PRO-FORMA 1: Sustainable Drainage System: Planning Permission

This pro-forma is a requirement of the Planning Validation Checklist. You **must complete all white boxes in full** and submit this pro-forma along with your supporting evidence to the Local Planning Authority for any application which seeks planning permission for major development (as defined in section 2 of Statutory Instrument 2015 No. 595).

This pro-forma supports developers and regulators in **summarising and confirming** how surface water from a development will be managed sustainably under current and future conditions. It should be completed in conjunction with the Council's 'Completing your Pro Forma' document and your sustainable drainage system should be designed in accordance with CIRIA The SuDS Manual C753.

The pro-forma follows Policy CS24 of Knowsley MBC's Local Plan, National Planning Policy Framework, House of Commons Written Statement (HWSW 161) on SuDS, Planning Practice Guidance and Defra's Non-Statutory Technical Standards for Sustainable Drainage Systems. It is supported by the Defra/EA Guidance on Rainfall Runoff Management and can be completed using freely available tools such as Tools for Sustainable Drainage Systems or approved Industry Standard surface water management design software. The Council's Sustainable Drainage & Surface Water Management Technical Guidance document also provides further information.

Section 1: Development Details

Development Name		Lyneham, Whiston			
Development Address ***(including postcode)***		Lyneham	**Planning Application Reference** *(if available)*		
Development Grid Reference	**Northings**	347796	**Expected lifetime of development** *(years)*		100
	Eastings	390989	**Have you submitted a Flood Risk Assessment?**		Yes ☐ No ☒
Total Development Site Area (Ha)		0.371	**Type of Planning Application (✓)**	**Outline**	☐
Site area served by proposed drainage system (excluding open space) (Ha)*		0.222		**Full**	☑
Is your surface water drainage system designed to a *(tick all that apply)***:**				**Hybrid**	☐
Greenfield Standard • *Site is undeveloped and a new drainage system will be installed; OR* • *Site is already developed and a new surface water drainage system will be installed to serve the new development.*		☑		**Reserved Matters**	☐
Previously Developed Standard • *Site is already developed and the entirety of the existing surface water drainage system will be used to serve the new development.*		☐			

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Section 2: Impermeable Area and Existing Drainage For outline or reserved matters applications, go to Section 3

	Existing (E)	Proposed (P)	Difference (P – E)		Evidence Checklist
Impermeable Area (Ha)	0	0.222	0.222	☐	Plans showing development layout of site with existing and proposed impermeable areas.
State Drainage Method	Greenfield / slabs	Pipes	N/A	☑	Plans showing current and proposed locations of sustainable drainage system.
Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?			Yes ■ No ☐	☑	Plans showing existing layout to include: • Watercourses, open or culverted • Water bodies – ponds, swales etc. • Sewers, including manholes • Highway drains, include manholes • Soakaways, filter drains

Section 3: Surface Water Discharge Hierarchy – Planning Practice Guidance

Surface Water Discharge Method	Proposed?		If YES - Evidence Checklist		If NO - Evidence Checklist	
1. Infiltration to ground	Yes ☐	No ■	☐	Completed Infiltration Checklist from CIRIA The SuDS Manual C753 Appendix B *An editable version of this form is available on SusDrain website.*	☐	Geotechnical Survey, including Soil Permeability Testing stating Percolation Coefficient, in accordance with BRE 365 **AND** Statement providing justification in your Sustainable Drainage Strategy
2. Discharge to watercourse or surface water body *(Main River or Ordinary)*	Yes ☐	No ■	☐	Watercourse and/or Water Body Survey Report	☐	Plan showing nearby watercourses and water bodies **AND** Statement providing justification in your Sustainable Drainage Strategy
3. Discharge to surface water sewer	Yes ■	No ☐	☑	Water and Sewerage Company written agreement for the Right to Connect.	☑	Plan showing nearby sewers **AND** Statement providing justification in your Sustainable Drainage Strategy
4. Discharge to combined sewer	Yes ☐	No ■				

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Section 4: Calculate Peak Discharge Rates – Technical Standards S2 and S3 (unless S1 applies)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) *Brownfield sites must reduce discharge rates by 50%*	Evidence Checklist	
Qbar	2.1	2.1		☑	MicroDrainage (or equivalent) calculations
1:1 Year Event	1.8	1.8	5		
1:30 Year Event	3.6	3.6	5		
1:100 Year Event	4.4	4.4	5		

Section 5: Calculate Discharge Volume – Technical Standards S4 and S6 (unless S1 applies)

Rainfall Event	Existing Volume (m^3)	Greenfield Volume (m^3)	Proposed Volume (m^3)	Evidence Checklist	
1:100 Year 6 Hour Event	71.9	71.9	147.6	☑	MicroDrainage (or equivalent) calculations

Section 6: Infiltration

Site Information	✓	Evidence Checklist	
Do your sustainable drainage proposals include any infiltration?	Yes ☐ No ☒ *If NO, please move on to Section 7*	☐	Proposed sustainable drainage plans
You should submit an alternative 'Plan B' sustainable drainage design utilising an alternative discharge method if site specific ground conditions are unknown at this stage. This will become the default design in the event infiltration proposals are not feasible upon site specific ground investigation. **Have you submitted an alternative 'Plan B' sustainable drainage design?**	Yes ☐ No ☒	☐	'Plan B' conceptual sustainable drainage plans and statement of approach

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Section 7: Storage – Technical Standards S7, S8 and S9

Storage Details	Details	Evidence Checklist	
State climate change allowance used (%)	30 & 45	✔	State / use in MicroDrainage
State storage volume provided (m^3) *(excluding non-void spaces)* *Must include an allowance for climate change and urban creep.*	178	✔	Drainage plans showing location of attenuation and all flow control devices and any supporting calculations
Summarise how storage will be provided for 1:30 year event on site. *Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas **and** no flooding occurs offsite in a 1 in 100 year (+ climate change allowance) event.*	Pipe network / Manholes within highway to be adopted by United Utilities. Hydro-Brake Flow Control Manhole provided.	✔	Plans showing size and location of storage and supporting calculations
Summarise how storage will be provided for 1:100 year (+ climate change) 6 hour event on site. *Where storage above the 1:30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by MicroDrainage (or equivalent) calculations.*	Pipe / Manhole network and off line cellular attenuation. Some areas of permeable paving provided but not included in calculations. Hydro-Brake Flow Control Manhole provided.	✔	Plans showing size and location of storage and supporting calculations

Section 8: Operation and Maintenance – Technical Standard S12 and HCWS161

Consideration	Select ALL that apply (✓)		Evidence Checklist	
State how ALL components of the sustainable drainage system will be maintained for the design life of the development.	**Sustainable drainage features are at property level**	✔	✔	Statement provided within your Sustainable Drainage Strategy
	Sustainable drainage system to be adopted by Water and Sewerage Company through a Section 104 agreement *(Water Industry Act 1991)*	☐		
	Applicant to secure maintenance of sustainable drainage features by entering into a Section 106 agreement *(Town and Country Planning Act 1990)*	☐		

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Declaration and Submission

This pro-forma has been completed using evidence from information which has been submitted with my planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details			
Form completed by	Dave Samuels	**Email Address**	dave.samuels@sutcliffe.co.uk
		Daytime Telephone	0151 227 3155
Form signed off by	Dave Samuels	**Accreditation(s) and/or Qualification(s) of Signatory**	BEng(Hons) CEng MIStructE MaPS
Date *(dd/mm/yyyy)*	23.09.22	**Company**	Sutcliffe Projects
Client Details			
Name	David Belcher	**Company**	Built Group Ltd

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Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.399
Areal Reduction Factor	1.00
Area (ha)	0.371
SAAR (mm)	861
CWI	45.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	30.99
Greenfield Runoff Volume (m^3)	71.930

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.399	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	400

Designed with Level Soffits

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	30.532	0.076	401.7	0.043	5.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
2.000	4.578	0.046	100.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
2.001	8.028	0.080	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	🔒
1.001	32.967	0.082	402.0	0.193	0.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
1.002	7.535	0.076	99.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.27	55.553	0.043	0.0	0.0	0.0	1.86	2104.0	5.8
2.000	50.00	5.10	55.602	0.000	0.0	0.0	0.0	0.77	6.0	0.0
2.001	50.00	5.27	55.556	0.000	0.0	0.0	0.0	0.77	6.0	0.0
1.001	50.00	5.57	55.476	0.236	0.0	0.0	0.0	1.86	2103.2	31.9
1.002	50.00	5.69	55.394	0.236	0.0	0.0	0.0	1.01	17.8«	31.9

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Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.027	0.027	0.027
	User	-	100	0.008	0.008	0.035
	User	-	100	0.008	0.008	0.043
2.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.193	0.193	0.193
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.236	0.236	0.236

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.399		

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Online Controls for Surface Network 1

Non Return Valve Manhole: S6, DS/PN: 2.001, Volume (m³): 3.9

Hydro-Brake® Optimum Manhole: S3, DS/PN: 1.002, Volume (m³): 51.5

Unit Reference	MD-SHE-0100-5000-1410-5000
Design Head (m)	1.410
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	55.394
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.410	5.0
Flush-Flo™	0.424	5.0
Kick-Flo®	0.866	4.0
Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.3	1.200	4.6	3.000	7.1	7.000	10.6
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.3
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.4	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

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Offline Controls for Surface Network 1

Pipe Manhole: S2, DS/PN: 1.001, Loop to PN: 2.000

Diameter (m)	0.225	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	56.640

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Storage Structures for Surface Network 1

Tank or Pond Manhole: S5, DS/PN: 2.000

Invert Level (m) 55.603

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	42.0	1.400	42.0	1.401	0.0

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Summary Wizard of 360 minute 100 year Summer I+0% for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.399
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	S1	360 minute 100 year Summer I+0%	58.725	56.490	-0.263	0.000	0.00
2.000	S5	360 minute 100 year Summer I+0%	59.000	55.602	-0.100	0.000	0.00
2.001	S6	360 minute 100 year Summer I+0%	58.993	55.556	-0.100	0.000	0.00
1.001	S2	360 minute 100 year Summer I+0%	58.846	56.490	-0.186	0.000	0.01
1.002	S3	360 minute 100 year Summer I+0%	58.408	56.490	0.946	0.000	0.32

PN	US/MH Name	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	S1		26.856	3.3	OK
2.000	S5		0.000	0.0	OK
2.001	S6		0.000	0.0	OK
1.001	S2	0.0	147.562	15.5	OK
1.002	S3		147.566	5.0	SURCHARGED

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Summary Wizard of 360 minute 100 year Winter I+0% for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.399
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	S1	360 minute 100 year Winter I+0%	58.725	56.463	-0.290	0.000	0.00
2.000	S5	360 minute 100 year Winter I+0%	59.000	55.602	-0.100	0.000	0.00
2.001	S6	360 minute 100 year Winter I+0%	58.993	55.556	-0.100	0.000	0.00
1.001	S2	360 minute 100 year Winter I+0%	58.846	56.463	-0.213	0.000	0.01
1.002	S3	360 minute 100 year Winter I+0%	58.408	56.463	0.919	0.000	0.32

PN	US/MH Name	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	S1		27.209	2.3	OK
2.000	S5		0.000	0.0	OK
2.001	S6		0.000	0.0	OK
1.001	S2	0.0	147.933	10.9	OK
1.002	S3		147.805	5.0	SURCHARGED

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