

7th January 2013

Ms Jane Wilkin
Planning Liaison Officer
London Team
Apollo Court
2 Bishops Square Business Park
St Albans Road West
Hatfield
AL10 9EX

Our Ref: SG/LUK11-18423_Bulls Bridge Drainage Strategy_1
Your Ref: NE/2012/115935/01-L01

Dear Ms Wilkin,

Re: Redevelopment of the site to provide an aggregate recycling and processing plant, asphalt plant and storage facility, gully waste recycling plant, aggregate storage facility, and term maintenance depot, with ancillary offices, structures and facilities, car and lorry parking, re-grading, and landscaping

Bulls Bridge Site, Hillingdon.

A copy of your letter of the 10th October 2012 to Karl Dafe of the London Borough of Hillingdon (LBH) has been provided to ENVIRON in relation to the above planning application. Your letter refers to the EA review of documents in relation to flood risk. Your letter goes on to state that the EA objects to the grant of planning permission and recommends refusal of on the basis of absent information within the Flood Risk Assessment (FRA).

This letter from ENVIRON is intended to provide the absent information and address additional concerns raised by the EA in order to overturn your decision to object to the proposals. Where applicable, the information provided in this letter supersedes that provided previously in ENVIRON's Drainage Assessment (ref: UK14-17916, dated August 2012) and WSP's FRA (ref: 1101284, dated August 2012). However, the previously submitted documents remain valid in other regards and replacement documents will not be issued.

EA Objection

It is understood that the EA objects to the proposals because the FRA fails to:

- Provide necessary data by way of infiltration/soakage tests in accordance with BRE365;
- Provide suitable calculations for the attenuation rate and volume; and
- Determine the proximity of the development to the top of the bank of the Yeading Brook and Grand Union Canal.

The information contained within the following paragraphs addresses each of these issues in turn.

Infiltration Data

Soakaway tests were carried out in accordance with BRE365 by Applied Geology on-site at Bulls Bridge, Hillingdon between the 17th and 20th December 2012. A report summarising the test results is appended (ref: AG1782-12let002, dated 21st December 2012). The average rate of infiltration measured on-site is 9.9×10^{-5} .

Drainage Calculations

The total area within the red line boundary for the planning application has been measured to be 3.09 hectares (ha). This includes an area of approximately 1,755 m² which comprises an existing shared access road with a neighbouring land user. This road is shown in survey drawings to benefit from gully drainage and is generally level with existing surrounding ground elevations. Post-development, the raising of the site area by a maximum of 1.2 m will mean that the existing access road is at a lower elevation than the rest of the site. As such, drainage of this road will remain independent of the drainage strategy for the rest of the site. The area of the road has therefore been removed from the drainage calculations for the overall site. Furthermore, part of the site in the west (which will incorporate car parking in the proposals) is located underneath the A312 overpass. This effectively shelters the underlying area from precipitation and is serviced by independent road gullies. The area of the overpass which intersects with the site area is approximately 1,500 m². This has also been removed from the drainage calculations.

In summary, the site area used in the drainage calculations is broken down as follows:

- Total site area = 2.76 ha;
- Retained impermeable raised area (main site) = 2.33 ha;
- Car Park = 0.073 ha;
- Landscaping main site = 0.22 ha; and
- Soft verge between access road and Yeading Brook = 0.14 hectares.

As presented in the attached drawing from Clark Smith Partnership (ref: CWY14-105), the car park would be paved using permeable pavements with sufficient sub-base storage to store the entire runoff from the car park for the climate change-corrected 100 year storm. The percentage impermeable area of the overall site for the purposes of the drainage calculations is therefore 84%.

A range of peak runoff rates for the existing Site have been calculated using the Modified Rational Method as described by the Wallingford Procedure. Flood Estimation Handbook (FEH) software has been used to generate statistical data on rainfall events for a range of return periods. Results were obtained using:

- the FEH method to establish rainfall depths for a range of return periods (rainfall depths have been increased by 20% to allow for the potential impacts of climate change over the next 100 years);
- the FEH to determine catchment descriptors such as annual average rainfall;
- the Wallingford Procedure to determine values for soil index (SOIL) and urban catchment wetness index (UCWI); a soil index value of 0.3 and a UCWI value of 52 have been determined for the site; and
- the Modified Rational Method to calculate storm runoff volumes for each return period.

The following Modified Rational Method formula was applied:

$$Q = 2.78 \times C \times i \times A$$

Where,

Q	=	Peak flow rate (L/s);
C	=	Run-off coefficient (dimensionless);
i	=	Rainfall intensity (mm/hr); and

A = Total area of site (ha).

Potential runoff volumes for the overall site, in the absence of mitigation measures, are presented in Table 1.

Table 1: Overall Site Runoff Volumes (m³) (pre-mitigation)							
Storm Duration	Return Period (years)						
	2	5	10	30	50	100	100+CC
30 mins	256	370	473	688	815	1025	1230
40 mins	280	403	513	736	870	1087	1304
50 mins	300	429	543	776	914	1137	1364
1 hr	318	451	570	808	951	1179	1414
2 hr	394	550	684	951	1106	1358	1630
4 hr	447	616	760	1047	1212	1472	1767
6 hr	489	668	819	1120	1290	1562	1874

It is proposed to discharge clean runoff from the site (via Sustainable Drainage Systems (SUDS)) into Thames Water sewers at a rate no greater than greenfield runoff (approximately 5 L/s/ha). The allowable discharge from the site is therefore 13.8 L/s. Table 2 presents the allowable discharge from the site for a range of storm durations.

Table 2: Allowable Discharge Volumes (m³)	
Storm Duration	Volume
30 mins	25
40 mins	33
50 mins	41
1 hr	50
2 hr	99
4 hr	149
6 hr	199

Subtracting the allowable discharge volumes (Table 2) from the unmitigated total volumes of runoff (Table 1) provides an estimate of the total volume of attenuation required to ensure the site complies with an allowable greenfield discharge rate of 5 L/s/ha. The results of these calculations are presented in Table 3.

Table 3: Remaining Storm Volumes (m³) After Allowable Discharge							
Storm Duration	Return Period (years)						
	2	5	10	30	50	100	100+CC
30 mins	231	345	448	663	790	1000	1206
40 mins	247	370	480	703	837	1054	1271
50 mins	259	388	502	734	872	1096	1323
1 hr	268	402	520	759	901	1129	1365
2 hr	295	451	584	851	1007	1259	1531
4 hr	298	467	611	898	1062	1323	1618
6 hr	290	469	621	921	1092	1363	1676

In previous consultations with the EA it has been established that, in order to ensure continued treatment of underlying soil contamination, infiltration as a means of draining the site must be retained. It is therefore proposed to discharge site runoff via soakaways. The infiltration tests appended to this letter suggest that such means are applicable.

Soakaway units with dimensions as follows have been determined to be feasible for installation at the proposed development:

- Circular concrete units with 3 m diameter x up to 3 m deep (2 m effective storage);
- Infiltration based on internal surface area of units multiplied by 50% depth (omitting basal infiltration in accordance with BRE365); and
- Soakaways inter-linking pipework c.225 mm diameter.

A total of 42 soakaways with these dimensions would provide 58.9 L/s discharge. Adding this rate of discharge into the figures presented in Table 2 provides a revised allowable discharge for the site as presented in Table 4.

Table 4: Allowable Discharge Volumes plus Infiltration (42 soakaways)	
Storm Duration	Volume (m³)
30 mins	131
40 mins	174
50 mins	218
1 hr	262
2 hr	523
4 hr	785
6 hr	1047

The revised attenuation volumes taking into consideration the figures from Table 4 are presented in Table 5.

Table 5: Remaining Storm Volumes (m³) After Allowable Discharge and Infiltration							
Storm Duration	Return Period (years)						
	2	5	10	30	50	100	100+CC
30 mins	125	239	342	557	684	894	1099
40 mins	106	229	338	562	695	912	1129
50 mins	82	211	325	557	695	919	1146
1 hr	56	190	308	547	689	917	1153
2 hr	0	26	160	427	583	835	1106
4 hr	0	0	0	262	426	687	981
6 hr	0	0	0	73	243	515	828

The peak remaining volume of attenuation required to ensure that the entire 30 year storm is dealt with without causing above-ground flooding or exceedance of the allowable discharge rate is 562 m³. The total volume of effective storage within 42 soakaway units would be 593 m³ and would therefore be more than sufficient to ensure this strategy is feasible.

The peak climate change-corrected 100 year runoff volume, once the 593 m³ of attenuation is accounted for, is 559 m³. It is proposed for this residual volume of runoff to be stored above-ground within the main site area by allowing the drainage system to back up. Spread over the retained impermeable raised area of 2.33 ha, which will be level and surrounded by raised elevations to prevent runoff from flooding adjacent areas, this volume would be equivalent to an average depth of less than 3 cm. Given the low vulnerability of the proposed land use in accordance with the National Planning Policy Framework (NPPF), such a depth of flooding is unlikely to represent a significant hazard.

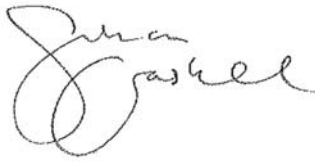
Drawing CWY14-105 appended to this letter presents an outline layout of the proposed SUDS measures including potential soakaway locations. There is sufficient space within the site to ensure these measures do not impact on proposed site activities and the proposals are therefore considered readily achievable. The drainage measures would be subject to review at the detailed drainage design stage in accordance with EA, LPA and Thames Water requirements.

Proximity of the Development to Water Bodies

As shown in Drawing CWY14-105, no development will take place within 8 m of the Yeading Brook and/or 5 m of the Grand Union Canal. This excludes the car park area, which is a minimum of 4 m from the top of the Yeading Brook. However, there would be no impact on the river bank, access to the river bank or impacts on floodplain storage as a result of the car park which will be at the same level as existing ground elevations. It should also be noted that this area does not, at present, offer significant ecological benefit as it is underneath the A312. Where not already existing and so far as is practicable, a buffer zone planted with native species would be provided to ensure compliance with the aims of the Water Framework Directive.

I trust that we have interpreted your requirements correctly and look forward to hearing from you in due course. If you have any questions, please do not hesitate to contact me.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Simon Gaskell'. The signature is fluid and cursive, with the first name 'Simon' written above the last name 'Gaskell'.

Simon Gaskell
Manager

cc. Karl Dafe, Hillingdon Borough Council

Encl. Clark Smith Partnership Drawing CWY14-105