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Reliant Building Contractors

Drainage Impact Assessment

Talbot Road, Penistone

July 2010

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APPENDICES

1 Introduction

1.1 Egniol Environmental Limited has been appointed by Reliant Building Contractors to undertake a flood risk assessment in accordance with Planning Policy Statement 25 (PPS 25) at a site in Penistone, north Sheffield.

1.2 The client proposes to develop the site for the use of residential dwelling and retail. The development plan is included in **Appendix A**.

1.3 The site is located to the south of Talbot Road, National Grid Reference 424362,403400 and has an area of 0.53 Ha.

1.4 The site does not lie in a flood zone as defined by the Environment Agency and as indicated by the use of their online flood maps. The site has an area of 0.53 hectares, therefore any flood risk will stem from the inclusion of impermeable surfaces post development and the effect this has on surface water runoff.

1.5 This report will propose how the surface water management system can be designed to ensure surface water runoff does not cause flooding downstream of the site.

2 Current Surface Water Management

2.1 The site is classified as brownfield, and has previously been used as a commercial/industrial estate. The majority of the site consists of concrete hardstanding and buildings.

2.2 Currently, the site has no formal drainage. This is indicated by the lack of manholes and gullies; with downpipes from rooftops discharging onto the concrete hardstanding. Surface water runoff therefore currently flows overland towards the entrance of the site and onto the B6462 St Marys Street before entering the Yorkshire Water sewer system further downstream. In periods of prolonged, intense precipitation, this has the potential to exacerbate surface water flooding.

2.3 A Yorkshire Water sewer network plan was obtained and is included in **Appendix B**. The plan shows a surface water line running close to the entrance of the site. The topographical survey **(Appendix C)** indicates the site slopes towards the entrance of the site. Therefore a connection to this manhole would be the most suitable location to discharge surface water.

2.4 The concrete hardstanding consists of an area calculated using AutoCAD 2008 to be 0.37 Ha and the grassed areas amount to 0.16 Ha. Using the Simulation module in Windes, a model was created of the pre developed site and the runoff calculated. **Appendix D** indicates runoff at present for a 100 year storm is 129.1l/s. A surface water scheme will therefore be designed to ensure post development discharge will not be increased above 129.1/s, including an additional 30% for the allowance of climate change.

3 Proposed Surface Water Management and Hydraulic Modelling

3.1 The area of the hardstanding surfaces post development is estimated to be approximately 0.41ha. The remaining areas will be grassed and precipitation on these areas will naturally soak away.

3.2 It is proposed the runoff from the post development hardstanding areas is attenuated and discharged into Yorkshire Water clean network at a rate no greater than the calculated existing discharge rate of 129 l/s, for storms with a return period no greater than 100 years, and including an allowance of 30% for climate change. Therefore post development discharge rates are proposed to be no greater than pre development discharge rates.

3.3 Due to the close proximity of old railway bridge which is now part of the transpennine way, it is recommended that soakaways are not used as a method of surface water disposal. Discharging surface water runoff to groundwater may compromise the structural integrity of the foundations of the bridge and other structures in the near vicinity.

3.4 Microdrainage version W11.4 was used to model a schematic surface water management network. The simulation of the critical 1:100 (+ 30%) year rainfall event have been calculated. Copies of these calculations are included in **Appendix E.**

3.5 The Microdrainage model considers the invert level of the connecting sewer will be approximately 217.5m AOD, assuming a connection to Yorkshire Waters manhole located at the entrance of the site **(Appendix B)**.

3.6 Attenuation is provided in the form of a 2 metre deep boxed culvert, 60 metres long and a cross sectional area of 1.08 m^2, providing attenuation volume of 64.8m^3. The flow is restricted using an orifice plate, to a maximum of 121.9 l/s for a 100 year storm with a 30% allowance for climate change. A schematic drainage layout plan can be seen in **Appendix F.**

3.7 SUDS has been incorporated into the design where possible. This is indicated by the use of green roofs, and SUDS appropriate aggregates for the use of car parks and access roads. This will delay the runoff from entering the sewerage system, reducing the demand on the sewerage network. The model does not consider these, therefore increasing the factor of safety in the model.

3.8 The capacity of the Yorkshire Water clean sewer system will be slightly improved as the maximum post development discharge during a 100 year storm is proposed to be less that pre development discharge by 8l/s.

4 Conclusion

4.1 Egniol Environmental has assessed the potential flood risk caused by a proposed development near Talbot Road, Penistone. As the development is not in a flood zone, the risk stems from the inclusion of hard surfaces and the effect this has downstream of the site.

4.2 The site is approximately 0.53ha, of which 0.39ha is currently impermeable and drains onto the B6462 St Marys Street. The development will increase the impermeable area to 0.41ha. It is proposed to discharge the surface water into the Yorkshire Water clean network.

4.3 A hydraulic model was constructed to show that it is possible to provide attenuation to keep post development discharge no greater than that of pre development discharge rates.

4.4 Less water will soak away as the permeable area is reduced post development. It is not advised to increase the rate of water which soaks away due to the proximity of the bridge and other tall buildings.

4.5 Attenuation is to be provided with a box culvert 1 metre in depth, 1.8 metres in width and 60 metres in length. The surface water is released from the boxed culvert at a maximum rate of 121.9 l/s for 100 year storms with a 30 percent allowance for climate change.

4.6 The model design is a conservative model as it does not consider the use of SUDS (Green Roofs etc) incorporated into the design of the development. The use of SUDS in this instance reduces the demand on the sewerage system.

4.7 A detailed hydraulic design is to be undertaken before development commences.

APPENDIX A

DEVELOPMENT PLAN

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM

2. DO NOT SCALE

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF EGNIOL ENVIRONMENTAL LIMITED PRIOR TO CONSTRUCTION WORKS COMMENCING

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RELIANT BUILDING CONTRACTORS

DRAINAGE IMPACT ASSESSMENT

PROPOSED DEVELOPMENT PLAN

DRAWN BY: AP	DATE: 23.07.2010	
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CAD FILE REF: M:\CAD Projects\3913 Penistone\3913.DIA\Drawings\Current Working Drawings\3913.DIA.01.dwg

APPENDIX B

YORKSHIRE WATER SEWER PLAN

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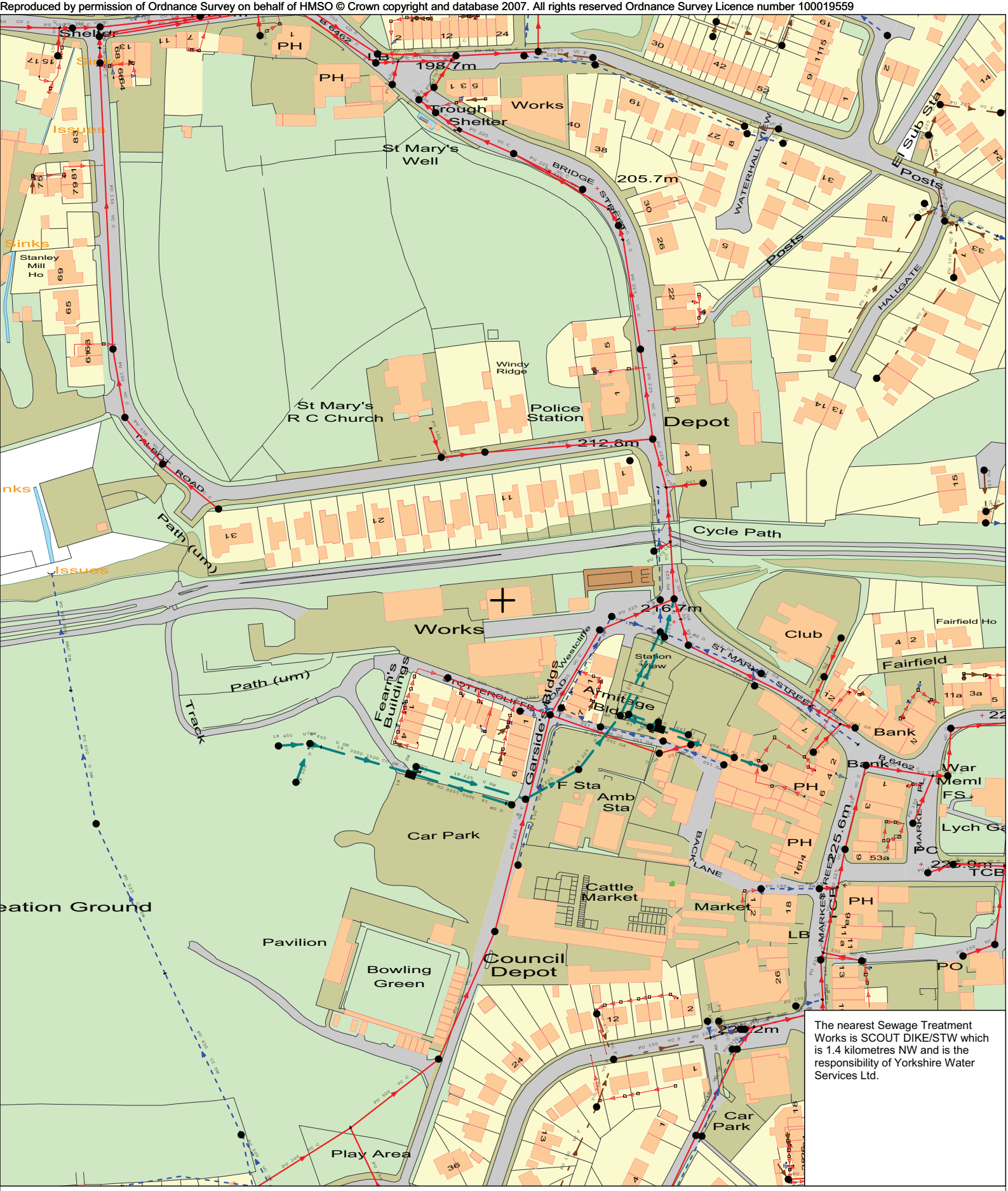

The nearest Sewage Treatment Works is SCOUT DIKE/STW which is 1.4 kilometres NW and is the responsibility of Yorkshire Water Services Ltd.

Public Waste Water Network 09/07/2010 09:59:23 OS Grid Coordinates: 424229 : 403155 Map Name : SE2403SW kaya

APPENDIX C

TOPOGRAPHICAL SURVEY

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM

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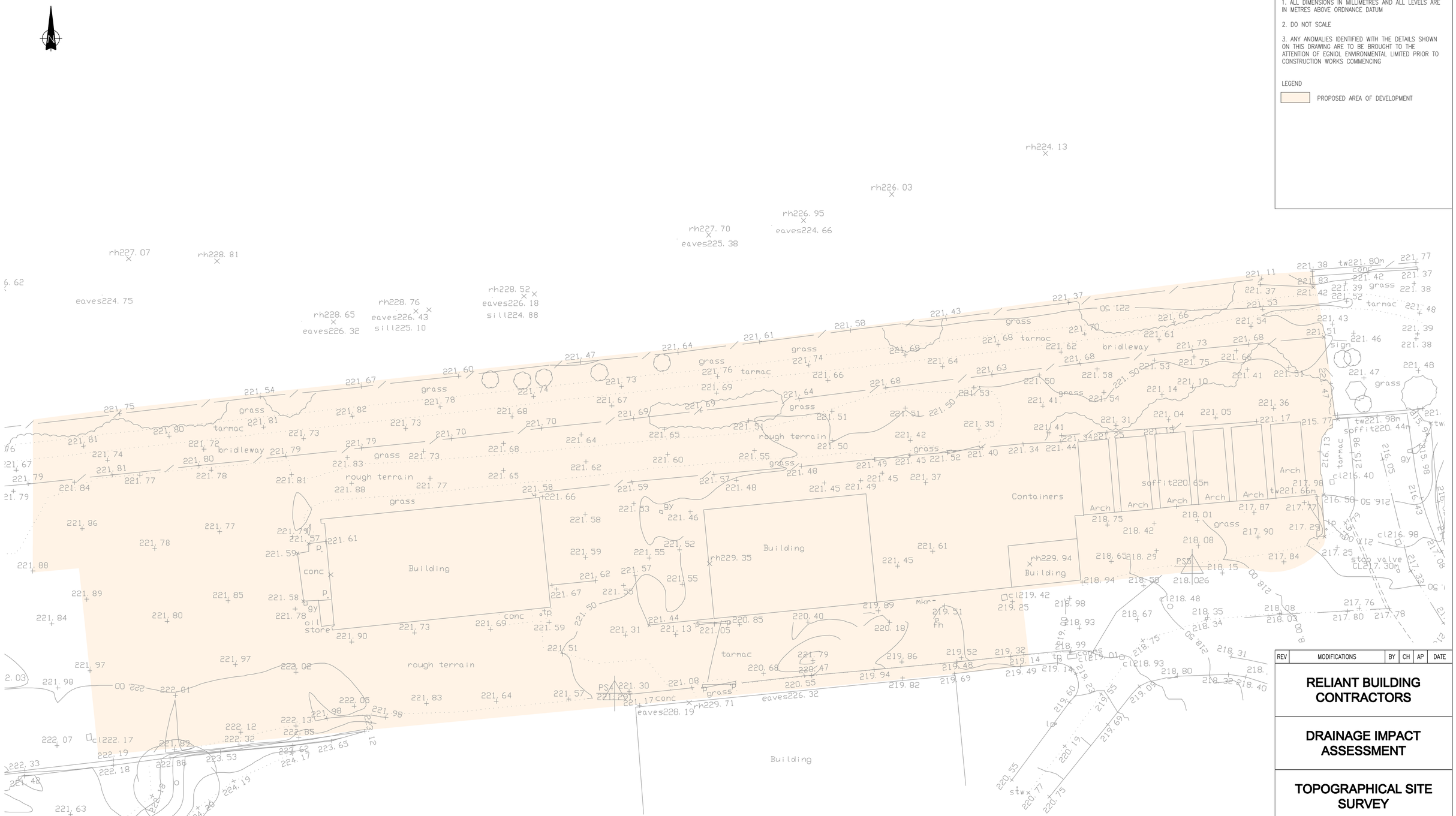
LEGEND

PROPOSED AREA OF DEVELOPMENT



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RELIANT BUILDING CONTRACTORS

DRAINAGE IMPACT ASSESSMENT

TOPOGRAPHICAL SITE SURVEY

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APPENDIX D

MICRODRAINAGE SIMULATION –
EXISTING RUNOFF MODEL

Existing Network Details for Penistone.SIM

* - Indicates pipe has been modified outside of System 1

	PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
*	1.000	20.000	0.250	80.0	0.400	5.00	5.000	___	-1
*	1.001	200.000	2.000	100.0	0.130	5.00	5.000	___	-1

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	1.000	2	221.000	220.250	0.650	221.000	220.000	0.900		1250
*	1.001	2	221.000	220.000	0.900	0.000	218.000	0.000		1250

Simulation Criteria for Penistone.SIM

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	77	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	4.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.400	Storm Duration (mins)	30
Ratio R	0.288		

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Summary of Critical Results by Maximum Level (Rank 1) for Penistone.SIM

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	0%					
1.001	15 Winter	100	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	2	220.315	-0.035	0.000	0.36	0.0	125.5	OK
1.001	2	220.075	-0.025	0.000	0.39	0.0	129.1	OK

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APPENDIX E

MICRODRAINAGE SIMULATION –
100 YEAR PLUS 30 % STORM SIMULATION

Existing Network Details for Penistone.SIM

* - Indicates pipe has been modified outside of System 1

	PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
*	1.000	20.000	1.500	13.3	0.080	10.00	0.600	o	225
*	1.001	20.000	0.900	22.2	0.073	0.00	0.600	o	225
*	2.000	15.000	2.525	5.9	0.074	5.00	0.600	o	225
*	1.002	15.000	0.100	150.0	0.076	0.00	0.600	[]	3
*	1.003	35.000	0.900	38.9	0.081	0.00	0.600	[]	3
*	3.000	20.000	2.525	7.9	0.080	5.00	0.600	o	225
*	1.004	15.000	0.100	150.0	0.070	0.00	0.600	[]	3
*	1.005	20.000	0.500	40.0	0.000	0.00	0.600	o	375

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	1.000	0	222.000	220.500	1.275	221.800	219.000	2.575		1500
*	1.001	2	221.800	219.000	2.575	221.500	218.100	3.175		1250
*	2.000	3	221.700	221.000	0.475	221.500	218.475	2.800		1200
*	1.002	4	221.500	218.100	2.800	221.000	218.000	2.400		1250
*	1.003	5	221.000	218.000	2.400	220.500	217.100	2.800		1250
*	3.000	6	221.500	220.000	1.275	220.500	217.475	2.800		1250
*	1.004	7	220.500	217.100	2.800	218.480	217.000	0.880		1250
*	1.005	8	218.480	217.000	1.105	218.000	216.500	1.125	Orifice	1200

Simulation Criteria for Penistone.SIM

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	4.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model FSR Return Period (years) 100

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Synthetic Rainfall Details

Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840
Ratio R	0.351	Storm Duration (mins)	30
Profile Type	Summer		

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Online Controls for Penistone.SIM

Orifice Manhole: 8, DS/PN: 1.005, Volume (m³): 15.7

Diameter (m) 0.235 Invert Level (m) 217.000
Discharge Coefficient 0.600

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Summary of Critical Results by Maximum Level (Rank 1) for Penistone.SIM

Margin for Flood Risk Warning (mm) 100.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%					
1.001	15 Winter	100	+30%					
2.000	15 Winter	100	+30%					
1.002	30 Winter	100	+30%					
1.003	30 Winter	100	+30%					
3.000	15 Winter	100	+30%					
1.004	15 Winter	100	+30%	100/15 Summer				
1.005	30 Winter	100	+30%	100/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	0	220.571	-0.154	0.000	0.22	0.0	28.5	OK
1.001	2	219.135	-0.090	0.000	0.66	0.0	66.0	OK
2.000	3	221.069	-0.156	0.000	0.20	0.0	38.5	OK
1.002	4	218.491	-0.209	0.000	0.09	0.0	118.8	OK
1.003	5	218.465	-0.135	0.000	0.04	0.0	149.5	OK
3.000	6	220.076	-0.149	0.000	0.25	0.0	41.7	OK
1.004	7	218.337	0.637	0.000	0.10	0.0	127.4	SURCHARGED
1.005	8	218.321	0.946	0.000	0.46	0.0	121.9	SURCHARGED

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APPENDIX F

SCHEMATIC DRAINAGE LAYOUT

NOTES

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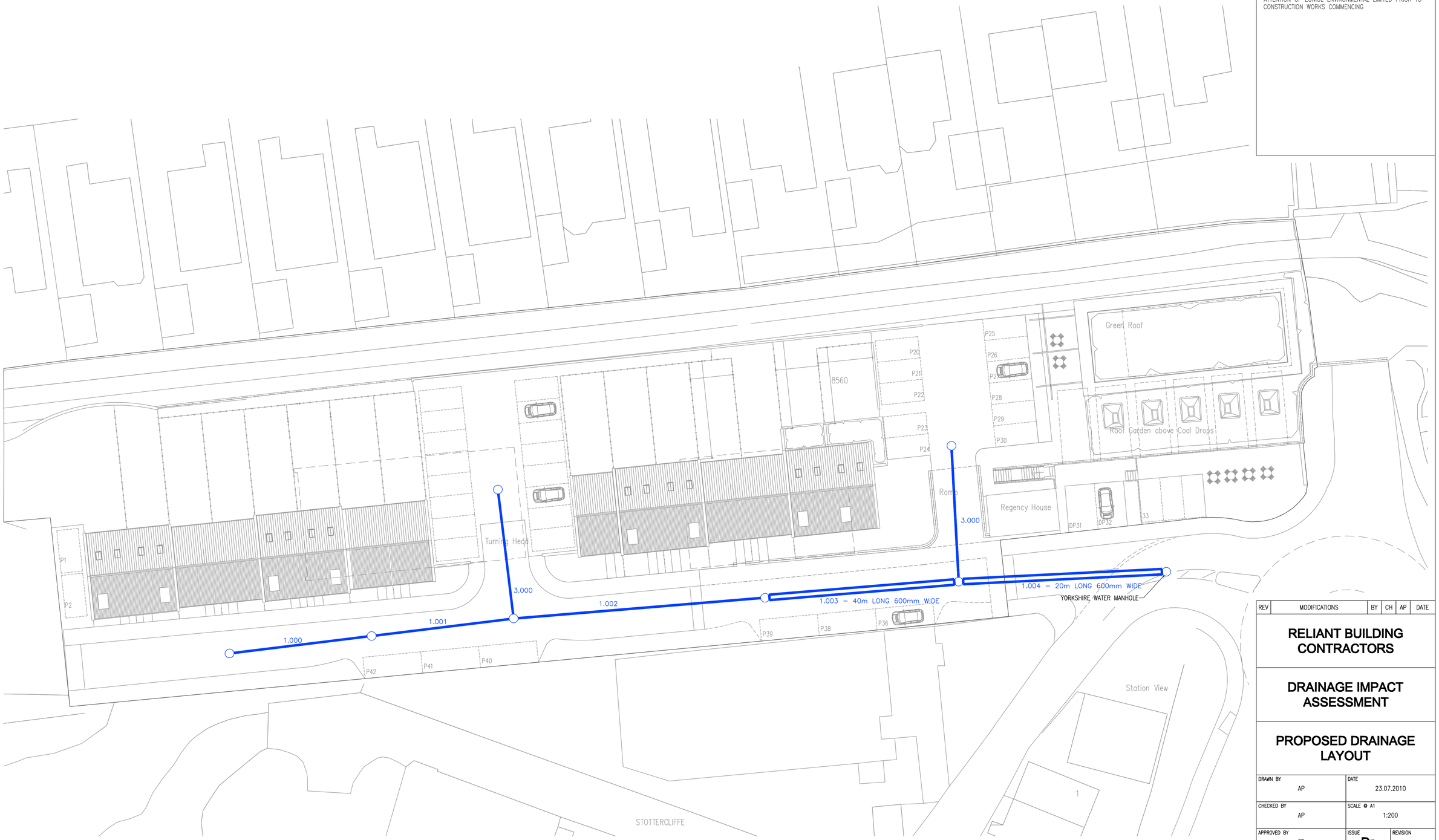

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DRAINAGE IMPACT ASSESSMENT

PROPOSED DRAINAGE LAYOUT

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