Exe	1.4
Dart	1.7
Clywd/Conwy	2.0
Dee	2.9
Eden	1.2
Anglesey	3.0
Tamar	2.9
Fal	5.8
Camel	7.1
Tone/Parrett	3.3
Frome, Bristol Avon	2.3
Wye	2.0
Usk	2.2
Taff	2.8
Neath	2.8
Loughar	3.9
Tywi	2.0
Teifi	2.5
Rheidol/Ystwyth	4.1
Dovey	3.2
Glaslyn	2.6
All other freshwaters not listed above	1.4