

FERN HILL FARM

FLOOD RISK ASSESSMENT and SUSTAINABLE DRAINAGE STRATEGY

Final Report for:

Mr Nick Green

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CONTENTS

1.0	INTRODUCTION	5
1.1	Overview	5
2.0	SITE DESCRIPTION AND EXISTING CONDITIONS	7
2.1	Site Description	7
2.2	Proposed Future Use	7
2.3	Site Levels	7
2.4	Underlying Ground	7
3.0	FLOOD RISK and FLOOD ZONES.....	10
3.1	Brief.....	10
3.2	Fluvial, Tidal.....	10
3.3	Surface Water.....	12
3.4	Other Sources.....	13
3.5	Historic Flooding.....	15
3.6	Internal Drainage Board	16
4.0	SUMMARY	17
5.0	MANAGING SURFACE WATER.....	18
5.1	Brief.....	18
5.2	Climate Change.....	18
5.3	Sustainable Drainage Systems (SUDS).....	19
6.0	DRAINAGE STRATEGY	23
6.1	Surface Water Drainage Strategy.....	23
6.2	Foul Flows.....	23
7.0	MAINTENANCE STRATEGY	24
8.0	CONCLUSIONS	27
Appendix A		28
Appendix B		29
Appendix C		30
Appendix D		31
Appendix E.....		32
Appendix F.....		33

APPENDICES

APPENDIX A – PROPOSED SITE LAYOUT DRAWING

APPENDIX B – EXISTING BOREHOLE LOG

APPENDIX C – FLOOD MAP FOR PLANNING

APPENDIX D – SFRA FLOOD MAPS

APPENDIX E – CAUSEWAY FLOW CALCULATIONS

APPENDIX F – DRAINAGE ARRANGEMENT

1.0 INTRODUCTION

1.1 Overview

- 1.1.1 We have been instructed by Mr Nick Green to prepare a Flood Risk Assessment [FRA] to support proposals for an extension and conversion of a stone stable building to a self-build dwelling in Rochdale on land to the west of Fern Hill Farm, Lanehead, Rochdale. **Figure 1.1** illustrates the site location.

Figure 1.1: Site Location



- 1.1.2 This report presents the findings of an FRA, which has been carried out in accordance with the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Technical Guidance, Environment Agency (EA) interactive maps, Rochdale Borough's Strategy for Flood Risk Management 2014 – 2024 and the Level 1 Strategic Flood Risk Assessment for Greater Manchester - Update (SFRA).
- 1.1.3 This FRA aims to identify and assess the risks of all forms of flooding to and from the site and demonstrate how the flood risks will be managed, taking climate change into account. The FRA also considers the management of surface water run-off and outlines the proposed drainage strategy.
- 1.1.4 As the proposed site resides within an area designated as flood zone 1 with an approximate site area of 0.04 hectares (400m²) an FRA is not typically required however, due to the risk of surface water flooding shown in **figure 1.2** below an FRA has become necessary.

Figure 1.2: Requirements within Flood zone 1

This location is in flood zone 1

In your proposed development site there is a risk of flooding from:

- surface water

Flood risk assessments

Developments in flood zone 1 that are less than 1 hectare (ha) only need a flood risk assessment (FRA) where:

- land has been identified as having critical drainage problems
- land is identified in the local planning authority's (LPA) strategic flood risk assessment (SFRA) as being at increased flood risk in future
- it would increase the vulnerability classification and land may be subject to sources of flooding other than rivers or sea

The site you have drawn is 0.04ha.

- 1.1.5 The development should not increase the risk of flooding elsewhere and this FRA has therefore also been prepared to demonstrate that this has been achieved. Consideration has also been given to minimising the risk of pollution to controlled waters and the site conditions prior to, during and after development.
- 1.1.6 The content of the flood risk assessment will be delivered in line with the objectives contained within paragraph 20 of the Flood risk and coastal change guidance which indicates:
- *whether a proposed development is likely to be affected by current or future flooding from any source.*
 - *whether it will increase flood risk elsewhere.*
 - *whether the measures proposed to deal with these effects and risks are appropriate.*
 - *the evidence for the local planning authority to apply (if necessary) the Sequential Test, and.*
 - *whether the development will be safe and pass the Exception Test, if applicable.*
- 1.1.7 Although a flood risk assessment is necessary, following the guidance within Paragraph 21 of the Flood risk and coastal change guidance (Extract below):

A flood risk assessment needs to be appropriate to the scale, nature and location of the development. For example, where the development is an extension to an existing house (for which an application for planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, the local planning authority would generally need a less detailed assessment to be able to reach an informed decision on the planning application.

2.0 SITE DESCRIPTION AND EXISTING CONDITIONS

2.1 *Site Description*

- 2.1.1 The site forms circa 0.04 hectares of Brownfield land. The site is located approximately 3.83km to the northwest of Rochdale centre and 7.8km to the northeast of Bury. National Grid reference 387151, 415323 is located at the central point of the proposed site area with the nearest postcode is identified as OL12 6BW.
- 2.1.2 A proposed site layout plan drawing reference 3691-05 Rev D is shown in **Appendix A**.
- 2.1.3 An unnamed watercourse is culverted below the proposed site.
- 2.1.4 An informal pond is located to the rear of the existing stable block with the Greenbooth Reservoir located 1.5km to the west of the proposed site.
- 2.1.5 The River Spodden flows through the Healey Hill Nature Reserve located approximately 750m to the west of the site.

2.2 *Proposed Future Use*

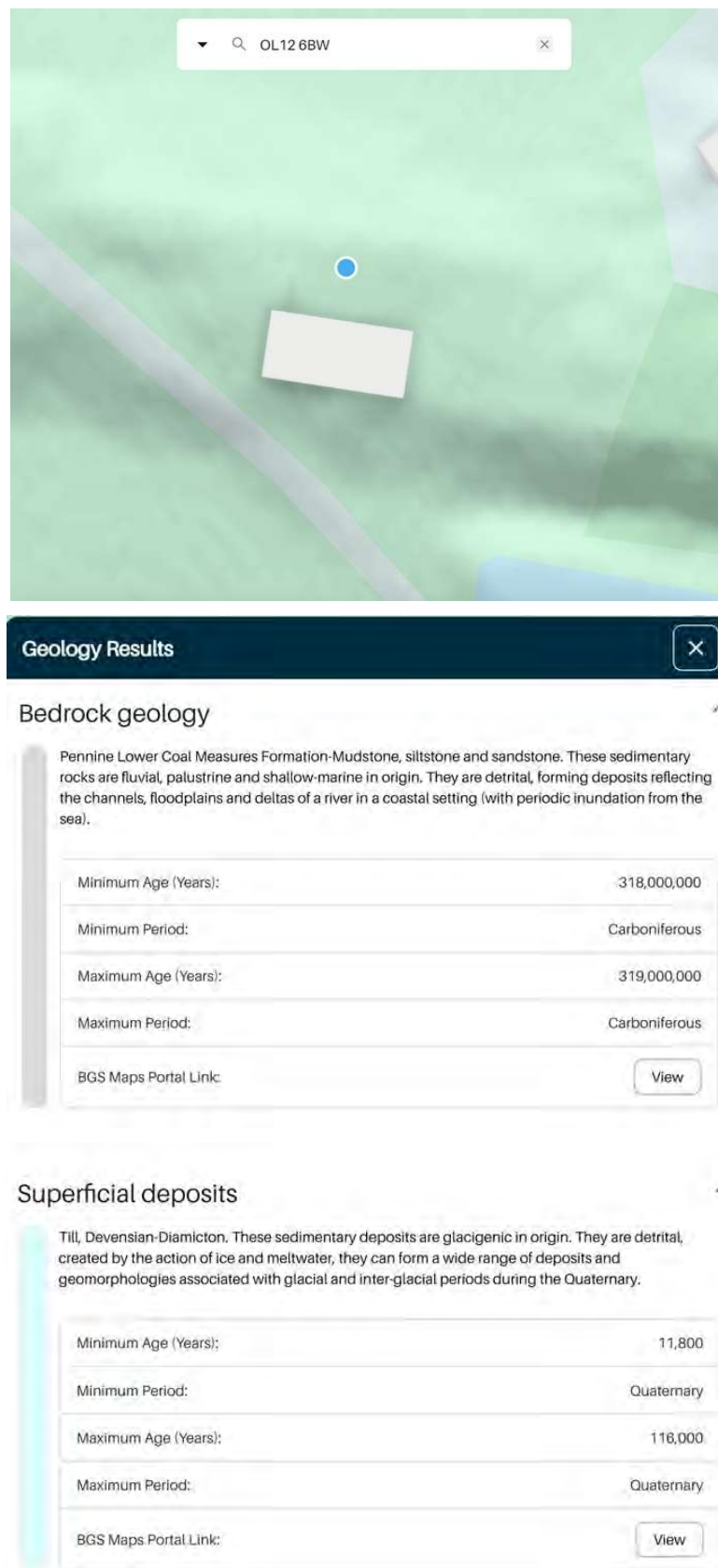
- 2.2.1 It is proposed to introduce an extension and conversion of the existing stone stable building to a self-build dwelling, the proposed site layout plan drawing reference 3691/05 Rev D by CJ Partnership Architects is presented in **Appendix A**.

2.3 *Site Levels*

- 2.3.1 Following assessment of the topographical survey, the site appears to have a nominal fall, falling in a south to north direction from an approximately level of 224.616 on the southern boundary to 223.64 on the northern boundary.

2.4 *Underlying Ground*

- 2.4.1 Review of British Geological Survey (BGS) geology mapping records indicates that the bedrock geology through the site is underlain Pennine Lower Coal Measures Formation-Mudstone, siltstone and sandstone, with superficial deposits of Till, Devensian-Diamicton, Extract of the BGS information is shown in **Figure 2.1**.

Figure 2.1: BGS Information

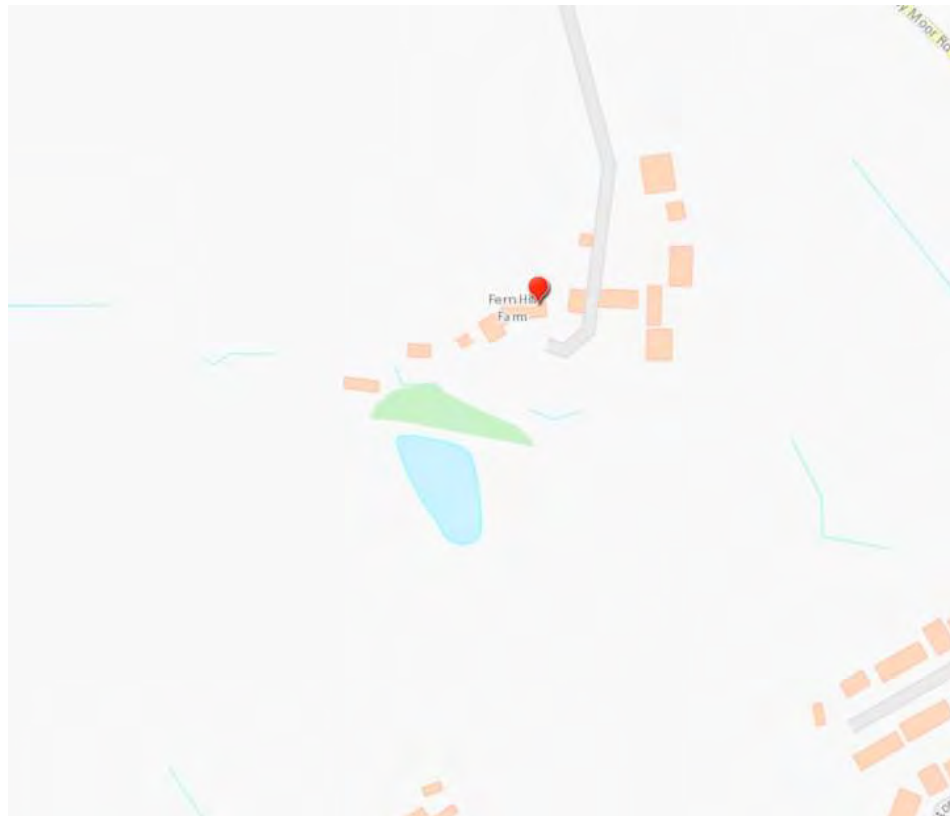
2.4.2 The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

- *Igneous rocks - are derived from molten magma in the Earth's crust. They may, for example, be extruded at the surface by volcanic activity to form lavas and tuffs (ash) or intruded into other rocks to form large masses of granite and gabbro at depth or minor, cross-cutting basalt dykes near the surface.*
- *Metamorphic rocks - such as schist and gneiss are those that have been changed from one rock type to another in the solid state by the recrystallisation of minerals, often at high temperatures and pressures when buried deep in the Earth's crust.*
- *Sedimentary rocks - are formed when grains and fragments of existing rocks are eroded away by ice, water and wind action, transported elsewhere and redeposited as a sediment. These sediments are often laid down in layers or strata of loose particles of gravel, sand, silt and clay. Over time they may be buried by later sediments and consolidated or cemented to form stratified or bedded rocks such as conglomerate, sandstone, siltstone and claystone. Other sedimentary rocks such as ironstone and limestone are created by chemical or biogenic (life) action.*

2.4.3 There are unfortunately no boreholes located in the immediate vicinity of the proposed site shown in **Figure 2.2** below.

2.4.4 A single borehole is located approximately 500m to the south at Shawfield Farm which is too far from the site to provide a clear indication of the anticipated ground conditions to be encountered however as a guide the borehole log reference SD81SE321 has been included with **Appendix B**.

Figure 2.2: BGS Borehole Locations



3.0 FLOOD RISK and FLOOD ZONES

3.1 Brief

- 3.1.1 The vulnerability of the site to flooding from rivers, sea and other sources has been considered, along with the potential to increase flooding elsewhere through the addition of impermeable areas and the effect on surface water run-off. Typical sources of flooding include fluvial, tidal, surface water, groundwater, sewers and anthropogenic sources; these are considered below.
- 3.1.2 The local flood risk management strategy has also been consulted.

3.2 Fluvial, Tidal

- 3.2.1 Flood maps are produced by the EA for the whole of the UK to highlight areas at particular risk of flooding by categorising them into different Zones. These maps are based on a broad assessment of areas using digital mapping techniques and extracts from the EA flood maps for the site and its surroundings are included in the figures below.
- 3.2.2 The EA flood map for planning, extract in **Figure 3.1**, full report provided in **Appendix C**, shows that the development area and its immediate surroundings are wholly located within EA Flood Zone 1 (unshaded areas).

Figure 3.1: Flood Zone Map



- 3.2.3 Areas located in flood zone 1 are defined as having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
- 3.2.4 The risk of flooding from Rivers and Sea has been identified as Very Low.

Figure 3.2: Flood Map for Rivers and Sea Description

Rivers and the sea [More about your rivers and sea flood risk](#)

Yearly chance of flooding

Very low Low Medium High

Yearly chance of flooding between 2036 and 2069

Very low Low Medium High

What makes rivers and sea flooding more likely

Low-lying areas that are close to rivers or the sea are more likely to flood when water levels rise.

This information takes into account any flood defences.

[Why flood defences cannot completely prevent flooding](#)

- 3.2.5 Inspection of Annex 3 of the NPPF shown in **Figure 3.3**, indicates buildings used for Dwelling houses are classified as More Vulnerable, as such the proposed use is acceptable in the identified flood zone.

Figure 3.3: Annex 3: Flood risk vulnerability classification**More vulnerable**

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

- 3.2.6 All uses including More Vulnerable are considered appropriate in both Flood Zone 1 as shown in Table 2 of the NPPF shown in **Figure 3.4**.

Figure 3.4: NPPF Table 2**Table 2: Flood risk vulnerability and flood zone 'incompatibility'**

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

3.3 Surface Water

- 3.3.1 The EA's surface water flood map shown in **Figures 3.5** identifies the surface water flood risk for the proposed site. The surface water flood category for the site has been identified as being low, with an instance of flooding anticipated to be no more than 150mm in depth located along the line of the existing watercourse.

Figure 3.5 Surface Water flood Map

Figure 3.6 Surface Water Flood Map Description

The screenshot shows a web interface for 'Surface water' flood risk. It has a title 'Surface water' and a link 'More about your surface water flood risk'. Below this, there are two sections for risk assessment. The first section, 'Yearly chance of flooding', has four buttons: 'Very low', 'Low' (highlighted in yellow), 'Medium', and 'High'. The second section, 'Yearly chance of flooding between 2040 and 2060', also has four buttons: 'Very low', 'Low' (highlighted in yellow), 'Medium', and 'High'. Below these sections, there is a heading 'What surface water is' followed by a paragraph explaining that surface water flooding is sometimes known as flash flooding and occurs when rainwater cannot drain away through normal drainage systems. At the bottom, there is a link 'Why surface water flooding is a problem'.

- 3.3.2 Surface water flooding occurs when rainwater does not drain away through normal drainage systems or soak into the ground but lies on or flows over the ground instead.
- 3.3.3 Anecdotal evidence from existing residents indicates that there has only been one instance of exceedance experienced onsite, this was identified as a result of the trash screen on the upstream entrance to the culvert becoming blocked, once the debris was removed normal operation was restored.
- 3.3.4 Although the risk of flooding from surface water flooding has been identified as being low, an element of flooding has been identified onsite during both the current and future scenarios; to reduce the sites impact on the current areas of flooding, Management of surface water is to be considered as part of the development proposals, and a preliminary drainage strategy is outlined within Section 7 of this FRA report.

3.4 Other Sources

- 3.4.1 The EA also identifies the potential for flooding from both reservoir and groundwater flooding. The extract below shown in **Figures 3.8** indicates that the proposed site is unaffected from both sources of flooding.
- 3.4.2 Groundwater flooding typically results from heavy/prolonged rainfall causing the level of the groundwater table to rise, which may lead to emergence of groundwater at the surface or into underground features such as basements. Low lying areas of land with permeable underlying strata may be particularly susceptible.
- 3.4.3 **Figure 3.8** below shows the site to not be affected from either reservoir or groundwater flooding.

Figure 3.8 Flood Map Other Sources

Groundwater[More about your groundwater flood risk](#)

We use groundwater flood alert areas to check the risk of flooding from groundwater.

This location is outside of a groundwater flood alert area.

► [What this means](#)

What groundwater is

Groundwater is the water that is usually held in rocks and soil underground.

Groundwater flooding happens when this water rises and flows above the surface.

Flooding from rivers is more likely when groundwater levels are high.

Reservoirs[More about your reservoir flood risk](#)

Flooding from reservoirs is unlikely in this area.

What a reservoir is

A reservoir is a large natural or artificial lake that is designed to collect and store water.

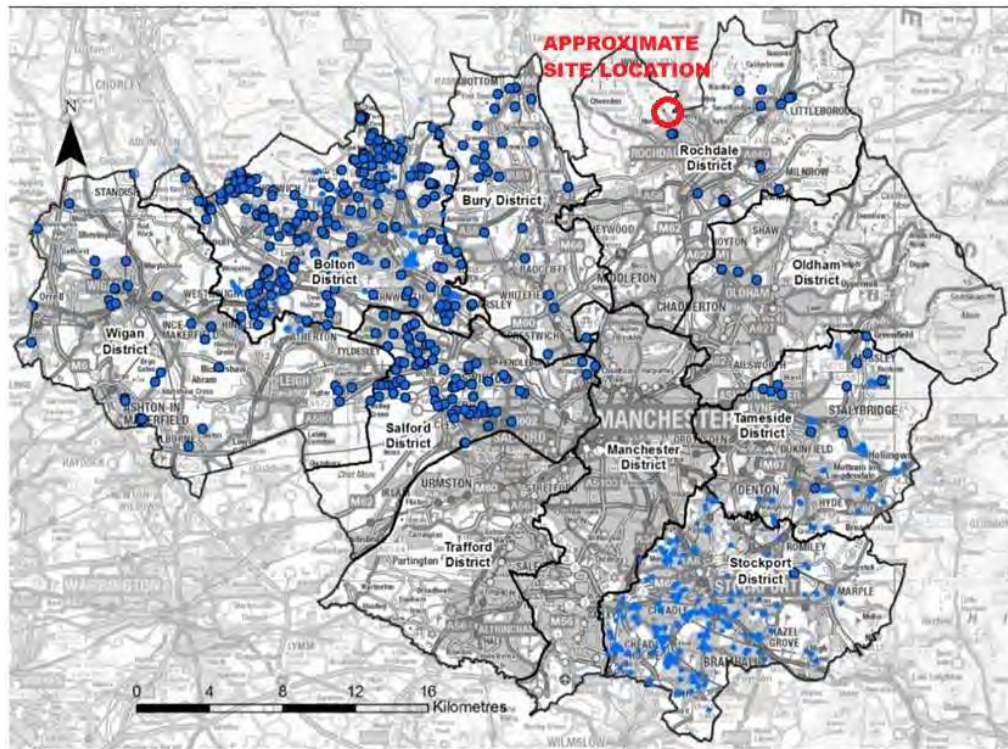
They are usually formed by building a dam across a river, or by building a large tank or surrounding embankment. If one of these dams or embankments fails, then water could escape from the reservoir. This would result in land or properties being flooded.

3.5 Historic Flooding

- 3.5.1 Section 6.7 of the SFRA highlights a number of historic flood events within the Study area from a number of various sources, figure 6-7 from the SFRA shows flood incidents recorded by the LLFA (extract below) with historic sewer flooding incidents recorded by United Utilities and EA flood records shown in **Appendix D**.

Figure 3.9 LLFA Historic Flood Map

Figure 6-7: GM LLFA historic flood incidents

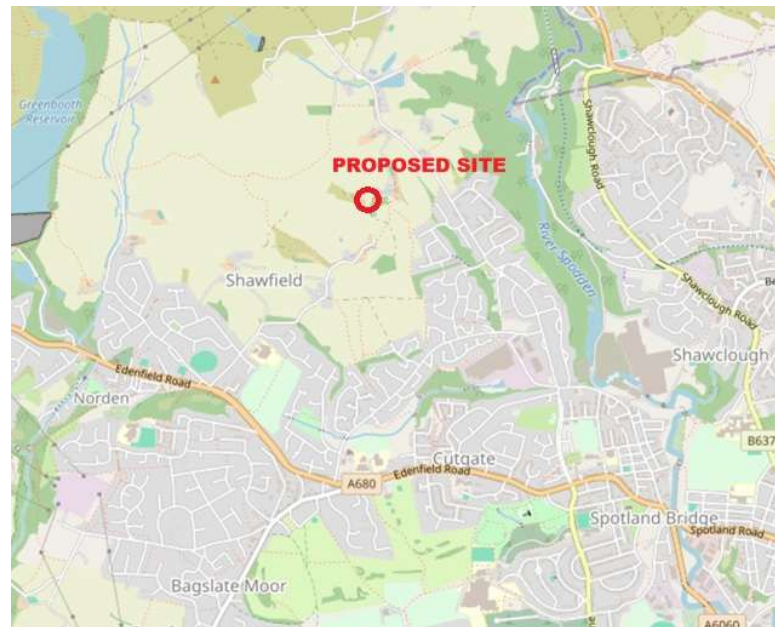


- 3.5.2 The proposed site has not been referenced in any of these areas as such the site can be considered to not suffer from historic flooding incidents.

3.6 Internal Drainage Board

- 3.6.1 The Internal Drainage Board is a public body that manage water levels within defined areas, the proposed site is not located within an area under the control of the IDB.

Figure 3.10 IDB Area Plan



4.0 SUMMARY

- 4.1.1 The site is designated as Brownfield.
- 4.1.2 The proposed development lies wholly within an area designated as flood zone 1 and is categorised as more vulnerable use.
- 4.1.3 All Land uses including more vulnerable are acceptable within flood zone 1 areas.
- 4.1.4 The risk of Surface Water flooding for both current and future scenarios has been identified as Low
- 4.1.5 The risk of flooding from Rivers and Sea for both current and future scenarios has been identified as being Very low.
- 4.1.6 The site is not considered to suffer from either reservoir or groundwater flooding.
- 4.1.7 The site has not suffered from historic flood events
- 4.1.8 A preliminary drainage strategy is discussed in Section 7 which shows that post-development flood risks will not be increased due to the development plans.
- 4.1.9 The identified flood risk should not preclude the proposed development

5.0 MANAGING SURFACE WATER

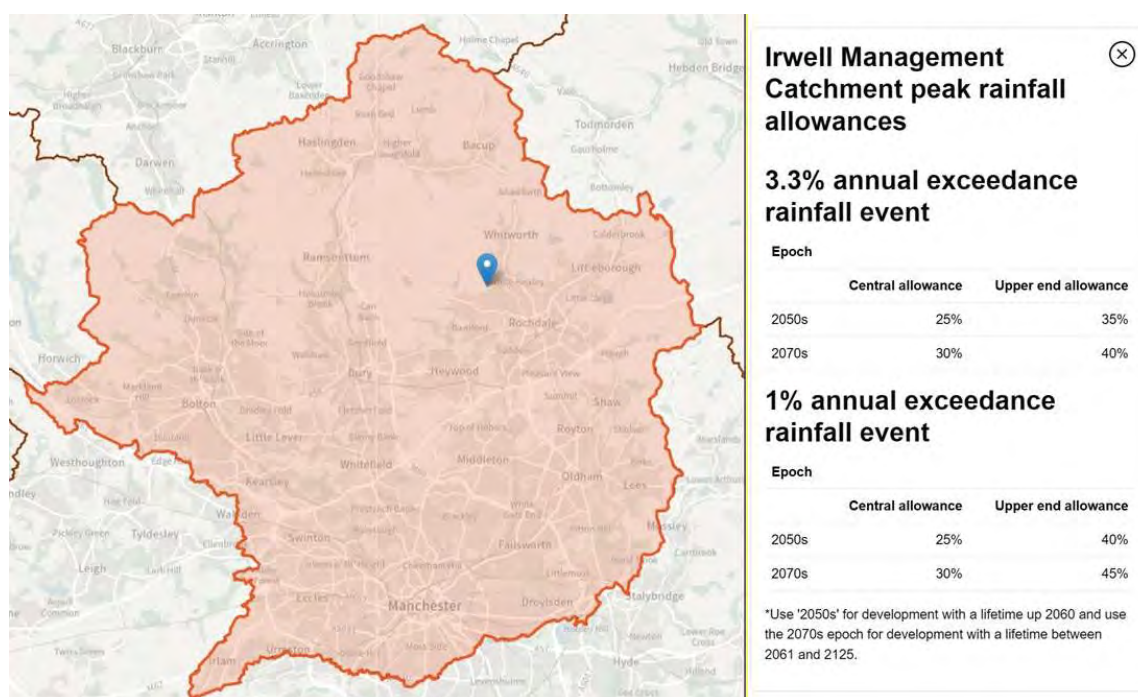
5.1 Brief

- 5.1.1 In accordance with the NPPF and SFRA, consideration should be given to natural water flows at the site. The development should not adversely affect flow or increase flood risk elsewhere, including increasing run-off rates. The disposal of surface water should be dealt with in a sustainable way and climate change should also be accounted for. The site drainage strategy is discussed in Section 7.

5.2 Climate Change

- 5.2.1 There is evidence to suggest that the climate is changing with sea levels predicted to continue to rise along with more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall. The NPPF recommends that the effects of climate change be accounted for in FRA, with consideration of the EA flood maps and local authority SFRA.

Figure 5.1 Climate Change Allowances

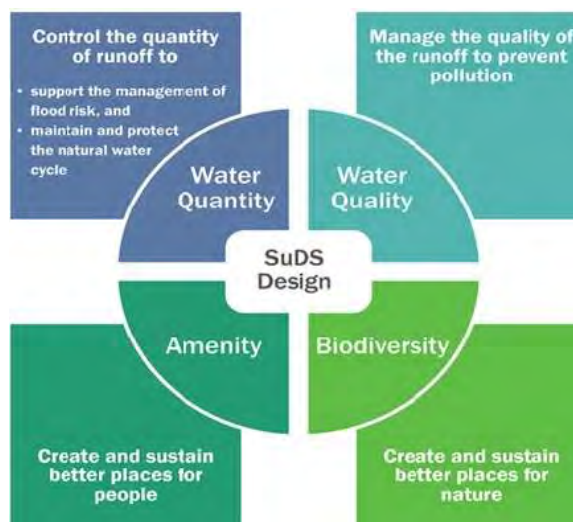


- 5.2.2 Increased rainfall or higher intensity short-duration rainfall may increase as a result of climate change. The .GOV website states that for the [Irwell Management Catchment peak rainfall allowances](#) – that the upper allowance for the 3.3% annual exceedance rainfall event a 40% allowance for climate change should be applied a 45% for the 1% annual exceedance rainfall event is therefore being allowed for within the new surface water drainage design to take account of climate change.
- 5.2.3 Climate change may also lead to variations in groundwater level which will also be considered during the drainage design.

5.3 Sustainable Drainage Systems (SUDS)

- 5.3.1 SUDS are a desirable way to manage surface water disposal within new developments and SUDS methods for surface water drainage management are discussed further within the SUDS Manual. When designing surface water drainage strategies priority should be given to disposal of surface water via infiltration drainage systems over (first) discharge to watercourses (second) prior to identifying a possible discharge to sewers.

Figure 5.2 Four Pillars of SuDS



- 5.3.2 The proposed development will address the above 4 pillars of SuDS design criteria with the inclusion of a range of sustainable features through a comprehensive treatment train.
- Water Quantity** As the site currently includes existing buildings, the site has been categorised as brownfield, in line with Table 4-3 of the SFRA extract in **Figure 5.3** below, for brownfield sites in Rochdale all flows will be restricted to 50% reduction over existing predevelopment discharge rates.

Figure 5.3 SFRA Discharge Requirements

CDA Policy			
Authority	Brownfield sites	Greenfield sites	Other
			floodings in a 1 in 100 year plus climate change event
Oldham	50% less than pre-development	Current runoff up to 1 in 100 AEP event + climate change	FRAs required for all development over 0.5 ha in CDAs and to have regard to recommended runoff rates; development should be designed so that there is no flooding to the development in a 1 in 30 AEP event and no property flooding in a 1 in 100 year plus climate change event
Rochdale	50% less than pre-development	Current runoff up to 1 in 100 AEP event + climate change	Any site within a CDA requires regard to SFRA and full compliance with any strategy for CDA areas

In order to identify the predevelopment discharge rate.

Assuming:

- runoff coefficient $C = 0.9$,
- 1 in 100-year rainfall intensity ≈ 90 mm/hr (typical for the Rochdale area),
- no existing attenuation

the Modified Rational Method gives:

$$Q = 2.78 \times C \times I \times A$$

where:

$$Q = \text{l/s,}$$

$$C = 0.9,$$

$$I = 45 \text{ mm/hr (100 year), } 15 \text{ mm/hr (1 year),}$$

$$A = 0.040 \text{ ha.}$$

Therefore:

$$Q = 2.78 \times 0.9 \times 15 \times 0.040 \text{ 1 in 1 year}$$

$$Q = 2.78 \times 0.9 \times 45 \times 0.040 \text{ 1 in 100 year}$$

$$Q = 4.5 \text{ l/s (current 1 in 100-year discharge rate)}$$

$$Q = 1.5 \text{ l/s (current 1 in 1-year discharge rate)}$$

The proposed 1 in 100-year flow plus 45% allowance for climate change will be restricted to no more than 2.2 l/s representing a reduction in excess of 50% above the current discharge rate.

- **Water Quality** Traditional drainage features will be supported with the inclusion of areas of vegetation and permeable construction within the parking bays to collect overland flow from the external areas.
- **Biodiversity** The proposed development will be delivered in keeping with the existing site setting creating a better environment for nature to thrive.

Amenity connecting people with water has been proven to improve the well-being of people that live in or visit the proposed property, The proposed design has taken the opportunity to create visually attractive areas which can connect the residents or visitors to nature during their visit.

- 5.3.3 Standard 1 of the National standards for sustainable drainage systems (SuDS) shown in **figure 5.3** highlights the preferred final run off destinations from proposed developments where practicable.

Figure 5.3 Standard 1

Standard 1: runoff destinations

1.1 A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

1.2 Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body
- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

Note 1: priority 1 is the highest priority and priority 5 is the lowest.

Note 2: for the purposes of this standard, a combined sewer is a sewer intended to receive both foul sewage and surface runoff and does not include a sewer intended to receive only foul sewage, even if it has the capacity to accommodate additional flows or has an element of surface water in it already.

1.3 To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable. Higher cost alone shall not be a reason to utilise lower priority final destinations.

1.4 Where more than one final destination is utilised, each final destination's ability to accept runoff shall be maximised in order of priority.

- 5.3.4 The proposed site will address the new guidance as follows:

- **Priority 1 – Non-Potable Uses** – The site does not have a significant demand for non-potable uses with only a few sanitary units being proposed, as such the inclusion of a rainwater harvesting system is considered disproportionate and unnecessary.

To satisfy the requirements of Priority 1 the development should consider the introduction of rainwater butts at downpipe locations to collect water for irrigation purposes.

- **Priority 2 – Infiltration** – infiltration as a standalone discharge methodology is not considered feasible, however where possible all surface water flows will be provided the opportunity to recharge the existing ground satisfying priority 2.
- **Priority 3 – Discharge to above ground Surface Water Body** – An existing unnamed watercourse is located beneath the proposed site, all existing buildings within the immediate vicinity of the site currently use the watercourse a discharge location.

The proposed development will maintain the current discharge methodology, to satisfy Priority 3 all flows will be restricted to 50% over the predevelopment brownfield flow to the existing watercourse, downstream of the existing culvert.

- **Priority 4 – discharge to a surface water sewer** – Not Required
- **Priority 5 – Discharge to combined sewer** – Not Required.

All foul flows will be collated and discharged to a Klargester Bio Disc domestic sewage treatment plant.

6.0 DRAINAGE STRATEGY

6.1 *Surface Water Drainage Strategy*

- 6.1.1 With infiltration not considered suitable as a standalone discharge methodology and given the location of the existing watercourse, in accordance with the SUDS hierarchy, it is proposed that all surface water flows arising from the proposed development are to discharge at a restricted rate into the watercourse.
- 6.1.2 The site area within the red line boundary has been established as 0.04 hectares.
- 6.1.3 With the above in mind the area within the red line boundary has been used to provide the predevelopment 1 in 100-year brownfield discharge rate of 4.5/s.
- 6.1.4 In line with the SFRA the post development discharge rate will be restricted to a maximum of 2.2 l/s for the 1 in 100-year storm plus 45% allowance for climate change.
- 6.1.5 The external areas will be designed to fall towards permeable materials providing not only interception but also source control and attenuation.
- 6.1.6 Causeway Flow modelling software has been used to identify the necessary storage volumes inclusive of 45% allowance for climate change and a safety factor of 2 shown in **Appendix E**.
- 6.1.7 Attenuation will be provided on the site to ensure that the flow rate of 2.2 l/s is not exceeded during a 1 in 100-year storm event, inclusive of a 45% allowance for climate change.
- 6.1.8 The site drainage network will be designed in accordance with current best practice to have sufficient capacity not to flood during both the critical 1 in 30-year storm (plus 40% allowance for climate change) and also the critical 1 in 100-year storm event (plus 45% allowance for climate change). In this way the risk of off-site flooding, which could result in damage to other buildings and essential services, will be minimised and the risk of flooding elsewhere should not be increased as a result of the development proposals.
- 6.1.9 Using onsite attenuation, it will be possible to avoid any exceedance occurring at the site for all storms up to and significantly beyond the 1 in 100-year storm plus 45% climate change allowance.
- 6.1.10 An indicative drainage strategy and contributing drainage area plan are shown in **Appendix F**.
- 6.1.11 Further discussions with the appropriate approving bodies are required to agree the proposed drainage strategy.

6.2 *Foul Flows*

- 6.2.1 All foul flows will be discharged via a Klargester Bio Disc domestic sewage treatment facility.

7.0 MAINTENANCE STRATEGY

- 7.1.1 SuDS components require good maintenance including inspections to identify performance issues and plan appropriate maintenance needs, checks on the operation and maintenance of the drainage system and landscape management. Therefore, it is intended that those responsible for the drainage within a development will be provided with an Operation and Maintenance Manual as part of the documentation provided under the Construction (Design and Management) regulations 2015 at the end of the construction works. Maintenance requirements that would be appropriate for this development, to be included in the document are outlined below.
- 7.1.2 All maintenance necessary for the proposed development will be undertaken, appointed and/or suitably managed by the property owner.
- 7.1.3 The Drainage network and inherent SuDS have been designed with minimal maintenance in mind. The maintenance is generally of a 'common sense' approach and is to comprise:
- Regular day to day care: - litter collection, grass cutting and checking the inlets and outlets where water enters or leaves a drainage feature.
 - Occasional tasks: - managing vegetation in wet areas (ponds, swales, etc.) and removing any silt that builds up in the drainage features.
 - Remedial work: -repairing damage when, and where, necessary.
- Specific recommendations for each feature are provided in the following sections and should be referred to in the first instance if there are any issues.

Manholes and PPICs

- 7.1.4 Manholes are typically sized in accordance with Sewers for Adoption, which relates to the incoming and outgoing pipe diameters. However, as the system is not Adopted, PPICs have been used where manufacturer's limitations permit. Typically, PPICs can be used for depths up to 3m and for pipe diameters up to 150mm.

Personnel access into PPIC chambers is not possible, and therefore rodding/jetting should be carried out from ground level. This is generally accepted as good practice and in accordance with good health and safety procedures. Where larger manholes, which could accommodate man access, have been included maintenance should also take place from ground level. Man, access should be resisted and only used as a last resort.

Maintenance schedule	Required action	Frequency
Occasional Maintenance and Monitoring	Covers should be lifted and inspected for litter and debris to ensure that the runs are free flowing.	3 Monthly (or as required).

Inlets, Outlets, Flow Control Device and Inspection Chambers

- 7.1.5 Inlets and outlets structures may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.
- 7.1.6 The surface water flow off site is limited to the agreed rates as shown in the drawings in **Appendix H**. The flow is limited by a Hydrobrake. This is a proprietary system and will be installed in line with the manufacturers written instructions. Operation and Maintenance guidance is provided within the manufacturers' standard documentation.

Maintenance schedule	Required action	Frequency
Regular Maintenance	Inlets, outlets and surface control structures Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly (or as required).
Occasional Maintenance	Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As required.
Remedial Works	Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary. As required Repair physical damage if necessary	As required.
Inspection chambers and below ground	Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Every 6 months (or as required).

Permeable Surfacing

- 7.1.7 Permeable surfacing requires regular inspection and maintenance to ensure it continues to provide effective surface water management, maintain its infiltration capacity, and achieve its intended design life. Routine maintenance primarily involves preventing the build-up of sediment, debris and vegetation that can reduce permeability, together with periodic inspections to identify any signs of damage, settlement or reduced performance. The maintenance activities outlined below will help ensure the permeable surfacing continues to operate effectively and safely throughout its service life.
- 7.1.8 Additional considerations are to include:
- Vacuum sweeping should ideally be carried out using a regenerative air or vacuum sweeper rather than a mechanical brush sweeper, as brush sweepers may push fines into the pavement.
 - Do not allow stockpiles of soil, sand or construction materials to remain on the permeable surface.
 - Maintain surrounding landscaped areas to minimise sediment wash onto the pavement.

Maintenance schedule	Required action	Frequency
Regular Maintenance	Inspect the permeable surface for sediment, debris, litter and vegetation. Sweep or vacuum sweep the surface to remove accumulated material and maintain infiltration. Remove weeds by hand or approved herbicide where necessary. Check for signs of ponding, settlement or damage to the surface.	Quarterly (or as required).
Occasional Maintenance	Inspect joints and replace jointing aggregate where it has been lost. Remove staining from oils or other contaminants where practical. Ensure adjacent landscaped areas do not deposit soil or mulch onto the permeable surface.	As required.
Remedial Works	Where infiltration has reduced significantly, undertake specialist vacuum sweeping or pressure cleaning followed by vacuum extraction. Repair or replace damaged paving blocks, cracked surfaces or areas affected by settlement. Reinstall bedding and jointing material in accordance with the original design	As required.
Inspection of Drainage Components	Inspect catchpits, inspection chambers, edge drains and outlet structures (where provided). Remove accumulated silt and debris to ensure free drainage. Check that any overflow structures remain unobstructed and are operating correctly.	Every 6 months (or as required).
Winter Maintenance	Remove leaves, snow and debris promptly to minimise blockage of surface pores. Avoid excessive application of sand, as this can clog the pavement. Use de-icing salts only where necessary and in accordance with the manufacturer's recommendations.	During autumn and winter, or as required.
Long-term Maintenance	Review the overall condition of the permeable pavement, including infiltration performance, surface levels and structural integrity. Undertake infiltration testing if persistent ponding is observed and identify areas requiring rehabilitation or replacement.	Every 3–5 years (or if performance declines).

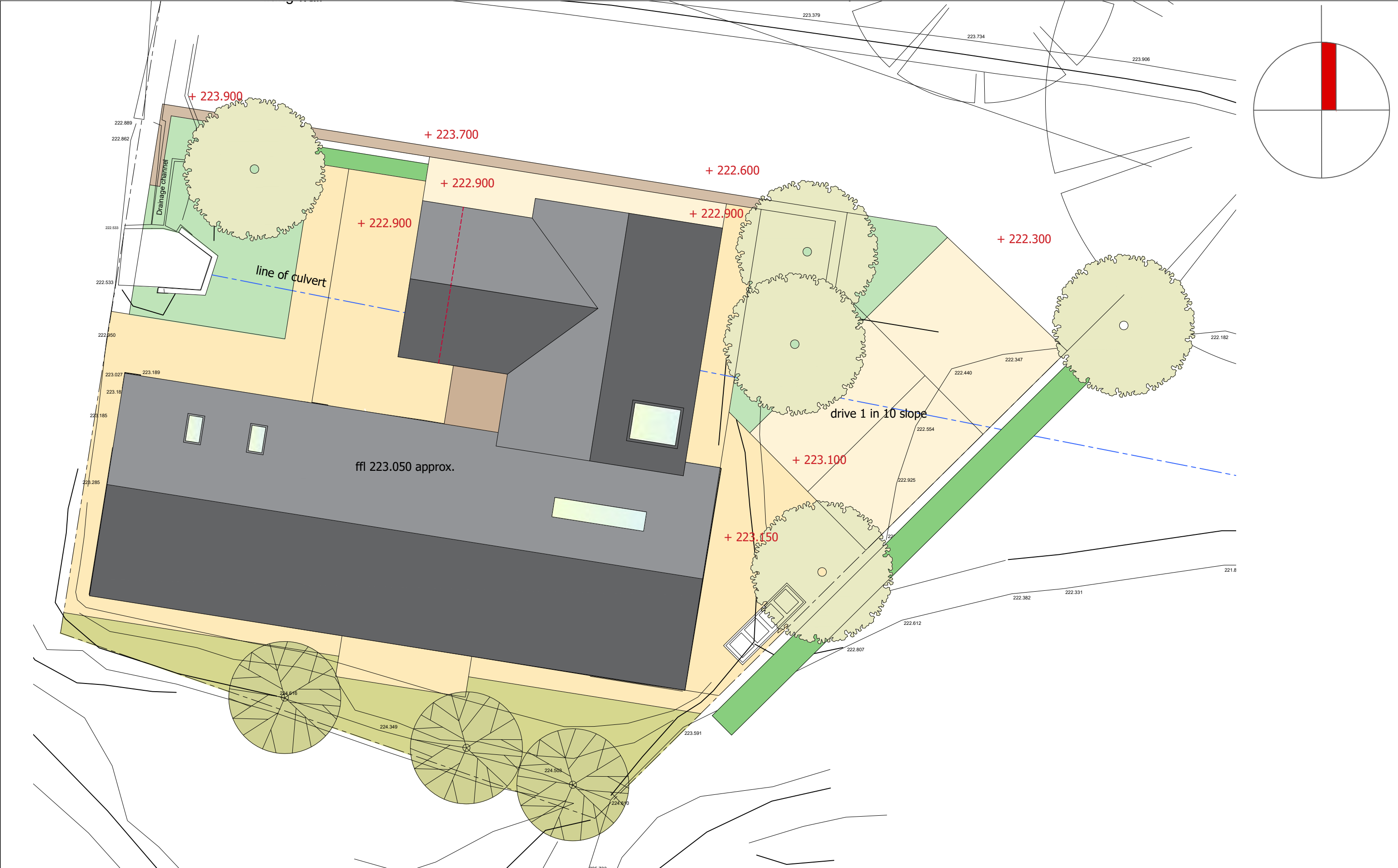
Flow Control Device

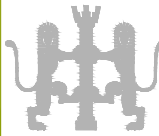
- 7.1.9 The surface water flow off site is limited to no more than 2.2 l/s. The flow is limited by a Hydrobrake Optimum flow control. These are proprietary systems and will be installed in line with the manufacturers written instructions. Operation and Maintenance guidance is provided within the manufacturers' standard documentation.

8.0 CONCLUSIONS

- 8.1.1 The site is Wholly contained within in Environment Agency (EA) Flood Zone 1. Reference to NPPF Table 3 shows that an Exception Test is not required as buildings used for dwelling houses are classified as more vulnerable which are acceptable in areas categorised as flood Zone 1.
- 8.1.2 The risk of flooding elsewhere should not be increased as a result of the development.
- 8.1.3 A maximum permissible discharge rate of 2.2 l/s for the 1 in 100-year storm event plus 45% allowance for climate change will be used to inform the proposed development drainage design.
- 8.1.4 The site drainage will be designed with sufficient capacity not to flood during both the 1 in 30-year storm event and the 1 in 100 years plus climate change storm event (+45%). The risk of off-site flooding would not increase as a result of the development and safe access, and egress will be maintained.
- 8.1.5 Foul flows generated by the new dwelling are to be discharged to a Klargester Bio Disc domestic foul water treatment facility.
- 8.1.6 Discharge restrictions/charges may apply for connections to the public drainage network and for discharge of surface waters into the adjacent watercourse.
- 8.1.7 The potential for pollution of controlled waters is considered to be low provided best practice procedures are following during development. Drainage systems should be maintained to ensure that they do not become blocked and unable to discharge.

Appendix A



Mr and Mrs Green Proposed Stables Conversion Fern Hill Farm Fern Hill Lane Rochdale OL12 6BW	Site Plan as Proposed	contract no	drawing no	revision	Revisions: A. Landscape details added.PDC,September 2025 B. Plan reduced in size and landscaping/parking arrangements amended.PDC, March 2026 C. Garden elevation amended.PDC, March 2026 D. Roof design and levels added and landscaping amended.PDC, April 2026	Blue Pit Mill Queensway Castleton Rochdale OL11 2PG +44 (0)1706 631347 info@cjpartnership.com www.cjpartnership.com	CJPARTNERSHIP ENVIRONMENTAL ARCHITECTS 
	work to figured dimensions	3691	05	D			
	© CJ Partnership owns the copyright of this design / drawing which must not be reproduced in whole or in part without the written permission of CJ Partnership	drawn by	date	scale @ A3 1:100			

Appendix B



Central L.S.
North West NRA.

SD 81/139

RECEIVED N.C.D.C.

14-1-94

SIG: S. With ans

APPROVED

(WATER WELL ENGINEERS) LTD
LANGATE INDUSTRIAL ESTATE
WIGAN ROAD
BRYN WN4 0QZ
TEL: 0942 722706
24 HOUR: 0942 893660
FAX: 0942 719008

ACCIDENT
NUMBER

14981

76

SD8/SE 321

RECORD OF BOREHOLE

NUMBER OF BOREHOLE: 165-17-1992

BOREHOLE SUNK FOR: MR B WILD

ADDRESS OF BOREHOLE: THE STABLES, SHAWFIELD FARM, SHAWFIELD,
LANE, NORDEN, ROCHDALE.

NATIONAL GRID REFERENCE: SD8693 1492

PURPOSE OF BOREHOLE: DOMESTIC

DATE OF SINKING: SEPTEMBER 1992

BOREHOLE SUNK BY: J.P. WHITTER (WJW ENG) LTD MACHINE: DANDO

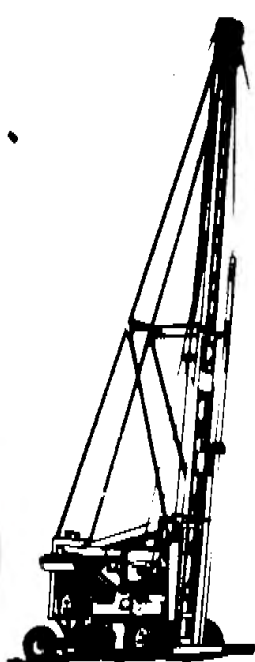
INFORMATION FROM: UNIT 21, LANDGATE IND. EST., WIGAN ROAD,
BRYN, LANCASHIRE. WN4 0QZ.

ADDITIONAL NOTES AND PUMP DETAILS:

40FT OF 6" STEEL CASING

PUMP DEPTH - 120 FT

[illegible]



Central L.S.
Northwest NRA.

SD81/139

J.P. WHITTER

(WATER WELL ENGINEERS) LTD
LANGATE INDUSTRIAL ESTATE
WIGAN ROAD
BRYN WN4 0QZ
TEL: 0942 722706
24 HOUR: 0942 893660
FAX: 0942 719008

76

SD8/SE

RECORD OF BOREHOLE

NUMBER OF BOREHOLE: 16S-17-1992

BOREHOLE SUNK FOR: me B WILD

ADDRESS OF BOREHOLE: THE STABLES, SHAWFIELD FARM. SHAWFIELD,
LANE. NORDEN, ROCHDALE.

NATIONAL GRID REFERENCE: SD 8693 1492

PURPOSE OF BOREHOLE: DOMESTIC

DATE OF SINKING: SEPTEMBER 1992

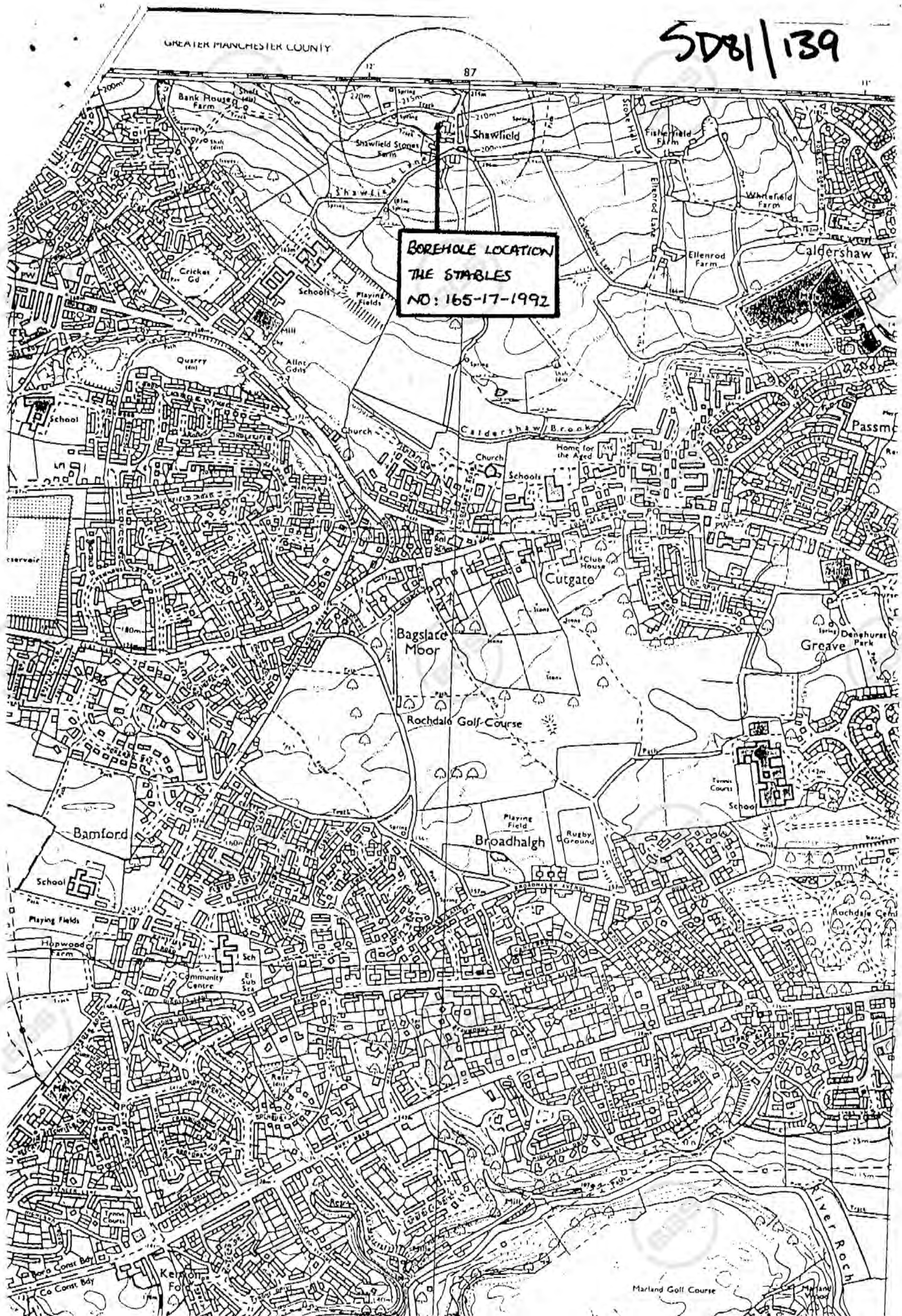
BOREHOLE SUNK BY: J.P. WHITTER (W/LW ENG) LTD MACHINE: DANDO

INFORMATION FROM: UNIT 21, LANDGATE IND. EST., WIGAN ROAD,
BRYN, LANCASHIRE. WN4 0DZ.

ADDITIONAL NOTES AND PUMP DETAILS:

40FT OF 6" STEEL CASING
PUMP DEPTH - 120FT

[illegible]





Name of site

Central L.S. Nwd West
NRA

W R B No.

THE STABLES (SHAWFIELD FARM)

76 SD 81/139
SD81SE

Owner MR. B. WILD

Licence no.
Appn no.
Cancelled

Nat. grid ref. SD 8693 1492

Occupier

IGS ref. no.

Status BOREHOLE - DOMESTIC

Ground Level m OD ft. OD

Aquifer

Level of well top m OD ft. OD

Code

Rest water level m bwt ft. bwt

Summary of geological section

Thickness

Depth

(Date) m OD ft. OD

BOREHOLE LOG AVAILABLE

Construction: Method Date SEPT. 1992

Depth
bwt

Dia.

Linings (below well top)

From

To

Dia.

Type

Abstraction rates

Type of pump

gph PWL

Chem./bact. anal. YES/NO

gpd

Well driller J.P. WHITTER
(W/W ENG) LTD

If insufficient space has been allowed, continue in 'Notes' overleaf.

Lockie 162

Appendix C

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
387152/415320

Created
6 July 2026 16:42

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2026 AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

Unspecified

Location (easting/northing)

387152/415320

Scale

1:2,500

Created

6 Jul 2026 16:42

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area



0 20 40 60m

Appendix D

Figure 6-9: HFM and RFO outlines

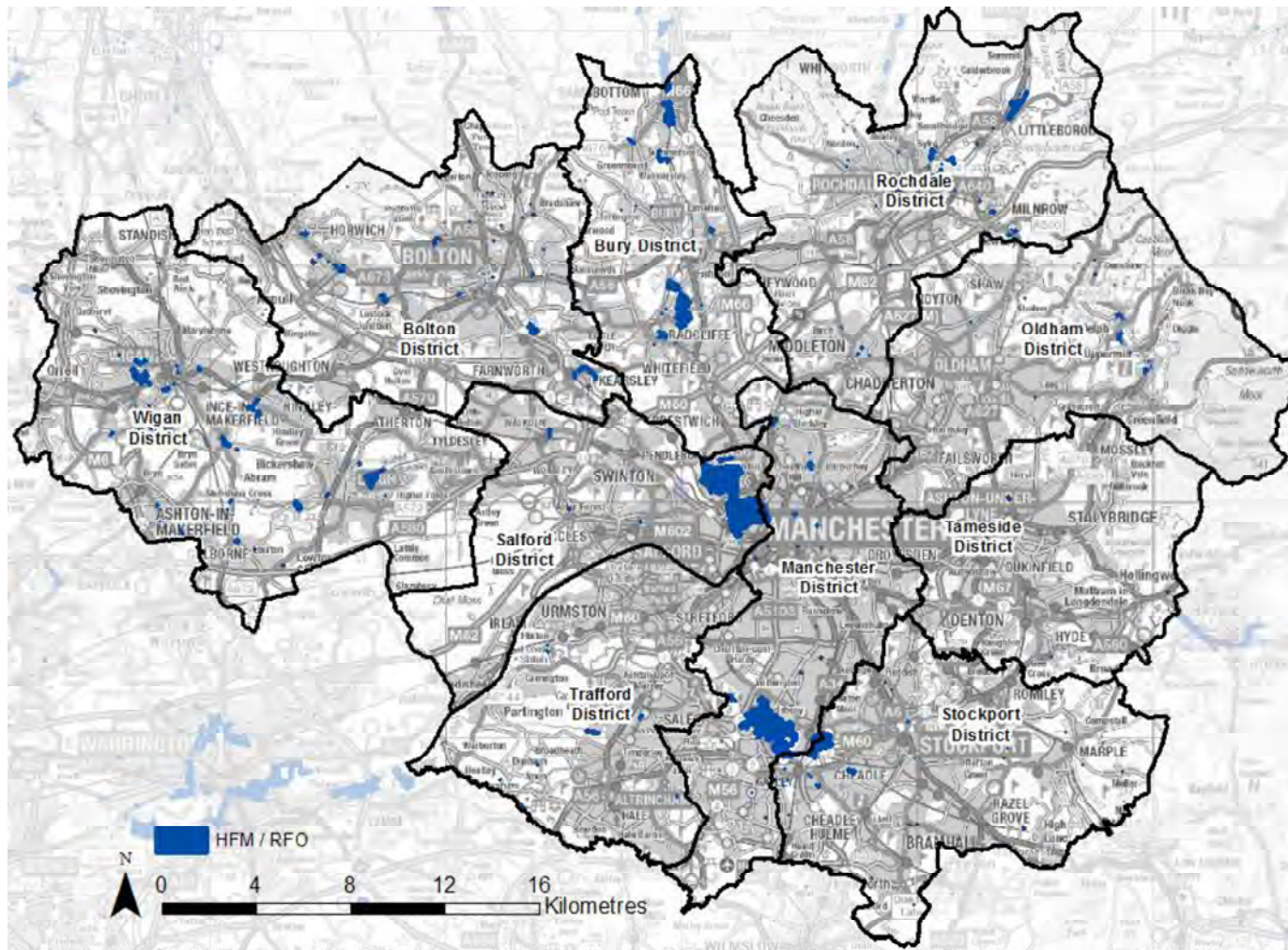


Figure 6-7: GM LLFA historic flood incidents

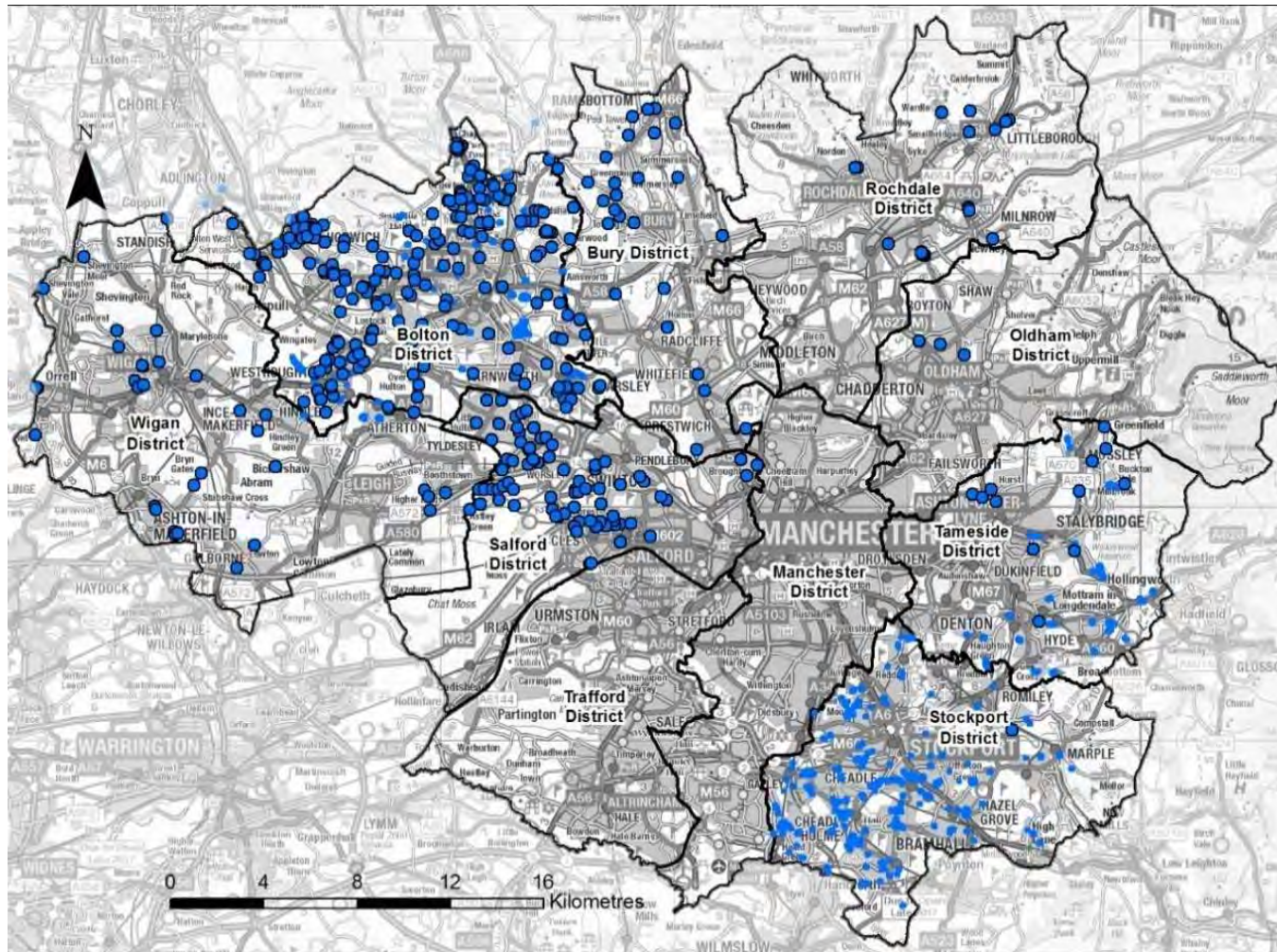
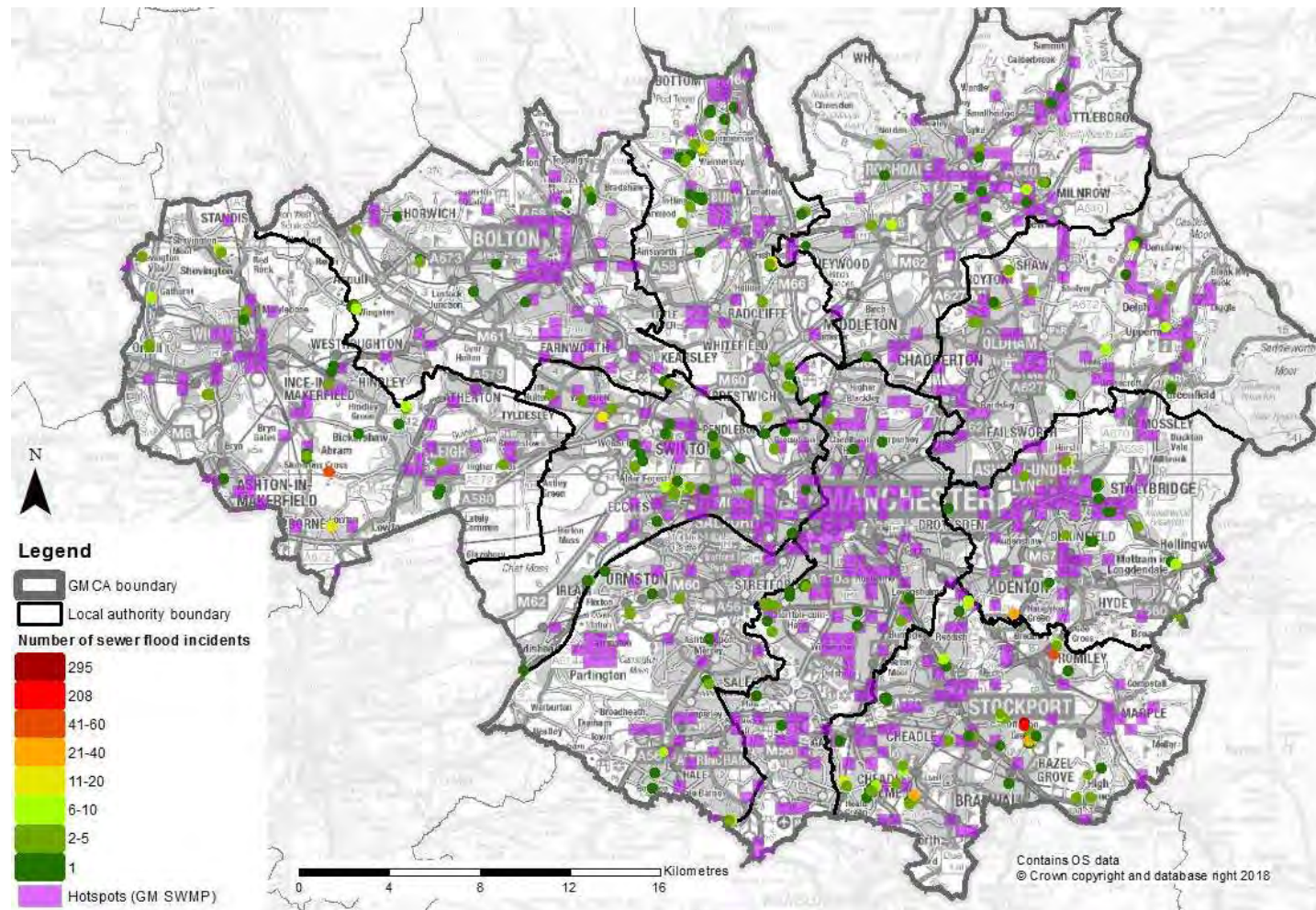


Figure 6-8: UU historic sewer flooding incidents and GM SWMP Hotspots



Appendix E

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SPPIC3	34	222.310	0.010	0.2	0.0035	0.0000	OK
15 minute winter	SPPIC4	10	222.148	0.017	0.6	0.0060	0.0000	OK
15 minute winter	SMH1 PERM SURF	13	221.803	0.103	1.1	0.0652	0.0000	OK
15 minute summer	OUTFALL HEADWALL	1	220.983	0.000	0.8	0.0000	0.0000	OK
15 minute winter	SPPIC1	11	222.177	0.017	0.6	0.0071	0.0000	OK
15 minute winter	SPPIC2	11	221.975	0.016	1.1	0.0045	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SPPIC3	1.000	SPPIC4	0.2	0.291	0.009	0.0075	
15 minute winter	SPPIC4	1.001	SPPIC2	0.5	0.535	0.024	0.0060	
15 minute winter	SMH1 PERM SURF	Orifice	OUTFALL HEADWALL	0.9				0.5
15 minute winter	SPPIC1	2.000	SPPIC2	0.6	0.552	0.026	0.0082	
15 minute winter	SPPIC2	1.002	SMH1 PERM SURF	1.1	0.654	0.010	0.0483	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SPPIC3	11	222.319	0.019	0.8	0.0067	0.0000	OK
15 minute winter	SPPIC4	11	222.162	0.031	2.0	0.0113	0.0000	OK
30 minute winter	SMH1 PERM SURF	23	222.128	0.428	3.1	0.2720	0.0000	SURCHARGED
15 minute summer	OUTFALL HEADWALL	1	220.983	0.000	1.8	0.0000	0.0000	OK
15 minute winter	SPPIC1	10	222.192	0.031	2.1	0.0132	0.0000	OK
30 minute winter	SPPIC2	23	222.128	0.169	3.4	0.0477	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SPPIC3	1.000	SPPIC4	0.8	0.410	0.035	0.0201	
15 minute winter	SPPIC4	1.001	SPPIC2	2.0	0.776	0.087	0.0348	
30 minute winter	SMH1 PERM SURF	Orifice	OUTFALL HEADWALL	1.9				2.7
15 minute winter	SPPIC1	2.000	SPPIC2	2.0	0.786	0.089	0.0447	
15 minute winter	SPPIC2	1.002	SMH1 PERM SURF	3.6	0.649	0.031	0.1819	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SPPIC3	10	222.322	0.022	1.1	0.0077	0.0000	OK
30 minute winter	SPPIC4	23	222.238	0.106	2.3	0.0384	0.0000	OK
30 minute winter	SMH1 PERM SURF	23	222.239	0.539	3.5	0.3427	0.0000	SURCHARGED
15 minute summer	OUTFALL HEADWALL	1	220.983	0.000	2.1	0.0000	0.0000	OK
30 minute winter	SPPIC1	23	222.239	0.079	2.3	0.0328	0.0000	OK
30 minute winter	SPPIC2	23	222.239	0.280	4.6	0.0792	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SPPIC3	1.000	SPPIC4	1.1	0.452	0.047	0.0571	
15 minute winter	SPPIC4	1.001	SPPIC2	2.8	0.818	0.122	0.0817	
30 minute winter	SMH1 PERM SURF	Orifice	OUTFALL HEADWALL	2.2				3.6
15 minute winter	SPPIC1	2.000	SPPIC2	2.9	0.830	0.126	0.0888	
15 minute summer	SPPIC2	1.002	SMH1 PERM SURF	4.6	0.778	0.040	0.2063	

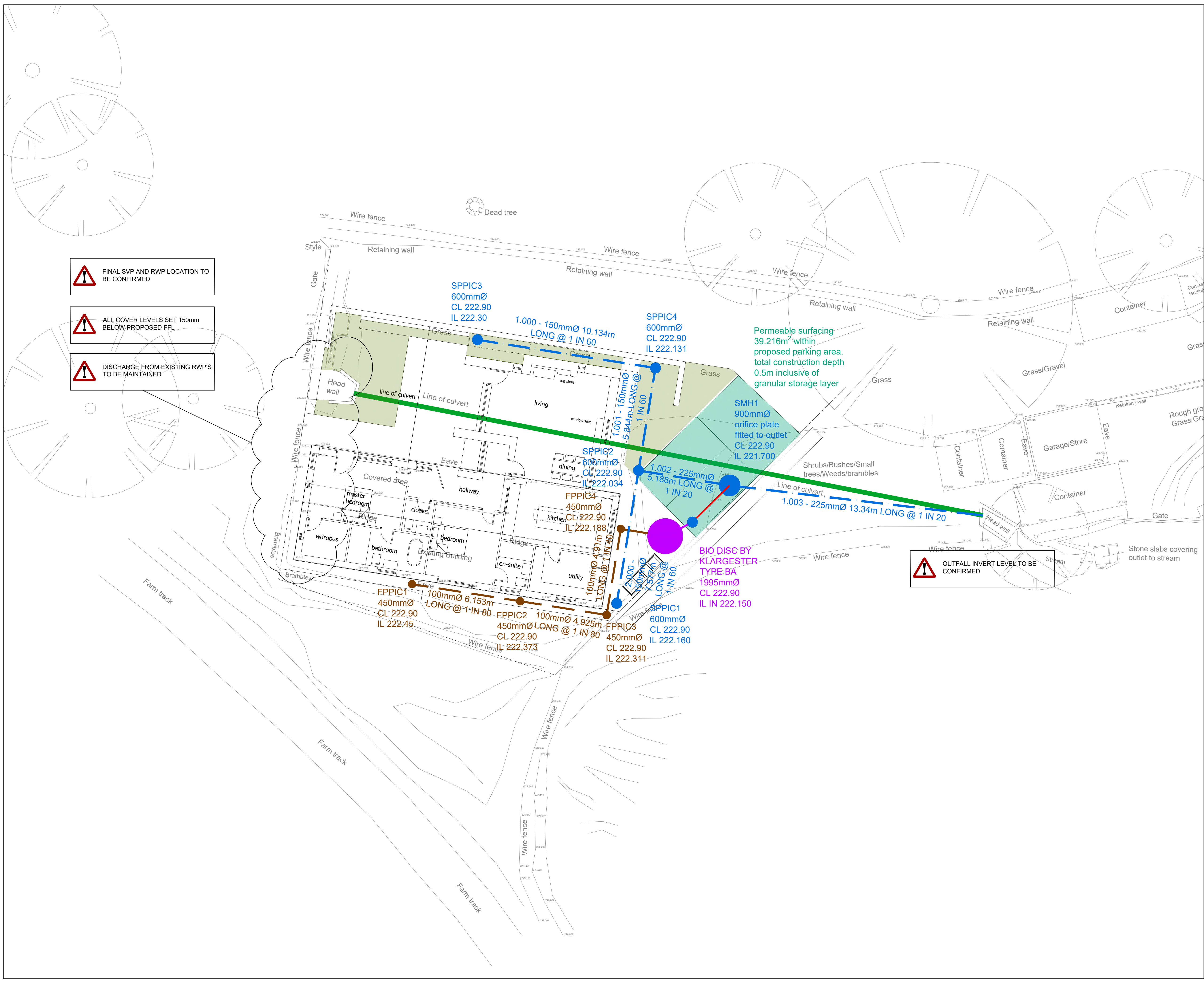
Node SMH1 PERM SURF Online Orifice Control

Flap Valve	x	Invert Level (m)	221.700	Design Flow (l/s)	2.2	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Depth (m)	1.500	Diameter (m)	0.038		

Node SMH1 PERM SURF Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	222.400	Length (m)	8.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	350.0	

Appendix F



FINAL SVP AND RWP LOCATION TO BE CONFIRMED

ALL COVER LEVELS SET 150mm BELOW PROPOSED FFL

DISCHARGE FROM EXISTING RWPS TO BE MAINTAINED

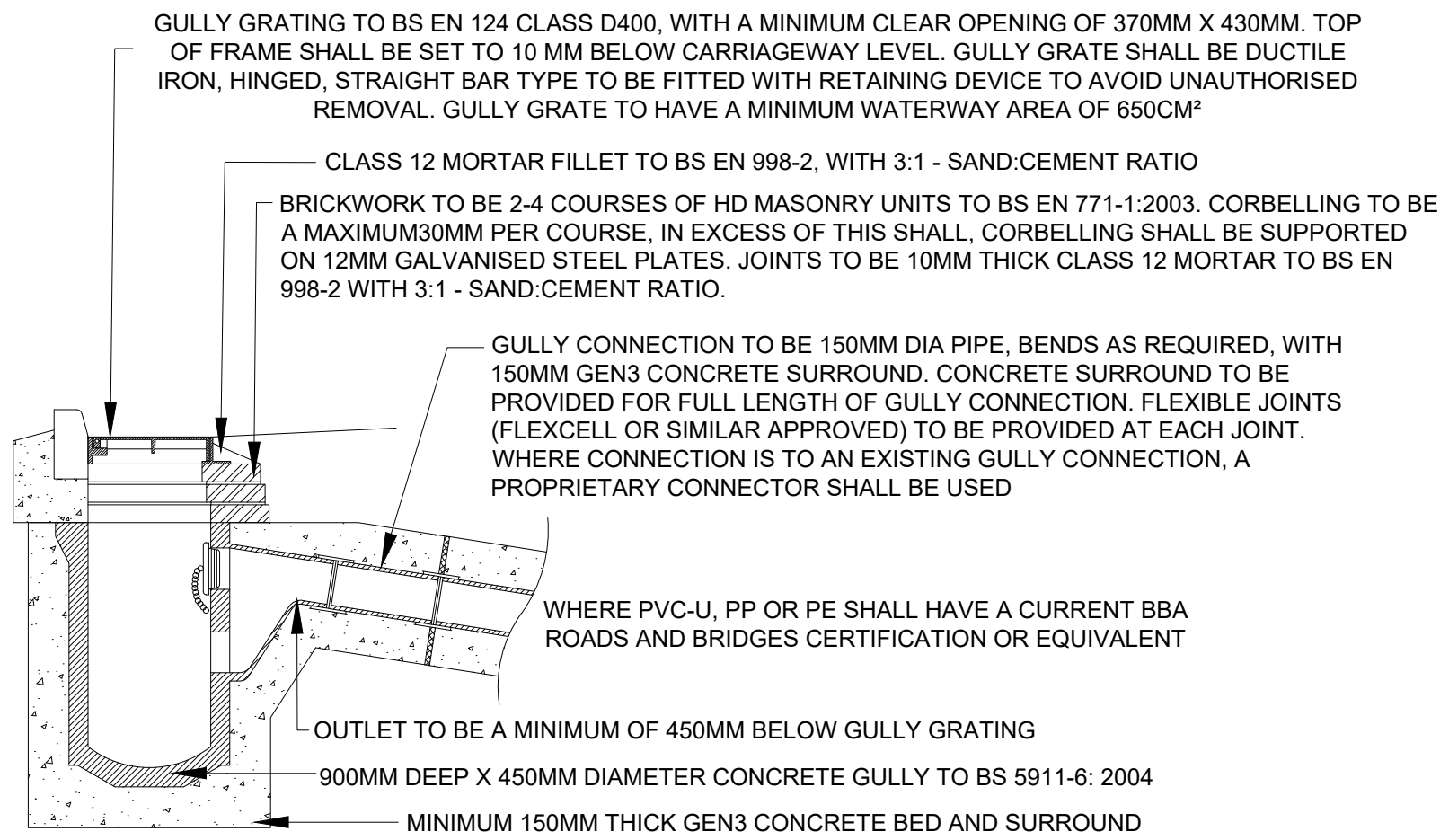
OUTFALL INVERT LEVEL TO BE CONFIRMED

KEY

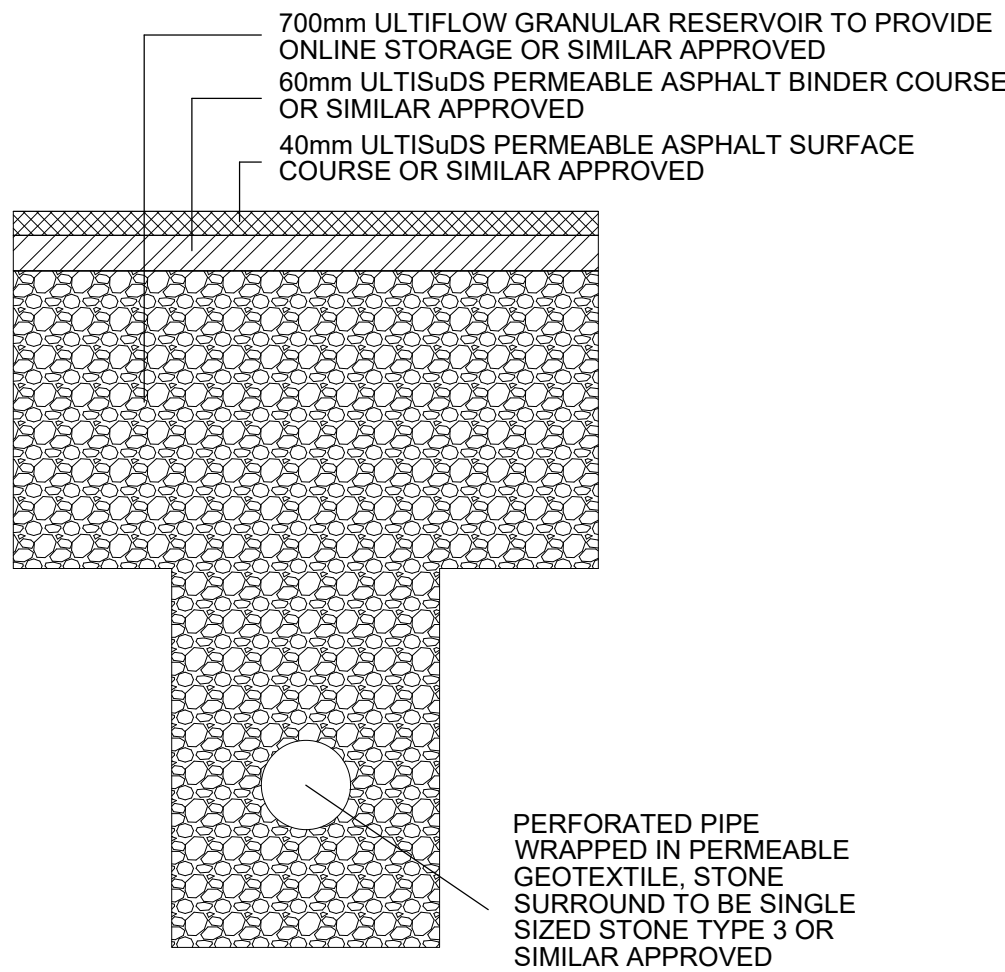
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL WATER DRAIN
- PROPOSED PERFORATED PIPE WRAPPED IN PERMEABLE MEMBRANE
- ANTICIPATED LINE OF EXISTING CULVERTED WATERCOURSE
- PROPOSED PERMEABLE SURFACING PARKING BAYS
- NEW 450mmØ FOUL WATER INSPECTION CHAMBER
- NEW 600mmØ SURFACE WATER INSPECTION CHAMBER
- NEW SURFACE WATER MANHOLE
- KLARGESTER BIO DISC TYPE BA OR SIMILAR APPROVED

P1	JUL 26	FIRST ISSUE	CD	GRE	GRE
Rev	Date	Revision Details	By	Chkd	Appd

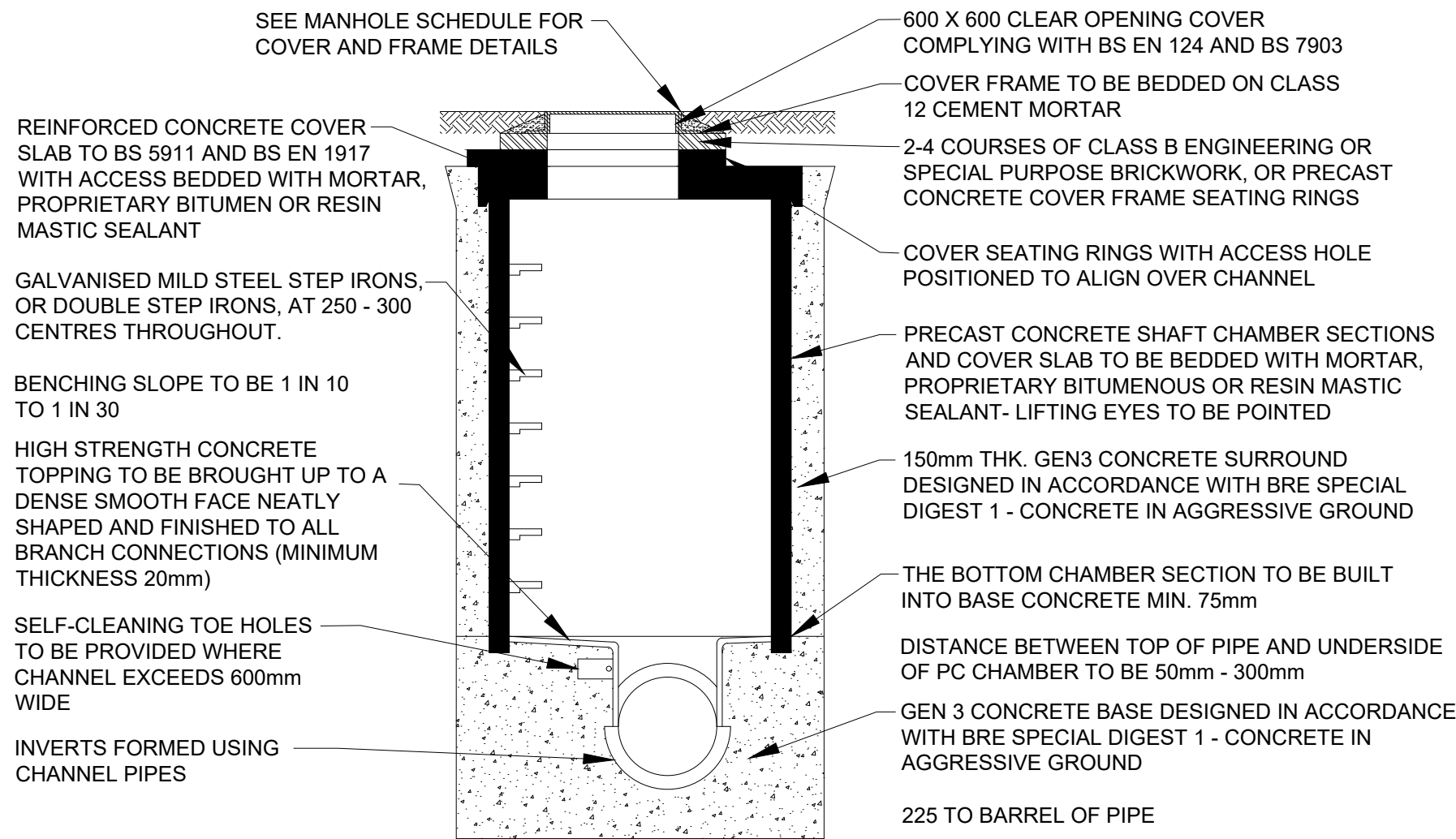
Client	MR NICK GREEN				
Project	FERN HILL FARM				
Title	DRAINAGE ARRANGEMENT SHEET 1 OF 2				
Drawing No.	26-012-100				Revision P1
Scale	1:100 @ A1	Date	JULY 2026		
Drawn	CD	Chk	GRE	App	GRE



ROAD GULLY DETAIL

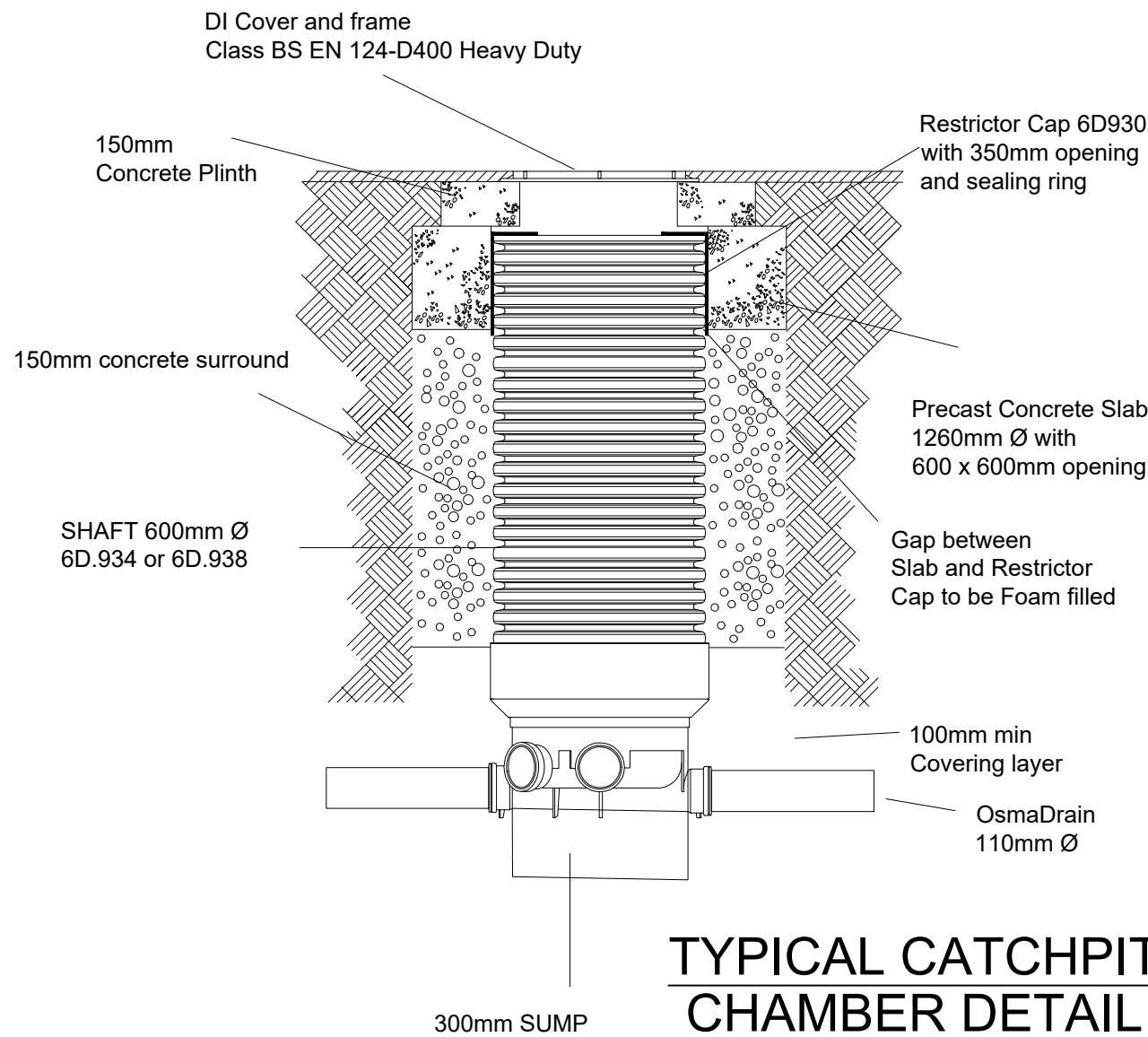


TYPICAL PERMEABLE SURFACING (PARTIAL INFILTRATION) DETAIL INCLUDING ONLINE STORAGE

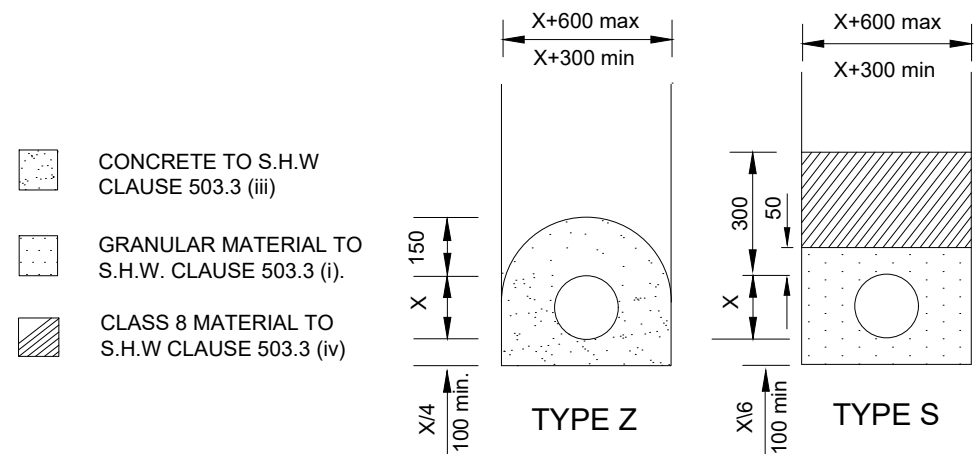


TYPICAL TYPE 2 CONCRETE MANHOLE (PCC) DETAIL

MAX DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 0m - 3m



TYPICAL CATCHPIT CHAMBER DETAIL non entry



TYPICAL PIPE BED AND SURROUND DETAIL

DRAINAGE NOTES

- ALL NON ADOPTABLE DRAINS UP TO 150 Dia. TO BE 'POLYPIPE uPVC UNDERGROUND DRAIN' MANUFACTURED IN ACCORDANCE WITH BS EN 1401-1OR EQUAL APPROVED.
- ALL NON ADOPTABLE DRAINS WITH A PIPE Dia of 225 or 300 TO BE EITHER A PLAIN WALLED PLASTIC PIPE TO BS 1401-1 (POLYSEWER) OR A STRUCTURED WALL PLASTIC PIPE TO WIS-04-35-01 'POLYSEWER'. OR EQUAL APPROVED
- ALL ADOPTABLE DRAINS UP TO 300 Dia. TO BE 'POLYSEWER' BY 'POLYPIPE' AND MANUFACTURED IN ACCORDANCE WITH THE WATER INDUSTRY SPECIFICATION WIS-4-35-01.
- DRAINAGE PIPEWORK 400mm to 600mm DIA TO BE 'RIDGIDRAIN' HDPE BY POLYPIPE OR EQUAL APPROVED.
- ALL PIPE LENGTHS NOT TO EXCEED 3m.
- DRAINS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
- NEW INSPECTION CHAMBERS (IC) TO BE A MINIMUM OF 450MM DIA. EXCEPT FOR MINI ACCESS CHAMBERS WHICH MAY BE SMALLER, REFER TO M.H. SCHEDULE FOR ACTUAL SIZES.
- ALL EXTERNAL RAINWATER PIPES (RWP) TO BE TERMINATED AT RODDABLE GULLIES. INTERNAL RWP's TO ARCHITECTS DETAILS BUT SHOULD ALLOW FOR RODDABLE ACCESS.
- FOR ALL DRAINAGE ABOVE GROUND FLOOR SLAB INCLUDING SETTING OUT FOR PENETRATIONS THROUGH THE GROUND FLOOR SLAB REFER TO ARCHITECTS DRAWING & SPECIFICATIONS
- ANY DRAINS PASSING THROUGH SUBSTRUCTURE WALLS TO HAVE A MINIMUM 50mm CLEAR SPACE, RC LINTEL SUPPORT ABOVE & CEMENT FIBRE COLLARS EITHER SIDE TO PREVENT VERMIN ENTRY
- ANY DRAINS CAST IN & PASSING THROUGH CONCRETE GROUND BEAMS TO HAVE A FLEXIBLE JOINT NOT MORE THAN 150mm FROM THE FACE OF THE GROUND BEAM. (FLEXIBLE JOINT TO MANUFACTURERS DETAILS) AND A MAXIMUM 600mm LONG ROCKER PIPER EITHER SIDE
- ANY ALTERATIONS TO DRAINAGE PROPOSED BY CONTRACTOR TO BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF WORK ON SITE. ANY REVISIONS ARE ALSO SUBJECT TO THE APPROVAL OF THE LOCAL BUILDING INSPECTOR.
- ALL DRAINS RUNNING UNDER BUILDINGS TO HAVE A MINIMUM FALL OF 1:40 TOWARDS THE BUILDING EXTERIOR. PIPE TO BE ENCASED IN 100MM GRANULAR FILL.
- COVER LEVELS SHOWN ARE APPROXIMATE ONLY AND SHOULD BE ALTERED TO SUIT FINISHED SURFACE LEVELS.
- THE BEDDING SPECIFICATION FOR ALL ADOPTABLE DRAINS WHERE COVER IS GREATER THAN 1200mm SHALL BE TYPE 'S'...WHERE COVER IS LESS THAN 1200mm TYPE 'Z' SHALL BE USED
- THE DEVELOPER/CONTRACTOR MUST SELF VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THOSE SET OUT IN 'SEWERS FOR ADOPTION 7TH EDITION' PROPOSED COVER AND INVERT LEVELS TO BE CONFIRMED BY THE CONTRACTOR PRIOR TO ANY WORKS COMMENCING ONSITE

P1	APR 26	FIRST ISSUE	GRE		
Rev	Date	Revision Details	By	Chkd	Appd

Client	MR NICK GREEN				
Project	FERN HILL FARM				
Title	DRAINAGE ARRANGEMENT SHEET 2 OF 2				
Drawing No.	26-012-100				Revision P1
Scale	NTS @ A1		Date	JULY 2026	
Drawn	GRE	Chk		App	