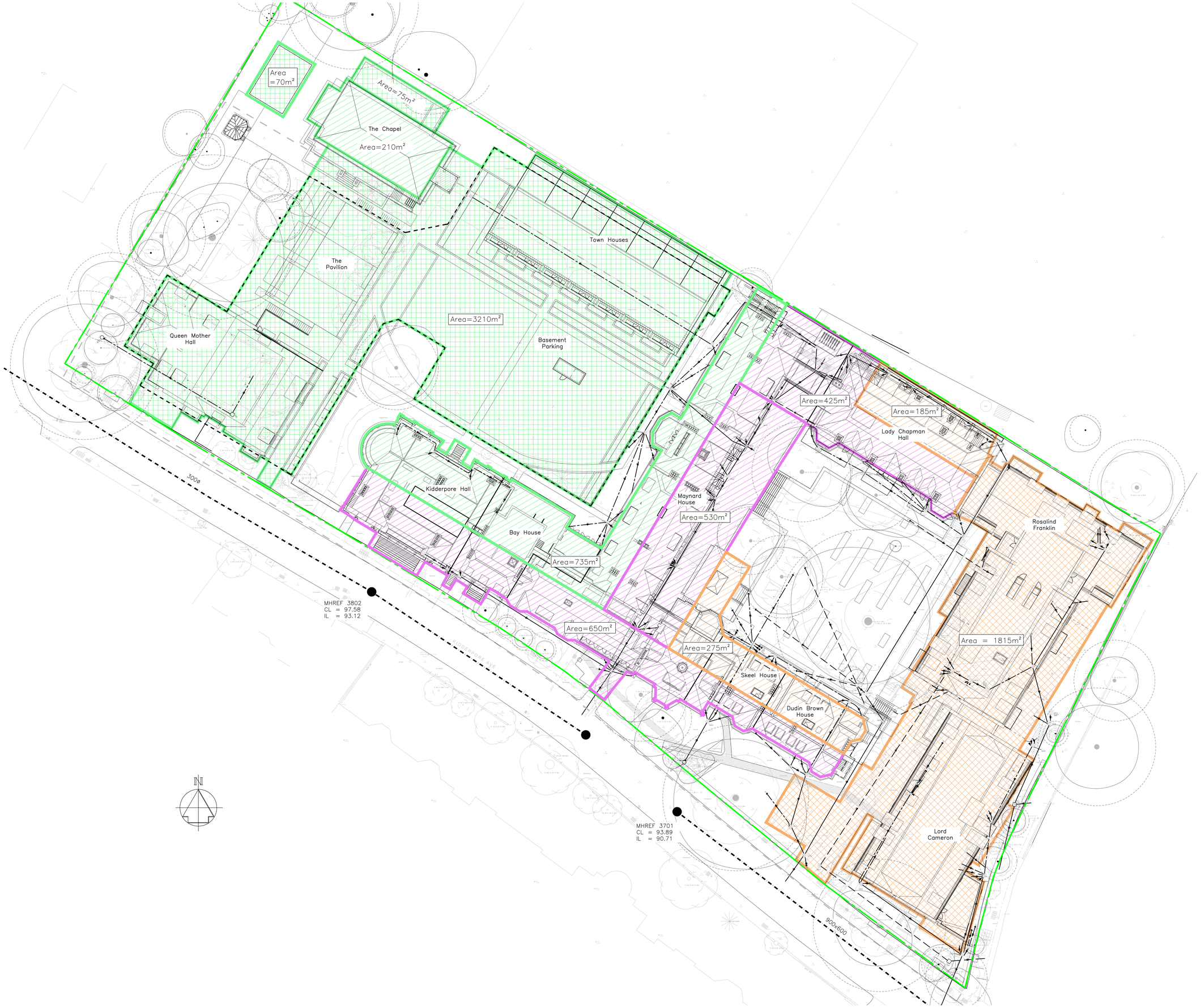

General Notes:

1. Any indication of site boundaries is to be considered diagrammatic. This Engineering Layout is based upon layouts prepared by others and our details are not in themselves intended to be any definition of land ownership.
2. The underlying survey information has been provided by Murphy Surveys (July. 2014). Tully DeAth cannot be held responsible for any inaccuracies therein.
3. Only impermeable areas draining to the sewer network are shown. Impermeable areas draining to landscaping are not shown.

Impermeable Areas

Proposed or reconstructed existing impermeable area draining to south-western outfall.

Impermeable area from retained buildings draining to south-western outfall.

Total impermeable area draining to south-western outfall = 4300m²

Existing impermeable area continuing to drain via existing outfalls = 1605m²

Total impermeable area continuing to drain to existing outfalls = 1605m²

Proposed or reconstructed existing impermeable area draining to south-eastern outfall.

Existing impermeable area draining to south-eastern outfall.

Total impermeable area draining to south-eastern outfall = 2275m²

Total impermeable area = 8180m²

Legend

- Existing Combined Sewer
- Existing Storm Sewer
- Existing Foul Sewer
- Existing Combined Sewer

Other

- Extent of Basement
- Site Boundary

REV	DATE	DESCRIPTION	BY	CHK'D
A	26.06.15	Hatching amended to reflect retention of the chapel and Maynard House patio.	SFK	

MOUNTAVIL

TITLE:
Proposed Site Layout & Impermeable Areas

PROJECT:
Kidderpore Avenue, NW3

SCALE: 1:200@A0 DATE: June 2015 DRAWN: JSR CHK'D: SFK

JOB NO.	DRG NO.	REV.
11316-CIV-101		A

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General Notes:

1. Any indication of site boundaries is to be considered diagrammatic. This Engineering Layout is based upon layouts prepared by others and our details are not in themselves intended to be any definition of land ownership.
2. The underlying survey information has been provided by Murphy Surveys (July. 2014), Tully DeAth cannot be held responsible for any inaccuracies therein.
3. Only impermeable areas draining to the sewer network are shown. Impermeable areas draining to landscaping are not shown.
4. All existing drainage that is scheduled for retention within the proposed drainage layout shall be CCTV surveyed prior to completion of detailed design in order to verify its condition and connectivity.
5. Where proposed drainage is shown as running adjacent to a building and a tree root protection zone the drainage shall have the minimum possible off-set from the building. For proposed buildings an off-set of 600mm from the outer face of the foundations should be feasible. In all such instances the drainage concerned will be no greater than 150mm in diameter. This should also be feasible with respect to existing buildings pending further investigation of existing foul drainage scheduled for retention.

Legend

- Inspection Chamber
- Constructed Manhole
- Rodding Eye
- Existing private combined drain that will continue to carry storm water flows from retained building areas.
- Proposed Surface Water Drain
- Proposed Surface Water Collector Drain – Perforated pipe
- Existing Surface Water Drain to be retained.
- Suspended Drainage
- Existing Combined Sewer
- Proposed Green Roof
- Proposed Impermeable Paving
- Area that will require pumping.
- General Impermeable Area
- Potential Surcharge above ground level and flood route during exceedence event

Other

- Extent of Basement
- Site Boundary

REV	DATE	DESCRIPTION	BY	CHK'D
A	26.06.15	Note 5 added. Paving amended by Maynard House. Hatching amended to include pumping.	SFK	

MOUNTANVIL

TITLE:

Drainage Strategy

PROJECT:

Kidderpore Avenue, NW3

SCALE: 1:200@A0	DATE: June 2015	DRAWN: JSR	CHK'D: SFK
JOB NO.	DRG NO.	REV.	
11316-CIV-102		A	

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Appendix E – London Borough of Camden

Surface Water Drainage Pro-Forma

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our advice note on surface water drainage. Developers should complete this form and submit it to the Local Planning Authority, referencing from where in their submission documents this information is taken. The pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management and uses the storage calculator on www.UKsuds.com. This pro-forma is based on current industry best practice and focuses on ensuring surface water drainage proposals meet national and local policy requirements. The pro-forma should be considered alongside other supporting SuDS Guidance.

1. Site Details

Site	KIDDERPORE AVENUE, HAMPSTEAD
Address & post code or LPA reference	LONDON NW3 7ST.
Grid reference	525360 185850
Is the existing site developed or Greenfield?	DEVELOPED
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding?	No
Total Site Area served by drainage system (excluding open space) (Ha)*	1.2255 Ha

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0.5000	0.8190	0.3190	If proposed > existing, then runoff rates and volumes will be increasing. Section 6 must be filled in. If proposed ≤ existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	SEWER	SEWER	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Infiltration		✓	SOAKAGE TESTS SUGGEST NOT	e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		✓	CLOSEST WATER COURSE - 2.8Km AWAY	e.g. Is there a watercourse near by?
To surface water sewer	✓		FLOWS ARE BEING REDUCED	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		✓		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

↑ AS DISCUSSED WITH AMY FARTHING - CBC

GREENFIELD RUN OFF	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	% Difference (difference /existing x 100)	Notes for developers
Greenfield QBAR → 4.7l/s	N/A	N/A	N/A		QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1 4.0l/s	69.4l/s	30.7l/s	−38.7l/s	−55.8%	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30 10.7l/s	156.9l/s	59.0l/s	−97.9l/s	−62.4%	
1in 100 15.1l/s	200.0l/s	73.3l/s	−126.7l/s	−63.4%	
1 in 100 plus climate change	N/A	93.4l/s	−106.6l/s	−53.3%	The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

AS DISCUSSED WITH AMY KARTAING-LBC

GREENFIELD VOLUME	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
GREENFIELD RUN OFF VOLUME		N/A	N/A	
1 in 1 101.5m^3	152.1 m^3	175.0m^3	22.9m^3	Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30 225.9m^3	355.5 m^3	398.0m^3	62.5m^3	
1in 100 6 hour 290.1m^3	434.7m^3	516.6m^3	81.9m^3	
1 in 100 6 hour plus climate change 377.2m^3	565.3 m^3	675.5m^3	109.7m^3	The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m^3)	DISCHARGE VOLUMES ARE INCREASING	Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m^3)		Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible] (m^3)		Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m^3		Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	CLAYGATE MEMBER ON LONDON CLAY	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	No	Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level		Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	BOTH	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	POSSIBLE SOURCES OF CONTAMINATION IDENTIFIED IN DESK STUDY FINAL SI AWAITED.	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	NO – WITHIN BURIED CULVERTS	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	COMBINATION OF OPTION 1 AND UNATTENUATED FLOW FROM RETAINED LISTED BUILDINGS.	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used?	EXTENSIVE GREEN ROOFING. PERMEABLE PAVING. PIPED DRAINAGE WITH CULVERT STORAGE	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	YES	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Drainage system can contain in the 1 in 100 storm event without flooding	YES	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Drainage system can contain in the 1 in 100 +CC storm event without flooding	YES	
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	N/A	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters

		must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.
How are rates being restricted (hydrobrake etc)	2No HYDROBRAKES	Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	MOUNT ANVIL MANAGEMENT COMPANY	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	SEE SECTION 6.0 OF DRAINAGE STRATEGY STATEMENT.	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	DRAINAGE STRATEGY STATEMENT – APPENDIX B AND SECTION 5.1	DRAWING 11316-CIV-100
Section 3	DRAINAGE STRATEGY STATEMENT – SECTION 3	4+5
Section 4	DRAINAGE STRATEGY STATEMENT – APPENDIX F - CALCULATION	MD/01, HAND/01,02,05
Section 5	DRAINAGE STRATEGY STATEMENT - APPENDIX F - CALCULATION	HAND/03-05
Section 6	DRAINAGE STRATEGY STATEMENT - SECTION 5	6 – 13
Section 7	DRAINAGE STRATEGY STATEMENT - SECTION 3	4+5
Section 8	DRAINAGE STRATEGY STATEMENT - SECTIONS 5 & 6	6 - 13

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an

increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By..... S. Kaemena ..... SIMON KAEMENA .....
Qualification of person responsible for signing off this pro-forma .....BSc (Hons) MCIWEM MIHT CEng

Company.....TULLY DE'ATH CONSULTANTS .....
On behalf of (Client's details).....MOUNT ANVIL .....
Date:.....24 JUNE 2015 .....

Appendix F – Calculations

Calculations - Index

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Unit 4, St Saviours Wharf, Mill Street, London, SE1 2BE

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Tully De'Ath consultants

Job: KIDDERPORE AVENUE Job No: 11316

By: SFK Date: 23/6/15 Sheet No: HAND/01

CALCULATION OF PEAK DISCHARGE RATES FROM EXISTING SITE.

IMPERMEABLE AREA = 5000 m²

USE TRRL 595 RAINFALL FIGURES

1 IN 1 YR = 50 mm/HR $Q_{1in1} = \frac{5000 \times 50}{3600} = 69.4$ l/s

1 IN 30 YR = 113 mm/HR $Q_{1in30} = \frac{5000 \times 113}{3600} = 156.9$ l/s

1 IN 100 YR = 144 mm/HR $Q_{1in100} = \frac{5000 \times 144}{3600} = 200.0$ l/s

50% 1 IN 1 YR = 69.3/2 = 34.7 l/s

50% 1 IN 30 YR = 156.9/2 = 78.5 l/s

50% 1 IN 100 YR = 199.6/2 = 100.0 l/s

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Tully De'Ath consultants

Job: Uddenpore Avenue Job No: 11316

By: SFK Date: 17/6/15 Sheet No: HAND 02

CALCULATION OF PEAK DISCHARGE RATES FROM UN-ATTENUATED AREAS OF EXISTING BUILDINGS

1790 m² - USE TRL'95 RAINFALL FIGURES

1 IN 1 YR = 50 mm/Hr $Q_{IN1} = \frac{1605 \times 50}{3600} = 22.31/s$

1 IN 30 YR = 113 mm/Hr $Q_{IN30} = \frac{1605 \times 113}{3600} = 50.41/s$

1 IN 100 YR = 144 mm/Hr $Q_{IN100} = \frac{1605 \times 144}{3600} = 64.21/s$

1 IN 100 YR + 30% = 64.21/s × 1.3 = 83.51/s