St James CE Primary School, Clitheroe

Drainage Strategy

Final Report

September 2024

Prepared for:

Cassidy & Ashton Architects

Cassidy+Ashton

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Contract

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This report describes work commissioned by the Cassidy & Aston Architects on behalf of the Diocese of Blackburn. The Client's representative for the contract was Alistair Baines. Mark Watson, Peter Barber, Edward Parker and Mark Bentley of JBA Consulting carried out this work.

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Contents

List of Figures

List of Tables

Abbreviations

bgl…..... Below Ground Level
BGS…..... British Geological Society
CC..... Climate Change
DS…..... Drainage Strategy
EA…..... Environment Agency
Ha…..... Hectare
mAOD..... Metres Above Ordnance Datum
NGR…..... National Grid Reference
NPPF..... National Planning Policy Framework
SUDS..... Sustainable Urban Drainage
yr…..... Year

Executive Summary

JBA Consulting were commissioned by Cassidy & Aston Architects on behalf of the Diocese of Blackburn to carry out a Drainage Strategy (DS) for the reconfiguration and expansion of the St James' Primary School in Clitheroe. As part of the site development, a Drainage Strategy to attenuate future surface water runoff is proposed for the Infant School redevelopment.

This DS was produced to meet the requirements of the drainage related planning conditions 14, 16, 17 and 18 of planning consent 3/2021/0731. This was to assess the impact and potential risks from the consented works and seeks to show how the consented development will not affect local drainage at the site and nearby.

The now consented proposals form a redevelopment to the Infant School building and grounds at Clitheroe. It is proposed to construct a new Infant School building to the rear of the existing school building, repurposing part of the existing building for the nursery school, then demolishing the rest of the older school building to be redeveloped into a new car park and recreational area to the north.

Local ground conditions do not support the use of infiltration techniques due to poor permeability of soils and lack of space for soakaways, therefore other options for development drainage were assessed in line with the Drainage Hierarchy.

Existing site drainage found that the existing Infant School building drains to the local public combined sewer to the north west of the building and the existing play area drains to the adjacent watercourse via surface land drain. These connections will be reused with a reduction of peak flows as a brownfield redevelopment.

Sufficient on-site surface water attenuation could be achieved by private cellular storage features within the site. The existing peak flow rate for the existing Infant School buildings was calculated to be 17.26 l/s, will be reduced by a minimum of 30% of the existing peak flow rate to a proposed total peak flow rate of 12.0 l/s, therefore compliant to brownfield drainage principles.

The site will be developed in stages and as the new Infant School building is additional hardstanding, this has been treated as a greenfield site with a practical minimum flow rate proposed of 3.5 l/s, discharging to the adjacent Mearley Brook watercourse. The proposed 3.5 l/s will be combined with the peak flow rate of 8.5 l/s for the proposed car park redevelopment which will reuse the existing combined sewer connection to the north west, thus the finalised site will not increase the peak flow rate from the overall site of 12 l/s.

1 Introduction

1.1 Background

JBA Consulting were commissioned by Cassidy & Aston Architects on behalf of the Diocese of Blackburn to carry out a Drainage Strategy (DS) for the reconfiguration and expansion of the St James' Primary School in Clitheroe.

1.2 Site Location and Description

St. James School is situated off Greenacre Street in Clitheroe, Lancashire, with coordinates NGR: 374,152mE 441,315mN. The school site is bisected by Mearley Brook, with classrooms, playgrounds, and facilities on both sides of the Brook. Access across the brook is provided by a footbridge located within the school premises.

Mearley Brook is classified as a Main River and falls under the responsibility of the Environment Agency (EA). The watercourse runs along its entire length of the school grounds and is fed by Plimlico Brook, Worston Brook, Page Brook, and Shaw Brook. It eventually joins Pendleton Brook (NGR: 373703 440643) approximately 800m downstream from the school. The location plan is shown in Figure 1-1.

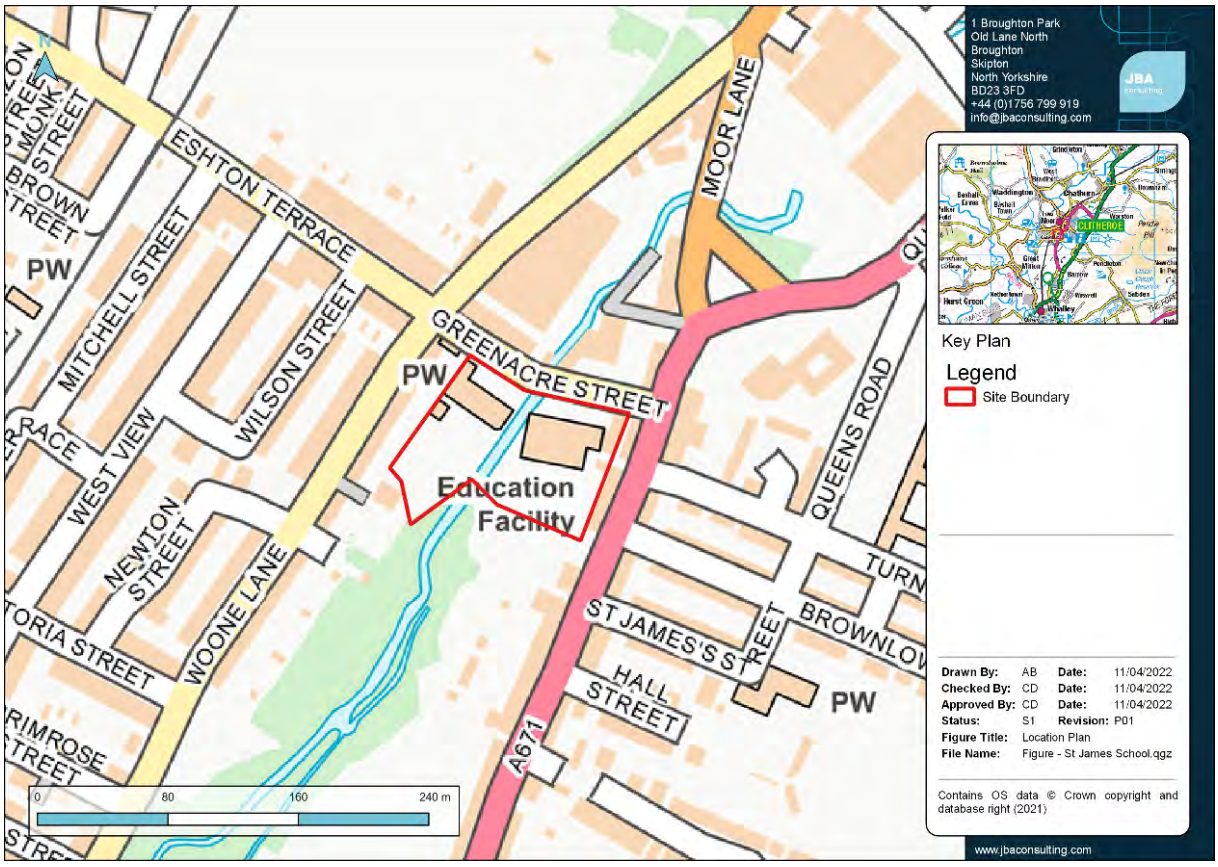


Figure 1-1: Location Plan

1.3 Proposed Development

The proposed new Infant school building will be situated on the right bank, adjacent to the existing playground (Appendix A). The new building will be orientated parallel to the school boundary wall at Woone Lane, with foot and wheelchair access from the playground. The proposed school building will feature; four classrooms, 11 toilet cubicles, covered walkway to retained building (nursery) and a canopy. Access to the proposed school building will be via a staircase or ramp that connects to the playground.

The current land use at the location of the proposed new building is greenfield space/grass. The grass land is banked and raised above the playground and other nearby school buildings.

In addition to the construction work, the existing Infant School to the north of the site along Greenacre Street is scheduled for demolition and being redeveloped as a new school entrance and car park, see Figure 1-2.

Works to the left bank are limited to internal modifications and are not to be changed in terms of drainage, therefore are not discussed within this report.

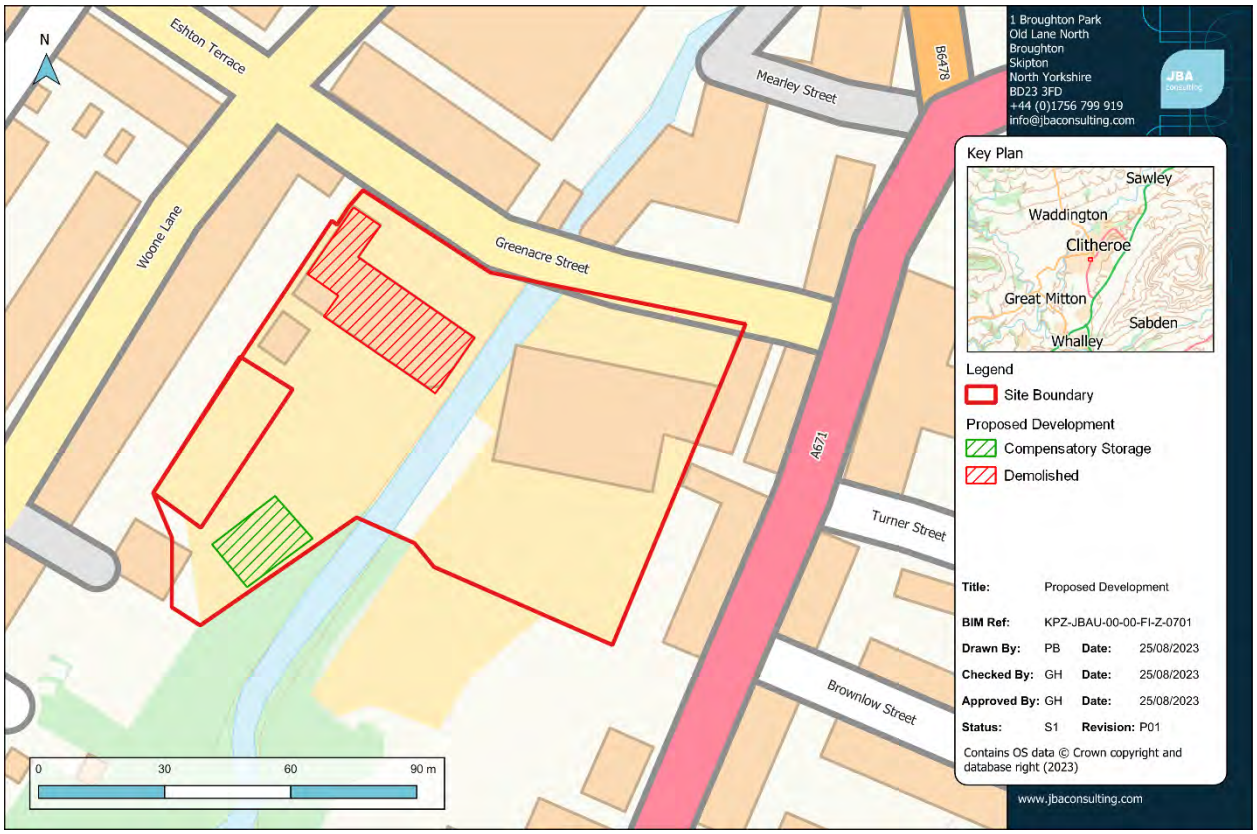


Figure 1-2: Proposed Development

1.4 Site Geology

A desktop survey of the available British Geology Society's website[1] have shown that the underlying strata would not be suitable for soakaways/infiltration trenches to be used to dispose of development surface water runoff from the proposed development, as it shows Made Ground which is expected for the brownfield site.

The British Geology Society's Data on publicly available boreholes was consulted for the site geological information, the nearest borehole to the site was SD74SW34, grid reference 374275, 441451 which is to the north of the site close to the Mearley Brook at the B6478 Whalley Road. The recorded strata were Made Ground to a depth of 3.15mbgl down to light grey weathered Limestone to a depth of 3.40mbgl when the borehole ends.

The recorded Bedrock layer was noted to be Clitheroe Limestone Formation and Hodder Mudstone Formation. The Superficial layers was noted to be Alluvium - Clay, silt, sand and gravel and Till, Devensian.

1.5 Drainage Planning Conditions

This report is to provide the relevant information to meet the requirements of the drainage related planning conditions 14, 16, 17 and 18 of planning consent 3/2021/0731. This was to assess the impact and potential risks from the consented works and seeks to show how the consented development will not affect local drainage at the site and nearby. These conditions are listed below:

Table 1-1: Applicable Drainage Conditions

	Summary	Wording
Condition 14	Separate Drainage systems	Foul and surface water shall be drained on separate systems. Reason: To secure proper drainage and to manage the risk of flooding and pollution on and off the site.

1 GeoIndex Onshore, British Geology Society, 2023, https://mapapps2.bgs.ac.uk/geoindex/home.htm

Condition 16	Detailed SW Drainage Strategy	No development shall commence in any phase until a detailed, final surface water sustainable drainage strategy for the site has been submitted to, and approved in writing by, the Local Planning Authority. The detailed surface water sustainable drainage strategy shall be based upon the site specific flood risk assessment and indicative surface water sustainable drainage strategy submitted and sustainable drainage principles and requirements set out in the National Planning Policy Framework, Planning Practice Guidance and Defra Technical Standards for Sustainable Drainage Systems. No surface water shall be allowed to discharge to the public foul sewer(s), directly or indirectly. The details of the drainage strategy to be submitted for approval shall include, as a minimum; a) Sustainable drainage calculations for peak flow control and volume control for the: i 100% (1 in 1-year) annual exceedance probability event; ii. 3.3% (1 in 30-year) annual exceedance probability event + 40% climate change allowance, with an allowance for urban creep; iii. 1% (1 in 100-year) annual exceedance probability event + 50% climate change allowance, with an allowance for urban creep Calculations must be provided for the whole site, including all existing and proposed surface water drainage systems. b) Final sustainable drainage plans appropriately labelled to include, as a minimum: i. Site plan showing all permeable and impermeable areas that contribute to the drainage network either directly or indirectly, including surface water flows from outside the curtilage as necessary; ii. Sustainable drainage system layout showing all pipe and structure references, dimensions and design levels; to include all existing and proposed surface water drainage systems up to and including the final outfall;

	Summary	Wording
		iii. Details of all sustainable drainage components, including landscape drawings showing topography and slope gradient as appropriate; iv. Drainage plan showing flood water exceedance routes in accordance with Defra Technical Standards for Sustainable Drainage Systems; v. Finished Floor Levels (FFL) in AOD with adjacent ground levels for all sides of each building and connecting cover levels to confirm minimum 150 mm+ difference for FFL; vi. Details of proposals to collect and mitigate surface water runoff from the development boundary; vii. Measures taken to manage the quality of the surface water runoff to prevent pollution, protect groundwater and surface waters, and delivers suitably clean water to sustainable drainage components; c) Evidence that a free-flowing outfall can be achieved. If this is not possible, evidence of a surcharged outfall applied to the sustainable drainage calculations will be required. The sustainable drainage strategy shall be implemented in accordance with the approved details. Reason: To ensure satisfactory sustainable drainage facilities are provided to serve the site in accordance with the Paragraphs 167 and 169 of the National Planning Policy Framework, Planning Practice Guidance and Defra Technical Standards for Sustainable Drainage Systems.
Condition 17	Construction Surface Water Management Plan	No development in any phase shall commence until a Construction Surface Water Management Plan, detailing how surface water and stormwater will be managed on the site during each phase of construction, including demolition and site clearance operations, has been submitted to and approved in writing by the Local Planning Authority. The details of the plan to be submitted for approval shall include method statements,

	Summary	Wording
		scaled and dimensioned plans and drawings detailing surface water management proposals to include for each phase, as a minimum: a) Measures taken to ensure surface water flows are retained on-site during the construction phase(s), including temporary drainage systems, and, if surface water flows are to be discharged, they are done so at a restricted rate that must not exceed the equivalent greenfield runoff rate from the site. b) Measures taken to prevent siltation and pollutants from the site entering any receiving groundwater and/or surface waters, including watercourses, with reference to published guidance. The plan shall be implemented and thereafter managed and maintained in accordance with the approved plan for the duration of each phase of construction. Reason: To ensure the development is served by satisfactory arrangements for the disposal of surface water during each construction phase(s) so it does not pose an undue surface water flood risk on-site or elsewhere during any construction phase in accordance with Paragraph 167 of the National Planning Policy Framework.

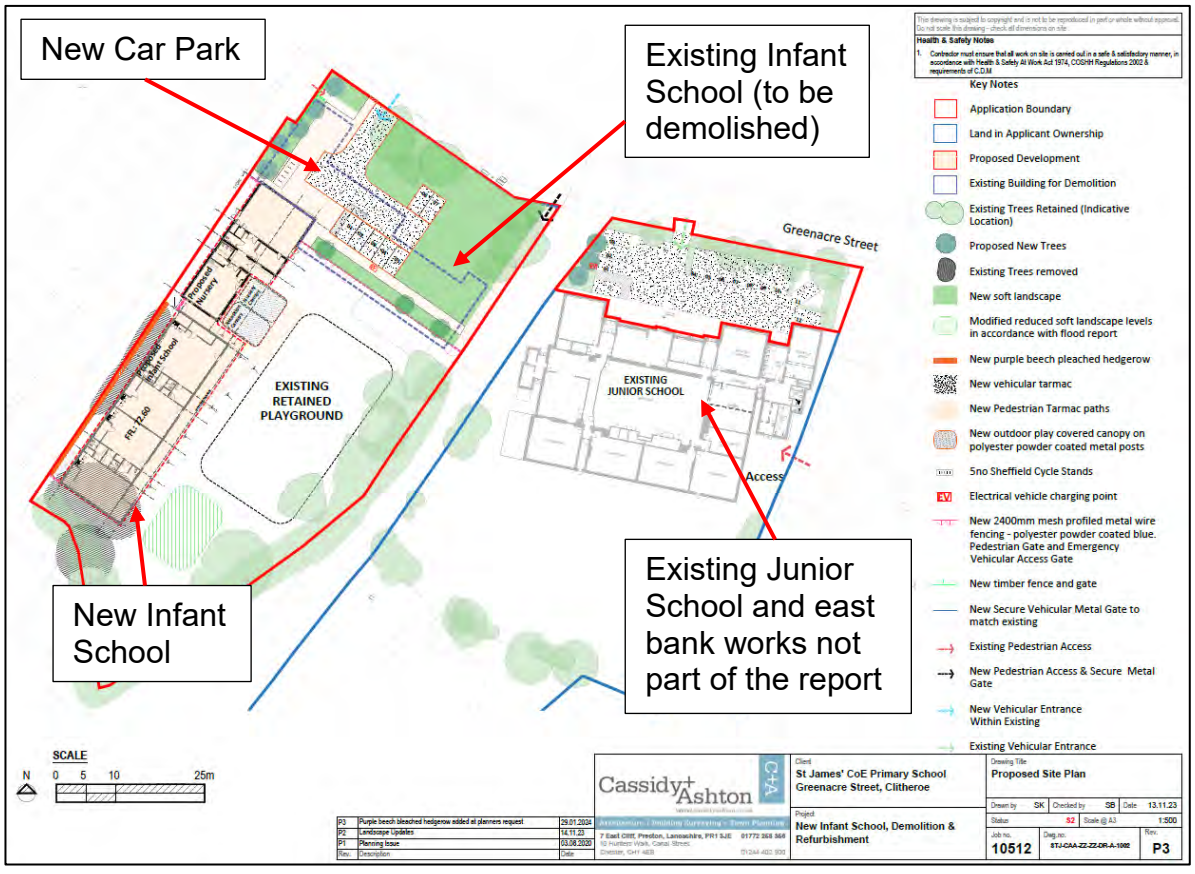
	Summary	Wording
Condition 18	Maintenance Plan	The commencement of use of the development shall not be permitted until a site-specific Operation and Maintenance Manual for the lifetime of the development, pertaining to the surface water drainage system and prepared by a suitably competent person, has been submitted to and approved in writing by the Local Planning Authority. The details of the manual to be submitted for approval shall include, as a minimum: a) A timetable for its implementation; b) Details of the maintenance, operational and access requirement for all SuDS components and connecting drainage structures, including all watercourses and their ownership; c) Pro-forma to allow the recording of each inspection and maintenance activity, as well as allowing any faults to be recorded and actions taken to rectify issues; d) The arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme in perpetuity; e) Details of financial management including arrangements for the replacement of major components at the end of the manufacturer's recommended design life; f) Details of whom to contact if pollution is seen in the system or if it is not working correctly; and g) Means of access for maintenance and easements. Thereafter the drainage system shall be retained, managed, and maintained in accordance with the approved details. Reason: To ensure that surface water flood risks from development to the future users of the land and neighbouring land are minimised, together with those risks to controlled waters, property, and ecological systems, and to ensure that the sustainable drainage system is subsequently maintained pursuant to the requirements of Paragraph 169 of the National Planning Policy Framework.

2 Site Drainage Assessment

2.1 Proposed Plan

The proposed site plan is shown in Figure 2-1. It is proposed to construct a new Infant School to the rear of the existing infant school on the western (right) bank of the site, with demolition of the existing Infant School building to be redeveloped into a new car parking area and road access.

Figure 2-1: Proposed Site Masterplan



2.2 Phasing of Works

The proposed works need to be phased to be able to provide sufficient teaching capacity and to continue as a fully functioning Infant School and the existing playground area will remain unchanged, therefore it is proposed that the works will be phased as below:

- Phase 1 - Construction of new Infant School to the rear of the existing building, conversion of part of the existing infant school to the new Nursery School. The rest of the Infant School to remain whilst construction is completed.
- Phase 2 - Demolition of Existing infant school and then construct new Car Park to the north.

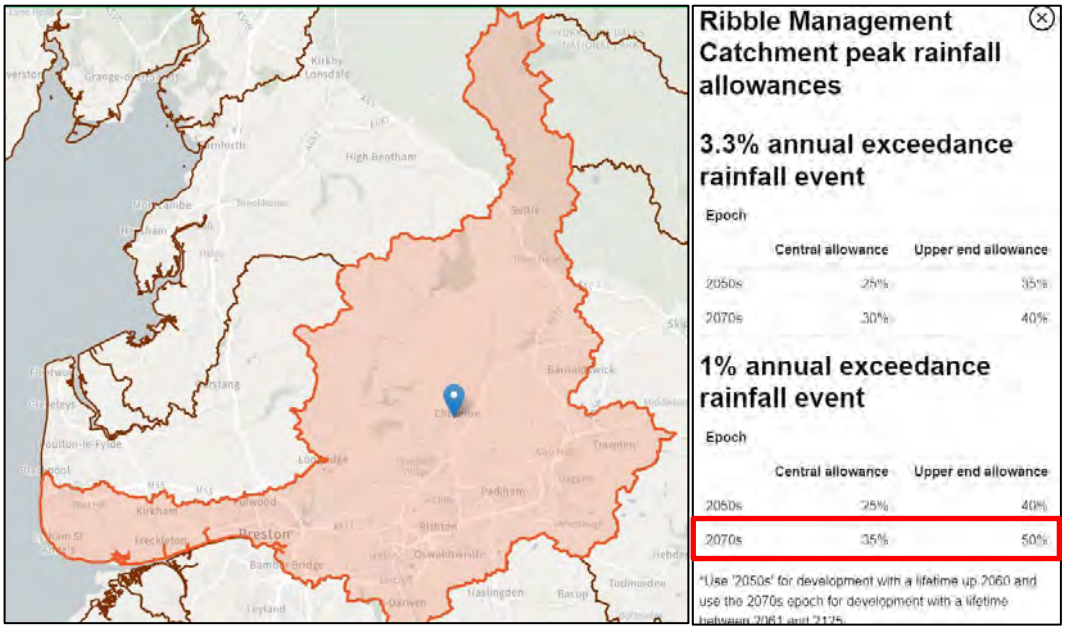
2.3 Climate Change Allowance

New updates to the NPPF in May 2022 introduced updated Flood Risk Classifications and upgraded allowances for climate change to be used for developments. The guideline recommendation is to use for flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact as stated in Table 2 of the guideline.

The Environment Agency's Table 1 shows anticipated changes in peak rainfall intensity in small catchments (less than 5km2), or urbanised drainage catchments.

As the proposed site is considered a 'More Vulnerable' development within Flood Zone 3 (as per the existing Flood Map for Planning), based on the latest climate change allowances and the anticipated 100yr lifespan of the development, this is an additional 50% for a design rainfall event.

Figure 2-2: Climate Change Allowances - Ribble Management Catchment



2.3.1 Urban Creep

As stipulated by the LLFA, Urban Creep has been applied to the proposed impermeable areas that will be drained by the proposals.

Typically the building area of 705.1m^2 would not have Urban Creep applied as any increases in building sizes would encroach on the paved areas around it and also would constituted a further planning application and be incorporated by a future drainage system, however as the playground area of 642.2m^2 is not part of the proposed drainage system, (retaining its existing free outfall to the watercourse) but maybe developed in the future, Urban Creep has been applied to the larger proposed building area of Phase 1 to account for any playground/paved area increases in the future. Phase 2 has Urban Creep applied directly to the paved areas and car parking

areas. Table 2-1 shows how Urban Creep is applied, the MicroDrainage results shown in Appendix E have the Urban Creep Impermeable Areas applied directly within the MicroDrainage Model.

Table 2-1: Urban Creep Areas

Features	Area (m2)	Area +10% Urban Creep (m2)
Phase 1 - Buildings	705.1	775.6
Phase 1 - Paths	124.2	136.6
Total	**829.3**	**912.2**
Phase 2 - Paths	254.9	280.4
Phase 2 - Car Park	274.8	302.3
Total	**529.7**	**582.7**

2.4 Runoff from Existing Site

The existing Infant School building and contributing area actively drains to the United Utilities combined sewer system to the north-west of the site. This has been confirmed by an onsite sewer CCTV survey by DTM Drainage Solutions, the full report is provided in Appendix B and a sketch of the current Infant School drainage is shown in Figure 2-3 below.

Figure 2-3: Sketch of Existing Infant School Drainage

With this, we can consider the existing Infant School as a Brownfield development. For the existing Infant School building and paved areas, a contributing area of 1241.4m^2 was shown to be draining to the combined sewer as a blind connection near manhole 1306 and the existing play area has a contributing area of 642.2m^2 drains directly to the existing surface drain into the Mearley Brook.

The existing play area is to remain unchanged therefore the existing drainage will remain in place with no change.

The existing brownfield runoff rate was calculated for the existing Infant School using the Modified Rational Method as per Equation 24.5 of The SUDS Manual[2]. The results used an contributing area of 1241.4m^2 (0.1241ha), a rainfall intensity of 50mm/hr to estimate a peak flow rate of 17.29 l/s for the existing Infant School hardstanding area to the combined sewer.

Figure 2-4: Modified Rational Method equation

EQ. 24.5 Modified rational method equation to determine peak flow rates

$$Q = 2.78\, C\, i\, A$$

where:

Q = design event peak rate of runoff (l/s)

C = non-dimensional runoff coefficient which is dependent on the catchment characteristics

$$C = C_V\, C_R$$

where C_V = volumetric runoff coefficient

C_R = dimensionless routing coefficient

i = rainfall intensity for the design return period (in mm/hr) and for a duration equal to the "time of concentration" of the network

A = total catchment area being drained (ha)

Note: 2.78 is a conversion factor to address the rainfall unit being in mm/hr.

2.5 Options for Surface Water Disposal

It is a requirement of the H3 Building Regulations[3] that all new developments follow the preferred hierarchy for disposal of surface water disposal. Consideration should firstly be given to:

- Disposal via Infiltration (soakaway).
- Disposal to the nearest watercourse / sea.
- Disposal to a nearby public surface water sewer.
- Disposal to a nearby public combined sewer, in that priority order.

2 The SUDS Manual C753, CIRIA 2015

3 Drainage and Waste Disposal, The Building Regulations 2015 H3, HM Government

2.5.1 Disposal via Infiltration

As the first option for the drainage hierarchy, the option to discharge development runoff into the local ground via infiltration is assessed and determination if the underlying ground is suitable for infiltration.

A desktop survey of the available BGS website (Section 1.4) have shown that the underlying strata is not suitable for soakaways/infiltration trenches to be used to dispose of development surface water runoff from the proposed development, as it thick layers of Made Ground, therefore this option has been discounted.

2.5.2 Disposal via Watercourse

The second preferred option would be to discharge the surface water run-off from the development to a watercourse. As shown by Figure 2-3, the existing site drains to the nearby combined sewer for both foul and surface water from the existing Infant School and the existing play area drains directly to the adjacent Mearley Brook watercourse to the east of the boundary. As the site sites adjacent to a nearby watercourse, new proposals should be directed towards the watercourse at a restricted rate.

2.5.3 Disposal via Sewers

A pre-planning enquiry has been submitted to United Utilities which shows that the existing Infant School drains to the nearby combined sewer within the path to the west, connecting to the main combined sewer of Greenacre Street. The site drainage survey found that there is an existing 150mm private combined sewer connecting to the public combined sewer at manhole 13.

As an existing connection remains, the site can benefit from reusing this drainage connection at a restricted brownfield drainage rate from the areas that were previously connected to the public combined sewer.

Table 2-2: Summary of Drainage Hierarchy

Drainage Option	Summary	Applicable?
Disposal via Infiltration (soakaway).	Underlying Made Ground	✖
Disposal to the nearest watercourse / sea.	Adjacent to Mearley Brook	✓
Disposal to a nearby public surface water sewer.	None Nearby	✖
Disposal to a nearby public combined sewer.	Existing Connection to Combined Sewer	✓

2.6 Peak Flow Rate

NPPF requires that any development should not increase flood risk to others but should aim to contribute towards a reduction. As the site has an existing combined connection to the public combined sewer, the site should not increase flood risk or peak flow rates beyond that of the existing flow rate of 17.2l/s.

As per brownfield drainage principles, a minimum 30% reduction in existing peak flow rate is required, therefore the site peak flow rate will be restricted to 12.0 l/s, and this will be applied site wide as to not increase flow rates from the site at any phase of the development.

2.7 Phases of Development and Drainage Strategy

2.7.1 Phase 1 - Construction of New Infant School

The proposed Infant School will be constructed as a new building that is currently an undeveloped grassed, this will be combined with the portion of the existing Infant School building that will be ultimately retained as the proposed Nursery School, therefore the new building should be treated as a new greenfield development and thus restricted to greenfield runoff rates.

The online greenfield runoff rates tool from HR Wallingford[4] was consulted to determine the greenfield runoff rate from the new Infant School proposed impermeable area of 704.6m^2 (minimum of 0.1ha used) generates a greenfield runoff rate of 0.92l/s. This is deemed to be too small for a practical flow control device restriction as the risk of blockage is too high for small apertures, therefore a practical minimum flow control rate of 3.5l/s is proposed for the proposed Infant School building and retained Nursery School.

To necessitate a 3.5 l/s flow control, storage of excess runoff will be required within the proposed drainage system, this will be provided by geocellular crates, upstream of the 3.5l/s flow control and this will be designed to accommodate the 1 in 100 year plus 50% climate change allowance. The MicroDrainage calculations for the new Infant School found that a cellular crate storage of 7m x 7m x 0.5m depth gave a volume of 23.275m^3 (accounting for 95% porosity) was sufficient for all design flood events up to the 1 in 100 year plus 50% climate change allowance plus 10% urban creep. The full hydraulic calculations can be seen in Appendix E.

The location of the storage crates will be placed underneath the area marked for Flood Compensatory Storage (further details see the FRA); therefore the cover level of the cellular storage and manholes have been reduced to the new ground level of 71.79mAOD. The new Infant School building and Nursery School drainage will be

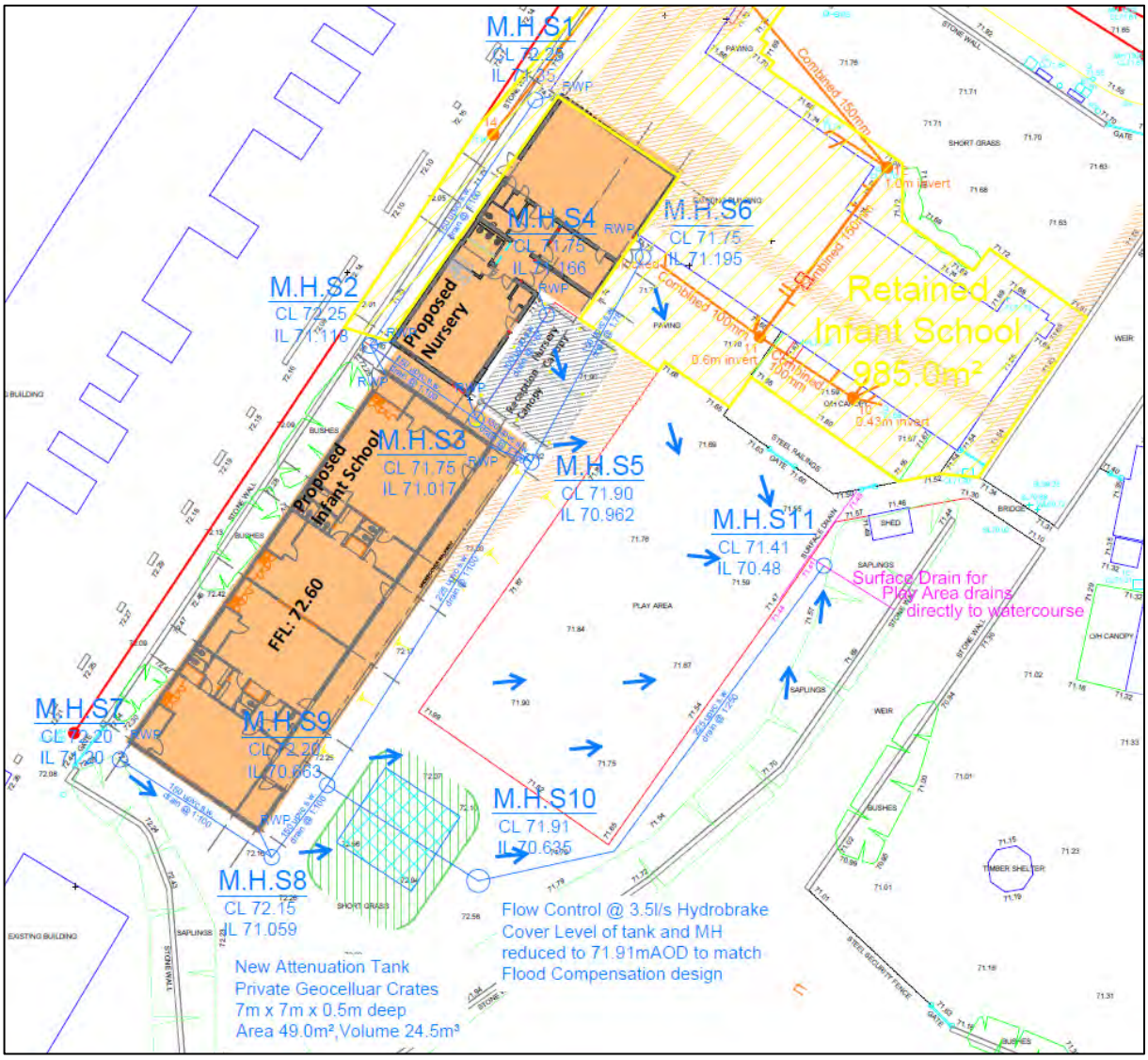
4 Greenfield Runoff Rate Estimation Tool, HR Wallingford, 2024, https://www.uksuds.com/tools/greenfield-runoff-rate-estimation

directed to the existing watercourse outlet connection, utilising the same outlet as the Play Area surface drainage system. A new manhole will be constructed onto the existing outlet pipe to connect the restricted flows from the Phase 1 works, downstream of the play area as to not alter to flows from the play area.

The remaining Infant School building will continue to drain to the combined sewer as existing, however as the drainage from the Nursery School portion of the building will be diverted to the new Infant School drainage system, this is anticipated to be a reduced flow rate and volume of flows contributing to the combined sewer, therefore no increase in flow rate is anticipated from Phase 1 works.

As the existing Play Area will be unchanged, this area will have no change in peak flow rate during Phase 1.

Figure 2-5: Phase 1 Drainage Plan



2.7.2 Phase 2 - Demolition of Existing Infant School and Construction of New Car Park Area.

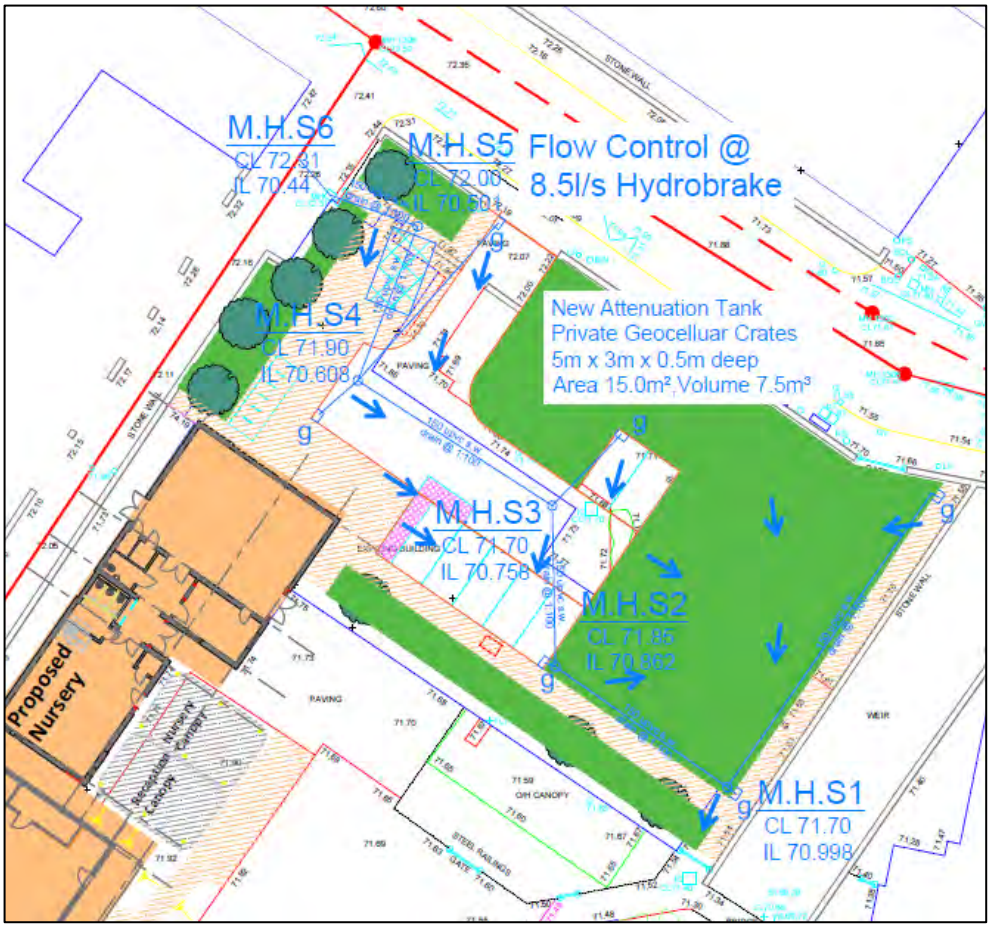
With the proposed Infant School now constructed and operational, the remaining existing infant school building will be demolished to make way for the proposed car park and access gate.

As proven by the site drainage survey, this portion of the site benefits from an existing combined sewer connection to the local public combined sewer to the north-west of the site, therefore the remaining brownfield peak flow rate allowance will be used for this phase of the development, as per section 2.6. As Phase 1 will be restricted to the practical minimum flow rate of 3.5 l/s as a greenfield development, the remaining 8.5 l/s will be used.

The new car park and proposed pathways will be drained to the existing combined sewer as per the existing infant school connection at the restricted flow rate of 8.5 l/s, this represents a 51% reduction in flow rate to the public combined sewer and an overall reduction of 30% from the full site.

To necessitate a 8.5 l/s flow control, storage of excess runoff will be required within the proposed drainage system, this will be provided by geocellular crates, upstream of the 8.5l/s flow control and this will be designed to accommodate the 1 in 100 year plus 50% climate change allowance. The MicroDrainage calculations for the new Car Park found that a cellular crate storage of 5m x 3m x 0.5m depth gave a volume of 14.25m^3 (accounting for 95% porosity) was sufficient for all design flood events up to the 1 in 100 year plus 50% climate change allowance plus 10% urban creep. The full hydraulic calculations can be seen in Appendix E.

Figure 2-6: Phase 2 Drainage Plan



2.7.3 MicroDrainage Calculations

As per the Lancashire County Council Drainage Systems (SUDS) Pro-forma, the MicroDrainage model uses a CV value of 1.0 (the software shows a default of 0.84 for winter although this was adjusted to 1.0 for both within the model build).

2.8 Summary of Drainage Design

A review of the drainage design is shown below in Table 2-3.

Table 2-3: Summary of Drainage Design

Phase of Works	Flow Control	Storage Size
Phase 1 - New Infant School	3.5 l/s Greenfield to watercourse, reduced flow from existing infant school, play area unchanged	23.275m2
Phase 2 - New Car Park	8.5 l/s reduced flow rate to combined sewer	14.25m2
Finalised Design	8.5 l/s reduced flow rate to combined sewer, 3.5 l/s from Phase 1, play area unchanged	37.575m2

2.9 Proposed Surface Water Pollution Control

Sufficient on-site surface water attenuation could be achieved by connecting the proposed rainwater downpipes and gulley features on the site. The proposed drainage features will also provide an benefit to mitigate the risk of pollution from the development runoff. CIRIA C758 provides the following information on pollution hazards and controls offered by the implemented drainage features.

Table 2-4: Pollution Hazards Indices - Table 26.2 CIRIA C758

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

The table shows that the proposals will have a Low pollution hazard level for a low density scheme, therefore it is deemed that no site gulleys for car parking areas will be sufficient to control pollution from vehicular areas. A silt trap should be used upstream and downstream of the proposed geocellular crate to capture any sediments and pollutants, with easy access to remove these during operational maintenance.

3 SuDS Maintenance and Management

3.1 Proposed Site Drainage

The surface water drainage strategy for the proposed development utilises SuDS features to intercept and convey pluvial surface water runoff. The design of the system aims to attenuate runoff and encourage infiltration.

The proposed storm water system consists of the following SuDS components:

- Geocellular Tanks; and
- Gulleys.

3.2 Maintenance Categories

There are three categories of maintenance activities referred to in this report:

- **Regular maintenance** (including inspections and monitoring).
- Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.
- **Occasional maintenance**
- Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).
- **Remedial maintenance**
- Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

3.3 Management and Maintenance Team

As the site benefits from an existing maintenance team that maintains the existing school facility, landscaping and drainage needs, the existing team can also undertake management and maintenance responsibilities for the proposals and undertake this as part of its ongoing maintenance schedule and also utilise use of professional maintenance companies to clean/repair and aspects of the drainage system as and when required.

3.4 Operation and Maintenance Requirements

Regular inspection and maintenance is required to ensure the effective long-term operation of below-ground storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. Table 21.3 (below) provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.

Maintenance Plans and schedules should be developed during the design phase and will be specific to the type of tank that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Figure 3-1: Maintenance of Storage Tanks - CIRIA C753

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Figure 3-2: Maintenance Checklist - CIRIA C753

TABLE B.25 SuDS maintenance inspection checklist

General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								
Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								

TABLE B.25 **SuDS maintenance inspection checklist**

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are the infiltration trenches/swales in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								

TABLE B.25 SuDS maintenance inspection checklist

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								

4 Summary and Conclusions

4.1 Existing Surface Water Runoff

The existing Infant School building and contributing area actively drains to the United Utilities combined sewer system to the north-west of the site. This has been confirmed by an onsite sewer CCTV survey by DTM Drainage Solutions,

With this, we can consider the existing Infant School as a Brownfield development. For the existing Infant School building and paved areas, a contributing area of 1241.4m^2 was shown to be draining to the combined sewer as a blind connection near manhole 1306 and the existing play area has a contributing area of 642.2m^2 drains directly to the existing surface drain into the Mearley Brook. The existing play area is to remain unchanged.

The existing brownfield runoff rate was calculated to estimate a peak flow rate of 17.29 l/s for the existing Infant School hardstanding area to the combined sewer.

4.2 Proposed Surface Water Design

The proposed Infant School will be constructed as a new building that is currently an undeveloped grassed area, this will be combined with the portion of the existing Infant School building that will be ultimately retained as the proposed Nursery School, therefore the new building should be treated as a new greenfield development and thus restricted to greenfield runoff rates.

The online greenfield runoff rates tool generates a greenfield runoff rate of 0.92l/s. This is deemed to be too small for a practical flow control device restriction as the risk of blockage is too high for small apertures, therefore a practical minimum flow control rate of 3.5l/s is proposed for the proposed Infant School building and retained Nursery School. To necessitate a 3.5 l/s flow control, a cellular crate storage of 7m x 7m x 0.5m depth gave a volume of 23.275m^3 was sufficient for all design flood events up to the 1 in 100 year plus 50% climate change allowance plus 10% urban creep.

As proven by the site drainage survey, the existing infant school benefits from an existing combined sewer connection to the local public combined sewer to the north-west of the site, therefore the remaining brownfield peak flow rate allowance will be used for this phase of the development, as per section 2.6. As Phase 1 will be restricted to the practical minimum flow rate of 3.5 l/s as a greenfield development, the remaining 8.5 l/s will be used. To necessitate a 8.5 l/s flow control, a cellular crate storage of 5m x 3m x 0.5m depth gave a volume of 14.25m^3 was sufficient for all design flood events up to the 1 in 100 year plus 50% climate change allowance plus 10% urban creep.

A Site Plan

Health & Safety Notes

1. Contractor must ensure that all work on site is carried out in a safe & satisfactory manner, in accordance with Health & Safety At Work Act 1974, COSHH Regulations 2002 & requirements of C.D.M

Key Notes

- Application Boundary
- Land in Applicant Ownership
- Proposed Development
- Existing Building for Demolition
- Existing Trees Retained (Indicative Location)
- Proposed New Trees
- Existing Trees removed
- New soft landscape
- Modified reduced soft landscape levels in accordance with flood report
- New purple beech pleached hedgerow
- New vehicular tarmac
- New Pedestrian Tarmac paths
- New outdoor play covered canopy on polyester powder coated metal posts
- 5no Sheffield Cycle Stands
- EV Electrical vehicle charging point
- New 2400mm mesh profiled metal wire fencing - polyester powder coated blue. Pedestrian Gate and Emergency Vehicular Access Gate
- New timber fence and gate
- New Secure Vehicular Metal Gate to match existing
- Existing Pedestrian Access
- New Pedestrian Access & Secure Metal Gate
- New Vehicular Entrance Within Existing
- Existing Vehicular Entrance

SCALE

N 0 5 10 25m

Rev.	Description	Date
P3	Purple beech bleached hedgerow added at planners request	29.01.2024
P2	Landscape Updates	14.11.23
P1	Planning Issue	03.08.2020

Cassidy+Ashton C+A
www.cassidyashton.co.uk
Architecture + Building Surveying + Town Planning
7 East Cliff, Preston, Lancashire, PR1 3JE 01772 258 356
10 Hunters Walk, Canal Street, Chester, CH1 4EB 01244 402 900

Client
St James' CoE Primary School Greenacre Street, Clitheroe

Project
New Infant School, Demolition & Refurbishment

Drawing Title
Proposed Site Plan

Drawn by	SK	Checked by	SB	Date	13.11.23
Status	S2	Scale @ A3	1:500		

Job no. **10512**
Dwg.no. **STJ-CAA-ZZ-ZZ-DR-A-1002**
Rev. **P3**

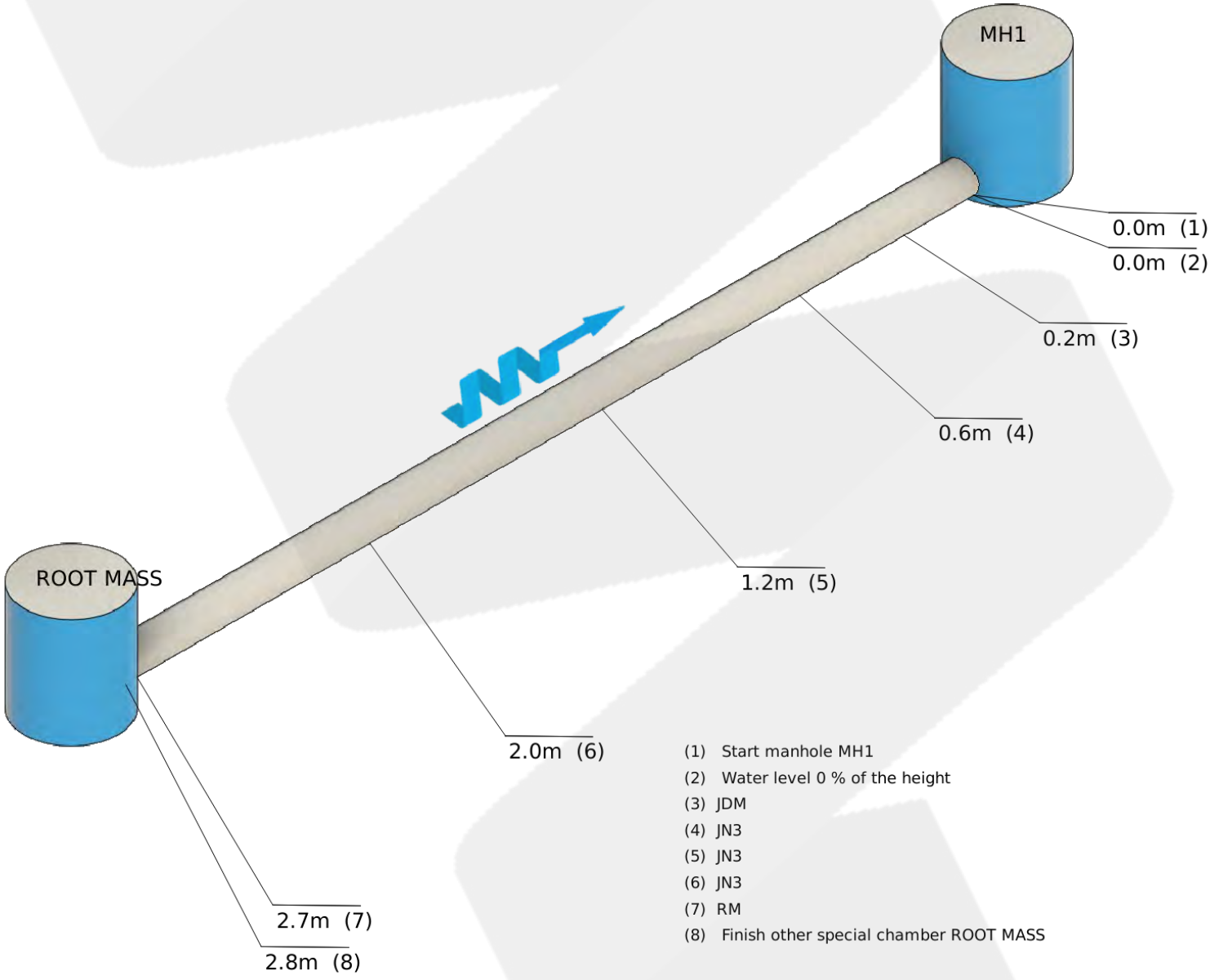
B DTM Drainage Survey Report

DTM DRAINAGE SOLUTIONS	**Project Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Project Information	
Filename	St_James_Church_of_England_Primary_School
Site Name/Number	St James Church of England Primary School
Street	Greenarce Street
Town/Village	Clitheroe
Postcode	BB7 1ED
Parking Restrictions	ok
Client	Cassidy And Ashton
Reference	
Drawing Number	
Reason	Checking Drainage
Engineer	DM
Export Date	26/03/24
Export Time	12:19
Weather	No rain or snow (D)

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh1_z	Start: MH1	Direction: Upstream	End: ROOT MASS
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.48
Date: 2024-03-26	Time: 09:49	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.48
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

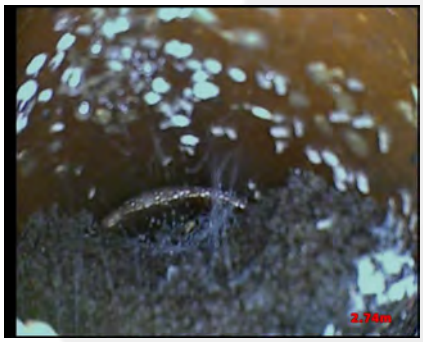
Observation [3]:
JDM

Observation [4]:
JN3

Observation [5]:
JN3

Observation [6]:
JN3

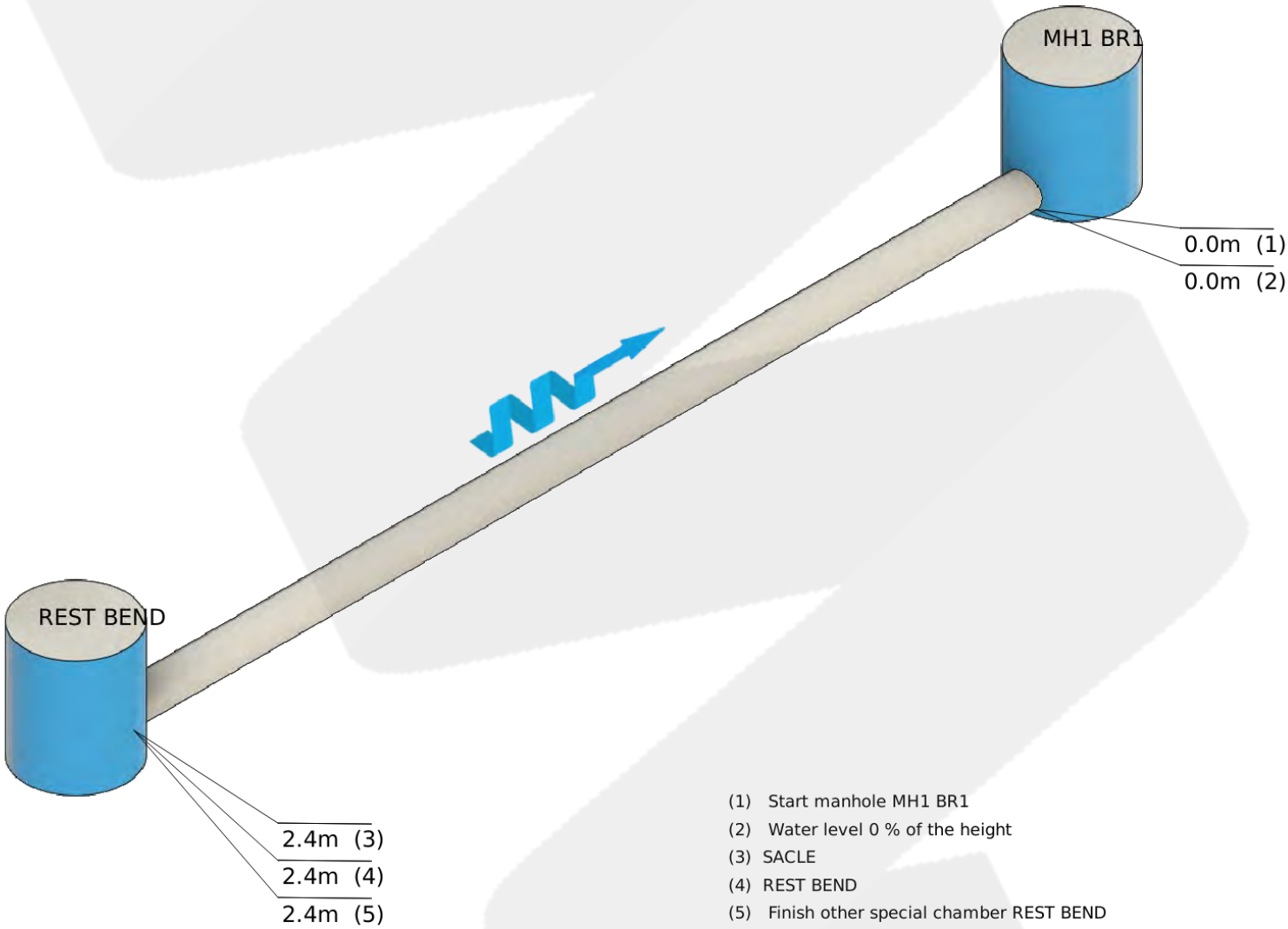
	Section Images	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [7]:
RM

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

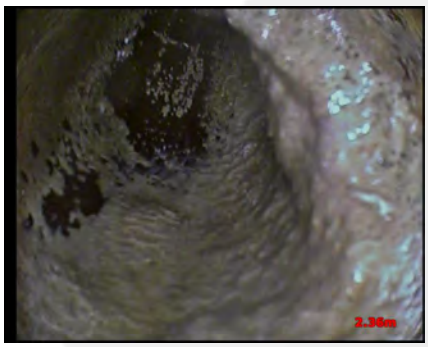
Section Video: mh1_br1_root_mass	Start: MH1 BR1	Direction: Upstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.48
Date: 2024-03-26	Time: 10:03	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.48
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



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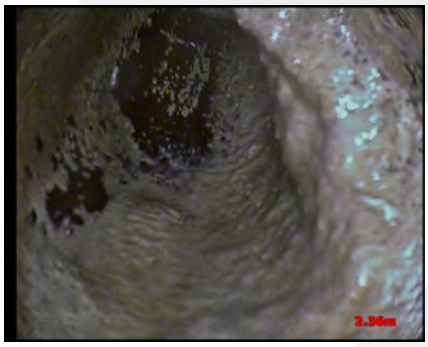
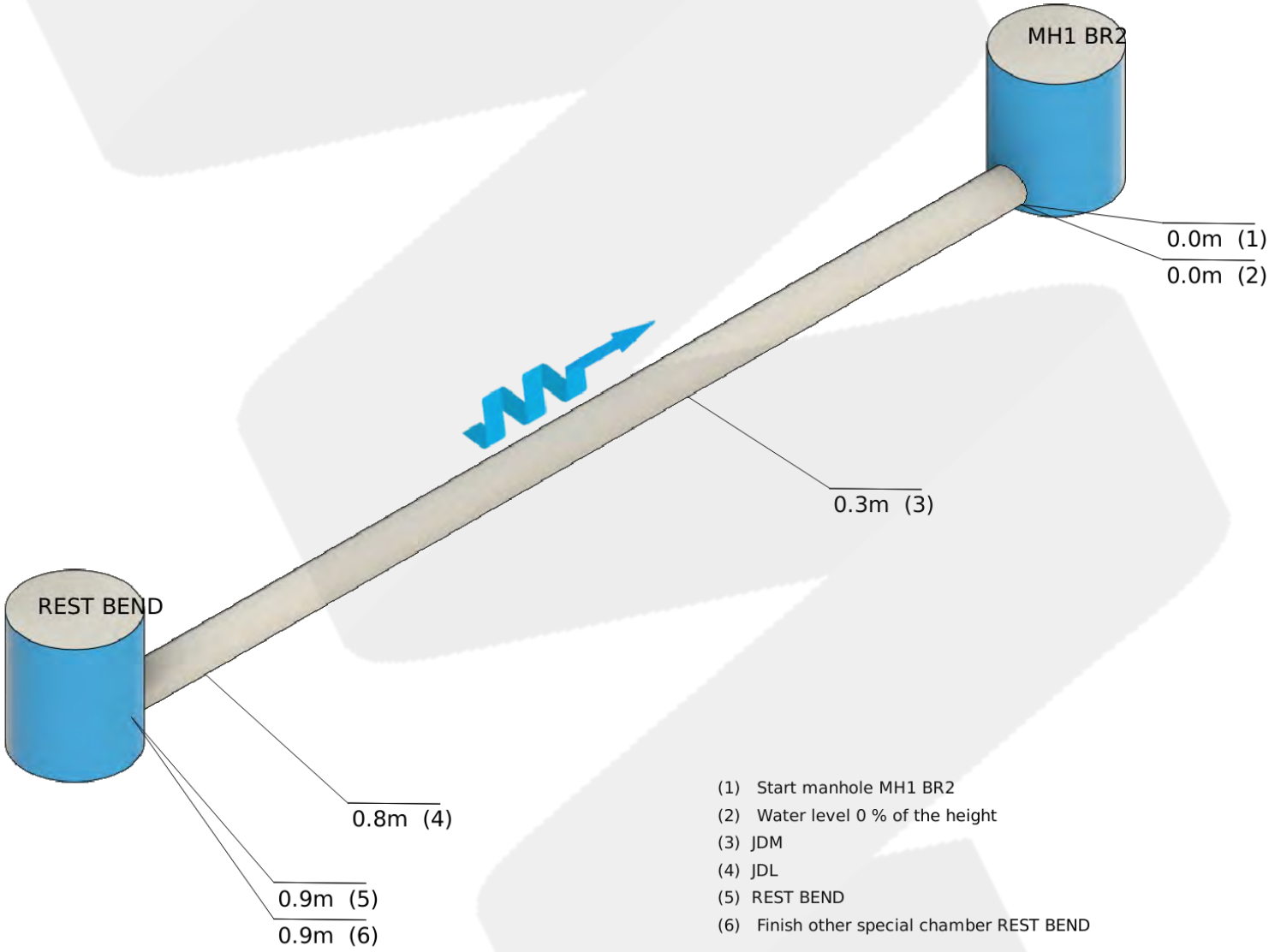


Observation [4]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh1_br2_rest_bend	Start: MH1 BR2	Direction: Upstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.48
Date: 2024-03-26	Time: 10:05	Comments:	



(1) Start manhole MH1 BR2
(2) Water level 0 % of the height
(3) JDM
(4) JDL
(5) REST BEND
(6) Finish other special chamber REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.48
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

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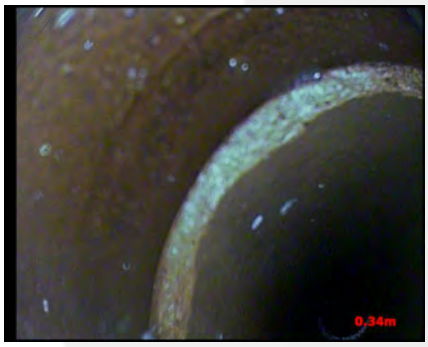
Engineer: DM	Date: 26/03/24	Reference:



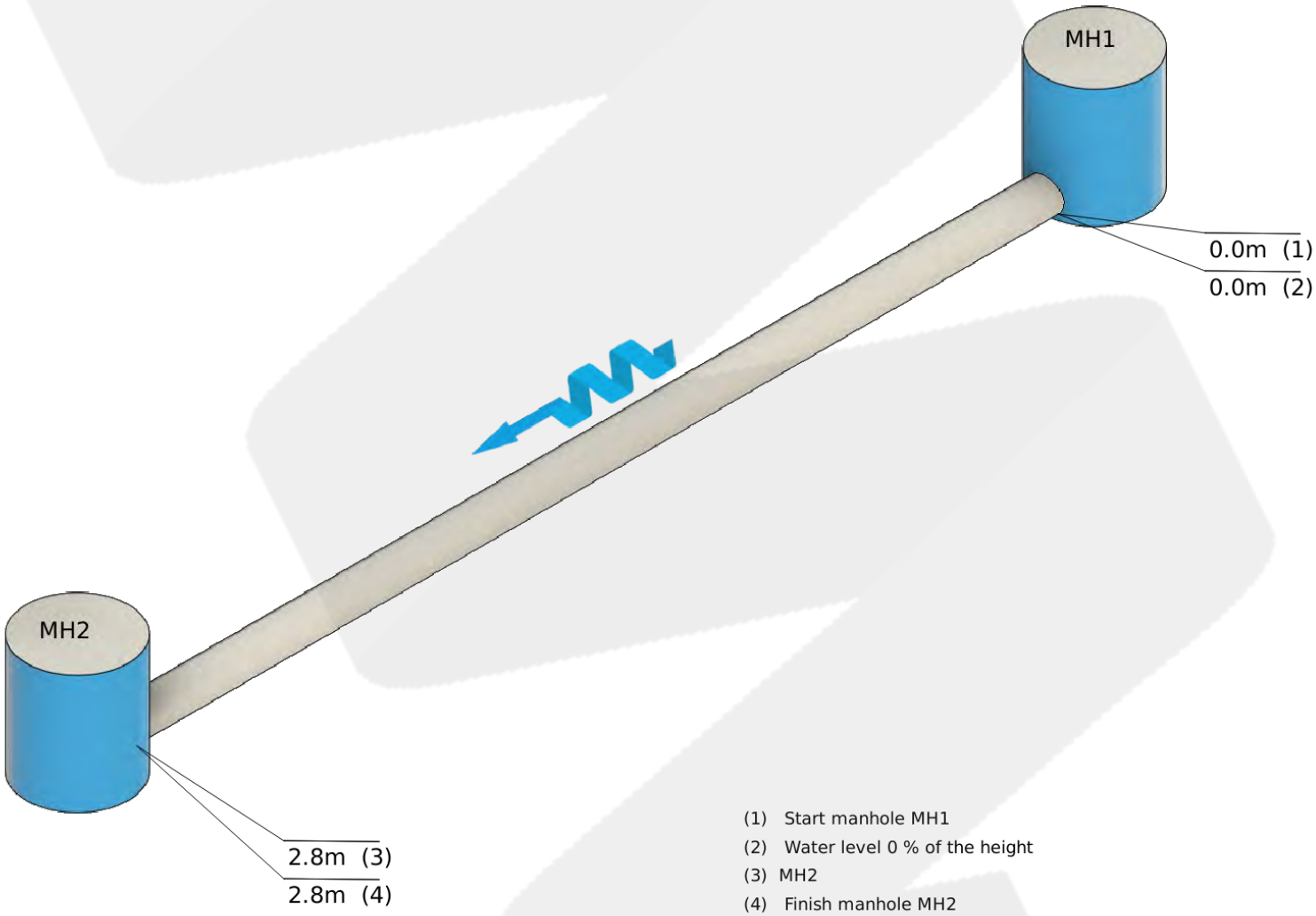
Observation [3]:
JDM

Observation [4]:
JDL

Observation [5]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh1__mh2	Start: MH1	Direction: Downstream	End: MH2
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.48
Date: 2024-03-26	Time: 10:07	Comments:	



(1) Start manhole MH1
(2) Water level 0 % of the height
(3) MH2
(4) Finish manhole MH2

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.48
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

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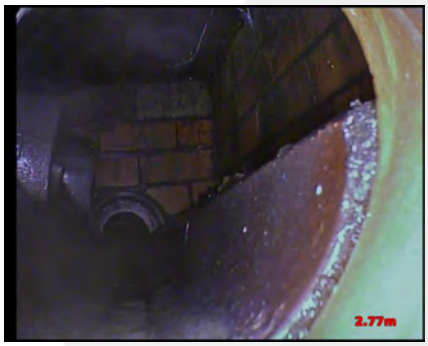
Engineer: DM	Date: 26/03/24	Reference:



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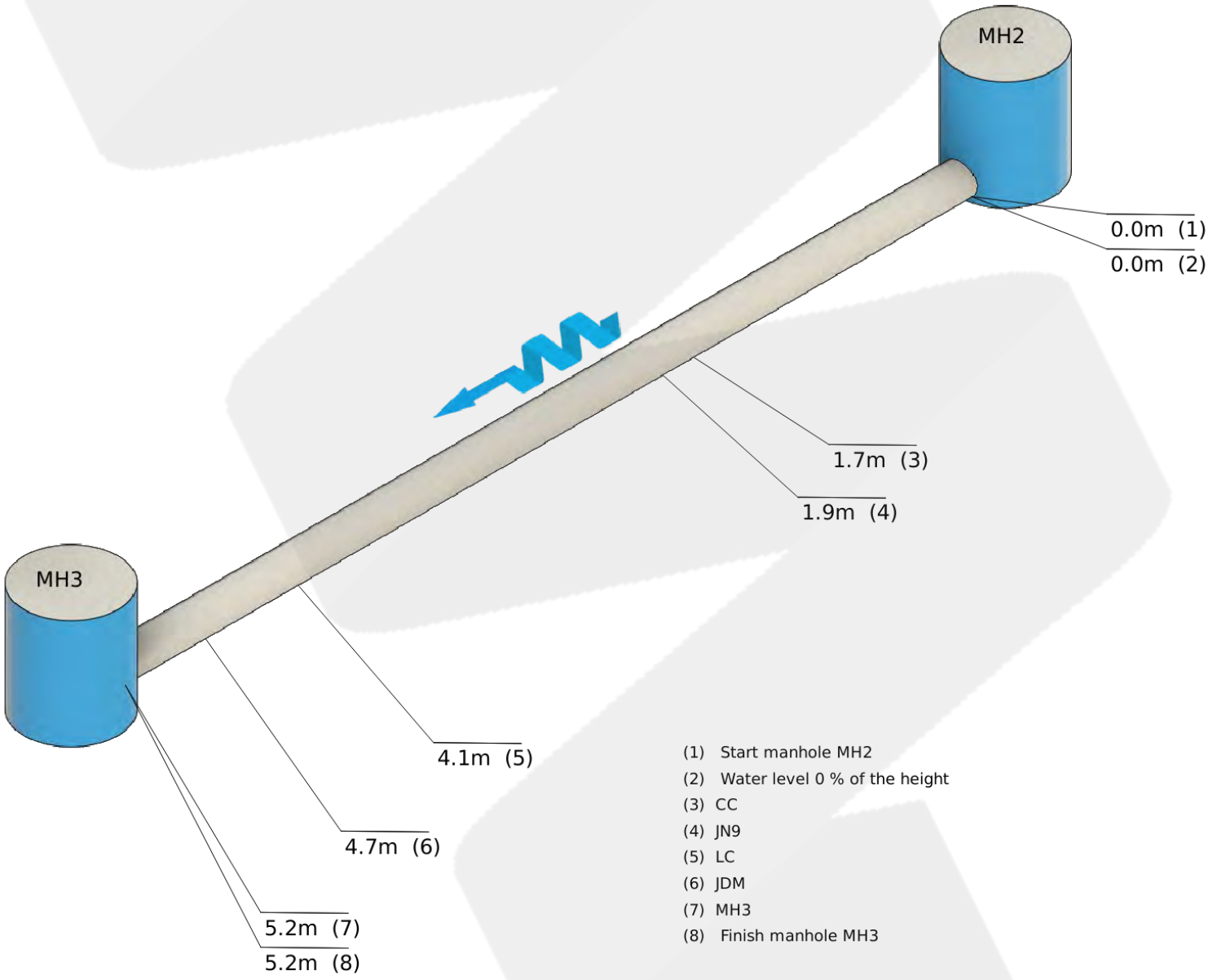
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh2_mh3	Start: MH2	Direction: Downstream	End: MH3
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.55
Date: 2024-03-26	Time: 10:10	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.55
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

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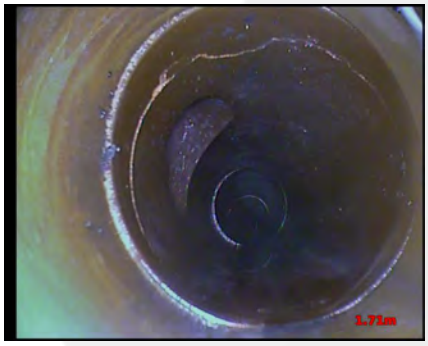
Engineer: DM	Date: 26/03/24	Reference:



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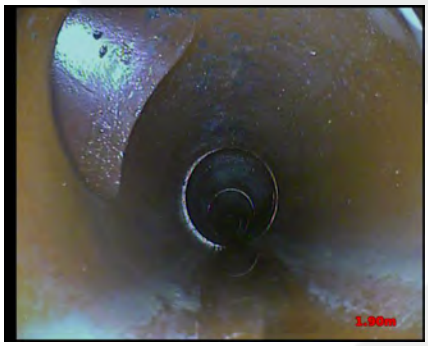


Observation [4]:
JN9

Observation [5]:
LC

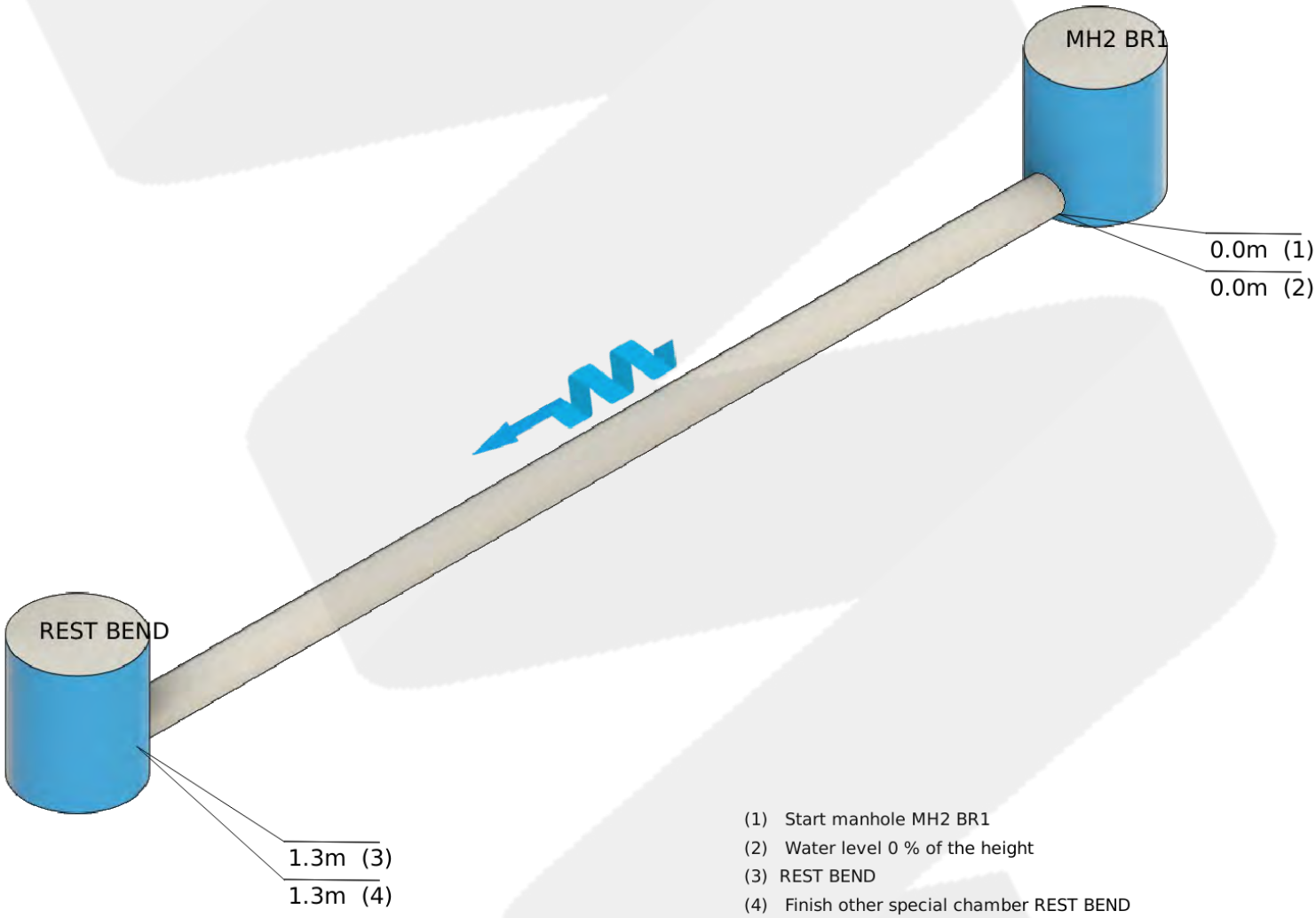
Observation [6]:
JDM

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [7]:
MH3

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh2_br1_rest_bend	Start: MH2 BR1	Direction: Downstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.55
Date: 2024-03-26	Time: 10:12	Comments:	



(1) Start manhole MH2 BR1
(2) Water level 0 % of the height
(3) REST BEND
(4) Finish other special chamber REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.55
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

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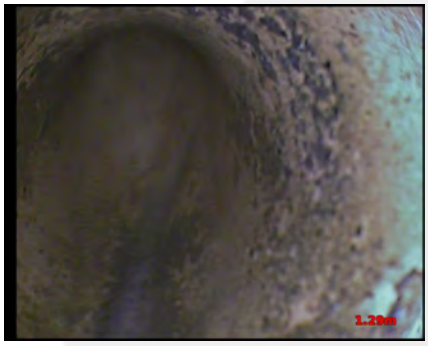
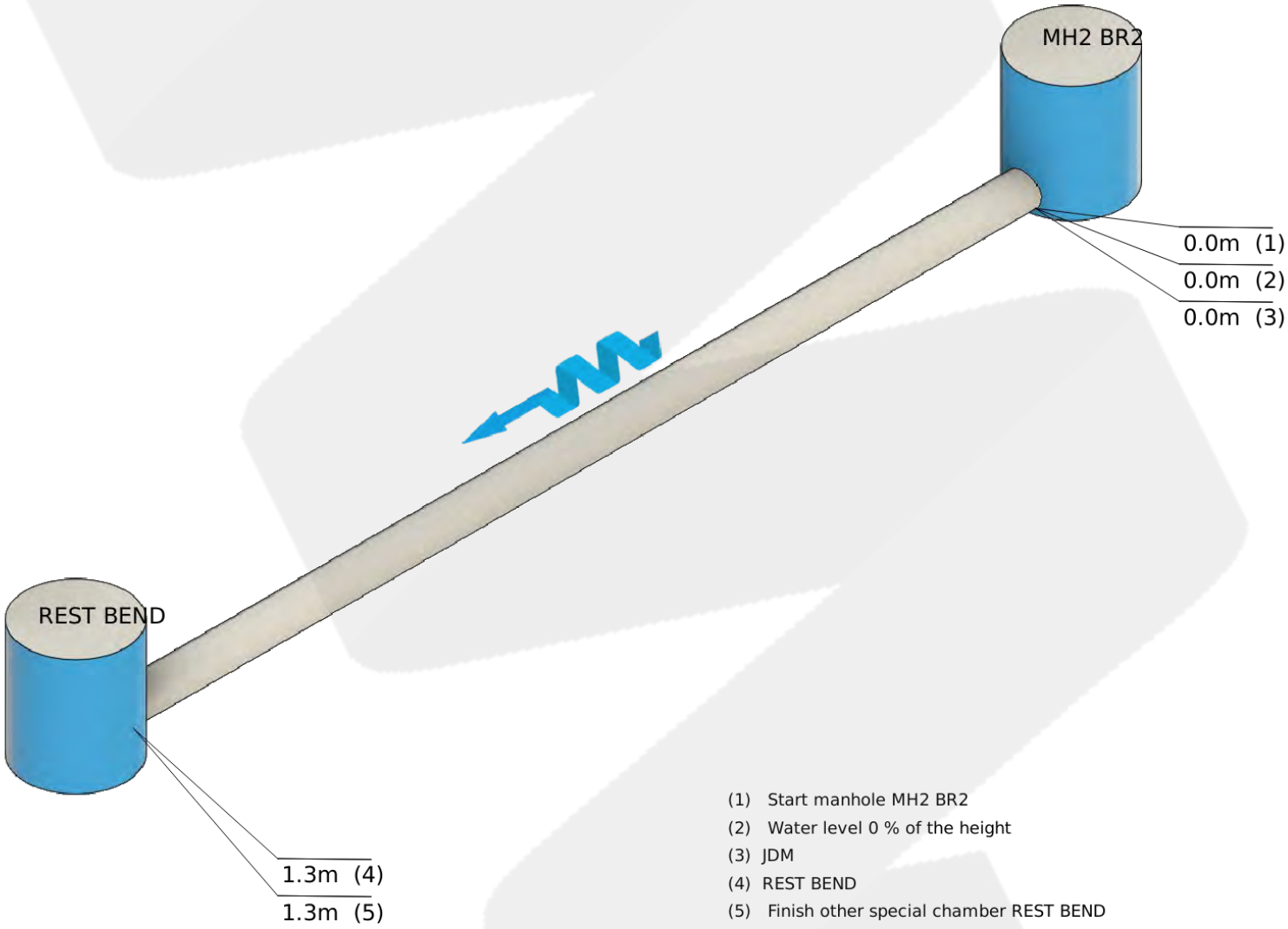
Engineer: DM	Date: 26/03/24	Reference:



Observation [3]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh2_br2_rest_bend	Start: MH2 BR2	Direction: Downstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.55
Date: 2024-03-26	Time: 10:13	Comments:	

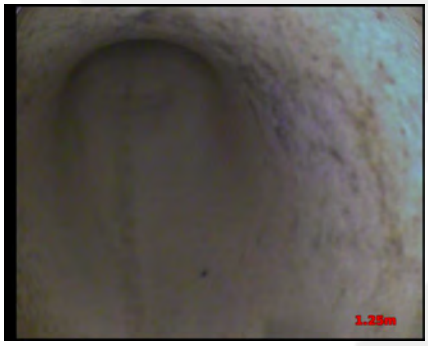


DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.55
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

	Section Images	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JDM



Observation [4]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh2_br3_rest_bend	Start: MH2 BR3	Direction: Downstream	End: GULLY
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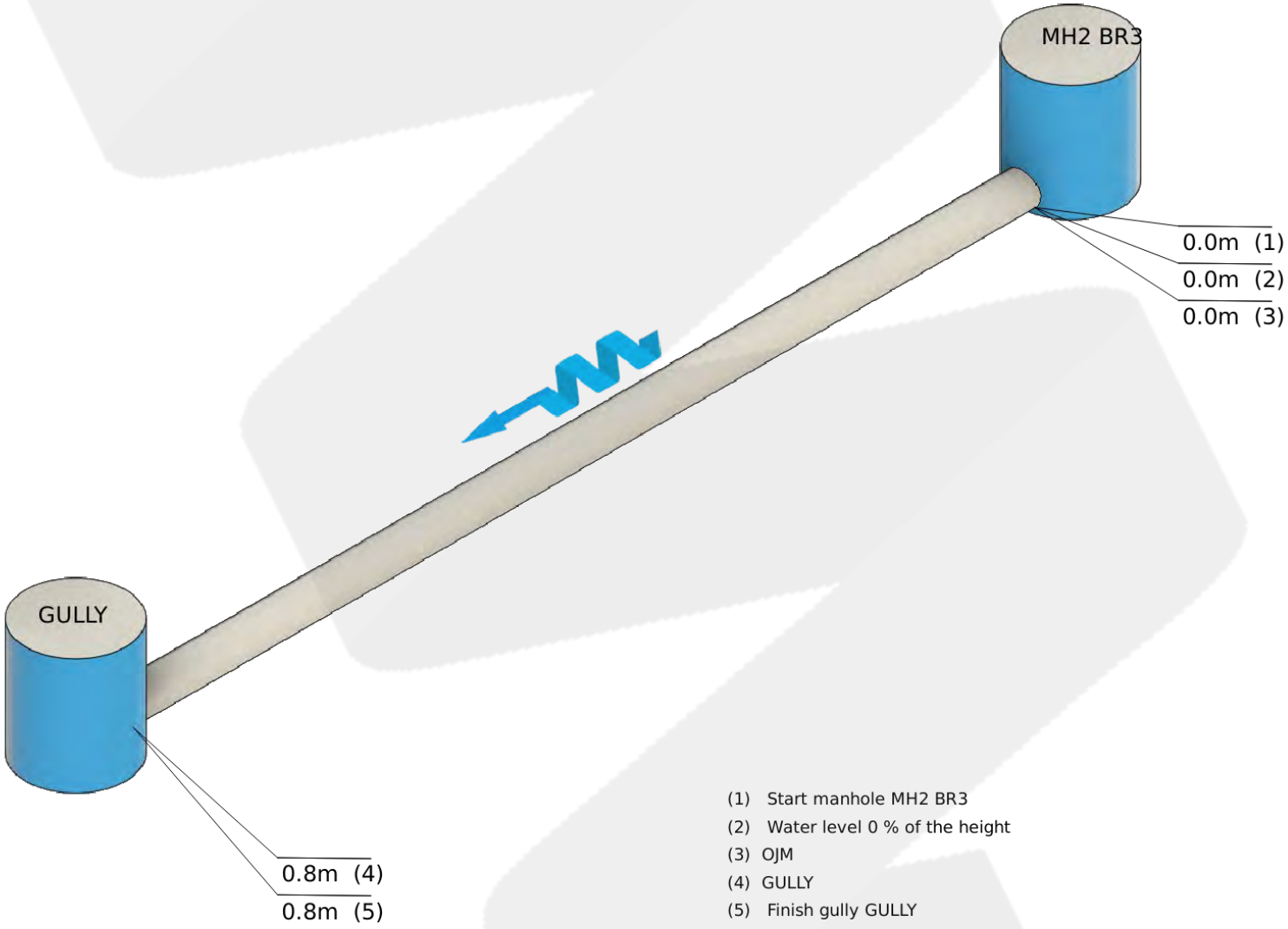
Date: 2024-03-26	Time: 10:15	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.55
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
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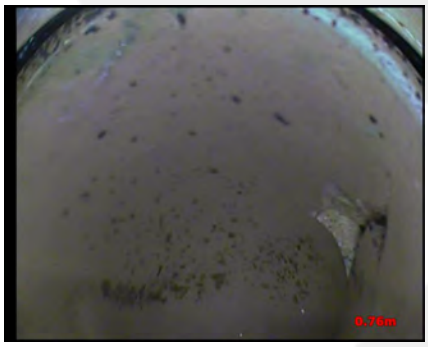
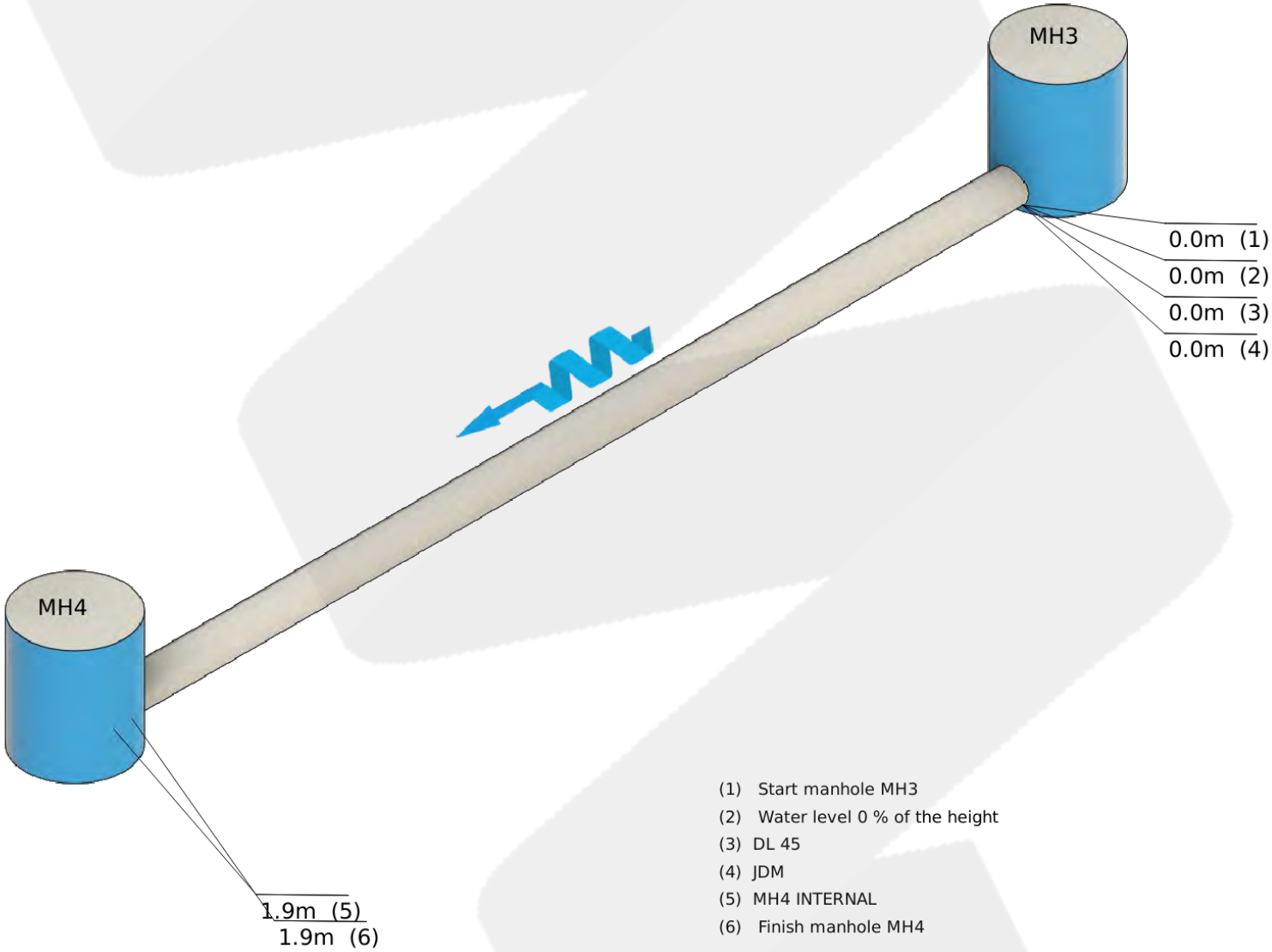


Observation [4]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

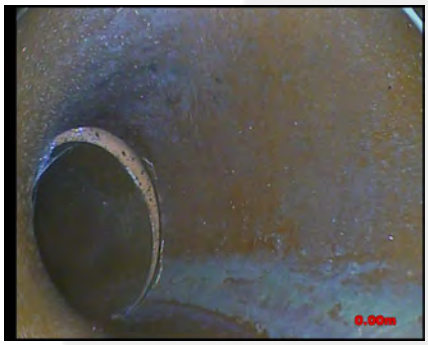
Section Video: mh3_mh4	Start: MH3	Direction: Downstream	End: MH4
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.69
Date: 2024-03-26	Time: 10:32	Comments:	



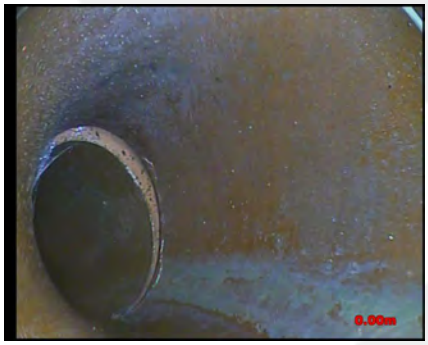
DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.69
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [3]:
DL 45

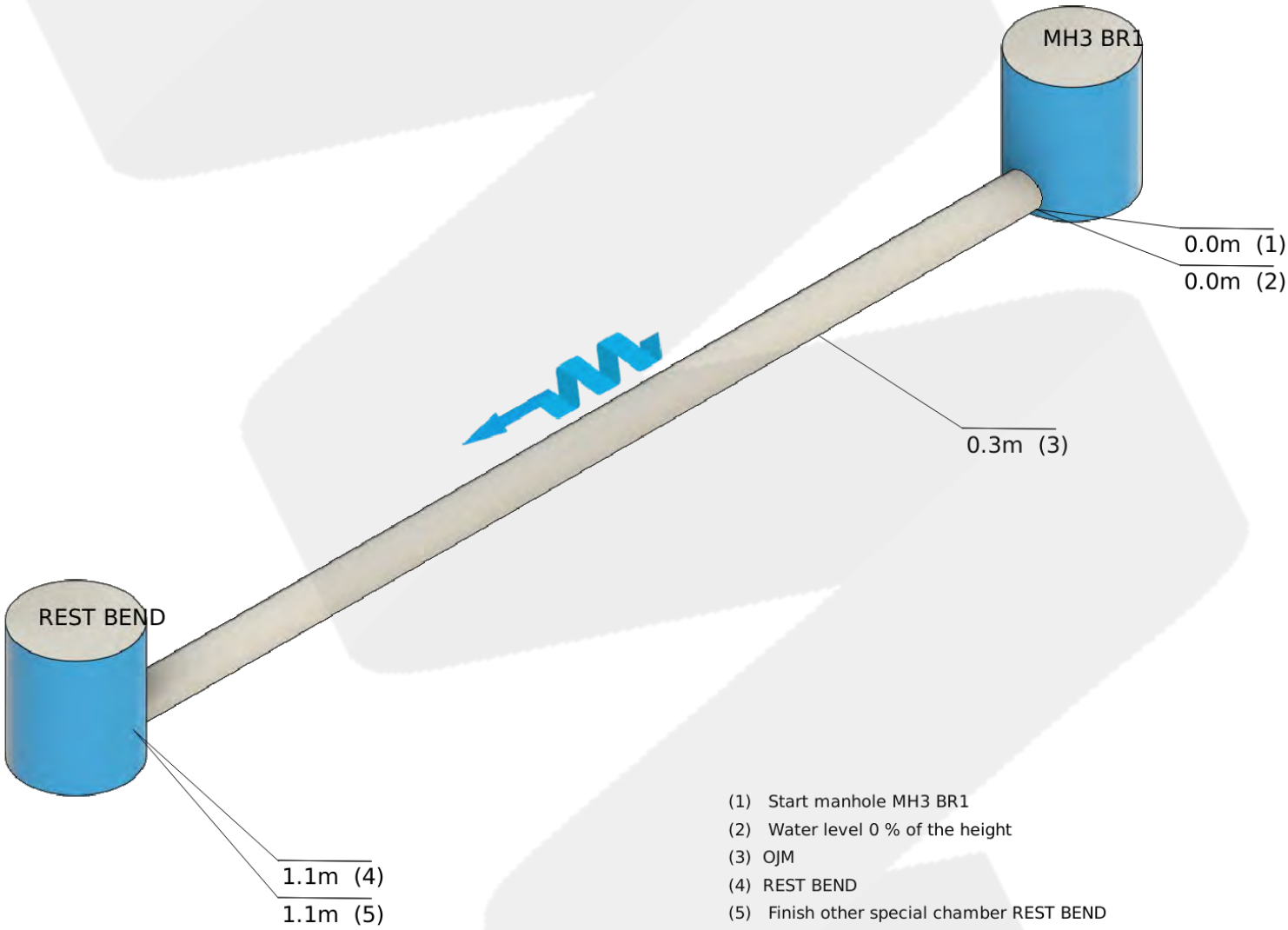


Observation [4]:
JDM

Observation [5]:
MH4 INTERNAL

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

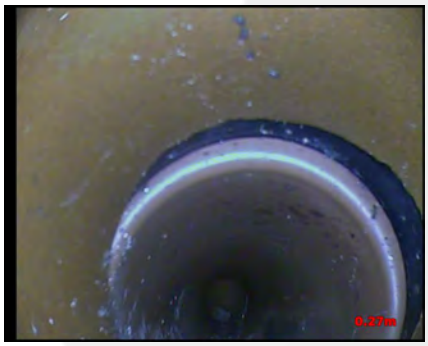
Section Video: mh3_br1_rest_bend	Start: MH3 BR1	Direction: Downstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.69
Date: 2024-03-26	Time: 10:33	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.69
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

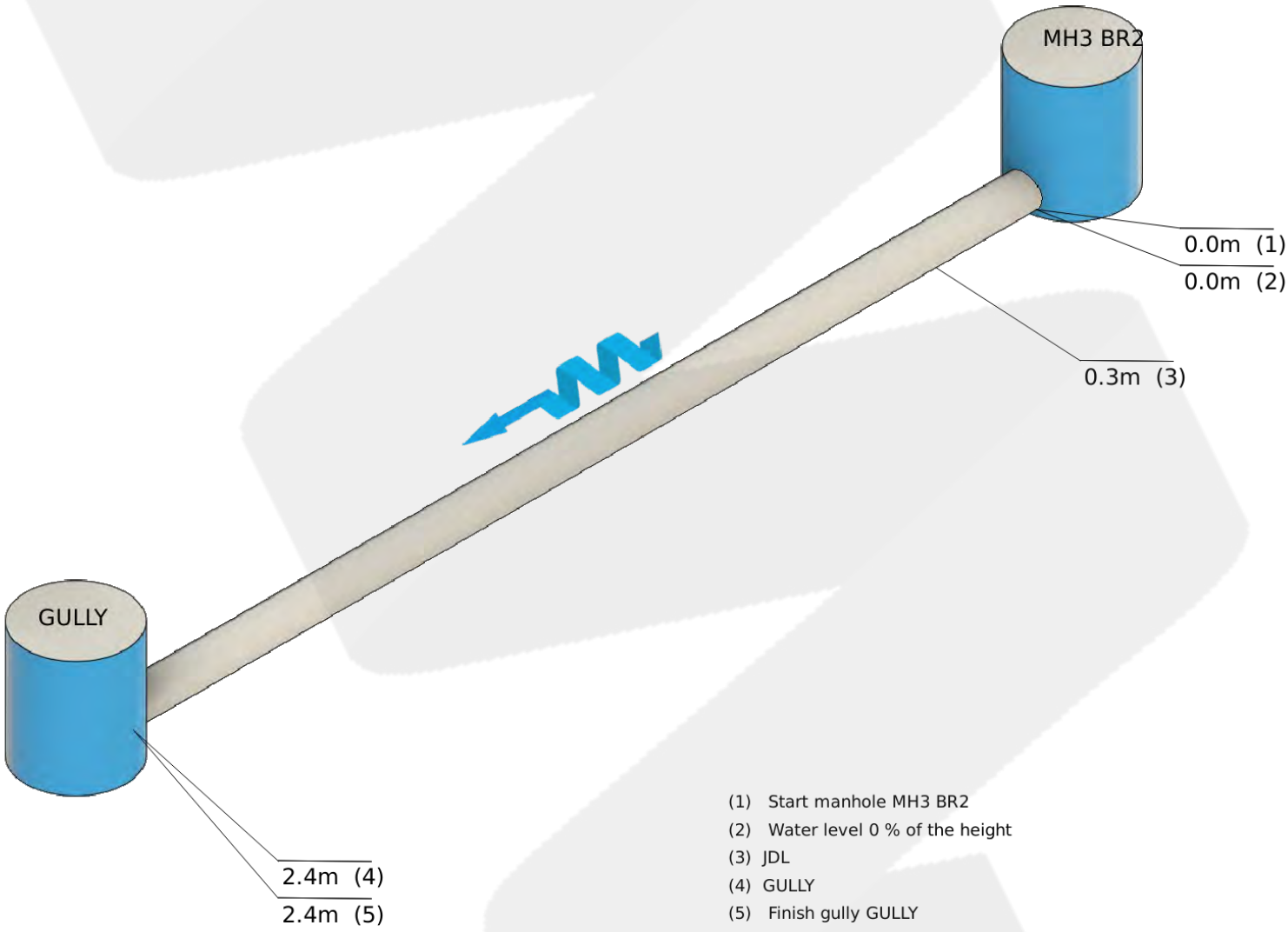


Observation [3]:
OJM

Observation [4]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

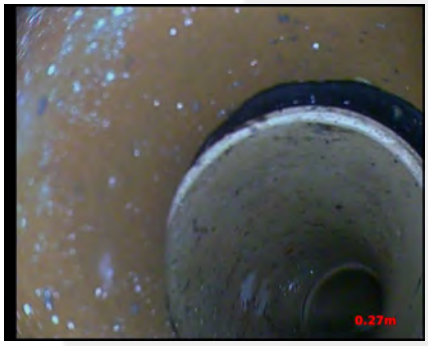
Section Video: mh3_br2_rest_bend	Start: MH3 BR2	Direction: Downstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.69
Date: 2024-03-26	Time: 10:35	Comments:	



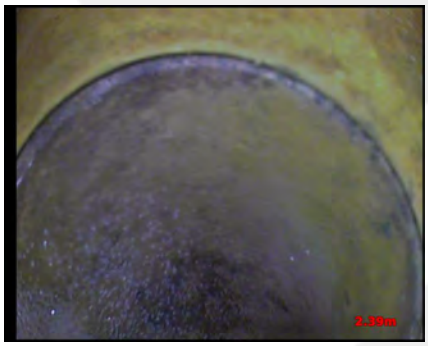
DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.69
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



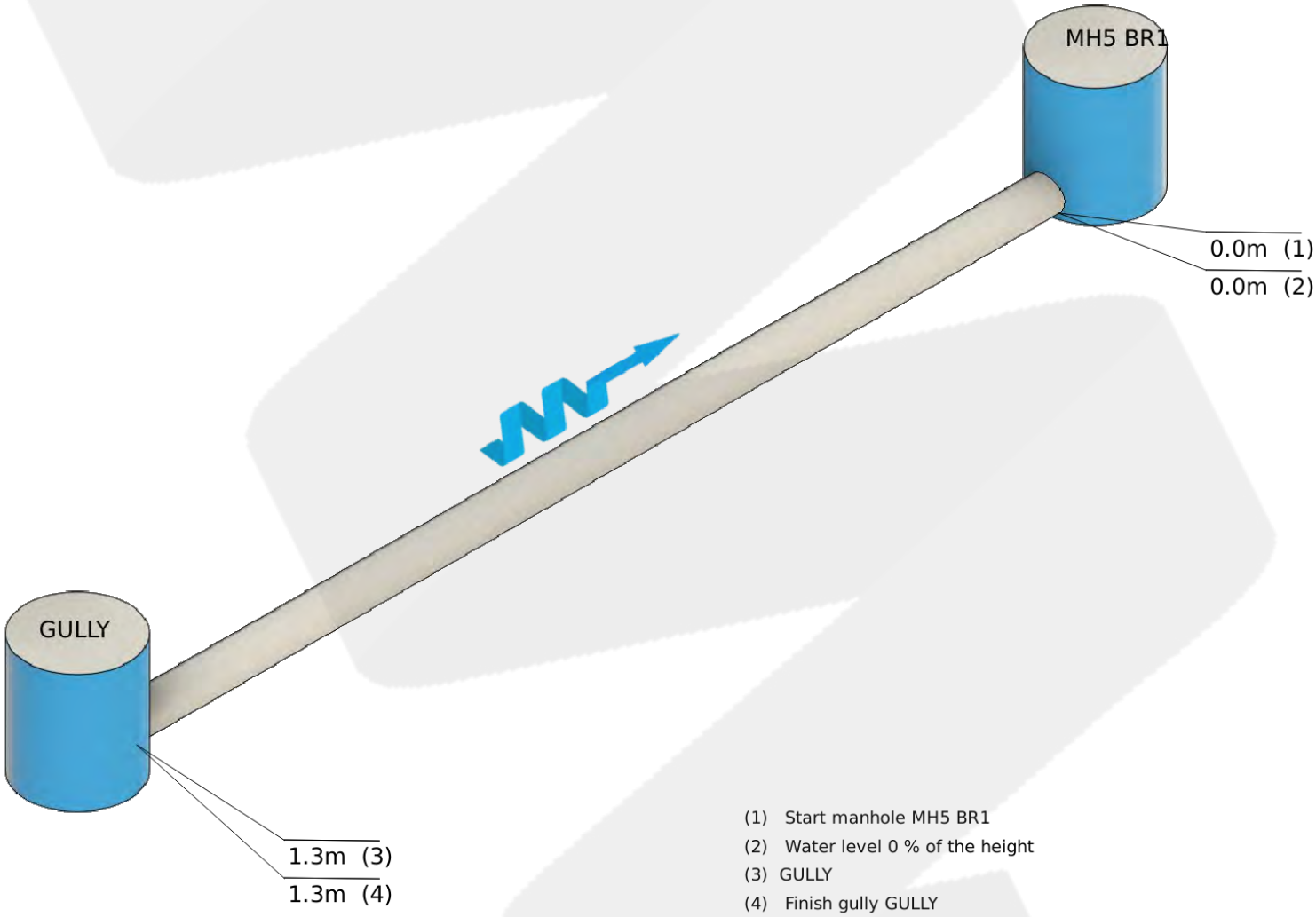
Observation [3]:
JDL



Observation [4]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

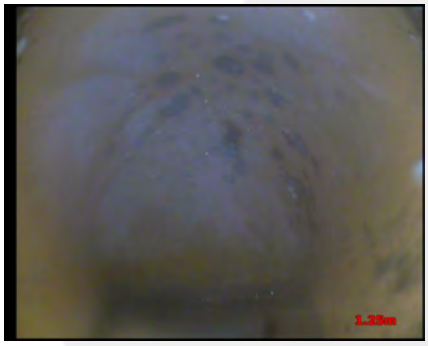
Section Video: mh5_br1_gully	Start: MH5 BR1	Direction: Upstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.45
Date: 2024-03-26	Time: 10:41	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.45
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

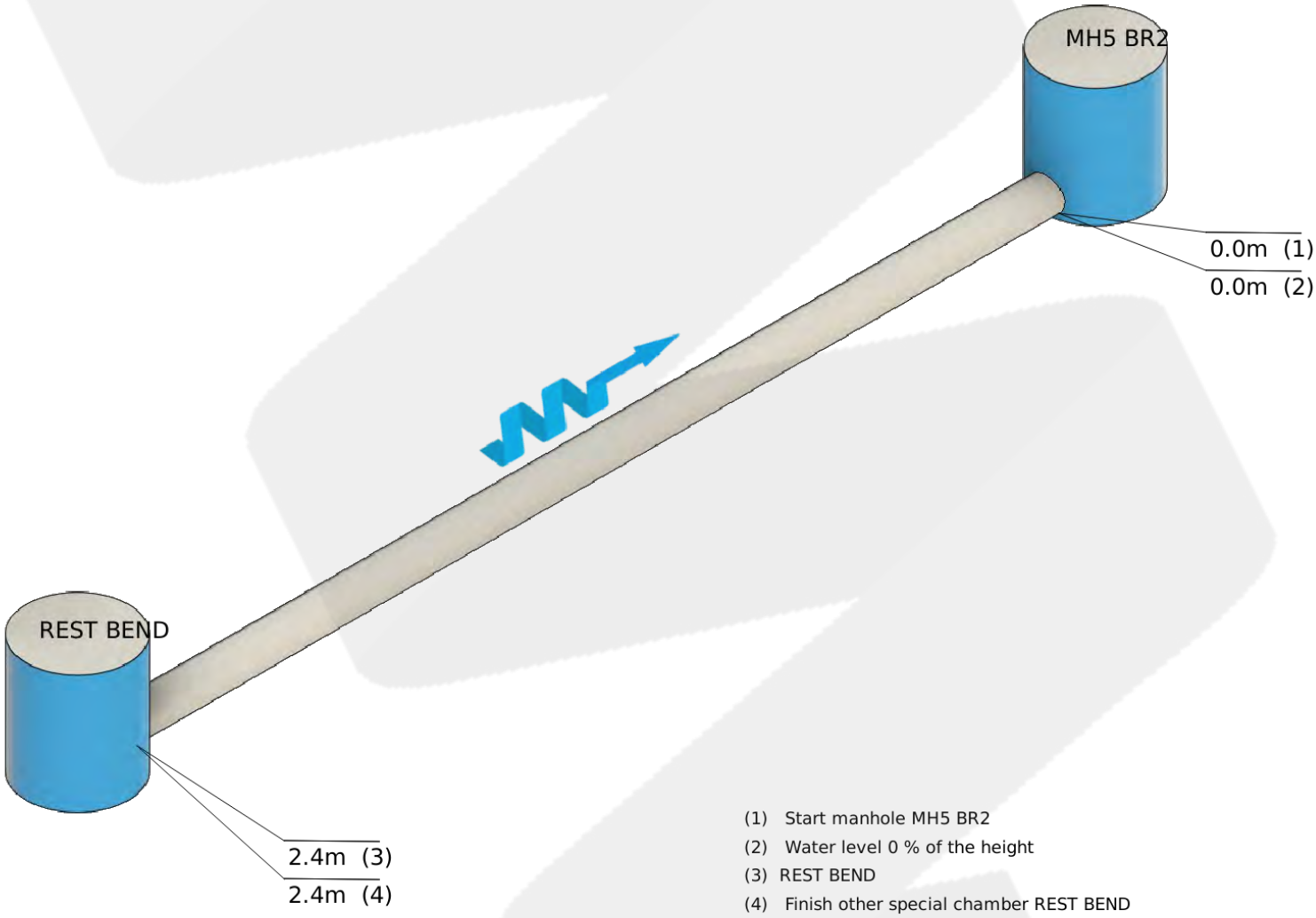
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [3]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh5_br2_rest_bend	Start: MH5 BR2	Direction: Upstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.45
Date: 2024-03-26	Time: 10:43	Comments:	



(1) Start manhole MH5 BR2
(2) Water level 0 % of the height
(3) REST BEND
(4) Finish other special chamber REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

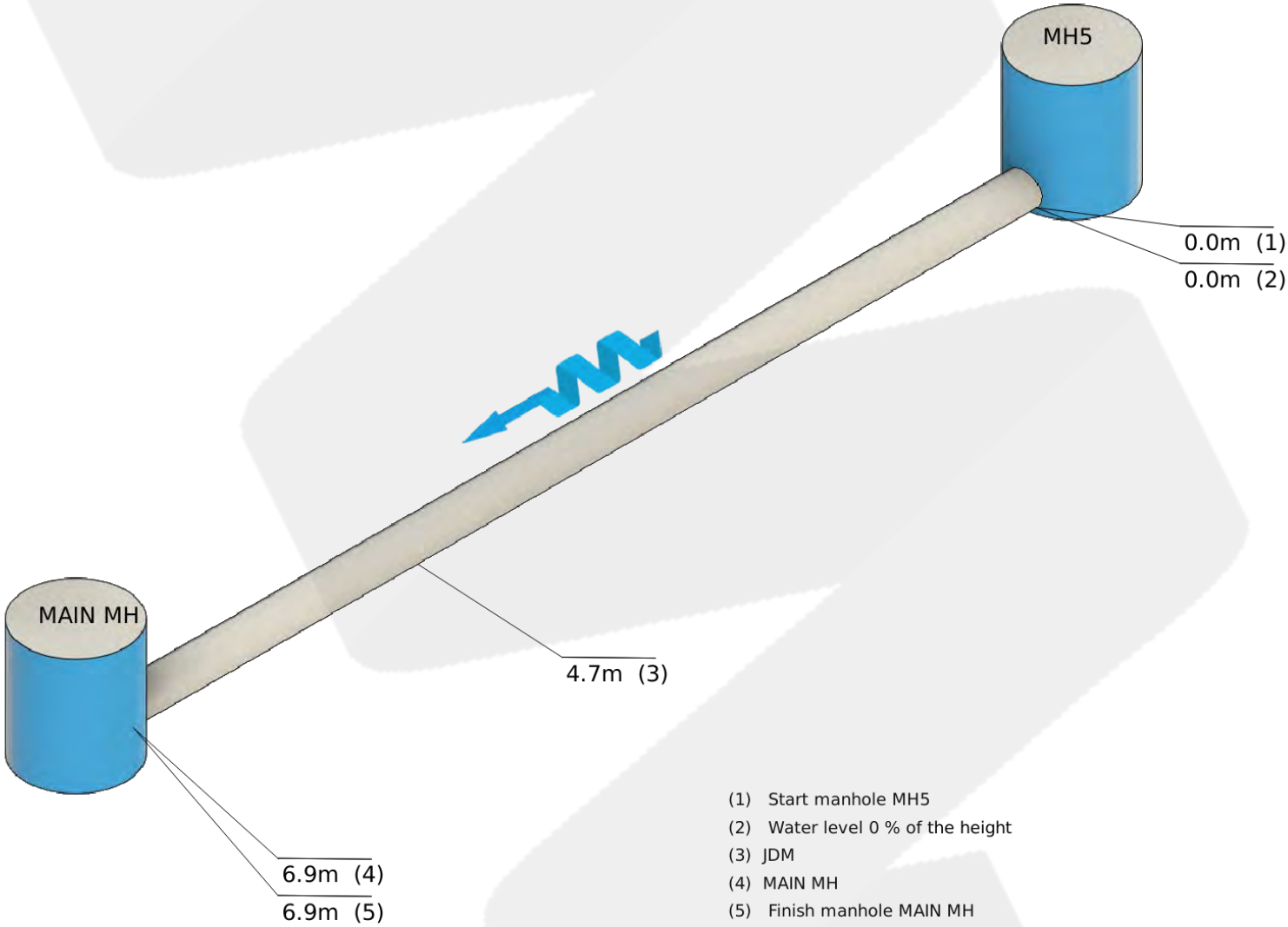
Additional Information	
Invert Depth	00.45
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh5__z	Start: MH5	Direction: Downstream	End: MAIN MH
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.45
Date: 2024-03-26	Time: 10:44	Comments:	

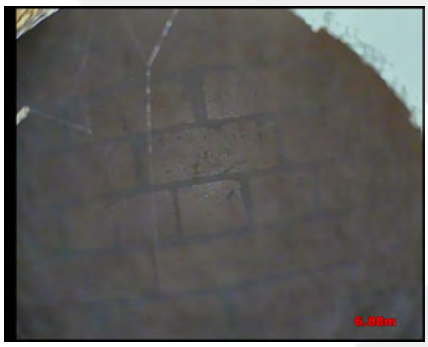


DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.45
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

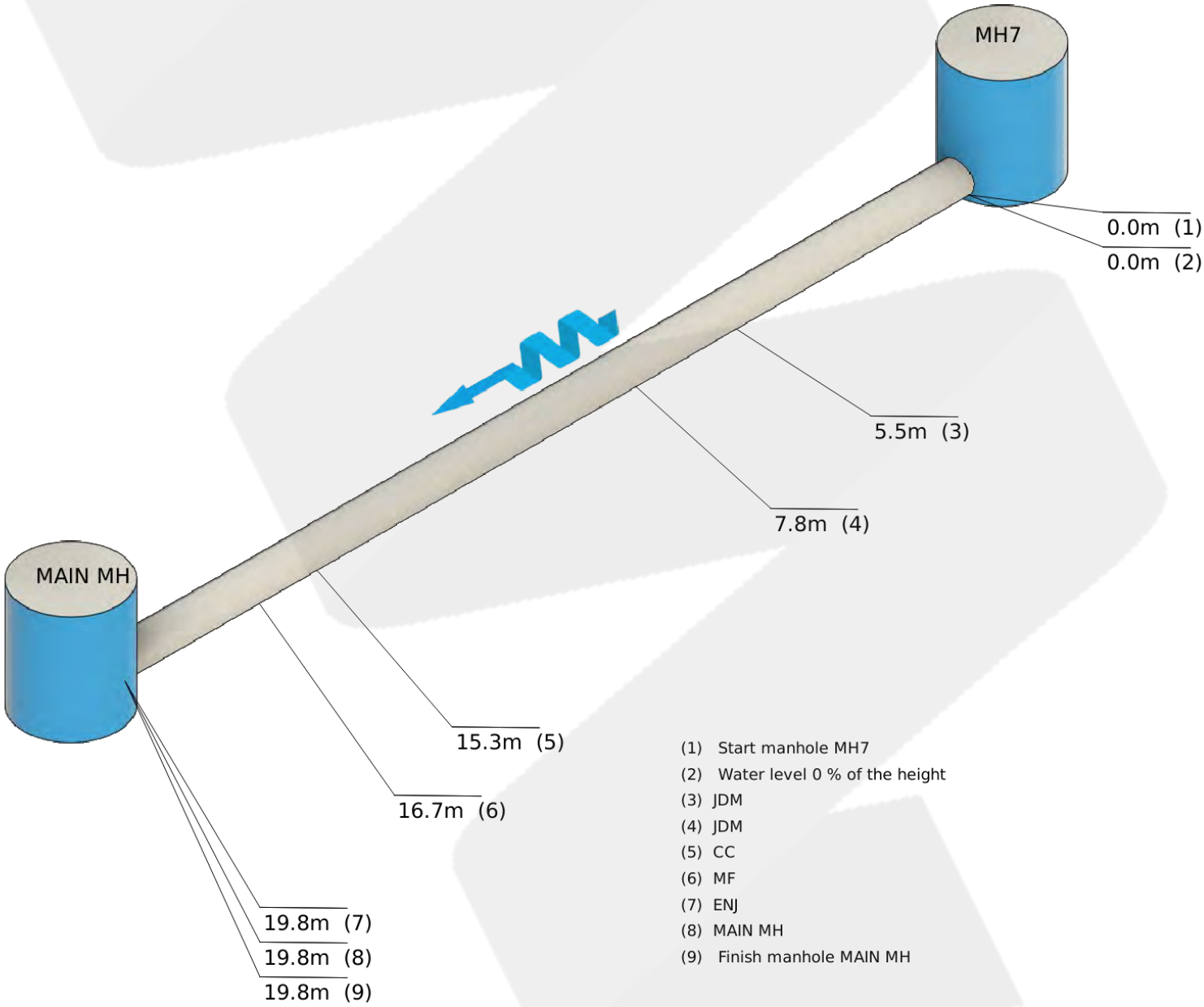
Observation [3]:
JDM



Observation [4]:
MAIN MH

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh7_main_mh	Start: MH7	Direction: Downstream	End: MAIN MH
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 01.20
Date: 2024-03-26	Time: 10:51	Comments:	

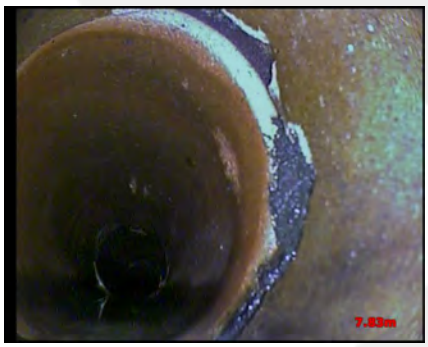


DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

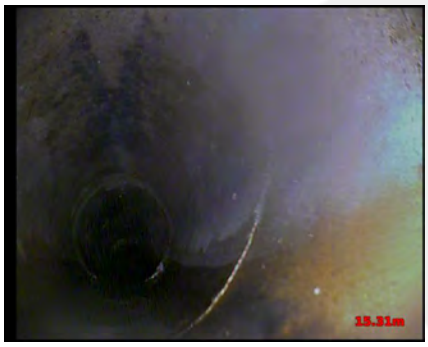
Additional Information	
Invert Depth	01.20
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

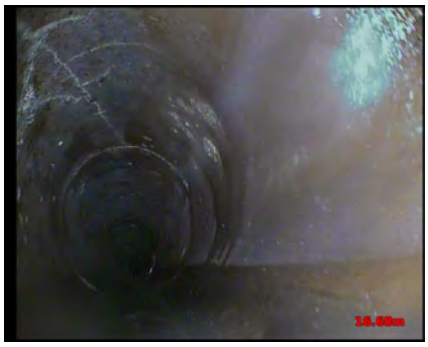
Observation [3]:
JDM



Observation [4]:
JDM



Observation [5]:
CC



Observation [6]:
MF

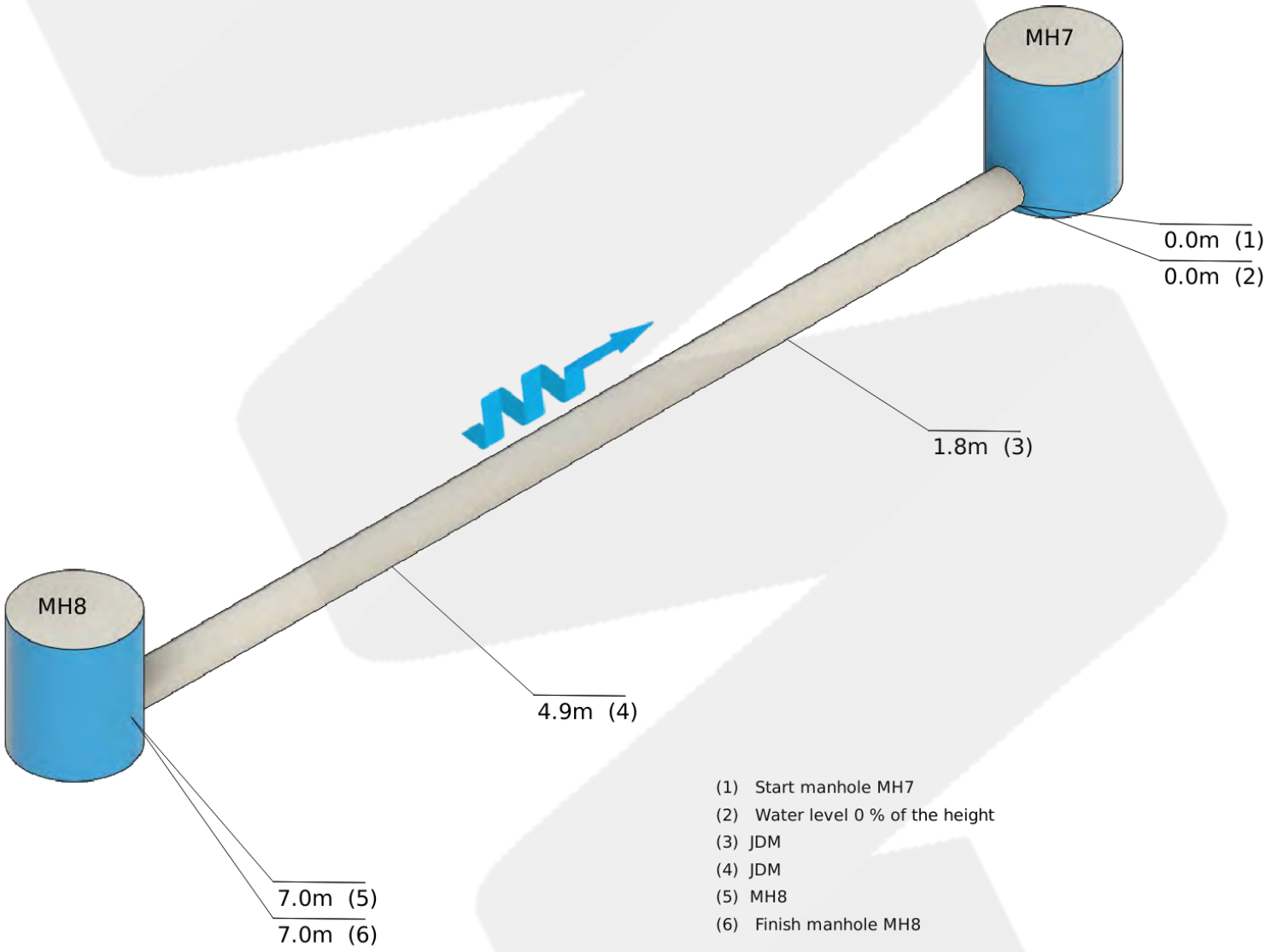
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [7]:
ENJ

Observation [8]:
MAIN MH

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

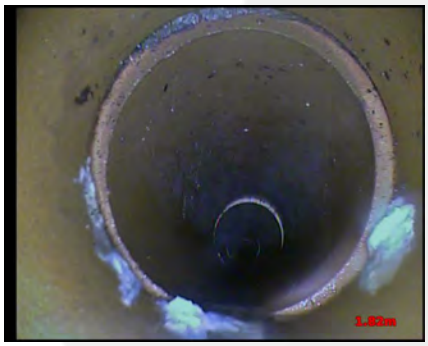
Section Video: mh7_mh8	Start: MH7	Direction: Upstream	End: MH8
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 01.20
Date: 2024-03-26	Time: 10:57	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	01.20
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



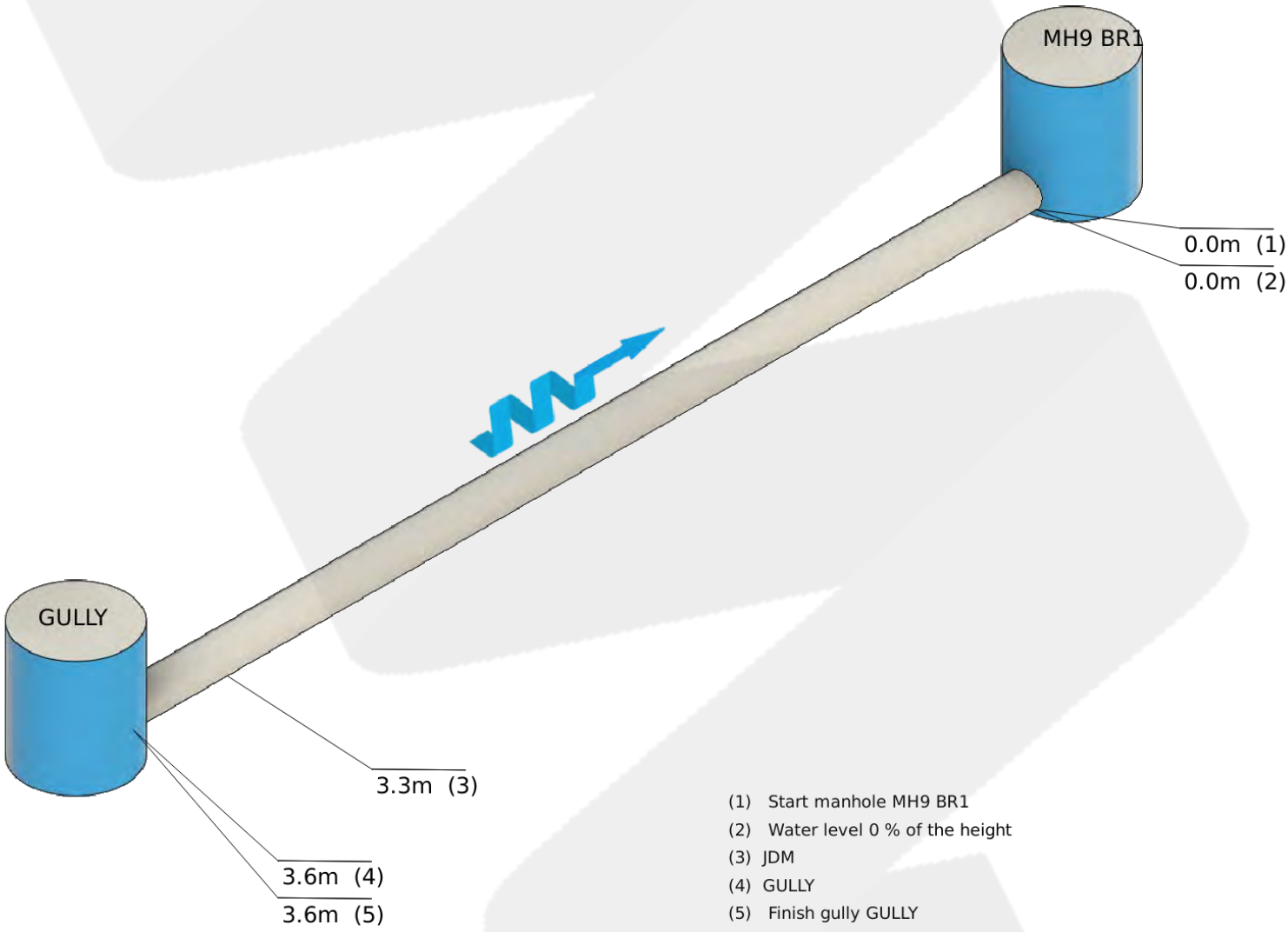
Observation [3]:
JDM

Observation [4]:
JDM

Observation [5]:
MH8

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

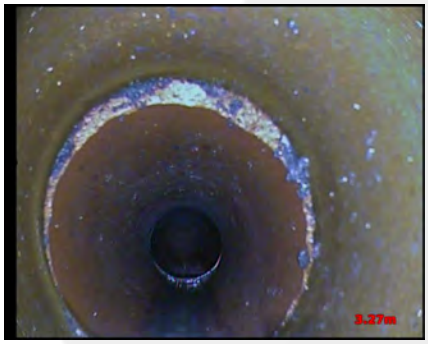
Section Video: mh9_br1_rest_bend	Start: MH9 BR1	Direction: Upstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.90
Date: 2024-03-26	Time: 11:01	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.90
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

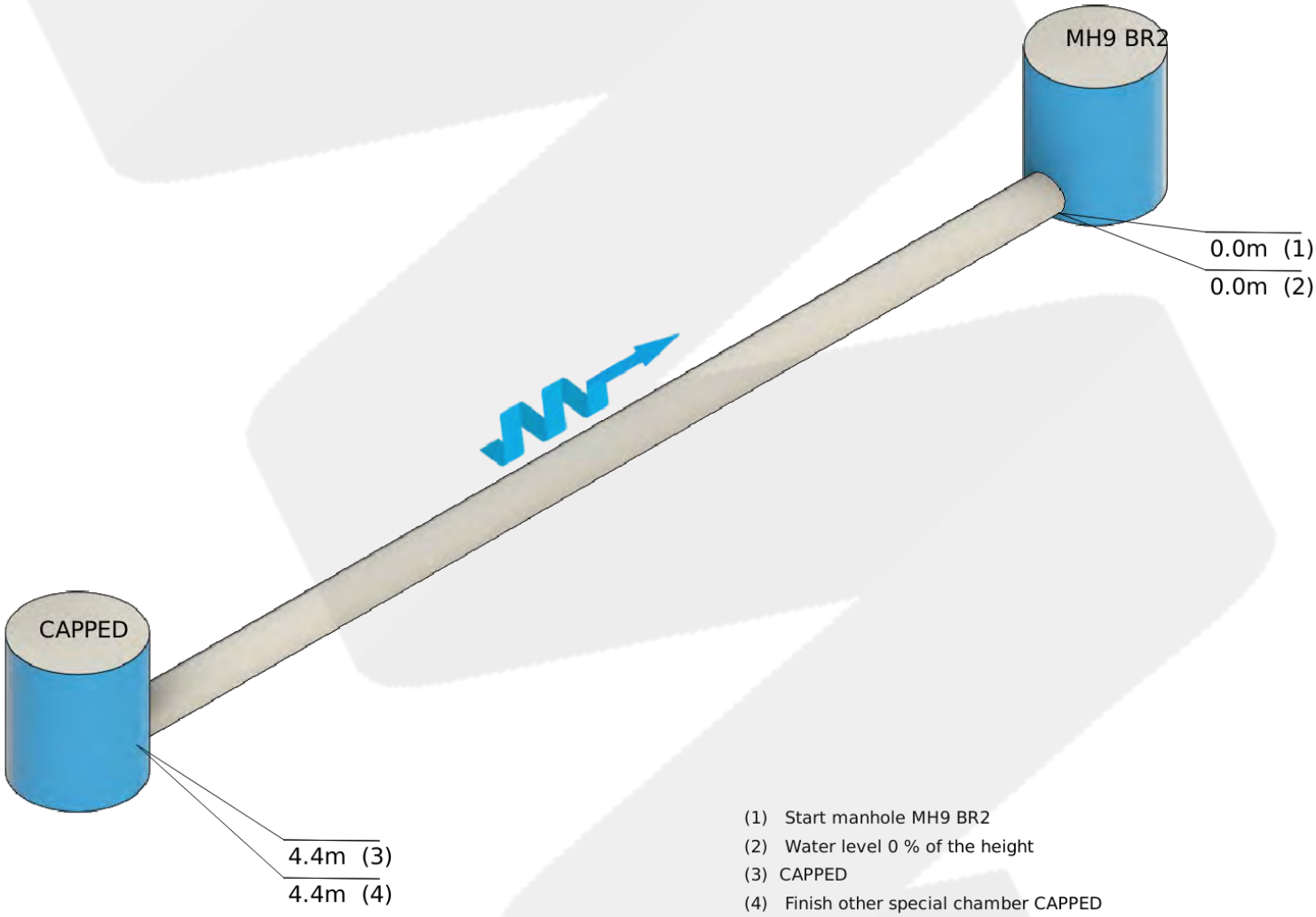


Observation [3]:
JDM

Observation [4]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh9_br2_gully	Start: MH9 BR2	Direction: Upstream	End: CAPPED
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.90
Date: 2024-03-26	Time: 11:04	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

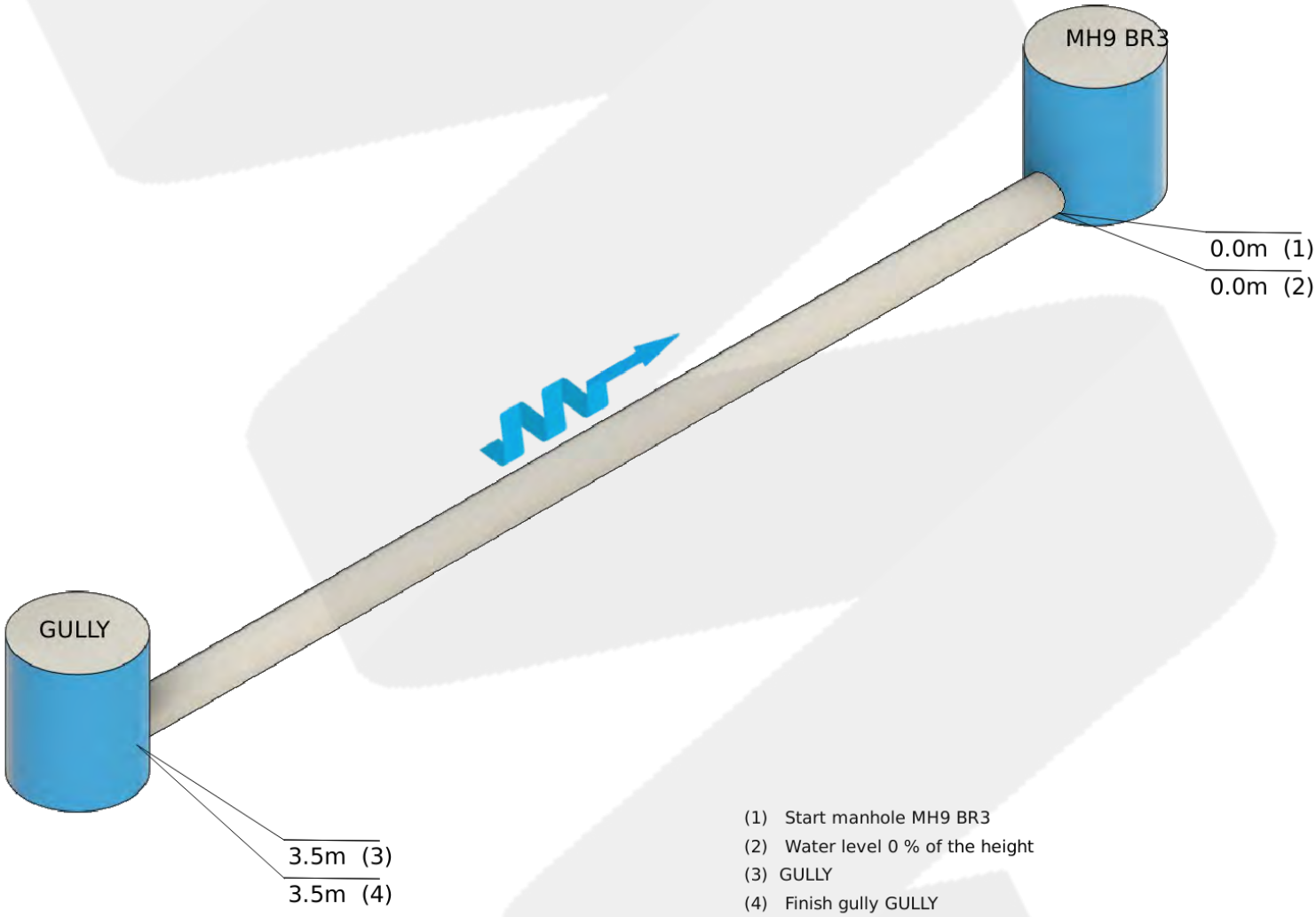
Additional Information	
Invert Depth	00.90
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
CAPPED

	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

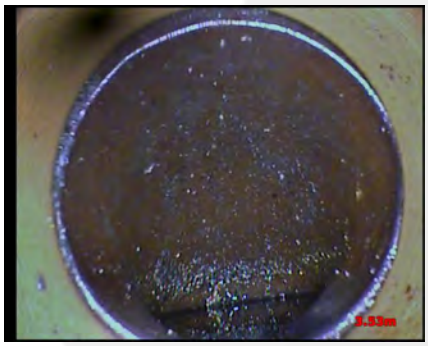
Section Video: mh9_br3_z	Start: MH9 BR3	Direction: Upstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.90
Date: 2024-03-26	Time: 11:06	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.90
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

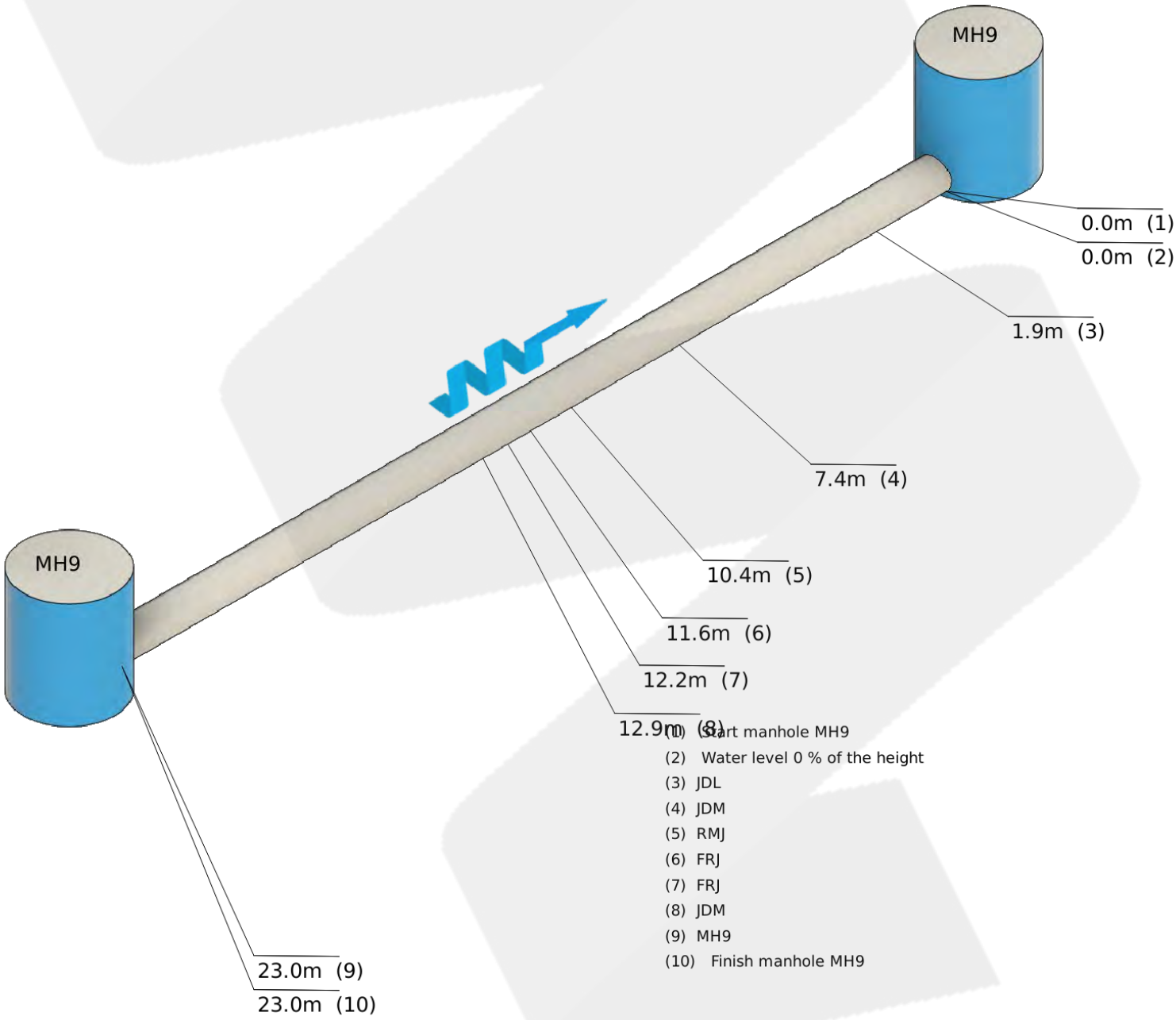
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [3]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh9__z	Start: MH9	Direction: Upstream	End: MH9
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.90
Date: 2024-03-26	Time: 11:07	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.90
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JDL

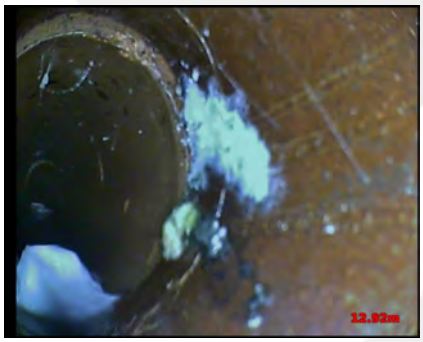
Observation [4]:
JDM

Observation [5]:
RMJ

Observation [6]:
FRJ

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [7]:
FRJ

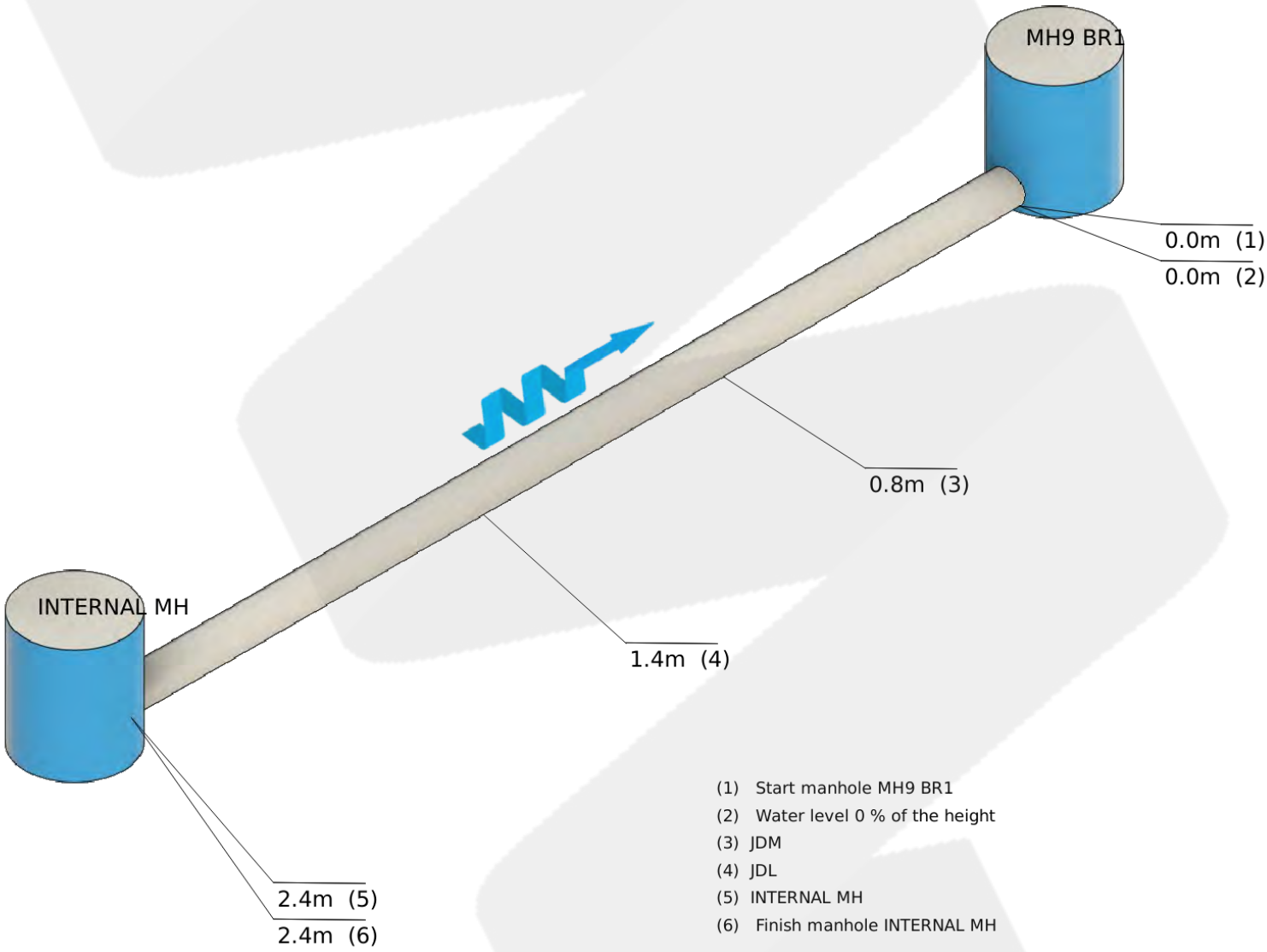


Observation [8]:
JDM

Observation [9]:
MH9

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

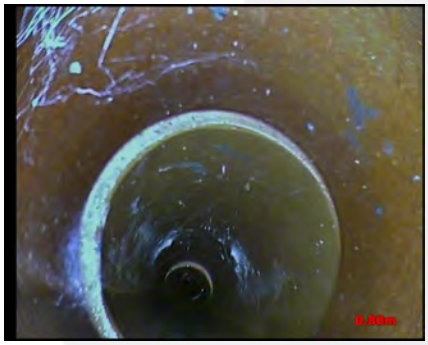
Section Video: mh9_br1_rest_bend(1)	Start: MH9 BR1	Direction: Upstream	End: INTERNAL MH
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.30
Date: 2024-03-26	Time: 11:17	Comments:	



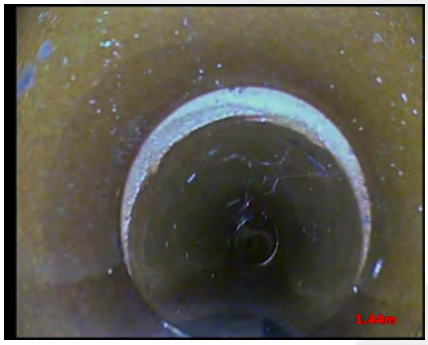
	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.30
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [3]:
JDM

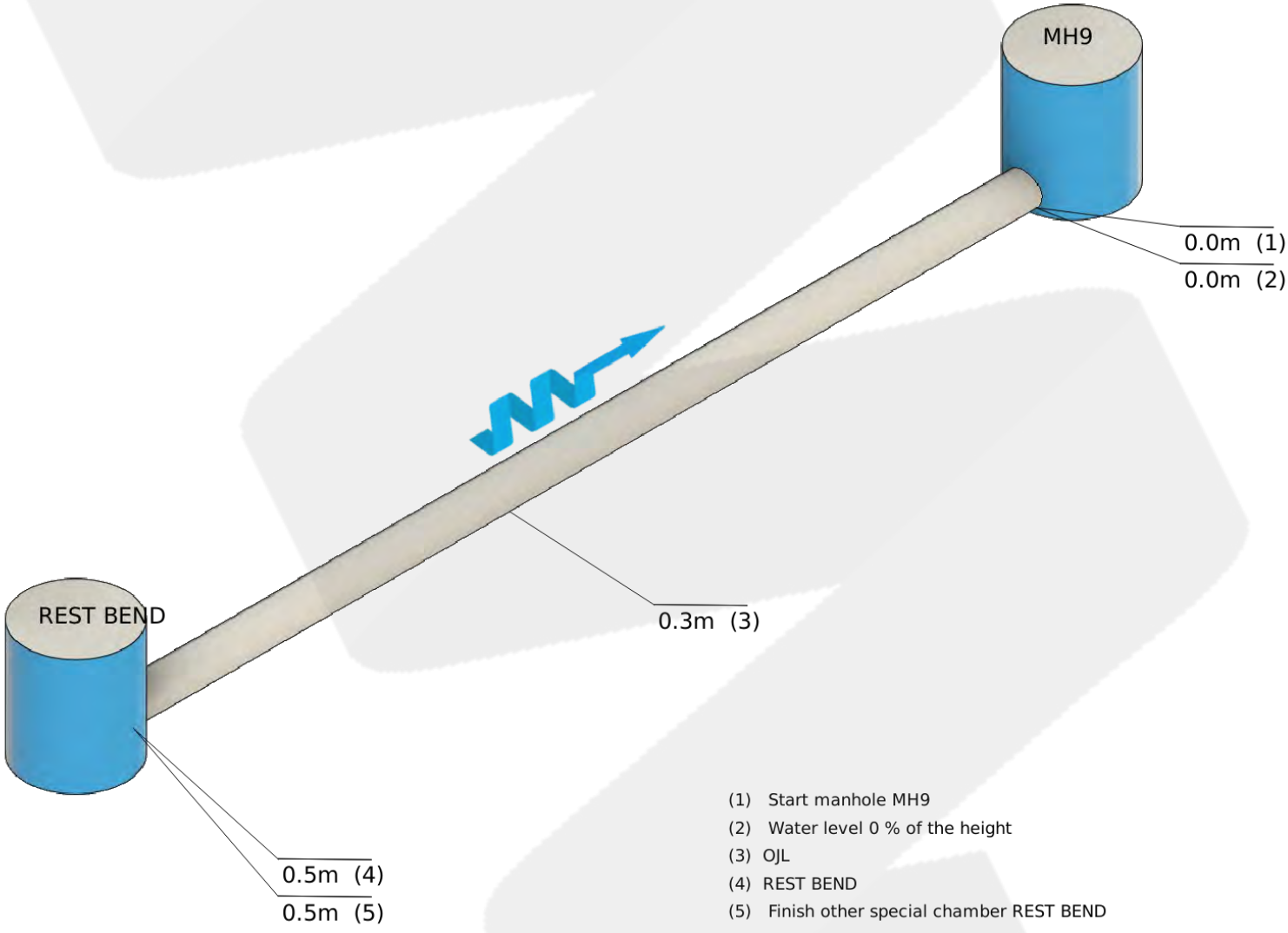


Observation [4]:
JDL

Observation [5]:
INTERNAL MH

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh9__z(1)	Start: MH9	Direction: Upstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.30
Date: 2024-03-26	Time: 11:19	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.30
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

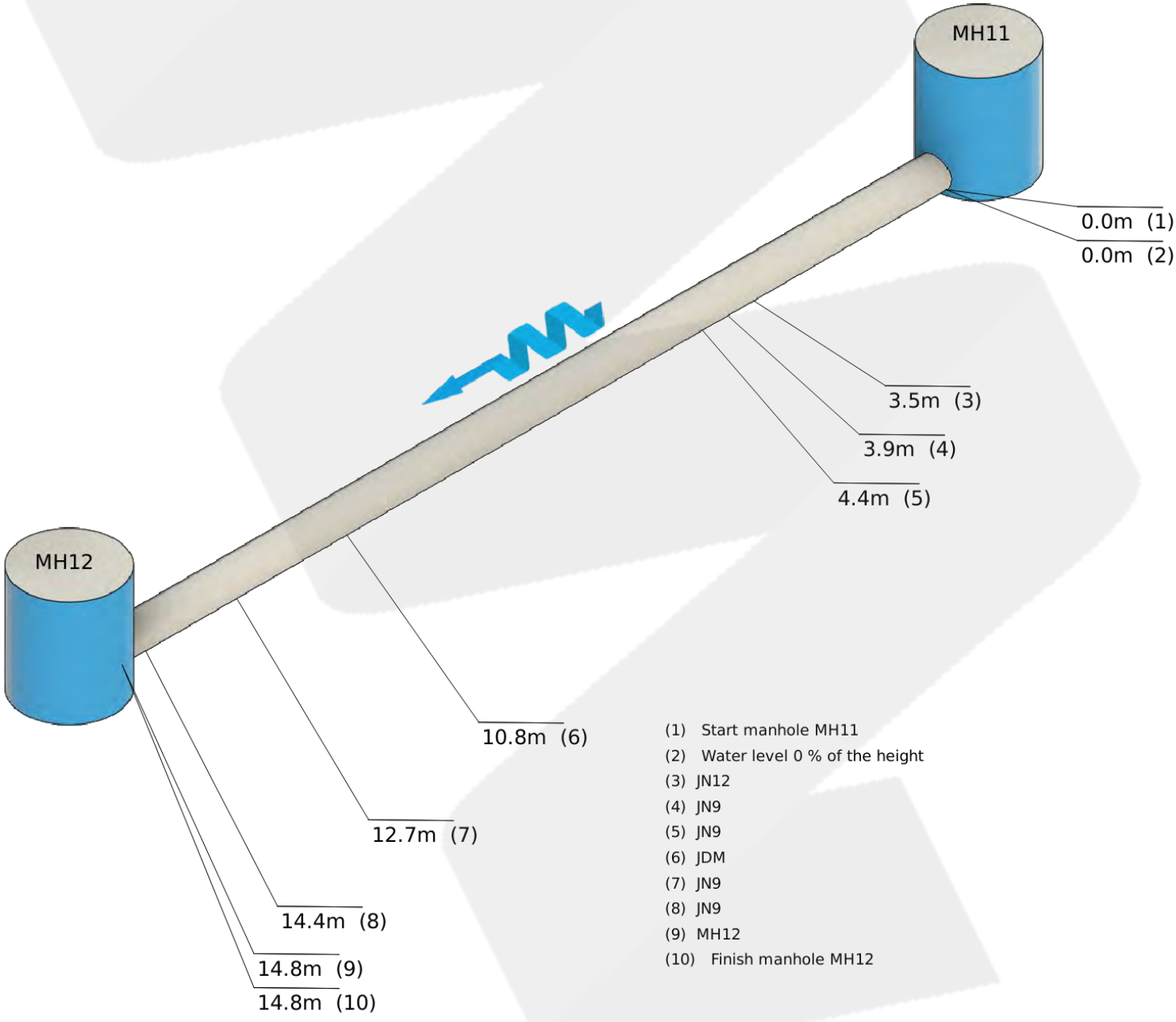
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
OJL

Observation [4]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh11_mh12	Start: MH11	Direction: Downstream	End: MH12
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 00.60
Date: 2024-03-26	Time: 11:35	Comments:	



	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.60
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JN12

Observation [4]:
JN9

Observation [5]:
JN9

Observation [6]:
JDM

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

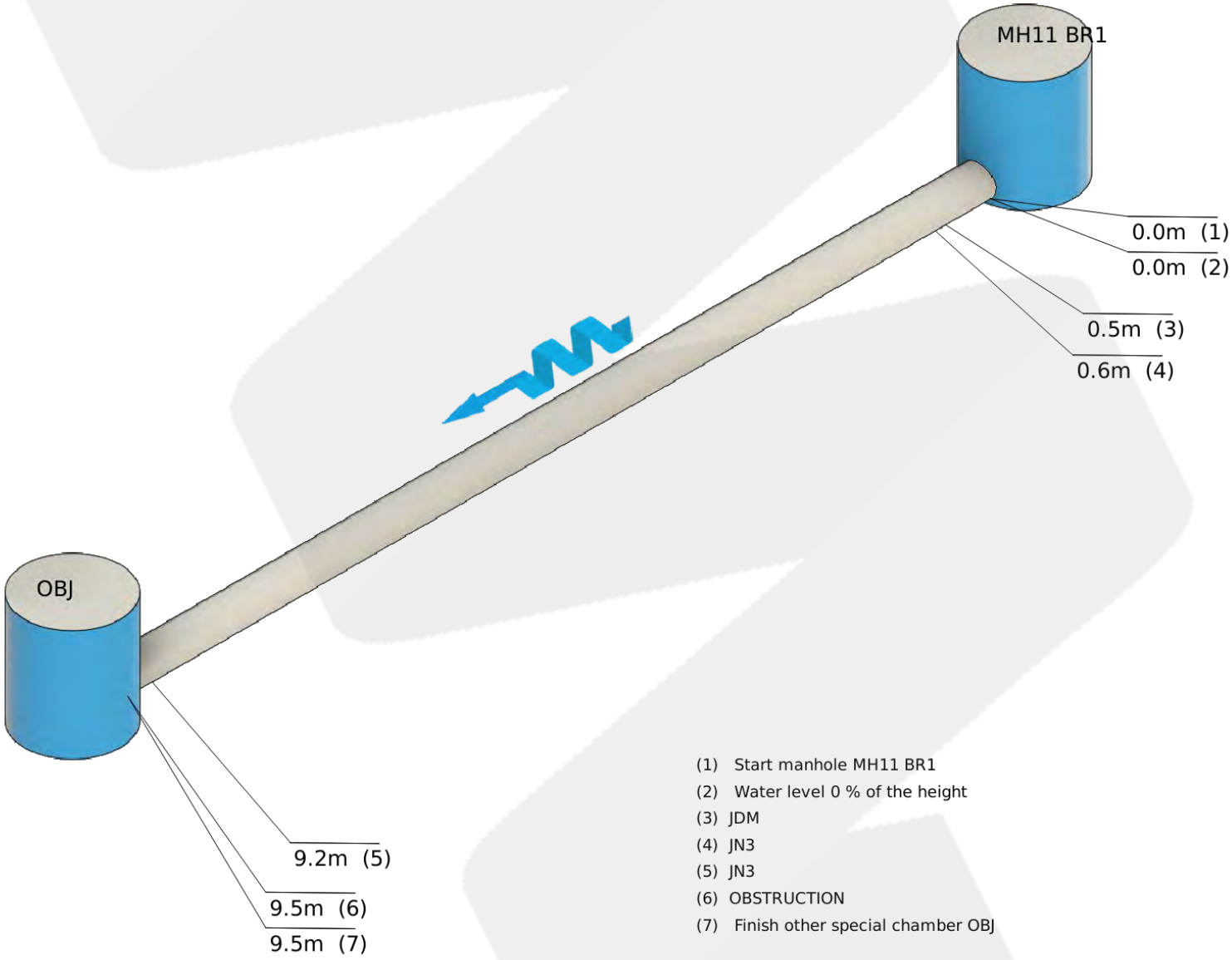
Observation [7]:
JN9

Observation [8]:
JN9

Observation [9]:
MH12

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh11_br1_mh12	Start: MH11 BR1	Direction: Downstream	End: OBJ
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.60
Date: 2024-03-26	Time: 11:39	Comments:	



(1) Start manhole MH11 BR1
(2) Water level 0 % of the height
(3) JDM
(4) JN3
(5) JN3
(6) OBSTRUCTION
(7) Finish other special chamber OBJ

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

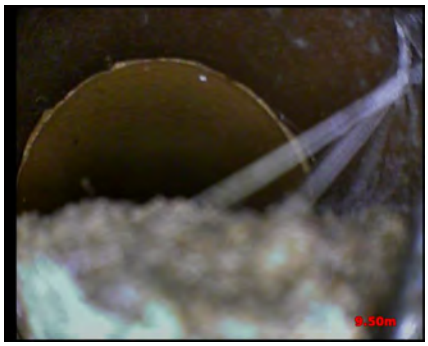
Additional Information	
Invert Depth	00.60
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JDM

Observation [4]:
JN3

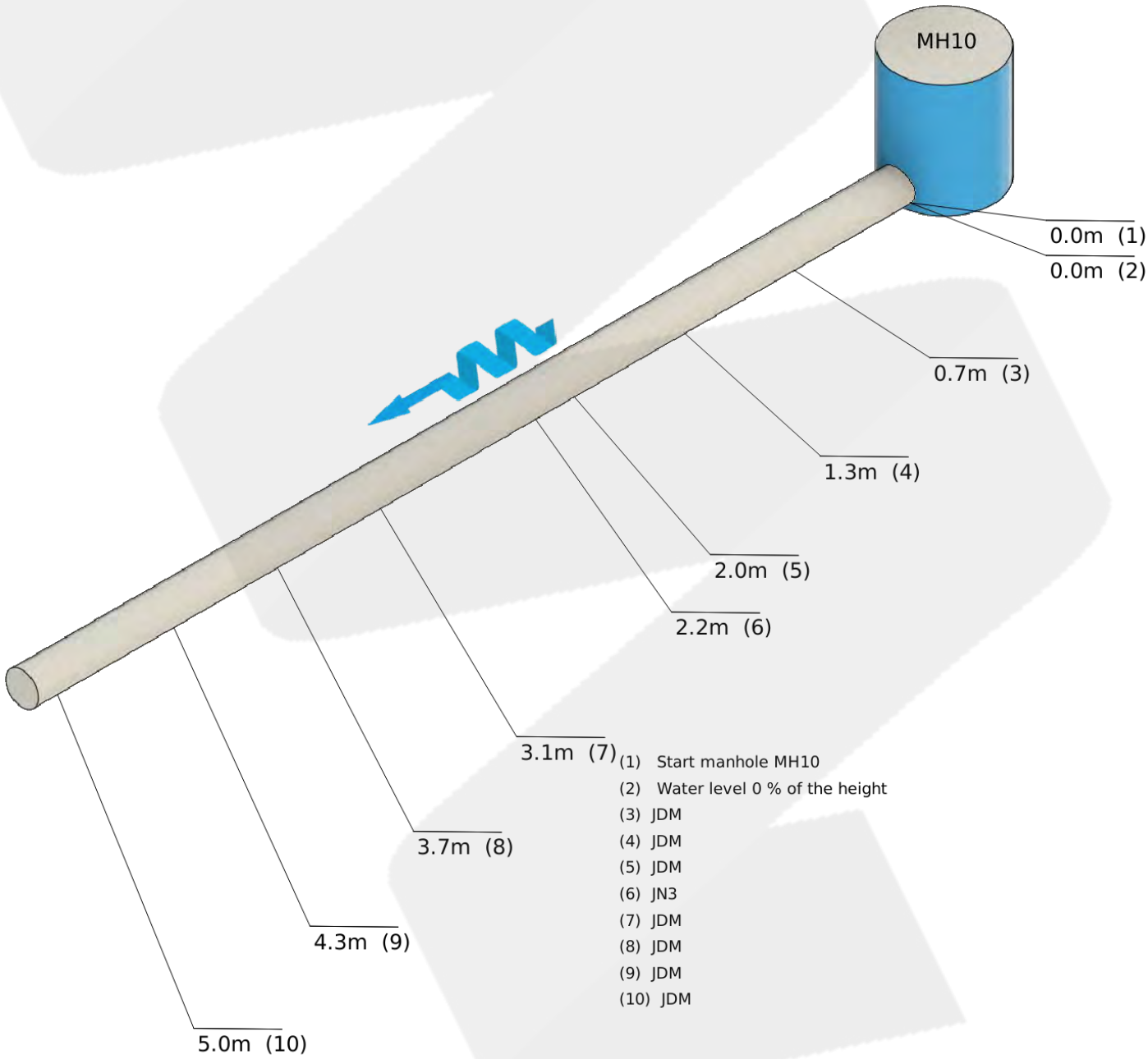
Observation [5]:
JN3



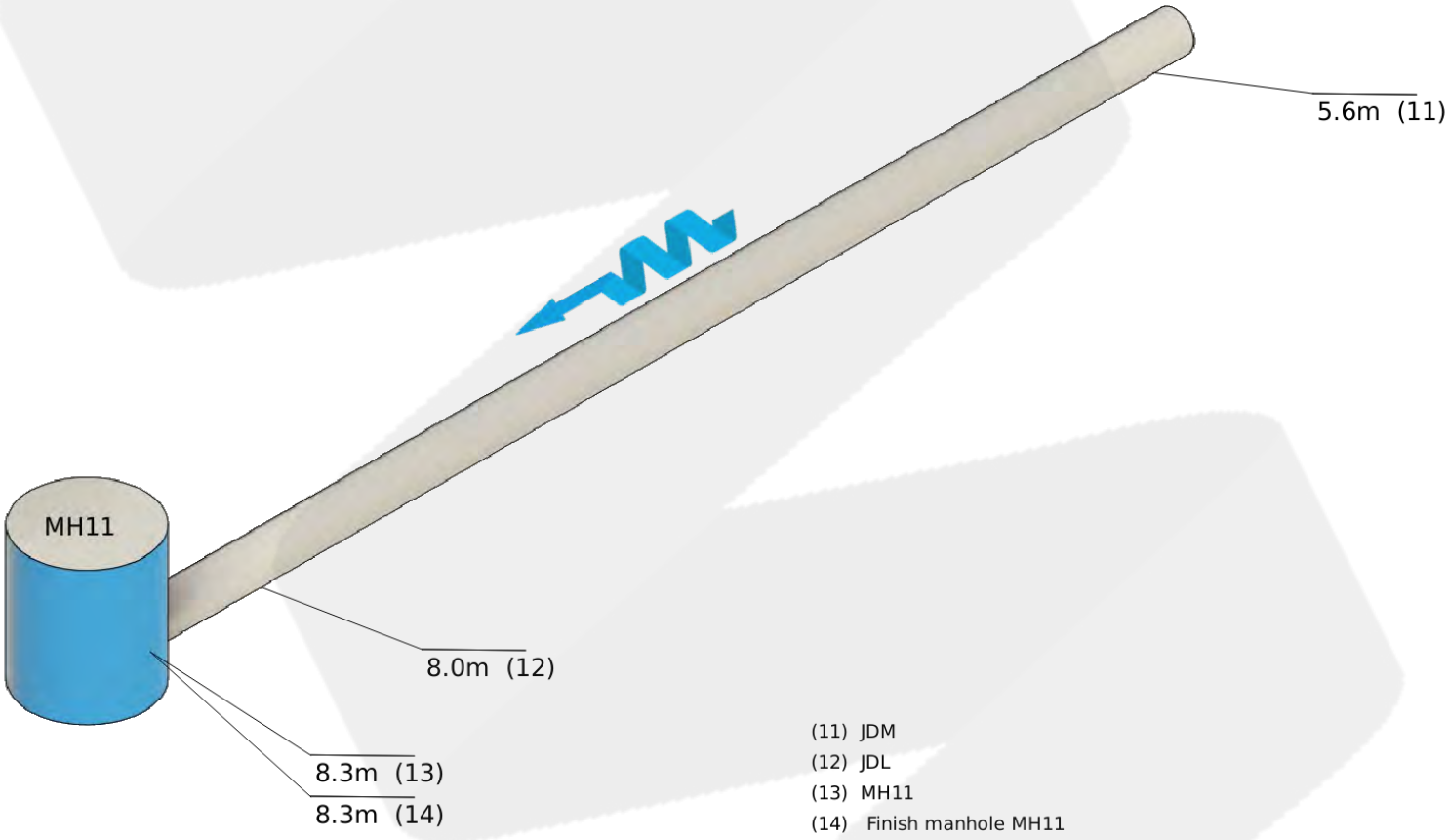
Observation [6]:
OBSTRUCTION

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh10_mh11	Start: MH10	Direction: Downstream	End: MH11
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.43
Date: 2024-03-26	Time: 11:45	Comments:	



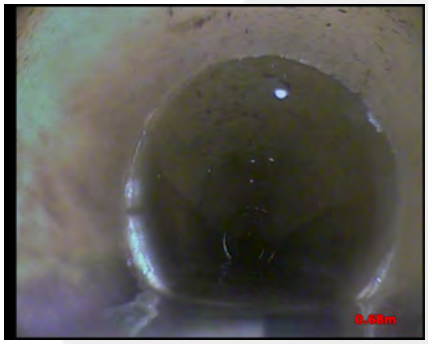
DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



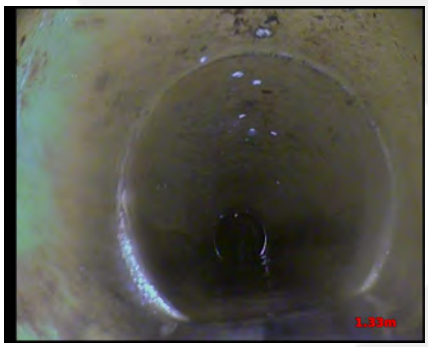
DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.43
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

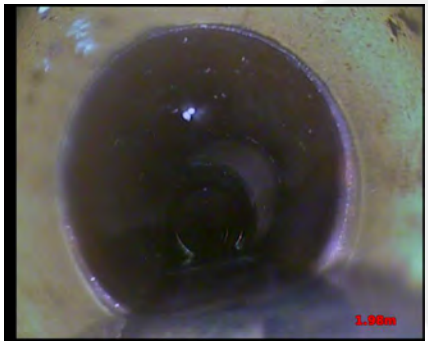
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



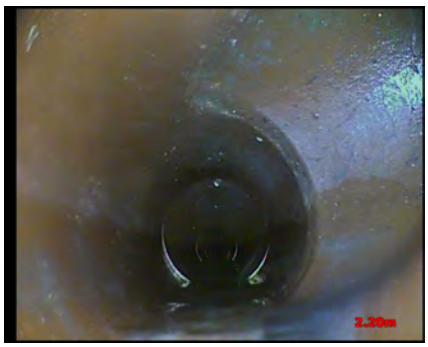
Observation [3]:
JDM



Observation [4]:
JDM

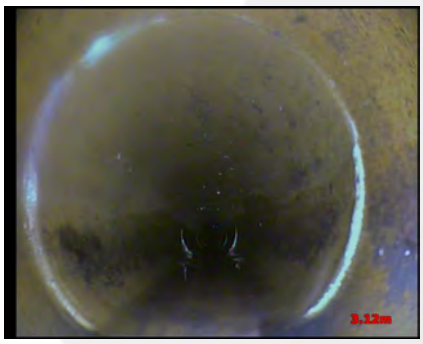


Observation [5]:
JDM



Observation [6]:
JN3

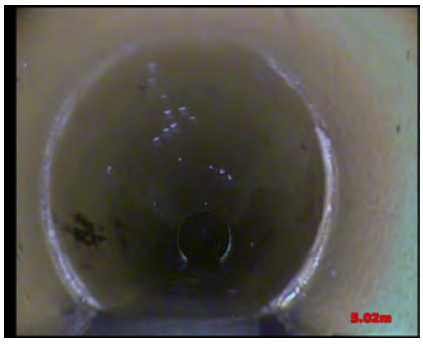
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



Observation [7]:
JDM

Observation [8]:
JDM

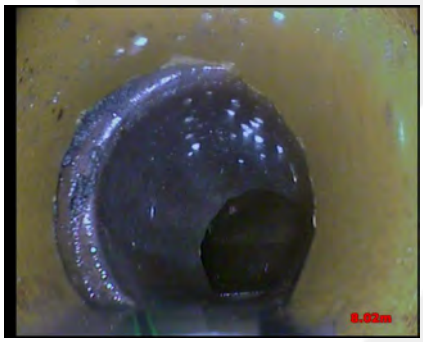
Observation [9]:
JDM



Observation [10]:
JDM

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [11]:
JDM

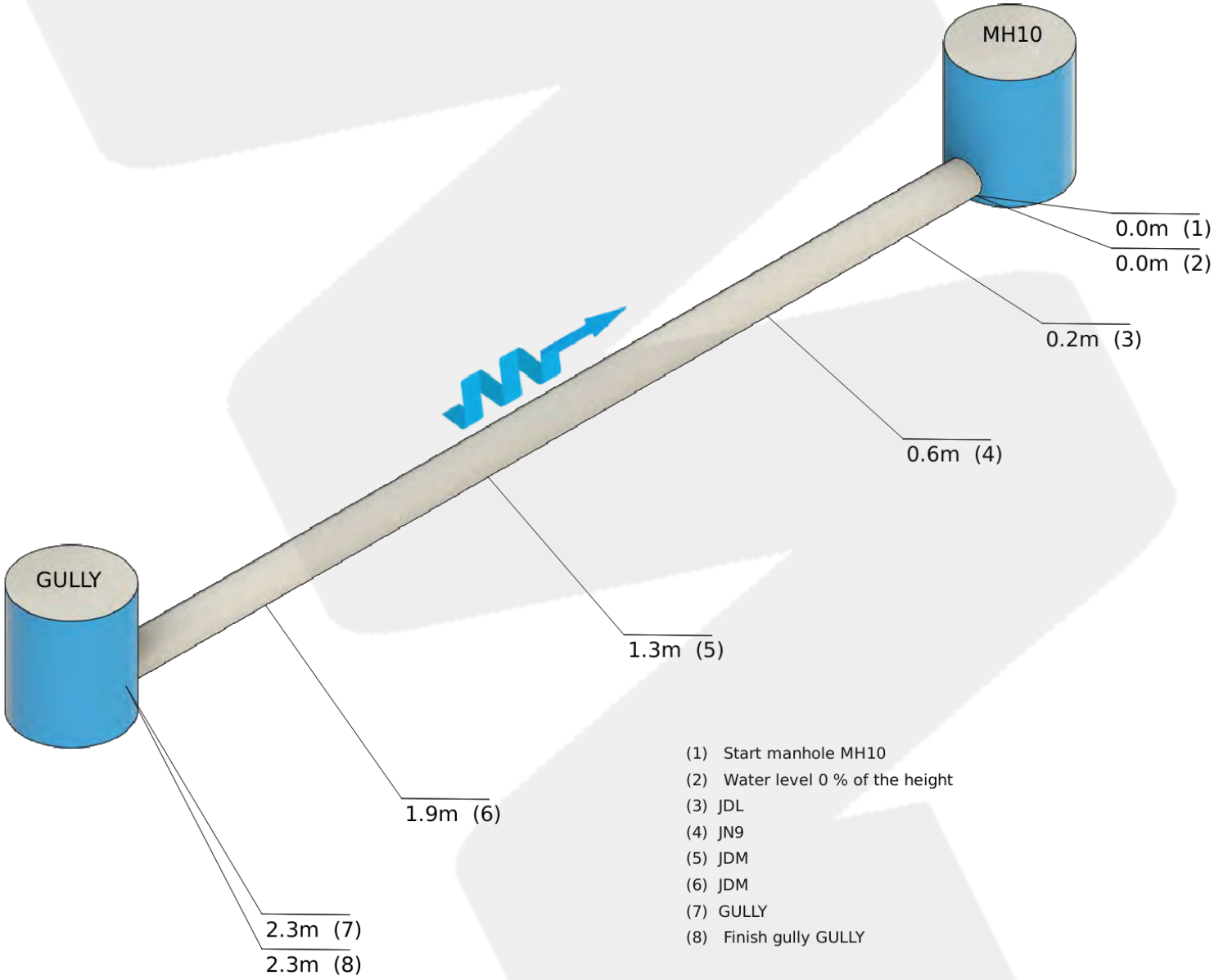


Observation [12]:
JDL

Observation [13]:
MH11

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh10_z	Start: MH10	Direction: Upstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.43
Date: 2024-03-26	Time: 11:50	Comments:	

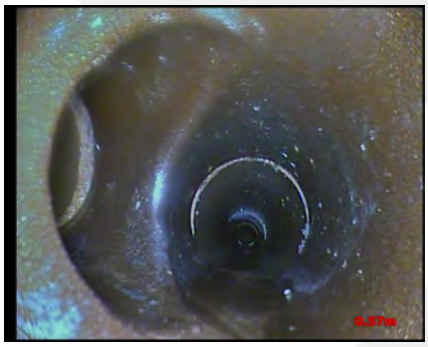


DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.43
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

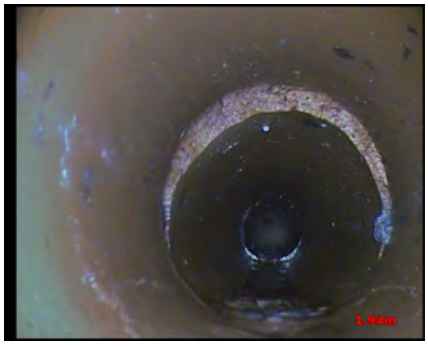
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JDL



Observation [4]:
JN9

Observation [5]:
JDM



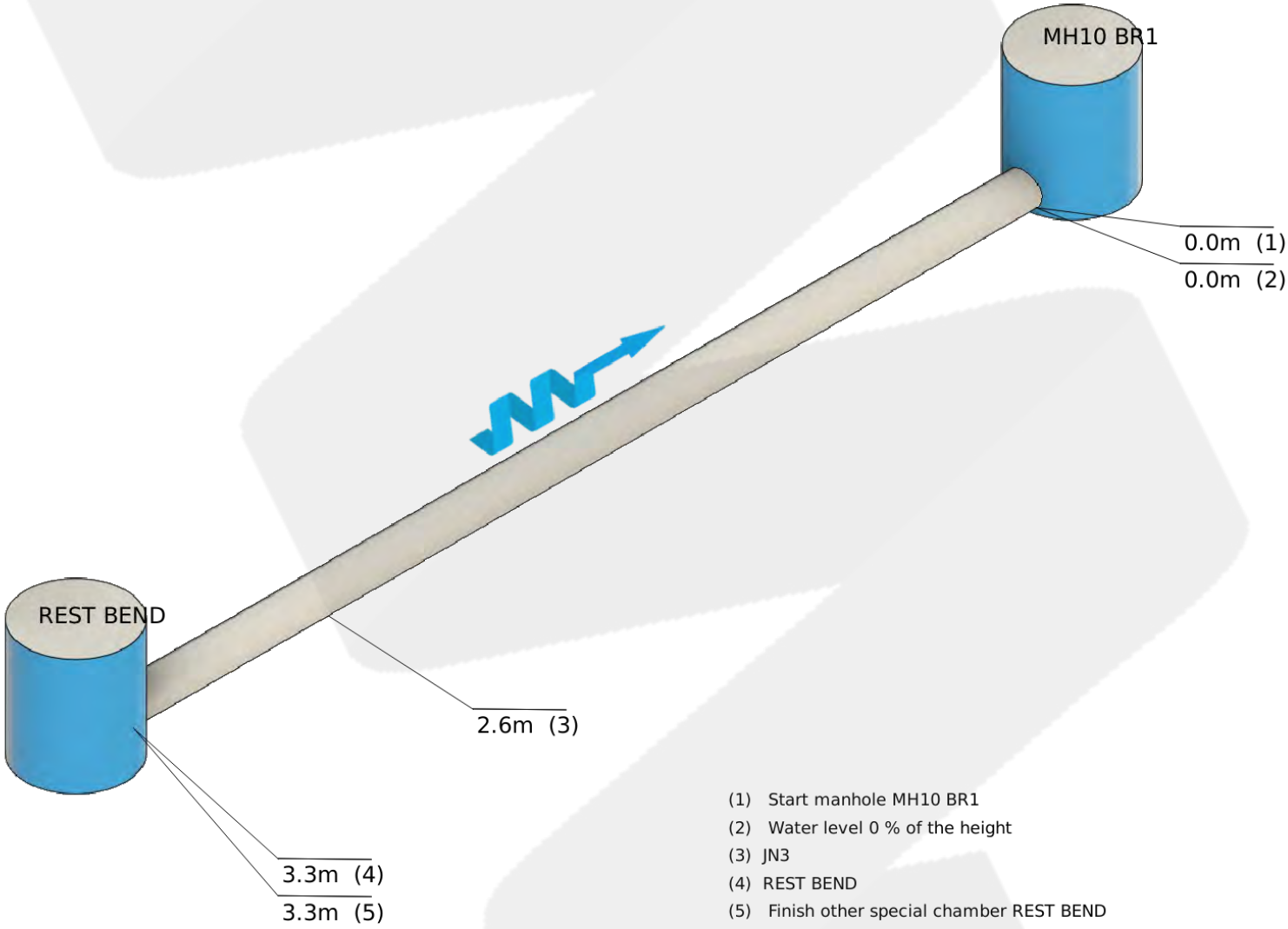
Observation [6]:
JDM

	Section Images	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [7]:
GULLY

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh10_br1_gully	Start: MH10 BR1	Direction: Upstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.43
Date: 2024-03-26	Time: 11:52	Comments:	

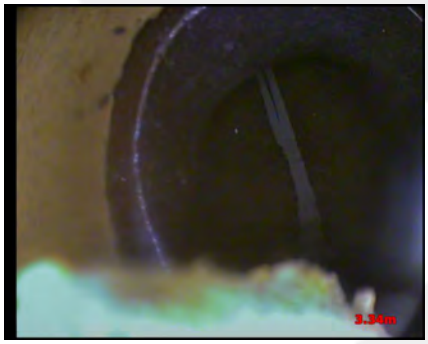


	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.43
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

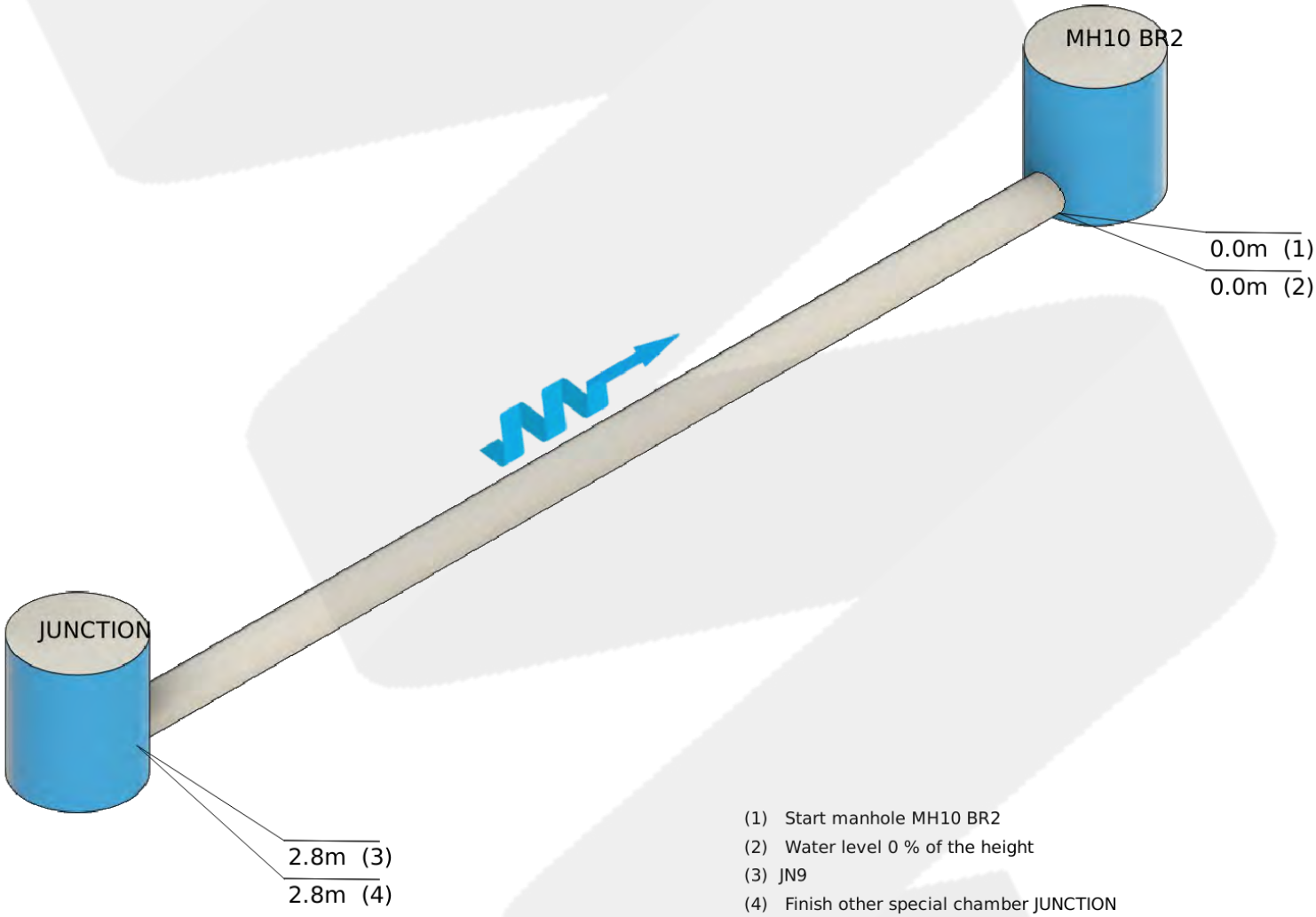
Observation [3]:
JN3



Observation [4]:
REST BEND

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh10_br2_rest_bend	Start: MH10 BR2	Direction: Upstream	End: JUNCTION
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 00.43
Date: 2024-03-26	Time: 11:53	Comments:	

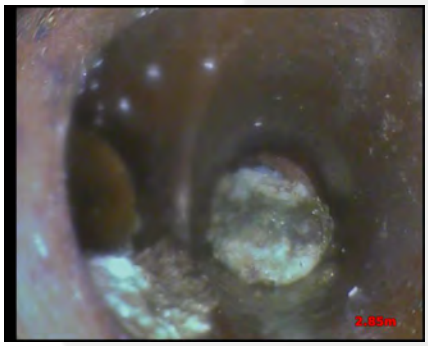


(1) Start manhole MH10 BR2
(2) Water level 0 % of the height
(3) JN9
(4) Finish other special chamber JUNCTION

	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	00.43
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

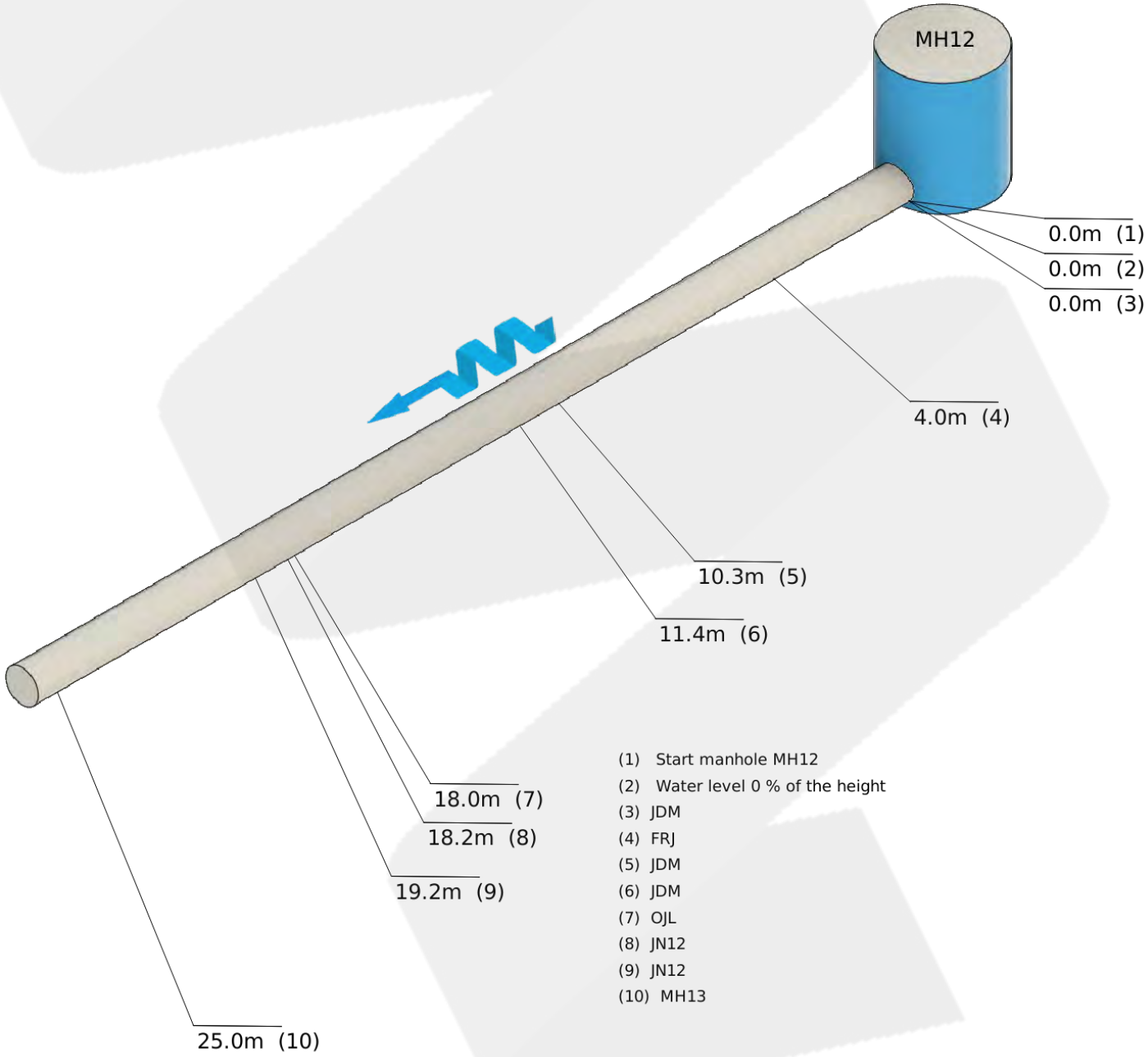
	Section Images	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



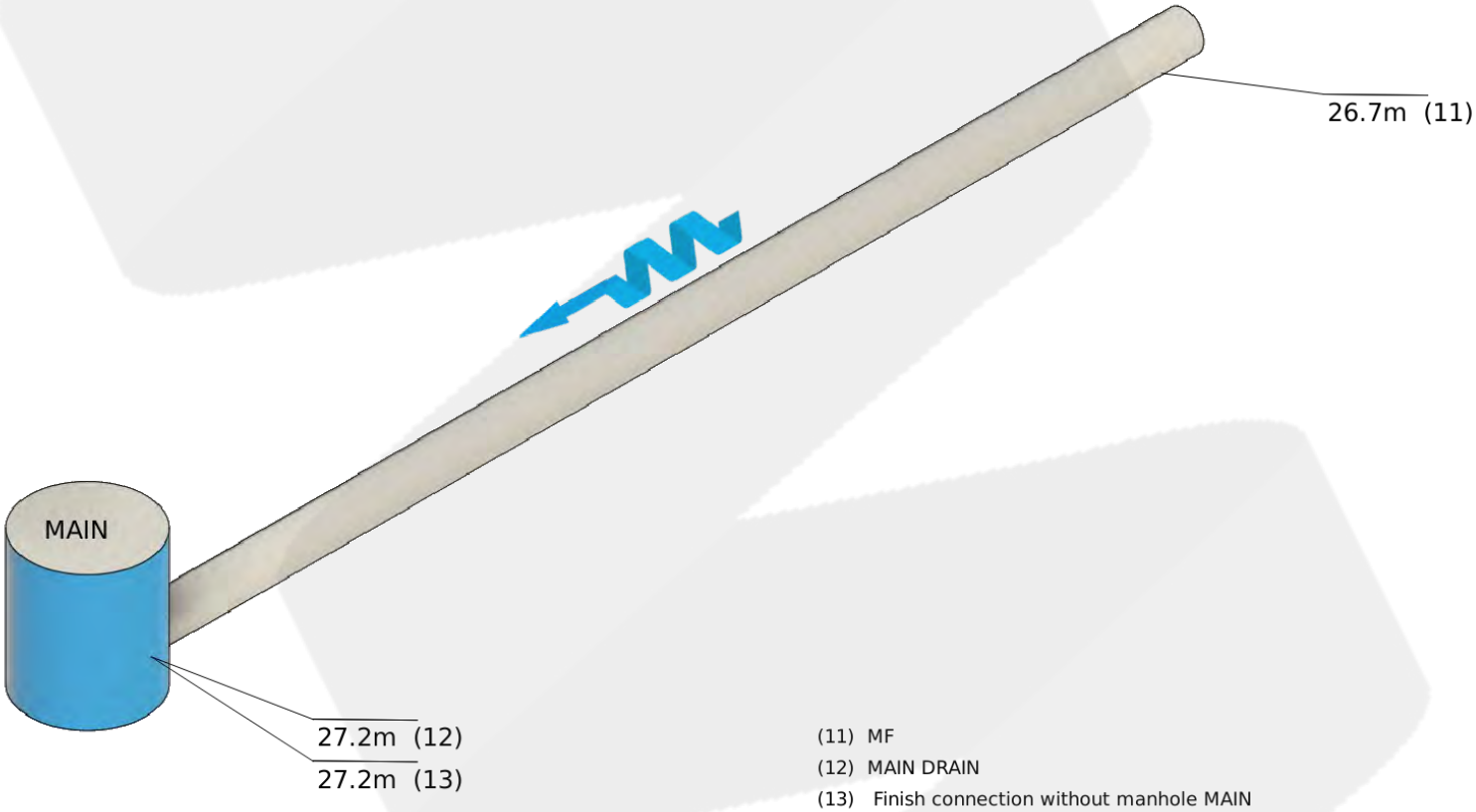
Observation [3]:
JN9

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh12_z	Start: MH12	Direction: Downstream	End: MAIN
Material: Vitrified Clay (VC)	Pipeline Size: 150	Duty: Combined (C)	Invert Depth: 01.00
Date: 2024-03-26	Time: 12:04	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:



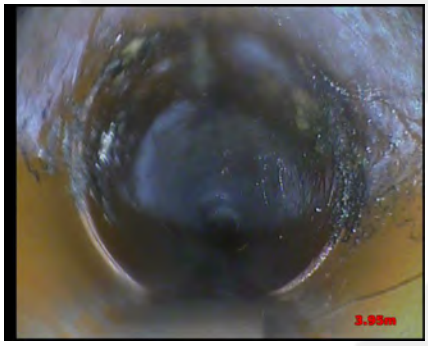
(11) MF
(12) MAIN DRAIN
(13) Finish connection without manhole MAIN

	Section Information	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

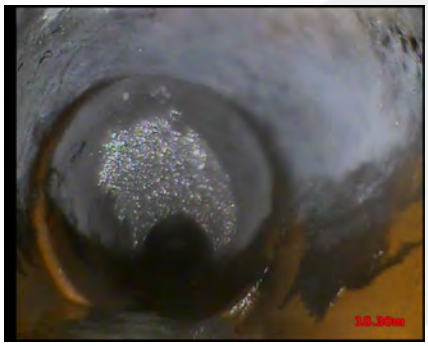
Additional Information	
Invert Depth	01.00
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
JDM



Observation [4]:
FRJ



Observation [5]:
JDM

Observation [6]:
JDM

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

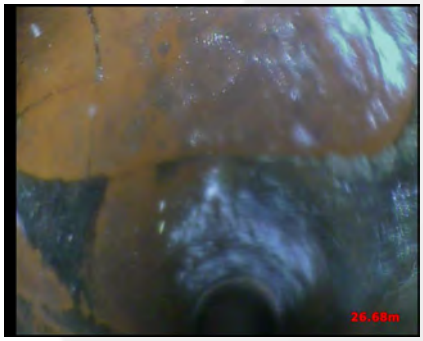
Observation [7]:
OJL

Observation [8]:
JN12

Observation [9]:
JN12

Observation [10]:
MH13

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

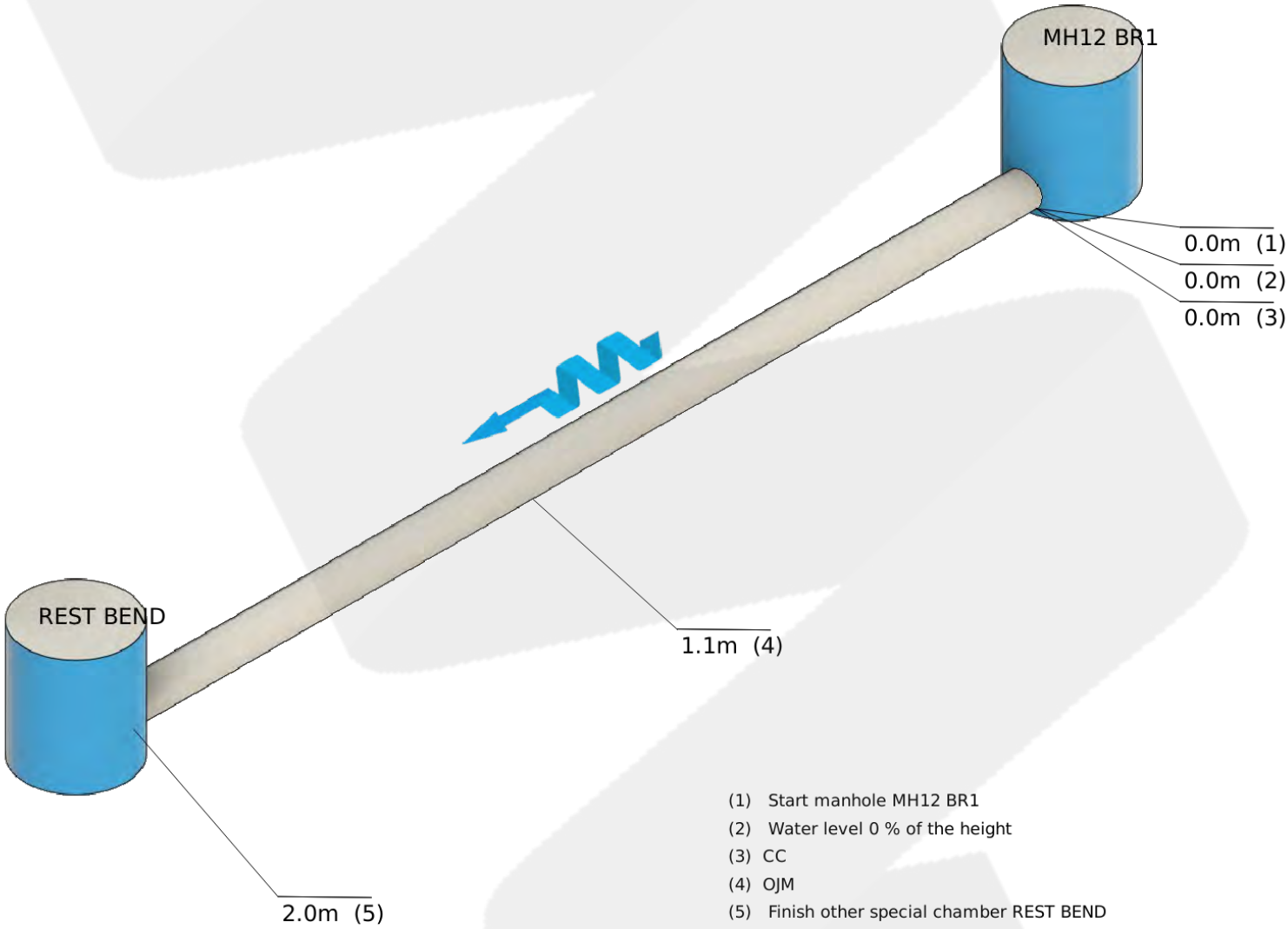


Observation [11]:
MF

Observation [12]:
MAIN DRAIN

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Section Video: mh12_br1_z	Start: MH12 BR1	Direction: Downstream	End: REST BEND
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 01.00
Date: 2024-03-26	Time: 12:14	Comments:	



DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	01.00
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

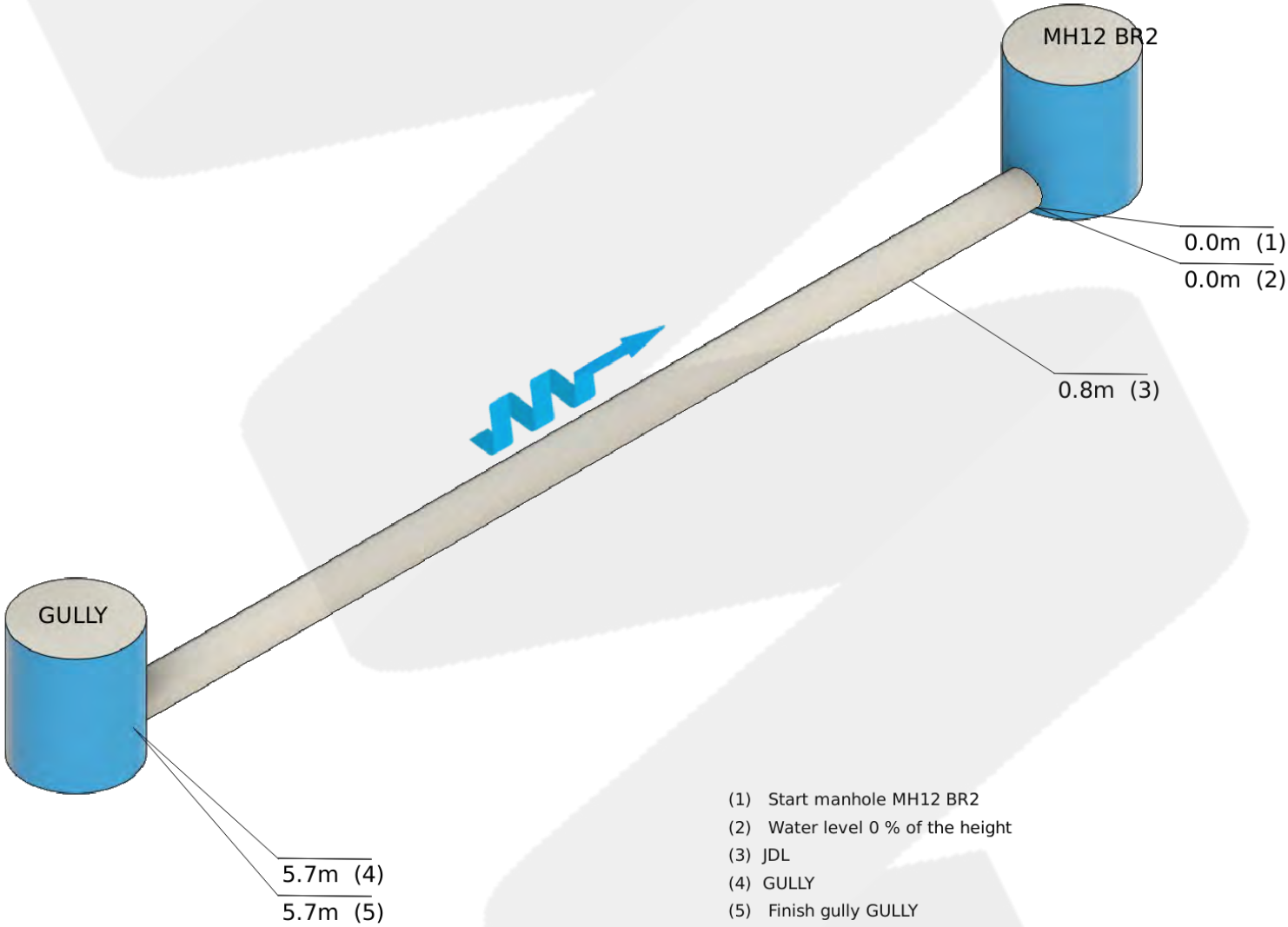
DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Observation [3]:
CC

Observation [4]:
OJM

DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

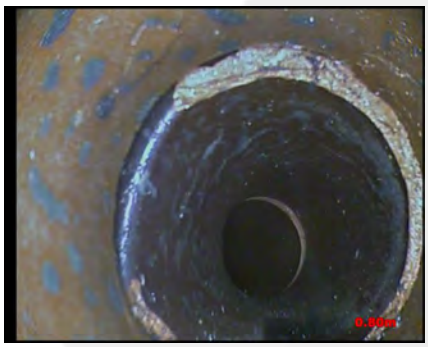
Section Video: mh12_br2_gully	Start: MH12 BR2	Direction: Upstream	End: GULLY
Material: Vitrified Clay (VC)	Pipeline Size: 100	Duty: Combined (C)	Invert Depth: 01.00
Date: 2024-03-26	Time: 12:16	Comments:	



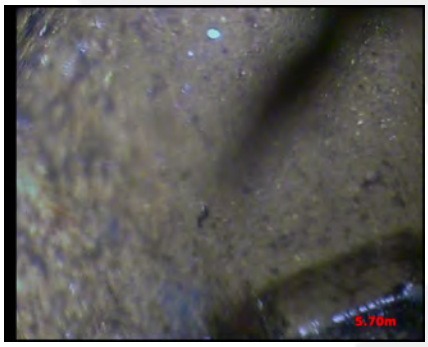
DTM DRAINAGE SOLUTIONS	**Section Information**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

Additional Information	
Invert Depth	01.00
End Depth	.
Method of Inspection	Direct Inspection (A)
Pre-Cleaned	Yes (Y)
Pipeline Length Reference	
Pipe Shape	Circular (C)

DTM DRAINAGE SOLUTIONS	**Section Images**	St James Church of England Primary School , Greenarce Street , Clitheroe , BB7 1ED
Engineer: DM	Date: 26/03/24	Reference:

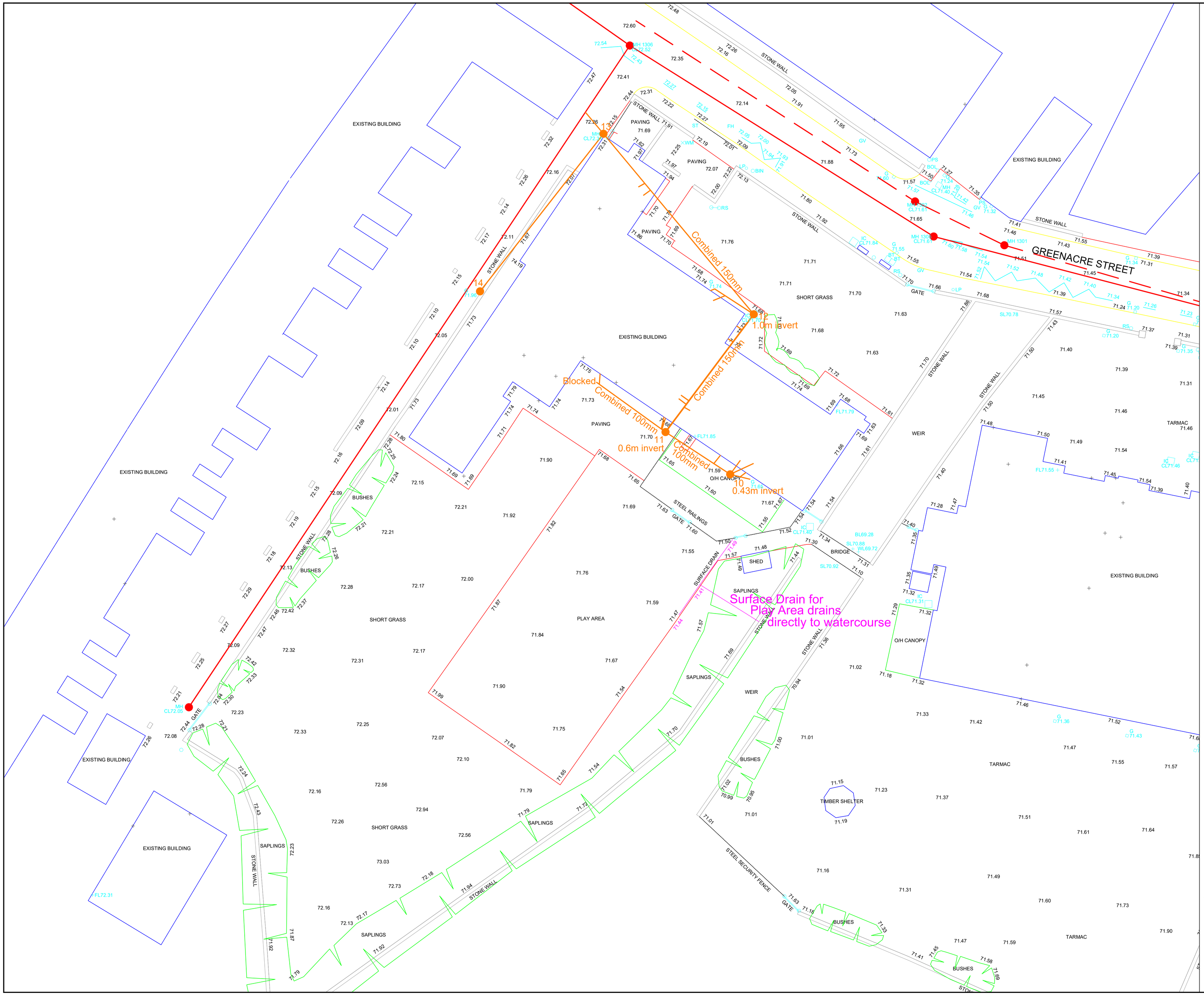


Observation [3]:
JDL



Observation [4]:
GULLY

C Existing Site Drainage Layout



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KEY:

- Existing Hardstanding Areas
- Proposed Surface Water Access Chamber
- Proposed Surface Water Pipe
- Existing Private Sewer Pipe
- Existing Combined Sewer Pipe
- Exceedance Flow Routes

Rev.						
P01	Initial Design	30/04/24	MW	MW	PB	MB
Rev.	Modifications	Date	Drawn	Designed	Checked	Approved

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for

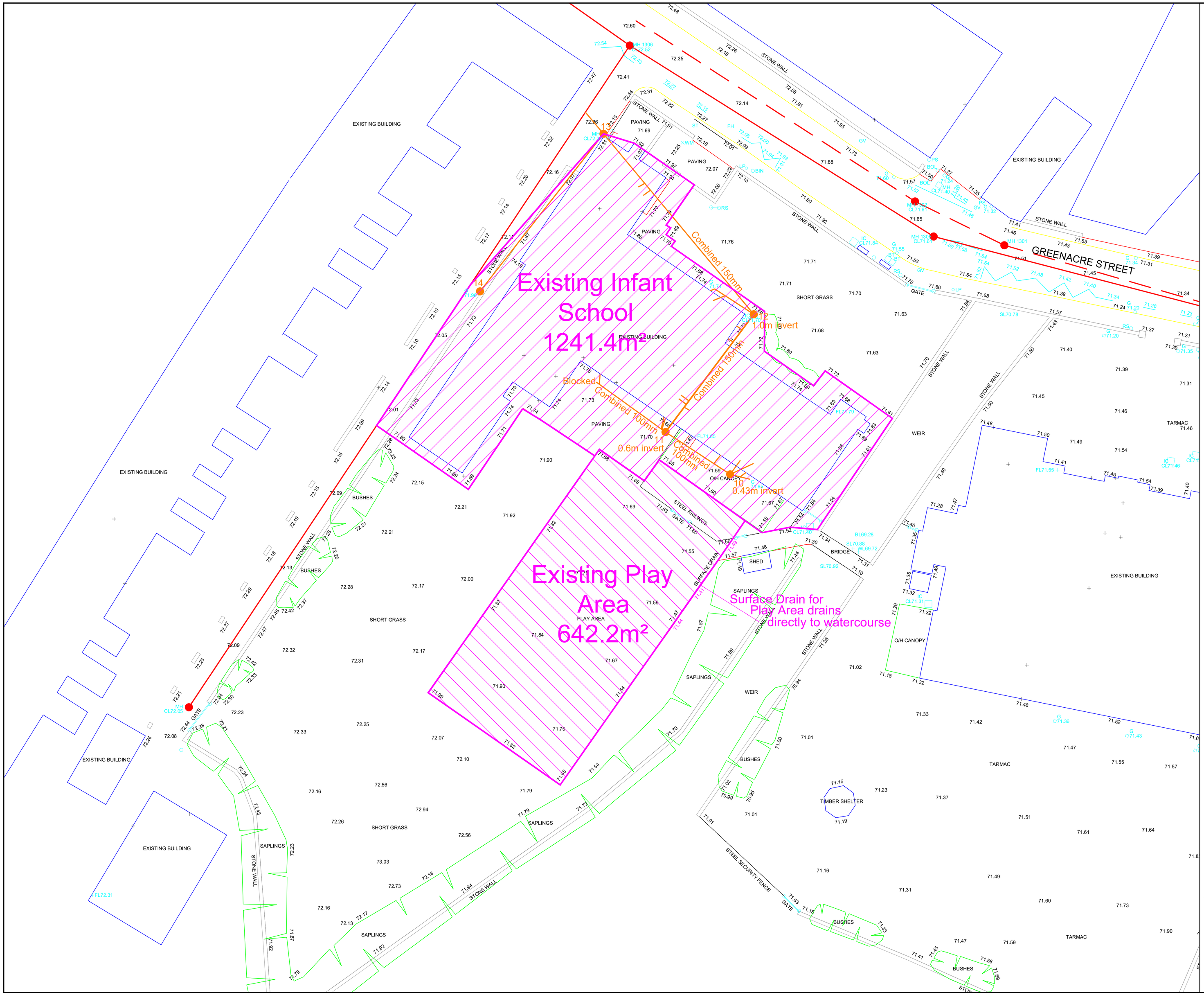
St James' CofE Primary School, Clitheroe

Cassidy & Ashton Architects and Building Surveyors
Existing Drainage Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0001

Drawing Number:	Rev.:	Sheet No.:	Status:
0001	P01	1 of 1	S3



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Proposed Surface Water Access Chamber

Proposed Surface Water Pipe

Existing Private Sewer Pipe

Existing Combined Sewer Pipe

Exceedance Flow Routes

100m² = Impermeable area assigned to Microdrainage model pipe number.

1.000 = Microdrainage model pipe number.

Rev.	Modifications	Date	Drawn	Designed	Checked	Approved
P01	Initial Design	30/04/24	MW	MW	PB	MB

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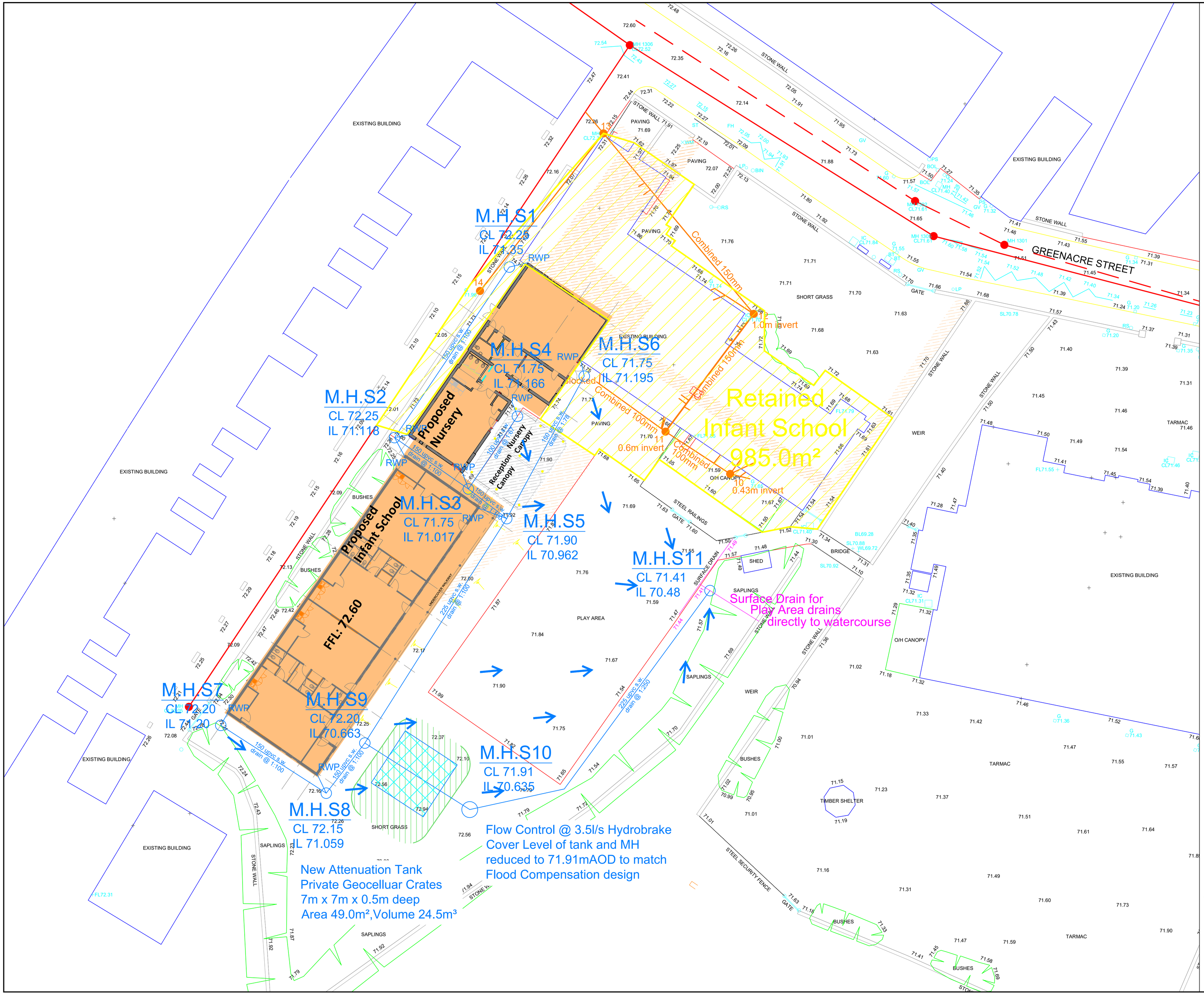
Cassidy & Ashton Architects and Building Surveyors
Existing Hardstanding Areas Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0002

Drawing Number:	Rev.:	Sheet No.:	Status:
0002	P01	1 of 1	S3

D Schematic Drainage Plans



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Rev.	Modifications	Date	Drawn	Designed	Checked	Approved
P03	Updated to suit Compensatory Storage	05/09/24	MW	MW	PB	MB
P02	Updated Urban Creep	12/06/24	MW	MW	PB	MB
P01	Initial Design	30/04/24	MW	MW	PB	MB

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for

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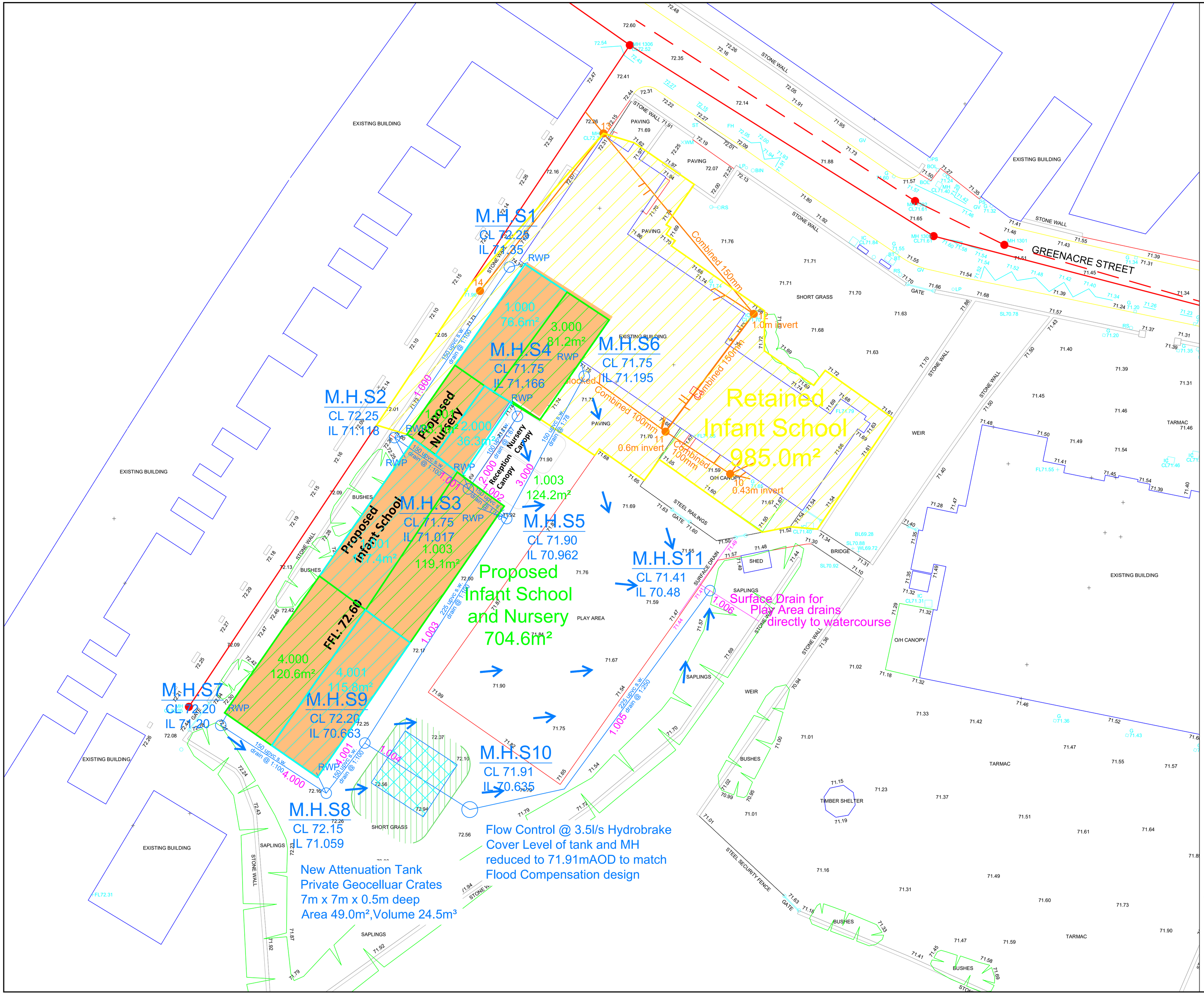
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 1 Drainage Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0003

Drawing Number:	Rev.:	Sheet No.:	Status:
0003	P03	1 of 1	S3



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Proposed Surface Water Pipe

Existing Private Sewer Pipe

Existing Combined Sewer Pipe

Exceedance Flow Routes

100m² = Impermeable area assigned to Microdrainage model pipe number.

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Urban Creep Calculations
Phase 1

Feature	Area	+10% UC
Buildings	705.1m²	775.6m²
Paths	124.2m²	136.6m²
Total	829.3m²	912.2m²

Urban Creep Calculations
Phase 2

Feature	Area	+10% UC
Paths	254.9m²	280.4m²
Car Park	274.8m²	302.3m²
Total	529.7m²	582.7m²

Rev.	Modifications	Date	Drawn	Designed	Checked	Approved
P03	Updated to suit Compensatory Storage	05/09/24	MW	MW	PB	MB
P02	Updated Urban Creep	12/06/24	MW	MW	PB	MB
P01	Initial Design	30/04/24	MW	MW	PB	MB

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for

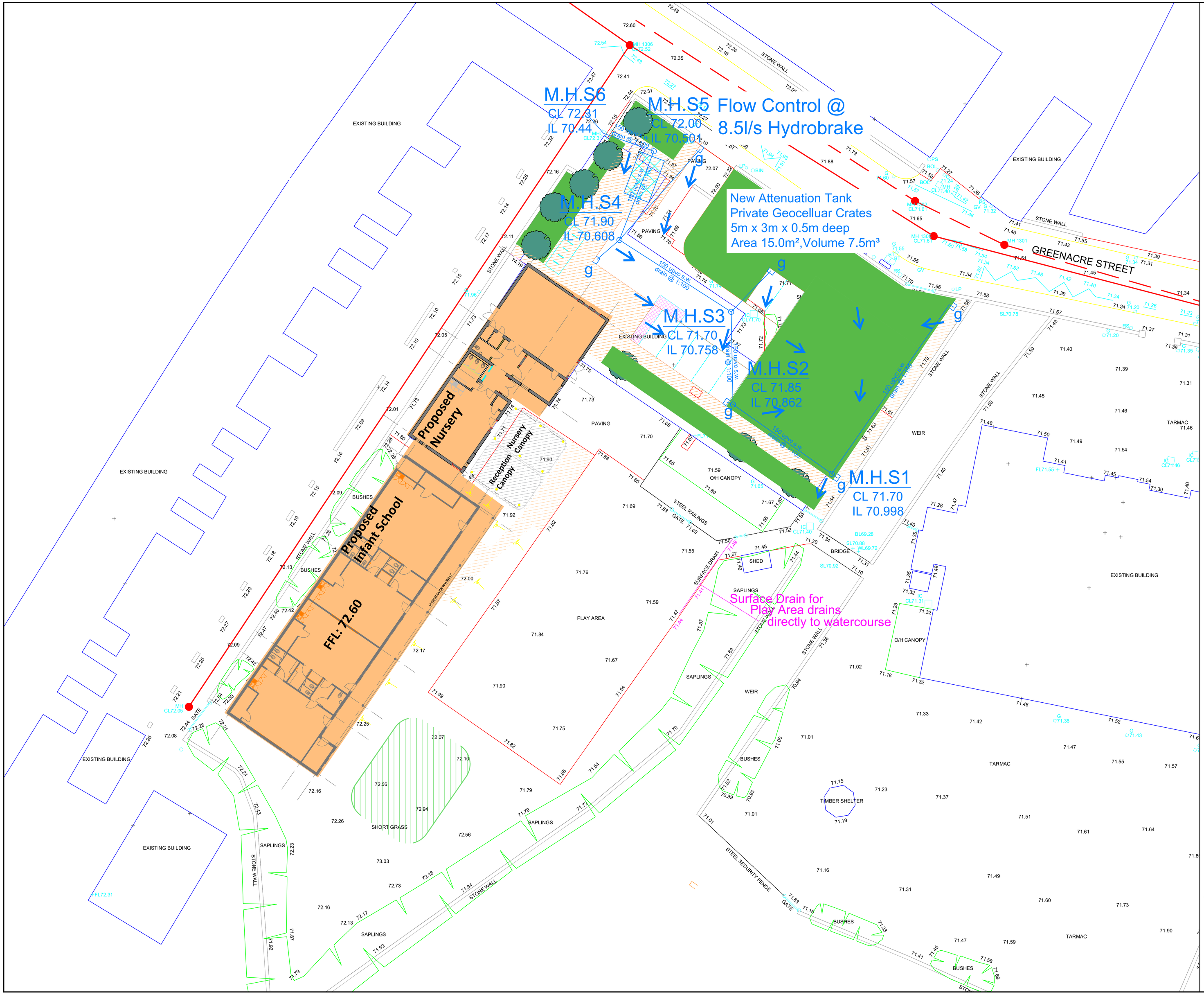
St James' CofE Primary School, Clitheroe

Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 1 Hardstanding Area Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0004

Drawing Number:	Rev.:	Sheet No.:	Status:
0004	P03	1 of 1	S3



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Rev.		Date	Drawn	Designed	Checked	Approved
P01	Initial Design	30/04/24	MW	MW	PB	MB
Rev.	Modifications	Date	Drawn	Designed	Checked	Approved

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for

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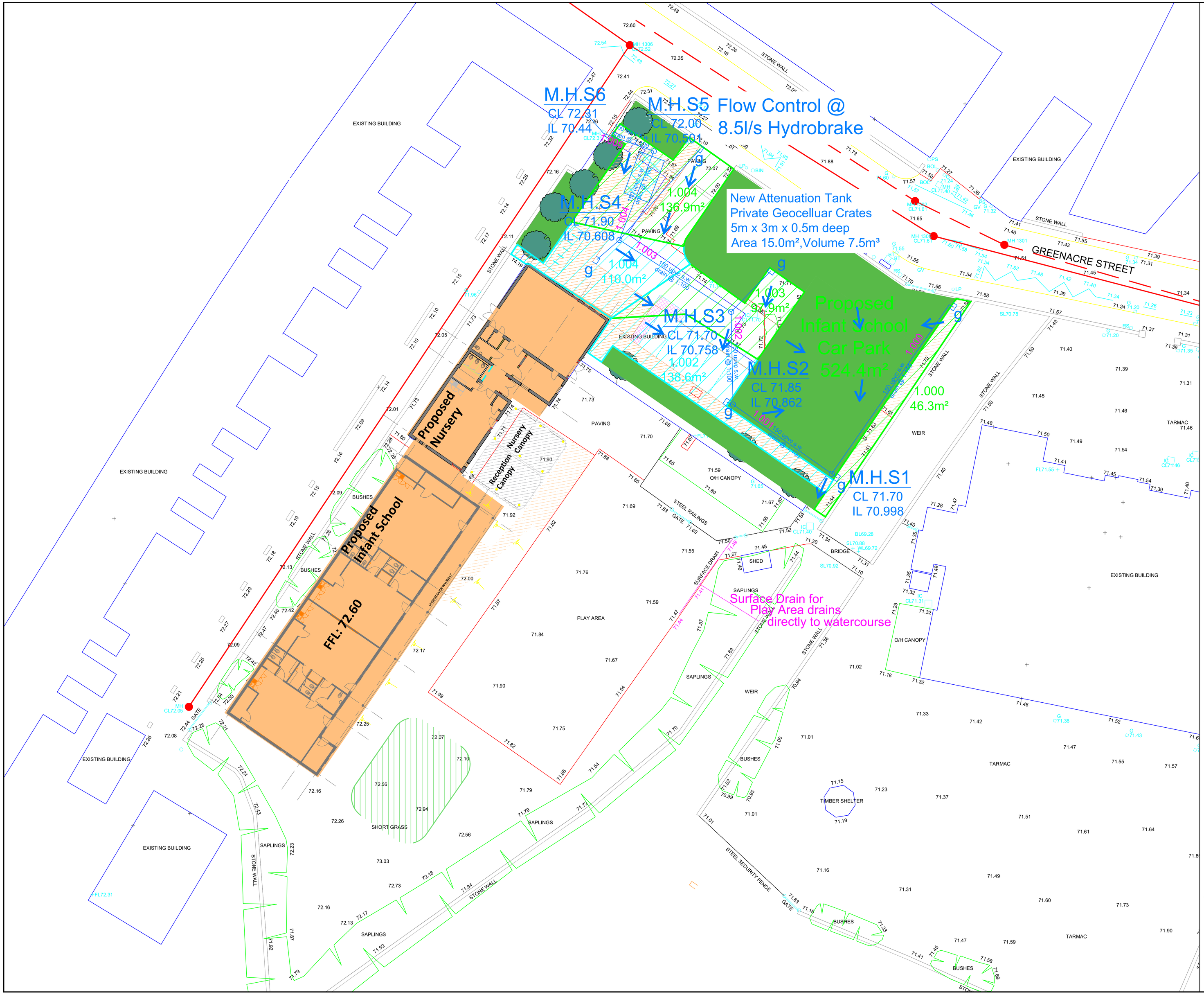
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 2 Drainage Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0005

Drawing Number:	Rev.:	Sheet No.:	Status:
0005	P01	1 of 1	S3



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Total	529.7m²	582.7m²

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P01	Initial Design	30/04/24	MW	MW	PB	MB

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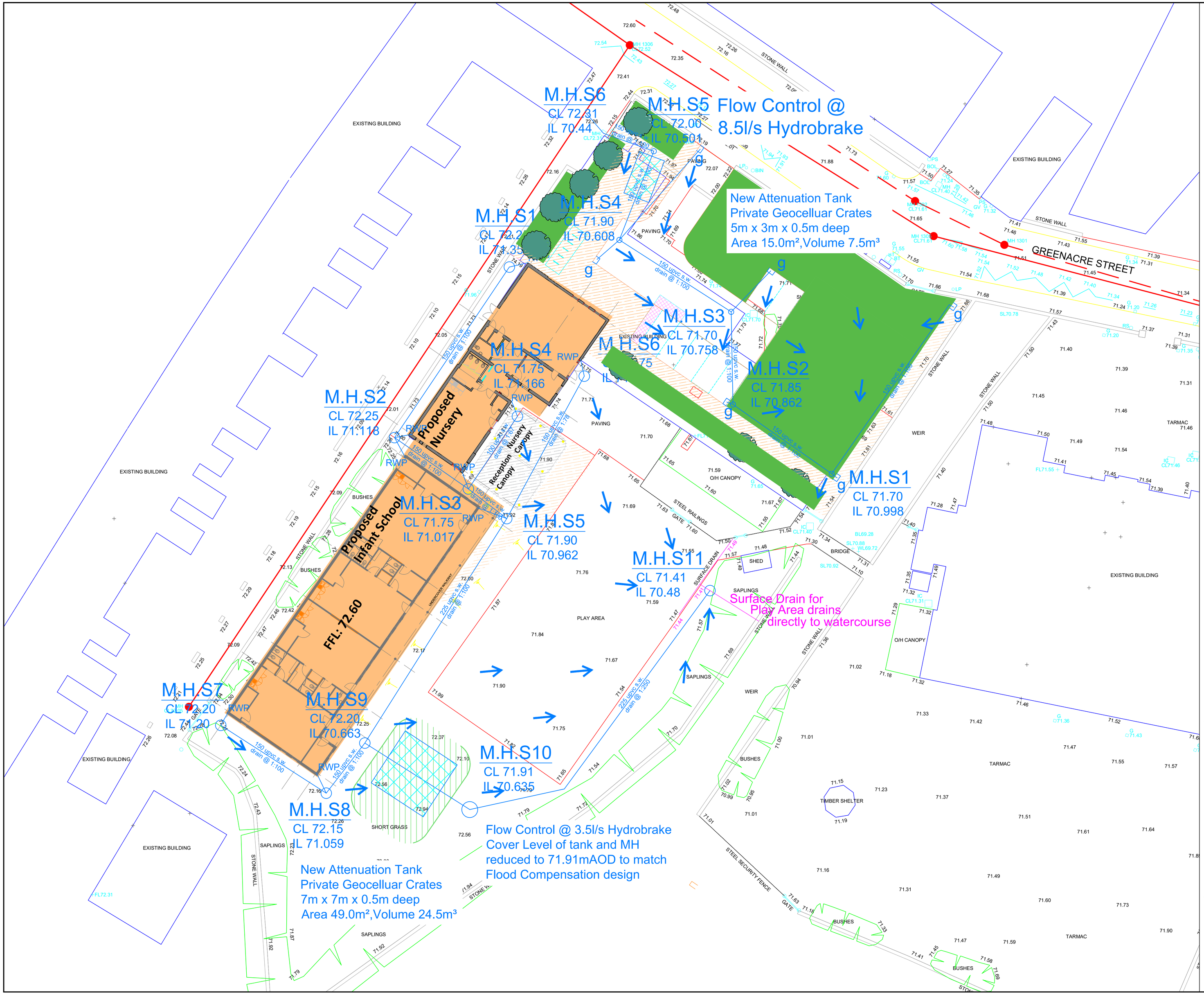
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 2 Hardstanding Area Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0006

Drawing Number:	Rev.:	Sheet No.:	Status:
0006	P02	1 of 1	S3



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Rev.	Modifications	Date	Drawn	Designed	Checked	Approved
P03	Updated to suit Compensatory Storage	05/09/24	MW	MW	PB	MB
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Cassidy & Ashton Architects and Building Surveyors
Proposed Finalised Drainage Plan

Scale: 1:100 @ A1	Drawn:	M Watson 30/04/24
	Designed:	M Watson 30/04/24
	Checked:	E Parker 30/04/24
	Approved:	M Bentley 30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0007

Drawing Number:	Rev.:	Sheet No.:	Status:
0007	P03	1 of 1	S3

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Design of Construction Phase Buffer Strips

Buffer strips to intercept runoff from higher ground and intercept exposed earth areas and encourage infiltration. The buffer strips will be located on the downslope side of the proposed landscaping batters.

Silt Fences to be located on the downsteam side of buffer strips to retain runoff within the buffer strip, allowing soils and runoff to be reused on site.

2.0m buffer strip width, 1:4 side slopes, ~0.50m depth

Typical Construction Buffer Strip

Buffer strips to intercept runoff from higher ground and intercept exposed earth areas and encourage infiltration

Construction drainage collected into temporary ditch and silt barrer - discharged to the existing outlet into the combined sewer

Construction drainage collected into temporary ditch and silt barrer - discharged to the existing outlet into the watercourse

Surface Drain for Play Area drains directly to watercourse

Rev.	Modifications	Date	Drawn	Designed	Checked	Approved
P01	Initial Design	30/04/24	MW	MW	PB	MB

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Preliminary Construction Phase Drainage Plan

Scale: 1:100 @ A1	Drawn:	M Watson	30/04/24
	Designed:	M Watson	30/04/24
	Checked:	E Parker	30/04/24
	Approved:	M Bentley	30/04/24

Digital File Name: MTN-JBAU-ZZ-00-DR-C-0008

Drawing Number:	Rev.:	Sheet No.:	Status:
0008	P01	1 of 1	S3

E MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.050	4-8	0.042

Total Area Contributing (ha) = 0.092

Total Pipe Volume (m³) = 4.745

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.174	0.232	99.9	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	10.135	0.101	100.3	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	9.877	0.149	66.3	0.004	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	5.465	0.055	99.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	18.276	0.233	78.4	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	29.935	0.299	100.1	0.026	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	14.142	0.141	100.3	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	7.131	0.071	100.4	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	14.004	0.028	500.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	38.650	0.155	249.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.38	71.350	0.009	0.0	0.0	0.0	1.01	17.8	1.6
1.001	50.00	5.55	71.118	0.027	0.0	0.0	0.0	1.00	17.7	4.9
2.000	50.00	5.17	71.166	0.004	0.0	0.0	0.0	0.95	7.4	0.7
1.002	50.00	5.64	71.017	0.031	0.0	0.0	0.0	1.01	17.8	5.6
3.000	50.00	5.27	71.195	0.009	0.0	0.0	0.0	1.14	20.1	1.6
1.003	50.00	6.02	70.962	0.066	0.0	0.0	0.0	1.31	52.0	11.9
4.000	50.00	5.23	71.200	0.013	0.0	0.0	0.0	1.00	17.7	2.3
4.001	50.00	5.35	71.059	0.026	0.0	0.0	0.0	1.00	17.7	4.7
1.004	50.00	6.43	70.663	0.092	0.0	0.0	0.0	0.58	23.0	16.6
1.005	50.00	7.21	70.635	0.092	0.0	0.0	0.0	0.82	32.7	16.6

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	MHS1	72.250	71.350	0.750	Open Manhole	1200
1.001	o	150	MHS2	72.250	71.118	0.982	Open Manhole	1200
2.000	o	100	MHS4	71.750	71.166	0.484	Open Manhole	1200
1.002	o	150	MHS3	71.750	71.017	0.583	Open Manhole	1200
3.000	o	150	MHS6	71.750	71.195	0.405	Open Manhole	1200
1.003	o	225	MHS5	71.900	70.962	0.713	Open Manhole	1200
4.000	o	150	MHS7	72.200	71.200	0.850	Open Manhole	1200
4.001	o	150	MHS8	72.150	71.059	0.941	Open Manhole	1200
1.004	o	225	MHS9	72.200	70.663	1.312	Open Manhole	1200
1.005	o	225	MHS10	71.790	70.635	0.930	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	23.174	99.9	MHS2	72.250	71.118	0.982	Open Manhole	1200
1.001	10.135	100.3	MHS3	71.750	71.017	0.583	Open Manhole	1200
2.000	9.877	66.3	MHS3	71.750	71.017	0.633	Open Manhole	1200
1.002	5.465	99.4	MHS5	71.900	70.962	0.788	Open Manhole	1200
3.000	18.276	78.4	MHS5	71.900	70.962	0.788	Open Manhole	1200
1.003	29.935	100.1	MHS9	72.200	70.663	1.312	Open Manhole	1200
4.000	14.142	100.3	MHS8	72.150	71.059	0.941	Open Manhole	1200
4.001	7.131	100.4	MHS9	72.200	70.988	1.062	Open Manhole	1200
1.004	14.004	500.1	MHS10	71.790	70.635	0.930	Open Manhole	1200
1.005	38.650	249.4	OUTFALL	71.600	70.480	0.895	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.009	0.009	0.009
1.001	-	-	100	0.018	0.018	0.018
2.000	-	-	100	0.004	0.004	0.004
1.002	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.009	0.009	0.009
1.003	-	-	100	0.026	0.026	0.026
4.000	-	-	100	0.013	0.013	0.013
4.001	-	-	100	0.013	0.013	0.013
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.092	0.092	0.092

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	OUTFALL	71.600	70.480	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Summer Storms	Yes
Winter Storms	Yes

Synthetic Rainfall Details

Cv (Summer)	1.000
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: MHS10, DS/PN: 1.005, Volume (m³): 1.8

Unit Reference	MD-SHE-0096-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	70.635
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.5
Flush-Flo™	0.162	3.5
Kick-Flo®	0.359	3.0
Mean Flow over Head Range	-	2.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	1.200	5.2	3.000	8.1	7.000	12.1
0.200	3.5	1.400	5.6	3.500	8.7	7.500	12.6
0.300	3.3	1.600	6.0	4.000	9.2	8.000	13.0
0.400	3.2	1.800	6.3	4.500	9.8	8.500	13.4
0.500	3.5	2.000	6.7	5.000	10.3	9.000	13.8
0.600	3.8	2.200	7.0	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.7		

Storage Structures for Storm

Cellular Storage Manhole: MHS10, DS/PN: 1.005

Invert Level (m) 70.635 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	49.0	0.0	0.500	49.0	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	MHS1	15 Summer	1	+0%	100/15 Summer				71.378
1.001	MHS2	15 Summer	1	+0%	30/15 Summer				71.167
2.000	MHS4	15 Summer	1	+0%	30/15 Summer				71.186
1.002	MHS3	15 Summer	1	+0%	30/15 Summer				71.072
3.000	MHS6	15 Summer	1	+0%	100/15 Summer				71.222
1.003	MHS5	15 Summer	1	+0%	30/15 Summer				71.027
4.000	MHS7	15 Summer	1	+0%	100/15 Summer				71.235
4.001	MHS8	15 Summer	1	+0%	30/15 Summer				71.109
1.004	MHS9	15 Summer	1	+0%	30/15 Summer				70.813
1.005	MHS10	120 Summer	1	+0%	30/15 Summer				70.754

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	MHS1	-0.122	0.000	0.08			1.3	OK	
1.001	MHS2	-0.101	0.000	0.23			3.6	OK	
2.000	MHS4	-0.080	0.000	0.09			0.6	OK	
1.002	MHS3	-0.095	0.000	0.29			4.2	OK	
3.000	MHS6	-0.123	0.000	0.07			1.3	OK	
1.003	MHS5	-0.160	0.000	0.18			8.8	OK	
4.000	MHS7	-0.115	0.000	0.12			2.0	OK	
4.001	MHS8	-0.100	0.000	0.24			3.6	OK	
1.004	MHS9	-0.075	0.000	0.77			12.1	OK	
1.005	MHS10	-0.106	0.000	0.11		44	3.4	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	MHS1	15 Summer	30	+50%	100/15 Summer				71.489
1.001	MHS2	15 Summer	30	+50%	30/15 Summer				71.462
2.000	MHS4	15 Summer	30	+50%	30/15 Summer				71.374
1.002	MHS3	15 Summer	30	+50%	30/15 Summer				71.358
3.000	MHS6	15 Summer	30	+50%	100/15 Summer				71.304
1.003	MHS5	15 Summer	30	+50%	30/15 Summer				71.281
4.000	MHS7	15 Summer	30	+50%	100/15 Summer				71.289
4.001	MHS8	180 Summer	30	+50%	30/15 Summer				71.276
1.004	MHS9	180 Summer	30	+50%	30/15 Summer				71.273
1.005	MHS10	180 Summer	30	+50%	30/15 Summer				71.266

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	MHS1	-0.011	0.000	0.35			5.9	OK	
1.001	MHS2	0.194	0.000	1.02			16.0	SURCHARGED	
2.000	MHS4	0.108	0.000	0.38			2.7	SURCHARGED	
1.002	MHS3	0.191	0.000	1.23			18.0	SURCHARGED	
3.000	MHS6	-0.041	0.000	0.31			5.9	OK	
1.003	MHS5	0.094	0.000	0.79			38.5	SURCHARGED	
4.000	MHS7	-0.061	0.000	0.56			9.1	OK	
4.001	MHS8	0.067	0.000	0.40			6.0	SURCHARGED	
1.004	MHS9	0.385	0.000	1.22			19.1	SURCHARGED	
1.005	MHS10	0.406	0.000	0.13		132	3.9	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	MHS1	15 Summer	100	+50%	100/15 Summer				71.981
1.001	MHS2	15 Summer	100	+50%	30/15 Summer				71.945
2.000	MHS4	15 Summer	100	+50%	30/15 Summer				71.746
1.002	MHS3	15 Summer	100	+50%	30/15 Summer				71.747
3.000	MHS6	15 Summer	100	+50%	100/15 Summer				71.683
1.003	MHS5	15 Summer	100	+50%	30/15 Summer				71.652
4.000	MHS7	120 Winter	100	+50%	100/15 Summer				71.574
4.001	MHS8	120 Winter	100	+50%	30/15 Summer				71.571
1.004	MHS9	120 Winter	100	+50%	30/15 Summer				71.567
1.005	MHS10	120 Winter	100	+50%	30/15 Summer				71.559

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	MHS1	0.481	0.000	0.48			8.1	FLOOD RISK	
1.001	MHS2	0.677	0.000	1.33			21.0	SURCHARGED	
2.000	MHS4	0.480	0.000	0.79			5.5	FLOOD RISK	
1.002	MHS3	0.580	0.000	1.52			22.2	FLOOD RISK	
3.000	MHS6	0.338	0.000	0.43			8.0	FLOOD RISK	
1.003	MHS5	0.465	0.000	1.01			49.1	FLOOD RISK	
4.000	MHS7	0.224	0.000	0.22			3.6	SURCHARGED	
4.001	MHS8	0.362	0.000	0.44			6.7	SURCHARGED	
1.004	MHS9	0.679	0.000	1.36			21.3	SURCHARGED	
1.005	MHS10	0.699	0.000	0.15		132	4.6	FLOOD RISK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.051	4-8	0.008

Total Area Contributing (ha) = 0.059

Total Pipe Volume (m^3) = 1.395

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.202	0.232	100.0	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.600	0.136	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	10.441	0.104	100.4	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	14.979	0.150	99.9	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	10.726	0.107	100.2	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	6.018	0.060	100.3	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.38	71.230	0.006	0.0	0.0	0.0	1.00	17.8	1.1
1.001	50.00	5.61	70.998	0.006	0.0	0.0	0.0	1.00	17.8	1.1
1.002	50.00	5.78	70.862	0.021	0.0	0.0	0.0	1.00	17.7	3.8
1.003	50.00	6.03	70.758	0.032	0.0	0.0	0.0	1.01	17.8	5.8
1.004	50.00	6.21	70.608	0.044	0.0	0.0	0.0	1.00	17.7	7.9
1.005	50.00	6.31	70.501	0.059	0.0	0.0	0.0	1.00	17.7	10.7

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	GULLEY	71.860	71.230	0.480	Open Manhole	1200
1.001	o	150	MHS1	71.650	70.998	0.502	Open Manhole	1200
1.002	o	150	MHS2	71.850	70.862	0.838	Open Manhole	1200
1.003	o	150	MHS3	71.700	70.758	0.792	Open Manhole	1200
1.004	o	150	MHS4	71.900	70.608	1.142	Open Manhole	1200
1.005	o	150	MHS5	72.000	70.501	1.349	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	23.202	100.0	MHS1	71.650	70.998	0.502	Open Manhole	1200
1.001	13.600	100.0	MHS2	71.850	70.862	0.838	Open Manhole	1200
1.002	10.441	100.4	MHS3	71.700	70.758	0.792	Open Manhole	1200
1.003	14.979	99.9	MHS4	71.900	70.608	1.142	Open Manhole	1200
1.004	10.726	100.2	MHS5	72.000	70.501	1.349	Open Manhole	1200
1.005	6.018	100.3	OUTFALL	72.510	70.441	1.919	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.006	0.006	0.006
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.015	0.015	0.015
1.003	-	-	100	0.011	0.011	0.011
1.004	-	-	100	0.012	0.012	0.012
1.005	-	-	100	0.015	0.015	0.015
				Total	Total	Total
				0.059	0.059	0.059

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	OUTFALL	72.510	70.441	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: MHS5, DS/PN: 1.005, Volume (m³): 1.9

Unit Reference	MD-SHE-0142-8500-0500-8500
Design Head (m)	0.500
Design Flow (l/s)	8.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	142
Invert Level (m)	70.501
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	8.5
Flush-Flo™	0.214	8.5
Kick-Flo®	0.390	7.6
Mean Flow over Head Range	-	6.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	12.8	3.000	19.9	7.000	29.9
0.200	8.5	1.400	13.8	3.500	21.4	7.500	31.0
0.300	8.3	1.600	14.7	4.000	22.8	8.000	32.0
0.400	7.7	1.800	15.6	4.500	24.1	8.500	33.0
0.500	8.5	2.000	16.4	5.000	25.4	9.000	34.0
0.600	9.3	2.200	17.1	5.500	26.5	9.500	34.9
0.800	10.6	2.400	17.9	6.000	27.7		
1.000	11.8	2.600	18.6	6.500	28.8		

Storage Structures for Storm

Cellular Storage Manhole: MHS5, DS/PN: 1.005

Invert Level (m) 70.501 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	15.0	0.0	0.500	15.0	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	GULLEY	15 Summer	1	+0%	100/15 Summer				71.252
1.001	MHS1	15 Summer	1	+0%	30/15 Summer				71.021
1.002	MHS2	15 Summer	1	+0%	30/15 Summer				70.904
1.003	MHS3	15 Summer	1	+0%	30/15 Summer				70.809
1.004	MHS4	15 Summer	1	+0%	30/15 Summer				70.670
1.005	MHS5	30 Summer	1	+0%	30/15 Summer				70.607

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	GULLEY	-0.128	0.000	0.05			0.9	OK	
1.001	MHS1	-0.127	0.000	0.06			0.9	OK	
1.002	MHS2	-0.108	0.000	0.17			2.8	OK	
1.003	MHS3	-0.099	0.000	0.25			4.1	OK	
1.004	MHS4	-0.088	0.000	0.35			5.6	OK	
1.005	MHS5	-0.044	0.000	0.38		13	5.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	GULLEY	15 Summer	30	+50%	100/15 Summer				71.305
1.001	MHS1	15 Summer	30	+50%	30/15 Summer				71.288
1.002	MHS2	15 Summer	30	+50%	30/15 Summer				71.286
1.003	MHS3	15 Summer	30	+50%	30/15 Summer				71.254
1.004	MHS4	30 Summer	30	+50%	30/15 Summer				71.151
1.005	MHS5	30 Summer	30	+50%	30/15 Summer				71.117

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	GULLEY	-0.075	0.000	0.25			4.1	OK	
1.001	MHS1	0.140	0.000	0.26			4.3	SURCHARGED	
1.002	MHS2	0.274	0.000	0.63			10.0	SURCHARGED	
1.003	MHS3	0.346	0.000	0.87			14.3	SURCHARGED	
1.004	MHS4	0.393	0.000	1.16			18.4	SURCHARGED	
1.005	MHS5	0.466	0.000	0.63		20	9.4	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

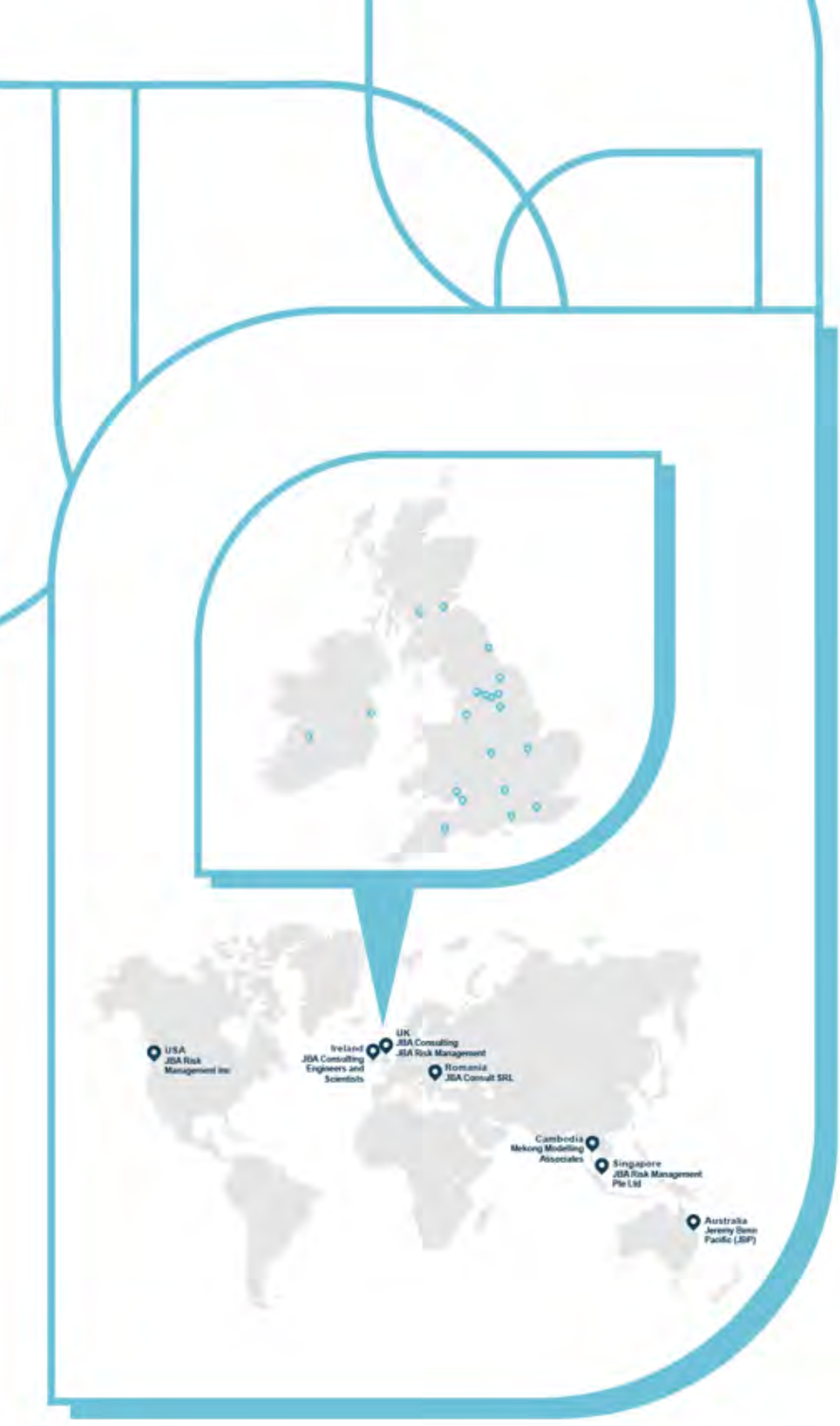
Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	GULLEY	15 Summer	100	+50%	100/15 Summer				71.680
1.001	MHS1	15 Summer	100	+50%	30/15 Summer				71.649
1.002	MHS2	15 Summer	100	+50%	30/15 Summer				71.706
1.003	MHS3	15 Summer	100	+50%	30/15 Summer				71.679
1.004	MHS4	30 Summer	100	+50%	30/15 Summer				71.502
1.005	MHS5	30 Summer	100	+50%	30/15 Summer				71.446

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	GULLEY	0.300	0.000	0.31			5.2	FLOOD RISK	
1.001	MHS1	0.501	0.000	0.45			7.3	FLOOD RISK	
1.002	MHS2	0.694	0.000	0.68			10.8	FLOOD RISK	
1.003	MHS3	0.771	0.000	1.11			18.2	FLOOD RISK	
1.004	MHS4	0.744	0.000	1.48			23.6	SURCHARGED	
1.005	MHS5	0.795	0.000	0.77		25	11.5	SURCHARGED	



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