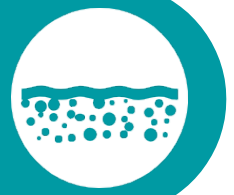


SuDSmart



Foul Drainage Assessment

Site Address

Woodville Garage
14 Gresford Road
Llay
LL12 0NW

Date

2022-09-29

Report Status

FINAL

Grid Reference

333398, 356230

Site Area

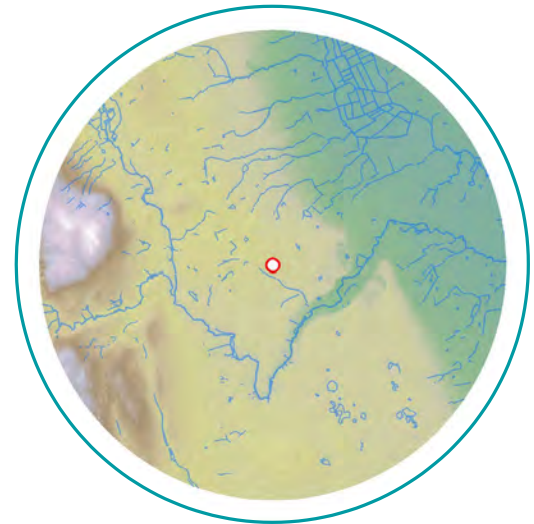
0.10 ha

Report Prepared for

Robert Whitney

Report Reference

77196.06R1



Discharge to Sewer

Due to the close proximity to the public foul sewer network discharge to sewer is proposed. Foul water is proposed to be treated via a primary settling tank and BioKube PTP with phosphorous reduction kit to provide sufficient phosphate removal before being discharged to the nearby wastewater treatment works.

This foul water strategy should be submitted to NRW and Wrexham County Borough Council to confirm that the proposed strategy can be agreed in principle prior to construction works.

Report Author

James Robinson

Project Consultant

Report Reviewer

Michelle Gregg

Principal Drainage Engineer

Report Checker

David South

Senior Project Consultant

GeoSmart Information Ltd
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1 Executive summary



This report assesses the drainage options for discharging foul flows generated by a proposed residential development of three detached dwellings at Woodville Garage, 14 Gresford Road, Llay, LL12 0NW.

The destination of foul water drainage should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2015), each option must be considered and discounted in the following order:

1. Connection to the public sewer.
2. Package sewage treatment plant (PTP) (which can be offered to the Sewerage Undertaker for adoption).
3. Septic Tank.
4. If none of the above are feasible a cesspool.

A Dwr Cymru Welsh Water asset location plan has been obtained for the Site confirming a public foul sewer is located within 10 m north of the Site beneath Gresford Road. As a result of the close proximity to the sewer network, discharge to sewer is proposed.

According to GeoSmart's SD50 mapping the infiltration potential is Moderate, therefore a non-mains foul drainage strategy for treatment prior to discharge to ground via a drainage field is potentially feasible. Whilst the ground conditions at the Site have the potential to be conducive to infiltration features due to the spatial constraints at the Site this is not considered suitable.

Ordnance Survey (OS) mapping indicates there is no surface water feature within 100 m of the Site. Therefore, discharge to surface water is not considered feasible and thereby not proposed.

Phosphate reduction

In accordance with Natural Resources Wales (NRW) advice issued on the 22nd July 2022 it is confirmed that the Site is served by mains drains to the Gresford Water treatment works (WTWW) eventually discharging into the River Dee and Bala Lake Special Area of Conservation (SAC). Whilst it is acknowledged that the WTWW will remove a percentage of the phosphates and is within the current consented limits, it is understood that these consents are outdated and additional treatment is expected from developers.

Through the use of a primary settling tank and BioKube package treatment plant (PTP) with phosphorous reduction kit (see Appendix D for associated product specifications) sufficient treatment will be given to the foul water providing significant betterment on the existing development and providing suitable pre-treatment before discharging into the WTWW.

Foul drainage suitability

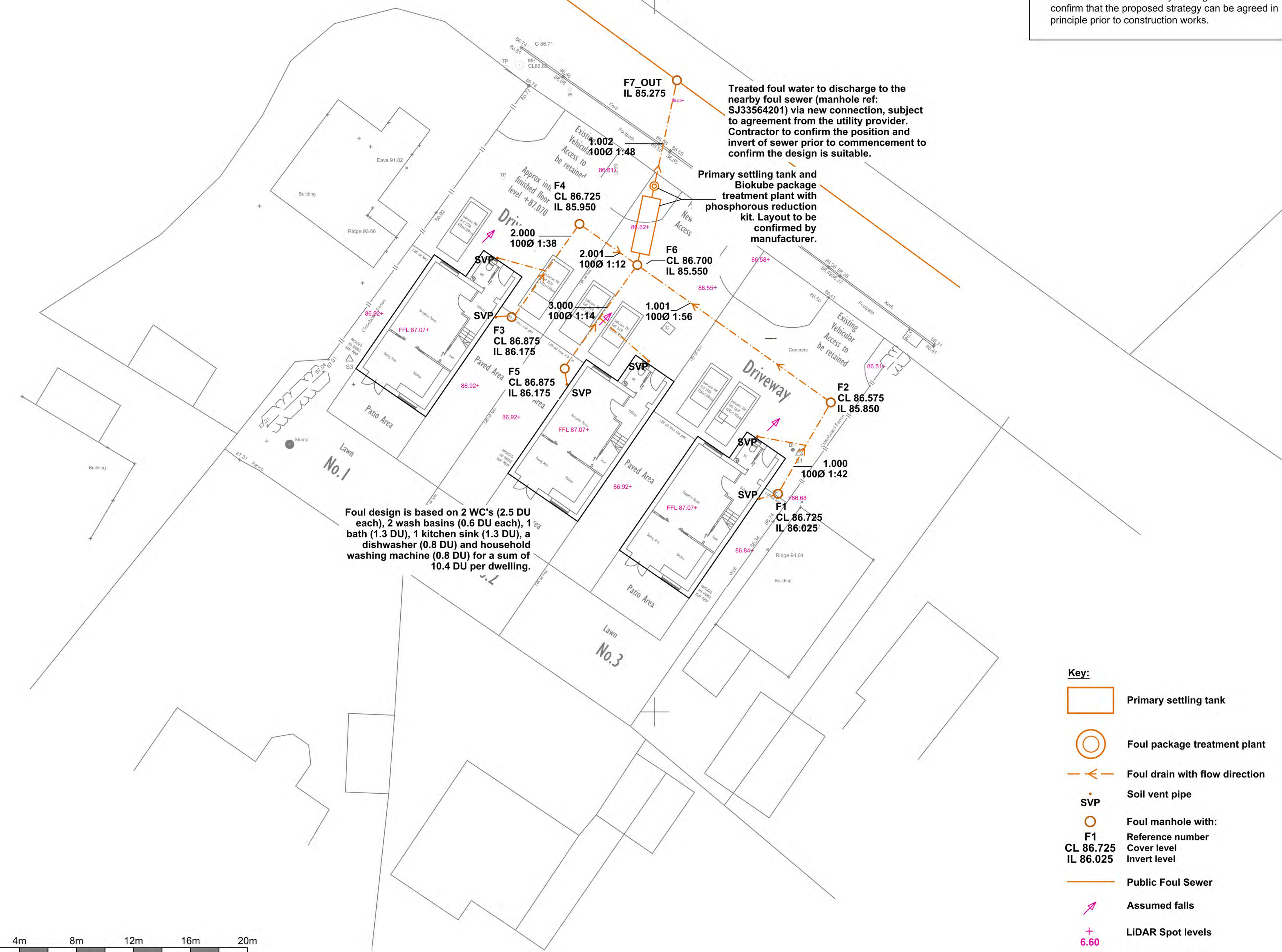
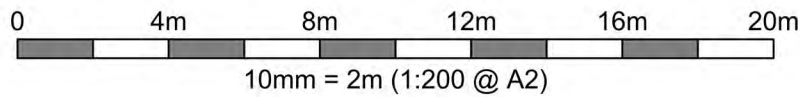
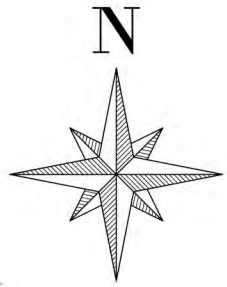
Risk	Issue	Result
Discharge Location	What is the potential to discharge to sewers?	High
	What is the potential to discharge to surface water features?	Low
	What is the infiltration potential at the Site?	Low*
Flooding	What is the river (fluvial) flood risk at the Site?	Very Low
	What is the surface water (pluvial) flood risk at the Site?	Very Low
	What is the groundwater flood risk at the Site?	Negligible
Pollution	Is the groundwater a protected resource?	No
	Is the surface water feature a protected resource?	N/A

*Whilst initial mapping indicates a Moderate potential for infiltration on the basis of spatial constraints this has been reduced to Low.

Recommendations

This foul water strategy should be submitted to NRW and Wrexham County Borough Council to confirm that the proposed strategy can be agreed in principle prior to construction works.

The capacity of the public sewer network should be confirmed with the utility provider and gain permission to connect where required.



Foul design is based on 2 WC's (2.5 DU each), 2 wash basins (0.6 DU each), 1 bath (1.3 DU), 1 kitchen sink (1.3 DU), a dishwasher (0.8 DU) and household washing machine (0.8 DU) for a sum of 10.4 DU per dwelling.

Treated foul water to discharge to the nearby foul sewer (manhole ref: SJ33564201) via new connection, subject to agreement from the utility provider. Contractor to confirm the position and invert of sewer prior to commencement to confirm the design is suitable.

Primary settling tank and Biokube package treatment plant with phosphorous reduction kit. Layout to be confirmed by manufacturer.

Drainage Strategy:

- Foul drainage strategy consists of a primary settling tank with package treatment plant and phosphate reduction kit.
- Foul water should be discharged to the foul sewer beneath Gresford Road, subject to agreement by the utility provider.
- This foul water strategy should be submitted to NRW and Wrexham County Borough Council to confirm that the proposed strategy can be agreed in principle prior to construction works.

Notes.

1. Do not scale from this drawing.
2. All dimensions are in millimeters unless otherwise stated.
3. This drawing to be read in conjunction with all other relevant drawings and documents.
4. All drainage to be constructed to SSG Design and Construction Guidance, current British standards and building regulations and other relevant standards.
5. Exact locations of soil vent pipes and other internal drainage down pipes to be confirmed by architect.
6. Contractor to confirm locations of existing services prior to commencement on site and to arrange for any necessary diversions, lowering or protection works as required.
7. All specialist drainage components such as attenuation tanks, flow control and pumping stations to be designed and installed as per manufacturers requirements.
8. Cover levels to be confirmed by landscape architect. Cover levels and invert levels are in meters unless otherwise stated. If cover levels change from assumed then drainage design should be re-assessed.
9. Private foul pipes to be 100mm Ø with minimum fall of 1:40 unless a WC is connected then minimum gradient 1:80, unless otherwise stated.
10. Minimum cover to thermoplastic pipes in garden or patio areas 0.6m, in driveway 0.9m, in road 1.2m, otherwise concrete protection will be required.
11. Access chamber cover class A15 for garden and patio, B125 for driveway, C250 for lightly trafficked roads or small private carparks.
12. Design should be reviewed in light of any additional information or on validation or otherwise of any assumptions.
13. As the Site has previously been developed an existing suitable discharge point may already be present on the site. A survey of the existing drainage should be undertaken to confirm.
14. Design is for planning purposes only and not for construction. Design should be confirmed prior to construction to ensure all available information is considered and any assumed information should be verified.

P01	29.09.22	Initial issue	JR	MG
Rev	Date	Detail	Drwn	Chkd

Client:
Robert Whitney

Project:
Woodville Garage

Drawing Title:
**Proposed
Foul Drainage Layout**

Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU

Drawn by: JR	Checked by: MG	Date: Sept 2022
Scale: 1:200 @ A2		Status: Preliminary
Drawing No: 77196 100		Issue: P01

2 Site analysis



Site location

Figure 1. Aerial Imagery (Bluesky, 2022)

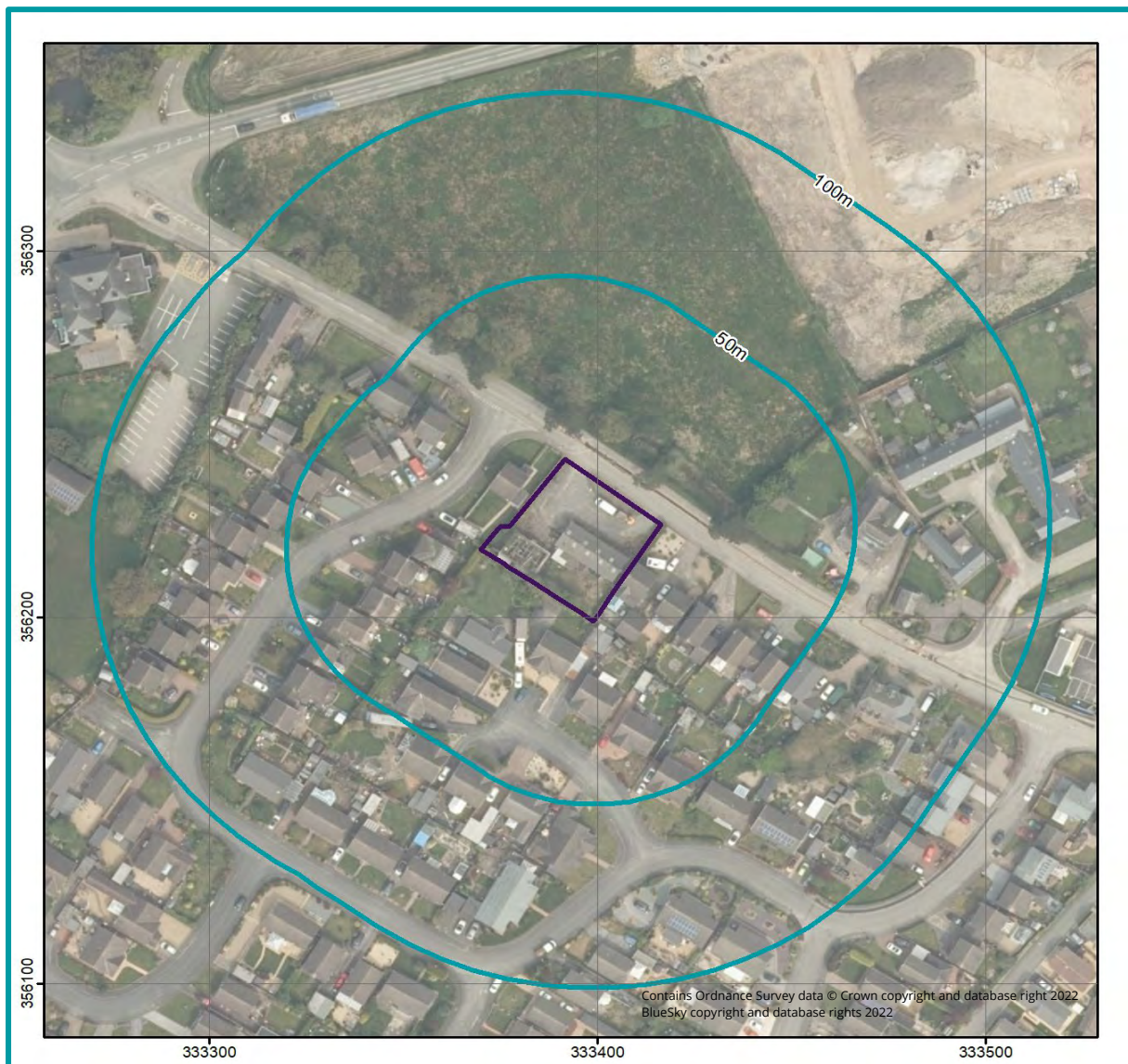
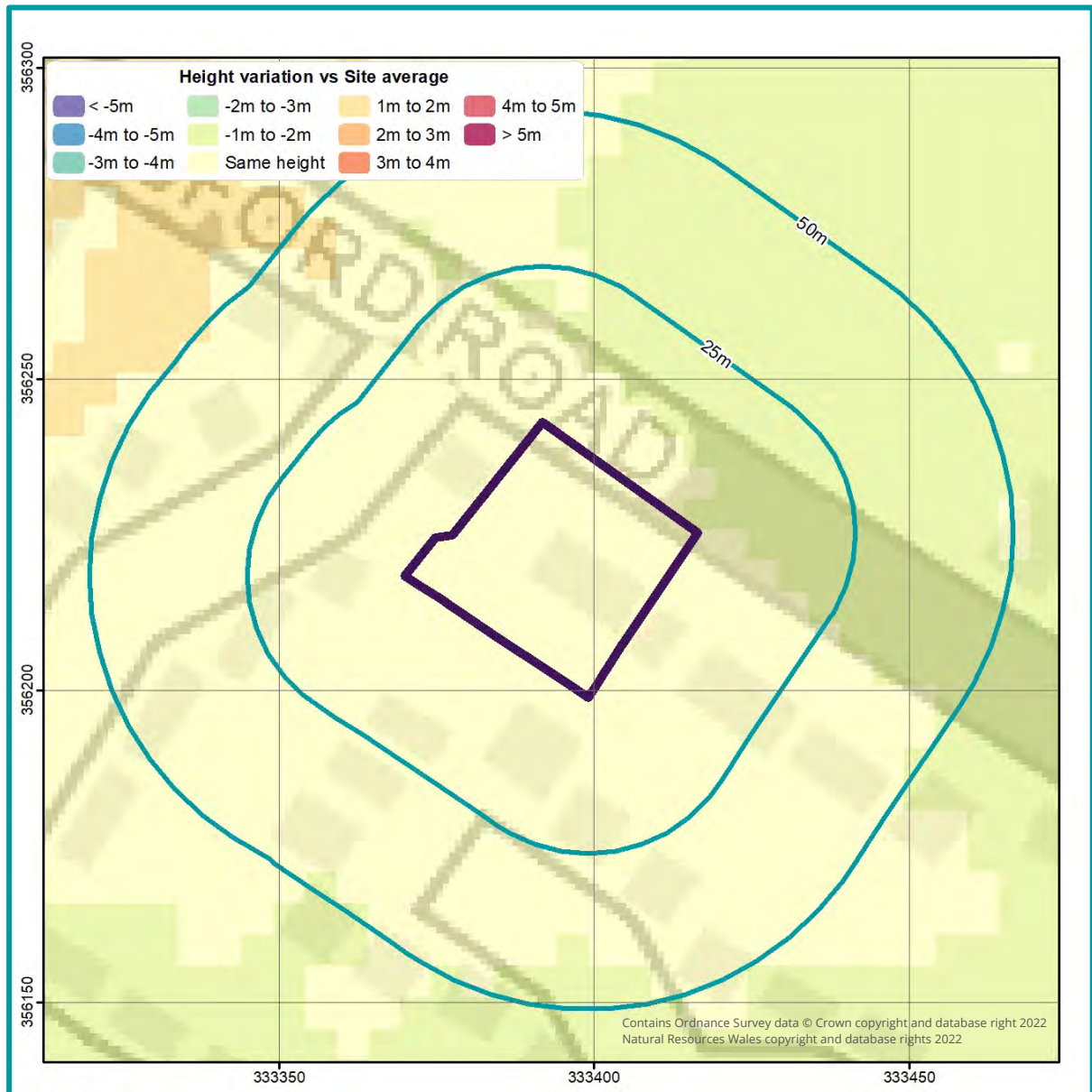


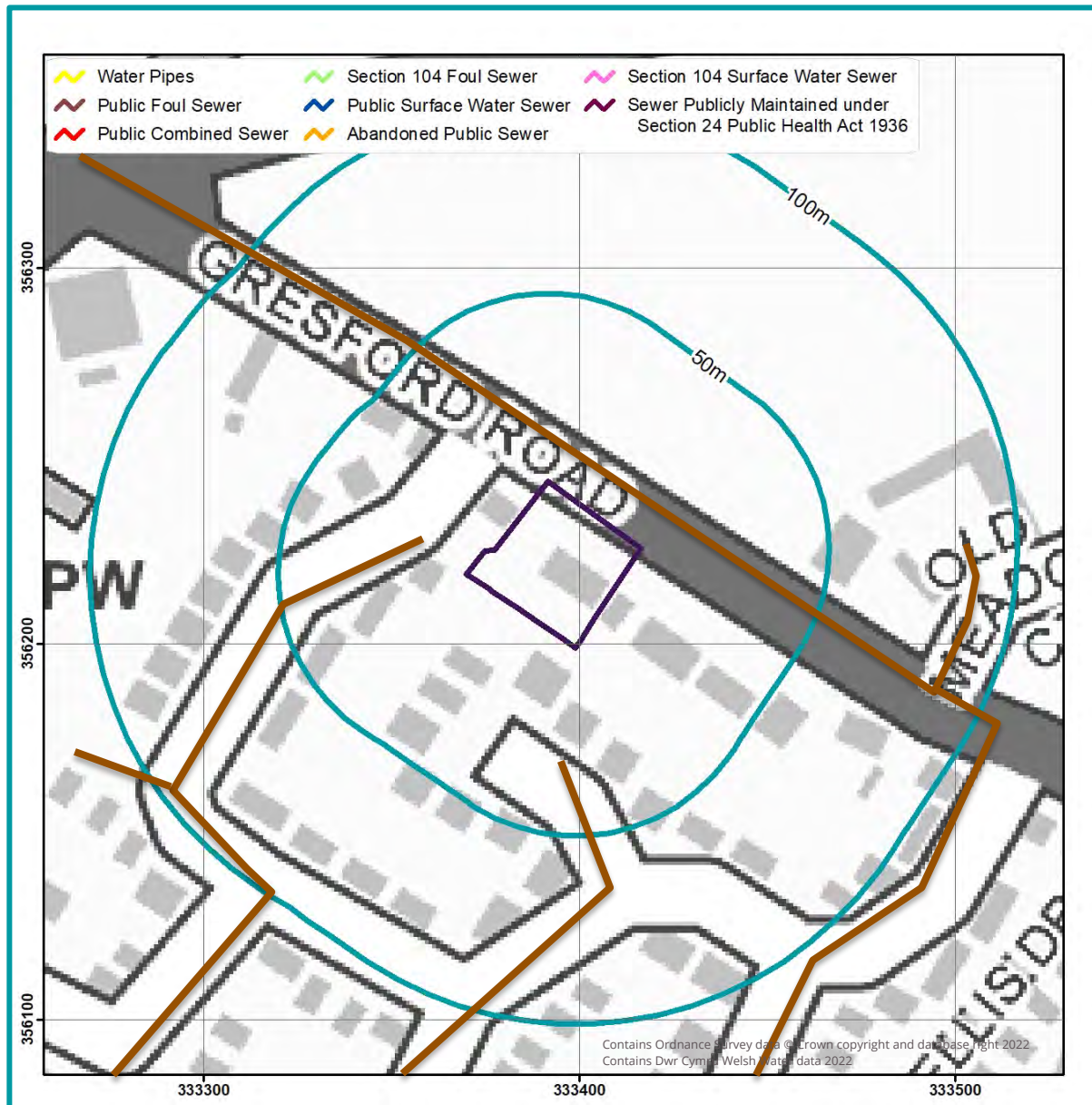
Figure 2. Site topography (GeoSmart, 2022)



An assessment of the topography at the Site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localized depressions. The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area. The mapping confirms the overall Site is generally level falling gradually to the north east.

Further analysis could be undertaken by visiting the Site or by collecting additional topographic survey to provide further confirmation of ground levels.

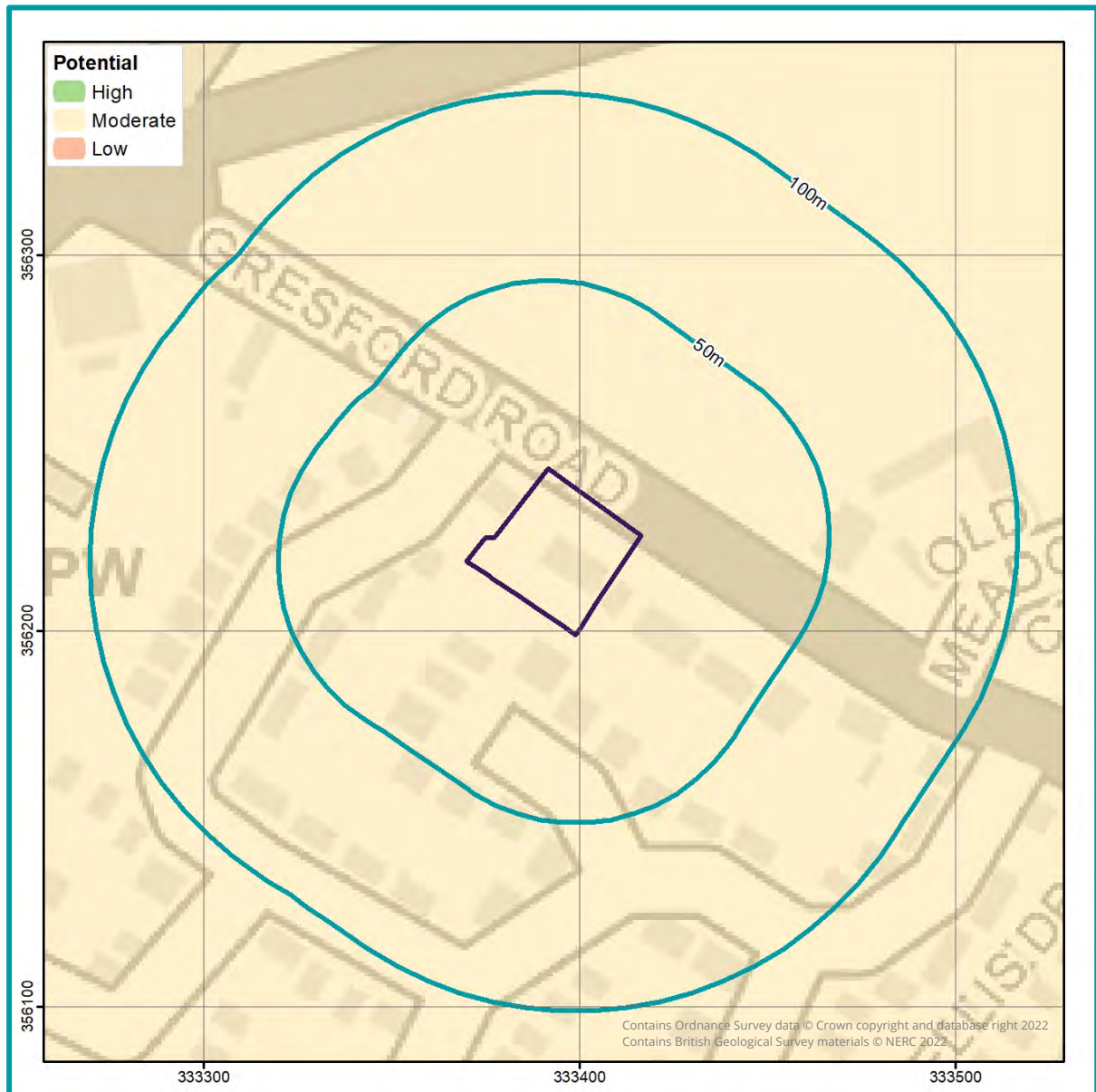
Figure 3. Sewer features map (OS & Dwr Cymru Welsh Water, 2022)



GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the Dwr Cymru Welsh Water asset plan obtained for the Site there is a public foul sewer, located within 10 m to the north of the Site.

Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider would also be required to determine that sufficient capacity is available to accept the proposed discharge, and to gain permission to connect if required.

Figure 4. SuDS infiltration suitability (SD50) map (GeoSmart, 2022)



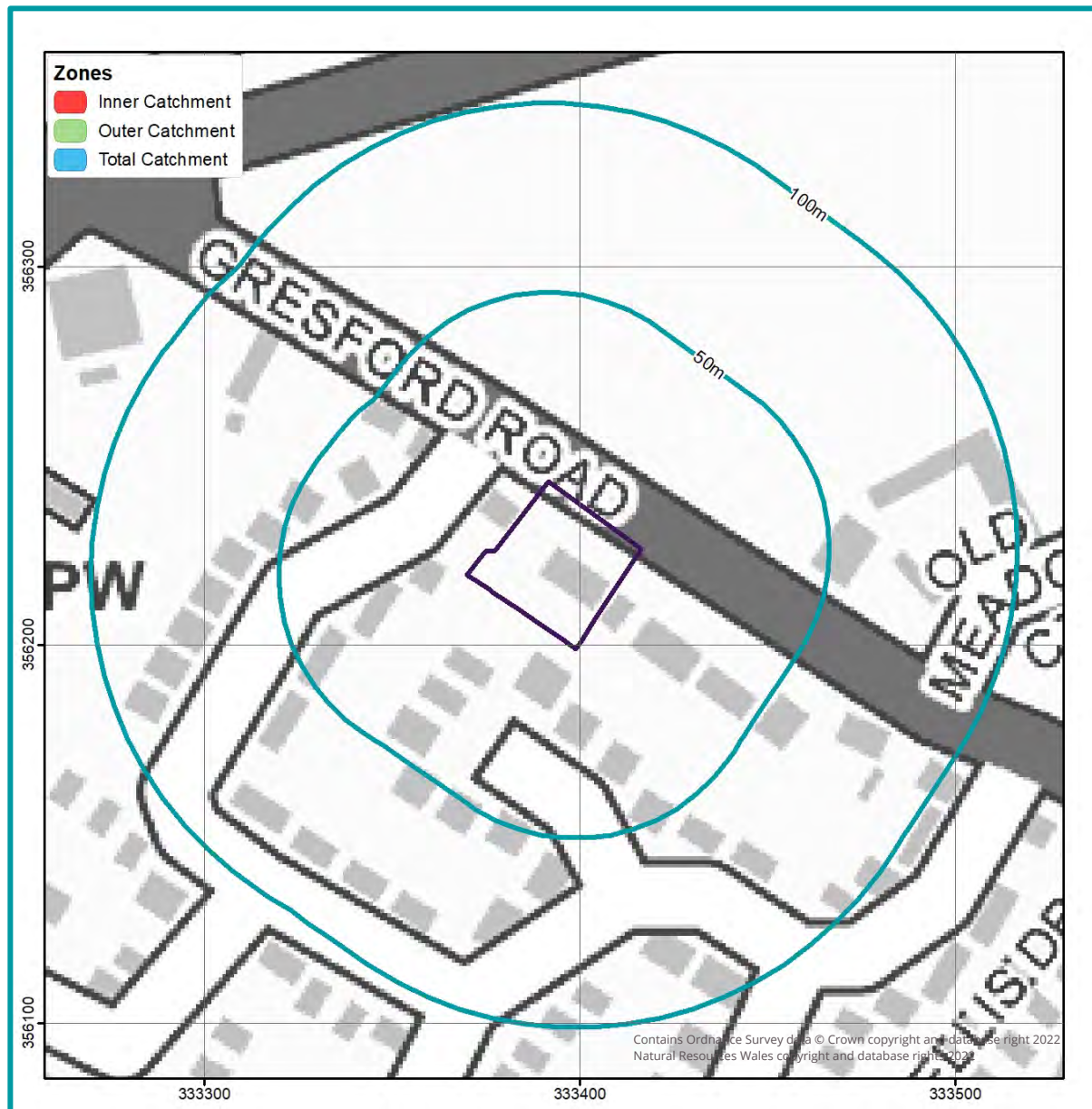
The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual Site drainage design and the planning of further Site investigation.

There is a Moderate potential for infiltration SuDS across the Site. It is likely that the underlying geology at the Site has a variable permeability and infiltration to ground via a drainage field should be possible at the Site.

Despite this, due to the spatial constraints of the Site being confined by the proposed buildings and boundaries a drainage field is not considered feasible. This is due to the

required 15 m buffer between foul water infiltration features and habitable buildings (Building Regulations, 2010) being unable to be met.

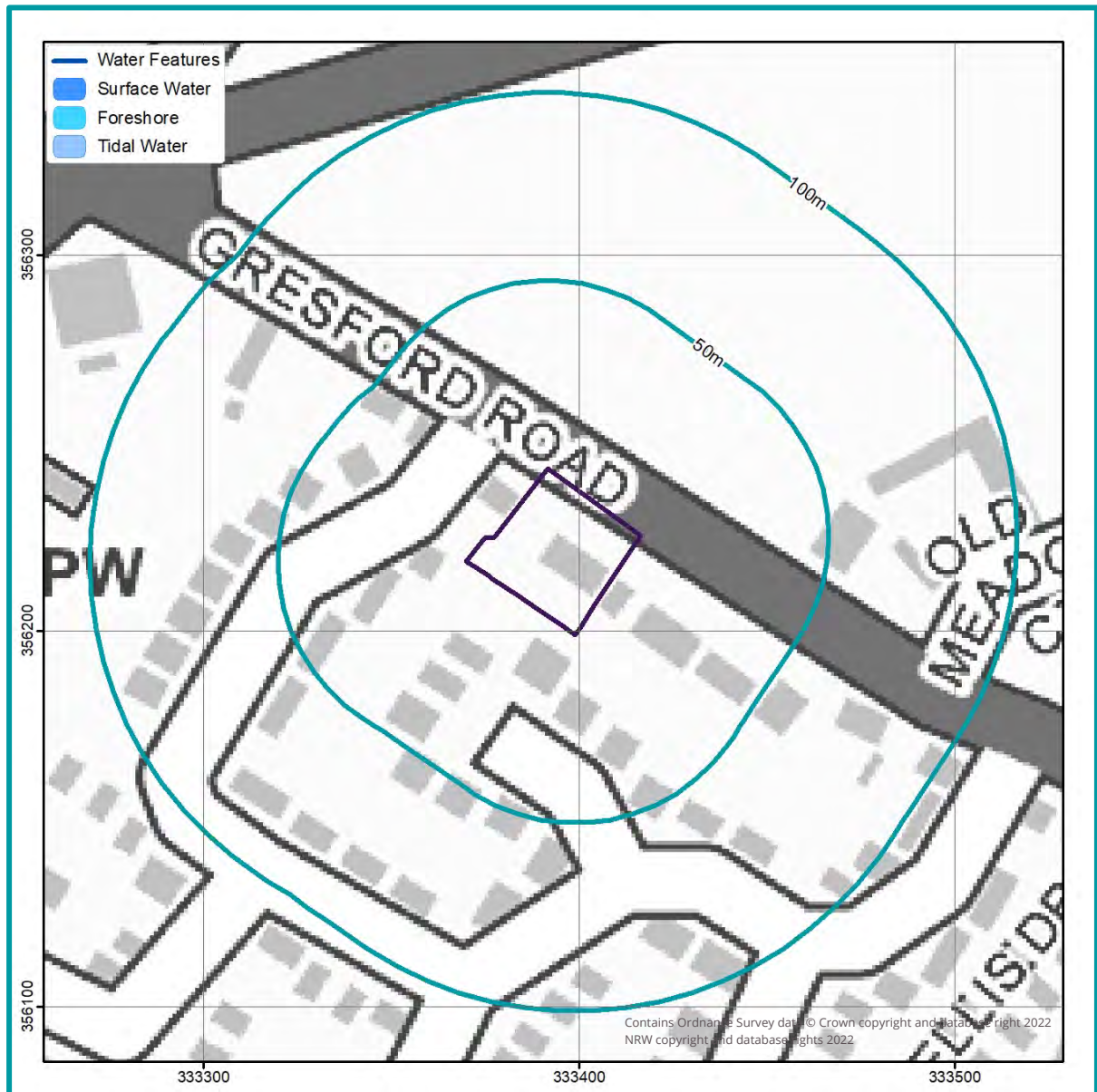
Figure 5. Source protection zone map (NRW, 2022)



An assessment of NRW's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site is not located within an SPZ.

If further analysis is required, this would involve a review of Site specific contaminated land data. If hazards are identified, it is recommended that the Local Authority and Natural Resources Wales are contacted to confirm the susceptibility of any SPZs within the wider area.

Figure 6. Surface water features map (NRW, 2022)



The mapping above confirms that there are no surface water features within 100 m of the Site. Therefore, discharge to surface water via a PTP is unlikely to be appropriate.

According to DEFRA's MagicMap, the Site is not within 250m of a SSSI or SPA.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and Natural Resources Wales to confirm the presence, location and condition of any additional unmapped surface water features.

Figure 7. Risk of flooding from rivers & sea map (NRW, 2022)



According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) map, the Site has a Very Low risk of flooding from fluvial or coastal flooding, with less than 0.1% annual probability of flooding, therefore the SuDS design is unlikely to be affected.

Figure 8. Risk of surface water flooding map (NRW, 2022)



GeoSmart have undertaken an assessment of the risk of flooding from surface water (pluvial) sources within the vicinity of the Site using NRW's Risk of Flooding from Surface Water (RoFSW) mapping. According to the NRW's RoFSW (pluvial) flood mapping, the Site has a Very Low risk of pluvial flooding.

The above map shows the extent and depth of flooding during a 1% annual probability (1 in 100 year) event, this confirms there are no areas on the Site which would be affected by flooding in the 100 year event.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and Natural Resources Wales to confirm the pluvial flood risk, flood depths and velocities where applicable.

Figure 9. Groundwater flood risk (GW5) map (GeoSmart, 2022)



GeoSmart have undertaken an assessment of the risk of flooding from groundwater within the vicinity of the Site. GeoSmart's Groundwater Flood Risk Screening (GW5) map confirms the Site has a Negligible risk of groundwater flooding during a 1% annual probability (1 in 100 year) event.

3 Foul Drainage Strategy



The destination of foul water drainage should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2015) and Welsh Government Circular 008/2018:

1. A public sewer;
2. A private sewer communicating with a public sewer;
3. A Package Treatment Plant;
4. A septic tank.

Due to the presence of a mapped public foul sewer located within 10 m north of the Site, discharge to sewer is considered the most suitable destination for foul water.

Due to the sensitivity of the River Dee and Bala Lake (SAC), despite a level of treatment provided by the WTW, additional treatment is required by developers. The detailed foul drainage drawing in Appendix C demonstrate the proposed foul water strategy showing the inclusion of a primary settling tank and a BioKube PTP with phosphorous reduction Kit. This will provide sufficient treatment to the foul water providing significant betterment on the existing development.

4 Maintenance



Regular maintenance is essential to ensure effective operation of the drainage features over the intended lifespan of the proposed development. The SuDS Manual (C753) (CIRIA, 2015) provides a maintenance schedule for SuDS with details of the necessary required actions as shown in the Table below.

Table 1. SuDS operation and recommended maintenance requirements

Asset type	Maintenance schedule (and frequency)
Underground drainage pipe network and manholes	Regular maintenance: - Trimming any roots that may be causing blockages (annually or as required). Monitoring: - Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually).
Package Treatment Plant	Regular maintenance: - Service (annually or as required/recommended by manufacturer). Monitoring: - Survey inside of tank for sludge or scum build-up and remove (annually or as required/recommended by manufacturer). - Check the electrical components, blowers, pumps, UV-units, are operational (weekly or as required/recommended by manufacturer). - Check air vents for obstructions (weekly or as required/recommended by manufacturer). Refer to manufacturers operation and maintenance manual for further details.
Primary Settling tank	Regular maintenance: - Remove sludge (annually or as required/recommended by manufacturer). - Survey inside of tank for sludge or scum build-up and remove (annually or as required/recommended by manufacturer). Monitoring: - Inspect for signs of blockages (monthly or as required/recommended by manufacturer). Refer to manufacturers operation and maintenance manual for further details.

Health and safety considerations for SuDS

GeoSmart reports may include outline strategies or designs to support with development plans. Any drawings or advice provided do not comprise any form of detailed design. Implementation of any conceptual scheme options may constitute 'Construction Work' as defined by CDM Regulations (2015).

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional.

GeoSmart does not provide health and safety advisory services but we are required to advise you of your general responsibilities under CDM (visit <http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/> for more information).

Please remember that detailed design work should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

5 Further information



The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: FloodSmart Report		The FloodSmart Report range provides clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at a Site. Our consultants assess available data to determine the level of risk based on professional judgement and years of experience. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.
✓	Additional assessment: SuDSmart Report		The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs. Please contact info@geosmartinfo.co.uk for further information.

6 References and glossary



CIRIA (2015) The SuDS manual (C753).

GeoSmart (2022) GeoSmart GW5 Version 2.4.

HM Government (2010). The building regulations 2010 Part H drainage and waste disposal (2015 edition).

LASOO (2015) Practice Guidance, Local Authority SuDS Officer Organisation.

Ministry of Housing, Communities & Local Government. (2021). National Planning Policy Framework (NPPF).

Ministry of Housing, Communities & Local Government. (2014). National Planning Policy Guidance (NPPG).

Welsh Government (2018). Sustainable Drainage Systems Standards for Wales.

Welsh Government (2016). Flood Consequence Assessments: Climate change allowances.

Glossary

General terms

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

The terms included in this glossary have been taken from CIRIA (2015) guidance.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2022 BlueSky copyright and database rights 2022
Flood Risk (RoFRS/Pluvial/Surface Water Features/SPZ)	Natural Resources Wales copyright and database rights 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2022) Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Sewer Location	Contains Ordnance Survey data © Crown copyright and database right 2022 Contains Welsh Water sewer data 2022
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2022 Natural Resources Wales copyright and database rights 2022

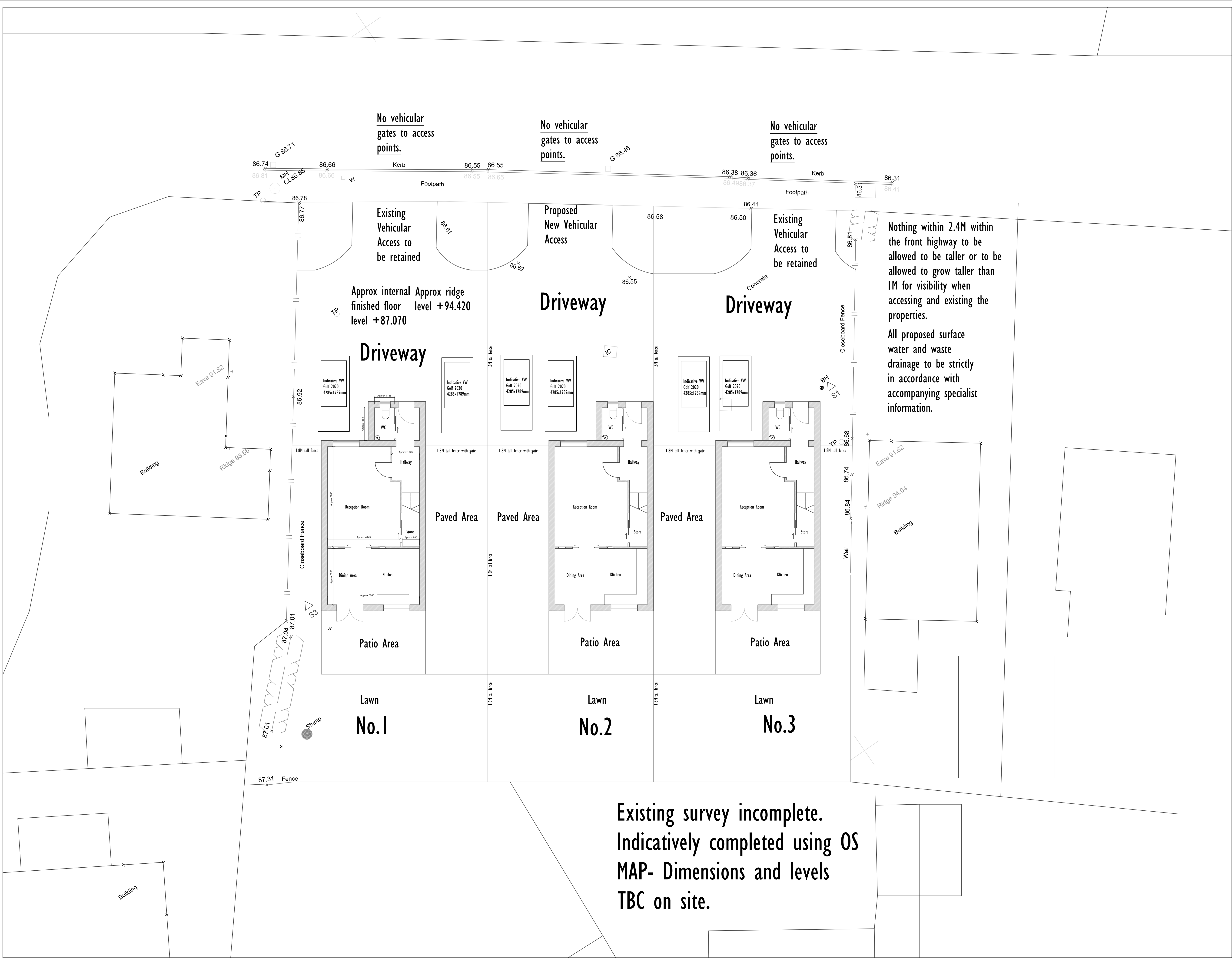
7 Appendices



Appendix A



Site plans



Site Plan
(1:100)



SCOTT ARCHITECTURE LTD
Tel: 07973117032
E-Mail: info@scottarchitecture.co.uk
68 High Street, Tarporley,
Cheshire, CW6 0AT

CLIENT:	Mr R. Whitney (Roof Plus)
PROJECT:	22008- Woodville Garage, 14 Gresford Road, Llay, LL12 0NW
DRAWING TITLE:	Proposed Plans 2
Scale:	1:100@A1
JOB No.	22008
DRAWING No.	22008-PL-102
STATUS:	PLANNING

REVISION	DATE
0	04.05.22

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CDM REGULATIONS
The contractor is responsible for informing the client, and for carrying out all measures necessary to ensure compliance with any relevant health and safety legislation, in particular the construction design and management 'CDM' regulations. Any discrepancies in the drawings should be reported to the architectural designer for decision.

STRUCTURAL INFORMATION
For all structural information refer to structural engineers drawings and details. Drawings to be read in conjunction with other specialist drawings of dimensions to be checked on site before works and fabrication of components commence. All discrepancies to be reported to the architectural designer at the first opportunity.

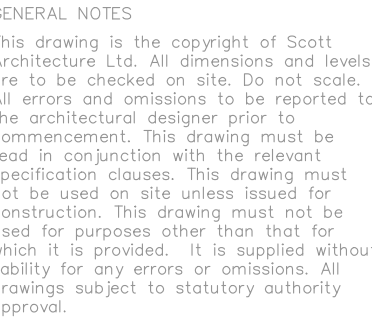
MATERIALS
All materials and components must be suitable for their intended purpose and location and must be manufactured and installed in accordance with all relevant British standards and codes of practice. Any reference to an approved document in this specification relates to the relevant approved document of the building regulations. All work generally to be carried out in accordance with the building regulations and the satisfaction of the approved building control inspectorate.

All Dimensions and Levels to be checked on site

Impact on neighbouring property Right of Light advised to be assessed before commencement of proposed work

Community Infrastructure Levy Forms to be completed and confirmation received from council prior to commencement that all required information has been received. If these forms are not completed prior to commencement then the Levy will become due and no relief will be possible.

CLIENT: Mr R. Whitney (Roof Plus)	
PROJECT:	
22008- Woodville Garage, 14 Gresford Road, Llay, LL12 0NW	
DRAWING TITLE:	
Proposed Plans 3	
Scale: 1:50@A1	
JOB No. 22008	
DRAWING No.22008-PL-10	
STATUS: PLANNING	
REVISION	DATE
0	04.05.22

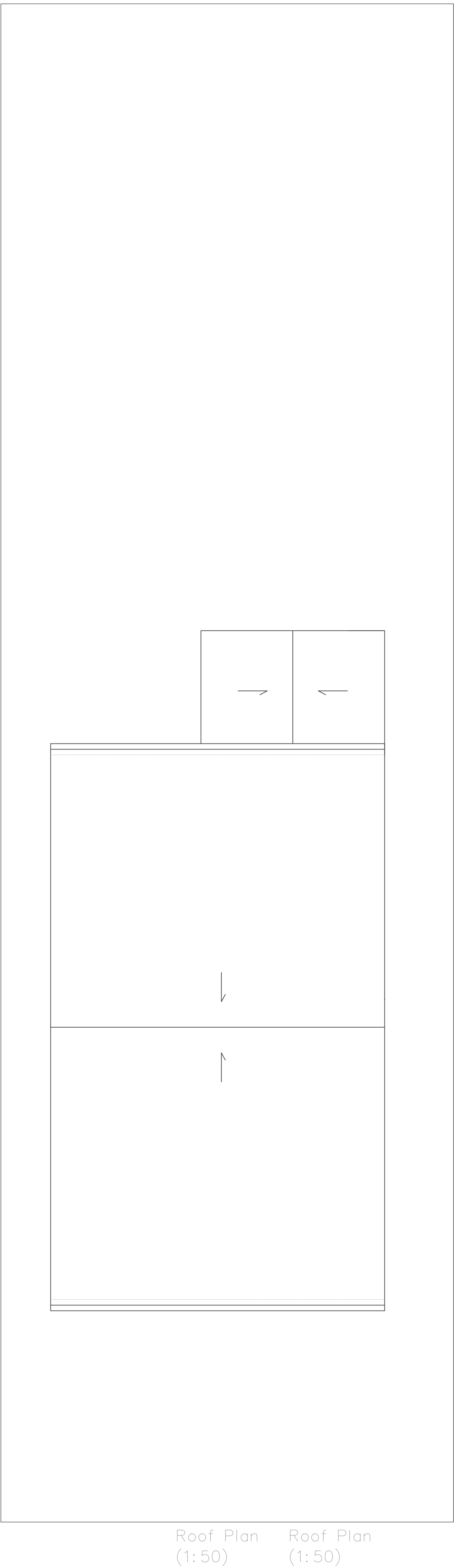
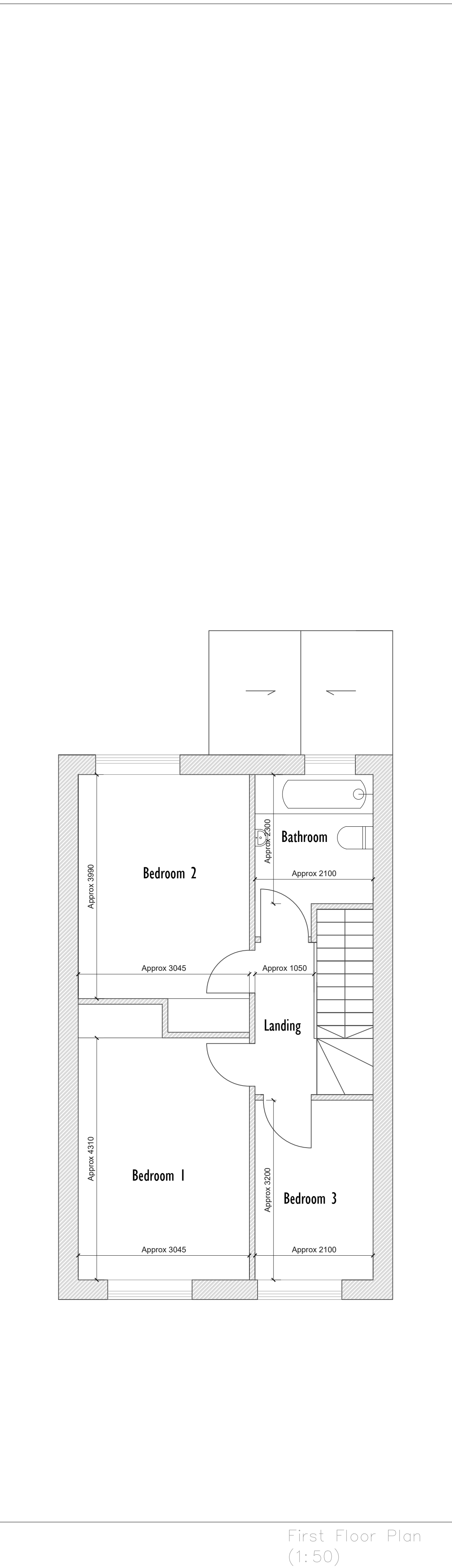
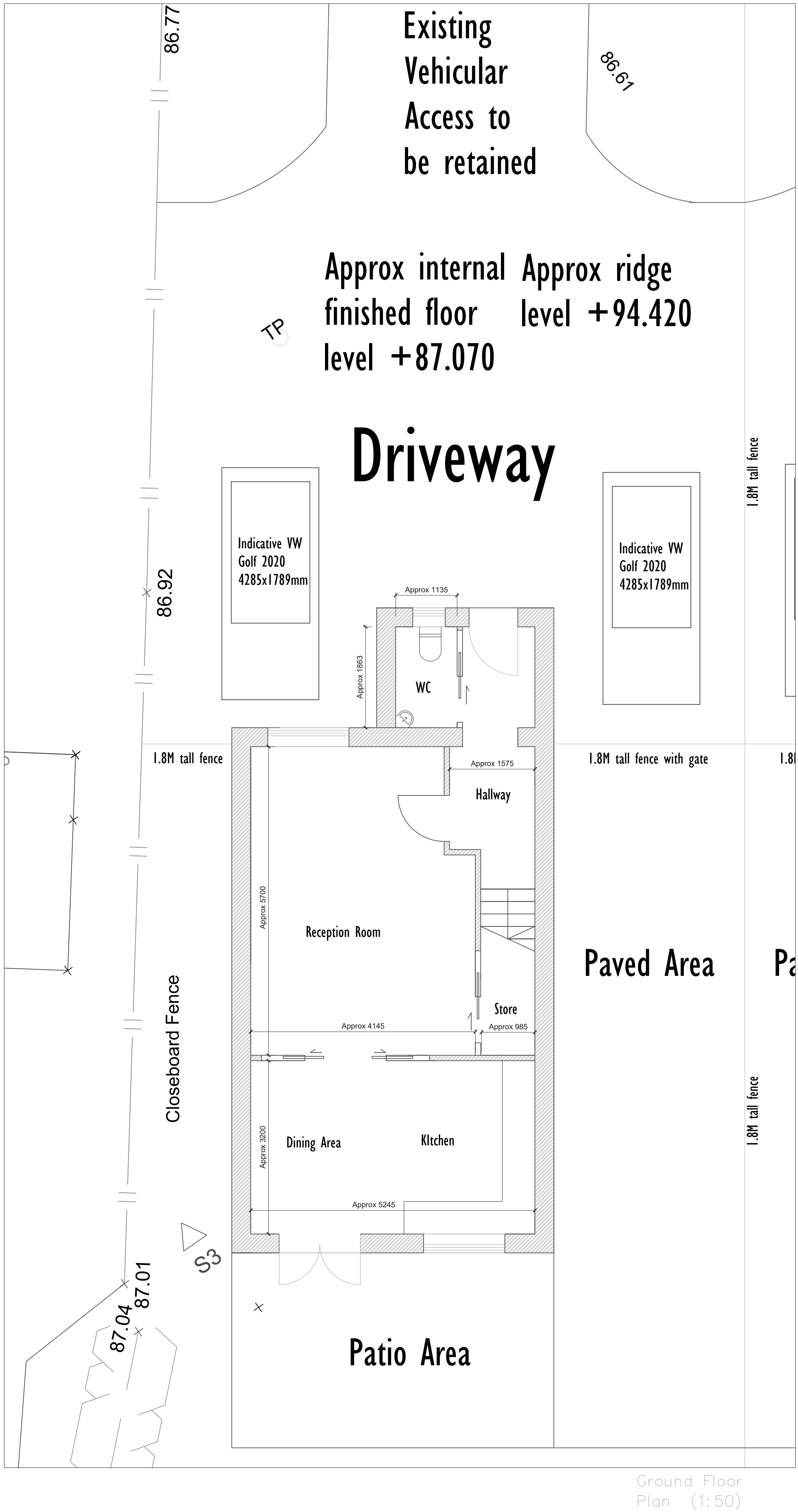


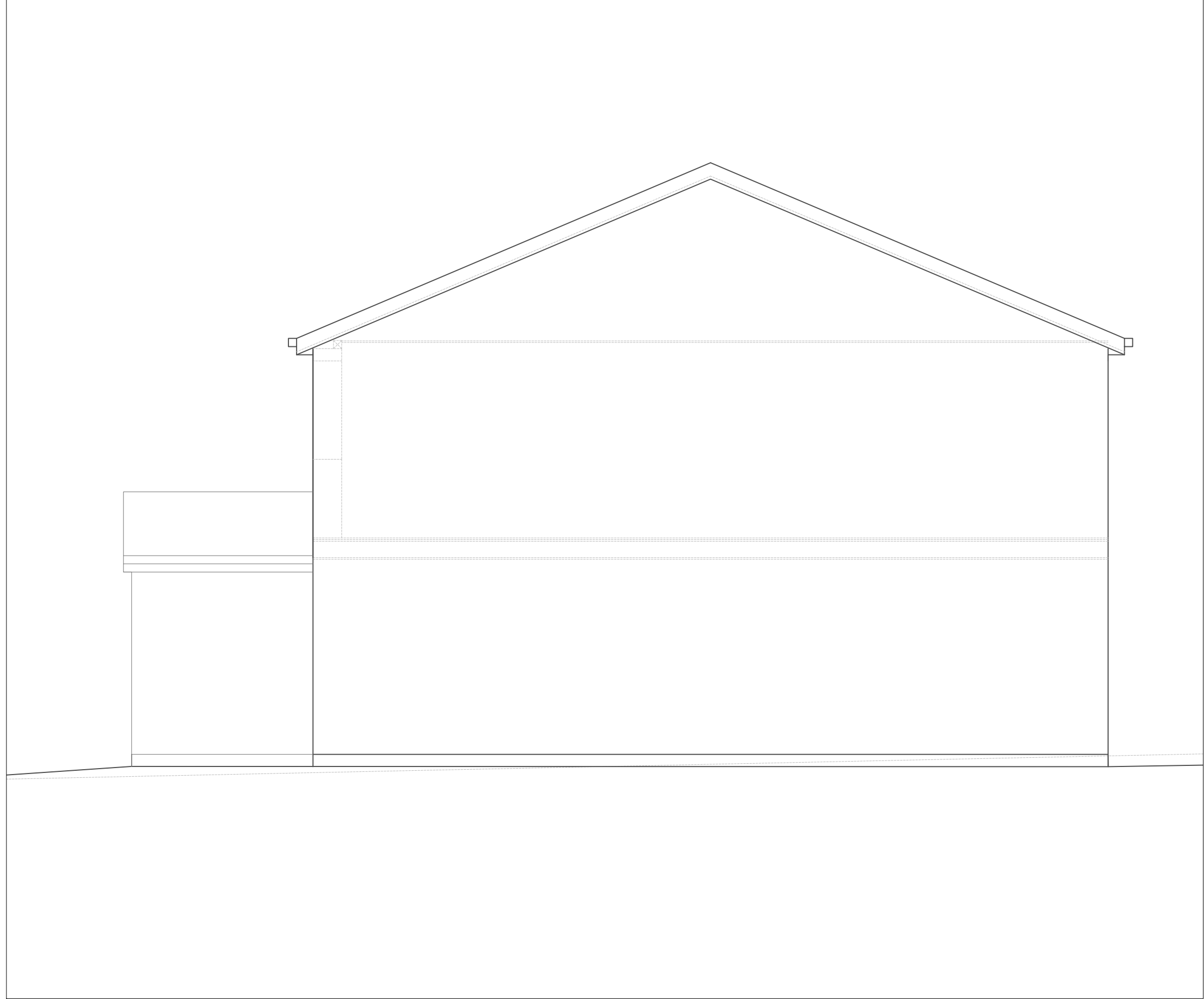
CDM REGULATIONS
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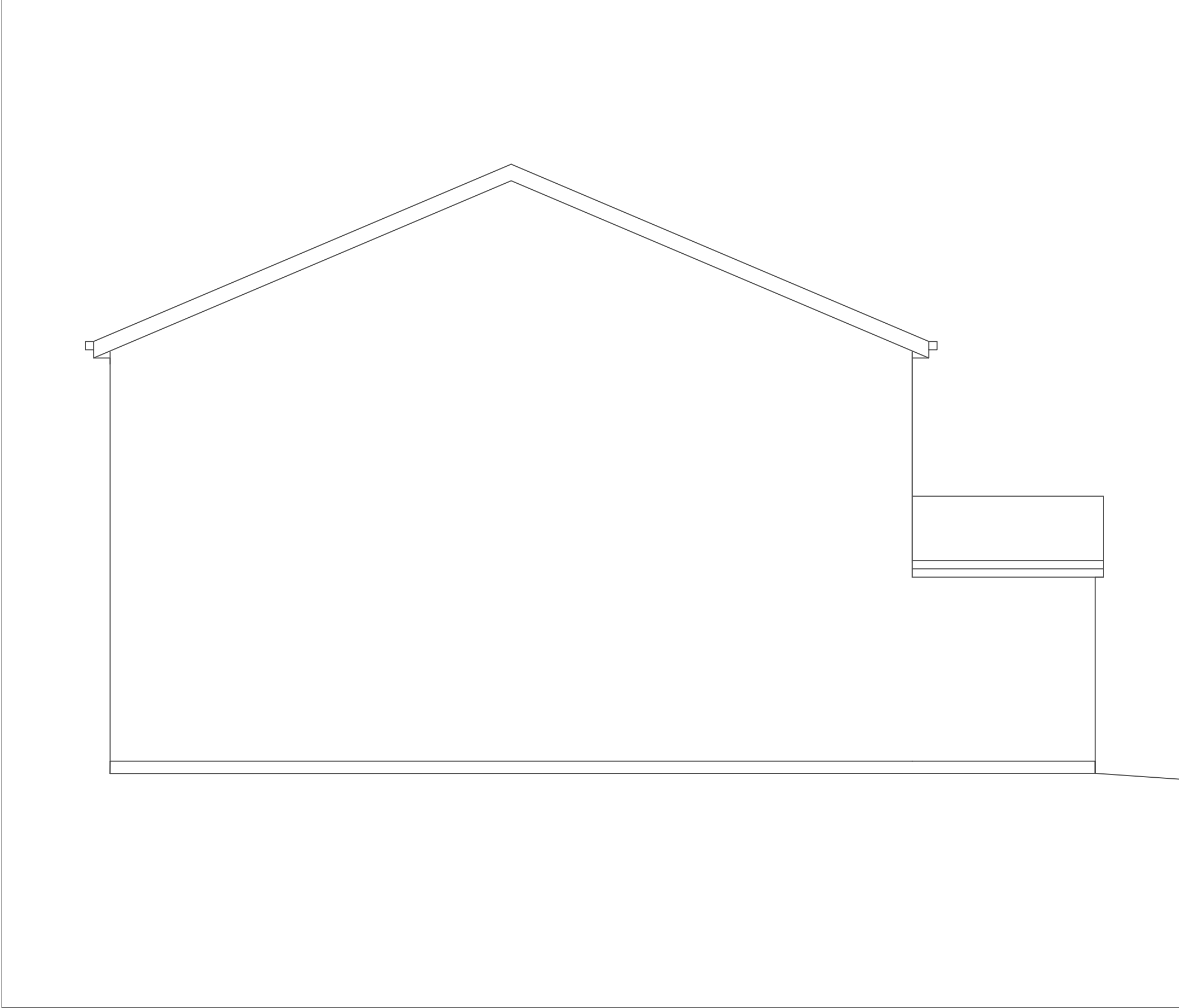
MATERIALS

All materials and components must be suitable for their intended purpose and location and must be manufactured and installed in accordance with all relevant British standards and codes of practice. Any reference to an approved document in this specification relates to the relevant approved document of the building regulations. All work generally to be carried out in accordance with the building regulations and the satisfaction of the approved building control inspectorate.

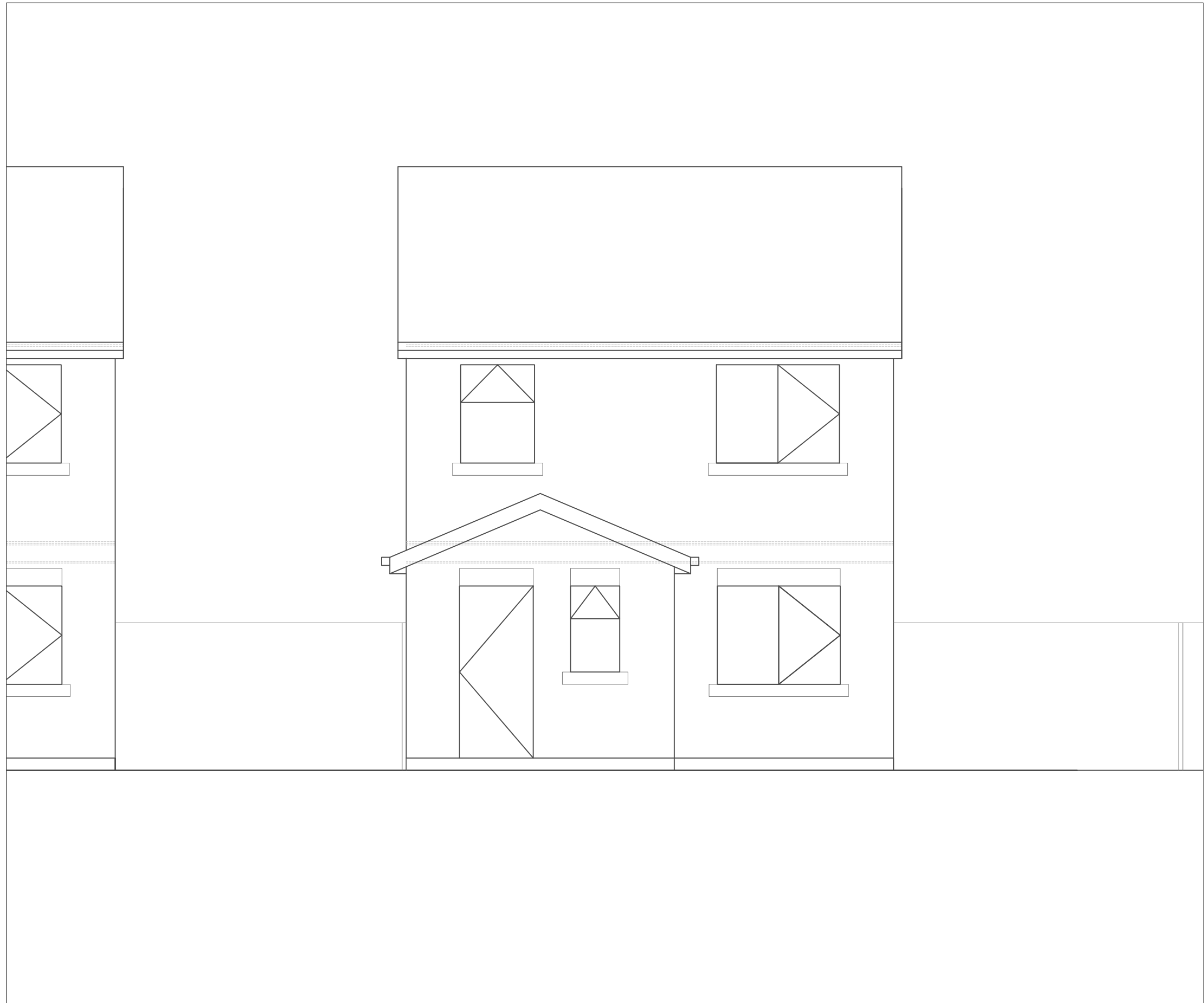




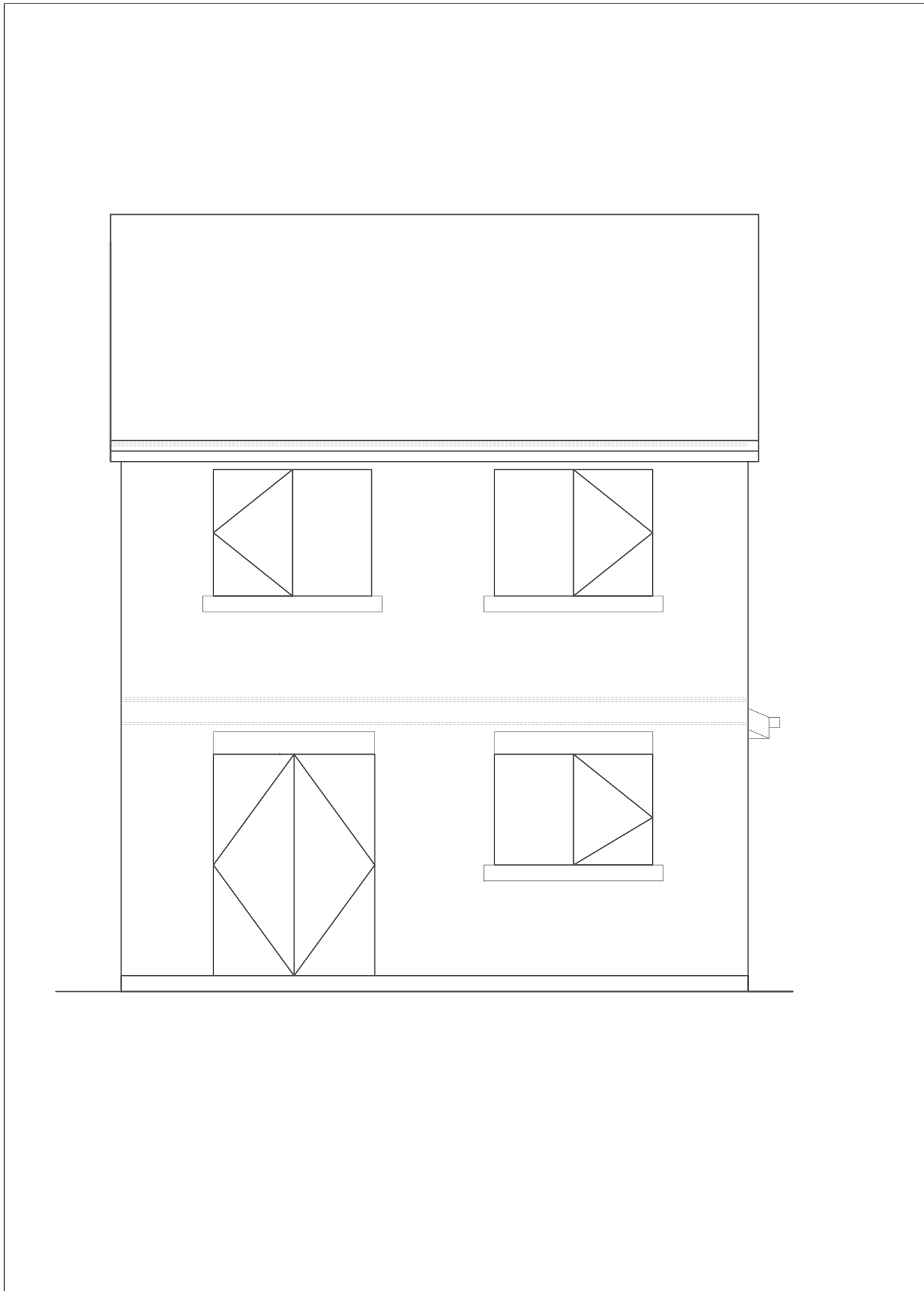
Side West Elevation
(1:50)



Side East Elevation
(1:50)



Front Elevation
(1:50)



Rear Elevation
(1:50)



SCOTT ARCHITECTURE LTD
Tel: 07973117032
E-Mail:
info@scottarchitecture.co.uk
68 High Street, Tarporley,
Cheshire, CW6 0AT

CLIENT: Mr R. Whitney (Roof Plus)

PROJECT:
22008- Woodville Garage, 14
Gresford Road, Llay, LL12 0NW

DRAWING TITLE:
Proposed Elevations
Scale: 1:50@A1
JOB No. 22008
DRAWING No.22008-PL-110
STATUS: PLANNING

REVISION	DATE
0	04.05.22

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STRUCTURAL INFORMATION
For all structural information refer to structural engineers drawings and details. Drawings to be read in conjunction with all other specialist drawings of dimensions to be checked on site before works and fabrication of components commences. All discrepancies to be reported to the architectural designer at the first opportunity.

MATERIALS
All materials and components must be suitable for their intended purpose and location and must be manufactured and installed in accordance with all relevant British standards and codes of practice. Any reference to an approved document in this specification relates to the relevant approved document of the building regulations. All work generally to be carried out in accordance with the building regulations and the satisfaction of the approved building control inspectorate.

All Dimensions and Levels to be checked on site

Impact on neighbouring property
Right of Light
advised to be assessed before commencement of proposed work

Community Infrastructure Levy Forms to be completed and confirmation received from council prior to commencement that all required information has been received. If these forms are not completed prior to commencement then the Levy will become due and no relief will be possible.

Appendix B



Flow Calculations

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.600
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Units	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
3	10.4	86.875	Adoptable	333639.792	356227.238	0.700
4		86.725	Adoptable	333644.757	356234.277	0.775
5	10.4	86.875	Adoptable	333643.939	356224.401	0.700
1	10.4	86.725	Adoptable	333658.671	356215.343	0.700
2		86.575	Adoptable	333662.327	356221.672	0.725
6		86.700	Adoptable	333648.795	356231.440	1.150
6_OUT		86.525	Adoptable	333651.578	356244.154	1.250

Links

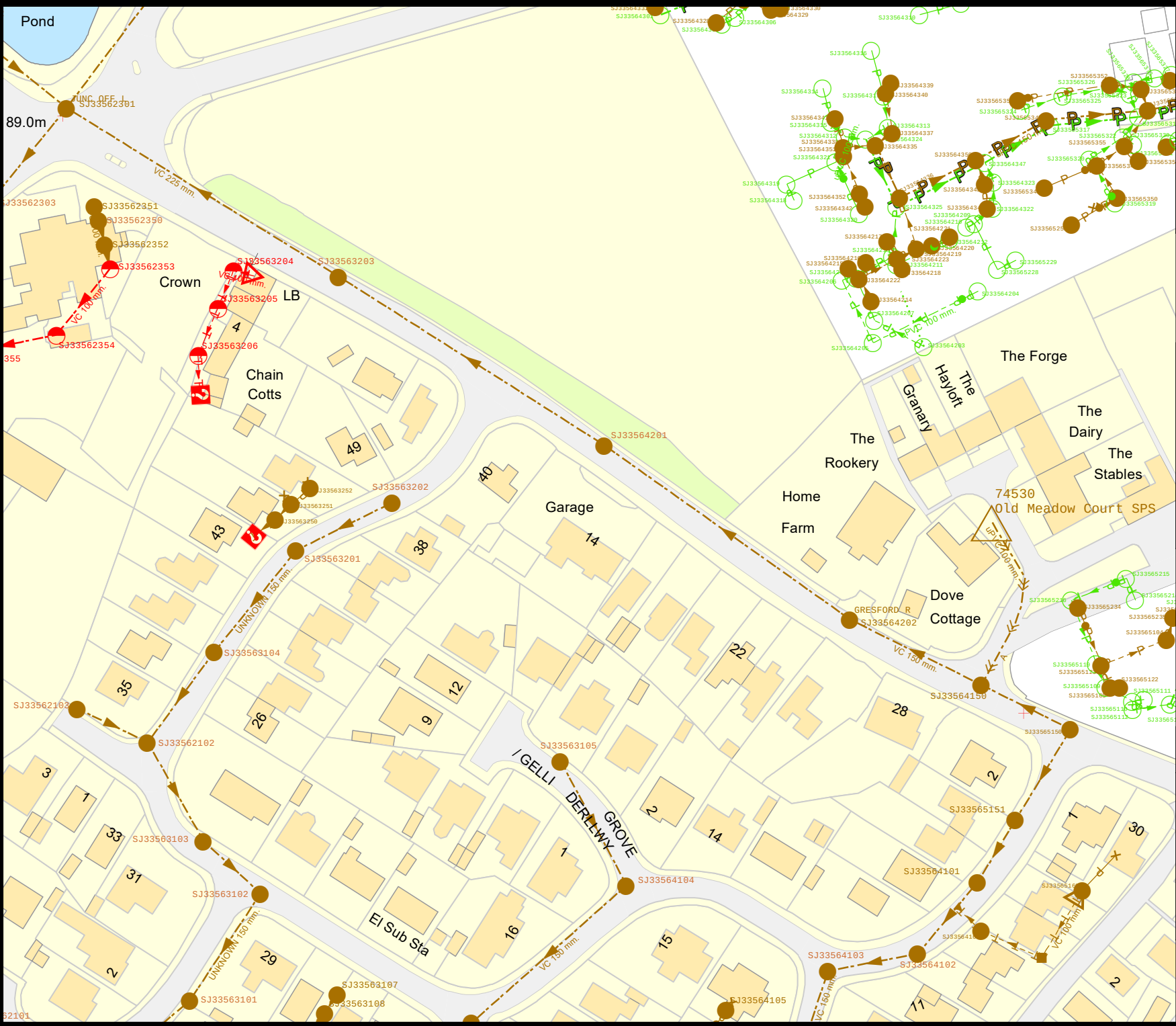
Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
2.000	3	4	8.614	1.500	86.175	85.950	0.225	38.3	100
2.001	4	6	4.935	1.500	85.950	85.550	0.400	12.3	100
3.000	5	6	8.552	1.500	86.175	85.550	0.625	13.7	100
1.000	1	2	7.309	1.500	86.025	85.850	0.175	41.8	100
1.001	2	6	16.689	1.500	85.850	85.550	0.300	55.6	100
1.002	6	6_OUT	13.015	1.500	85.550	85.275	0.275	47.3	100

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	0.595	1.078	8.5	1.6	0.600	0.675	0.000	0	10.4	0.0	30	0.830
2.001	0.856	1.902	14.9	1.6	0.675	1.050	0.000	0	10.4	0.0	22	1.224
3.000	0.846	1.806	14.2	1.6	0.600	1.050	0.000	0	10.4	0.0	23	1.187
1.000	0.570	1.031	8.1	1.6	0.600	0.625	0.000	0	10.4	0.0	30	0.794
1.001	0.521	0.893	7.0	1.6	0.625	1.050	0.000	0	10.4	0.0	32	0.717
1.002	0.649	0.969	7.6	2.8	1.050	1.150	0.000	0	31.2	0.0	42	0.891

Appendix C



Dŵr Cymru Welsh Water asset plan



14 Gresford Road Llay Wrexham LL12 0NW



LEGEND(Representative of most common features)

	Foul chamber		Outfall
	Surface water chamber		Lamphead
	Combined chamber		Storm Overflow
	Combined sewer overflow		Rising main
	Special purpose chamber		Gravity sewer
	Treatment works		Private sewer
	Pumping station		Private sewer subject to Sect. 104 adoption agreement
	NB: Sewer symbol colour indicates the type:		Private Sewer Transfer
	RED - Combined		Lateral Drain
	GREEN - Surface Water		Inspection Chamber
	BROWN - Road		
	Purple - Former S24 sewers (for indicative purposes only)		

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

Dŵr Cymru Cylinddydd (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the understanding that it is based on the best information available and is not warranted as to its correctness in the event of excavations or other works made in the vicinity of the company's apparatus. The error of locating apparatus liable carrying out any excavations made entirely on your. The information which is supplied by the Company is done so in accordance with statutory requirements of sections 104 and 105 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not include the existence of water mains, surface pipes, drains, buried pipes or other apparatus and any excavation apparatus laid before 1 September 1988, or if they are, the potential for excavation and possible movement may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provisions of the New Roads and Street Works Act 1991 and the Company's rights to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref: 333400,356228
Map scale: 1:1250
Printed by: Zara Howells
Printed on: 17 Aug 2022

Appendix D



Settling Tank and Package Treatment Plant Specifications

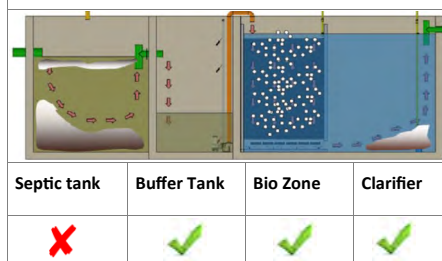
Venus

Product Description

BioKube's Venus systems are small STP plants most commonly used for single or smaller groups of households.

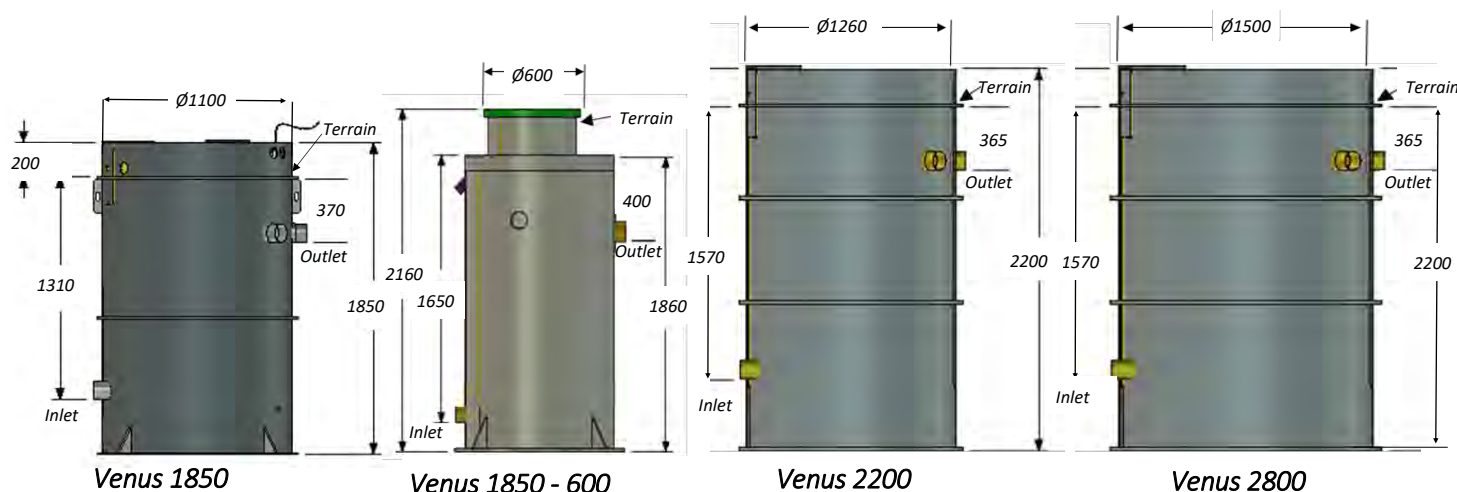
The Venus systems are typically installed after a septic tank either in- or above ground.

Integrated Treatment Steps



Venus installed at a farm house

Dimensions & Pipe Placement



	Venus 1850	Venus 1850 - small lid	Venus 2200	Venus 2800
Height (mm)	1,850	2,160	2,160	2,220
Diametre (mm)	1,100	600/1,010	600/1,010	1,500
Weight (kg)	220	200	200	450
Power consump. (kwh/year)	400	400	700	1400
Size of Internal Pump well (L)	300	300	300	500
Tank Material	PP	PP	PP	PP
Piping Material	PVC	PVC	PVC	PVC
Outlet/Sludge Return Pipe (mm)	110/110	110/110	110/110	110/110
Capacity (PE*) Effluent Class Normal**	10 PE	10 PE	20 PE	40 PE
Capacity (PE*) at Effluent Class High***	5 PE	5 PE	10 PE	20 PE
Capacity (m³/day) Effluent Class Normal**	1,5 m³	1,5 m³	3,0 m³	4,5 m³
Capacity (m³/day) Effluent Class High***	0,75 m³	0,75 m³	1,5 m³	2,25m³
Septic tank size effluent Class Normal****	≥ 3,75 m³	≥ 3,75 m³	≥ 6,0 m³	≥ 12 m³
Septic tank size effluent Class High****	≥ 2,0 m³	≥ 2,0 m³	≥ 3,75 m³	≥ 6,0 m³

*1 PE = 60g BOD, 12 g N-total, 2,5 g P-total, 150 L/dag

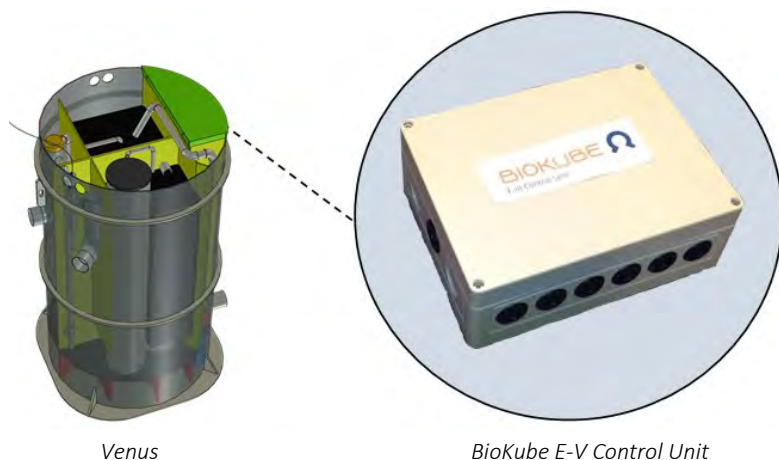
**Effluent Class Normal: BOD < 25 mg/liter

***Effluent Class High: BOD < 10 mg/liter, NH4 < 5 mg/liter, 50 % TN reduktion.

**** Based on one yearly emptying of sludge. Smaller septic tank sizes can be applied if more frequent sludge emptying is accepted.

Venus

Control Components



Venus

BioKube E-V Control Unit

BioKube E-III Control Unit

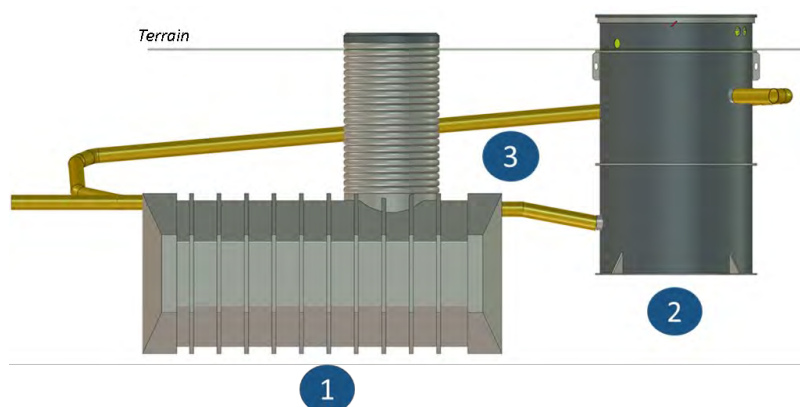
All electrical component in the Venus Unit; e.g. Blowers, pumps, UV Units, are integrated and connected to the BioKube E-III control unit, from where the power is distributed and controlled.

The Control Unit is placed in the internal control room (see drawing).

The plant is normally powered with 230 Volt, 1 phase power supply. The maximum current is 2.5 Amperes depending on the number and size of components installed.

Systems for 110V power supply regions can be supplied upon request.

Full Installation Principles



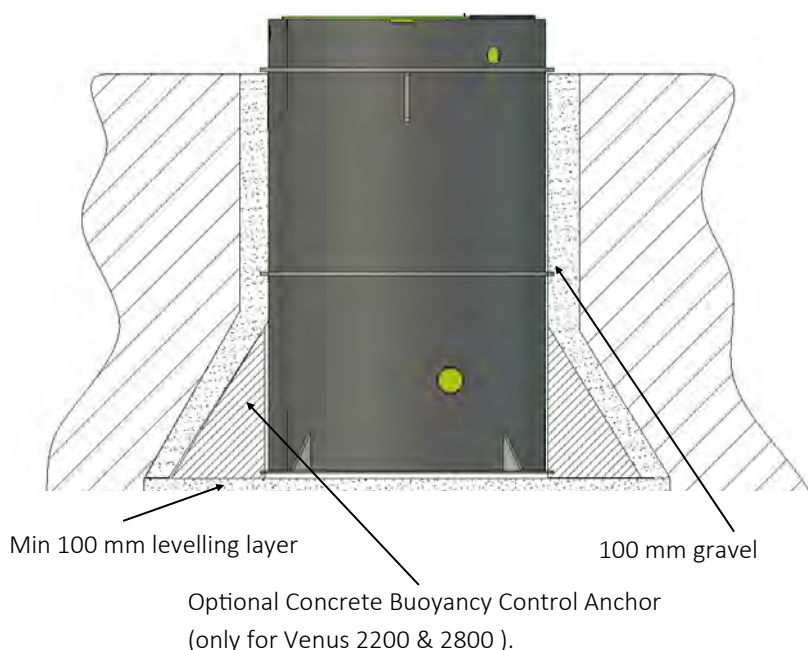
Installation Components

The Venus Systems are typically installed in ground after a septic tank. The septic tank should be supplied locally from one of many standard suppliers. Alternatively it can be casted on site in concrete.

- 1 Septic tank
- 2 Venus wastewater treatment plant
- 3 Sludge return pipe

For more information see the installation manual

Construction Principles - Backfilling



Backfilling

The system requires to be installed on a level and compressed surface (e.g. gravel layer).

When back-filling a 100 mm layer of gravel must be placed around the plant.

In case of high ground water levels it is recommended to cast a buoyancy control concrete anchor around the bottom of the Venus plant.

The Venus plant can also be installed above ground without any additional equipment.

For more information see the installation manual.

BioKube is the only system that is able to guarantee effluent quality

- ✓ Low BOD
- ✓ Low Ammonium (NH_4)
- ✓ Low Phosphorous
- ✓ Shallow Installation
- ✓ EN 12566-3
- ✓ Effluent Guarantee

BioKube is an elite sewage treatment plant and the only system that can guarantee the quality of its effluent.

BioKube should be the first choice for those who need or desire a sewage treatment plant that is able to purify wastewater to the highest standards.

Following testing on 2,300 BioKube systems an average effluent quality was recorded of:

COD 43 mgL^{-1}

NH_4 5 mgL^{-1}

Phosphorous 1 mgL^{-1}

This is four times cleaner than the UK Royal Commission Standard



Effluent sample from a BioKube sewage treatment plant

WTE Ltd
Blackberry Farm
Fog Lane
Ellerton
YO42 4PU

01759 369 915

www.biokube.co.uk

BioKube Standard Effluent:

BOD < 20 mg/L
S. Solids < 20 mg/L
NH₄ < 20 mg/L

BioKube Elite Effluent:

BOD < 10 mg/L
S. Solids < 15 mg/L
NH₄ < 5 mg/L

The optional Phosphorous reduction kit can achieve Phosphorous levels of P < 1.5 mg/L

BioKube is the only system that is able to guarantee effluent quality

Certified to
EN 12566-3

WTE Ltd
Blackberry Farm
Fog Lane
Ellerton
YO42 4PU

01759 369 915

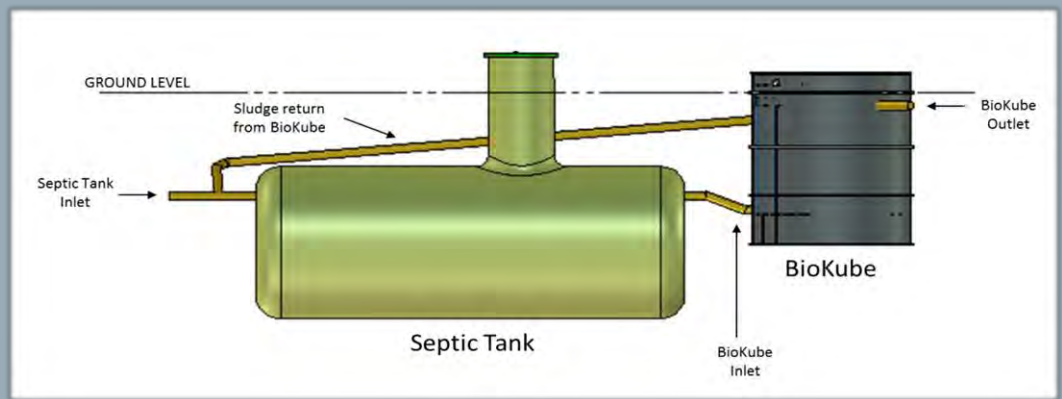
www.biokube.co.uk

BioKube is an Advanced Wastewater Treatment System (ATWS) that is one of the most efficient sewage treatment plants available anywhere in the world.

Like other systems BioKube is a two tank sewage treatment plant with each tank fulfilling a different role.

Septic Tank - The first tank is a septic tank that separates solids and liquids from the wastewater. The solids are retained and digested by anaerobic bacteria and the liquid is allowed to flow into the BioKube ATWS.

BioKube ATWS - This is where the majority of the treatment occurs. The BioKube uses simple air compressors to blow air into the liquid effluent and create an environment suitable for different strains of aerobic bacteria. These bacteria then digest pollutants in the effluent in a controlled process that ensures the final effluent is safe for discharge into the environment. Any sludge that develops in the BioKube is pumped back to the septic tank thus ensuring the BioKube has no requirement to be emptied by a tanker.



The Environment Agency and SEPA may request effluent with low NH₄ and phosphorous levels.

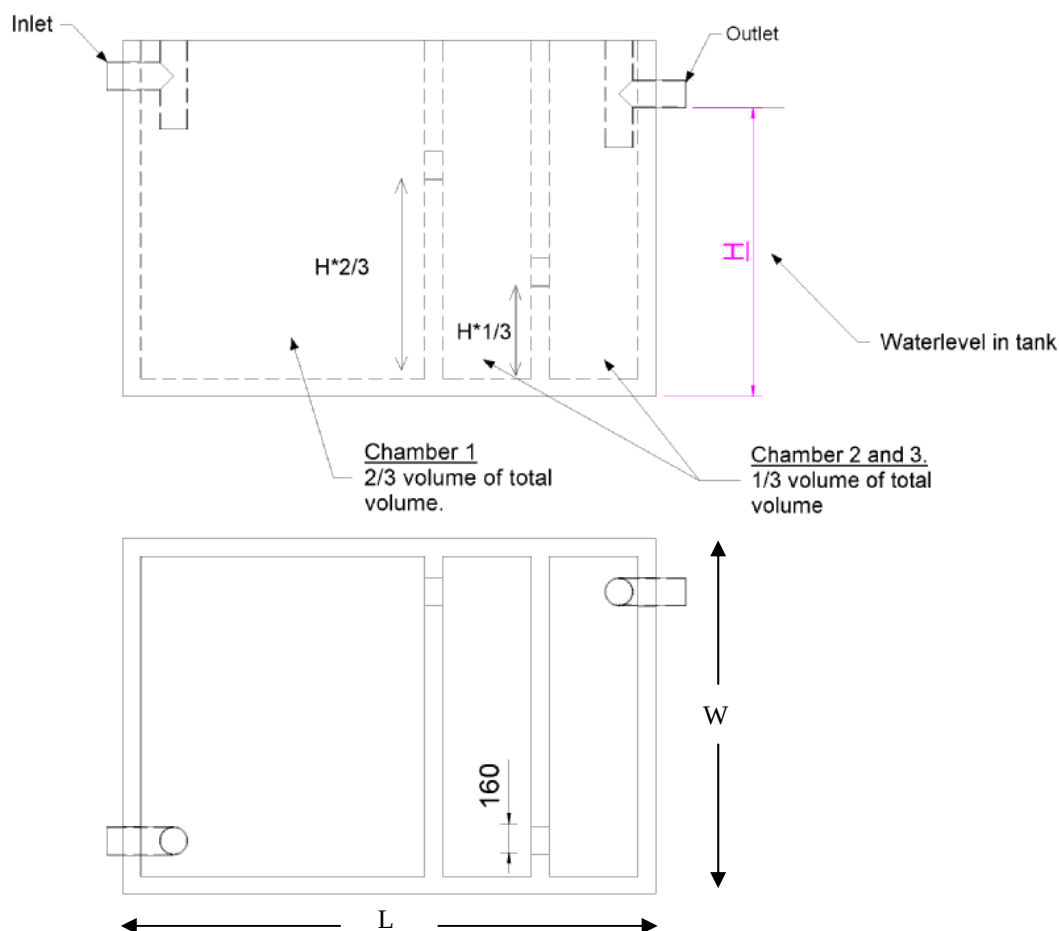
The BioKube is able to treat wastewater to a level that exceeds standard sewage treatment plants.

Model	PE		Height (mm)	Diameter (mm)	Outlet Invert (mm)
	Standard Effluent	Elite Effluent			
Venus 1850	7	5	1,850	1,110	370
Venus 2200	14	10	2,200	1,260	365
Venus 2800	20	28	2,200	1,500	365
Mars 3000 3C	42	30	2,200	2,000	255
Mars 3000 4C	56	40	2,200	2,000	255

Biokube Settling Tank in concrete.

aug. 2010, hbl

The first step in all BioKube cleaning process is the separation of sludge from the waste water. For our systems we recommend the traditional and very efficient pre settlement tank (septic tank), and we recommend a 3 chamber tank. 1st chamber approx 2/3 and 2nd and 3rd chamber each 1/6.



Tank size	PE pcs.	Days between emptying	Depth (H) mm	Wide (W)mm	Length (L)mm	Inlet outlet
15 m ³	75	100	3,000	1,285	4,000	110/110
25 m ³	125	100	3,000	1,900	4,400	110/110
30 m ³	150	100	3,000	1,900	5,200	110/110
50 m ³	250	100	4,000	1,900	6,500	110/110
80 m ³	400	100	4,000	2,280	8,800	160/160
125 m ³	625	100	4,000	4,000	7,800	160/160
165 m ³	850	100	4,000	4,500	9,000	160/160

The capacity in the settling tank is based on house hold waste water. One PE equals 1.5 litre slugde/day.

Biokube settling tanks 5 - 50 PE see next page.

Settling Tank for BioKube 5 – 50 PE systems.

For these systems it is assumed that the settling tank will be emptied every 12 months. If the emptying frequency is every 6 months, the size should be 2/3 of the specified. If the emptying frequency is every 24 months, the size should be 200 % of the specified.

BioKube will as described on the opposite page recommend a 3 chamber settling tank. This is however not critical, it is just a simple way of getting good unctionality in the settling tank.

If in doubt, always take a bigger tank. It is a cheap way of ensuring good retention of particles.

No. PE	Emptying intervals month.	Size of tanks.
5 PE	12	2,200
10 PE	12	4,500
15 PE	12	6,500
20 PE	12	9,000
30 PE	12	12,000
40 PE	12	18,000
50 PE	12	22,000



Picture of 3 chamber settling tank for 5 PE system built on site.

The picture also illustrate connection of:

- a) Incoming water to BioKube. From the 3rd chamber of settling tank. Notice also the T-Pipe.
- b) Return sludge and water from house. Comes into the first big chamber of the settling tank.

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
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The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

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Please ask your search provider if you would like a copy of the search code

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- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

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We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

martinlucass@geosmartinfo.co.uk

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