




PJA		Page 8
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3

PN	US/MH		Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status
	Name									Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.001	S8	15	Winter	2	+0%	100/15	Summer			23.301	-0.204	0.000	0.22		13.4	OK
1.002	S9	15	Winter	2	+0%	100/15	Summer			23.248	-0.207	0.000	0.21		16.4	OK
1.003	S10	15	Winter	2	+0%	100/15	Summer			22.995	-0.205	0.000	0.22		27.7	OK
2.000	S11	15	Winter	2	+0%	100/15	Summer			23.055	-0.245	0.000	0.08		10.4	OK
1.004	S12	15	Winter	2	+0%	30/15	Summer			22.663	-0.112	0.000	0.71		44.6	OK
1.005	S13	15	Winter	2	+0%	30/15	Summer			22.481	-0.194	0.000	0.47		52.7	OK

US/MH Level		
PN	Name	Exceeded
1.001	S8	
1.002	S9	
1.003	S10	
2.000	S11	
1.004	S12	
1.005	S13	


PJA										Page 9	
Seven House, High Street Longbridge Birmingham, B31 2UQ					06396 Rudloe Drive Quedgeley						
Date 01/09/2022					Designed by SWJ						
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX					Checked by DMcC						
Innovyze					Network 2019.1						
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3</u>											
<u>Simulation Criteria</u>											
Areal Reduction Factor 1.000			Manhole Headloss Coeff (Global) 0.500			MADD Factor * 10m³/ha Storage 0.000					
Hot Start (mins) 0			Foul Sewage per hectare (l/s) 0.000			Inlet Coeffiecient 0.800					
Hot Start Level (mm) 0			Additional Flow - % of Total Flow 0.000			Flow per Person per Day (l/per/day) 0.000					
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 0				Number of Storage Structures 0				Number of Real Time Controls 0			
<u>Synthetic Rainfall Details</u>											
Rainfall Model					FEH		Data Type		Point		
FEH Rainfall Version					2013 Cv (Summer)		0.750				
Site Location GB 381375 213365 SO 81375 13365					Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)					300.0		DVD Status		ON		
Analysis Timestep 2.5 Second Increment (Extended)					Inertia Status		ON				
DTS Status					ON						
Profile(s)					Summer and Winter						
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years)					2, 30, 100						
Climate Change (%)					0, 0, 40						

PJA		Page 10									
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley										
Date 01/09/2022	Designed by SWJ										
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC										
Innovyze	Network 2019.1										
<p><u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3</u></p>											
<table> <thead> <tr> <th></th><th>US/MH</th><th>Level</th></tr> <tr> <th>PN</th><th>Name</th><th>Exceeded</th></tr> </thead> <tbody> <tr> <td>1.000</td><td>S7</td><td></td></tr> </tbody> </table>				US/MH	Level	PN	Name	Exceeded	1.000	S7	
	US/MH	Level									
PN	Name	Exceeded									
1.000	S7										
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3

PN	US/MH		Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Pipe		Status	
	Name									Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)		Flow (l/s)
1.001	S8	15	Winter	30	+0%	100/15	Summer			23.365	-0.140	0.000	0.54		33.3	OK
1.002	S9	15	Winter	30	+0%	100/15	Summer			23.311	-0.144	0.000	0.52		41.3	OK
1.003	S10	15	Winter	30	+0%	100/15	Summer			23.107	-0.093	0.000	0.55		68.6	OK
2.000	S11	15	Winter	30	+0%	100/15	Summer			23.085	-0.215	0.000	0.18		23.7	OK
1.004	S12	15	Winter	30	+0%	30/15	Summer			22.982	0.207	0.000	1.71		107.7	SURCHARGED
1.005	S13	15	Winter	30	+0%	30/15	Summer			22.686	0.011	0.000	1.11		126.1	SURCHARGED

PN	US/MH Name	Level Exceeded
1.001	S8	
1.002	S9	
1.003	S10	
2.000	S11	
1.004	S12	
1.005	S13	


PJA										Page 12	
Seven House, High Street Longbridge Birmingham, B31 2UQ					06396 Rudloe Drive Quedgeley						
Date 01/09/2022					Designed by SWJ						
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX					Checked by DMcC						
Innovyze					Network 2019.1						
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3</u>											
<u>Simulation Criteria</u>											
Areal Reduction Factor 1.000			Manhole Headloss Coeff (Global) 0.500			MADD Factor * 10m³/ha Storage 0.000					
Hot Start (mins) 0			Foul Sewage per hectare (l/s) 0.000			Inlet Coefficient 0.800					
Hot Start Level (mm) 0			Additional Flow - % of Total Flow 0.000			Flow per Person per Day (l/per/day) 0.000					
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 0				Number of Storage Structures 0				Number of Real Time Controls 0			
<u>Synthetic Rainfall Details</u>											
Rainfall Model					FEH		Data Type Point				
FEH Rainfall Version					2013 Cv (Summer)		0.750				
Site Location GB 381375 213365 SO 81375 13365					Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)					300.0		DVD Status ON				
Analysis Timestep 2.5 Second Increment (Extended)					Inertia Status ON						
DTS Status					ON						
Profile(s)					Summer and Winter						
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years) 2, 30, 100											
Climate Change (%) 0, 0, 40											




100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3

										Water	Surcharged	Flooded	Pipe		
PN	US/MH	Storm	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow	Status
	Name		Period	Change	Surge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	
1.001	S8	15 Winter	100	+40%	100/15 Summer				24.396	0.891	0.000	0.87		53.1	SURCHARGED
1.002	S9	15 Winter	100	+40%	100/15 Summer				24.315	0.860	0.000	0.83		66.4	SURCHARGED
1.003	S10	15 Winter	100	+40%	100/15 Summer				24.149	0.949	0.000	0.87		109.2	SURCHARGED
2.000	S11	15 Winter	100	+40%	100/15 Summer				23.918	0.618	0.000	0.30		40.5	SURCHARGED
1.004	S12	15 Winter	100	+40%	30/15 Summer				23.800	1.025	0.000	2.87		181.5	FLOOD RISK
1.005	S13	15 Winter	100	+40%	30/15 Summer				22.940	0.265	0.000	1.90		214.6	SURCHARGED






	US/MH	Level
PN	Name	Exceeded
1.001	S8	
1.002	S9	
1.003	S10	
2.000	S11	
1.004	S12	
1.005	S13	

PJA		Page 0																																
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley																																	
Date 01/09/2022	Designed by SWJ																																	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC																																	
Innovyze	Network 2019.1																																	
<div>STORM SEWER DESIGN by the Modified Rational Method</div> <div>Design Criteria for Surface Network 4</div> <div>Pipe Sizes STANDARD Manhole Sizes STANDARD</div> <div>FEH Rainfall Model</div> <table><tr><td>Return Period (years)</td><td>5</td><td>Volumetric Runoff Coeff.</td><td>0.750</td></tr><tr><td></td><td></td><td>PIMP (%)</td><td>100</td></tr><tr><td>FEH Rainfall Version</td><td>2013</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Site Location</td><td>GB 381375 213365 SO 81375 13365</td><td>Minimum Backdrop Height (m)</td><td>0.000</td></tr><tr><td>Data Type</td><td>Point</td><td>Maximum Backdrop Height (m)</td><td>0.000</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> <div>Designed with Level Soffits</div>			Return Period (years)	5	Volumetric Runoff Coeff.	0.750			PIMP (%)	100	FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0	Site Location	GB 381375 213365 SO 81375 13365	Minimum Backdrop Height (m)	0.000	Data Type	Point	Maximum Backdrop Height (m)	0.000	Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200	Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00	Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Return Period (years)	5	Volumetric Runoff Coeff.	0.750																															
		PIMP (%)	100																															
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0																															
Site Location	GB 381375 213365 SO 81375 13365	Minimum Backdrop Height (m)	0.000																															
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Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00																															
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500																															
<div>Network Design Table for Surface Network 4</div> <div>« - Indicates pipe capacity &lt; flow</div> <table><tr><td>PN</td><td>Length</td><td>Fall</td><td>Slope</td><td>I.Area</td><td>T.E.</td><td>Base</td><td>k</td><td>HYD</td><td>DIA</td><td>Section</td><td>Type</td><td>Auto</td></tr><tr><td></td><td>(m)</td><td>(m)</td><td>(1:X)</td><td>(ha)</td><td>(mins)</td><td>Flow (l/s)</td><td>(mm)</td><td>SECT</td><td>(mm)</td><td></td><td></td><td>Design</td></tr></table> <div>Network Results Table</div>			PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type	Auto		(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)			Design						
PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type	Auto																						
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)			Design																						
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PJA		Page 2
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	

Network Design Table for Surface Network 4

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	14.646	0.029	505.0	0.124	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	6.366	0.125	50.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	7.318	0.125	58.5	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	33.278	0.383	86.9	0.079	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	8.909	0.182	49.0	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	5.35	23.029	0.124	0.0	0.0	0.0	0.69	49.0	16.8
1.001	50.00	5.40	23.000	0.124	0.0	0.0	0.0	2.21	156.1	16.8
1.002	50.00	5.46	22.875	0.155	0.0	0.0	0.0	2.06	145.5	21.0
1.003	50.00	5.97	22.750	0.234	0.0	0.0	0.0	1.08	19.1<	31.7
1.004	50.00	6.08	22.367	0.234	0.0	0.0	0.0	1.44	25.5<	31.7

PJA		Page 3
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	

Manhole Schedules for Surface Network 4

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	24.500	1.471	Open Manhole	1050	1.000	23.029	300				
S2 Basin	24.500	1.500	Open Manhole	1050	1.001	23.000	300	1.000	23.000	300	
S3	24.500	1.625	Open Manhole	1350	1.002	22.875	300	1.001	22.875	300	
S4 FCC	24.875	2.125	Open Manhole	3000	1.003	22.750	150	1.002	22.750	300	
S5	24.300	1.933	Open Manhole	1200	1.004	22.367	150	1.003	22.367	150	
S6	22.863	0.678	Open Manhole	0		OUTFALL		1.004	22.185	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	381435.071	213388.534	381435.071	213388.534	Required	
S2 Basin	381421.910	213394.961	381421.910	213394.961	Required	
S3	381417.238	213399.286	381417.238	213399.286	Required	

06396
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Network 2019.1


## Manhole Schedules for Surface Network 4

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S4 FCC	381409.974	213400.176	381409.974	213400.176	Required	
S5	381376.943	213404.225	381376.943	213404.225	Required	
S6	381377.329	213413.126			No Entry	

### Free Flowing Outfall Details for Surface Network 4

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.004	S6	22.863	22.185	0.000	0	0

PJA		Page 5																				
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley																					
Date 01/09/2022 File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Designed by SWJ Checked by DMcC																					
Innovyze		Network 2019.1																				
<p style="text-align: center;"><u>Simulation Criteria for Surface Network 4</u></p> <p> Volumetric Runoff Coeff 0.750    Manhole Headloss Coeff (Global) 0.500    Inlet Coeffiecient 0.800  Areal Reduction Factor 1.000    Foul Sewage per hectare (l/s) 0.000    Flow per Person per Day (l/per/day) 0.000  Hot Start (mins) 0    Additional Flow - % of Total Flow 0.000    Run Time (mins) 60  Hot Start Level (mm) 0    MADD Factor * 10m<sup>3</sup>/ha Storage 0.000    Output Interval (mins) 1 </p> <p> Number of Input Hydrographs 0    Number of Offline Controls 0    Number of Time/Area Diagrams 0  Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0 </p> <p style="text-align: center;"><u>Synthetic Rainfall Details</u></p> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>5</td> <td>Winter Storms</td> <td>No</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Site Location</td> <td>GB 381375 213365 SO 81375 13365</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Data Type</td> <td>Point Storm</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> </table>			Rainfall Model	FEH	Summer Storms	Yes	Return Period (years)	5	Winter Storms	No	FEH Rainfall Version	2013	Cv (Summer)	0.750	Site Location	GB 381375 213365 SO 81375 13365	Cv (Winter)	0.840	Data Type	Point Storm	Storm Duration (mins)	30
Rainfall Model	FEH	Summer Storms	Yes																			
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PJA		Page 6
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	

Online Controls for Surface Network 4

Hydro-Brake® Optimum Manhole: S4 FCC, DS/PN: 1.003, Volume (m³): 15.4


Unit Reference	MD-SHE-0090-4000-1300-4000	Sump Available	Yes
Design Head (m)	1.300	Diameter (mm)	90
Design Flow (l/s)	4.0	Invert Level (m)	22.750
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		


Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.0	Kick-Flo®	0.796	3.2
Flush-Flo™	0.388	4.0	Mean Flow over Head Range	-	3.5


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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	0.600	3.8	1.600	4.4	2.600	5.5	5.000	7.5	7.500	9.1
0.200	3.7	0.800	3.2	1.800	4.7	3.000	5.9	5.500	7.9	8.000	9.4
0.300	3.9	1.000	3.5	2.000	4.9	3.500	6.3	6.000	8.2	8.500	9.7
0.400	4.0	1.200	3.9	2.200	5.1	4.000	6.8	6.500	8.5	9.000	9.9
0.500	3.9	1.400	4.1	2.400	5.3	4.500	7.1	7.000	8.8	9.500	10.2

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PJA		Page 7																				
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley																					
Date 01/09/2022	Designed by SWJ																					
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC																					
Innovyze	Network 2019.1																					
<div>Storage Structures for Surface Network 4</div> <div>Tank or Pond Manhole: S2 Basin, DS/PN: 1.001</div> <div>Invert Level (m) 23.000</div> <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>48.1</td><td>0.500</td><td>106.4</td><td>1.000</td><td>178.9</td><td>1.500</td><td>265.5</td><td>1.501</td><td>265.5</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	48.1	0.500	106.4	1.000	178.9	1.500	265.5	1.501	265.5
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)													
0.000	48.1	0.500	106.4	1.000	178.9	1.500	265.5	1.501	265.5													
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PJA										Page 8	
Seven House, High Street Longbridge Birmingham, B31 2UQ					06396 Rudloe Drive Quedgeley						
Date 01/09/2022					Designed by SWJ						
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX					Checked by DMcC						
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<u>Simulation Criteria</u>											
Areal Reduction Factor 1.000			Manhole Headloss Coeff (Global) 0.500			MADD Factor * 10m³/ha Storage 0.000					
Hot Start (mins) 0			Foul Sewage per hectare (l/s) 0.000			Inlet Coeffiecient 0.800					
Hot Start Level (mm) 0			Additional Flow - % of Total Flow 0.000			Flow per Person per Day (l/per/day) 0.000					
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 1				Number of Storage Structures 1				Number of Real Time Controls 0			
<u>Synthetic Rainfall Details</u>											
Rainfall Model					FEH		Data Type		Point		
FEH Rainfall Version					2013 Cv (Summer)		0.750				
Site Location GB 381375 213365 SO 81375 13365					Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)					300.0		DVD Status		ON		
Analysis Timestep 2.5 Second Increment (Extended)					Inertia Status		ON				
DTS Status					ON						
Profile(s)					Summer and Winter						
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years)					2, 30, 100						
Climate Change (%)					0, 0, 40						


PJA		Page 9									
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley										
Date 01/09/2022	Designed by SWJ										
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC										
Innovyze	Network 2019.1										
<p><u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4</u></p>											
<table> <thead> <tr> <th></th><th>US/MH</th><th>Level</th></tr> <tr> <th>PN</th><th>Name</th><th>Exceeded</th></tr> </thead> <tbody> <tr> <td>1.000</td><td>S1</td><td></td></tr> </tbody> </table>				US/MH	Level	PN	Name	Exceeded	1.000	S1	
	US/MH	Level									
PN	Name	Exceeded									
1.000	S1										
©1982-2019 Innovyze											


PJA		Page 10
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	


2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
									Level (m)	Depth (m)	Volume (m³)			
1.001	S2 Basin	120 Winter	2	+0%	30/15 Summer				23.213	-0.087	0.000	0.05		4.3
1.002	S3	120 Winter	2	+0%	2/15 Winter				23.212	0.037	0.000	0.05		4.7
1.003	S4 FCC	120 Winter	2	+0%	2/15 Summer				23.211	0.311	0.000	0.21		3.9
1.004	S5	480 Winter	2	+0%					22.409	-0.108	0.000	0.18		3.9

PN	US/MH Name	Status	Level
			Exceeded
1.001	S2 Basin	OK	
1.002	S3	SURCHARGED	
1.003	S4 FCC	SURCHARGED	
1.004	S5	OK	

PJA										Page 11	
Seven House, High Street Longbridge Birmingham, B31 2UQ					06396 Rudloe Drive Quedgeley						
Date 01/09/2022					Designed by SWJ						
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX					Checked by DMcC						
Innovyze					Network 2019.1						
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4</u>											
<u>Simulation Criteria</u>											
Areal Reduction Factor 1.000			Manhole Headloss Coeff (Global) 0.500			MADD Factor * 10m³/ha Storage 0.000					
Hot Start (mins) 0			Foul Sewage per hectare (l/s) 0.000			Inlet Coefficient 0.800					
Hot Start Level (mm) 0			Additional Flow - % of Total Flow 0.000			Flow per Person per Day (l/per/day) 0.000					
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 1				Number of Storage Structures 1				Number of Real Time Controls 0			
<u>Synthetic Rainfall Details</u>											
Rainfall Model					FEH		Data Type Point				
FEH Rainfall Version					2013 Cv (Summer)		0.750				
Site Location GB 381375 213365 SO 81375 13365					Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)					300.0		DVD Status ON				
Analysis Timestep 2.5 Second Increment (Extended)					Inertia Status ON						
DTS Status					ON						
Profile(s)					Summer and Winter						
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years) 2, 30, 100											
Climate Change (%) 0, 0, 40											


PJA		Page 12									
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley										
Date 01/09/2022	Designed by SWJ										
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC										
Innovyze	Network 2019.1										
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4</u>											
<table><thead><tr><th></th><th>US/MH</th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>Exceeded</th></tr></thead><tbody><tr><td>1.000</td><td>S1</td><td></td></tr></tbody></table>				US/MH	Level	PN	Name	Exceeded	1.000	S1	
	US/MH	Level									
PN	Name	Exceeded									
1.000	S1										
©1982-2019 Innovyze											

PJA		Page 13
Seven House, High Street Longbridge Birmingham, B31 2UQ	06396 Rudloe Drive Quedgeley	
Date 01/09/2022	Designed by SWJ	
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX	Checked by DMcC	
Innovyze	Network 2019.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.001	S2 Basin	120 Winter	30	+0%	30/15 Summer				23.576	0.276	0.000	0.06		5.5
1.002	S3	120 Winter	30	+0%	2/15 Winter				23.575	0.400	0.000	0.06		5.1
1.003	S4 FCC	120 Winter	30	+0%	2/15 Summer				23.574	0.674	0.000	0.21		3.9
1.004	S5	1440 Winter	30	+0%					22.409	-0.108	0.000	0.18		3.9

PN	US/MH Name	Status	Level Exceeded
1.001	S2 Basin	SURCHARGED	
1.002	S3	SURCHARGED	
1.003	S4 FCC	SURCHARGED	
1.004	S5	OK	

PJA										Page 14	
Seven House, High Street Longbridge Birmingham, B31 2UQ					06396 Rudloe Drive Quedgeley						
Date 01/09/2022					Designed by SWJ						
File 22.08.30 SITE3D DRAINAGE MODELS (REV D).MDX					Checked by DMcC						
Innovyze					Network 2019.1						
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4</u>											
<u>Simulation Criteria</u>											
Areal Reduction Factor 1.000			Manhole Headloss Coeff (Global) 0.500			MADD Factor * 10m³/ha Storage 0.000					
Hot Start (mins) 0			Foul Sewage per hectare (l/s) 0.000			Inlet Coeffiecient 0.800					
Hot Start Level (mm) 0			Additional Flow - % of Total Flow 0.000			Flow per Person per Day (l/per/day) 0.000					
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 1				Number of Storage Structures 1				Number of Real Time Controls 0			
<u>Synthetic Rainfall Details</u>											
Rainfall Model					FEH		Data Type Point				
FEH Rainfall Version					2013 Cv (Summer)		0.750				
Site Location GB 381375 213365 SO 81375 13365					Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)					300.0		DVD Status ON				
Analysis Timestep 2.5 Second Increment (Extended)					Inertia Status ON						
DTS Status					ON						
Profile(s)					Summer and Winter						
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years) 2, 30, 100											
Climate Change (%) 0, 0, 40											





# Technical Note

**Project:** Rudloe Drive, Quedgeley

**Subject:** Drainage strategy

<b>Client:</b>	Linden Homes	<b>Version:</b>	0.0
<b>Project No:</b>	06396	<b>Author:</b>	[REDACTED]
<b>Date:</b>	15/07/2022	<b>Approved:</b>	Daniel McCrudden

## I Introduction

This technical note has been produced to support the reserved matters planning application and answer the objections raised over the proposed drainage strategy for the development north of Rudloe Drive in Quedgeley, Gloucester. The scheme forms part of the wider regeneration of the former RAF Quedgeley airbase, for which, a site wide drainage infrastructure strategy was developed and previously agreed for separate reserved matters planning consent in 2010.

This technical note will set out how the proposed strategy follows the principles set out in the agreed site wide infrastructure strategy and the proposals put forward for the outline planning submission, both of which are summarised in the FRA, named “Land North of Rudloe Drive, Kingsway, Quedgeley, Gloucester FRA & Drainage Strategy”. The outline planning reference for the scheme is 21/00490/OUT.

## 2 Objections from the LLFA

In a letter, dated 21<sup>st</sup> June 2022, the LLFA raise objections to the reserved matters application for the scheme on two grounds. The following two sections detail out these objections.

### 2.1 Surface water attenuation

The LLFA objection, as quoted below, refers to the attenuation capacities of the two basins on site and how they are smaller than the volumes quoted on drawings previously submitted during the outline planning application stage.

*“This application refers to the reserved matters for planning consent 21/00490/OUT. That application showed the site developed in a way that required two attenuation basins with a total capacity for a volume of 432m<sup>3</sup> such that surface water could be discharged to the adjacent watercourse at 24 l/s. The plan submitted for this application only provides*

*attenuation storage capacity of 347m<sup>3</sup> to discharge surface water to the adjacent watercourse at 24 l/s. It is not clear where the layout offers any ability to reduce the attenuation storage capacity by 22%.”.*

## **2.2 Exceedance routing and ponding**

The second LLFA objection, as quoted below, refers to exceedance routing and ponding on the site.

*“Further, the drawing showing surface water flow direction arrows shows (Sht 7 of land-north-of-rudloe-drive-2200533rem-plans-2-of-2.pdf) a point of convergence at the junction of the roads in the eastern half of the development. This would suggest there will be ponding of water at this junction in front of units 38 and 39. It would be useful to have an indication of how deep this pond may get and how far it might spread”.*

The following sections of this report look to address these objections.

## **3 Site wide drainage infrastructure**

The FRA for the scheme summarises the site wide infrastructure strategy, detailing the various locations and sewer capacities provided for this development. The FRA states that this strategy was previously agreed with Gloucester City Council in 2010, see below.

*“A site-wide foul sewage and surface water/SuDS drainage strategy has been agreed with Gloucester City Council and approved as part of a reserved matters planning consent for the construction of balancing pond (Pond 5) on employment area FP5, planning reference 09/00114/REM, approved 9th December 2010.”*

This strategy is included within Appendix A.

The site wide strategy specified that the site would discharge its surface water flows through three main outfall areas, the existing sewers located within Rudloe Drive (south) and Newhaven Road (west) and 2 outfalls into the RAF tributary (north). All three areas eventually outfall into the main balancing pond (pond 5) in employment area FP5. The sewer capacities for each of these outfall locations are denoted on drawing 479-101 included within Appendix B.

## 4 Proposed drainage strategy

### 4.1 Outline planning proposed drainage strategy

The outline planning drainage strategy, included within the FRA, “Drawing 479-010 Preliminary Drainage Strategy”, was developed by Phoenix Design Partnership Ltd. and is included within Appendix C.

This drainage strategy used the three outfall locations specified in the site wide drainage infrastructure as allowed for in the FRA. The drained impermeable areas for all these locations, which are denoted on the strategy drawing, are calculated based on the assumption that 60% of the catchment is impermeable. This does not consider the exact impermeable areas of the development infrastructure.

The impermeable area catchment split per outfall location is documented below in table 1. The FRA states that the two attenuation basins can discharge into the RAF tributary at a combined discharge rate of 24 l/s. The outline strategy splits this acceptable discharge rate equally with 12 l/s assigned to each basin. Based on these discharge rates and the drained impermeable areas quoted by Phoenix Design Partnership Ltd., 1.026 ha across the two basins, a total storage capacity of 432m<sup>3</sup> was provided.

This results in an impermeable area catchment of 1.441 ha being drained with no restriction into the existing sewers within Newhaven Road and Rudloe Drive. This represents a split of 58% of the site’s catchment out-falling to existing sewers and 42% out-falling to the RAF tributary through the two attenuation basins.

**Table 1: Outline planning strategy catchment areas**

Outfall location	Gross catchment area	Impermeable area (assumed 60%)
Newhaven Road (existing sewer)	1.010	0.606
Rudloe Drive – Manhole S140 (existing sewer)	0.350	0.210
Rudloe Drive – Manholes S102, S104, S106, S108 (existing sewers)	1.041	0.625
RAF Tributary – Attenuation Basin (West)	0.750	0.450
RAF Tributary – Attenuation Basin (East)	0.960	0.576
<b>Total</b>	<b>4.111</b>	<b>2.467</b>

### 4.2 Reserved matters proposed drainage strategy

The proposed drainage strategy submitted for reserved matters planning submission was shown on PJA drawings 0103-P0 through 0105-P0. These have subsequently been updated for detail

design and therefore, the latest PJA drawings 0210-P1 through 0212-P1 will be referred to throughout and are included within this document in Appendix D.

The proposals, like the outline strategy, utilise the three outfall locations specified in the site wide drainage strategy from the FRA. The drained impermeable areas used however, reflect the exact areas shown on the site layout plan. The catchment area split can be seen on PJA drawing 0405-P1, included within Appendix E.

The catchment split per outfall location is documented below in table 2. Within these updated proposals, an impermeable area of 1.607 ha is being drained through the existing sewers located in Newhaven Road and Rudloe Drive without restriction. Consequently, the combined impermeable area that is drained to the RAF tributary through the two attenuation basins is 0.811 ha.

Because a larger part of the catchment is routed through the western basin (0.580 ha) compared to the eastern basin (0.231 ha), the proposed strategy makes use of the acceptable discharge rate by apportioning 20 l/s to the western basin and 4 l/s to the eastern basin. To that end, a total storage capacity of 347m<sup>3</sup> is provided.

The total storage capacity of the two attenuation basins has therefore reduced from the outline planning strategy to that submitted for reserved matters. This is because more of the site is being routed to the existing outfalls in Newhaven Road and Rudloe Drive compared to the RAF tributary. The percentage of the site's catchment out-falling to existing sewers is now 66%, with the other 34% out-falling towards the RAF tributary.

This represents an 8% reduction in the overall site catchment split out-falling through the two attenuation basins into the RAF tributary (42% at outline compared with 34% at reserved matters). This, combined with the differing approach to the apportionment of the accepted discharge rate, results in the total storage capacity of the two basins reducing from one proposal to another.

**Table 2: Reserved matters strategy catchment areas**

Outfall location	Impermeable area (Ha)
Newhaven Road (existing sewer)	1.013
Rudloe Drive – Manhole S140 (existing sewer)	0.000
Rudloe Drive – Manhole S102, S104, S106, S108 (existing sewer)	0.594
RAF Tributary – Attenuation Basin (West)	0.580
RAF Tributary – Attenuation Basin (East)	0.231
<b>Total</b>	<b>2.418</b>

### 4.3 Allowable discharge to existing sewers

The site wide drainage infrastructure, as shown in appendix A, is designed in such a way that the sewers in Rudloe Drive flow from east to west. At the point they reach the roundabout, the sewer network changes direction and flows from south to north, up Newhaven Road, eventually out-falling into balancing pond 5.

The allowable impermeable areas that can discharge to the existing sewer outfall locations in both Newhaven Road and Rudloe drive are documented within table 3. These are taken from the sewer capacities drawing 479-101 which is included within Appendix B.

**Table 3: Existing sewer allowable impermeable area discharge comparison**

Outfall location	Allowable impermeable area (Ha)	Proposed impermeable area (Ha)
Newhaven Road (existing sewer)	0.609	1.013
Rudloe Drive – Manhole S140 (existing sewer)	0.582	0.000
Rudloe Drive – Manhole S102, S104, S106, S108 (existing sewer)	0.629	0.594
<b>Total</b>	<b>1.820</b>	<b>1.607</b>

As can be seen from table 3, the site wide infrastructure sewers within Rudloe Drive are receiving less catchment area compared with what was previously allowed for (0.594 ha compared to 1.211 ha). This difference in impermeable area offsets the increase in impermeable area that has been routed to the sewers in Newhaven Road (1.013 ha compared with 0.609 ha).

As a result, the total impermeable area that has been discharged into the existing sewers that are part of the site wide strategy, at the final outfall point in Newhaven Road, is less, compared to what was allowed for (1.607 ha compared with 1.820 ha). Showing, that although more of the proposed sites catchment area has been routed to existing sewers instead of through the two detention basins, the overall sewer capacities allowed for in the original site wide infrastructure strategy (Appendix B) have been complied with.

## 5 Exceedance flood routing

The sites proposed drainage networks have been designed to attenuate and convey surface water flows for the 1 in 100-year + 40% climate change rainfall event with no flooding, in accordance with current guidance.

Therefore, exceedance flow routes are shown to demonstrate the flow paths that would be followed during an event that exceeds that modelled or blockage/failure of the system. If one

of these scenarios were to occur, the flooded volume of water would be retained within the kerbs of the road carriageway, until such a time where the water dissipates in the system. Once the water within the network starts flowing again, the flooded water can flow back into the system through the proposed gullies at the designed low point of the road.

The proposed exceedance flood routes are shown on PJA drawing 0402-P1. And this is included within Appendix F.

## **6 Conclusions**

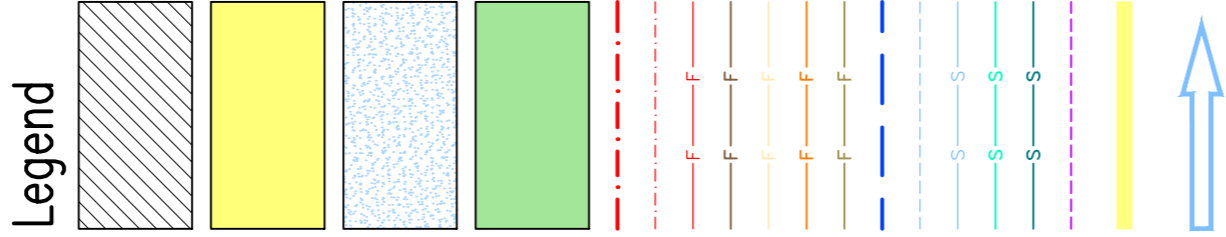
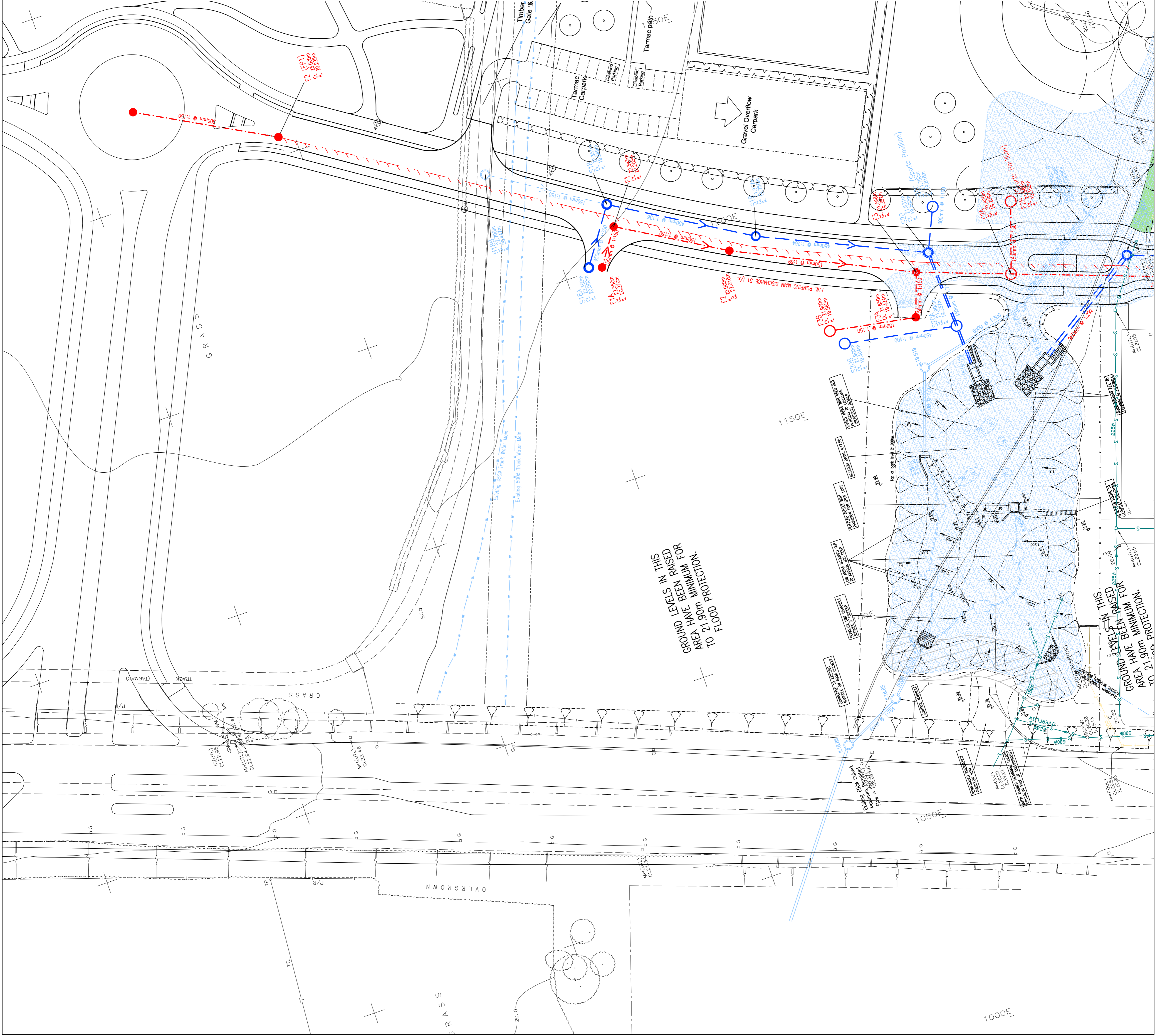
The drainage strategy for the development north of Rudloe Drive in Quedgeley, Gloucester has been developed in accordance with the site wide infrastructure strategy, that was previously agreed for reserved matters planning consent in 2010.

From the proposals submitted for outline planning to those submitted as part of the reserved matters submission, the total storage capacity of the two attenuation basins proposed for the scheme has reduced from 432m<sup>3</sup> to 347m<sup>3</sup>. However, this has been managed by re-directing some of the site's impermeable areas to the existing sewers within Newhaven Road and Rudloe Drive. Despite these changes, the surface water outfall locations and design capacities, which are summarised within the FRA (Land North of Rudloe Drive, Kingsway, Quedgeley, Gloucester FRA & Drainage Strategy), have been complied with.

Furthermore, the proposed drainage networks have been designed to attenuate and convey surface water flows for the 1 in 100-year event + 40% climate change rainfall event with no flooding, in accordance with current guidance. In an exceedance event or failure/blockage of the system, any water that were to pond in the area in front of plots 38-39 (as per the designated exceedance flow paths) would be retained within the kerb heights of the existing carriageway, until such a time when it can dissipate back through the drainage network. Should any flood water volume breach the highway kerbs, there are rows of external parking both sides of the road that can accommodate surface water, before reaching the properties which are set circa 400mm above the low point in this area. Therefore the risk of flood water entering properties mitigated.



## **Appendix A      Phoenix Design Partnership Ltd., Combined Drainage layout**



Foul Drainage Connection Details

US MH Reference	US MH Reference	Orientation	Diameter (mm)	Gradient (1:)	Capacity (l/s)	Invert Level (m)	Design Area Drained (ha)	Flow (l/s) @ 100% Runoff
F160	Spur	South	150	40	24	22.160	1.000	1.100
F107	Spur	North	150	40	24	21.770	0.500	0.550
F130	Spur	North	150	40	24	21.790	0.500	0.550
F108	Spur	South	150	40	24	21.500	0.400	0.440
F109	Spur	North	150	40	24	21.400	0.500	0.550
F109	Spur	South	150	40	24	21.225	0.200	0.220
F110	Spur	North	150	40	24	20.860	0.100	0.110
F110	Spur	South	150	40	24	21.255	0.200	0.220
F180	Spur	North	150	40	24	21.250	0.500	0.550
F180	Spur	South	150	40	24	21.210	0.200	0.220
F112	Spur	North	150	40	24	20.770	0.500	0.550
F113	Spur	North	150	40	24	20.565	0.500	0.550
F113	Spur	South	150	40	24	20.715	0.300	0.320
F114	Spur	North	150	40	24	20.430	0.100	0.110
F114	Spur	South	150	40	24	20.560	0.2	0.22
F220	Spur	North	150	40	24	22.175	0.100	0.110
F220	Spur	South	150	40	24	21.925	0.100	0.110
F211	Spur	North	150	40	24	21.175	0.100	0.110
F212	Spur	East	150	40	24	20.450	0.100	0.110
F212	Spur	South	150	40	24	20.450	0.100	0.110
F240	Spur	North	150	40	24	20.513	0.700	0.770
F14	F14A	*	150	150	12	19.881	0.700	0.770
F13	F13A	*	150	150	12	19.655	0.100	0.110
F11	F11A	*	150	150	12	19.04	1.000	1.100
F10	Spur	West	150	150	12	19.675	0.100	0
F8	F8A	*	150	8	50	19.600	0.600	0.660
F7	F7A	*	150	93	16	18.710	0.500	0.550
F5	F5A	*	150	19	36	19.000	1.000	1.100
F4	F4A	*	150	150	12	18.866	1.000	1.100
F2A	F2B	*	150	150	12	19.352	1.000	1.100
F3A	F3B	*	150	150	12	19.562	0.600	0.660
F1	F1A	*	150	150	12	20.270	1.300	1.430

Surface Water Drainage Connection Details

US MH Reference	US MH Reference	Orientation	Diameter (mm)	Gradient (1:)	Capacity (l/s)	Invert Level (m)	Design Area Drained (ha)	Flow (l/s) @ 100% Runoff
S100	Spur	South	375	200	141	22.545	0.420	58
S101	Spur	North	225	170	40	22.570	£	—
S102	Spur	South	375	200	141	22.465	0.540	75
S103	Spur	South	300	200	78	22.200	0.370	51
S103	Spur	South	300	200	78	22.120	0.220	31
S104	Spur	North	225	170	40	22.170	£	—
S104	Spur	South	300	200	78	22.065	0.190	26
S105	Spur	South	375	300	115	21.865	0.190	26
S106	Spur	North	225	170	40	21.955	£	—
S120	Spur	South	350	250	78	91.945	0.510	43
S108	Spur	North	225	170	40	21.770	£	—
S130	Spur	South	225	170	40	21.960	0.090	13
S131	Spur	North	225	170	40	21.935	0.080	11
S132	Spur	East	225	170	40	21.870	0.090	13
S132	Spur	South	225	170	40	21.660	0.090	13
S140	Spur	North	450	200	228	21.450	1.097	152
S10	S10A	*	225	225	34	21.303	0.095	13
S13	S13A	*	400	300	185	20.647	0.984	137
S14	S14A	*	525	500	215	20.596	1.050	146
S15A	S15B	*	380	150	90	20.400	0.337	44
S16	S16A	*	525	500	215	19.944	1.276	176
S17	S17A	*	450	300	185	19.629	0.869	121
S18	S18A	*	450	300	185	20.000	1.131	157
S20A	S20B	*	400	400	160	19.401	0.581	81
S20	S20C	*	300	160	87	19.818	0.200	28
Headwall	S20D	*	225	167	40	22.200	12/1s Max (£)	—
Headwall	S330	*	225	167	40	21.950	12/1s Max (£)	—

\* Connection to Unadopted Highway (US) Manhole.

£ Connection to Unadopted Highway (US) Manhole.

£ Alternative/Additional Outfalls for Alternated Flows: Maximum Combined Flow for the Three Outfalls Draining Each Area is not to Exceed 12/l/s.

B 16/10/2009 Highway layout updated. Spur levels amended.

A 25/07/2008 Existing foul sewer details amended.

Revisions:

Project: Kingsway Business Park, Quedgeley  
Kingsway Framework Area 5

Client:

Robert Hitchins Ltd.



Drawing: Combined Drainage Layout  
Sheet 2 of 2

Scale: 1:500 @ A1 Date: 08/06/2007 Drawn by: J.A

Drawing No: 0128/1000/02 Rev: B



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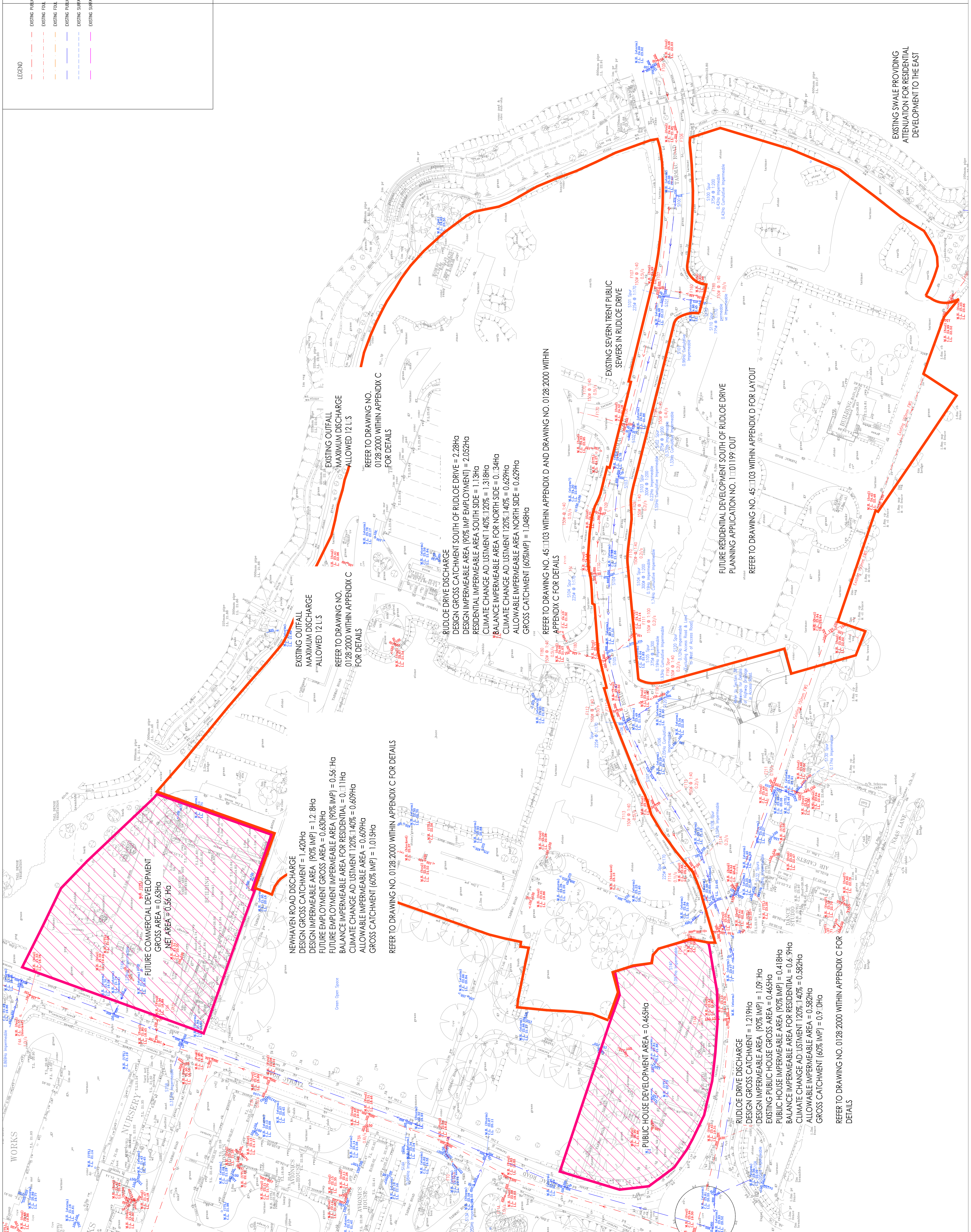
Dr Status FOR APPROVAL





**Appendix B      Phoenix Design Partnerships Ltd. Drawing 479-101**  
**Sewer design capacities**

LEGEND	
<span style="color: red;">---</span>	EXISTING PUBLIC FOUL SEWER
<span style="color: orange;">---</span>	EXISTING FOUL SPUR
<span style="color: yellow;">---</span>	EXISTING FOUL DRAINAGE TO BE ABANDONED
<span style="color: blue;">---</span>	EXISTING PUBLIC SURFACE WATER SEWER
<span style="color: green;">---</span>	EXISTING SURFACE WATER SPUR
<span style="color: magenta;">---</span>	EXISTING SURFACE WATER DRAINAGE TO BE ABANDONED



FUTURE COMMERCIAL DEVELOPMENT  
GROSS AREA = 0.63Ha  
NET AREA = 0.56 Ha

NEWHAVEN ROAD DISCHARGE  
DESIGN GROSS CATCHMENT = 1.420Ha  
DESIGN IMPERMEABLE AREA (90% IMP) = 1.2.8Ha  
FUTURE EMPLOYMENT IMPERMEABLE AREA = 0.630Ha  
FUTURE EMPLOYMENT IMPERMEABLE AREA (90% IMP) = 0.56 Ha  
BALANCE IMPERMEABLE AREA FOR RESIDENTIAL = 0.11Ha  
CLIMATE CHANGE ADJUSTMENT 120% 140% = 0.609Ha  
ALLOWABLE IMPERMEABLE AREA = 0.609Ha  
GROSS CATCHMENT (60% IMP) = 1.015Ha

REFER TO DRAWING NO. 0128 2000 WITHIN APPENDIX C FOR DETAILS

EXISTING OUTFALL  
MAXIMUM DISCHARGE  
ALLOWED 12 L/S

REFER TO DRAWING NO. 0128 2000 WITHIN APPENDIX C FOR DETAILS

EXISTING OUTFALL  
MAXIMUM DISCHARGE  
ALLOWED 12 L/S

REFER TO DRAWING NO. 0128 2000 WITHIN APPENDIX C FOR DETAILS

RUDLOE DRIVE DISCHARGE  
DESIGN GROSS CATCHMENT SOUTH OF RUDLOE DRIVE = 2.28Ha  
DESIGN IMPERMEABLE AREA (90% IMP EMPLOYMENT) = 2.052Ha  
RESIDENTIAL IMPERMEABLE AREA SOUTH SIDE = 1.13Ha  
CLIMATE CHANGE ADJUSTMENT 140% 120% = 1.318Ha  
BALANCE IMPERMEABLE AREA FOR NORTH SIDE = 0.34Ha  
CLIMATE CHANGE ADJUSTMENT 120% 140% = 0.629Ha  
ALLOWABLE IMPERMEABLE AREA NORTH SIDE = 0.629Ha  
GROSS CATCHMENT (60%IMP) = 1.048Ha

REFER TO DRAWING NO. 45 WITHIN APPENDIX D AND DRAWING NO. 0128 2000 WITHIN APPENDIX C FOR DETAILS

EXISTING SEVERN TRENT PUBLIC  
SEWERS IN RUDLOE DRIVE

FUTURE RESIDENTIAL DEVELOPMENT SOUTH OF RUDLOE DRIVE  
PLANNING APPLICATION NO. 1101199 OUT

REFER TO DRAWING NO. 45 WITHIN APPENDIX D FOR LAYOUT

RUDLOE DRIVE DISCHARGE  
DESIGN GROSS CATCHMENT = 1.219Ha  
DESIGN IMPERMEABLE AREA (90% IMP) = 1.09 Ha  
EXISTING PUBLIC HOUSE GROSS AREA = 0.465Ha  
PUBLIC HOUSE IMPERMEABLE AREA (90% IMP) = 0.418Ha  
BALANCE IMPERMEABLE AREA FOR RESIDENTIAL = 0.6.9Ha  
CLIMATE CHANGE ADJUSTMENT 120% 140% = 0.582Ha  
ALLOWABLE IMPERMEABLE AREA = 0.582Ha  
GROSS CATCHMENT (60% IMP) = 0.9 Ha

REFER TO DRAWING NO. 0128 2000 WITHIN APPENDIX C FOR DETAILS

EXISTING SWALE PROVIDING  
ATTENUATION FOR RESIDENTIAL  
DEVELOPMENT TO THE EAST

Revision:  
Project: Land North of Rudloe Drive  
Kingsway, Quedleygate  
Client:  
Drawing No: 479-101  
Scale: 1:500 @ A0  
Date: 18/02/2020  
Drawn By: P.A.  
Rev:

Robert Fletcher  
Sewer Design Capacities

Phoenix Design  
Engineering Ltd.  
Units 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

For Approval



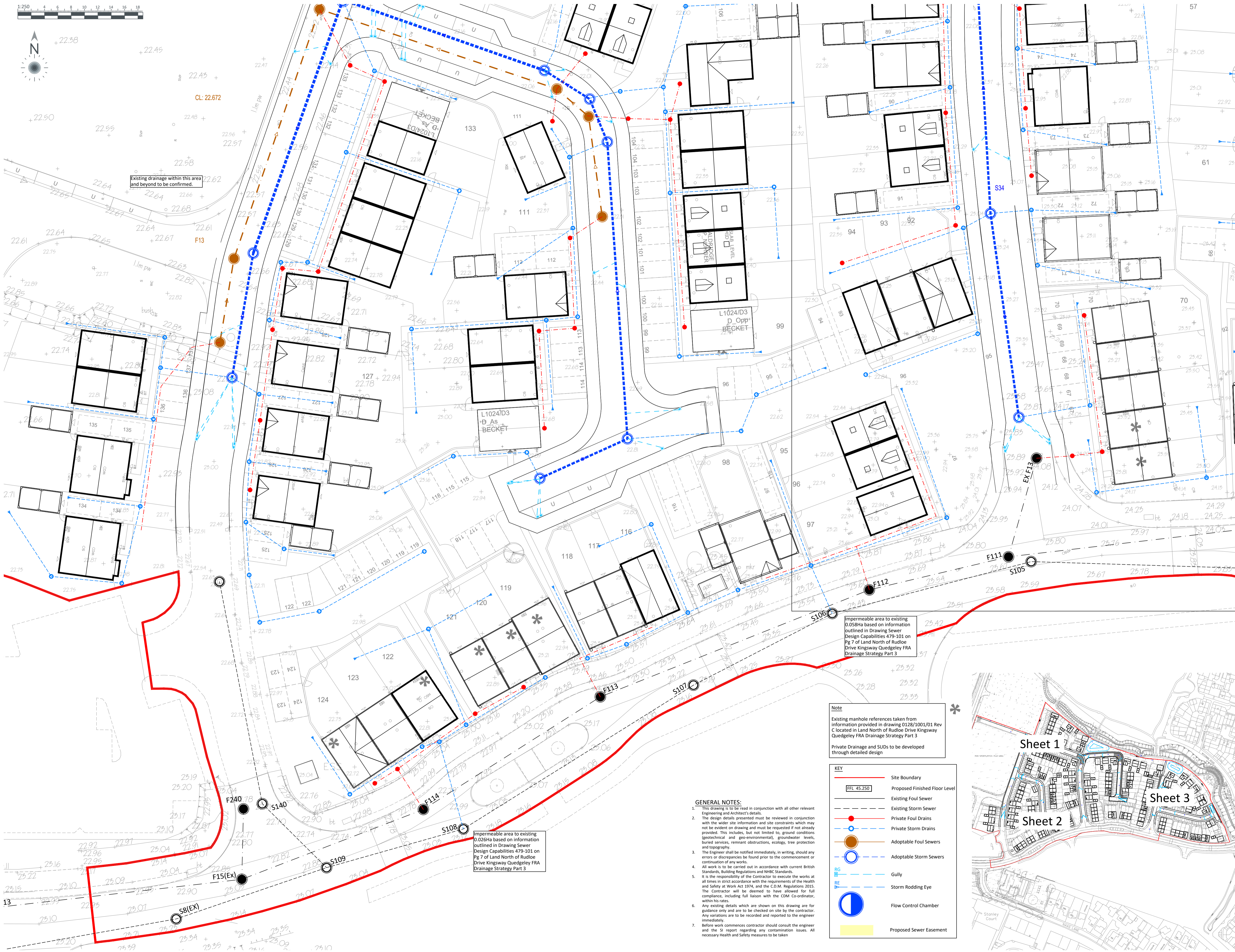
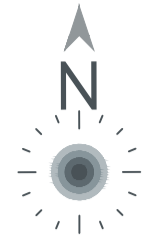
**Appendix C      Phoenix Design Partnerships Ltd. Drawing 479-010**  
**Preliminary Drainage Strategy**





## **Appendix D      PJA Drainage strategy**





Existing drainage within this area and beyond to be confirmed.

CL: 22.672

F13

F240

F15(Ex)

S8(Ex)

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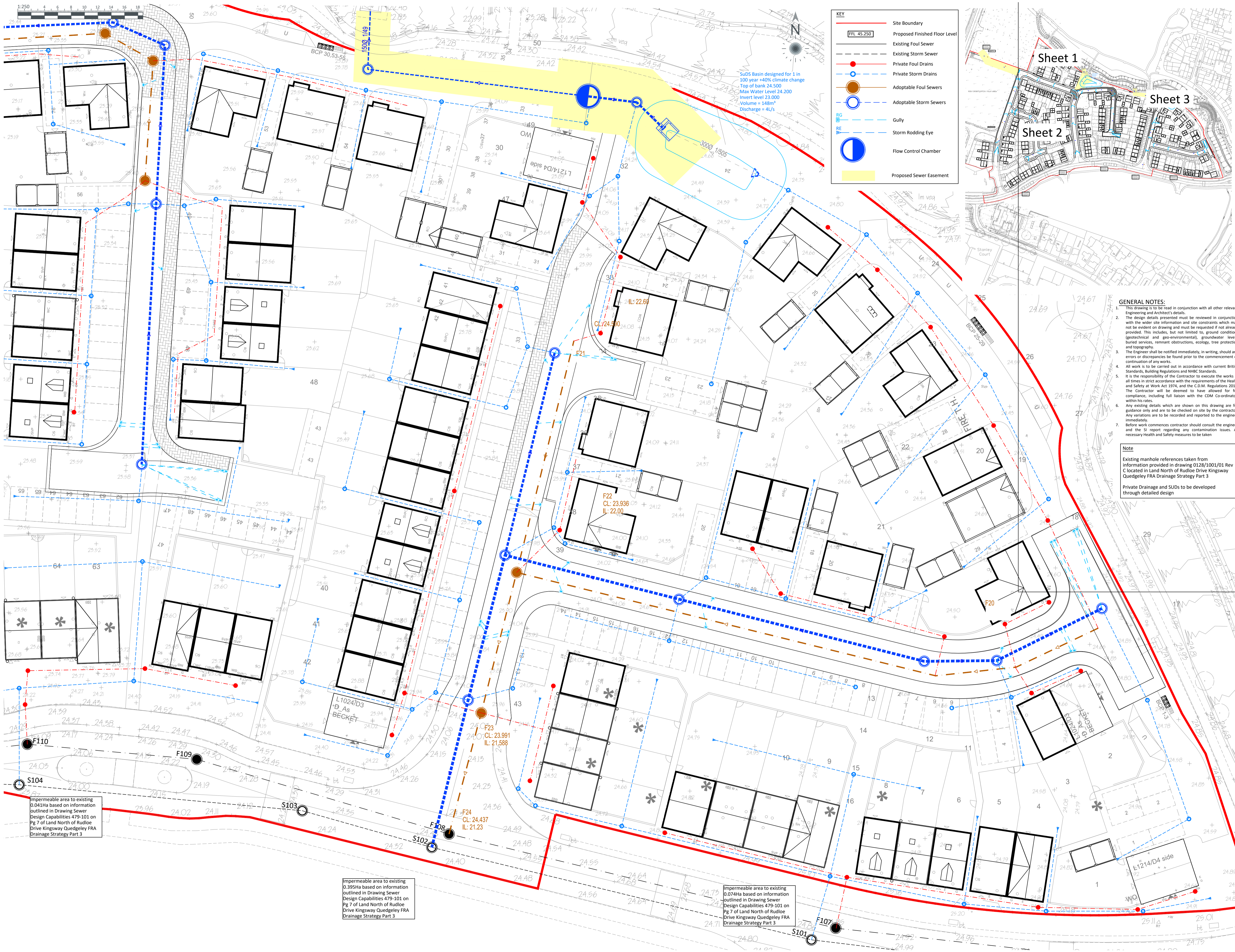
S-201

S-202

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S-205



**KEY**

- Site Boundary
- Proposed Finished Floor Level
- Existing Foul Sewer
- Existing Storm Sewer
- Private Foul Drains
- Private Storm Drains
- Adoptable Foul Sewers
- Adoptable Storm Sewers
- Gully
- Storm Rodding Eye
- Flow Control Chamber
- Proposed Sewer Easement

SuDS Basin designed for 1 in 100 year +40% climate change  
Top of tank 24.500  
Max Water Level 24.200  
Invert level 23.000  
Volume = 148m³  
Discharge = 4l/s

Sheet 1

Sheet 3

Sheet 2

**GENERAL NOTES:**

- This drawing is to be read in conjunction with all other relevant Engineering and Architect's details.
- The design details presented must be reviewed in conjunction with the wider site information and site constraints which may not be evident on drawing and must be requested if not already provided. This includes, but not limited to, ground conditions (geotechnical and geo-environmental), groundwater levels, buried services, remnant obstructions, ecology, tree protection and topography.
- The Engineer shall be notified immediately, in writing, should any errors or discrepancies be found prior to the commencement or continuation of any works.
- All work is to be carried out in accordance with current British Standards, Building Regulations and NHBC Standards. It is the responsibility of the Contractor to execute the works at all times in strict accordance with the requirements of the Health and Safety at Work Act 1974, and the C.D.M. Regulations 2015. The Contractor will be deemed to have allowed for full compliance, including full liaison with the CDM Co-ordinator, within his rates.
- Any existing details which are shown on this drawing are for guidance only and are to be checked on site by the contractor. Any variations are to be recorded and reported to the engineer immediately.
- Before work commences contractor should consult the engineer and the SI report regarding any contamination issues. All necessary Health and Safety measures to be taken.

**Note**

Existing manhole references taken from information provided in drawing 0128/1001/01 Rev C located in Land North of Rudloe Drive Kingsway Quedgeley FRA Drainage Strategy Part 3

Private Drainage and SUDs to be developed through detailed design

These drawings have been produced with reference to the CDM Regulations 2015. Please note that these are pre-construction phase drawings and should be subject to further design risk management as required in accordance with Regulation 9

**DRAINAGE NOTES:**

- Drainage works to start at the outfall connection and work upstream. Any discrepancies of existing invert levels to be reported immediately as this may alter the design.
  - The Contractor shall be responsible for checking all tie-ins for line and level with existing foul and surface water systems before commencing any works.
  - All drainage work is to be strictly in accordance with the requirements of the Building Regulations 2015, Approved Document Part H, "Drainage and waste disposal".
  - All existing land drains encountered on site during construction are to be re-connected.
  - Temporary protection to be provided to drainage work during construction as necessary.
  - Prior to commencing work on the drainage, all existing drains, sewers, manholes and outfalls to remain shall be located, identified and a CCTV condition survey carried out. Where necessary, protection to the existing drainage infrastructure shall be provided.
  - All existing sewers and manholes abandoned due to the proposed works are to be either removed, and suitably backfilled or grouted up.
  - All pipes to be 100 or 110mm dia. and laid at 1 in 80 unless stated otherwise.
  - All concrete is to be in accordance with BS EN 206-1, BS 8500 and the recommendations of BRE Special Digest (Concrete in Aggressive Ground).
  - Unless specified otherwise, in situ concrete shall be designated Mix Gen 3 (Grade C20), or an equivalent mix subject to the approval of the Engineer.
  - The following types of pipe may be used unless noted or agreed otherwise:
    - Pipes up to 300mm diameter to be Structured Wall to BS EN 13476, Polypropylene to BS EN 1852, PVC-U to BS EN 1401 or Vitrified Clay to BS EN 295.
    - Pipes over 300mm diameter to be Concrete to BS 5911, Structured Wall to BS EN 13476, Polypropylene to BS EN 1852 or PVC-U to BS EN 1401.
  - Both Clay and Concrete pipes shall be strength class 120 (100/150mm min crushing strength 28kN/m). Thermoplastic pipes shall have a minimum ring stiffness of SNA.
  - Pipes which run adjacent to buildings shall be installed in strict accordance with Part H, Clauses 2.23 to 2.25, Diagrams 7 and 8 are of particular relevance and shall be complied with.
  - All pipes, chambers and fittings shall be installed, bedded and backfilled in accordance with the manufacturers instructions subject to the following minimum requirements table.
- | Location                  | Cover to crown | Bedding            | Bedding        | Backfill                  |
|---------------------------|----------------|--------------------|----------------|---------------------------|
|                           |                | Clay/Concrete Pipe | Plastic Pipe   |                           |
| Roads (HDV)               | +1.2m          | Class A (Concrete) | Class S (HDPE) | Type 1 Granular           |
|                           | +0.3m          | Class A (Concrete) | Class S (HDPE) | Type 1 Granular           |
| Drives / car parking      | +0.9m          | Class A (Concrete) | Class S (HDPE) | Type 1 Granular           |
|                           | +0.9m          | Class A (Concrete) | Class S (HDPE) | Type 1 Granular           |
| Hard and soft Landscaping | +0.6m          | Class S (Concrete) | Class S (HDPE) | Suitable as stip material |
|                           | +0.6m          | Class S (Concrete) | Class S (HDPE) | Suitable as stip material |
- Pipes Penetrating Walls:
    - An opening is to be formed through walls to give pipes at least 50mm clearance all round. Brickwork over shall be supported by a lintel. Opening to be masked each side with rigid sheet material.
    - Pipes embedded in walls shall have joints formed within 150mm of either wall face. Adjacent rocker pipes of max 600mm length with flexible joints shall continue the pipework.
  - All pipes beneath buildings to be B&S in concrete. Where cover is less than 300mm the concrete is to be cast integrally with the floor slab.
  - All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NHBC Practice Note 3.
  - Ventilation shall be provided at the head of the foul drainage runs.
  - The first flexible joint in pipes adjoining a manhole shall be a maximum length of 600mm from the inside face of the manhole, connecting to a rocker pipe. The length of the rocker pipe shall be as follows:

Pipe Dia	Length of Rocker Pipe
150-600mm	600mm
675-750mm	1000mm
over 750mm	1200mm
  - All manholes and inspection chambers situated in areas subject to vehicular loading to have class D400 covers and frames to BS EN124 and those not subject to vehicular loading may have class B125 covers and frames.
  - Manholes located within block paved areas to have 150mm deep cover frames and bedded suitable for the size of blocks in use. The concrete haunching is NOT to be broken out to allow for block paving installation.
  - Drainage frames must be tied to manhole risers by use of manufacturers ties (eg. Polyprop ref FRK500 fixing kit and FRK501 black ties). The ground works contractor will be held fully responsible for any accidents due to incorrect fitting or failure to use the correct manufacturers fixing equipment.
  - Cover levels for manholes are approximate only and should be adjusted to match surrounding levels.
  - All works to sewers/ manholes being offered for adoption or on existing public sewers should be in accordance with "Sewers for Adoption, current Edition" and the Adopting Water Authority's recommendations.
  - Requirement for Land Drains to be assessed on site by the Site Manager.
  - Road gullies shall be trapped 4500 x 900mm deep with Class D 400 frame and grating to BS EN 124.
  - All manholes, pipe trenches etc. to be backfilled with imported granular fill to Class GF1-GF5 (Capping material) to (SHW) Table 6/1 & compacted in accordance with Table 6/4.
  - All pipelists shall be tested both before and after backfilling, using either air test or water test, in accordance with BS EN 1610.

**PRELIMINARY SCHEME**

For comment and review only.  
Design is based upon information available at the time. Design is subject to full review as additional information becomes available.  
Design is subject to full review upon receipt of comments from:

- Development Control
- LA Planning Authority
- Environment Agency
- LA Highways Department
- Sewerage Undertaker

PI 150722 Updated for drainage technical note. SWJ

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Exeter - London - Reading  
pij.co.uk

**Linden HOMES**

**DRAWING TITLE**

**DRAWING ISSUE STATUS**

**INFORMATION**

PJA JOB NO. SUB-CODE DRAWING NO. REVISION

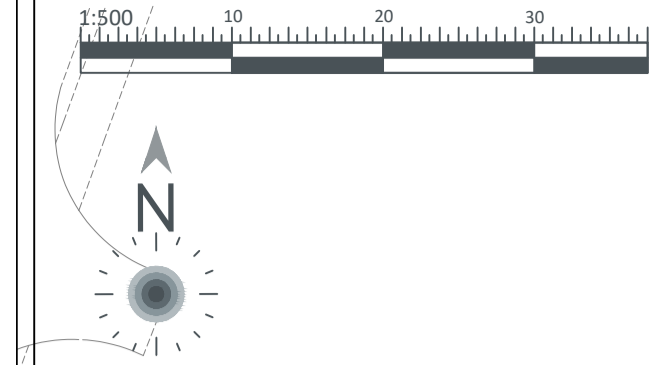
Revision Letter: P - Prelim / A - Approval / T - Tender / C - Construction

FOR DRAWING REFERENCE

SCALE DRAWN REVIEWED DATE

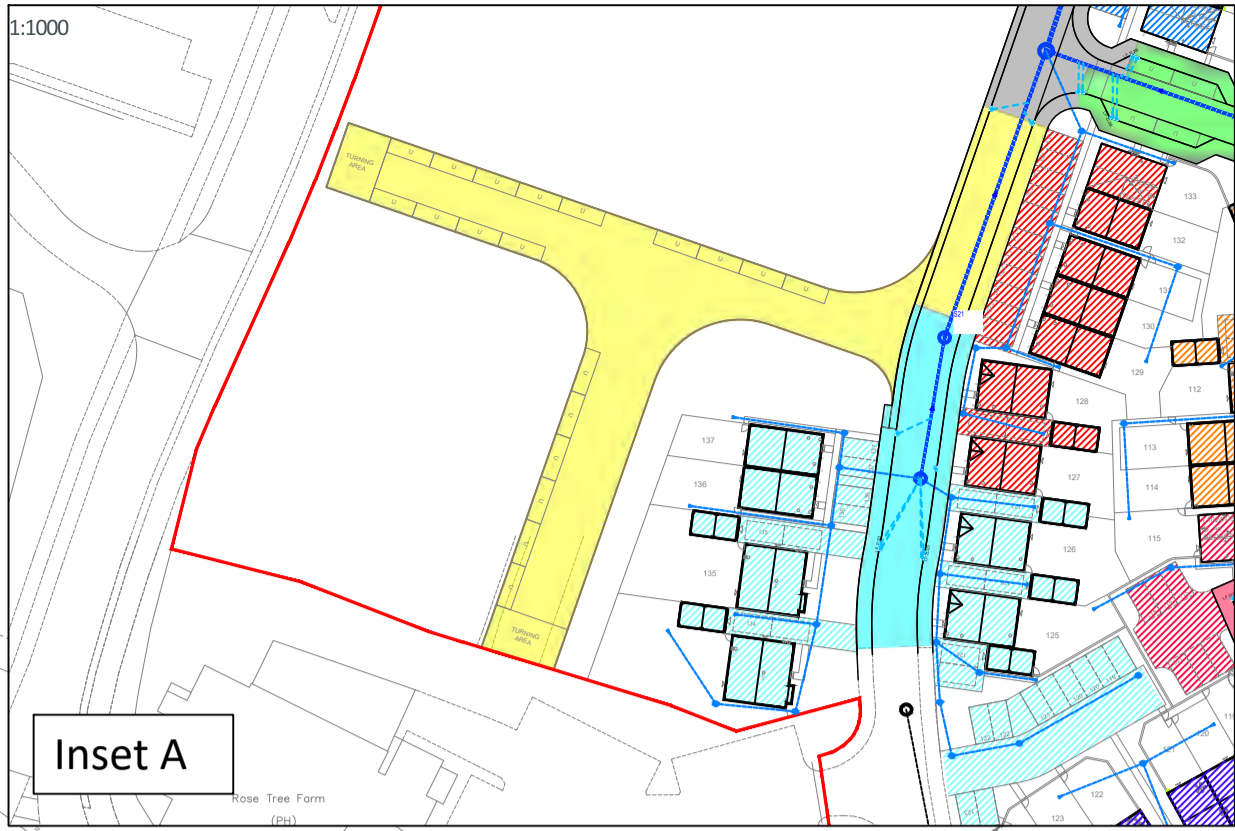


## **Appendix E      PJA Drainage catchment plan**



Sewers in Newhaven Road flow from south to north, out-falling in balancing pond 5 of the overall site wide drainage strategy. Sewers in Newhaven Road take flows from upstream sewers located within Rudloe Drive.

The total impermeable discharged to the existing network by this location is 1.607 ha compared with an allowable 1.820 ha.



Connections to Existing						
MH	Road	Area (m <sup>2</sup> ) House/drive	Area (Ha) Combined	UC - 6%	Area (m <sup>2</sup> )	Area (Ha)
S101	0	743	0.074	787.58	787.58	0.079
S104	0	408	0.041	432.48	432.48	0.043
S106	0	575	0.058	609.5	609.5	0.061
S108	0	259	0.026	274.54	274.54	0.027
S140	0	0	0.000	0	0	0.000
Total	0	1985	0.199	2104.1	2104.1	0.210

Surface Water Network 1 (Pond RHS)						
Pipe	Road	Area (m <sup>2</sup> ) House/drive	Area (Ha) Combined	UC - 6%	Area (m <sup>2</sup> )	Area (Ha)
1.000	0	1294	0.129	1371.64	1371.64	0.137
1.001	0	0	0.000	0	0	0.000
1.002	0	294	0.029	311.64	311.64	0.031
1.003	0	742	0.074	786.52	786.52	0.079
1.004	0	0	0.000	0	0	0.000
Total	0	2330	0.233	2469.8	2469.8	0.247

Surface Water Network 2 (Rudloe Drive Manhole S102)						
Pipe	Road	Area (m <sup>2</sup> ) House/drive	Area (Ha) Combined	UC - 6%	Area (m <sup>2</sup> )	Area (Ha)
1.000	340	245	0.059	259.7	599.7	0.060
1.001	193	254	0.045	269.24	462.24	0.046
1.002	208	0	0.021	0	208	0.021
1.003	197	619	0.082	656.14	853.14	0.085
2.000	237	352	0.059	373.12	610.12	0.061
1.004	479	219	0.070	232.14	711.14	0.071
1.005	0	611	0.061	647.66	647.66	0.065
Total	1654	2300	0.395	2438	4092	0.409

Surface Water Network 3 (Newhaven Road)						
Pipe	Road	Area (m <sup>2</sup> ) House/drive	Area (Ha) Combined	UC - 6%	Area (m <sup>2</sup> )	Area (Ha)
1.000	261	202	0.046	214.12	475.12	0.048
1.001	277	250	0.053	265	542	0.054
1.002	111	380	0.049	402.8	513.8	0.051
1.003	0	845	0.085	895.7	895.7	0.090
1.004	465	109	0.057	115.54	580.54	0.058
2.000	429	1139	0.157	1207.34	1636.34	0.164
2.001	1495	0	0.150	0	1495	0.150
1.005	657	609	0.127	645.54	1302.54	0.130
3.000	600	515	0.112	545.9	1145.9	0.115
1.006	179	1606	0.179	1702.36	1881.36	0.188
1.007	0	0	0.000	0	0	0.000
Total	4474	5655	1.013	5994.3	10468.3	1.047

Surface Water network 4 (LHS Pond)						
Pipe	Road	Area (m <sup>2</sup> ) House/drive	Area (Ha) Combined	UC - 6%	Area (m <sup>2</sup> )	Area (Ha)
1.000	372	397	0.077	420.82	792.82	0.079
1.001	245	937	0.118	993.22	1238.22	0.124
1.002	0	0	0.000	0	0	0.000
1.003	241	0	0.024	0	241	0.024
1.004	0	349	0.035	369.94	369.94	0.037
1.005	62	0	0.006	0	62	0.006
2.000	199	251	0.045	266.06	465.06	0.047
2.001	225	455	0.068	482.3	707.3	0.071
2.002	315	789	0.110	836.34	1151.34	0.115
2.003	336	358	0.069	379.48	715.48	0.072
1.006	0	0	0.000	0	0	0.000
3.000	0	0	0.000	0	0	0.000
1.007	0	264	0.026	279.84	279.84	0.028
Total	1995	3800	0.580	4028	6023	0.602

RTS PITCH / PLAY AREA

Refer to Inset A for view of existing road catchment. Existing drainage within this area to be confirmed.

Existing sewers in Rudloe Drive flow from east to west towards Newhaven Road. Once in Newhaven Road, the sewers flow from south to north towards balancing pond 5.

Proposed catchment discharging to Rudloe Drive sewers is 0.594 ha compared to an allowable area of 1.211 ha.

These drawings have been produced with reference to the CDM Regulations 2015. Please note that these are pre-construction phase drawings and should be subject to further design risk management as required in accordance with Regulation 9

**GENERAL NOTES:**

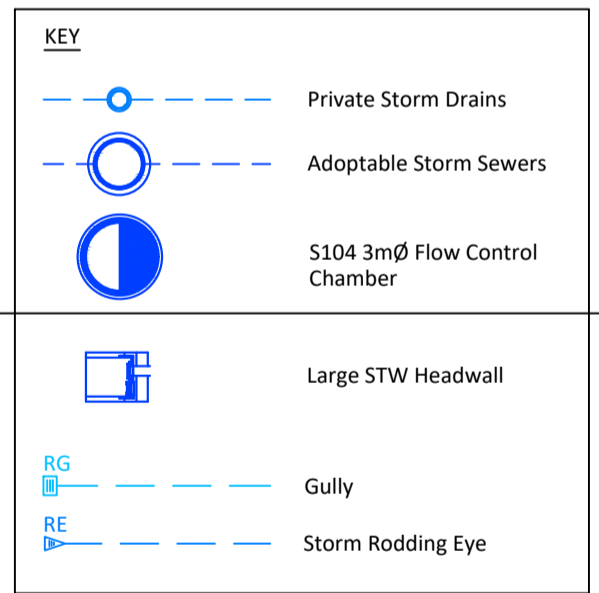
- This drawing is to be read in conjunction with all other relevant Engineering and Architect's details.
- The design details presented must be reviewed in conjunction with the wider site information and site constraints which may not be evident on drawing and must be requested if not already provided. This includes, but not limited to, ground conditions (geotechnical and geo-environmental), groundwater levels, buried services, remnant obstructions, ecology, tree protection and topography.
- The Engineer shall be notified immediately, in writing, should any errors or discrepancies be found prior to the commencement or continuation of any works.
- All work is to be carried out in accordance with current British Standards, Building Regulations and HSE Standards.
- It is the responsibility of the Contractor to execute the works at all times in strict accordance with the requirements of the Health and Safety at Work Act 1974, and the CDM Regulations 2015. The Contractor will be deemed to have allowed for full compliance, including full liaison with the CDM Co-ordinator, within his rates.
- Any existing details which are shown on this drawing are for guidance only and are to be checked on site by the contractor. Any variations are to be recorded and reported to the engineer immediately.
- Before work commences contractor should consult the engineer and the SI report regarding any contamination issues. All necessary Health and Safety measures to be taken.

**ADOPTABLE DRAINAGE NOTES:**

- This drawing is subject to approval by Local Authority, Building Control and / or Sewerage Undertaker. Any works undertaken prior to the granting of these approvals is carried out at at risk to others.
- Prior to commencing work on the drainage, all existing drains, sewers manholes and outfalls to remain shall be located, identified and a CCTV condition survey carried out. Where necessary, protection to the existing drainage infrastructure shall be provided.
- All existing sewers and manholes abandoned due to the proposed works are to be either removed, and suitably backfilled or grouted up.
- All manhole covers to comply with BS EN 124, and be kitemarked, adjusted to match surrounding levels.
- Cover levels for manholes are approximate only and should be adjusted to match surrounding levels.
- In block paved areas 'tuff' type covers should not be used, and frames must be 150mm deep.
- All manhole and drainage covers shall comply with BS EN124, BS EN 1338-1 and WADADON.
- Cover strengths to be:  
Class F500 in areas of heavy loading.  
Class D400 in all trafficked areas (roads, hard shoulder, parking areas and services yards).  
Manhole covers on foul only sewers shall be of low leakage types in order to prevent excessive surface water ingress.  
Drainage pipes 100mm Ø unless stated otherwise.
- Pipes to be -  
Vitrified clay to BS EN 295 or Concrete to BS 5911 or UPVC pipes to BS EN 1452 or Thermoplastic Structured wall pipes complying with WIS 4-35-01. BSI kitemarked. Class 8kN/m<sup>2</sup> nominal short term stiffness.
- All sewer pipes 300mm diameter or larger, to be concrete pipes, to BS 5911, unless noted otherwise.
- All pipes to be laid with soffit level, unless noted otherwise.
- Where cover to pipes is less than 1200mm under carriageway - concrete bed and surround or concrete protection slab is required.
- All concrete to drainage, manholes bases, surrounds etc to be in accordance with the BRE special digest 1 - Concrete in aggressive ground. Refer to site investigation report for sulphate requirements.
- All manholes, pipe trenches etc. to be backfilled with imported granular fill to Class SP1-65 (Capping material) to (SWH) Table 6/4 & compacted in accordance with Table 6/4.
- All pipelines shall be tested both before and after backfilling, using either air test or water test, in accordance with BS EN 1610. Upon completion of the drainage works all drains shall be flushed out and CCTV surveyed and shown to be free of all silt and debris and to have no joint displacements or other defects. A copy of the written report and video is to be forwarded to the Engineers for comment. Any defects shall be attributable to the contractor for rectification unless indicated otherwise by the CCTV report and agreed with the Engineers.
- Demarcation manholes and lateral drains need to be constructed in accordance with the Water UK/WRC "Design and Construction Guidance".
- All works to sewer/ manholes being offered for adoption or on existing public sewers should be in accordance with "Design and Construction Guidance" and the Adopting Water Authority's recommendations.

**PRELIMINARY SCHEME**  
For comment and review only.  
Design is based upon information available at the time.  
Design is subject to full review as additional information becomes available.  
Design is subject to full review upon receipt of comments from

- Development Control
- LA Planning Authority
- Environment Agency
- LA Highways Department
- Sewerage Undertaker



PI 15.07.22 Updated for revised drainage layout. SWJ

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**CLIENT**

**Linden HOMES**

**PROJECT**

**Rudloe Drive Quedgeley**

**DRAWING TITLE**

**Area Contribution Plan**

**DRAWING ISSUE STATUS**

**INFORMATION**

PJA JOB No. SUB-CODE DRAWING NO. REVISION

06396 0405 PI

Revision Letter: P - Prelim / A - Approval / Y - Tender / C - Construction

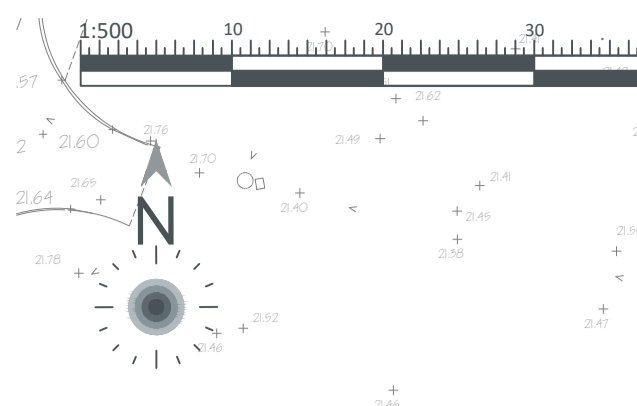
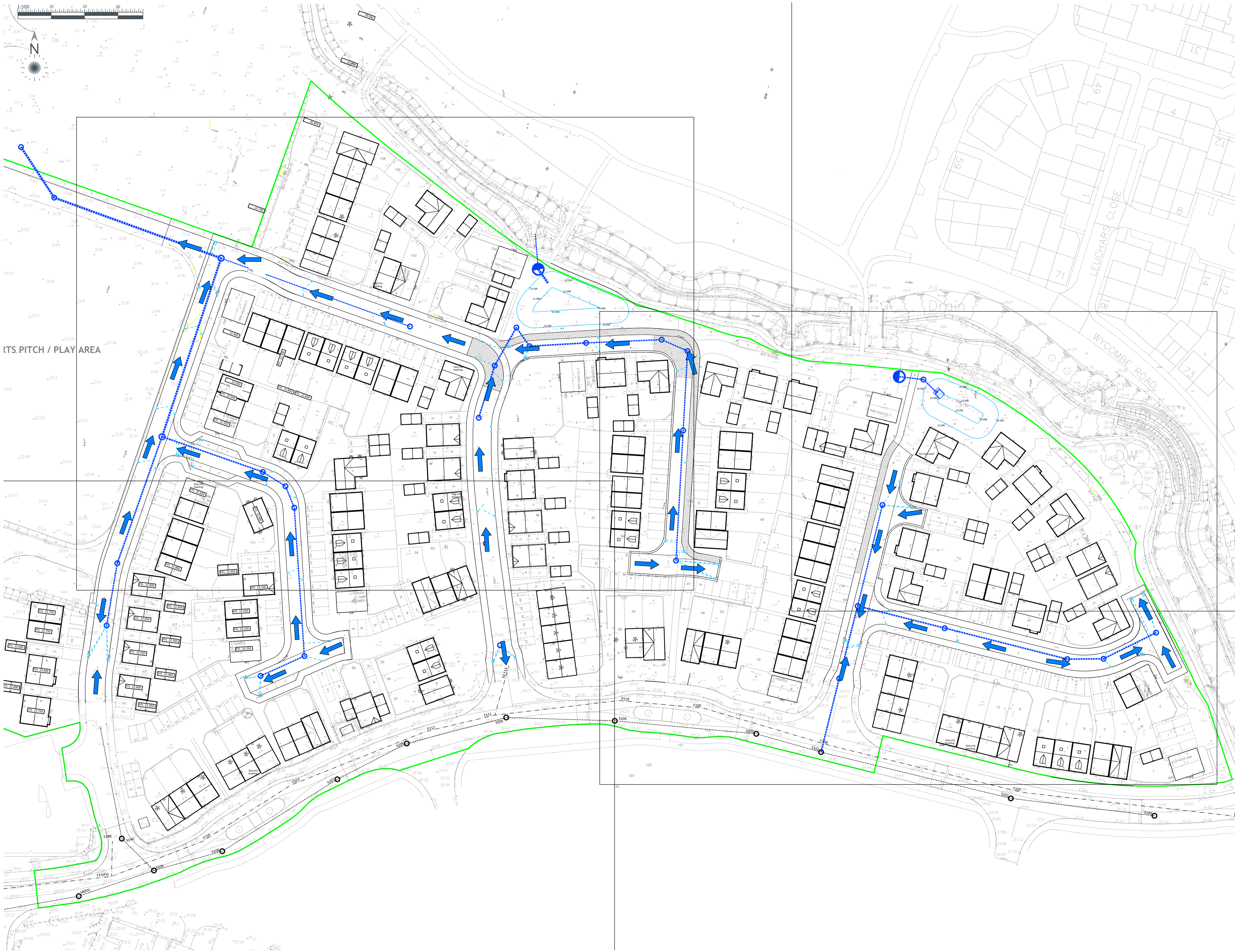
**RDQUE-PJA-XX-D2-Y-0405-00**

SCALE DRAWN REVIEWED DATE

A1@



## **Appendix F      PJA Flood routing plan**



These drawings have been produced with reference to the CDM Regulations 2015. Please note that these are pre-construction phase drawings and should be subject to further design risk management as required in accordance with Regulation 9

- GENERAL NOTES:**
- This drawing is to be read in conjunction with all other relevant Engineering and Architect's details.
  - The design details presented must be reviewed in conjunction with the wider site information and site constraints which may not be evident on drawing and must be requested if not already provided. This includes, but not limited to, ground conditions (geotechnical and geo-environmental), groundwater levels, buried services, remnant obstructions, ecology, tree protection and topography.
  - The Engineer shall be notified immediately, in writing, should any errors or discrepancies be found prior to the commencement or continuation of any works.
  - All work is to be carried out in accordance with current British Standards, Building Regulations and NHBC Standards.
  - It is the responsibility of the Contractor to execute the works at all times in strict accordance with the requirements of the Health and Safety at Work Act 1974, and the C.D.M. Regulations 2015. The Contractor will be deemed to have allowed for full compliance, including full liaison with the CDM Co-ordinator, within his rates.
  - Any existing details which are shown on this drawing are for guidance only and are to be checked on site by the contractor. Any variations are to be recorded and reported to the engineer immediately.
  - Before work commences contractor should consult the engineer and the SI report regarding any contamination issues. All necessary Health and Safety measures to be taken

- PRELIMINARY SCHEME**  
For comment and review only.  
Design is based upon information available at the time.  
Design is subject to full review as additional information becomes available.  
Design is subject to full review upon receipt of comments from
- Development Control
  - LA Planning Authority
  - Environment Agency
  - LA Highways Department
  - Sewerage Undertaker

- ADOPTABLE DRAINAGE NOTES:**
- This drawing is subject to approval by Local Authority, Building Control and / or Sewerage Undertaker. Any works undertaken prior to the granting of these approvals is carried out at risk to others.
  - Prior to commencing work on the drainage, all existing drains, sewers, manholes and outfalls to remain shall be located, identified and a CCTV condition survey carried out. Where necessary, protection to the existing drainage infrastructure shall be provided.
  - All existing sewers and manholes abandoned due to the proposed works are to be either removed, and suitably backfilled or grouted up.
  - All manhole covers to comply with BS EN 124, and be Kitemarked.
  - Cover levels for manholes are approximate only and should be adjusted to match surrounding levels.
  - In block paved areas 'infill' type covers should not be used, and frames must be 150mm deep.
  - All manhole and drainage covers shall comply with BS EN124, BS EN13598-1 and HA104/09.  
Cover strengths to be:  
Class E600 in areas of heavy loading.  
Class D400 in all trafficked areas (roads, hard shoulder, parking areas and services yards).  
Manhole covers on foul only sewers shall be of low leakage types.
  - Drainage pipes 100mm Ø unless stated otherwise.  
Pipes to be:  
Verified clay to BS EN 295 or Concrete to BS 5911 or UPVC pipes to BS EN 1452 or Thermoplastic Structured wall pipes complying with WS 4-35-01, BS kitemarked. Class 800kN/m² nominal short term ring stiffness.
  - All sewer pipes 300mm diameter or larger, to be concrete pipes, to BS 5911, unless noted otherwise.
  - All pipes to be laid with soffits level, unless noted otherwise.
  - Where cover to pipes is less than 1200mm under carriage way, concrete bed and surround or concrete protection slab is required.
  - All concrete to drainage, manholes bases, surrounds etc to be in accordance with the BRE special digest 1 - Concrete in aggressive ground. Refer to site investigation report for sulphate requirements.
  - All manholes, pipe trenches etc. to be backfilled with imported granular fill to Class 6F1-6F5 (Capping material) to (SHW) Table 10 of BS 5911, unless noted otherwise.
  - Manhole covers to be backfilled, using either air test or water test, in accordance with BS EN 1610.
  - Upon completion of the drainage works all drains shall be flushed out and CCTV surveyed and shown to be free of all silt and debris and to have no joint displacements or other defects. A copy of the written report and video is to be forwarded to the Engineers for comment. Any defects shall be attributable to the contractor for rectification unless indicated otherwise by the CCTV report and agreed with the Engineers.
  - Demolition of existing structures to be constructed in accordance with the Water UK WRC 'Design and Construction Guidance'.
  - All works to sewers/ manholes being offered for adoption or on existing public sewers should be in accordance with 'Design and Construction Guidance' and the Adopting Water Authority's recommendations

**KEY**

- 06396 RG Adoptable Storm Sewers
- 0402 P.I. Adoptable Storm Sewers
- RDQUE-PIA-XX-D2-Y-0402-00 Flow Control Chamber
- FFL 45.250 Proposed Finished Floor Level
- Site Boundary
- Flow Direction Arrow
- Major Contour

PI 01.07.22 Updated to latest site layout and levels design OB

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Exeter - London - Reading  
pij.co.uk

**CLIENT**  
**Linden HOMES**

**PROJECT**  
**Highway Road Gully**

**DRAWING TITLE**  
**INFORMATION**

PIA JOB No.	SUB-CODE	DRAWING NO.	REVISION

Revision Letter / P - Prelim / A - Approval / T - Tender / C - Construction  
BIM DRAWING REFERENCE

SCALE	DRAWN	REVIEWED	DATE

# Land North of Rudloe Drive, Kingsway, Gloucester

## Consolidated Schedule of Plans for Approval

## Reserved Matters Submission 22/00553/REM

## Outline Planning Permission (21/00490/OUT)

Consultant	Title	Reference	Date Submitted
Nexus	Affordable Housing Statement		27/05/2022
Nexus	Waste Minimisation Statement		27/05/2022
Nexus	CIL – Additional Information Form		27/05/2022
McBains	Design Compliance Statement		27/05/2022
AES	Energy and Sustainability Statement		02/09/2022
LF Acoustics	Noise Assessment		27/05/2022
Lighting Reality	Outdoor Lighting Report	433-201	27/05/2022
McBains	Site Location Plan	RDQUE MCB ZZ ZZ DR A 0201 P1	27/05/2022
McBains	Site Layout Plan	RDQUE MCB ZZ ZZ DR A 0230 P2	02/09/2022
McBains	Materials and Boundaries Plan	RDQUE MCB ZZ ZZ DR A 0231 P2	02/09/2022
McBains	Surface Finishes Plan	RDQUE MCB ZZ ZZ DR A 0232 P2	02/09/2022
McBains	Parking Strategy Plan	RDQUE MCB ZZ ZZ DR A 0233 P2	02/09/2022
McBains	Affordable Tenure Plan	RDQUE MCB ZZ ZZ DR A 0234 P2	02/09/2022
McBains	Adoptable Management Plan	RDQUE MCB ZZ ZZ DR A 0235 P2	02/09/2022
McBains	Refuse Strategy Plan	RDQUE MCB ZZ ZZ DR A 0236 P2	02/09/2022
McBains	Illustrative Streetscenes	RDQUE MCB ZZ ZZ DR A 0250 P2	02/09/2022
McBains	Knightley	RDQUE MCB ZZ ZZ DR A 0105 P2	02/09/2022
McBains	Knightley	RDQUE MCB ZZ ZZ DR A 0106 P2	02/09/2022
McBains	Elmslie	RDQUE MCB ZZ ZZ DR A 0107 P2	02/09/2022
McBains	Elmslie	RDQUE MCB ZZ ZZ DR A 0108 P2	02/09/2022
McBains	Leverton	RDQUE MCB ZZ ZZ DR A 0109 P2	02/09/2022

McBains	Pembroke	RDQUE MCB ZZ ZZ DR A 0110 P2	02/09/2022
<del>McBains</del>	<del>Myline</del>	<del>RDQUE MCB ZZ ZZ DR A 0111 P1</del>	<del>27/05/2022</del>
McBains	Becket	RDQUE MCB ZZ ZZ DR A 0112 P2	02/09/2022
<del>McBains</del>	<del>Becket</del>	<del>RDQUE MCB ZZ ZZ DR A 0113 P1</del>	<del>27/05/2022</del>
McBains	Becket	RDQUE MCB ZZ ZZ DR A 0114 P2	02/09/2022
<del>McBains</del>	<del>Cartwright</del>	<del>RDQUE MCB ZZ ZZ DR A 0115 P1</del>	<del>27/05/2022</del>
McBains	Alwin	RDQUE MCB ZZ ZZ DR A 0116 P2	02/09/2022
McBains	Alwin	RDQUE MCB ZZ ZZ DR A 0117 P2	02/09/2022
McBains	Alwin	RDQUE MCB ZZ ZZ DR A 0118 P2	02/09/2022
McBains	Alwin	RDQUE MCB ZZ ZZ DR A 0119 P2	02/09/2022
McBains	Aldridge	RDQUE MCB ZZ ZZ DR A 0120 P2	02/09/2022
McBains	Harford	RDQUE MCB ZZ ZZ DR A 0121 P2	02/09/2022
McBains	Knightley	RDQUE MCB ZZ ZZ DR A 0122 P1	02/09/2022
McBains	Knightley	RDQUE MCB ZZ ZZ DR A 0123 P1	02/09/2022
McBains	Leverton	RDQUE MCB ZZ ZZ DR A 0124 P1	02/09/2022
McBains	Leverton	RDQUE MCB ZZ ZZ DR A 0125 P1	02/09/2022
McBains	Becket	RDQUE MCB ZZ ZZ DR A 0126 P1	02/09/2022
McBains	Becket	RDQUE MCB ZZ ZZ DR A 0127 P1	02/09/2022
McBains	Aldridge	RDQUE MCB ZZ ZZ DR A 0128 P1	02/09/2022
McBains	Ashbee	RDQUE MCB ZZ ZZ DR A 0129 P1	02/09/2022
McBains	Ashbee	RDQUE MCB ZZ ZZ DR A 0130 P1	02/09/2022
McBains	Foulston	RDQUE MCB ZZ ZZ DR A 0131 P1	02/09/2022
McBains	Foulston	RDQUE MCB ZZ ZZ DR A 0132 P1	02/09/2022
McBains	Becket	RDQUE MCB ZZ ZZ DR A 0133 P1	02/09/2022
McBains	Windows Reveal and Tax Windows Details	RDQUE MCB ZZ ZZ DR A 0150 P1	02/09/2022
McBains	AF1 Maisonette	RDQUE MCB ZZ ZZ DR A 0140 P2	02/09/2022
McBains	Asher	RDQUE MCB ZZ ZZ DR A 0141 P2	02/09/2022
McBains	Asher	RDQUE MCB ZZ ZZ DR A 0142 P2	02/09/2022

McBains	Asher	RDQUE MCB ZZ ZZ DR A 0143 P2	02/09/2022
McBains	Cooper	RDQUE MCB ZZ ZZ DR A 0144 P2	02/09/2022
McBains	Cooper	RDQUE MCB ZZ ZZ DR A 0145 P2	02/09/2022
McBains	Speirs	RDQUE MCB ZZ ZZ DR A 0146 P2	02/09/2022
McBains	Speirs	RDQUE MCB ZZ ZZ DR A 0147 P2	02/09/2022
McBains	Asher	RDQUE MCB ZZ ZZ DR A 0148 P2	02/09/2022
McBains	Asher	RDQUE MCB ZZ ZZ DR A 0149 P1	02/09/2022
McBains	Single and Double Garages	RDQUE MCB ZZ ZZ DR A 0160 P1	27/05/2022
McBains	Single and Double Garages - Plots 31, 32, 56	RDQUE MCB ZZ ZZ DR A 0161 P2	02/09/2022
McBains	Carport	RDQUE MCB ZZ ZZ DR A 0162 P1	02/09/2022
Rappor	Visibility Assessment	22-0196-SK01E	02/09/2022
Rappor	Onsite Swept Path Analysis - Refuse Vehicle	22-0196-SP01E	02/09/2022
Rappor	Onsite Swept Path Analysis - Fire Tender	22-0196-SP02E	02/09/2022
Rappor	Onsite Swept Path Analysis - Panel Van	22-0196-SP03E	02/09/2022
Rappor	Onsite Swept Path Analysis - Estate Car	22-0196-SP04E	02/09/2022
IDP	General Arrangement 2 and 3	LA5530-001 A	02/09/2022
IDP	Planting Plan 1 of 3	LA5530-002 A	02/09/2022
IDP	Planting Plan 2 of 3	LA5530-003 A	02/09/2022
IDP	Planting Plan 3 of 3	LA5530-004 A	02/09/2022
IDP	Landscape Specification & Management Plan 2 and 3	LA5530-LSMP-01	27/05/2022
MHP	Arboricultural Survey, Impact Assessment and Protection Plan (V1)		27/05/2022
PJA	External Levels (Sheet 1 of 3)	RDQUE-PJA-XX-D2-Y-0100-00 – P1	02/09/2022
PJA	External Levels (Sheet 2 of 3)	RDQUE-PJA-XX-D2-Y-0101-00 – P1	02/09/2022
PJA	External Levels (Sheet 3 of 3)	RDQUE-PJA-XX-D2-Y-0102-00 – P1	02/09/2022
PJA	Drainage Strategy (Sheet 1 of 3)	(RDQUE-PJA-XX-D2-Y-0103-00 – P1	02/09/2022
PJA	Drainage Strategy (Sheet 2 of 3)	RDQUE-PJA-XX-D2-Y-0104-00 – P1	02/09/2022
PJA	Drainage Strategy (Sheet 3 of 3)	RDQUE-PJA-XX-D2-Y-0105-00 – P1	02/09/2022

PJA	S38 Agreement Plan	RDQUE-PJA-XX-D2-Y-0300-00 – P1	02/09/2022
PJA	S104 Agreement Plan	RDQUE-PJA-XX-D2-Y-0401-00 – P2	02/09/2022
PJA	Flood Routing Plan	RDQUE-PJA-XX-D2-Y-0402-00 – P2	02/09/2022
PJA	Area Contribution Plan	RDQUE-PJA-XX-D2-Y-0405-00	27/05/2022
PJA	Storm Sewer Design (Network 1)		27/05/2022
PJA	Storm Sewer Design (Network 4)		27/05/2022
PJA	Pond Cross Sections (Sheet 1 of 2)	RDQUE-PJA-XX-D2-Y-0416-00 –P0	02/09/2022
PJA	Pond Cross Sections (Sheet 2 of 2)	RDQUE-PJA-XX-D2-Y-0417-00 - P0	02/09/2022
PJA	Technical Note Drainage Strategy	06396	02/09/2022
PJA	Preliminary Drainage Strategy (App.C)	06396	02/09/2022
PJA	2022.09.01 SW Network 1 Calcs		02/09/2022
PJA	2022.09.01 SW Network 2 Calcs		02/09/2022
PJA	2022.09.01 SW Network 3 Calcs		02/09/2022
PJA	2022.09.01 SW Network 4 Calcs		02/09/2022
Lighting Reality	Street Lighting Layout	433_001	27/05/2022
Lighting Reality	Street Lighting Schedule	433_101	27/05/2022

# Rudloe Drive: Consultation Responses

Reference: 22/00553/REM

02/09/2022

Issues Raised	Comments
<b>City Archaeologist: 26<sup>th</sup> May 2022</b>	
<p>My comments here relate only to the areas of green space in the west of the site where a football pitch, dugouts and a LEAP are proposed. These areas have not yet been subject to archaeological investigation, but adjacent plots to the east and south have produced extensive evidence for Iron Age and Roman activity – which is likely to extend into this area. The archaeology is also very shallow in this general area – about 40cm below ground level. I understand that, according to the City Council’s New Housing and Open Space Strategy the ‘preparation of grass playing pitches will involve seeding, top soiling, grading and drainage’ so there will be a need for groundworks which could damage archaeological remains.</p> <p>In light of that context I am concerned that ground works associated with the proposed development have the potential to damage or destroy heritage assessments with archaeological interest. There, should you be minded to grant permission for this application I would ask that the following conditions be attached:</p> <p><b>SC45 Archaeological Written Scheme of Investigation- Submission of Details</b></p> <p>No demolition or development shall start within the application site until a written scheme of investigation of archaeological remains, including a timetable for the investigation, has been submitted to and approved in writing by the local planning authority. The scheme shall include an assessment of significance and research questions; and:</p> <p>a) The programme and methodology of site investigation and recording.</p> <p>b) The programme for post investigation assessment.</p> <p>c) Provision to be made for analysis of the site investigation and recording.</p> <p>d) Provision to be made for publication and dissemination of the analysis and records of the site investigation</p> <p>e) Provision to be made for archive deposition of the analysis and records of the site investigation</p>	<p>The comments note the potential for shallow deposits of archaeological significance (Iron Age/Roman) in the POS area on the western parts of the site, which have not been subject to investigation. The remainder of the site has been investigated fully.</p> <p>The comments note that the provision of a playing pitch in this location may require invasive works to be carried out that could damage as yet unknown archaeological deposits.</p> <p>The area of open space on which the junior-pitch is to be situated already exists and is a flat grassed recreational area, the intention in respect of which is to lay-out the pitch demarking the space and introducing goal posts. There is no requirement to excavate or undertake construction activities of the type anticipated by the comments provided to facilitate the provision of a junior pitch of the type proposed.</p> <p>Archaeology for the remainder of the site has been completed. No investigation is required in this area.</p> <p>In the event a precautionary condition is considered to be necessary the wording suggested is unduly onerous having regard to the concerns expressed. Any condition should refer only to development being precluded within the area proposed for use as a junior-pitch until such time that a WSI has been provided as indicated. To impose a pre-commencement condition affecting the whole of the application site based on these comments would be unreasonable.</p>