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320111064P

Beck Developments Ltd

**Primrose Mill, Woone Lane, Clitheroe
Phase 2**

Outline Flood Risk / Drainage Strategy

320111064P

D1433/R/02 – Rev A

14th Nov 2011

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Forward

This report has been prepared to support an outline planning application being made by Beck Developments Ltd for a site off Woone Lane Clitheroe.

The site forming part of the application is Phase 2 of a wider development of the area.

In July 2011, PSA Design was commissioned to undertake a Drainage Strategy, primarily to address issues at the Phase 1 site but also to take account of the potential development of Phase 2. The Phase 1 strategy was discussed and submitted to the Environment Agency and United Utilities and the philosophy and conclusions outlined within it subsequently approved.

An addendum to the Phase 1 report was also produced to sit alongside the main report which assessed the future impacts of any Phase 2 development. At the time, this area was referred to as the "Option Land". This addendum was also presented to the Environment Agency and United Utilities and whilst at that stage they were unable to officially comment the principles and conclusions were once again agreed.

At the time, the Phase 2 development drainage strategy was based upon an assumed housing density and hence impermeable areas. An outline masterplan has now been drawn up to form the basis of the new application and hence it is now possible to firm up the assumptions and conclusions sited within the original report.

Rather than re-address the approved Phase 1 report this revised assessment simply seeks to clarify the principles laid out within the "Option Land" addendum now that a masterplan has been drawn up.

For ease of reference the approved Phase 1 report together with the original "Option Land" addendum is included within this report as Appendix B.

1.0 Introduction

- 1.01 The Phase 1 strategy outlined a sustainable solution to provide surface water drainage via a new adopted system outfalling into Pendleton Brook.
- 1.02 The addendum to the report covering what was then referred to as the "Option Land" and which now forms part of the current application outlined a surface water drainage proposal that utilised the proposed adopted sewer.
- 1.03 This report will re-assess the estimated figures contained within the addendum to firm up allowable discharge rates and assess predicted attenuation requirements.
- 1.04 The strategy and figures formulated in this report will of course be re-assessed again at reserve matters stage should the outline application be successful.
- 1.05 Figure 1 shows the Phasing Plan which helps put the site in context.
- 1.06 The existing site layout and topographical survey is included as Figure 4.

2.0 Compliance with PPS 25

- 2.01 Reference to Environment Agency online flood mapping confirms that the site lies outside an area at risk of flooding and therefore lies within Flood Zone 1.
- 2.02 In accordance with PPS 25 residential development within Flood Zone 1 is compatible.
- 2.03 The Environment Agency will normally require that, for the range of annual flow rate probabilities up to and including the 1% annual probability (1 in 100 year event), the developed rate of run-off into a watercourse should be no greater than the undeveloped rate of run-off for the same event. (In the case of brownfield sites, drainage proposals will be measured against the existing performance of the site). United Utilities take a similar approach to that of the Environment Agency, however they would normally ask that flows be restricted to include up to the 3.33% annual probability (1 in 30 year event), whilst

demonstrating that the 1 in 100 year event does not pose a threat to the locality. Both these requirements are in line with the strategy outlined in PPS25 which states "surface water arising from a development site should, as far as reasonably practicable, be managed in a sustainable manner to mimic the surface water from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climatic change into account."

- 2.04 With the above in mind the following section assesses the surface water drainage from the proposed site.

3.0 Surface Water Drainage

- 3.01 The area of Phase 2 land is 25,020m² or 2.5ha.
- 3.02 Following a site walkover and review of aerial mapping it has been assumed that there are no existing areas that are positively drained and hence run-off will be solely greenfield.
- 3.03 Green field run-off (based on Environment Agency's requirements of 9l/s/ha) = 22.5 l/s. Therefore run-off from the developed site is likely to afford a maximum **allowable discharge rate of 22.5l/s.**
- 3.04 The proposed impermeable areas have been calculated and highlighted on Figure 3. For the purposes of this assessment it has been assumed that all impermeable areas will be drained via the surface water sewer. This approach will offer a robust assessment as it is highly likely that a good portion of associated driveways would be laid to fall into adjacent landscaping areas at detailed design stage.
- 3.05 The developer may also decide to include additional sustainable solutions as part of the detailed design process such as rainwater harvesting, low-flush systems, swales etc. These will all have positive impacts on the rainwater run-off rates and hence attenuation requirements

- 3.06 The total proposed impermeable areas for the Phase 2 development have been calculated at $10,446\text{m}^2$ or 1.045ha. This represents a slight reduction to the figures estimated as part of the original "Option Land" assessment (1.13ha).
- 3.07 MicroDrainage has been assessed to calculate the 1 in 30 year storm (with allowance for climatic change) in the same way as the Phase 1 report. The calculations (included overleaf) indicate that to restrict the run-off to existing greenfield rates of 22.5l/s based on a 1 in 30yr event and a proposed impermeable area of 1.045 ha, then an attenuation of 226.7m^3 would be required.
- 3.08 Similarly to the Phase 1 solution this attenuation would be accommodated for upstream of the 450mm diameter outfall sewer.
- 3.09 The 450mm diameter sewer will have more than adequate capacity to accommodate this additional flow above and beyond that of the Phase 1 and the Contour Housing site. The estimated total flow from all sites would be $- 22.5 + 176.5 + 4.3 = 203.3 \text{ l/s}$. A 450mm diameter pipe laid at a minimum of 1 in 150 gradient can accommodate approximately 264 l/s.
- 3.10 There are / will be a variety of ways the above storage could be accommodated for within the proposed system. Probably the most common for an adopted system would be a single or network of oversized pipe(s) with a flow control unit immediately prior to outfall. In way of a possible solution then a 130m length of 1.5m diameter concrete pipe with a HydroBrake fitted within the downstream manhole would be sufficient to accommodate in excess of 227m^3 . This could be located under then road immediately prior to the outfall into the proposed 450mm dia. sewer.
- 3.11 As part of the previous discussions United Utilities indicated that in principle they would have no objections to an unrestricted foul discharge from this site.
- 3.12 A diagrammatic outline drainage proposal is included as Figure 3

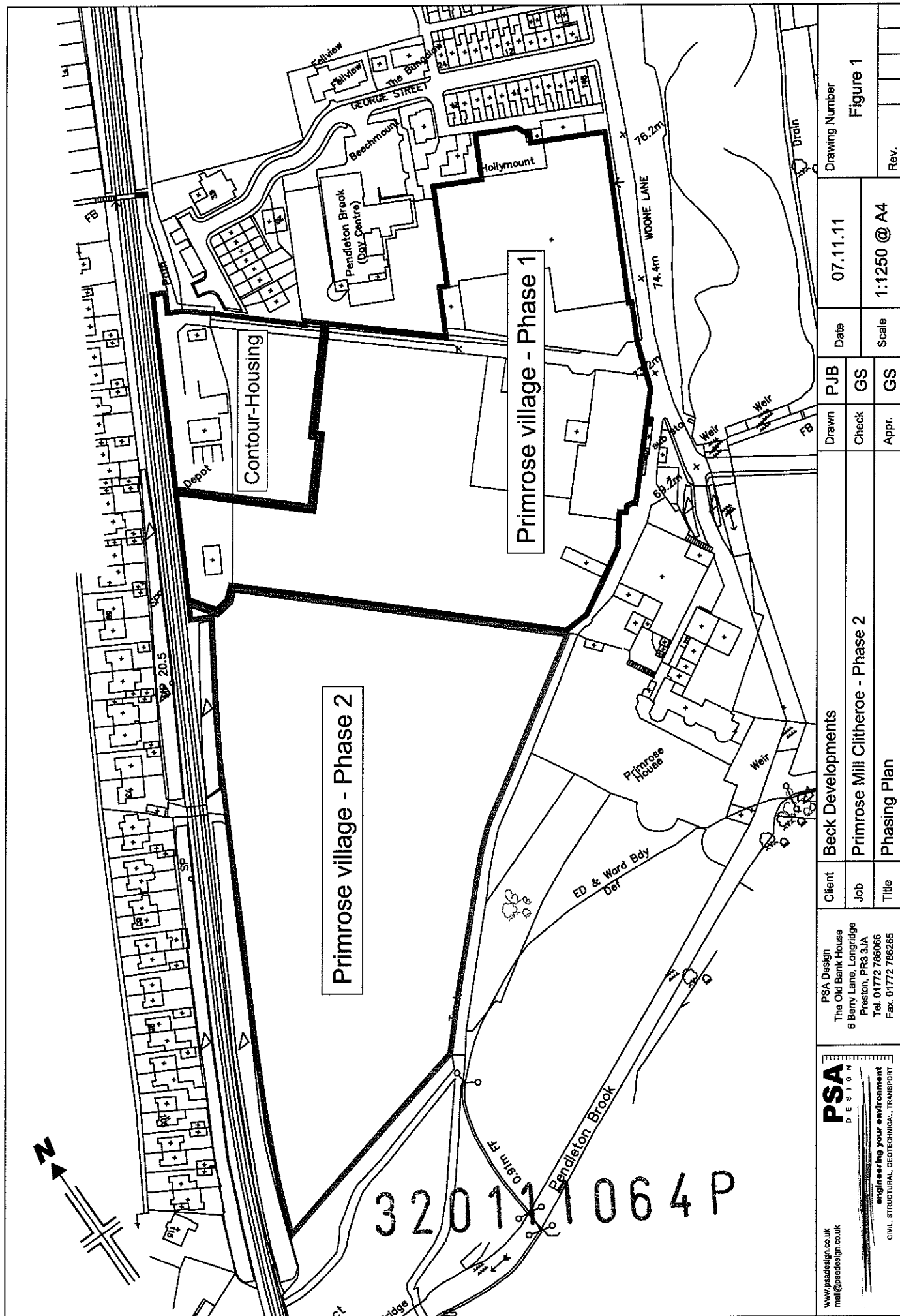
4.0 Conclusions

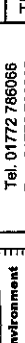
- 4.01 The preferred option for dealing with surface water discharge from the proposed site would be via a new 450mm diameter sewer to be constructed as part of the Phase 1 development as shown on Figure 3.
- 4.02 United Utilities and the Environment Agency in principle have no objection to the proposals subject to the relevant approvals and consents.
- 4.03 Attenuation would be dealt with upstream of the 450mm sewer within the proposed site. A total attenuation of around 233 4m³ would be required to accommodate a 1 in 30 year event.
- 4.04 The proposed surface water runoff will be restricted to the existing greenfield run-off calculated at 22.5l/s.
- 4.05 United Utilities have agreed that foul discharge can connect directly into the existing 1275mm sewer with no restrictions.
- 4.06 This report has provided evidence that a sustainable solution for dealing with surface water run-off from the site can be achieved. It is assumed that any permission granted as part of this outline application will contain conditions relating to the approval of a "surface water regulation system". The detailed design of the final system will be prepared as part of the reserved matters application and at that stage the Local Authority will consult with both United Utilities and the Environment Agency for final approval.

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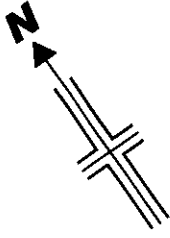
Figures

1. Phasing Plan
2. Proposed Impermeable Areas
3. Outline Drainage Proposal
4. Existing Site Layout & Topo Survey



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PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066 Fax. 01772 786265		Client	Beck Developments		
		Job	Primrose Mill Clitheroe - Phase 2		
		Title	Phasing Plan		
		Drawn	PJB	Date	07.11.11
		Check	GS	Scale	1:1250 @ A4
		Appr.	GS	Rev.	Figure 1

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Impermeable Areas

Roof Water =
4264m²

Driveway Water =
3343m²

Roads / Footways /
Parking = 2839m²

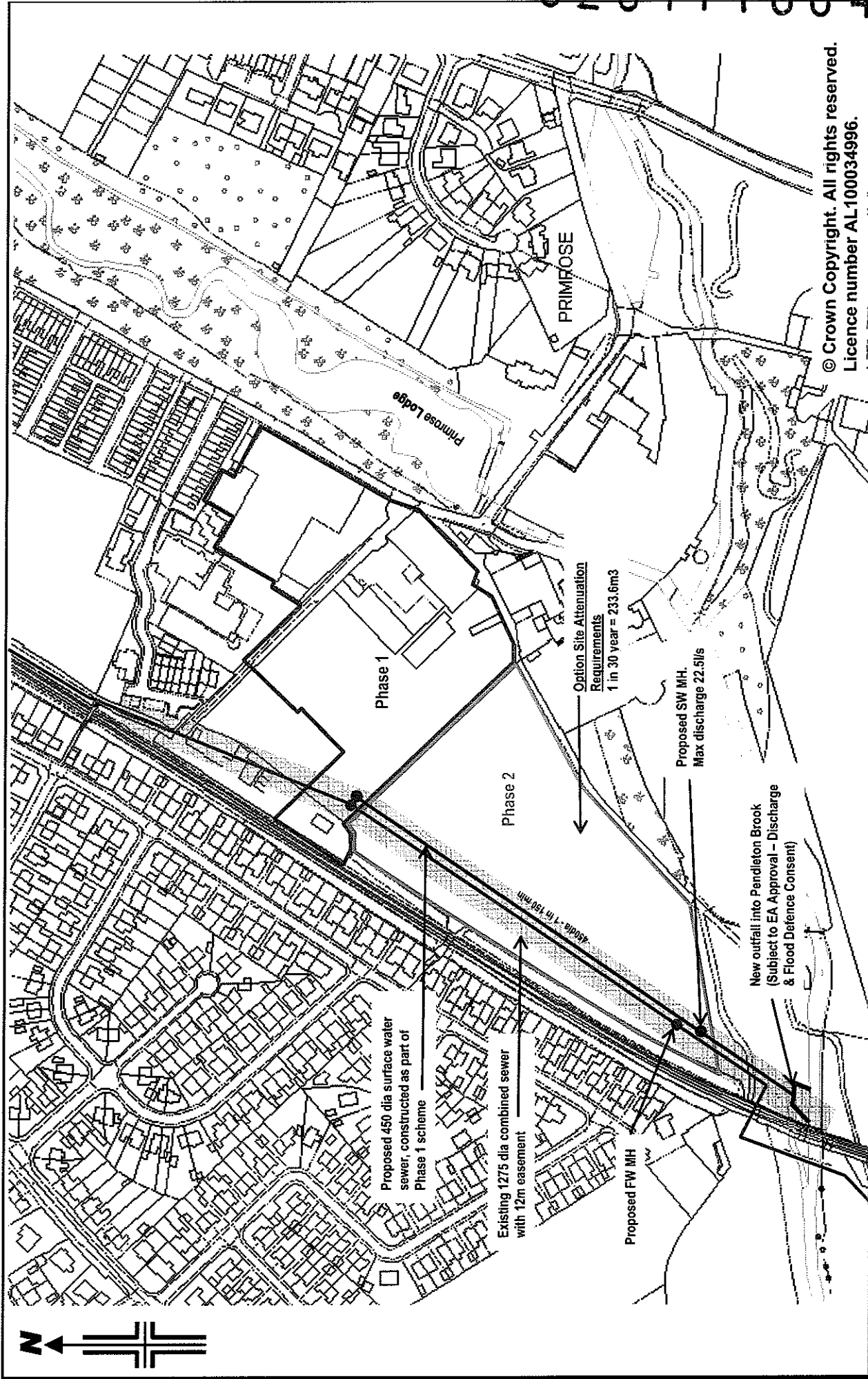
Total = 10,446m²

Total Site Area = 25,020m²



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			Job	Primrose Mill Clitheroe - Phase 2		Check	GS		Figure 2		
			Title	Proposed Impermeable Areas Plan		Appr.	GS	Scale	1:1250 @ A4		
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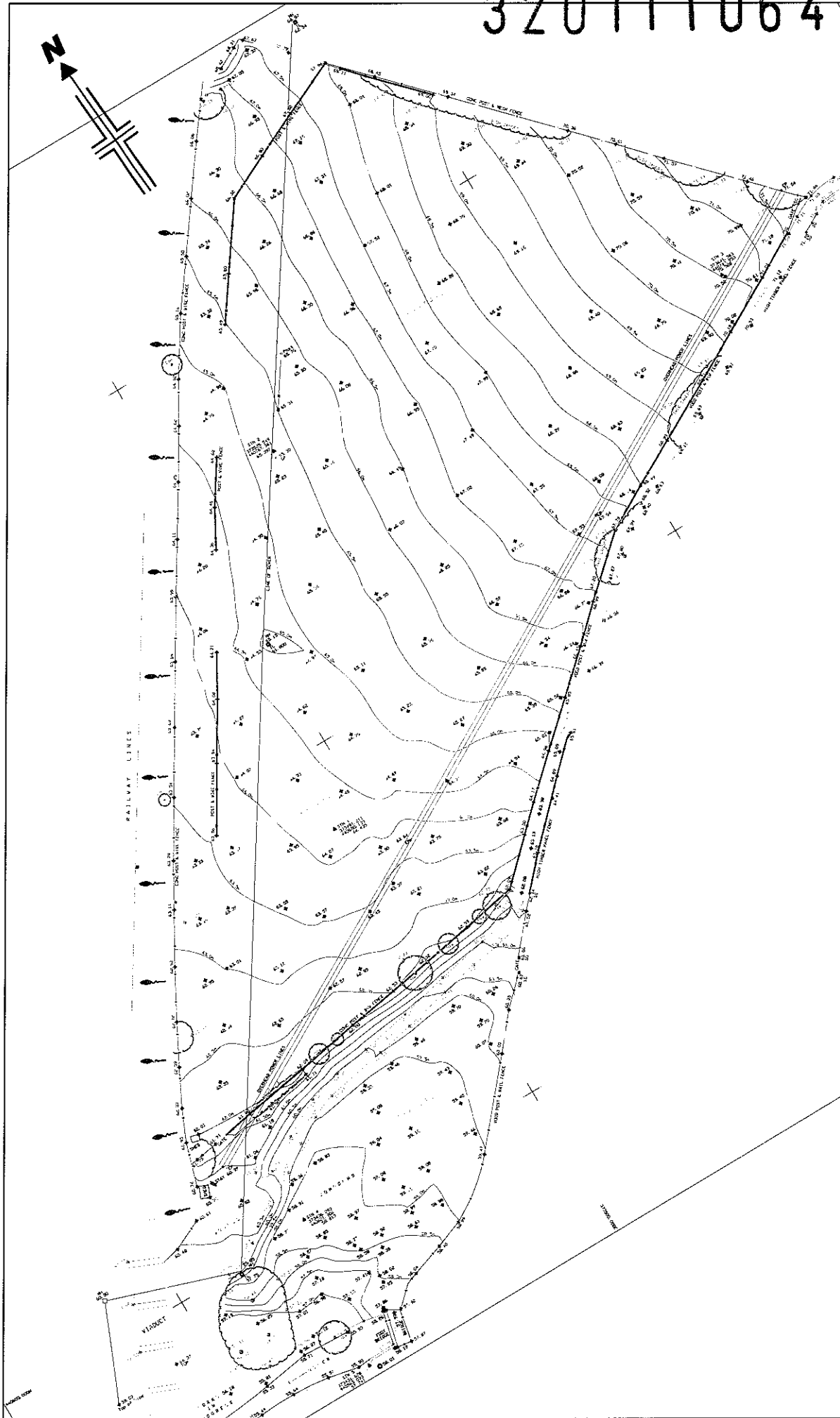
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		Job	Primrose Mill, Clitheroe - Phase 2	Checked		Scale	NTS			
		Title	Outline Drainage Proposals - Option Land	Approved				Rev		

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			Job	Primrose Mill Clitheroe - Phase 2		Drawn	PJB	07.11.11	
						Check	GS		
			Title	Phasing Plan		Appr.	GS	1:1250 @ A4	
								Date	
								Scale	
								Rev.	

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Appendix A

MircoDrainage Output
1 in 30yr Attenuation Requirements

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Micro Drainage

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Designed By grahams

Checked By

Source Control W.11.2

Circular Pipe Details

Diameter (m) 2.000 Length (m) 100.000 Cover Level (m) 102.700
Slope (1:x) 200.0 Invert Level (m) 100.000

Hydro-Brake Outflow Control

Design Head (m) 1.800 Diameter (mm) 175
Design Flow (l/s) 23.4 Invert Level (m) 100.000
Hydro-Brake Type MD6

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)
0.10	5.8	0.80	17.7	2.00	24.6	4.00	34.8	7.00	46.0
0.20	14.2	1.00	18.3	2.20	25.8	4.50	36.9	7.50	47.7
0.30	18.7	1.20	19.4	2.40	27.0	5.00	38.9	8.00	49.2
0.40	19.2	1.40	20.7	2.60	28.1	5.50	40.8	8.50	50.7
0.50	18.8	1.60	22.1	3.00	30.1	6.00	42.6	9.00	52.2
0.60	18.1	1.80	23.4	3.50	32.6	6.50	44.4	9.50	53.6

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Micro Drainage

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Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	19.2	19.2	101.0463	1.0463	118.1	O K
30 Summer	19.7	19.7	101.2323	1.2323	154.8	O K
60 Summer	20.6	20.6	101.3827	1.3827	184.7	O K
120 Summer	21.1	21.1	101.4532	1.4532	198.5	O K
180 Summer	21.2	21.2	101.4607	1.4607	199.9	O K
240 Summer	21.1	21.1	101.4502	1.4502	197.9	O K
360 Summer	20.8	20.8	101.4117	1.4117	190.4	O K
480 Summer	20.5	20.5	101.3597	1.3597	180.1	O K
600 Summer	20.1	20.1	101.3018	1.3017	168.6	O K
720 Summer	19.7	19.7	101.2423	1.2423	156.8	O K
960 Summer	19.2	19.2	101.1223	1.1223	133.0	O K
1440 Summer	19.2	19.2	100.8923	0.8923	88.8	O K
2160 Summer	19.2	19.2	100.5632	0.5632	34.1	O K
2880 Summer	18.9	18.9	100.3397	0.3397	10.1	O K
4320 Summer	14.9	14.9	100.2152	0.2152	3.4	O K
5760 Summer	12.2	12.2	100.1758	0.1757	2.1	O K
7200 Summer	10.4	10.4	100.1547	0.1547	1.6	O K
8640 Summer	9.2	9.2	100.1397	0.1397	1.2	O K
10080 Summer	8.2	8.2	100.1288	0.1288	1.0	O K
15 Winter	19.2	19.2	101.1288	1.1288	134.3	O K
30 Winter	20.4	20.4	101.3472	1.3472	177.6	O K
60 Winter	21.7	21.7	101.5402	1.5402	215.2	O K
120 Winter	22.3	22.3	101.6362	1.6362	233.1	O K
180 Winter	22.3	22.3	101.6387	1.6387	233.6	O K
240 Winter	22.2	22.2	101.6127	1.6127	228.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	69.36	18
30 Summer	48.18	32
60 Summer	32.16	60
120 Summer	20.81	98
180 Summer	15.91	130
240 Summer	13.08	166
360 Summer	9.93	236
480 Summer	8.15	304
600 Summer	6.99	374
720 Summer	6.16	440
960 Summer	5.04	570
1440 Summer	3.79	822
2160 Summer	2.85	1164
2880 Summer	2.32	1472
4320 Summer	1.74	2196
5760 Summer	1.42	2864
7200 Summer	1.22	3552
8640 Summer	1.07	4312
10080 Summer	0.96	4968
15 Winter	69.36	18
30 Winter	48.18	31
60 Winter	32.16	60
120 Winter	20.81	110
180 Winter	15.91	140
240 Winter	13.08	178

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Micro Drainage

Source Control W.11.2

Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	21.6	21.6	101.5347	1.5347	214.2	O K
480 Winter	21.0	21.0	101.4412	1.4412	196.1	O K
600 Winter	20.4	20.4	101.3437	1.3437	177.0	O K
720 Winter	19.7	19.7	101.2473	1.2473	157.8	O K
960 Winter	19.2	19.2	101.0583	1.0583	120.5	O K
1440 Winter	19.2	19.2	100.6563	0.6563	48.0	O K
2160 Winter	17.5	17.5	100.2742	0.2742	6.0	O K
2880 Winter	14.3	14.3	100.2022	0.2022	2.9	O K
4320 Winter	10.7	10.7	100.1588	0.1588	1.6	O K
5760 Winter	8.8	8.8	100.1353	0.1353	1.1	O K
7200 Winter	7.5	7.5	100.1202	0.1203	0.9	O K
8640 Winter	6.6	6.6	100.1097	0.1098	0.7	O K
10080 Winter	6.0	6.0	100.1018	0.1018	0.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	9.93	256
480 Winter	8.15	330
600 Winter	6.99	402
720 Winter	6.16	470
960 Winter	5.04	608
1440 Winter	3.79	850
2160 Winter	2.85	1100
2880 Winter	2.32	1468
4320 Winter	1.74	2200
5760 Winter	1.42	2920
7200 Winter	1.22	3672
8640 Winter	1.07	4360
10080 Winter	0.96	5136

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Appendix B

Approved Phase 1 Drainage Strategy (incl. Option Land Addendum)

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Beck Developments Ltd

Primrose Mill, Woone Lane, Clitheroe

Drainage Strategy

D1433/R/01 –

Original - 16 May 2011

Final Issue – 18 July 2011

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- 5. Outfall Pipe Size Requirements**
- 6. Attenuation Requirements**
- 7. Conclusions**
- 8. Update following Consultation**

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4. Existing Site Layout & Topo Survey

Appendices

- A. MicroDrainage Calculations
- B. Environment Agency Correspondence
- C. Approval Letters from United Utilities and Environment Agency

1.0 Introduction

- 1.01 PSA Design has been commissioned by Beck Developments Ltd to undertake a review of the drainage strategy for a site off Woone Lane Clitheroe
- 1.02 The site currently has planning permission for a large residential development on land surrounding the former Primrose Mill.
- 1.03 A flood risk assessment was prepared as part of the original submission by Weetwood Environmental Engineering (ref. 1103/R013JC – June 2008). In line with PPS 25 this report assessed the existing drainage from the site and outlined a number of potential solutions for dealing with the proposed surface water run-off. The contents of this report are referred to and utilised within this report.
- 1.04 Since the above flood risk assessment was prepared the proposed site layout has been altered and part of the site has been sold off to Contour Housing. Whilst the philosophy of the existing drainage from the site remains the same, we will adjust and recalculate the proposed run-off and attenuation requirements to reflect the revised proposals.
- 1.05 This report also seeks to qualify a preferred solution for dealing with the surface water run-off whilst in principle meeting with the requirements and recommendations of United Utilities and the Environment Agency.
- 1.06 The existing site layout and topographical survey is included as Figure 4.

2.0 United Utilities Contact

- 2.01 A meeting was held with John Lunt of United Utilities 26th April 2011
- 2.02 At this meeting 2 options were discussed with regard to dealing with surface water run-off from the site
 - 1. Via a single new outfall following the line of the existing adopted 1275mm dia. combined sewer discharging via a new outfall into Pendleton Brook to the south.

2. Via a split system with two outfalls, one being as above and the other serving the eastern portion of the site via an outfall into the lodge

2.03 Upon discussions with United Utilities and with review of the topographical survey the conclusion was made that option 1 would appear to be the most suitable to serve the site.

2.04 Whilst option 2 is not unfeasible it was ruled out a viable solution compared to option 1 for the following reasons:-

1. United Utilities suggested that in theory there is no reason why they would be unwilling to adopt an outfall into the lodge, however, the lodge would have to be under the ownership of either the local authority or a "reputable" management company.

2. Levels throughout the site fall from east to west and generally lend themselves to a single outfall following the contours of the land towards the existing combined sewer.

3. Constructing a new outfall into the lodge would involve work within an area of high environmental importance

4. Constructing a new outfall into the lodge would involve crossing Woone Lane and hence involve significant traffic management / diversion issues.

5. This option would involve two separate attenuation and storage facilities within the proposed system, equally two separate applications and consents from the Environment Agency.

2.05 United Utilities agreed at the meeting that they would support the construction of a surface water sewer discharging into Pendleton Brook. In principle as long as the correct procedures were followed and a Section 104 agreement was entered into then they would be happy to adopt the system.

2.06 United Utilities also confirmed that it would seem sensible, and they would have no objection in principle, to the sewer being constructed within the existing easement of the 1275 combined sewer. It is understood that the easement to the existing pipe is 12m (i.e. 6m either side of the pipe). It would therefore appear feasible that a new sewer could be constructed within the existing easement without the need for any additional land take

- 2.07 United Utilities also informed us that an agreement was in place in relation to the Contour Housing scheme currently under construction. The Contour Housing site has approval in place to discharge surface water into the combined sewer, however, it is understood that the agreement suggests that should such a surface water sewer ever be constructed then the Contour Housing site would be diverted into it. Discharge restrictions from this site are understood to be defined by the Environment Agency's greenfield run-off requirement of 9l/s/ha.
- 2.08 United Utilities would be lead by the Environment Agency in terms of run-off restrictions as they will be the ones giving consent to discharge into Pendleton Brook.
- 2.09 United Utilities indicated that Foul discharge from the site could be connected into the existing 1275mm combined sewer with no restrictions.
- 2.10 A diagrammatic outline drainage proposal is shown on Figure 1.

3.0 Environment Agency Contact

- 3.01 Correspondence and discussions have been undertaken with Colin Worswick of the Environment Agency. This correspondence is included as Appendix B.
- 3.02 In summary the Environment Agency response suggests that in principle they would have no objection to a new surface water sewer being constructed to outfall into Pendleton Brook subject to the following conditions:-
1. Run-off is attenuated to existing rates. Green-field run-off rate is 9 litres / second / hectare unless it can be proved otherwise.
 2. If the run-off currently discharges to a combined system, then "new" water would discharge to the brook therefore this needs to be considered.
 3. Flood Defence Consent is applied for.
- 3.03 The Environment Agency also confirmed that "The FRA (prepared by Weetwood) was accepted at the planning stage and the discharge rates contained within it were agreed."

However, it was noted by the Environment Agency that "if you are changing the way that the site drains for it to now all discharge to the brook (when it didn't previously) then green-field rates will apply."

- 3.04 As previously discussed in section 1 of this report, the site layout has altered since the production of the FRA and a small section of the land has been sold off to Contour Housing. The FRA also suggested that the surface water be dealt with via two outfalls as per the existing (via Pendleton Brook and the Combined Sewer).
- 3.05 As we are now looking at a single outfall solution into Pendleton Brook we need to re-assess the allowable discharge rates. We also need to take on board the Environment Agency's comments with regard to any new surface water (i.e. that that previously was assigned to outfall into the combined sewer) be restricted to greenfield run-off of 9 l/s/ha.
- 3.06 Equally, as the proposed site layout has changed then a revised assessment of the predicted attenuation requirements will need to be made over those outlined in the FRA.

4.0 Revised Allowable Discharge Rates

- 4.01 The FRA (as agreed with the Environment Agency) summarised allowable discharge rates as follows:
- a) Eastern Outfall (i.e. into Pendleton Brook)
 - Impermeable Area = 1.227 ha
 - Flow = **166.6 l/s** (based on a 1 in 1 yr flow)
 - b) Western Outfall (i.e. into the combined sewer)
 - Impermeable Area = 0.164 ha
 - Flow = 29.5 l/s (based on 1 in 2yr flow)
- 4.02 The Eastern outfall area will remain the same = **166.6 l/s**
- 4.03 The Western outfall area will be reduced to account for loss of land allocated to Contour Housing and all run-off from this area is now assumed to be greenfield run-off in line the Environment Agency's recommendations, therefore:

Total "Western" Area (from FRA) = 1 490ha
 Contour Housing Area = 0.478ha
 Revised Total Greenfield Run-off Area = 1.012ha

Greenfield run-off (based on EA's 9l/s/ha) = $1.012 \times 9 = 9\text{l/s}$

- 4.04 Therefore the revised allowable flow into Pendleton Brook = $166.6 + 9.0 = 175.6\text{ l/s}$
 (based on 1 in 1yr event)

5.0 Outfall Pipe Size Requirements

- 5.01 In line with best practice it is recommended that all attenuation should be made upstream of the proposed surface water sewer outfalling into Pendleton Brook. The surface water sewer running along the easement and outfalling into the brook will be free flowing and capable of accommodating the above flow, together with that from the Contour Housing site

- 5.02 It is understood that surface water run-off from the Contour Housing site was restricted to 9l/s/ha. Based on a site area of 0.478 ha, equates to a flow of 4.3l/s. Therefore the pipe would need to accommodate a total flow of $175.6 + 4.3 = 180\text{ l/s}$.

- 5.03 In accordance with MicroDrainage WinDes software then a 450mm diameter pipe laid at a minimum of 1 in 150 gradient would be best suited. Any smaller pipe would be likely to fall foul of United Utilities capacity requirements for adoptable sewers. A 450mm pipe also has the advantage of having some spare capacity to future proof any further potential development surrounding the area that may wish to tap into the system.

- 5.04 A typical standard outfall solution is shown of Figure 2. This would of course be subject to Environment Agency approval.

6.0 Attenuation Requirements

- 6.01 An assessment of the proposed impermeable areas has been calculated and is included as Figure 3. The Impermeable areas are as follows:

Roofwater – 4,970m²

Roads / Footways / Parking – 8,110m²

Total Impermeable Area = 13,080m²

- 6.02 At this stage it is unknown what the aspirations are from the developer in way of detailed drainage design. For that reason, at this stage to assess a worst case scenario it has been assumed that all of the impermeable areas will be positively drained and discharged via the new surface water outfall. Clearly should other sustainable methods (such as rainwater harvesting, swales, detention ponds etc) be incorporated into the design then this will help reduce the amount of attenuation required.
- 6.03 To accurately identify the amount of attenuation storage required we would have to model the entire proposed surface water system throughout the site as there is storage volume associated with it above and beyond that of the attenuation facility itself. So again the figure calculated represents a worst case scenario.
- 6.04 In line the United Utilities requirements and in accordance with PPS25 two scenarios have been assessed. A 1 in 30 (3.33%) year event and a 1 in 100 (1%) year event, both with an allowance for climatic change. In accordance with Environment Agency guidelines climate change will be taken into account in hydrological regions by increasing the rainfall depth by 10% for computing storage volumes. The official advice by Defra on river flows is that a 20% increase should be added for climate change, however, due to the relationship between rainfall and runoff being non-linear, the use of 10% additional rainfall is considered to approximate to a 20% increase in runoff for larger events.
- 6.05 United Utilities will require that that surface water be restricted and the attenuation be design to accommodate a 3.33% annual probability, 1 in 30 year event. It must also be demonstrated that the 1 in 100 year event does not pose a threat to the locality. It is generally accepted that during such an event flooding will occur. United Utilities request that some thought is given during the design process to assess overland flooding ensuring that flood waters are diverted away from properties and generally confined where possible to within kerbed areas of roads and parking areas.
- 6.06 MicroDrainage WinDes has been used to calculate the storage requirements based on the above criteria. The output is included as Appendix A and summarised below.

	1 in 30yr Storm	1 in 100yr Storm
Impermeable Area	13,080 m ²	
Run-off Restriction	175.6 l/s	
Attenuation Requirement	84.6 m ³	143.9 m ³

Table 1: Attenuation Requirements

- 6.07 There are / will be a variety of ways the above storage could be accommodated for within the proposed system. Probably the most common for an adopted system would be a single or network of oversized pipe(s) with a flow control unit immediately prior to outfall. In way of a possible solution then for example a 50m length of 1.5m diameter concrete pipe with a HydroBrake fitted within the downstream manhole would be sufficient to accommodate in excess of 85m³. This could be located under then road immediately prior to the proposed 450mm dia. sewer.

7.0 Conclusions

- 7.01 The preferred option for dealing with surface water discharge from the proposed site would be via a new 450mm diameter sewer constructed within the existing easement associated with the 1275mm combined system as shown on Figure 1.
- 7.02 United Utilities and the Environment Agency in principle would have no objection to the proposals subject to the relevant approvals and consents.
- 7.03 Attenuation would be dealt with upstream of the 450mm sewer within the proposed site. A total attenuation of around 85m³ would be required to accommodate a 1 in 30 year event.
- 7.04 The proposed surface water runoff will be restricted to the existing 1 in 1 year event of 175.6l/s. This figure has been calculated using Environment Agency approved rates from the FRA associated with the previous application together with guidance received from the Environment Agency.

- 7.05 As the FRA correctly summarised the allowable discharge rate, based on a 1 on 1 year event would provide betterment for all events greater than it. It therefore exceeds the requirements of PPS 25 which requires *"surface water arising from a development site should, as far as reasonable practicable be managed in a sustainable manner to mimic the surface water from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climatic change into account."*
- 7.06 United Utilities have verbally agreed that foul discharge can connect directly into the existing 1275mm sewer with no restrictions.
- 7.07 Ultimately at detailed design stage the Local Planning Authority will require that the planning condition attached to the approval regarding "surface water regulation system" be approved. The Local Authority will consult with both United Utilities and the Environment Agency at that stage for final approval.

8.0 Update following Consultation

- 8.01 The report was submitted to the Environment Agency and United Utilities in May 2011
- 8.02 The response from each party indicated that subject to detailed design, relevant consents and approvals then they have no objection to the drainage strategy. The responses are attached in Appendix C.

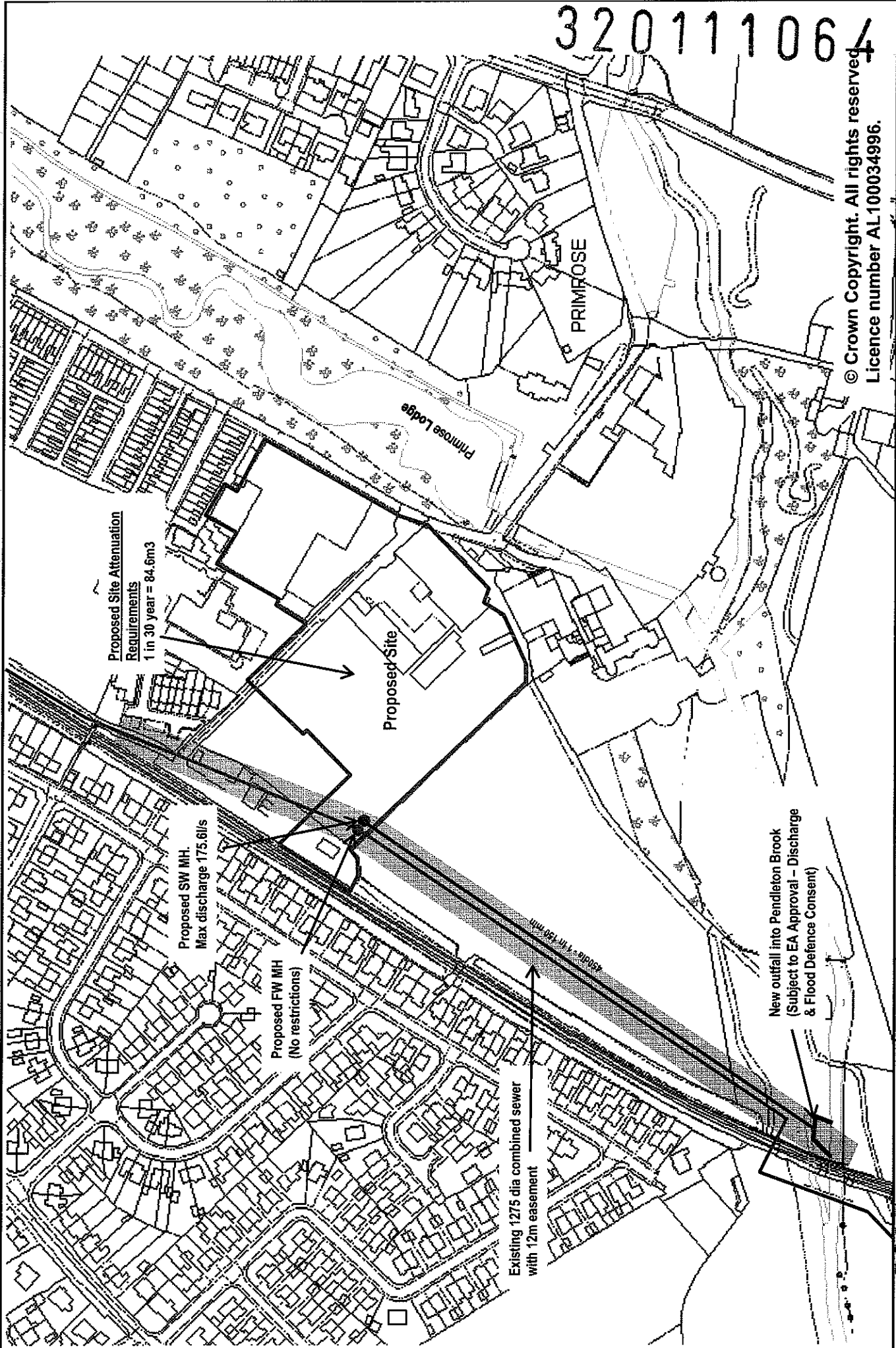
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Figures

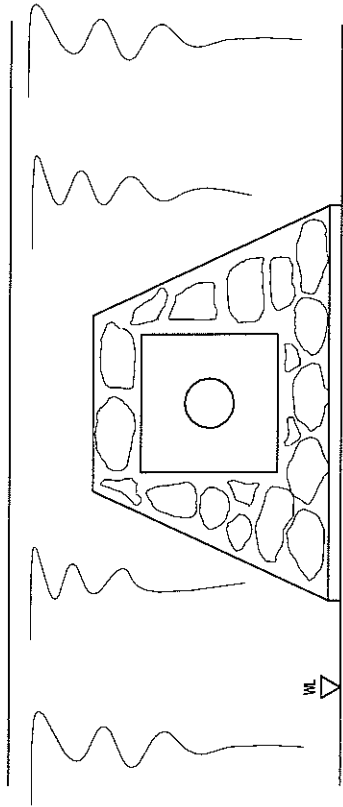
1. Outline Drainage Proposed
2. Proposed Outfall
3. Proposed Impermeable Areas
4. Existing Site Layout & Topo Survey

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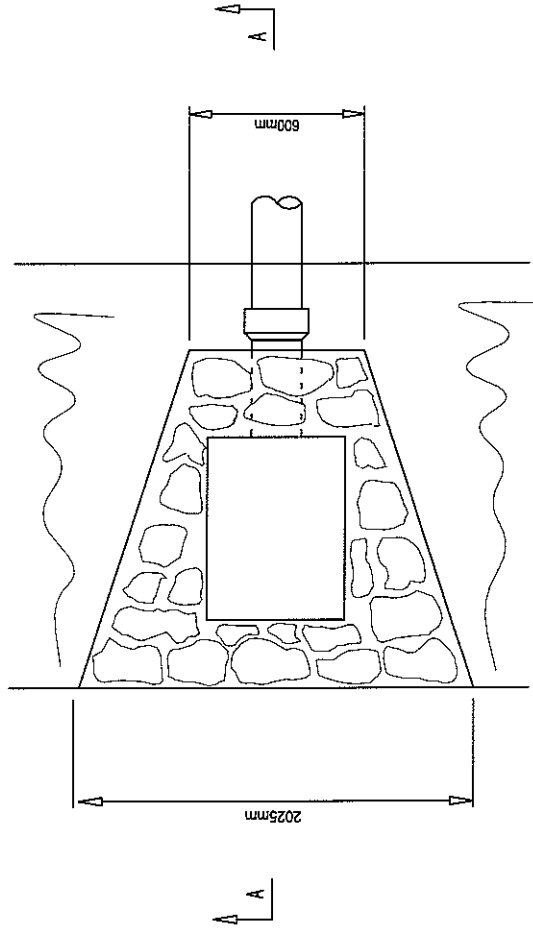
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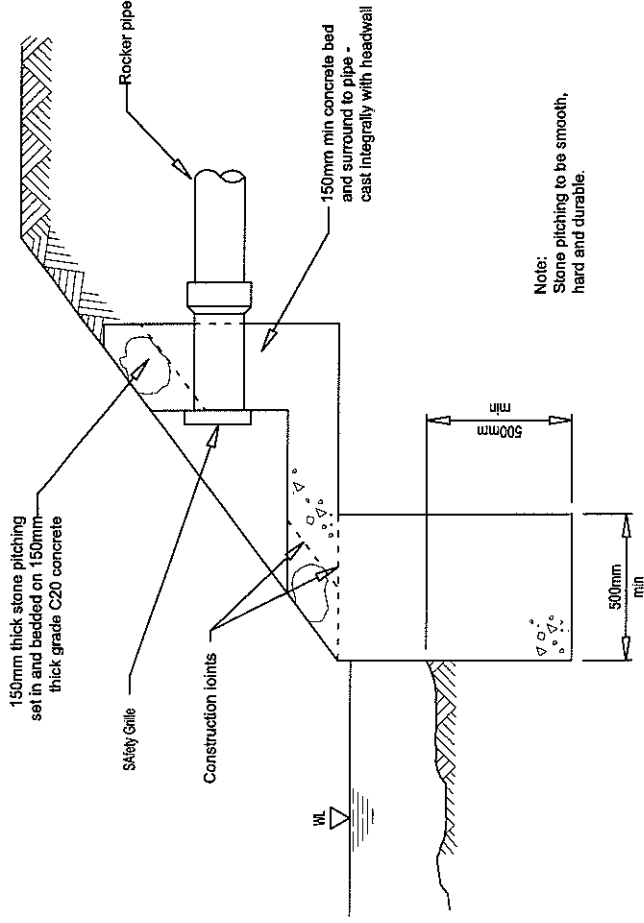
 PSA DESIGN <i>engineering your environment</i> CIVIL, STRUCTURAL, GEOTECHNICAL, TRANSPORT	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066		Client	Beck Developments Ltd		Drawing No.									
	Job		Job	Primrose Mill, Clitheroe		Date	17.05.11								
	Title		Title	Outline Drainage Proposals		Scale	NTS								
						Drawn	PJB	Checked	Approved	Rev					
Figure 1															



Front Elevation



Plan

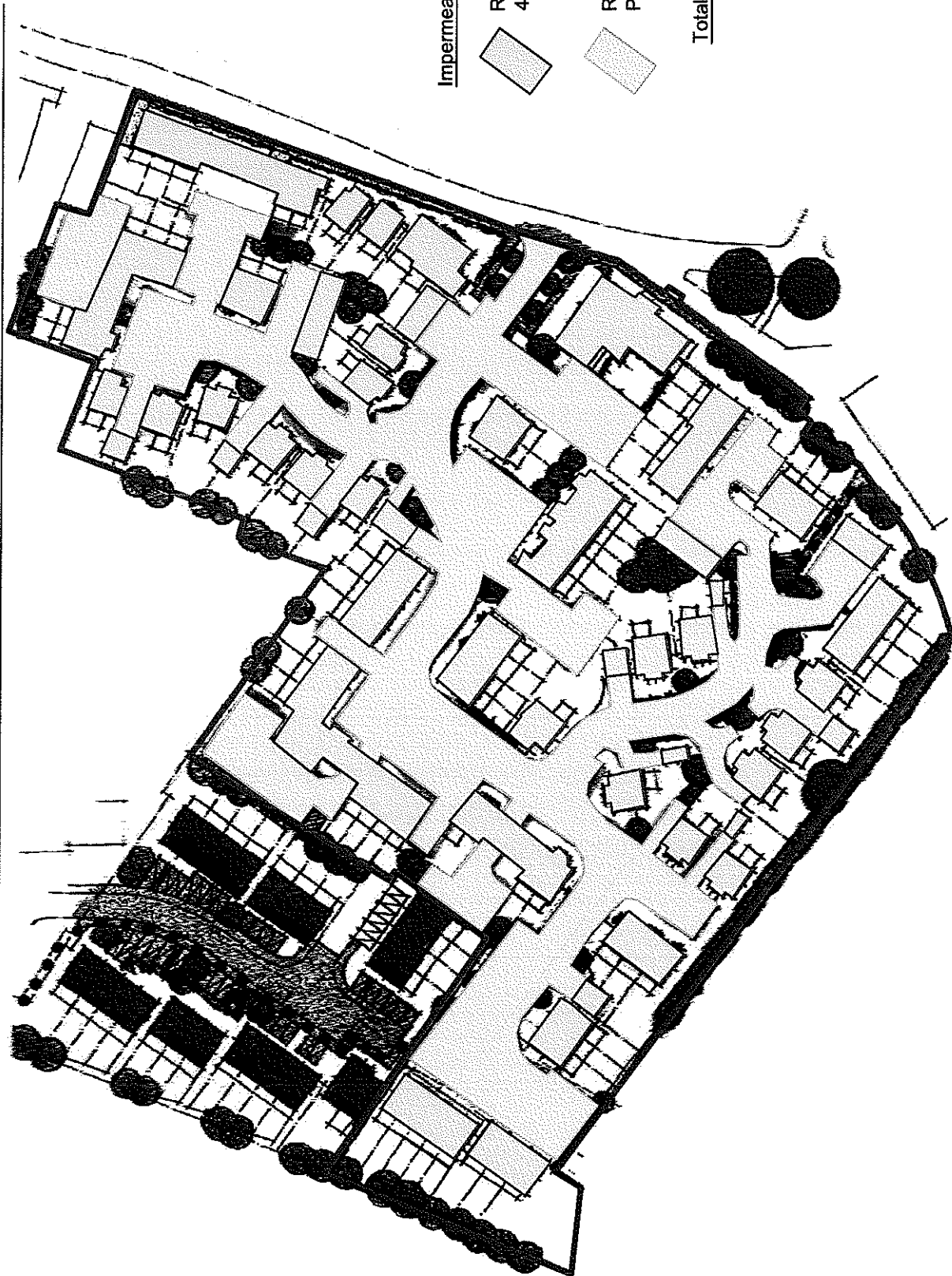


Note:
Stone pitching to be smooth,
hard and durable.

Section A-A

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Beck Developments Ltd		Scale	
Primrose Mill, Clitheroe		Not to Scale	
Typical Headwall Detail at Outfall to Watercourse		Drawn	Checked
		GS	AP
		Figure 2	
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		Rev.	



Impermeable Areas

Roof Water =
4970m²

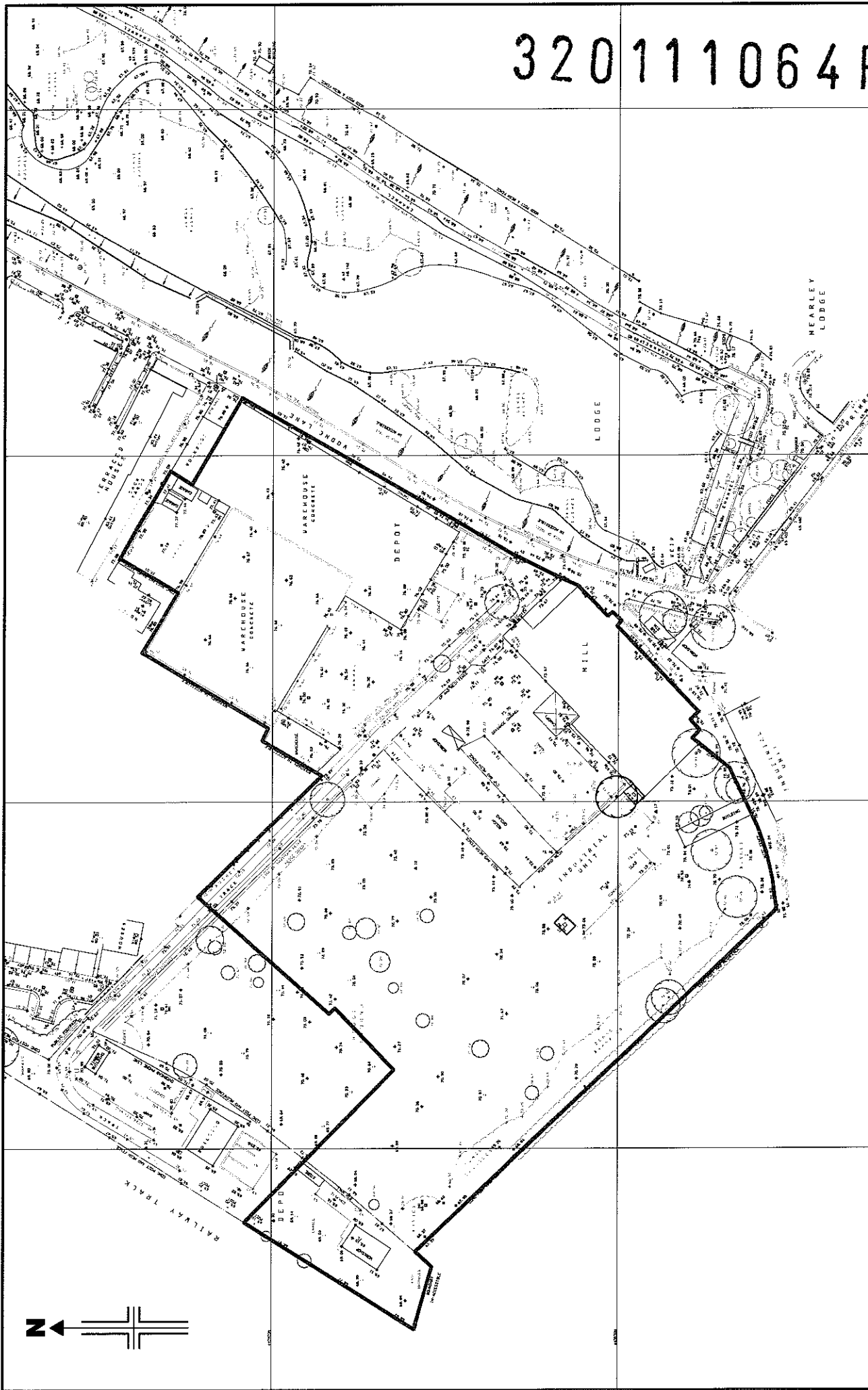
Roads / Footways /
Parking = 81100m²

Total = 13,080m²

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 www.psadesign.co.uk mail@psadesign.co.uk	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786068 Fax. 01772 786265		Client		Beck Developments		Date		Drawing Number	
	Job		Job		Primrose Mill, Clitheroe		Check		17.05.11	
	Title		Title		Impermeable Areas Drawing		Appr.		NTS	
							GS		Scale	
								Rev.		

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PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel: 01772 786066 Fax: 01772 786265		Client	Beck Developments Ltd		Drawing Number Figure 4	
www.psadesign.co.uk mail@psadesign.co.uk		Job	Primrose Mill, Clitheroe		Date	17.05.11
PSA DESIGN engineering your environment CIVIL, STRUCTURAL, GEOTECHNICAL, TRANSPORT		Title	Topographical Survey		Scale	1:000 @ A3
			Drawn	PJB	Appr.	GS
			Check	GS		
					Rev.	

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Appendix A

MircoDrainage Output
1 in 30yr and 1 in 100yr Attenuation Requirements

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Micro Drainage

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Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	30	Longest Storm (mins)	10080
M5-60 (mm)	19.000	Summer Storms	Yes
Ratio-R	0.270	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+10
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 1.308

Time	(mins)	Area
from:	to:	(ha)
0	4	1.308

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Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	175.4	175.4	101.2602	1.2603	72.9	O K
30 Summer	175.4	175.4	101.3562	1.3562	78.8	O K
60 Summer	175.2	175.2	101.1298	1.1298	64.0	O K
120 Summer	171.0	171.0	100.7668	0.7668	36.9	O K
180 Summer	152.2	152.2	100.5817	0.5817	23.5	O K
240 Summer	131.9	131.9	100.4927	0.4927	17.5	O K
360 Summer	103.9	103.9	100.3967	0.3967	11.5	O K
480 Summer	86.4	86.4	100.3432	0.3432	8.6	O K
600 Summer	74.4	74.4	100.3067	0.3067	6.7	O K
720 Summer	65.7	65.7	100.2797	0.2797	5.5	O K
960 Summer	53.9	53.9	100.2432	0.2432	3.9	O K
1440 Summer	40.6	40.6	100.2022	0.2022	2.5	O K
2160 Summer	30.6	30.6	100.1653	0.1652	1.6	O K
2880 Summer	25.0	25.0	100.1442	0.1443	1.2	O K
4320 Summer	18.7	18.7	100.1208	0.1208	0.8	O K
5760 Summer	15.4	15.4	100.1083	0.1083	0.6	O K
7200 Summer	13.1	13.1	100.0997	0.0998	0.5	O K
8640 Summer	11.5	11.5	100.0878	0.0878	0.4	O K
10080 Summer	10.3	10.3	100.0782	0.0783	0.3	O K
15 Winter	175.0	175.0	101.4697	1.4697	84.6	O K
30 Winter	175.5	175.5	101.4582	1.4582	84.1	O K
60 Winter	175.6	175.6	101.0108	1.0108	55.3	O K
120 Winter	152.5	152.5	100.5833	0.5832	23.6	O K
180 Winter	120.4	120.4	100.4532	0.4532	14.9	O K
240 Winter	100.1	100.1	100.3852	0.3852	10.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	69.36	13
30 Summer	48.18	21
60 Summer	32.16	36
120 Summer	20.81	66
180 Summer	15.91	96
240 Summer	13.08	124
360 Summer	9.93	184
480 Summer	8.15	244
600 Summer	6.99	306
720 Summer	6.16	366
960 Summer	5.04	488
1440 Summer	3.79	724
2160 Summer	2.85	1084
2880 Summer	2.32	1420
4320 Summer	1.74	2136
5760 Summer	1.42	2896
7200 Summer	1.22	3544
8640 Summer	1.07	4288
10080 Summer	0.96	5136
15 Winter	69.36	13
30 Winter	48.18	22
60 Winter	32.16	38
120 Winter	20.81	66
180 Winter	15.91	96
240 Winter	13.08	124

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Micro Drainage

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Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
360 Winter	76.6	76.6	100.3132	0.3132	7.0	O K
480 Winter	62.9	62.9	100.2712	0.2712	5.1	O K
600 Winter	53.9	53.9	100.2432	0.2432	3.9	O K
720 Winter	47.6	47.6	100.2237	0.2237	3.2	O K
960 Winter	38.9	38.9	100.1963	0.1962	2.4	O K
1440 Winter	29.3	29.3	100.1602	0.1603	1.5	O K
2160 Winter	22.1	22.1	100.1332	0.1333	1.0	O K
2880 Winter	18.0	18.0	100.1182	0.1183	0.7	O K
4320 Winter	13.6	13.6	100.1018	0.1018	0.5	O K
5760 Winter	11.0	11.0	100.0837	0.0838	0.4	O K
7200 Winter	9.4	9.4	100.0717	0.0718	0.3	O K
8640 Winter	8.3	8.3	100.0632	0.0633	0.2	O K
10080 Winter	7.5	7.5	100.0573	0.0572	0.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	9.93	184
480 Winter	8.15	244
600 Winter	6.99	306
720 Winter	6.16	366
960 Winter	5.04	488
1440 Winter	3.79	734
2160 Winter	2.85	1100
2880 Winter	2.32	1416
4320 Winter	1.74	2180
5760 Winter	1.42	2888
7200 Winter	1.22	3656
8640 Winter	1.07	4336
10080 Winter	0.96	4992

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Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	19.000	Summer Storms	Yes
Ratio-R	0.270	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+10
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 1.308

Time	(mins)	Area
from:	to:	(ha)
0	4	1.308

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Micro Drainage

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Summary of Results for 100 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
15 Summer	175.6	175.6	101.0213	1.0213	113.3	O K
30 Summer	175.5	175.5	101.0988	1.0988	128.4	O K
60 Summer	175.4	175.4	101.0628	1.0628	121.3	O K
120 Summer	174.6	174.6	100.8743	0.8743	85.4	O K
180 Summer	166.1	166.1	100.7113	0.7113	56.8	O K
240 Summer	155.8	155.8	100.5983	0.5983	39.1	O K
360 Summer	128.7	128.7	100.4817	0.4817	23.5	O K
480 Summer	108.6	108.6	100.4127	0.4127	16.2	O K
600 Summer	94.2	94.2	100.3672	0.3672	12.2	O K
720 Summer	82.9	82.9	100.3327	0.3327	9.6	O K
960 Summer	67.6	67.6	100.2858	0.2857	6.7	O K
1440 Summer	50.3	50.3	100.2322	0.2322	4.1	O K
2160 Summer	37.3	37.3	100.1902	0.1902	2.5	O K
2880 Summer	30.2	30.2	100.1637	0.1637	1.8	O K
4320 Summer	22.3	22.3	100.1342	0.1343	1.1	O K
5760 Summer	18.2	18.2	100.1188	0.1188	0.9	O K
7200 Summer	15.5	15.5	100.1087	0.1088	0.7	O K
8640 Summer	13.5	13.5	100.1012	0.1013	0.6	O K
10080 Summer	12.1	12.1	100.0918	0.0918	0.5	O K
15 Winter	175.7	175.7	101.1128	1.1128	131.1	O K
30 Winter	175.6	175.6	101.1773	1.1773	143.9	O K
60 Winter	175.7	175.7	101.0648	1.0648	121.7	O K
120 Winter	170.4	170.4	100.7603	0.7603	65.2	O K
180 Winter	150.0	150.0	100.5717	0.5717	35.3	O K
240 Winter	127.6	127.6	100.4777	0.4777	23.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	89.42	13
30 Summer	62.82	22
60 Summer	42.25	38
120 Summer	27.34	70
180 Summer	20.77	98
240 Summer	16.98	128
360 Summer	12.78	186
480 Summer	10.42	246
600 Summer	8.89	306
720 Summer	7.80	366
960 Summer	6.33	488
1440 Summer	4.71	724
2160 Summer	3.49	1100
2880 Summer	2.82	1436
4320 Summer	2.09	2124
5760 Summer	1.69	2904
7200 Summer	1.43	3640
8640 Summer	1.26	4296
10080 Summer	1.12	5040
15 Winter	89.42	14
30 Winter	62.82	23
60 Winter	42.25	40
120 Winter	27.34	72
180 Winter	20.77	98
240 Winter	16.98	128

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Summary of Results for 100 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	98.0	98.0	100.3787	0.3787	13.1	O K
480 Winter	80.3	80.3	100.3247	0.3247	9.1	O K
600 Winter	68.6	68.6	100.2887	0.2887	6.8	O K
720 Winter	60.2	60.2	100.2627	0.2627	5.4	O K
960 Winter	48.9	48.9	100.2278	0.2277	3.9	O K
1440 Winter	36.4	36.4	100.1868	0.1867	2.4	O K
2160 Winter	27.0	27.0	100.1517	0.1518	1.5	O K
2880 Winter	21.8	21.8	100.1322	0.1323	1.1	O K
4320 Winter	16.2	16.2	100.1113	0.1113	0.7	O K
5760 Winter	13.1	13.1	100.0993	0.0993	0.6	O K
7200 Winter	11.2	11.2	100.0847	0.0848	0.4	O K
8640 Winter	9.8	9.8	100.0742	0.0743	0.3	O K
10080 Winter	8.8	8.8	100.0667	0.0668	0.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	12.78	186
480 Winter	10.42	246
600 Winter	8.89	306
720 Winter	7.80	366
960 Winter	6.33	488
1440 Winter	4.71	734
2160 Winter	3.49	1100
2880 Winter	2.82	1452
4320 Winter	2.09	2172
5760 Winter	1.69	2856
7200 Winter	1.43	3608
8640 Winter	1.26	4352
10080 Winter	1.12	5144

Appendix B

Environment Agency Correspondence

320111064P

From: Worswick, Colin [mailto:colin.worswick@environment-agency.gov.uk]
Sent: 13 May 2011 10:41
To: Graham Sanderson
Subject: RE: Site off Woone Lane, Clitheroe

Graham,

The FRA was accepted at the planning stage and the discharge rates were agreed. However, if you are changing the way that the site drains for it to now all discharge to the brook (when it didn't previously) then green-field rates will apply.

The Planning Authority will consult with us regarding the attenuation.

Colin Worswick

Development and Flood Risk Engineer
North Area, North West Region
01772 714259
07741 019565

320111064P

From: Graham Sanderson [mailto:graham.sanderson@psadesign.co.uk]
Sent: 13 May 2011 09:59
To: Worswick, Colin
Subject: RE: Site off Woone Lane, Clitheroe

Colin, thanks for the reply

I'm assuming as the FRA was accepted as part of the original application then the Environment Agency reviewed and accepted the principles outlined with it. Can you please just confirm is this was the case. Assessments and calculations were included within this document to formulate the existing run-off from the site (both into the United Utilities combined system and Pendleton Brook). Clearly the existing site remains unaltered and hence the proposed attenuation rates will remain the same for the revised proposals.

I also note from the planning permission approval, the surface water discharge is conditioned within it along the lines of "SW regulation system to be approved by the Local Authority".

Kind Regards
Graham

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From: Worswick, Colin [mailto:colin.worswick@environment-agency.gov.uk]

Sent: 12 May 2011 13:35

To: Graham Sanderson

Subject: RE: Site off Woone Lane, Clitheroe

Graham,

We would not object to the surface water discharging to Pendleton Brook provided that:

1. Run-off is attenuated to existing rates. Green-field run-off rate is 9 litres/second/hectare unless you can prove otherwise
2. If the run-off currently discharges to a combined system, then "new" water would discharge to the brook therefore this needs to be considered.
3. Flood Defence Consent is applied for

Regards

Colin Worswick

Development and Flood Risk Engineer
North Area, North West Region
01772 714259
07741 019565

320111064P

Appendix C

Approval Letters from United Utilities and Environment Agency

320111064P

Graham Sanderson

Subject: FW: Woone Lane, Clitheroe

From: Lunt, John [<mailto:John.Lunt@uuplc.co.uk>]

Sent: 09 June 2011 16:30

To: Graham Sanderson

Subject: RE: Woone Lane, Clitheroe

Hi Graham,

In reply, I can confirm that the drainage strategy submitted is perfectly acceptable in principle to UU.

I hope this is sufficient for your needs but should you wish to discuss matters further then please don't hesitate to get in touch.

Regards,

John

DDI – 01925 678311

From: Graham Sanderson [<mailto:graham.sanderson@psadesign.co.uk>]

Sent: 31 May 2011 15:50

To: Lunt, John

Subject: RE: Woone Lane, Clitheroe

Hi John, hope you are well.

We've produced the attached drainage strategy for the site I met you about at Woone Lane, Clitheroe. If possible I would like your agreement and support in principle to the philosophy outlined within it.

Hopefully it reflects our discussions and meets with United Utilities' requirements at this stage.

Many thanks

Graham

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Addendum to Drainage Strategy Report – Option Land

This addendum has been prepared to assess the area of land to the south of the current development. It seeks to address the impacts of any potential development in terms of Foul and Surface Water run-off.

This area was discussed in confidence with United Utilities and the Environment Agency and their response was concurrent with that of the current development site in that they would have no objection in principle

The area of land in question has an area of 2.6ha.

Following a site walkover and review of aerial mapping it has been assumed that there are no existing areas that are positively drained and hence run-off will be solely greenfield.

Green field run-off (based on Environment Agency's requirements of 9l/s/ha) = 23.4 l/s. Therefore run-off from the developed site is likely to afford a maximum **allowable discharge rate of 23.4l/s**.

Assuming a development density similar to that of the current scheme then we can estimate an impermeable area for the "option land" as follows:

Approved Site Total Area = 3.01ha

Total Imp Area = 1.308ha

Factor = 2.3

Option Land Total Area = 2.6ha

Therefore $2.6/2.3 = 1.13 \text{ ha}$ – **Proposed Impermeable Area**

MicroDrainage has been assessed to calculate the 1 in 30 year storm (with allowance for climatic change) in the same way as the main report. The calculations (included overleaf) indicate that to restrict the run-off to existing greenfield rates of 23.4l/s based on a 1 in 30yr event and a proposed impermeable area of 1.13 ha, then an attenuation of **260.2m³** would be required.

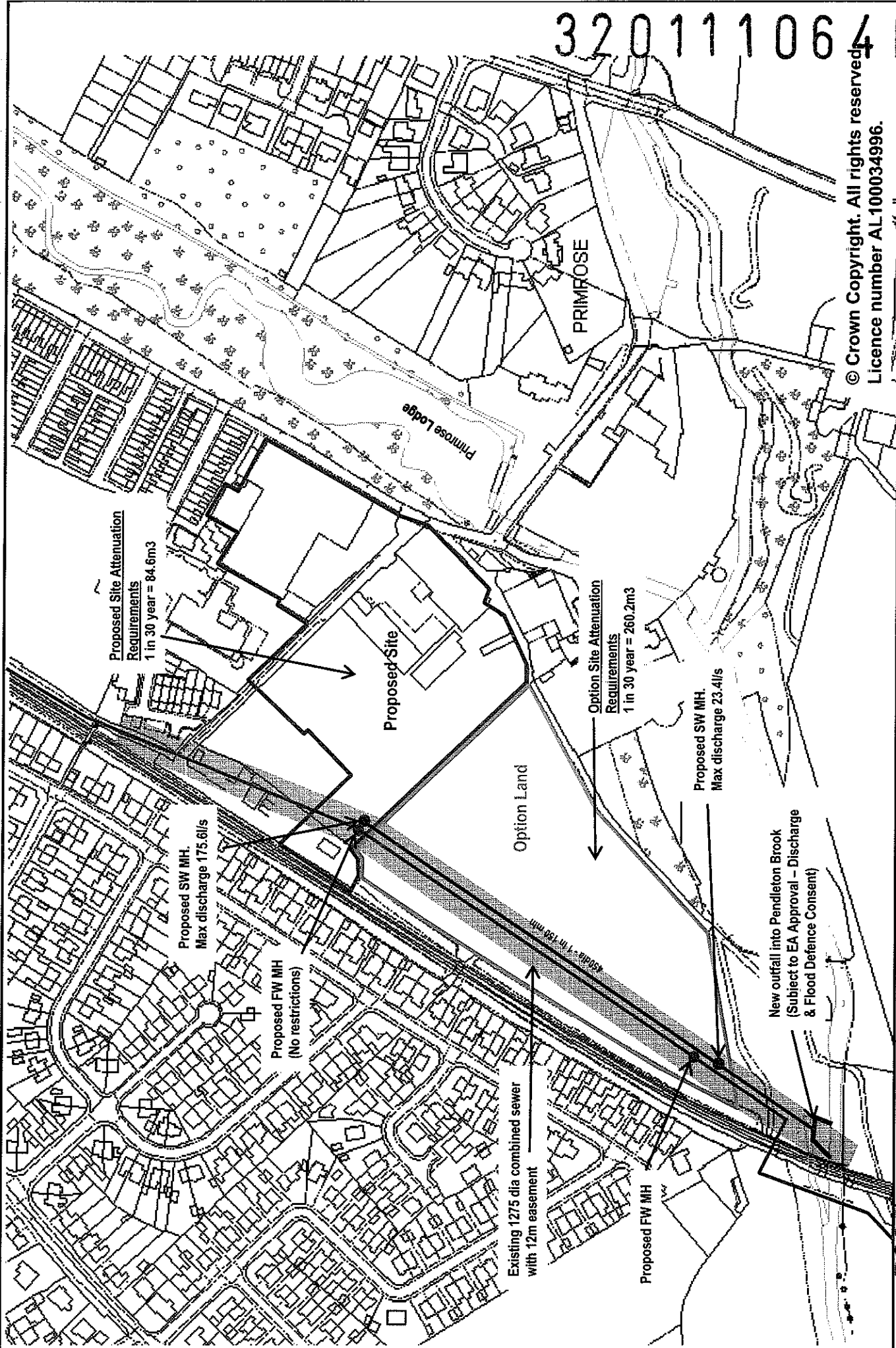
Similarly to the approved site this attenuation would be accommodated for upstream of the 450mm diameter outfall sewer

The 450mm diameter sewer should have more than adequate capacity to accommodate this additional flow above and beyond that of the approved site and the Contour Housing site. The estimated total flow from all sites would be $- 23.4 + 176.5 + 4.3 = 204.2 \text{ l/s}$. A 450mm diameter pipe laid at a minimum of 1 in 150 gradient can accommodate approximately 264 l/s.

United Utilities also indicated that in principle they would have no objections to an unrestricted foul discharge from this site.

A diagrammatic outline drainage proposal is included as Figure 5

320111064P



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 PSA DESIGN engineering your environment CIVIL, STRUCTURAL, GEOTECHNICAL, TRANSPORT	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066	Client Beck Developments Ltd	Drawn PJB	Date 17.05.11	Drawing No. Figure 5
	Job Primrose Mill, Clitheroe	Checked 	Approved 	Scale NTS	Rev
	Title Outline Drainage Proposals - Option Land				

PSA Design

Page 3

The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA

Date 18 May 2011 09:58

Designed By grahams

File option land proposed.SRC

Checked By

Micro Drainage

Source Control W.11.2

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	30	Longest Storm (mins)	10080
M5-60 (mm)	19.000	Summer Storms	Yes
Ratio-R	0.270	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+10
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 1.130

Time	(mins)	Area
from:	to:	(ha)
0	4	1.130

PSA Design

The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA

Page 1



Date 18 May 2011 09:58

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Micro Drainage

Source Control W.11.2

Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
15 Summer	19.2	19.2	101.1013	1.1013	128.9	O K
30 Summer	20.1	20.1	101.3062	1.3062	169.6	O K
60 Summer	21.3	21.3	101.4802	1.4802	203.7	O K
120 Summer	21.9	21.9	101.5672	1.5672	220.3	O K
180 Summer	21.9	21.9	101.5787	1.5787	222.4	O K
240 Summer	21.9	21.9	101.5702	1.5702	220.9	O K
360 Summer	21.6	21.6	101.5347	1.5347	214.1	O K
480 Summer	21.3	21.3	101.4832	1.4832	204.3	O K
600 Summer	20.9	20.9	101.4257	1.4257	193.1	O K
720 Summer	20.5	20.5	101.3657	1.3657	181.3	O K
960 Summer	19.7	19.7	101.2463	1.2463	157.6	O K
1440 Summer	19.2	19.2	101.0193	1.0193	112.8	O K
2160 Summer	19.2	19.2	100.6983	0.6983	54.7	O K
2880 Summer	19.2	19.2	100.4212	0.4212	17.0	O K
4320 Summer	16.1	16.1	100.2418	0.2417	4.5	O K
5760 Summer	13.1	13.1	100.1872	0.1872	2.4	O K
7200 Summer	11.3	11.3	100.1647	0.1647	1.8	O K
8640 Summer	9.9	9.9	100.1488	0.1488	1.4	O K
10080 Summer	8.9	8.9	100.1367	0.1368	1.2	O K
15 Winter	19.4	19.4	101.1903	1.1903	146.4	O K
30 Winter	21.0	21.0	101.4317	1.4317	194.2	O K
60 Winter	22.4	22.4	101.6557	1.6557	236.7	O K
120 Winter	23.3	23.3	101.7837	1.7837	258.9	O K
180 Winter	23.3	23.3	101.7907	1.7907	260.2	O K
240 Winter	23.2	23.2	101.7662	1.7662	256.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	69.36	18
30 Summer	48.18	32
60 Summer	32.16	60
120 Summer	20.81	100
180 Summer	15.91	132
240 Summer	13.08	168
360 Summer	9.93	238
480 Summer	8.15	306
600 Summer	6.99	374
720 Summer	6.16	442
960 Summer	5.04	576
1440 Summer	3.79	834
2160 Summer	2.85	1188
2880 Summer	2.32	1496
4320 Summer	1.74	2200
5760 Summer	1.42	2912
7200 Summer	1.22	3632
8640 Summer	1.07	4376
10080 Summer	0.96	5048
15 Winter	69.36	18
30 Winter	48.18	32
60 Winter	32.16	60
120 Winter	20.81	112
180 Winter	15.91	140
240 Winter	13.08	180

PSA Design

Page 2

The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA

Date 18 May 2011 09:58

Designed By grahams

File option land proposed.SRC

Checked By

Micro Drainage

Source Control W.11.2



Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
360 Winter	22.6	22.6	101.6877	1.6877	242.4	O K
480 Winter	22.0	22.0	101.5907	1.5907	224.7	O K
600 Winter	21.4	21.4	101.4912	1.4912	205.8	O K
720 Winter	20.7	20.7	101.3932	1.3932	186.7	O K
960 Winter	19.5	19.5	101.2053	1.2053	149.5	O K
1440 Winter	19.2	19.2	100.8388	0.8388	79.0	O K
2160 Winter	18.7	18.7	100.3102	0.3102	8.1	O K
2880 Winter	15.5	15.5	100.2282	0.2282	3.9	O K
4320 Winter	11.6	11.6	100.1693	0.1693	1.9	O K
5760 Winter	9.5	9.5	100.1438	0.1438	1.3	O K
7200 Winter	8.1	8.1	100.1277	0.1278	1.0	O K
8640 Winter	7.1	7.1	100.1158	0.1158	0.8	O K
10080 Winter	6.4	6.4	100.1072	0.1073	0.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	9.93	256
480 Winter	8.15	332
600 Winter	6.99	404
720 Winter	6.16	476
960 Winter	5.04	614
1440 Winter	3.79	878
2160 Winter	2.85	1120
2880 Winter	2.32	1468
4320 Winter	1.74	2180
5760 Winter	1.42	2848
7200 Winter	1.22	3544
8640 Winter	1.07	4264
10080 Winter	0.96	5024

320111064P

Mr Graham Sanderson
P S A Design Ltd
Old Bank House (6) Berry Lane
Longridge
Preston
PR3 3JA

Our ref: CE/2011/104786/01-L02
Your ref:
Date: 05 July 2011

Dear Mr Sanderson

**PROPOSED DRAINAGE STRATEGY
PRIMROSE MILL, WOONE LANE, CLITHEROE**

I refer to the above, and my previous letter dated 28 June 2011.

We confirm that we have no objection in principle to the proposed drainage strategy (reference D1433/R/01; dated 16 May 2011) subject to a detailed drainage design for the site being agreed prior to the commencement of any development (which could be conditioned as part of any subsequent planning approval).

Yours sincerely

Philip Carter
Planning Liaison Officer

Direct dial 01772 714219
Direct fax 01772 697032
Direct e-mail philip.carter@environment-agency.gov.uk

Environment Agency
PO Box 519, South Preston, Lancashire, PR5 8GD
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk
End

320111064P

LAND ON WOONE LANE, CLITHEROE

MEARLEY FOLD DEVELOPMENT

FLOOD RISK
ASSESSMENT



Prepared for:

Beck Developments
Challenge House
Challenge Way
Greenbank Business Park
Blackburn
Lancs, BB1 5QB

By:

LK Consult Ltd
The Corn Exchange
Fenwick Street
Liverpool
L2 7QL

December 2011

320111064P

EXECUTIVE SUMMARY

Scope and Background

This Flood Risk Assessment (FRA) has been undertaken by LK Consult to support a planning application for the development of land on Woone Lane, Clitheroe. The development comprises 32 dwellings, comprising apartments and terraced properties.

This report has been prepared in accordance with *Planning Policy Statement 25: Development and Flood Risk* (PPS25) Annex E and the guidance set out in the Practice Guide of December 2009. It summarises the methodology and results of the assessment.

In considering the proposals the following key principles have therefore been applied:-

- Identification of flood risks.
- Protection of users of the new development.
- No increased flood risk to third parties.

Consultations

The Environment Agency (EA) has been consulted to inform the preparation of this report. They have provided flood level data and a detailed flood map.

Ribble Valley Borough Council, Lancashire County Council and United Utilities were also consulted concerning flood risk.

Flood Risk

The site is potentially vulnerable to fluvial flooding from Mearley Brook to the south east of the site. Site inspection shows the site to be elevated in relation to, and with a fall towards, the Brook.

The site is shown on the Environment Agency's (EA) website Flood Zone Mapping (Figure 2-1) as being in all three flood zones (PPS 25 pages 22-24, Table D.1). A large portion of the site is in Flood Zones 1 and 2 – Low and Medium Risk – annual probability of flooding less than 1% (1 in 100). A small portion of the site lies in Flood Zone 3 – High Risk – annual probability of flooding greater than 1% (1 in 100).

Mitigation

Design

Site falls will be arranged to allow reasonably level access for occupants and visitors and allowing the site to be free-draining in case of local ponding at times of heavy rainfall. Floor levels of dwellings will be set as high as possible above flood level giving regard to necessary access for the less-able.

The development will result in a minor reduction of flood plain storage; however this loss will be mitigated by lowering areas adjacent to the development and at similar level in compensation.

Surface water runoff arising from the development will be managed by discharging into the adjacent Mearley Brook with prior consent from the EA. The proposed development has a

CONTENTS

320111064P

Executive Summary

1.	Introduction	1
2.	Proposed Development Site	2
3.	Assessment of Flood Risk	3
4.	Summary & Conclusions	7

APPENDICES

Appendix A:	Site Data
Appendix B:	Environment Agency Data
Appendix C:	Consultee Correspondence

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2. PROPOSED DEVELOPMENT SITE

2.1 The Site

The site is shown on the drawings included in Appendix A. The site is at National Grid Reference 374014, 441172 and is 0.8ha in area. Two site visits have been undertaken (the first visit was undertaken on the 13th May 2010 and the second visit undertaken on 25th May 2011). The site is currently classified as 'Greenfield'. Dense bushes/trees occupy the north western extent. A random stone wall marks the north-west boundary of the site. Allotments occupy the northern part of the site. Dense vegetation is present on and near the boundary adjacent the Mearley Brook.

2.2 Development Proposals

On the site it is proposed to construct 32 dwellings, comprising apartments and terraced properties with associated gardens and car parking. Access will be from Woone Lane to the north-west. The proposals are illustrated on the development plans in Appendix A.

2.3 Vulnerability

The development is shown on the Environment Agency's (EA) website Flood Zone Mapping as being in Flood Zones 1, 2 & 3 (PPS 25 page 22, Table D.1).

The proposed development is for residential end use and this is classified within the 'More Vulnerable' categories in Table D2 of PPS 25. PPS25 requires that, in this case, a Flood Risk Assessment will be required to accompany the Planning Application.

2.4 The Sequential and Exception Tests

PPS25 requires that the Sequential Test be applied to development proposals in Zones 2 and 3 to determine if there are any 'reasonably available' and suitable alternative sites at lower flood risk. The issues of actual flood risk are discussed below. The issues of safety and reduction in flood risk to others required by an Exception Test are also addressed in this document.

2.5 Site and Access Levels

A topographic survey of the site has been undertaken to OS GPS datum, and information is included on the drawings in Appendix A. The site appears to fall eastwards towards Mearley Brook, and has ground levels between 76.84m and 69.28m AOD. The proposed access would join the existing road at 76.52m AOD and the proposed parking and garden areas in the eastern part of the site near the Brook are currently between 69.9m AOD and 71.5m AOD.

existing flood risk in Clitheroe is high and will rise significantly in the future if no further action is taken. The policy recommends a thorough investigation of the flood risk associated with Mearley Brook and aspects such as sewer flooding and highway drainage need to be considered

3.2 Information from Other Consultees and Sources

The Local Authority, Ribble Valley Borough Council, has been consulted during this FRA process.

Lancashire County Council Highways department has confirmed that there has been no major flooding on Woone Lane in the last five years. The only surface water incidents relate to blocked or covered surface water gullies (see Appendix C for correspondence).

Ribble Valley Borough Council were consulted but did not provide a response.

A Level 1 SFRA² (Strategic Flood Risk Assessment) was produced by Ribble Valley Borough Council in May 2010. Information presented in the SFRA is referred to where appropriate throughout this report.

A FRA³ was recently carried out for a residential development on Woone Road. United Utilities' (UU) plans in the FRA indicate that there is a combined sewer in Woone Lane that discharges foul and surface water north westwards and is 300mm in diameter. There are no surface water sewers in the vicinity of the site according to UU records.

UU were consulted directly regarding potential sewer issues in the area. UU confirmed that the existing combined network is very near to full capacity. However UU do not have any record of public sewer flooding of properties in the site vicinity as a result of overloaded sewers and confirm that a foul connection would be acceptable.

3.3 Information from the Client

The Client has provided development proposals and a topographical survey to OS GPS datum of the site and access.

3.4 Flood Zone

The detailed flood map provided by the EA indicates that the site is in Flood Zones 1,2 and 3 (see Figure 2-3). Comparison of the data supplied by the EA with the topographical survey indicates that the 1% (100-y) flood level in this location will be around 70.8m AOD, which covers less than quarter of the site area. The 0.1% (1000-y) flood level is around 71.66m AOD, which covers roughly half the north-eastern part of the site. The site does not have any history of flooding, and is not in a flood warning area, which would tend to indicate that the EA mapping probably overstates the flood risk.

¹ EA 2009 Ribble Catchment Flood Management Plan (CFMP) Summary Report.

² Ribble Valley Borough Council (2010). 'Strategic Flood Risk Assessment – Level 1'

³ Weetwood Environmental Engineering (2008) "Primrose Mill, Clitheroe Flood Risk Assessment".

3.6 Mitigation Measures

3.6.1 *Proposed Site levels and Development Level*

Current Environment Agency guidance recommends that the minimum ground floor levels of residential developments are set at a minimum of 600mm above the 1% annual probability (1 in 100-year) flood level including 20% additional fluvial allowance for climate change. It is generally accepted that gardens and vehicle parking can be accommodated within the flood zone with suitable safeguards. The 'design' flood level for the site should therefore be the 1% annual probability event with allowance for climate change.

On the basis of the information provided, this flood level is 70.95m AOD including climate change allowance. The proposed dwellings will be accessed from the planned access road, where existing ground levels are generally at or above 71.5m AOD. Normal Environment Agency recommendation is to set ground floor level for the development at a minimum of 600mm above the 'design' level, or 71.55m AOD. Other EA guidance limits inundation to ground floors in the 1000-y (0.1%) annual probability event to a maximum of 600mm. On this site the 1000-y flood level is 71.66m AOD and so flooding to ground floors would be 110mm.

3.6.2 *Flood Storage Volume*

There is a potential small loss of flood storage volume because the proposed development and ground-works impinge on the area defined by the 1.0% flood extent (zone 3). Preliminary estimates indicate that this will not exceed 70 cu m. This loss can be mitigated by the lowering of an adjacent area identified to the north of the development down to a similar level to that lost in order to realise the same volume. An area is indicated on the mitigation plan in Figure 1-3 where lowering of ground levels to around 70.2m AOD can realise in excess of this figure if required.

3.6.3 *Safe Access*

The development is close to the north-eastern edge of the flood zones. Safe and dry access is therefore available via the planned road to the west above the 0.1% annual probability event. Therefore no mitigation is proposed.

3.6.4 *Flood Resilience and Resistance*

The development proposed may be subject to flooding at more extreme events than those considered, and therefore it may be prudent to incorporate flood resilience measures into ground floor construction to aid recovery after any event. Typical measures would include solid floors, use of suitable materials and services fed from upper floors with outlets at high level. Actual measures can be discussed and agreed with building control officers during detailed design.

3.7 Residual Risks

It is impossible to completely guard against flooding since extreme events greater than the design standard event are always possible. However, with the 0.1% annual probability flood event only slightly above the lowest building floor levels, the relatively elevated position of the development will safeguard it from localised fluvial flooding during extreme rainfall events and fluvial flooding events outside the scope of this assessment. In this situation it is not considered that a formal emergency evacuation plan will be necessary.

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APPENDIX A

SITE DATA

- **Location Plan**
- **Site Plan**
- **Proposed Development Plan**
- **Flood Storage Mitigation**

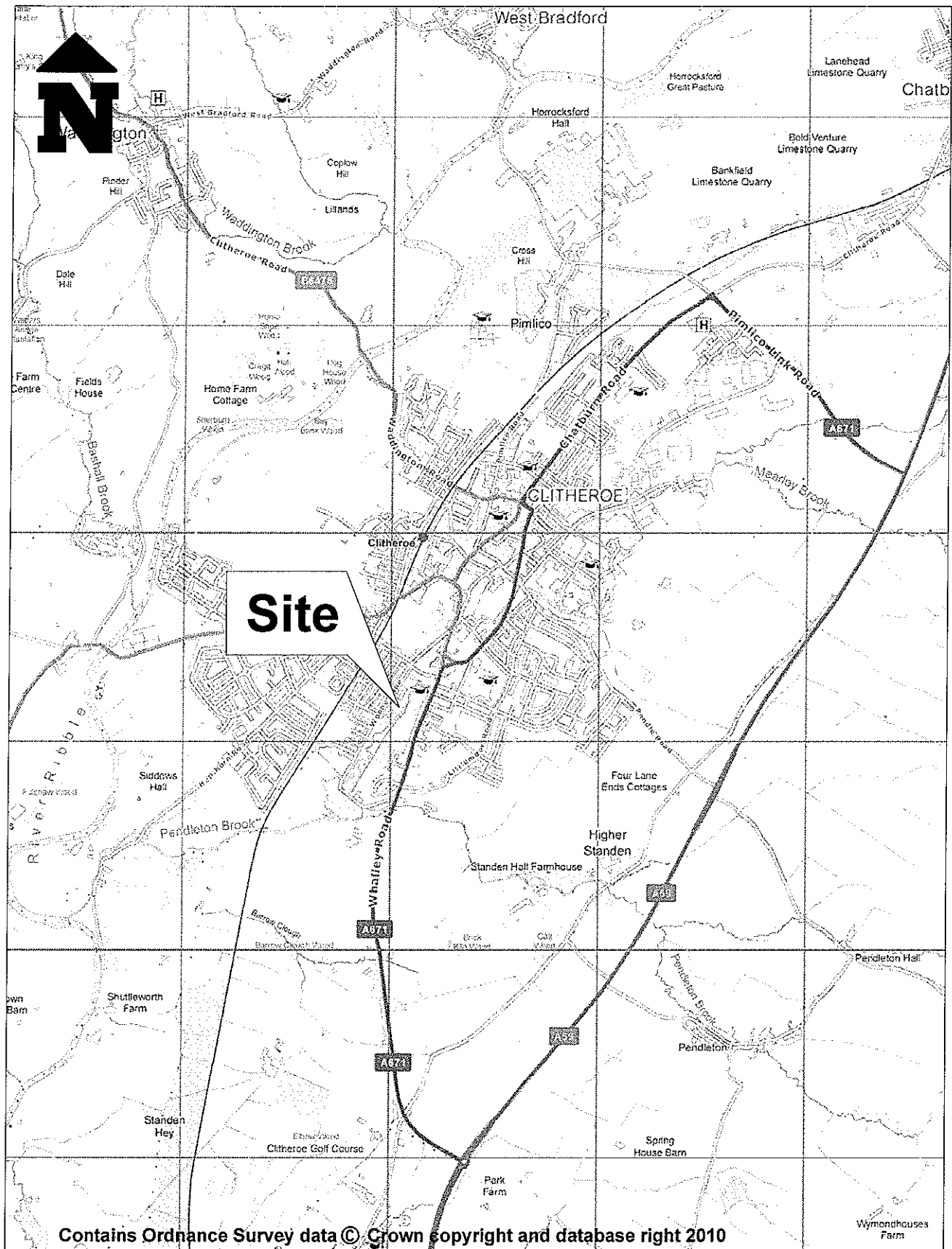


Figure 1-1: Location Plan, Land at Woone Lane, Clitheroe
Mearley Fold Development
Drawn: November 2011 Scale: ~ 1:25,000 @ A4

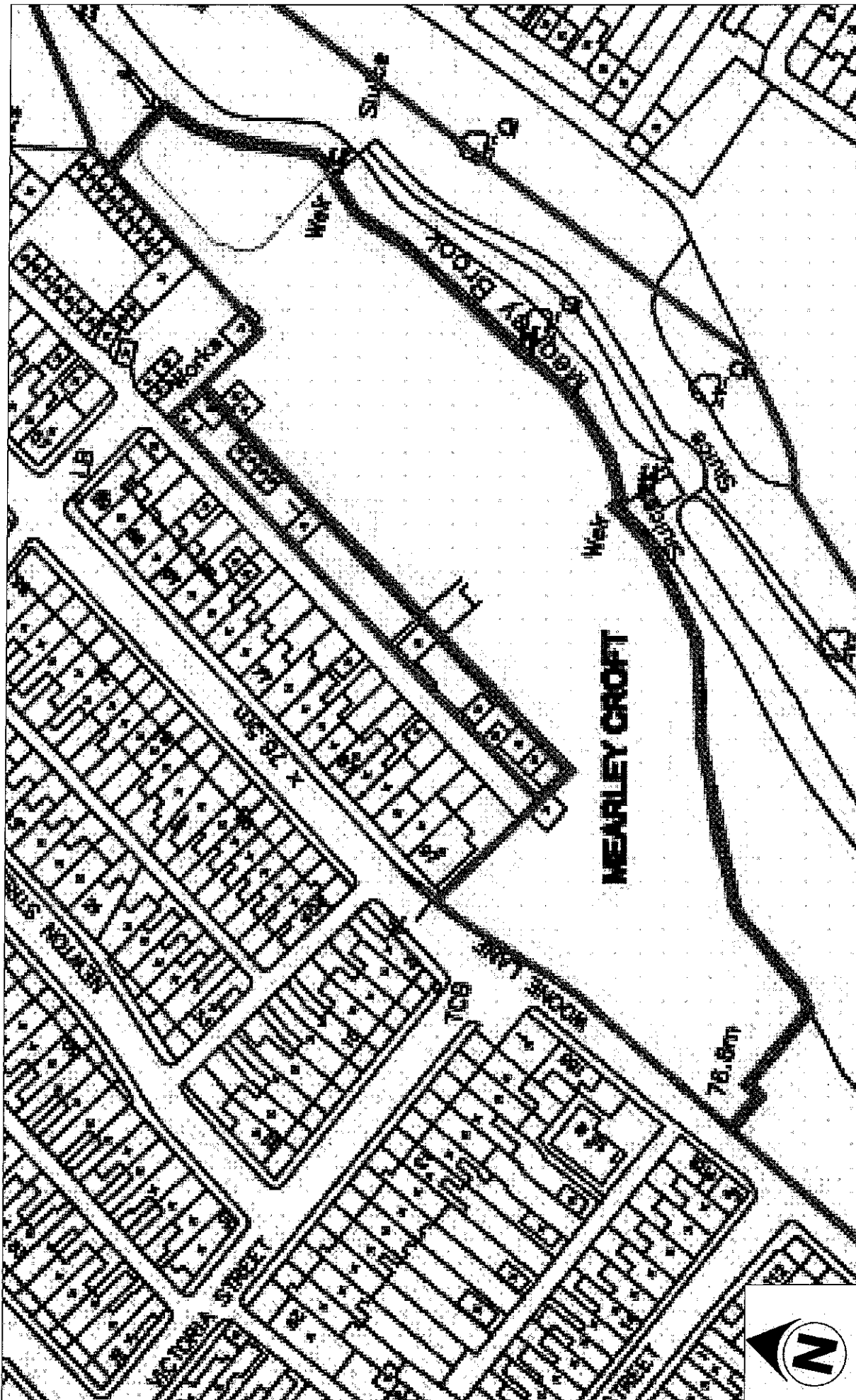
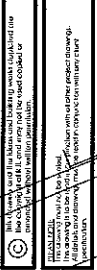
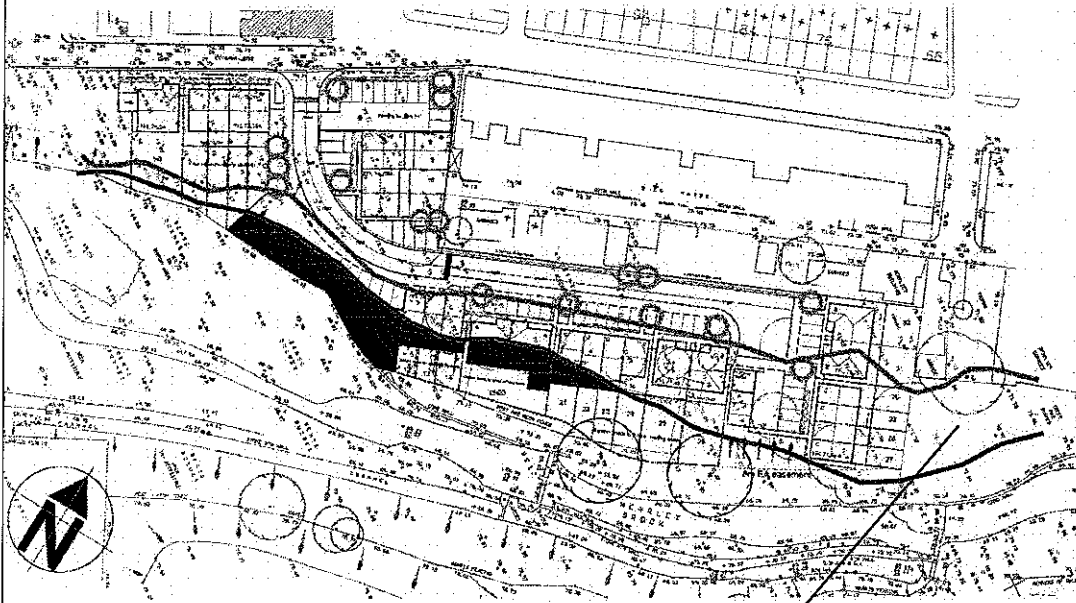


Figure 1-2: Site Plan
Mearley Fold Development
Drawn: December 2011 Scale ~1:1500 @ A4

017-01



Flood Volume potentially lost to development



Proposed Flood Storage Mitigation area

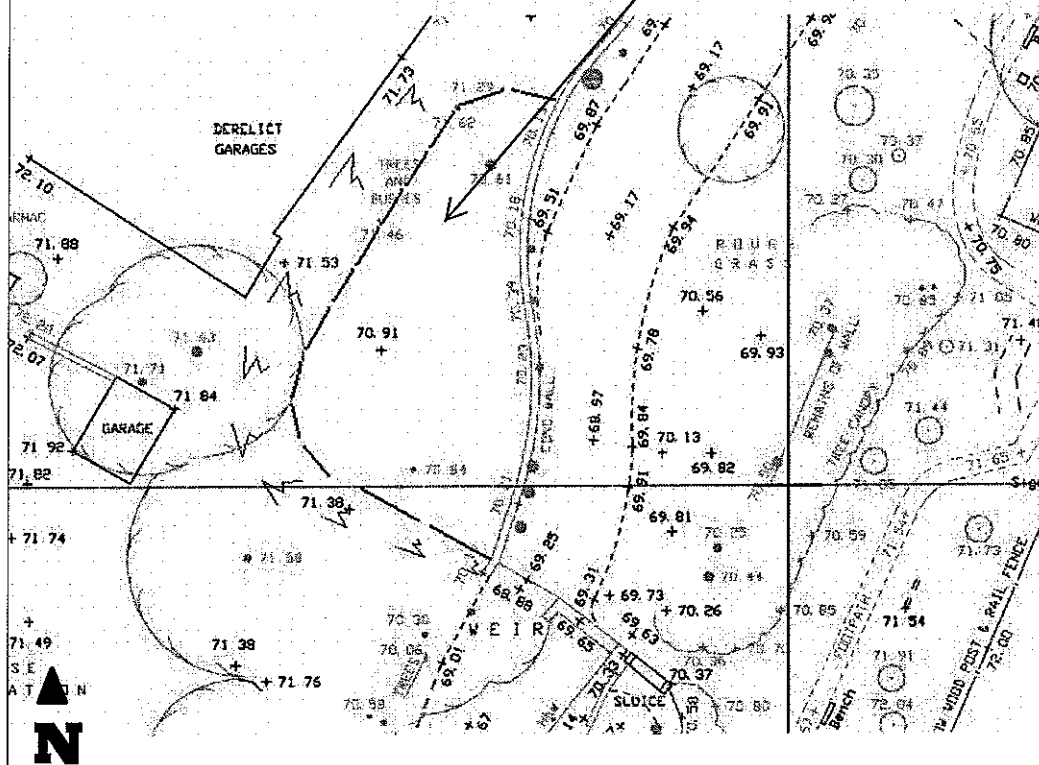


Figure 1-3: Flood Storage Compensation, Woone Lane, Clitheroe
Mearley Fold Development
Drawn: December 2011

320111064P

APPENDIX B

ENVIRONMENT AGENCY DATA

- EA Web-Based Flood Mapping
- EA Web-based Flood Warning Area
- Detailed Flood Map and Levels
- Flood Warning Areas

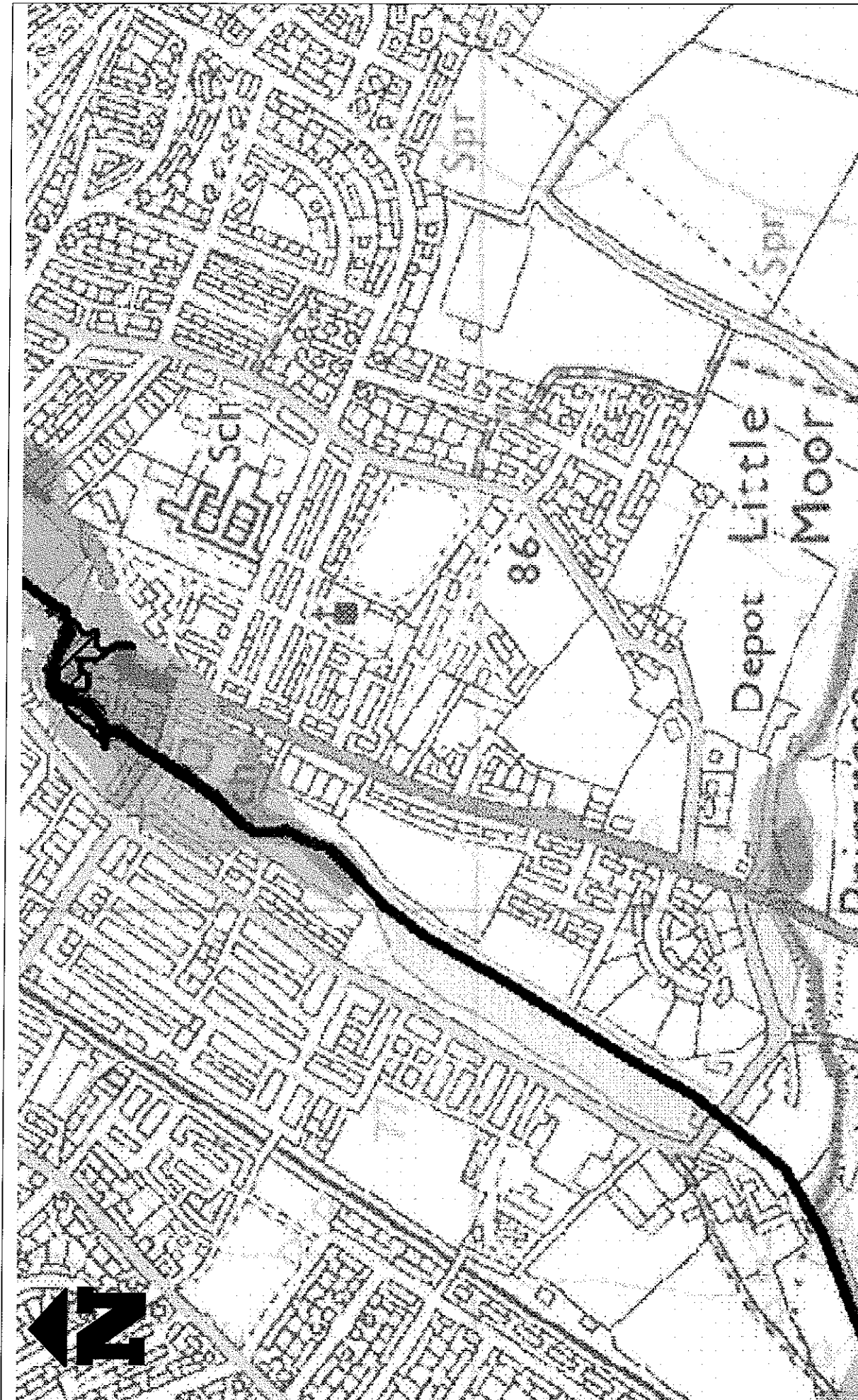


Figure 2-1: EA web based mapping, Land on Woone Lane, Clitheroe
Mearley Fold Development
Drawn: November 2011 Scale: ~1:7500 @ A4

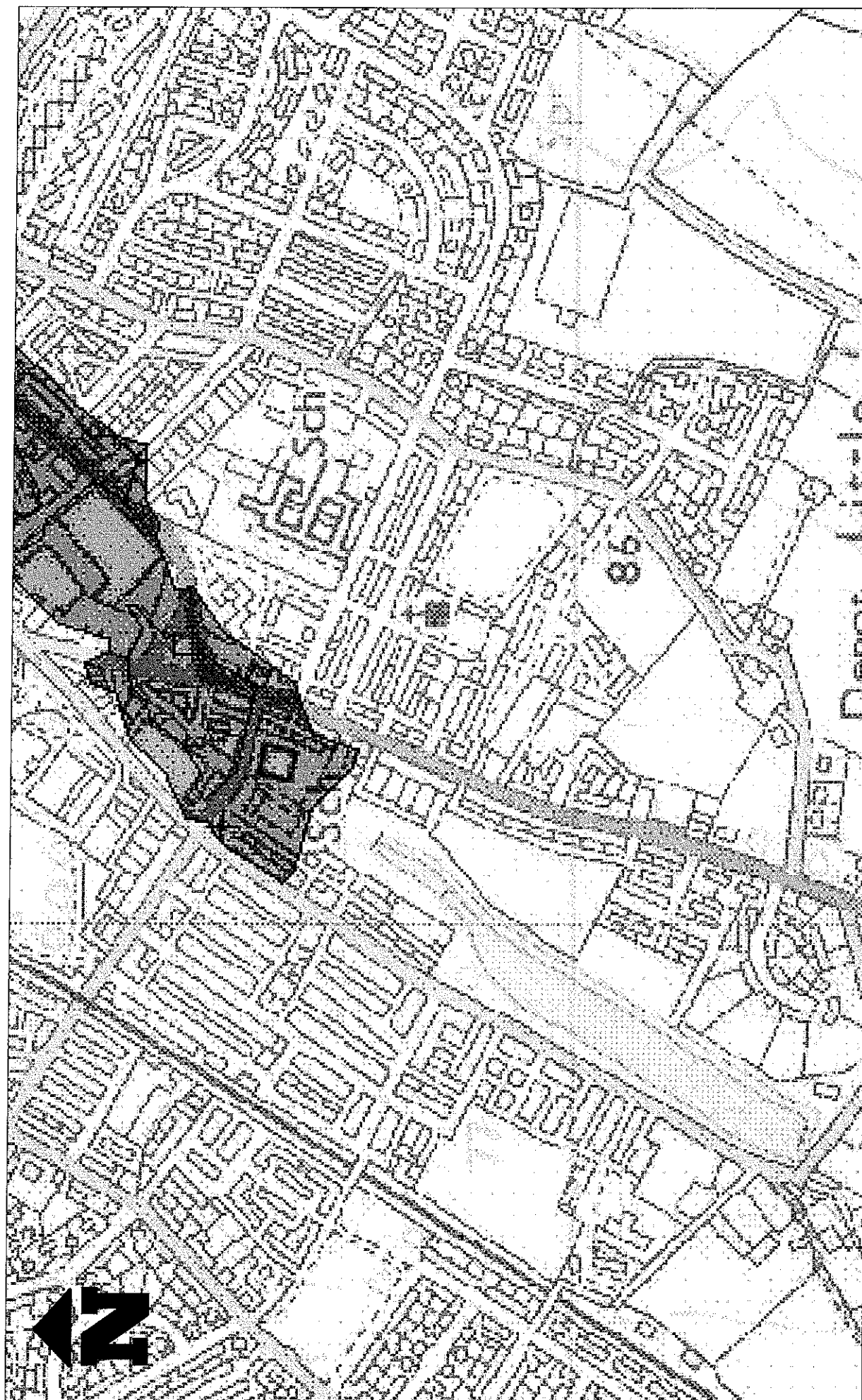


Figure 2-2: Environment Agency Web based Flood Warning Areas
Mearley Brook Development
Drawn: November 2011 Scale ~ 1:5000 @ A4

Legend

- Node Point Locations
- Main River
- Defences
- Historic Flood Events
- ABD
- Flood Zone 3
- Flood Zone 2

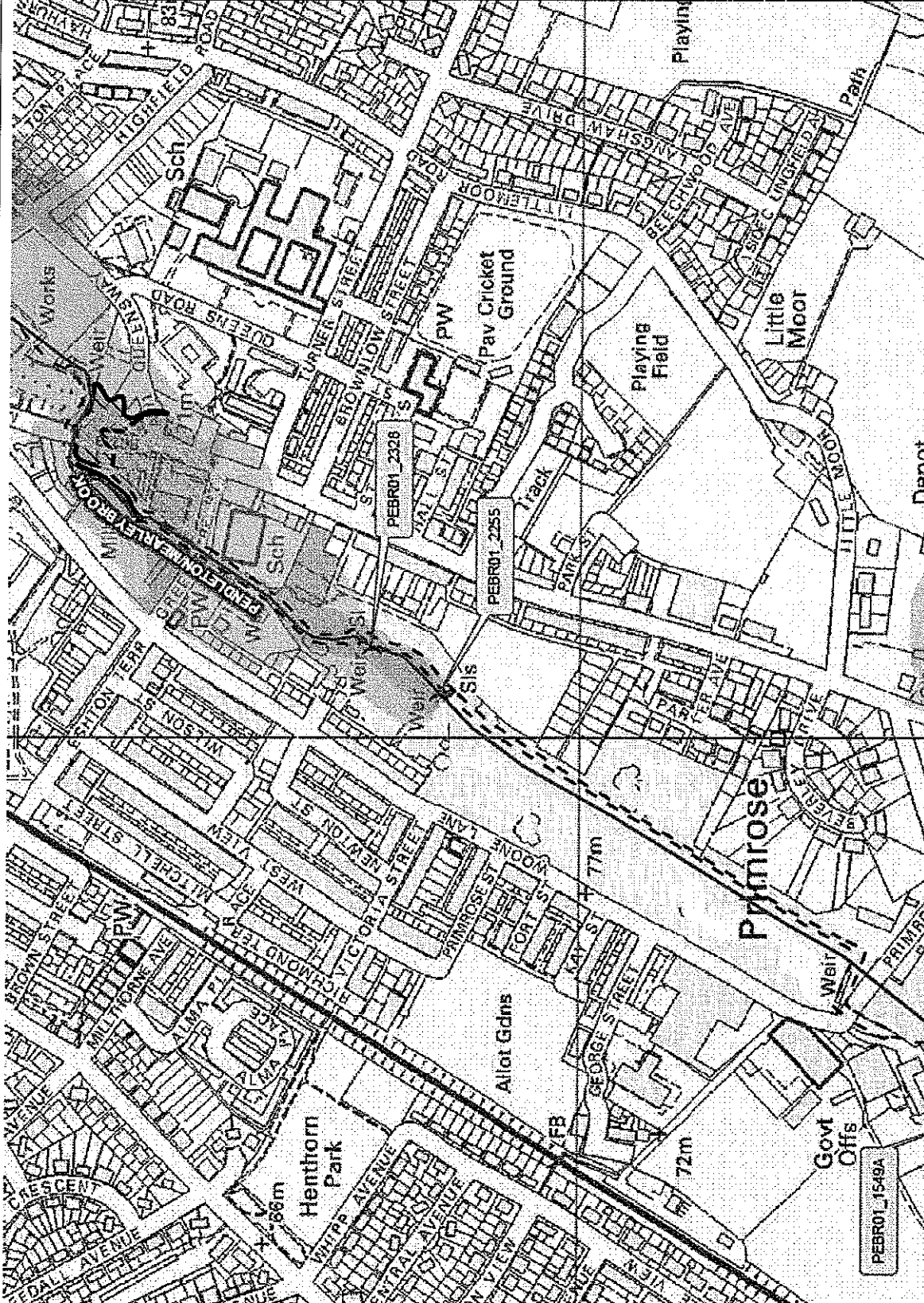


Figure 2-3: Detailed EA map centred on SD 73879 40905 created on 22 December 2010

Mearley Fold Development

Drawn: November 2011 Scale 5,000

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320111064P

Node	Flows (m3/sec) and Levels (mAOD) at Return Period:																			
	Q5		Q10		Q25		Q50		Q75		Q100		Q200		Q1000					
	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level
PEBR01_2328 (374075,441178)	18.23	70.49	20.5	70.59	24	70.71	25.48	70.76	26.35	70.78	26.92	70.8	28.01	70.82	81.44	71.66				
PEBR01_2255 (374035,441121)	18.1	70.48	20.4	70.58	23.87	70.7	25.46	70.75	26.29	70.77	26.88	70.78	27.95	70.81	81.38	71.66				
PEBR01_1549A (373682,440644)	18.1	60.46	20.4	60.55	23.87	60.66	25.46	60.73	26.29	60.77	26.88	60.8	27.95	60.87	81.39	61.72				
PEBR01_1549B (373666,440636)	26	60.46	29.81	60.55	35.5	60.66	39	60.73	41.43	60.77	42.99	60.8	47.32	60.87	112.93	61.72				

Level and Flow data taken from the Mearley Brook SFRM 2007, which is a 1D model. Datum is to OD Newly.

APPENDIX C
CONSULTEE CORRESPONDENCE

- United Utilities
- Lancashire County Council
- Ribble Valley Borough Council

320111064P

From: Planning Liaison [mailto:PlanningLiaison@uuplc.co.uk]

Sent: 03 November 2011 16:03

To: Michael Hartley

Subject: RE: Woone Lane, Clitheroe

Hello Michael,

In response to your enquiry I can also confirm that we have carried out detailed modelling in the area which shows that the existing combined network is very near to full capacity, however we do not have any record of public sewer flooding of properties in this vicinity as a result of overloaded sewers. i.e. properties on the 'at risk' register as compiled for our Regulator

Please note that United Utilities Water plc (UW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the 'at risk' register.

This does not include any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UW has no control and not a facet of sewer capacity.

Taking all factors into account, the drainage strategy for the site should be designed using a total separate system.

Surface water flows generated from the new development will not be permitted to discharge in to the public sewerage system and should be discharged directly in to the adjacent watercourse with the prior consent of The EA

We would accept foul flows from the development into the public combined network.

Further to the comments above, please also be aware of the following disclaimer and future declaration

"United Utilities Water plc (UW) will provide information on connection points and maximum permitted discharge rates to public sewers in response to enquiries by developers and in response to Planning Applications where Planning Authorities have elected to consult UW on drainage matters.

However, the points of connection and discharge rates cannot be allocated and reserved for a particular development. UW reserves the right to revise the connection point and discharge rate current at the time that a formal application for connection to public sewer is made, in order to take account of possible changes in discharges to the public sewer between the date of the enquiry and the date of the connection being required".

Please also note that the SUDS element of the Floods and Water Management Act is expected to come into force in 2012 and the responsibility for approval and subsequent adoption of surface water drainage systems will then rest with the appropriate SUDS Approval Body and not United Utilities

If I can be of any further assistance in the meantime then please don't hesitate to get in touch.

Regards,

Graham Perry

320111064P

From: Michael Hartley [mailto:M.Hartley@thelkgroup.com]
Sent: 25 October 2011 15:48
To: dlm.uu.planning.liaison
Subject: Woone Lane, Clitheroe

Dear Sir/Madam

Leyden Kirby Associates has been commissioned by the owner to undertake a Flood Risk Assessment at Woone Lane, Clitheroe (National Grid Ref: 374014, 441172). A plan showing the site labelled as Mearley Brook outlined in red is attached. The site is expected to be developed as a residential area with gardens

Could you please provide us with any information in your possession regarding any incidences of, or possible problems with, flooding associated with your foul, surface water and land drainage in the area of the site? We would also appreciate any limitations that you might set on the discharge of foul or surface water flows from the site. We are also speaking to the council and have been in contact with the Environment Agency.

In accordance with good SuDS practice, we are also investigating responsible options for surface water disposal and are looking at the opportunities for infiltration and attenuation.

If you require any further information or would like to discuss the issues raised then please contact me on M.Hartley@thelkgroup.com or 0161 763 7200. Please let us know as soon as possible if there is a charge for this information so that we can raise the necessary payment.

Thank you for your assistance

Kind Regards

Michael Hartley
Geo-environmental Engineer



CONTACT NUMBERS:

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LK GROUP - COMPANY ACCREDITATIONS:



REGISTERED OFFICE:

320111064P

From: Finch, Peter [mailto:Peter.Finch@lancashire.gov.uk]
Sent: 26 October 2011 12:58
To: Michael Hartley
Subject: RE: Woone Lane, Clitheroe

Dear Michael,

There has been no major flooding on the highway in the last 5 years. The only surface water incidents relate to blocked or covered surface water gullies.

You will need to contact United Utilities regarding the foul sewer system

Regards
Peter

From: Michael Hartley [mailto:M.Hartley@thelkgroup.com]
Sent: 26 October 2011 11:53
To: Finch, Peter
Subject: Woone Lane, Clitheroe

Dear Mr Finch

Leyden Kirby Associates has been commissioned by the owner to undertake a Flood Risk Assessment at Woone Lane, Clitheroe (National Grid Ref: 374014, 441172). A plan showing the site labelled as Mearley Brook outlined in red is attached. The site is expected to be developed as a residential area with gardens.

Could you please provide us with any information in your possession regarding any incidences of, or possible problems with, flooding associated with your foul, surface water and land drainage in the area of the site? We are also speaking to Ribbles Valley Borough Council and have been in contact with the Environment Agency.

If you require any further information then please contact myself on this contact email address or Phil Hunter at p.hunter@thelkgroup.com

Please let us know as soon as possible if there is a charge for this information so that we can raise the necessary payment.

Thank you for your assistance

Kind Regards

Michael Hartley
Geo-environmental Engineer



CONTACT NUMBERS:

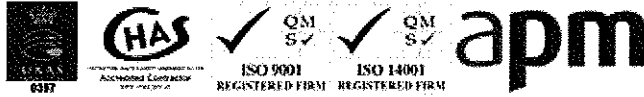
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