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For the attention of Ciara Whelehan, Planning Policy Manager

DRAFT

Dear Sirs,

ADVICE ON MINERALS
LAND AT FOREST ROAD (AREA C), HAINAULT, IG6 3HJ

Further to our recent discussions and correspondence regarding the above, we now provide our advice as set out below.

SCOPE OF ADVICE

You have instructed us to provide a report on the potential economic mineral present at Forest Road (Area C), Hainault, IG6 3HJ. As agreed this is our Stage 1 Report comprising a 'desk based' review of published geological and other relevant information to ascertain the potential extent & nature of economic mineral at the property. It includes a review against existing and proposed planning policy.

For this report we have reviewed and relied upon the following publically available information:

1. Plan – Figure 4 Minerals Safeguarding Land, as provided by you. This shows the area in question, split into sub areas 7, 8, 9 and 10. This comprises the land being reviewed in this report .

2. Information available from the British Geological Survey (BGS) online resource including the Geology of Britain Viewer and related Borehole Scans. All such information is used courtesy of BGS © NERC 2016.

3. Information available from the LB Redbridge online planning resource including the Minerals Local Plan (MLP) (adopted 2012) and the Redbridge 2028 Core Strategy Review – Preferred Options Report dated January 2013.

4. Published current and historic Ordnance Survey (OS) maps.

5. Information available from the Environment Agency (EA) online resource.

LOCATION

The property is located towards the eastern extent of the LB Redbridge, around 2 miles from the North Circular/M11 motorway intersection and 1 mile from Hainault Forest Country Park. The land is bounded to the north mainly by residential property, to the south by Forest Road, to the west by a railway line and to the east by Elmbridge Road. The land to the south comprises former sand & gravel workings that have been restored to leisure use (lake, golf course etc) or agricultural uses.

DESCRIPTION

The property extends to approximately 82.27 hectares (203.30 acres) as shown outlined red on the Site Plan attached as **Appendix 1.**

The land is broadly level at between approximately 33m to 34m AOD throughout most of the site.

It is used predominantly as playing fields/sports pitches including pavilions and other associated buildings however additional land uses include an industrial estate, a farmhouse & farm shop, some residential properties (south west corner), allotments and a Traveller's Site.

HISTORIC LAND USE

The OS six-inch map dated 1881 shows the land in agricultural use with the only buildings being Forest Farm noted in the south west corner, where the current farm buildings are located. The railway line is not yet developed.

The updated OS six-inch map of 1921 shows most of the land still in agricultural use however the middle part of the site is now noted as Fairlop Oak and Hainault Recreation Ground. The railway line has been developed and now forms the west boundary. A 'gravel pit' is noted immediately to the west of the railway line. This map was updated again in 1946 with the only change being what appears to be the development of industrial property where the current Forest Industrial Park is situated.

The 1:25,000 OS map dated 1959 records the school on the north boundary as well as some additional isolated buildings that appear to be pavilion facilities for the playing fields. In addition there is some development shown on the eastern boundary which is no longer present on site. We understand this was a an estate of prefabricated houses erected immediately post war to deal with the housing shortage. The date of their removal is unconfirmed but has been estimated as sometime in the 1960's.

The OS mapping from 1959 onwards shows no significant difference (other than the demolition of the 'prefabs' noted above) when compared with the current mapping.

Based on these documents the subject land appears to have been in the current land uses for a considerable period of time. In particular, there is no evidence *from these sources* of any past mineral workings or landfill activity.

PLANNING

The Redbridge LDF and MLP documentation confirms the site as within the Green Belt (Policy E1) and within a Green Corridor (Policy E2).

The London Plan Policy apportions LB Redbridge a target of 100,000 tonnes per annum of aggregate production, with all of this currently coming from the Tarmac Brett JV operation at Fairlop Quarry. MLP policy is to identify and safeguard sites with the potential for sustainable aggregate extraction and to ensure at least 7 years supply (700,000 tonnes) of mineral with planning permission.

The site has Mineral Safeguarded Land status and is designated as a Mineral Search Area – areas where the presence of significant mineral reserves is indicated by the BGS mapping but where deposits have not actually been confirmed through bore hole test drilling. The area to the south of Forest Road contains two preferred areas of mineral extraction – Aldborough Hatch Farm and Hainault Farm - together these sites are estimated to provide 1.22 million tonnes of sand & gravel and would operate as extensions to the adjacent Fairlop Quarry.

Under Policy M4 of the MLP, planning applications for development on Minerals Safeguarded land will be refused if it contains commercially viable mineral resources unless there is an overriding community need for the proposed development that outweighs the need for the mineral.

The Redbridge 2028 Core Strategy Review of January 2013 proposed no significant change to the minerals policy as contained in the MLP.

POTENTIAL MINERAL RESOURCE

Geology

The BGS data confirms that the surface geology throughout the site is the Boyn Hill Gravel Member. This is a Pleistocene river terrace deposit of sand & gravel with possible lenses of silt, clay or peat. It is found at thicknesses of 1m to 9m but on average is around 5m thick. This is the same geology recorded at the nearby Fairlop Quarry.

The bedrock geology is noted as the London Clay Formation – a sedimentary bedrock of clay, silt and some layers of sandy clay. It can be found up to 150m thick in this part of the London Basin.

Only the sand and gravel has potential as an economic mineral.

Boreholes

While the surface geology provides a general indication of the minerals present, the detailed position can only be fully established by undertaking detailed ground investigations. For sand & gravel this normally comprises boreholes and/or trial pits.

We understand no ground investigations have been carried out as part of any specific exercise to identify the likely economic sand & gravel deposit at the property, as part of the planning process or otherwise. In these circumstances we have reviewed the historic borehole data held within the BGS website as a means to estimate the potential reserves.

There are eight historic boreholes on the subject land, three in the west, close to the railway line, two adjacent to the industrial area/all weather pitches and three along the southern boundary around the middle point of the relevant length of Forest Road. The approximate positions are shown on the Site Plan at **Appendix 1**. Ideally there would be a series of boreholes at regular intervals throughout the site as the detailed geology can vary significantly over such a large site. In the absence of any further on site boreholes, we have looked at boreholes to the west of the railway line, of which there are a reasonable number.

We have summarised the borehole data on the Borehole Data Schedule contained at **Appendix 2**. From this you will note:

The boreholes located on the west (1,2 & 3) show a sand and gravel layer of between 3.5m and 6m thick with overburden of between 0.7m and 1.1 thick. The respective averages are 0.90m and 5.00m. (There is over 3m of made ground at boreholes 1& 2 which we assume results from the construction of the railway embankment)

The boreholes at the industrial area/all weather pitches (4 & 5) show a sand and gravel layer of between 4.0m and 5.0m thick with overburden of between 2.0m and 2.4m thick. The respective averages are 4.75m and 2.2m.

The boreholes along Forest Road (6, 7 & 8) show a sand and gravel layer of between 1.5m and 3.5m thick with overburden of between zero and 1m thick. The respective averages are 2.67m and 0.47m.

The overall average figures are sand & gravel 4.14m thick and overburden 1.20m thick.

The boreholes from the land to the west of the railway line show a sand and gravel layer between 5m and 7m thick below overburden of around 1m thick.

We would reiterate that these figures should be taken as a very general indication only as there are insufficient boreholes to establish the extent of the mineral (and overburden) with any degree of certainty.

Resource Estimate

Adopting the information from the boreholes, we have calculated the potential sand & gravel resource set out on the Tonnage Calculation Schedule contained at **Appendix 3**.

The borehole data suggests that there should be a reasonable prospect of there being an average of around 4.0m of sand & gravel at the subject property. There will of course be some areas above or below this figure but given the available evidence we consider 4m to be a reasonable assumption.

The site is however currently subject to a number significant constraints in terms of the exiting use of the land and local plan policy. These are set out in your adopted Mineral Local Plan document as shown below:

Fullwell Cross Allotments & Forest Farm Cottages - This site is constrained by its current uses which include active allotments and residential use. LDF Policies CR2 'Allotments' and H1 'Housing Provision' both resist the loss of these land uses unless under special circumstances.

Hainault Sports Ground & Pavilion and Playing Fields – This site is constrained by its current uses which include recreational facilities and sports playing fields protected by LDF Policy CR3 'Sport, Leisure and Cultural Facilities'.

Hainault Recreation Ground – This site is constrained by its current uses which include recreational facilities and sports playing fields, which are protected by LDF Policy CR3 'Sport, Leisure and Cultural Facilities'.

Hainault Playing Fields & Caravan Site – This site is constrained by its current uses which include recreational facilities, sports playing fields and a caravan site protected by LDF Policies CR3 'Sport, Leisure and Cultural Facilities' and H3 'Travellers and Gypsy Sites'.

Accordingly, while the gross site area could yield mineral in theory, in practice a net land area would apply. To estimate a net land area that may be capable of mineral extraction, we have allowed for various "stand offs" or 'buffer zones'. There are no prescribed stand off distances within the LB Redbridge Minerals Local Plan (MLP) – the distance from operational quarry workings is to be subject to an Environmental Impact Assessment. In our experience from other locations for this type of sand & gravel operation, these stand off zones can vary from nil where there is no sensitive boundary to 100m for some residential boundaries.

In this case we have adopted two sets of stand off distances covering the possible range that may be applied in practice. **Stand off A** is based on approximately 40m from the boundary of residential property, the railway line, the John Bramston Primary School and the Traveller's Site plus at least a 5m buffer from the boundary for all other land uses. This area is shown outlined green on the Site Plan. **Stand off B** is based on approximately 90m from the boundary of residential property, the railway line, the John Bramston Primary School and the Traveller's Site and around 5m to 10m from the boundary for all other land uses (mainly roads) reflecting the potential requirement for more substantial screening bunds. This area is shown outlined purple on the Site Plan.

We have assumed that in due course the allotments can be worked as can all the playing fields and the play park on the basis that these land areas can be restored back to these uses on completion of extraction. There is an area in the south west corner that is effectively sterilised as it is too small to be worked in isolation and on scenario B, an area between the farm and the industrial estate is sterilised.

We have applied the assumed 4m mineral thickness to the estimated net areas to give a mineral volume. This has been converted to tonnes by a suitable estimated density factor, giving gross tonnage. From this we have deducted 10% to reflect 'working losses' - generally the tonnage lost from washing silts and other non-saleable material from the sand & gravel. Working losses for S&G can range from nominal amounts to over 15% but generally are found in the 5% to 10% range.

The resultant estimated figure for potentially exploitable mineral is:

Stand off scenario A - 3.19 million tonnes.

Stand off scenario B - 2.23 million tonnes.

This compares with the estimated reserve figure of 3.3 million tonnes noted within Schedule 1 - Safeguarded Sites of the MLP which we understand was estimated by the Quarry Products Association (QPA) as part of a mineral assessment undertaken in 2004. We have not had sight of this report or assessment.

In the absence of detailed geological data, it is not possible to confirm the true extent of the economic potential of this mineral however some matters which can reduce economic viability should not occur at the subjects. For example, in other sites in the area there is significant clay overburden above the sand & gravel that would make it uneconomic to quarry (generally an overburden to mineral ratio at or above 1:1 – in other words if there is 1m of overburden there has to be at least 1m of mineral underneath to make it economically viable).

In addition, due to the costs associated with planning and environmental matters along with other site establishment costs, operators require a minimum total tonnage over which to spread these costs. In most cases the minimum figure for a new site (not an extension to an existing operation) is around 1 million tonnes and hence any detailed borehole testing & analysis would have to identify a substantially poorer resource than is expected from the existing data. The currently identified site constraints could also reduce the available tonnage over and above the figures we have estimated however it would require very significant change to reduce the potential reserve below 1 million tonnes.

As advised previously, our estimates should be viewed as indicative only as there is insufficient detailed information to provide more accurate figures.

SUMMARY & CONCLUSIONS

The site extends to approximately 82.27 hectares (203.30 acres). The current land use is mixed and although predominantly playing fields/sports pitches including pavilions and other associated buildings, additional land uses include an industrial estate, a farmhouse & farm shop, some residential properties (south west corner), allotments and a Traveller's Site. It is located in the Green Belt.

The land has been designated as a Mineral Search Area in the MLP – defined as areas where the presence of significant mineral reserves is indicated by the BGS mapping but where deposits have not actually been confirmed through bore hole test drilling. It is allocated as Mineral Safeguarded Land affording protection from development unless there is an overriding community need for the proposed development that outweighed the need for the mineral. It has also been identified as having the potential to be included in the LB Redbridge 7 year mineral land bank.

The surface geology throughout the site is the Boyn Hill Gravel Member comprising sand & gravel with possible lenses of silt, clay or peat. This is the same geology recorded at the nearby Fairlop Quarry. The sand & gravel is underlain by London Clay. Only the sand and gravel has potential as an economic mineral.

There are eight historic boreholes on the subject land. Ideally there would be a series of boreholes at regular intervals throughout the site as the geology can vary significantly over such a large site. In the absence of any further on site boreholes, we have considered these boreholes and based on this information we have estimated average figures for sand & gravel at 4.14m thick and overburden at 1.20m thick. This is further supported by historic boreholes from the land to the west of the railway line showing a sand and gravel layer between 5m and 7m thick below overburden of around 1m thick.

Based on the information we have reviewed, and after applying allowances for estimated stand off zones and working losses, as well as built development & planning policy constraints, we consider there could be in the region of between 2.0 and 3.0 million tonnes of potentially exploitable sand & gravel at Forest Road.

There are no other matters that would suggest the extent or nature of the mineral would be adversely affected.

The data on which our opinions are based is limited and accordingly our estimate of economic reserve could change significantly, either up or down, depending on the results of ground investigation or other relevant information not currently made available to us.

We trust this is suitable for your purposes. We would be pleased to provide any clarification or further input as required.

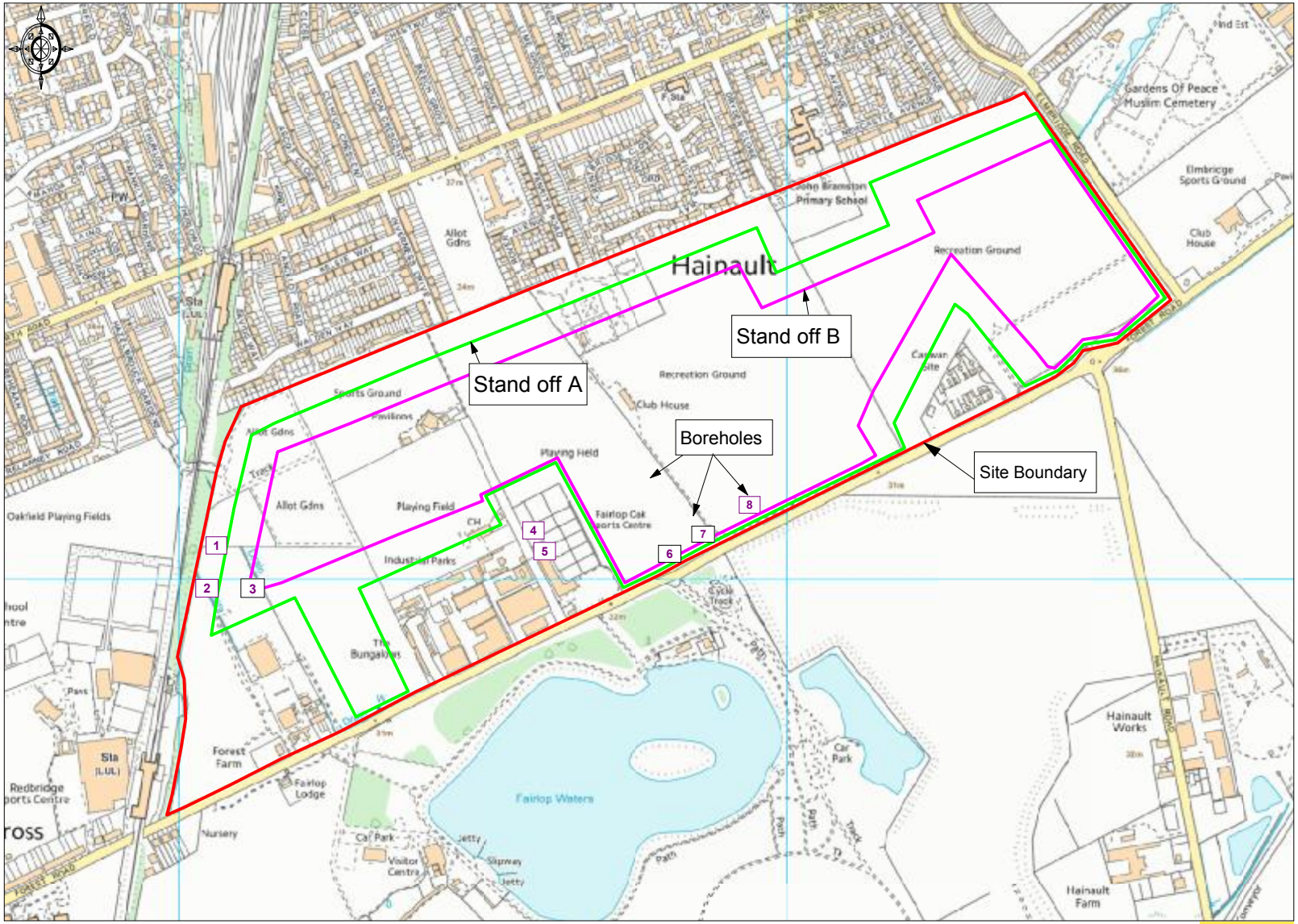
Yours faithfully
For and on behalf of Savills (UK) Ltd

ALAN HAMILTON BSC MRICS MIQ
Director
Mineral & Waste Management

Enc: Appendices 1 to 3

Appendix 1

LB Redbridge - Area C, Forest Road, Hainault



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Appendix 2

LB Redbridge - Forest Road, Hainault - Borehole Data Schedule

	Borehole				
Material Thickness (m)	**1**	**2**	**3**		**Average**
Topsoil/made ground	3.0	3.4	0.4		2.3
Overburden	1.0	1.1	0.7		0.9
Sand & gravel	6.0	5.5	3.5		5.0
Clay	1.0+	1.0+	1.0+		1.0+

	Borehole				
Material Thickness (m)	**4**	**5**			**Average**
Topsoil	0.4	0.3			0.35
Overburden	2.0	2.4			2.20
Sand & gravel	5.0	4.5			4.75
Clay	1.0+	1.0+			1.0+

	Borehole				
Material Thickness (m)	**6**	**7**	**8**		**Average**
Topsoil/made ground	1.9	0.9	1.0		1.27
Overburden	0.0	0.4	1.0		0.47
Sand & gravel	3.0	3.5	1.5		2.67
Clay	1.0+	1.0+	1.0+		1.0+

Overburden - excl made ground					1.20
Sand & gravel					4.14

Notes:

1. Information is taken from borehole scans made available via the BGS online Geology of Britain Viewer - © NERC 2016. The approximate borehole locations are as shown on the Savills Site Plan.

2. Some strata layers have been amalgamated and the thickness figures rounded where appropriate.

3. The data produced should be treated as a general estimate only and is not a substitute for more detailed ground investigations.

4. "Overburden" comprises a range of descriptions including silty clay and sandy clay but overall is assumed not capable of yielding saleable sand & gravel aggregate.

5. "Sand & gravel" comprises a range of descriptions including dense & very dense sand & gravel and gravels but overall is assumed to be capable of yielding saleable sand & gravel aggregate

Appendix 3

LB Redbridge - Area C, Forest Road - Tonnage Calculation Schedule

Gross Area

Gross Area (no stand off)	822,700	m2
S&G Thickness	4.00	
Volume	3,290,800	m3
Conversion to t	1.6	
Tonnage	5,265,280	t
Working loss (silts etc)	10%	
Net Tonnage	**4,738,752**	t

Net Area A

Net Area (less stand off A)	553,750	m2
S&G Thickness	4.00	
Volume	2,215,000	m3
Conversion to t	1.6	
Tonnage	3,544,000	t
Working loss (silts etc)	10%	
Net Tonnage	**3,189,600**	t

Net Area B

Net Area (less stand off B)	387,560	m2
S&G Thickness	4.00	
Volume	1,550,240	m3
Conversion to t	1.6	
Tonnage	2,480,384	t
Working loss (silts etc)	10%	
Net Tonnage	**2,232,346**	t

Notes:

1. Information is taken from borehole scans made available via the BGS online Geology of Britain Viewer - © NERC 2016. The approximate borehole locations are as shown on the Savills Site Plan.
2. Some strata layers have been amalgamated and the thickness figures rounded where appropriate.
3. The data produced and calculations from this data should be treated as a general estimate only and is not a substitute for more detailed ground and other investigations.
4. "Overburden" comprises a range of descriptions including silty clay and sandy clay but overall is assumed not capable of yielding saleable sand & gravel aggregate.
5. "Sand & gravel" comprises a range of descriptions including dense & very dense sand & gravel and gravels but overall is assumed to be capable of yielding saleable sand & gravel aggregate
6. These figures are subject to review to reflect updated information subsequently received.