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Prepared on behalf of

Park Portfolio Limited

Former Pow Beck Nursing Home
Meadow Road, Whitehaven

Drainage Strategy

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IHE

Acknowledgements:

Yorkshire Water
Environment Agency

Disclaimer

The methodology adopted and the sources of information used by Sanderson Associates (Consulting Engineers) Ltd in providing its services are outlined within this Report.

Any information provided by third parties and referred to herein has not been checked or verified by Sanderson Associates (Consulting Engineers) Ltd, unless otherwise expressly stated within this report.

This report was checked and approved on the 29 July 2021 and the Report is therefore valid on this date, circumstances, regulations and professional standards do change which could subsequently affect the validity of this Report.

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Report Ref:	300068/001/01		July 2021
Author:	Peter Maurice		
Checked & Approved:	Karen Smith MIHE	**Date:**	29 July 2021

Contents

Page No

Appendices

APPENDIX A - Drawings

Possible Drainage Strategy: 300068/001

Existing Permeable and Impermeable Drawing: 300068/002

Proposed Permeable and Impermeable Drawing: 300068/003

Topographical Survey – J1530

Proposed Site Layout - 1610

APPENDIX B – Utility Records

United Utilities

APPENDIX C – Windes Calculations

Existing Surface Water Run Off Estimate

Proposed Storage Calculations

1 Introduction

1.1 Sanderson Associates (Consulting Engineers) Limited has been appointed by Park Portfolio Ltd, to prepare a drainage strategy relating to the proposed redevelopment of the former Pow Beck Nursing Home, Meadow Road, Whitehaven. The proposals comprise the erection of a 36 bed Extra Care Facility comprising 27 single bed flats and 9 two-bed flats for rent.

1.2 The report assesses, evaluates and quantifies the existing and proposed drainage mechanisms of the site and considers any drainage requirements to ensure a suitable and acceptable strategy for surface and foul water discharge.

2 Existing Situation

2.1 Existing Site Description

2.1.1 The application site consists of a detached former purpose built 38-bed Care Facility with ancillary off-street parking facilities (14 spaces). The site was formerly owned and operated by the Council and has now been closed and decomissioned.

2.1.2 Access to the site is gained via a priority T-junction with Meadow Road towards the north-western corner of the site. In addition to the application site the access road, which is unadopted, provides access to an additional car parking area to the north of the site which contains an additional 7 Nº parking spaces and is associated with housing along St Andrews Crescent; formerly Pow Beck Court.

2.1.3 The surrounding area is predominantly residential and is within approximately 3.3km of Whitehaven town centre. The site's location in respect to the surrounding area as illustrated within **Figure 1**.

Figure 1 – Site Location Plan

2.2 Existing Site Analysis

2.2.1 The existing site layout and makeup have been assessed to establish the estimated surface water runoff rate.

2.2.2 The total site area is 3,109m^2 (0.31Ha) with 931m^2 of building/structure and 1,561m^2 of hard standing. 617m^2 is considered to be permeable (naturally drained). Therefore the site is considered to be 80% impermeable and 20% permeable as shown on **Drawing 300068/002** included in **Appendix A.**

2.2.3 A topographical survey of the existing site has also been undertaken. As part of the survey, manhole lids were lifted and pipe depths and directions noted. These are shown on Drawing J1530 included in **Appendix A.**

2.2.4 The topography of the site slopes from northeast to southwest towards the south western boundary of the site. There is a total level change of 2.67m across the site. The site levels range from 26.67m AOD on the north eastern boundary to 24.00m AOD upon the south western boundary of the site as shown on the topographical survey contained within **Appendix A**.

2.2.5 It is noted that an adopted sewer runs across the eastern side of the site and below the existing building, see existing United Utility record in **Appendix B**. Sanderson Associates has been made aware that in 2011 a CCTV survey of the sewer was carried out, but a copy of the survey has not been able to be provided by the LLFA. Comments received advise that cracking within the culvert section that appears to pass beneath the existing Pow Beck House was observed.

2.2.6 The existing surface water run off rate has been assessed using Microdrainage (Xp Solutions) source control software. The Modified Rational Method has been used. The existing runoff rate has been calculated at 22.6l/s. Applying a 30% reduction gives a discharge rate of 15.82 l/s. The WinDES output file is contained in **Appendix C**.

3 Proposed Development

3.1 It is proposed that the site is redeveloped still for residential (C3) use with the construction of a 45-bed Care Facility with associated hard standing and gardens/open green areas.

3.2 Access to the site will continue to be gained via a priority T-junction with Meadow Road towards the north-western corner of the site. The site is proposed to be developed in line with the proposed site layout reference 1610. The received ground floor plan is contained in **Appendix A** of this report.

3.3 On assessing the proposed site layout, the overall site area has been calculated to remain at 3,109m^2 (0.31Ha) with 1,287m^2 of building/structure and 1,060m^2 of hard standing. 762m^2 is considered to be permeable (naturally drained). Therefore the proposed site is considered to be 75.5% impermeable and 24.5% permeable as shown on **Drawing 300068/003** included in **Appendix A**.

3.4 It is noted that the proposed development provides a reduction in combined impermeable area over the existing site from 80% to 75.5%.

3.5 The final drainage layout will be confirmed as part of the detailed drainage design and consultations held with the Local Lead Flood Authority and United Utilities with regards to the final design details and future adoption of the drainage techniques to be utilised.

4 Drainage Design Considerations

4.1 Foul Drainage

4.1.1 The topographical survey and United Utility records confirm that there are existing foul water drains discharging into the existing foul sewers recorded crossing to the East of the development site. It is proposed that these existing connections will be utilised for the proposed development.

4.1.2 The sites foul system should be constructed in line with 'Sewers for adoption - a design and construction guide for developers' 7th edition.

4.2 Methods of Surface Water Treatment

4.2.1 The current building regulations, Part H3, detail the favoured hierarchy of surface water disposal being in order of preference, to ground by infiltration, to watercourse and then to sewer.

1. **Infiltration**
2. **Watercourse**
3. **Sewer**

1. Infiltration Drainage

4.2.2 Infiltration methods of drainage such as soakaways and filter drains percolate surface water runoff allowing it to permeate into the subsoil at its natural rate mimicking the natural process of drainage and as such are subject to the local ground conditions.

4.2.3 Given that 80% of the site is already impermeable, there is very little opportunity for infiltration testing / provision. With approximately 75.5% of the proposed development site to be impermeable, this option has therefore been discounted.

4.2.4 Assessment of existing records show that the development site has a high / medium to high risk of a pollutant reaching groundwater, therefore the decision not to consider infiltration is supported.

2. Discharge to Watercourse

4.2.5 The closest watercourse to the site is Pow Beck which is located 540m north west of the site.

3. Discharge to Sewer

4.2.6 As advised above, there are existing public surface water sewers within the development site that already accommodate the existing surface water run-off.

4.3 Attenuation Options

Attenuation in ponds/basin and open water features

4.3.1 As it is proposed that the site will be redeveloped again for residential use, having an open water structure to store rainwater within the site poses a risk to the safety of the potential occupants of the site.

4.3.2 Although the impermeable areas of the site are being reduced from 80% to 75.5%, there is still little room for provision of an open water structure.

Attenuate rainwater by storing in tanks or sealed water features

4.3.3 Attenuating the surface water runoff into Geo-cellular systems underneath the parking and pedestrianised areas is considered to be an option for the site. These could provide the storage required to accommodate the 1 in 100 year storm event + 30% climate change.

4.3.4 In line with current guidance, attenuation should be provided to ensure that the system does not flood during a 1 in 30 year storm event and for a 1 in 100 year storm event + 30% climate change the system can flood but the surcharge must not flood properties and be kept within the site's boundary.

4.3.5 Given the nature of the proposed development it is recommended that storage is provided for both the 1 in 30 year storm event and the 1 in 100 year storm event + 30% climate change.

5 Proposed Surface Water Drainage Strategy

5.1 The purpose of this Surface Water Drainage Strategy is to detail the principle of a sustainable drainage strategy and layout. The final details should be designed and confirmed at the detailed design stage and following consultations with the Local Planning, Highway and Drainage Authority.

5.2 It is clear that there is an opportunity to provide a level of SuDs techniques appropriate for the new site which will contribute to a sustainable development and improve urban design, by balancing the different issues that influence the development.

5.3 In regards to surface water discharge there is currently only one option available to the client due to infiltration and discharge to a watercourse being deemed unviable.

5.4 Therefore, discharge to the existing surface water sewers is deemed the only viable option of surface water discharge.

5.5 An existing surface water run off rate of 22.6l/s has been calculated however it is proposed to reduce this by 30% as a betterment to the existing situation. This is on top of the reduction in impermeable area from the existing site to the development proposal (80% to 75.5%). It is therefore proposed to restrict the surface water into the existing sewer to 15.82l/s, this is subject to approval from the local authority and United Utilities.

5.6 As infiltration methods of drainage have been deemed unviable, attenuation methods in the form of sealed water features would be required to accommodate the level of storage and would be the most appropriate means of attenuation on this site with a volume of 116m³ of storage required for a 1 in 100 storm event including climate change (+40%) in line with the NPPF.

5.7 It is proposed to locate the storage within the car parking spaces to the North of the proposed development building, and the open space located to the South of the development building. It is also proposed that the restricted discharge rate of 15.82 l/s will be shared across both points of connection so that each would be restricted to approximately 7.91 l/s.

5.8 Drainage Strategy drawing **300068/001** located in **Appendix A** indicates a possible layout option. The final drainage layout will be confirmed as part of the detailed drainage design and consultations held with the Local Highway Authority and United Utilities with regards to the final design details and future adoption of the drainage techniques to be utilised.

6 Conclusion

6.1 This report serves to review and assess the impact of the proposed development on the flood mechanisms of the site and the impact on the surrounding area in accordance with NPPF.

6.2 It is proposed to restrict the surface water into the existing United Utilities sewer at a combined rate of 15.82l/s, the associated storage will be in the form of sealed water features located to the north and south of the proposed development building within the car park / open space.

6.3 This report concludes that the site can be developed without increasing flood risk to the site itself and other sites in the vicinity and also without unacceptable residual risk of flooding, with the implementation of suitable mitigation measures.

APPENDIX A - Drawings

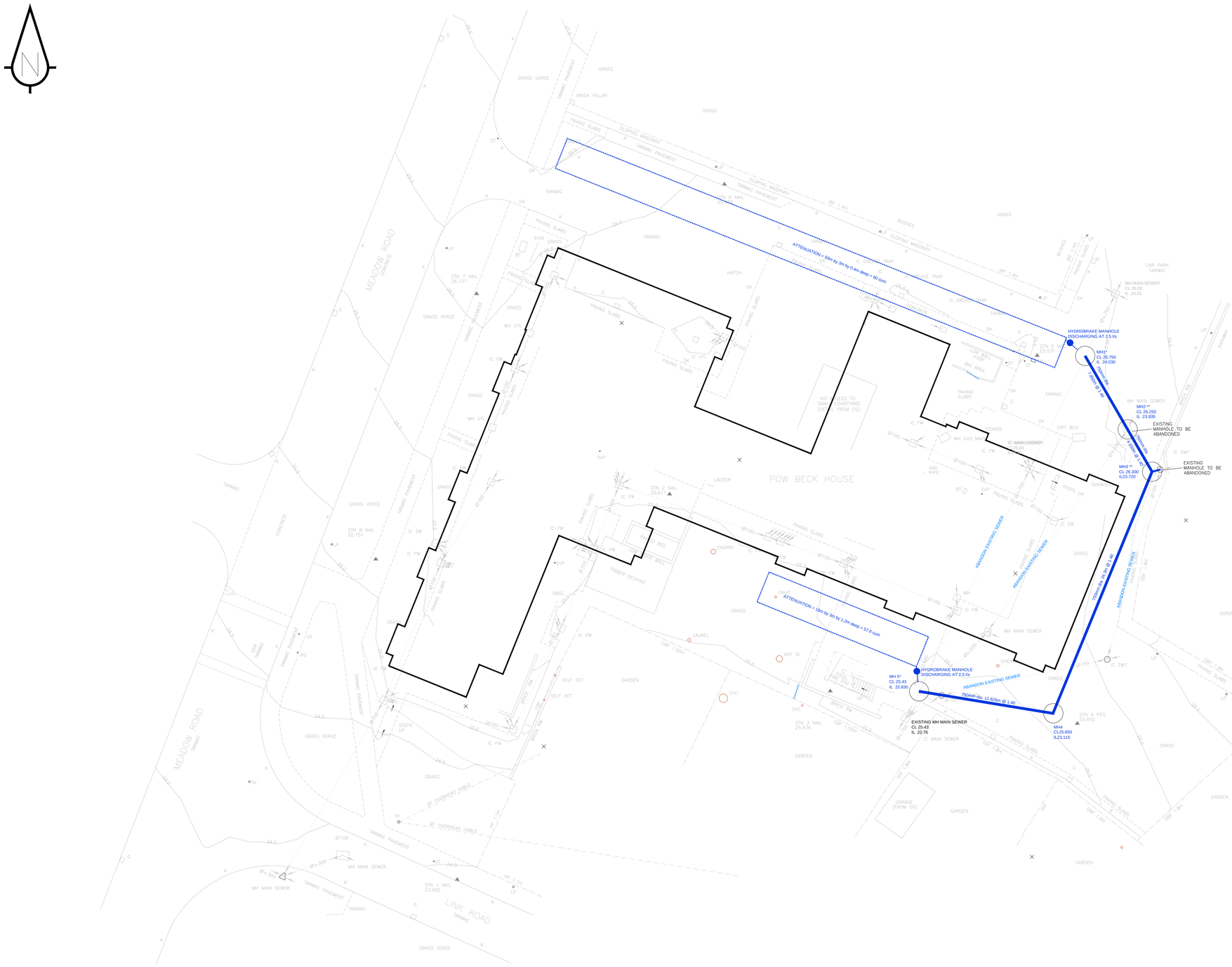
Possible Drainage Strategy: 300068/001

Existing Permeable and Impermeable Drawing: 300068/002

Proposed Permeable and Impermeable Drawing: 300068/003

Topographical Survey – J1530

Proposed Site Layout - 1610



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- Service connections are not shown but their presence should be anticipated.
- Reference to any third party equipment shown on this drawing was only relevant at the time the drawing was prepared.
- It is the client's responsibility to ensure that any equipment ordered meets the design.

TABLE

MH1
CONSTRUCT NEW MANHOLE ON EXISTING 750mm PIPE. CONNECT ATTENUATION TANK DISCHARGING AT 2.5 l/s INTO NEW MANHOLE

MH2
ABANDON EXISTNIG MANHOLE
CONSTRUCT NEW MANHOLE AT INTERSECTION OF EXISTING 225mm PIPE AND DIVERTED 750mm PIPE

MH3
CONSTRUCT NEW MANHOLE AT JUNCTION OF DIVERTED 750mm SEWER. THIS WILL MEAN THE CHAMBER FOR THE EXISTING 150mm PIPE IS ABANDONED AND THE EXISTING 150mm PIPE WILL CONNECT INTO THE NEW MANHOLE.

MH4
CONSTRUCT NEW MANHOLE AT JUNCTION OF DIVERTED 750mm SEWER.

MH5
CONSTRUCT NEW MANHOLE ON EXISTING 750mm PIPE. CONNECT ATTENUATION TANK DISCHARGING AT 2.5 l/s INTO NEW MANHOLE.

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Client: PARK PORTFOLIO LTD

Project Title: FORMER POW BECK NURSING HOME MEADOW ROAD, WHITEHAVEN

Drawing Title: PRELIMINARY DRAINAGE STRATEGY

Rev	Amendment	Drawn	Date	Checked

Scale: 1:200	Drawn By: PJM
Drawing Size: A1	Checked By: LOB
Date: 9 July 2021	Approved By: PJM
	Drawing Number: 300068_001 Rev:

Key:

Buildings: 2492.57sqm

Hardstanding: 1561.68sqm

Total impermeable area: 2942.57sqm

Permeable: 616.881sqm

Total Area: 3109.68

NORTH POINT SURVEY
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TITLE: Pow Beck House, Meadow Road, Whitehaven, CA
Topographical Survey

CLIENT: Simon Brumfitt

NOTES: Plan Datum: Ordnance Survey National Grid*
Height Datum: Ordnance Survey Datum*
*OSTN15 using Trimble VRS (GNSS)
Contour Interval 0.5m

SCALE	DATE	DRAWING NO.	REV
1/200 @ A1	Feb 2021	J1530.DWG	OR

Rev	Amendment	Drawn	Date	Checked

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Project Name

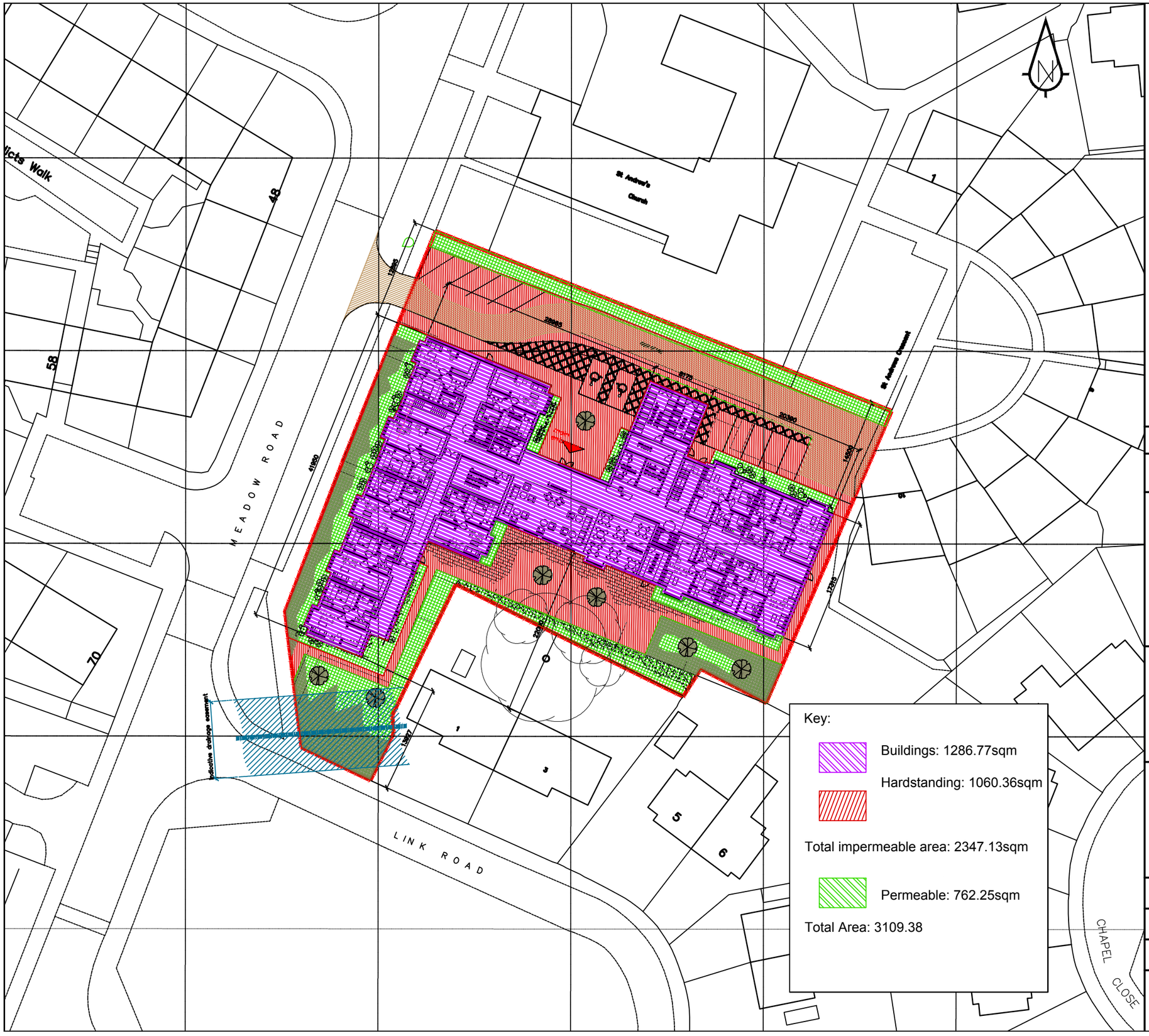
FORMER POW BECK
NURSING HOME
MEADOW ROAD, WHITEHAVEN

Drawing Title

EXISTING PERMEABLE
AND IMPERMEABLE AREAS

Scale 1:500 @ A3		Drawn By	LOB
Drawing Size	A3	Checked By	PJM
Date	29/07/21	Approved By	PJM

Drawing Number	Rev
300068_002	–



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Rev	Amendment	Drawn	Date	Checked

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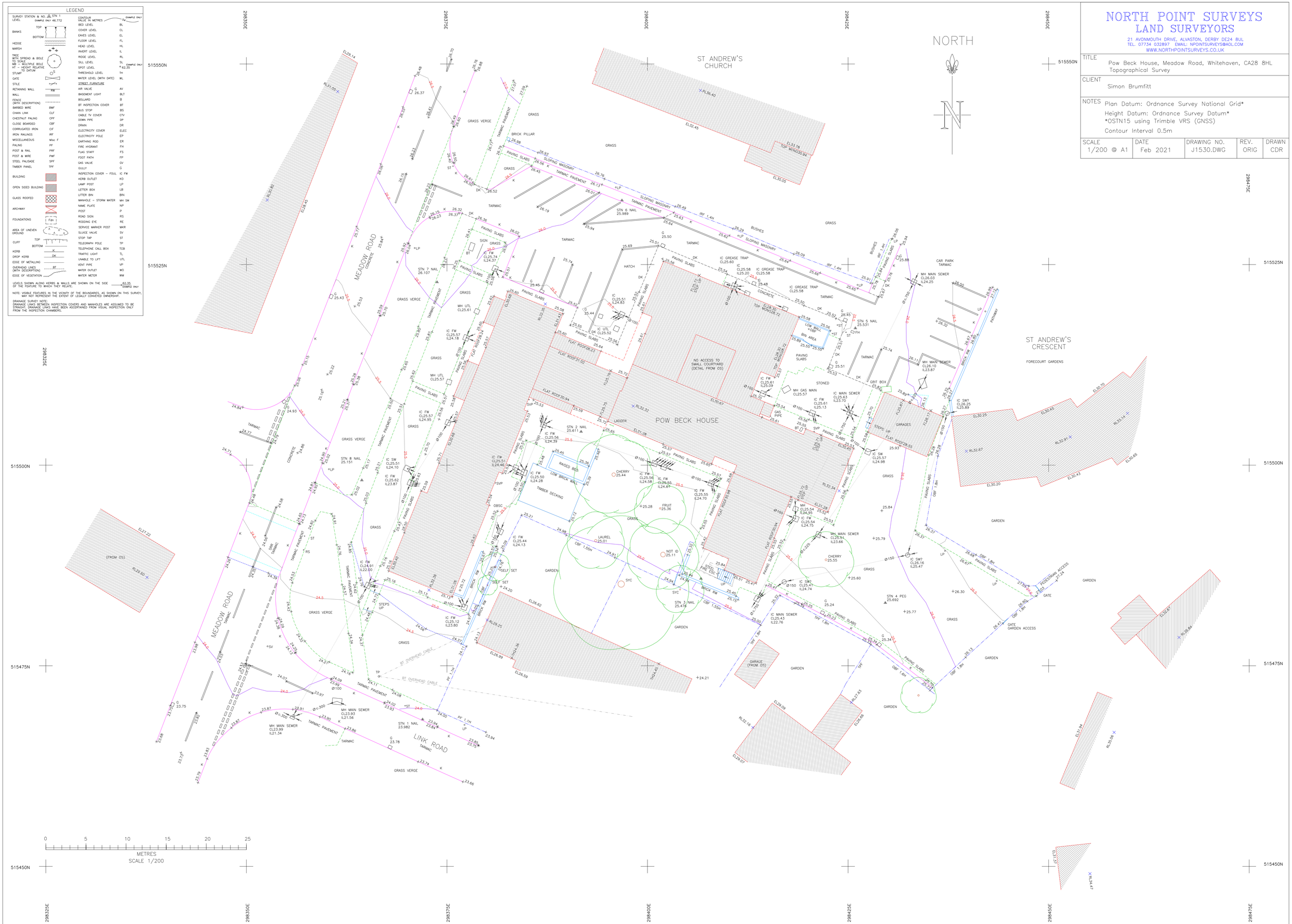
Project Name

FORMER POW BECK
NURSING HOME
MEADOW ROAD, WHITEHAVEN

Drawing Title

Proposed Impermeable Areas

Scale 1:500 @ A3		Drawn By	LOB
Drawing Size	A3	Checked By	PJM
Date	29/07/21	Approved By	PJM
	Drawing Number 300068_003		Rev –



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TITLE	Pow Beck House, Meadow Road, Whitehaven, CA28 8HL Topographical Survey
CLIENT	Simon Brumfitt
NOTES	Plan Datum: Ordnance Survey National Grid* Height Datum: Ordnance Survey Datum* *OSTN15 using Trimble VRS (GNSS) Contour Interval 0.5m

SCALE	DATE	DRAWING NO.	REV.	DRAWN
1/200 @ A1	Feb 2021	J1530.DWG	ORIG	CDR

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation including ground conditions - contaminants, drainage, design & planning/delivery negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features; accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

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FOR PLANNING

0 5 10 20
Metres at scale 1:200

Revision	Date	Notes
-	-	-

STANIFORTH
ARCHITECTS

Ground Floor Plan

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Drawing Status:	For Comment
Cad Reference:	1610-P01
Drawn:	SC
Checked:	IP
Date:	03-01-2021
Scale:	1:200 @ A1

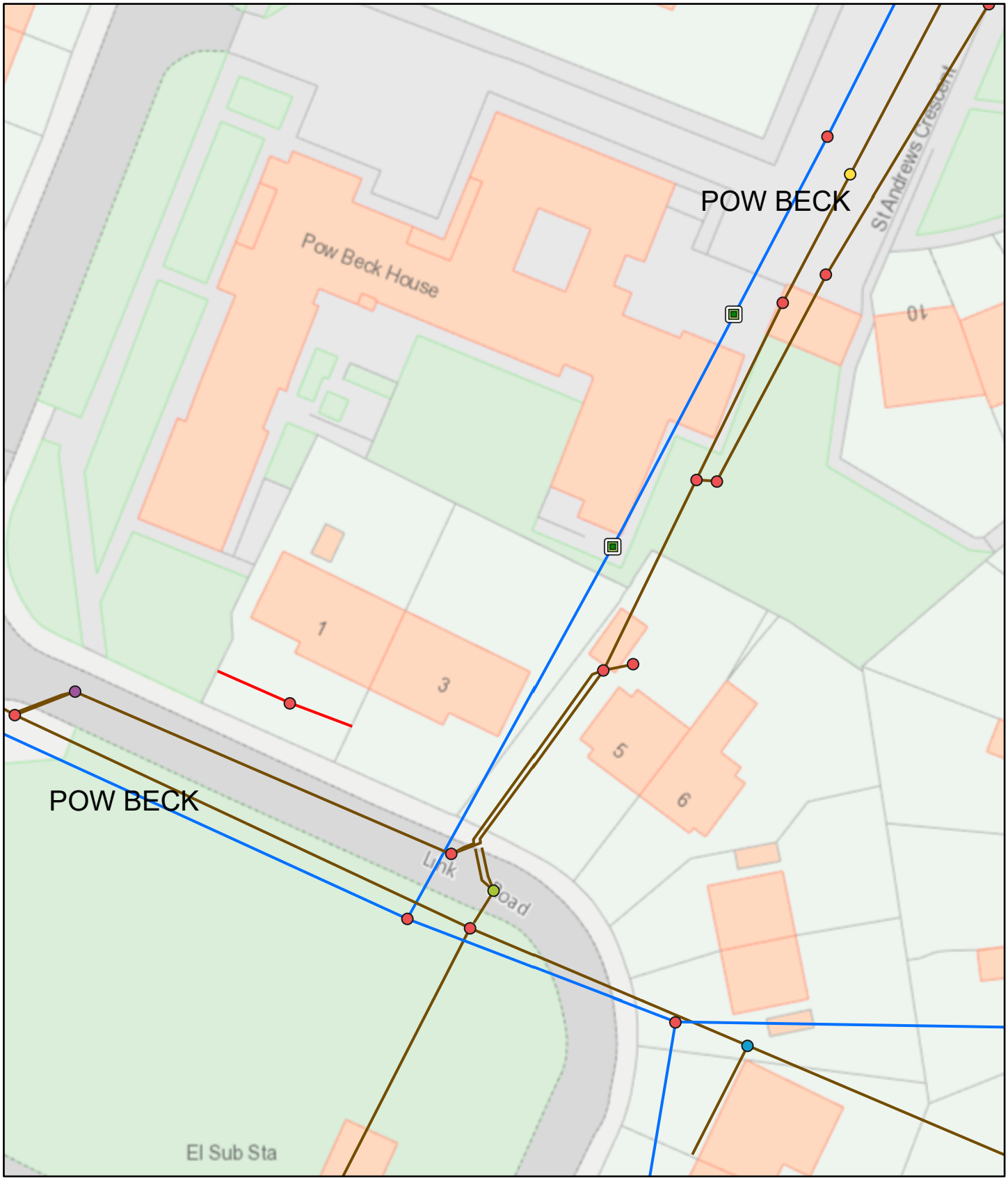
Project No.	Drawing No.	Revision
1610	P03	.

Meadow Road
Whitehaven

APPENDIX B – Utility Records

United Utilities

Pow Beck



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0 0.01 0.01 0.02 km

United Utilities - Points

- Manhole
- Fitting
- AbandNode
- Structure
- CleanOut

United Utilities - Lines

- Combined
- Foul
- Surface Water

Flood and Coastal Management Officer

APPENDIX C – Windes Calculations

Existing Surface Water Run Off Estimate

Proposed Storage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	16.000	Add Flow / Climate Change (%)	0
Ratio R	0.267	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000	0.100	100.0	0.235	5.00	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	35.39	5.17	0.000	0.235	0.0	0.0	0.0	1.00	17.8«	22.5

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.296	0.296	5.2	34.3	O K
30 min Summer	99.408	0.408	5.4	47.3	O K
60 min Summer	99.513	0.513	5.6	59.5	O K
120 min Summer	99.578	0.578	5.7	67.0	O K
180 min Summer	99.590	0.590	5.7	68.5	O K
240 min Summer	99.590	0.590	5.7	68.4	O K
360 min Summer	99.570	0.570	5.7	66.2	O K
480 min Summer	99.546	0.546	5.6	63.3	O K
600 min Summer	99.517	0.517	5.6	60.0	O K
720 min Summer	99.487	0.487	5.5	56.5	O K
960 min Summer	99.425	0.425	5.4	49.3	O K
1440 min Summer	99.310	0.310	5.2	36.0	O K
2160 min Summer	99.174	0.174	4.9	20.1	O K
2880 min Summer	99.079	0.079	4.8	9.2	O K
4320 min Summer	99.000	0.000	4.5	0.0	O K
5760 min Summer	99.000	0.000	3.6	0.0	O K
7200 min Summer	99.000	0.000	3.1	0.0	O K
8640 min Summer	99.000	0.000	2.7	0.0	O K
10080 min Summer	99.000	0.000	2.4	0.0	O K
15 min Winter	99.338	0.338	5.3	39.2	O K
30 min Winter	99.468	0.468	5.5	54.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.594	0.0	41.3	24
30 min Summer	66.218	0.0	58.4	37
60 min Summer	44.813	0.0	79.0	64
120 min Summer	29.415	0.0	103.4	110
180 min Summer	22.661	0.0	119.6	144
240 min Summer	18.683	0.0	131.5	176
360 min Summer	14.066	0.0	148.6	246
480 min Summer	11.501	0.0	162.0	316
600 min Summer	9.827	0.0	173.3	384
720 min Summer	8.635	0.0	182.6	452
960 min Summer	7.033	0.0	198.4	584
1440 min Summer	5.252	0.0	221.9	838
2160 min Summer	3.909	0.0	247.7	1196
2880 min Summer	3.164	0.0	267.6	1536
4320 min Summer	2.342	0.0	297.1	0
5760 min Summer	1.892	0.0	320.2	0
7200 min Summer	1.605	0.0	339.5	0
8640 min Summer	1.403	0.0	356.2	0
10080 min Summer	1.253	0.0	371.1	0
15 min Winter	93.594	0.0	46.1	24
30 min Winter	66.218	0.0	65.3	37

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.595	0.595	5.7	69.0	O K
120 min Winter	99.685	0.685	5.9	79.5	O K
180 min Winter	99.699	0.699	5.9	81.1	O K
240 min Winter	99.691	0.691	5.9	80.2	O K
360 min Winter	99.657	0.657	5.8	76.2	O K
480 min Winter	99.614	0.614	5.7	71.2	O K
600 min Winter	99.565	0.565	5.7	65.5	O K
720 min Winter	99.515	0.515	5.6	59.7	O K
960 min Winter	99.417	0.417	5.4	48.4	O K
1440 min Winter	99.247	0.247	5.1	28.6	O K
2160 min Winter	99.065	0.065	4.7	7.6	O K
2880 min Winter	99.000	0.000	4.4	0.0	O K
4320 min Winter	99.000	0.000	3.2	0.0	O K
5760 min Winter	99.000	0.000	2.6	0.0	O K
7200 min Winter	99.000	0.000	2.2	0.0	O K
8640 min Winter	99.000	0.000	1.9	0.0	O K
10080 min Winter	99.000	0.000	1.7	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	44.813	0.0	88.6	64
120 min Winter	29.415	0.0	116.1	118
180 min Winter	22.661	0.0	134.3	152
240 min Winter	18.683	0.0	147.7	190
360 min Winter	14.066	0.0	166.6	268
480 min Winter	11.501	0.0	181.6	342
600 min Winter	9.827	0.0	194.0	416
720 min Winter	8.635	0.0	204.6	486
960 min Winter	7.033	0.0	221.9	624
1440 min Winter	5.252	0.0	248.6	880
2160 min Winter	3.909	0.0	277.6	1216
2880 min Winter	3.164	0.0	299.8	0
4320 min Winter	2.342	0.0	332.8	0
5760 min Winter	1.892	0.0	358.6	0
7200 min Winter	1.605	0.0	380.2	0
8640 min Winter	1.403	0.0	398.9	0
10080 min Winter	1.253	0.0	415.6	0

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	116.0	0.700	116.0	1.400	0.0	2.100	0.0
0.100	116.0	0.800	116.0	1.500	0.0	2.200	0.0
0.200	116.0	0.900	116.0	1.600	0.0	2.300	0.0
0.300	116.0	1.000	116.0	1.700	0.0	2.400	0.0
0.400	116.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	116.0	1.200	0.0	1.900	0.0		
0.600	116.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.354	5.0
Kick-Flo®	0.745	4.0
Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	5.0	3.000	7.7	7.000	11.5
0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8
0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2
0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6
0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9
0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.1		