

Drainage Strategy Report

Proposed Development at:
33 Church Street,
Pontardawe,
Swansea.
SA8 4LS.

Prepared for: Charter Homes Ltd

Job No:14657

Date: October 2022



Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS

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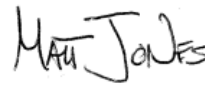
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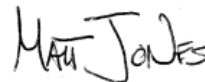
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1.0 INTRODUCTION

1.1 Purpose of the Assessment

Vale Consultancy have been appointed by Charter Homes Ltd (*the client*) to develop the drainage strategy in support of a SAB application for the demolition of a former social clubhouse and the construction of 10no 3 storey residential terraced dwellings site area of 0.182 ha of an existing developed land at 33 Church Street, Pontradaue, Swansea .SA8 4LS. NGR :272061 204208. The development has the benefit a Full Planning Consent: Ref: P2015/0851: Dated 21 March 2016

1.2 Limitations

This drainage appraisal report is prepared in support of a planning application and is for the exclusive benefit of the Client. It may not be assigned to or relied upon by third party without the agreement of Vale Consultancy in writing. Vale Consultancy retains all copyright and other intellectual property rights in the document and its contents unless transferred by written agreement between Vale Consultancy and the Client.

The findings and opinions expressed are based on the conditions encountered and/or the information reasonably available at the date of issue.

1.3 Scope of the Assessment

The scope of the assessment is as follows: -

Surface Water

- Obtain details of existing surface water sewers, ditch courses, watercourses, and any other water bodies within and adjacent to the site.
- Liaise with the Lead Local Flood Authority (NPTCBC) regarding points and rates of discharge and drainage constraints.
- Calculate expected surface water discharge flows based on likely development proposals.
- Obtain copies of available borehole records and geological maps to consider the feasibility of utilisation of sustainable drainage systems (SuDS) for the development site.
- Develop a surface water drainage strategy for the site using the principles of Sustainable Drainage Systems. The surface water drainage strategy will be in accordance with the NCC requirements.
- The outline application will be in accordance with the requirements of Schedule 3 of the Flood and Water Management Act 2010.

Foul Water

- Obtain details of existing foul public water sewers from Dwr Cymru Welsh Water (DCWW).
- Assess existing foul water network and review current off-site discharge points.
- Calculate expected foul water discharge flows based on development proposals.
- Liaise with DCWW in relation to a Hydraulic Modelling Assessment to determine the impact of the development on the public sewer network.
- Develop a Foul Water Drainage Strategy for the site.

2.0 DEVELOPMENT SITE

2.1 Site Location and Description

The candidate site is located at Church Street, Pontardawe, Swansea, approximately 12.5 km northwest of Swansea city centre. The site comprises of a plot area approximately 0.182ha of developed land on fairly flat elevated ground prior to demolition which was at an elevation av 49.50m AOD. The development plateau was reduced by an average of 2 mtrs to achieve compatibility with the existing level in Church Street (47.5m AOD) for the provision of off-road front of house parking.

The classification would be considered as "Brownfield."

The primary vehicular access entrance into the site will be off Church Street.

The application site occupies a total area of approximately 0.182 hectares of developed land and the sites are surrounded by well-established infrastructure and is centered on National Grid Reference Ref: NGR :272061 204208.

A review of the available data indicates that the site can take benefit of existing offsite sewerage assets which served the former social club, and the new development will take benefit from this existing asset and will seek to provide a level of betterment in terms of a reduced runoff rate from the new build areas which decants into the surface water sewerage asset routed in Church Street.

The site location is indicated in *Figure 1*.



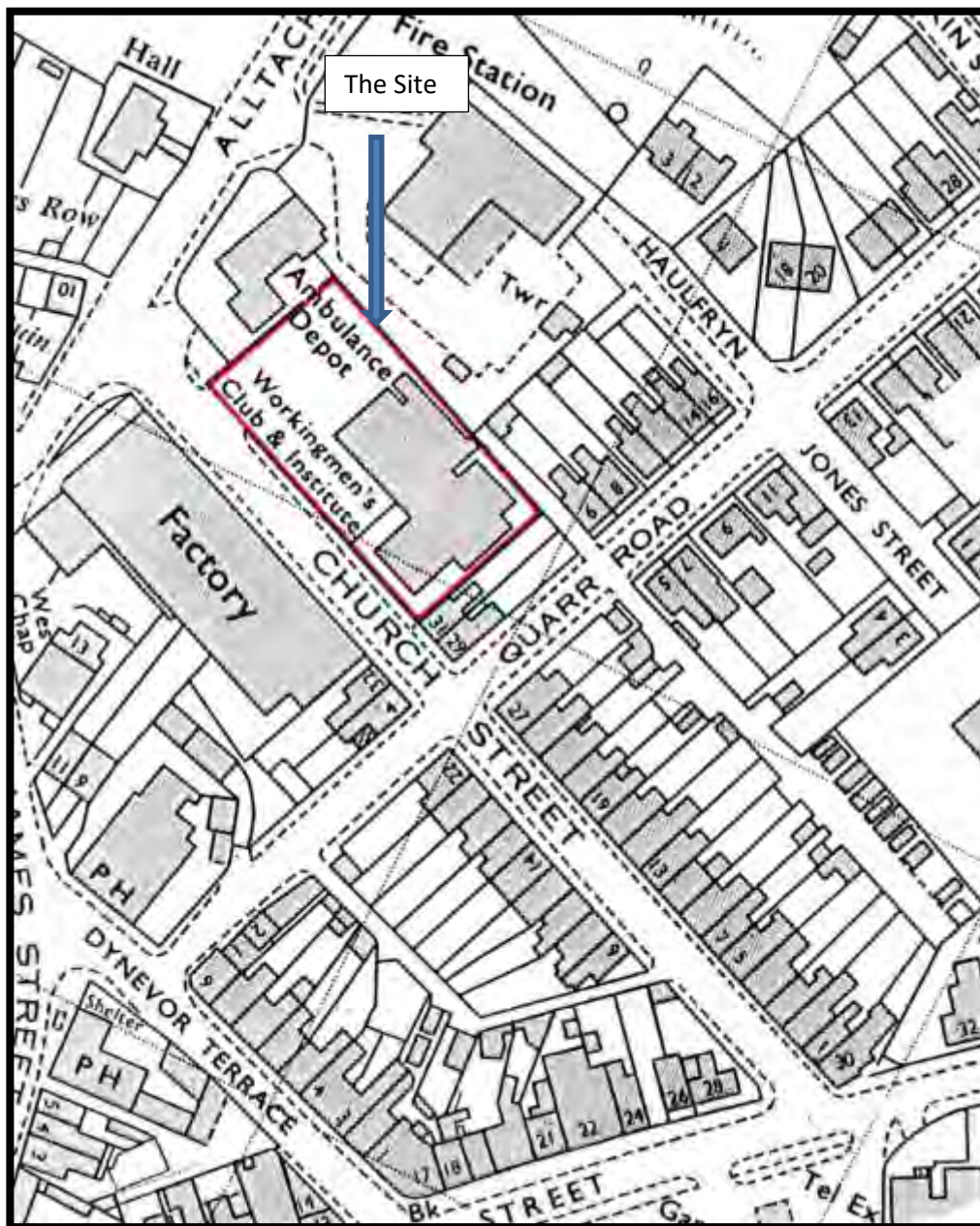




Figure 1 – Site Location

2.2 Site Proposal

The development proposals are to demolish the existing club house, reduce level and site clearance and construction of 10no terraced dwellings, with associated engineering works and parking, within a site boundary of 0.182 ha.

3.0 EXISTING SITE

3.1 Topography

The site topography as surveyed shows the ground levels averaging 49.5m AOD of total impermeable surfacing.

3.2 Geology

A review of geological information provided online by the British Geological Society (BGS) **Figure 3** indicates that the site is underlain by Alluvium clay, silt, sand and gravel. Glaciofluvial deposits, Devensian till Devensian-Diamicton with Alluvial Fan Deposits deposit over the bedrock geology Brithdir group mudstone Deposits -The Cranfield University Soilscape tool indicates clayey soil with impeded drainage.

Quantum Geotech carried out percolation field testing (February 2022) to assess the ground conditions in respect of the potential infiltration characteristics for soakaway drainage, and the results indicated low infiltration rates.

A total of six soakaway tests were performed in shallow trial pits. The results are summarised below.

Summary of Soakaway Test Results

Test Location	Base Depth of Test (mbgl)	Depth to Water at Test Start (mbgl)	Depth to Water at Test Start (mbgl)	Test Duration (mins)	Result/Comment
SA1	0.80	0.15	0.15	120	Insufficient Outflow to Calculate Permeability
SA2	0.70	0.20	0.20	210	Insufficient Outflow to Calculate Permeability
SA3	0.60	0.20	0.20	180	Insufficient Outflow to Calculate Permeability
SA4	0.90	0.25	0.25	180	Insufficient Outflow to Calculate Permeability
SA5	0.80	0.20	0.20	120	Insufficient Outflow to Calculate Permeability
SA6	0.90	0.25	0.25	90	Insufficient Outflow to Calculate Permeability

All six tests demonstrated no water drop or outflow during the test period, indicating the unsuitability of the prevailing ground for soakaways.

Design Note: ATEB Consult proposed drainage layout drg Ref No: 17/082-101-A which was submitted in support of planning indicates the non-viable proposal of point drainage deep soakaways in the rear gardens of each property. In consideration of the new evidence that infiltration as a surface water destination is not viable due to unfavourable ground conditions it is difficult to justify the legitimacy of the proposed design submitted in support of planning, and therefore a revised surface water design is proposed which will involve the retrofitting of SuDS components for each of the plots and a revised surface water destination to Priority level 4.





Figure 3: BGS Extract

3.3 Watercourses and Hydrology

The nearest surface water feature to the site is the Upper Clydach River which is located approximately 0.11km to the southeast of the site. The conveyancing route would involve crossing considerable infrastructure and a number of third-party land ownerships, and a trunk Road, on the intervening land between the site and the watercourses including rights of access which would be difficult to resolve and overcome

- Pluvial surface water is by unfettered run-off from the site which currently discharges into an existing below ground drainage network decanting into an offsite surface water sewer routed in Church Street.
- There are no known watercourses within the site boundary.
- No main river lies within the site boundary and the Upper Clydcah river which is 0.11km to the south of the site
- There are no known land drainage assets within the site boundary

3.4 Infiltration to Groundwater

As identified in Section 3.2, the underlying ground conditions and site percolation testing has been undertaken to determine the site infiltration characteristics and the results have concluded that point drainage soakaways are not a viable option which has influenced the revised design philosophy for the disposal of the surface water emanating from the development proposals.

In evaluating the potential constraints to the use of infiltration and given the infiltration results and the soil, layer ground characteristics which proved that selection and siting of infiltration components was a non-viable solution as a destination for the disposal of surface water runoff from the development. Consequently, it is difficult to understand the proposal indicated on *ATEB Consult drg No 17/082-101-A* which was submitted in support of the planning application which clearly shows that deep point drainage soakaways are proposed at the rear of each individual plot. It has therefore been concluded based on the visible site evidence of long standing water in the areas of the soakaways and the geotechnical properties of the surrounding soil that the performance of the proposed soakaways was an unacceptable proposal and a non-workable solution which required a redesign to seek alternative surface water destinations in line with the SuDS Standards which are aimed at ensuring that the most effective drainage scheme is delivered with the most preferred levels of surface water destination will be determined ..

3.5 Public Sewers and Existing Drainage

Following a commissioned CCTV drainage and dye test survey carried out by “Metrorod” a subsequent review of the results indicates that the predeveloped site drainage is served by a separate and private foul and surface water sewerage system. The existing surface water discharges unfettered surface runoff from both the now demolished existing building roof areas and the external yard areas to an offsite private surface water destination.

The redevelopment will have a separate foul water and surface drainage system utilising where possible the existing drainage system, in line with the best practice methods of design identified within Part H of the Building Regulations and Sewers for Adoption 7th Edition.

The point of connection for the surface water site drainage will take benefit from the existing offsite drain with the construction of a new offsite drainage lateral and for each plot a managed attenuation storage system and with a restricted flow rate provide by an orifice control is proposed, with a main vortex flow control device installed within a new flow control chamber prior to passing forward to the offsite surface water asset.

3.6 Sewage Treatment

No Increase from the existing foul water baseline loading and therefore no overload the Wastewater Treatment Works WWTW

3.7 Water Supply

The site is adequately served with a potable water supply

4.0 LEGISLATION

4.1 Environment (Wales) Act (2016)

This Act provides the legislation needed to plan and manage Wales’ natural resources in a more proactive and sustainable way. The key parts of the Act relating to flood and water management are:

- Part 1 – sustainable management of natural resources.
- Part 7 – flood and coastal erosion committee and land drainage (clarifies the law for other environmental regulatory regimes including flood risk management and land drainage).

4.2 Wales Spatial Plan (2008)

The Wales Spatial Plan (Ref. 8-13) is a framework for ensuring that the development of places and the delivery of services work together at a local, regional, and national level to improve the lives and prosperity of the citizens of Wales. It ensures the principles of sustainable development are fully embedded in future design with flood risk a recognised area of concern which needs to be addressed going forward.

The Planning Directorate has begun work on the National Development Framework (NDF) (Ref. 8-14) which will set out a 20-year land use framework for Wales and will replace the current Wales Spatial Plan. This document will set out where nationally important growth and infrastructure is needed and will provide direction for Strategic and Local Development Plans.

4.3 Planning Policy Wales (Edition 10, 2018)

Planning Policy Wales (PPW) (Ref. 8-15), which is supplemented by a series of Technical Advice Notes (TAN), sets out the land use planning policies for the Welsh Government. The PPW and TANs comprise national planning policy which should be considered in preparation of development plans. Meeting the Welsh Government's objective for sustainable development requires action through the planning system to move away from flood defence and towards a more positive avoidance of development in high-risk areas. Local planning authorities should consult with other authorities and NRW to ensure that, as well as not being at risk itself, the development does not increase the risk of flooding elsewhere.

4.4 TAN 15: Development and Flood Risk (2004)

TAN 15 provides guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding. It provides advice on matters including the use of DAMs to determine flood risk issues, how to assess the flooding consequences of proposed development and action that can be taken through development plans and development control (management) procedures to mitigate flood risk when planning for new development. This document is discussed in more detail within the site-specific Flood Consequence Assessment that accompanies the proposed development.

4.5 The Flood and Water Management Act (2010)

Under Schedule 3 of the Flood and Water Management Act, Lead Local Flood Authorities (LLFAs) were established as SuDS Approval Bodies (SAB) which will require BCBC to approve but not adopt the SuDS for this new development.

4.6 Local Flood Risk Management Strategy

Under the Flood and Water Management Act, a duty has been placed on BCBC to develop and maintain a Local Flood Risk Management Strategy (LFRMS). The strategy gives a clear vision on how flood risk will be managed in the authority's boundary and deals with only local flood risk which is defined in the act as being from:

- Surface water runoff
- Groundwater
- Ordinary watercourses (Main River flooding remains the responsibility of NRW)

4.7 Statutory Standards for Sustainable Drainage – 2018

As a requirement of the Flood and Water Management Act, the Government must publish Statutory Standards and consult on them prior to publication. These standards address the design, construction, maintenance, and operation of drainage systems. The Statutory Standards for sustainable drainage

consultation came into effect on 7th January 2019, requiring all new developments to include Sustainable Drainage Systems (SuDS) features that comply with the national standards.

In the legislation for sustainable drainage SAB will apply to

- Construction work means anything done by way of, in connection with or in preparation for the creation of a building or other structure,
AND
- Construction work has drainage implications if the building of structure will affect the ability of the land to absorb rainwater.

The building footprint exceeds the 100m² threshold

4.8 BS 8533: Assessing and managing flood risk in development – Code of practice

The British Standard 8533 (BS8533) has been published by the British Standards Institution (BSI) in October 2011. This aims to provide further details, guidance and recommendations to the developers, planning authorities and flood risk managers in order to consider and identify the flood risk from all the potential sources of flooding and how to avoid, reduce and mitigate their likely impact in new or existing developments.

4.9 The SuDS Manual (2015) CIRIA C753

NPTCBC are now the statutory consultee for major developments which have surface water implications. This new responsibility will require LLFAs to provide comments in relation to surface water drainage aspects of planning applications within 21 days.

The latest guidance on the use of SuDS is provided in 'The SuDS Manual' by CIRIA (ref: C753, London 2015). The SuDS Manual states that.

The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water runoff from developed areas.

The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying, and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone".

4.10 Sewers for Adoption 7th Edition

Sewers for Adoption is the standard in England and Wales for the design and construction of sewers to adoptable standards. It is a guide to assist developers in preparing their submission to a Sewerage Undertaker prior to entering an Adoption Agreement under Section 104 of the Water Industry Act 1991.

Dwr Cymru Welsh Water also publish supplementary guidance to Sewers for Adoption to define their specific requirements, where appropriate.

5.0 SUSTAINABLE DRAINAGE SYSTEMS (SuDS) COMPLIANCE

5.1 SuDS Objectives.

NPTCBC Land Drainage have confirmed that the proposed development will require SAB approval prior to any construction works commencing onsite.

Therefore, a surface water drainage system will be developed in line with the ideals of sustainable development are collectively referred to as Sustainable Drainage System (SuDS). These systems are designed both to manage the environmental risks resulting from urban runoff and to contribute wherever possible to environmental enhancement. It is proposed that SuDS techniques are utilised wherever possible to manage surface water runoff from the development. The following paragraphs describe how SuDS could be incorporated into the development proposals.

SuDS objectives are to minimise the adverse effects from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities.” (CIRIA C753, 2015).

The following reference guides will be reviewed and utilised, as appropriate, during the SuDS features design procedure.

- Planning for SuDS – making it happen (CIRIA C687)
- Site handbook for the construction of SUDS (CIRIA C698, 2007)
- Designing for exceedance in urban drainage: Good practice (CIRIA C635, 2006)
- Flood Risks to People, Defra /Environment Agency 2006
- The GRO Green Roof Guide
- Health and Safety Principles for SuDS (CIRIA RP992/17)

The design approach for an industrial infill on the available plots within an existing commercial/industrial setting will, take advantage of the space available for each plot, and each plot will attenuate and treat its own runoff with on-plot SuDS components.

5.2 The SuDS Management Train

The drainage design within the development, will comply with the four pillars of SUDS: Water Quality, Water Quantity, Amenity and Biodiversity.

The ‘management train approach’ should be central to the surface water drainage strategy for the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of stormwater discharge from the site, and is as follows:

Prevention - the use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse/harvesting.

Source Controls - control of runoff at source or as close to source as possible (e.g., soakaways, green roofs, pervious pavements)

Site Control - management of water in a local area and can include below ground storage/attenuation, detention basins, large infiltration devices.

Regional Control - management of water from a site or various sites and can include wetlands and balancing ponds.

5.3 Building Regulation Hierarchy

In line with current best practice, priority consideration for means of surface water discharge should be given firstly to the use of infiltration. There are two factors determining whether infiltration can be utilised onsite.

The first is the geological constraints determined by the underlying geology. Percolation field testing to BRE 365 have been undertaken across the site at 6 no locations and the percolation results have indicated poor infiltration results.

The second is the physical constraints determined by land use and the proposed masterplan. Building regulations requires a minimum 5m standoff distance of point source soakaway from any structure, building or public highway. The drainage strategy does not propose the use of point source soakaways where infiltration can be concentrated to one specific location, sometimes resulting in localised sub-flows. Instead, shallow infiltration via permeable surfaces mimics the principle of natural infiltration of previous undeveloped parts of the site, i.e., covered by grass and gravels.

5.4 Surface Water Runoff Destination

The Flood and Water Management Act 2010 (Schedule 3) came into effect in Wales in January 2019, which now requires new development to include Sustainable Urban Drainage Systems (SuDS) features which comply with the National Standards. The proposed development must therefore take into consideration the following hierarchy for surface water destination.

By exploring the Surface Water destination in line with the SuDS Standards which are aimed at ensuring that the most effective drainage scheme is delivered with the most preferred levels of surface water destination will be determined.

Surface water runoff destination have been considered in order of Priority Level.

Surface Water Disposal Mechanism	SUDS Hierarchy
Priority Level 1: Surface Water runoff is collected for use. Priority Level 2: Surface Water runoff is infiltrated to the ground. Priority Level 3: Surface Water runoff is discharged to a surface water body. Priority Level 4: Surface Water runoff is discharged to a surface water sewer, highway drain, or another drainage system. Priority Level 5: Surface Water runoff is discharged to a combined sewer.	Most Preferred  Least Preferred

Priority Level 1 –Collection for reuse. The level 1 solution will not be wholly adequate to deal fully with the development surface water drainage and would require overflow into the next lower priority destination and will be required when the collection storage is full.

The use of a proprietary rainwater harvesting system has been considered and disconnected due to the disadvantage of capital cost/installation and maintenance requirement that a specialist system would

Priority Level 2 -Discharge by infiltration into ground: The recently completed infiltration testing (April 2022) determined the non-viability of deep soakaways in accordance with BRE 365. However, although the use of traditional soakaways as a means of surface water disposal by point drainage soakaways to be is non-viable option as a means of managing surface water runoff from the impermeable areas as concentrated water discharges should be positioned 5.0m from any proposed or existing structure as the influx of large volume of water could cause instability on the substructure. Diffuse infiltration at or near the surface is a viable option and would not pose a risk to the proposed structure

Priority Level 3 -Discharge to Water Body. As there is no water body close the site suitable for direct discharge of development surface water and pumping is neither economically viable or technically acceptable due to the high costs of installation and operation and flooding should there be a failure of the pump station, discharge to a waterbody has been discounted.

Priority Level 4-Disachge to Public Surface Water Sewer. As there is a historic offsite surface water private drain into which the existing site discharges and is suitable for direct discharge and managed discharge for the redevelopment.

In accordance with WGSSSD, G23 and G24 the runoff rate for the previous developed sites should replicate the predeveloped site (*Greenfield*) of at least 30% betterment should be considered as an absolute minimum from the runoff rate from the previously development sites contributing catchment area.

The rate of run-off for the developed site should be no greater than the estimated peak runoff rate and runoff volumes from the site to help ensure that the flood risk associated with the receiving sewer is not increased by the development proposals. The approach for estimating runoff rates and volumes from the proposed impermeable catchment areas have been calculated using the FEH ReFH2 method. This method

allows estimation of the amount of runoff likely to be generated from the development proposals from a range of storm returns. The proposal will take benefit from and to discharge the surface water runoff from the site at a managed betterment rate to the existing drain within the site demise.

Primary and secondary destination of surface water runoff

Priority Level	Primary destination	Secondary destination	Comments
Priority Level 1	N	N	
Priority Level 2	N	N	
Priority Level 3	N	N	
Priority Level 4	Y	Y	
Priority Level 5	N	N	

Discharge to a foul drainage will not be permitted.

5.5 SuDS Site Constraints

Not all SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required, so that the SuDS limitations can be determined. This assessment considers the following:

Land Use Characteristics: The proposed density and land use of the development will influence the SUDS selection.

Site Characteristics: Geological, groundwater and contamination characteristics could all affect the suitability of infiltration SUDS techniques.

Catchment Characteristics: The site is currently greenfield and the discharge rate from the redeveloped site will need to be limited.

Environmental and Amenity Performance: Factors including maintenance regime, cost, safety, and habitat creation need to be considered to influence the SUDS selection for the site.

5.6 SuDS Design Philosophy

The SuDS philosophy for the development site and use of SuDS within the usable space of the site constraints and the extent of the development proposal – “fence to fence”-limits the potential use for retro fitting the opportunity for finding space to effectively provide amenity and biodiversity with a green infrastructure within the site boundary such as green roofs, rain gardens, swale, bioretention areas etc. The site is confined and restricted and the end use operation has influenced the sites layout in terms of planning and design constraints and the area of available land within the approved planning layout.

Amenity is not the main driver for this sub-catchment, and the estimated storage volumes can be provided within the proposed below ground attenuation components within the available space for each plot.

The plot roof areas, will require attenuation, which can be provided cost-effectively in attenuation tanks that lie beneath the frontage of the garage driveway.

For this specific scheme the use of retrofitting of SuDS components of raised planters to the front and rear are the most efficient and cost-effective way of delivering a SuDS scheme. It is therefore proposed

to make use of the external areas to the front of the plots by providing a below-ground void space for the temporary storage of surface water with a flow control release in the form of a Geocellular storage system of modular plastic units, which will address the and improve the way in which the surface water is managed, and above the below ground storage system will be a permeable surface *Type C* where the rainfall to filter through the permeable aggregate structural layers which will provide a treatment medium prior to discharge into the geocellular storage system.

As the space is limited for above ground conveyancing, the design concept does not necessarily include some of the more visible SuDS features, the design includes a sequence of components provide the necessary processes to control the frequency of runoff, flow rates and the volume of runoff, and to reduce concentrations of contaminants to acceptable levels.

The drainage techniques proposed for this site include prevention, source controls and site controls. The following SuDS strategy is proposed for the development and the techniques are discussed in further detail in Section 6.

5.7 The SuDS Drainage Concept (Ref: Appendix A)

Will consist of a standard roof collection system with rainwater down pipes from a traditional RWG collection system discharging into retrofitted raised planters with engineered soils and vegetation to manage runoff rates and volumes and treat pollution, prior to discharge into the below ground conveyancing pipework. Attenuation storage will be provided by a 3-dimensional free flow geocellular units located in the front driveways of the plots which are designed to withstand the required traffic loadings. The water quality hazard is predominantly very low pollution from rainwater. The water quantity passing forward to the offsite sewer will be provided by a vortex flow control regulated at 6.5l/sec with respective plot limited to a restricted runoff rate of 0.65l/sec.

5.8 SuDS Components Considered for the Development

Site control features such as detention basins and swales can be designed to attenuate storm runoff and provide conditions for settlement of suspended solids. The use of these types of attenuation within the development have been given due consideration and discounted as there is not enough land available to provide this large feature

A hierarchical approach to the drainage strategy has been considered for this development in accordance with Table 1. Each method is assessed to reach a conclusion appropriate to the development

TABLE 1: SuDS Assessment

Hierarchical SuDS Assessment			
	Comment	Issues To Consider	Appropriate To Development
Green roofs	<i>Can be used on suitable low-rise buildings</i>	<i>Safe maintenance access In keeping with character/appearance of adjacent buildings. The use of a green roof has been considered and discounted for the main buildings due the</i>	<i>Unlikely to be appropriate</i>

		<i>structural implications and the imposed load on the buildings.</i>	
Rainwater Harvesting	<i>Rainwater harvesting reduces the total runoff volume from the developed Site, particularly first 5mm of rainfall, and reduces treated water consumption</i>	<i>Economics for full rainwater harvesting systems (Ref Section 5.7.1)</i>	<i>Full rainwater harvesting unlikely to be economical for this Site</i>
Plot infiltration	<i>Reduces total runoff volume from the developed Site</i>	<i>Mobilisation of contaminants into the underlying strata and, therefore unsuitable for infiltration drainage</i>	<i>Not appropriate</i>
Permeable Paving & Subbase Drainage	<i>Can be used to provide pavement runoff water quality enhancement (treatment train) and subbase attenuation Permeable paving proprietary sub-base storage reduces requirements and volumes of storage structures</i>	<i>Shallow soils within the top 0.5m are not likely to be suitable for infiltration drainage via permeable surfaces Impact of saturation on pavement stability to be considered possibly requiring extensive use of impermeable membranes and underdrainage</i>	<i>Appropriate Type C SuDS System</i>
Bioretention System	<i>Can be used to reduce runoff rate and volumes, and treat pollution through the use of engineered soils and vegetation in the form of raised planters</i>	<i>Effective in delivering interception and a very flexible surface water management component Site constraints and space limitations</i>	<i>Appropriate for retrofitting of raised planters</i>

Swales	<i>Swales provide above ground flood conveyance routes Water quality enhancement is provided by filtration through vegetation and stone media</i>	<i>No space available for open basins in agreed site layout.</i>	<i>Not Appropriate</i>
Infiltration Basins	<i>Infiltration basins can be located within landscaped areas to attenuate storm flows up to the 100 years plus, climate change event</i>	<i>Underlying geology is likely to have poor drainage characteristics, therefore, unsuitable for infiltration drainage Health and safety issues for potential open water bodies in residential areas. No space available for open basins in agreed site layout.</i>	<i>Not appropriate</i>
Detention Ponds	<i>Detention basins can be located within landscaped areas to attenuate storm flows up to the 100 years plus climate change event</i>	<i>Health and safety issues for potential open water bodies in residential areas. No space available for open basins in agreed site layout.</i>	<i>Not appropriate</i>
Sub-Surface Storage (Tanks & Pipes, Geocellular crates)	<i>Suitable for use where there is insufficient space for an open basin Suitable for use where other factors prevent the use of open basins</i>	<i>Below geocellular crates can be considered as part of a controlled discharge system</i>	<i>Appropriate to development</i>

5.9 Rainwater Harvesting

The use of a proprietary rainwater harvesting system has been considered for the development plots and discounted due to the disadvantage of capital cost/installation and maintenance requirement that a specialist system would impose on the home owners and in addition following reasons also have an influence on the level of service that could be expected from the provision of a RWH system, as there is no foreseeable demand for non- potable water within the development proposals. There is no foreseeable need to harvest water at the site as DCWW has not identified any potential stresses on the mains water supply.

The use of rainwater harvesting is not a cost-effective /viable option for managing surface water runoff in comparison to the water supply benefit by installing/maintaining such a system.

Indicative costs estimate for a capture-store-pump-use based on a 2,000 (2m³) litre tank serving the development (*Technical source University of Exeter/STW*):

- Onsite installation costs (Inc of exaction/backfill, pipework electrical supply etc) =£1,500.00
- RWH system with a 2 m³ tank delivered to site =£2,500-£3,000

Capital Costs per system circa =£4,000/plot =10no plots =£40k

Average potable water consumption/ day for the office accommodation = 197m³/annum

DCWW Standard volumetric measured rate /m³=£1.36/m³

Typical water bill /annum=£1.36 x 197m³ =£268.00

The RWH system would provide a 25% reduction on water demand:

£268.00x25 % =£200.00/annum

Therefore a 25% saving set against the capital investment cost would result in a 58-year break even recovery of costs.

The obligation to provide such a system is not a mandatory requirement in so far as reuse/recycling has been given due consideration.

6.0 SURFACE WATER RUNOFF CONTROL AND DRAINAGE STRATEGY

The surface water from the development will be collected within the site and discharged using SuDS features.

The objectives of sustainable drainage systems are threefold:

- To limit the peak run-off rate to that of the pre-developed “Greenfield” condition.
- To limit the volume of run-off to that of the predeveloped condition.
- To maintain the quality of the surface water which is discharged.

The proposed drainage strategy is subject to liaison and approval with BCBC SAB.

6.1 Peak Run-off Flow Rate

In accordance with best practice CIRIA C753: Chapter 24, the rate of run-off for the developed site should be no greater than the estimated peak runoff rate and runoff volumes from the site in its pre-developed state. The approach for estimating runoff rates and volumes from the proposed permeable catchment areas will be calculated using the FEH ReFH2 method. This method allows estimation of the amount of runoff likely to be generated from the development proposals from a range of storm returns.

The calculation will include for the anticipated impermeable development area based on an initial estimated permeable development for the catchment area with a 10% allowance for urban creep is not applicable as the proposed development has maximised the developable site area.

Existing contributing areas & run-off rates

Former Social Club Building and External Hardstanding Area

The greenfield QBAR rate has been determined using ReFH2 software, using the ReH rainfall data specific to the site. Refer to ReFH2 software output below:

The total site contributing catchment area is circa 0.182 ha, which consists of the former social club hardstanding areas and footprint of the building roof area. The global greenfield run-off rates have been calculated using the FEH method the runoff rates for each return period (Qbar, 30 & 100).

Global Greenfield/Brownfield Run-off Rates by Return Period based on FEH

Return Period	Run- off Rate (l/s)
Qbar (Urbanised)	1.1
30 yr	14.4
100 tr	18.5

Proposed Development Surface Water Runoff Rate

The estimated peak runoff rate from the proposed site is based on 100% runoff from impermeable areas and 0% runoff from permeable areas, in accordance with CIRIA C753

The estimated runoff rates and volumes from the proposed impermeable catchment areas have been calculated using the Modified Rational (Wallingford) Method. This method allows estimation of the amount of runoff likely to be generated from the development proposals from a range of storm returns. Rainfall depths for various storm return periods have been produced using the *Micro- Drainage Windes (Version 2015.1. Depth –Frequency-Duration)* modelling functions have been used to calculate rainfall

intensities for a specific return period. The MRM uses the following equation to calculate peak runoff rate from a given area:

$$Q = 2.78 C_v C_R i A$$

Where:

CV = Volumetric Runoff Coefficient

Cr = 1.3 (Routing Coefficient)

I = Rainfall Intensity (mm/hr)

A = Area.

2.78 = Coefficient which accounts for the difference in units used for inputs and outputs of the equation.

The variable CV is a coefficient that describes the proportion of rainfall appearing on the surface water drainage system, CR is a routing coefficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner.

C = runoff coefficient, assumed to be 1.0

The Rational Method is recognised as oversimplifying the rainfall runoff process, but it considered sufficiently accurate for runoff estimations for small catchment contributing areas. The main assumption being that the rainfall occurs at a uniform intensity for a duration equal to the time of concentration of the catchment and that the rainfall occurs over the entire catchment area, with the rainfall return period being the same as the runoff return period.

An assessment of the site has been completed through sub-division of the site to smaller development parcels linked to the likely phasing of the scheme.

The calculation has been completed for the anticipated impermeable development area based on an initial estimated impermeable development for the residential catchment areas with a 10% allowance for urban creep

The calculation has been completed for the anticipated impermeable development area based on an initial estimated impermeable development for the residential catchment areas.

A_{previous} = 0.182ha

Runoff Pre-development impermeable = 0.182ha of which 98% is existing hard landscaped area

Area = 0.182 x 0.98 x 0.014 = 25 l/sec

Existing surface water runoff from the site 25 l/sec (*MRM simple method for design estimates for simple sites*).

Surface water design discharge rate 6.2 l/s. (75% betterment)

6.2 Three Annual Rainfall Probabilities (*merit specific consideration: 100%, 3.33% and 1%*)

The **100% annual probability** (once in one-year event) is the highest probability event to be specifically considered to ensure that the flows are tightly controlled for these frequent events.

The **3.33% annual probability** (1 in 30-year event) is of importance because of the linkage with the level of service requirements of Sewers for Adoption that requires surface water sewers can convey this storm event within the drainage network without causing flooding to any part of the site.

The **1% annual probability** (1 in 100-year event) has been selected since it represents the boundary between high and medium risk of fluvial flooding defined in TAN 15 and recognises it is not practicable to fully limit flows for the most extreme storm events. Also, during storm events of this magnitude, the capacity of the surface water drainage system may be inadequate, however the floor levels of the proposed buildings will be flood free.

Flood flows up to 1% annual probability are contained within the site and will have little material impact in terms of nuisance and damage. Overland flood flows within the site have been assessed for the short high intensity rainfall events of between 15 mins and 1-hour duration.

6.3 Surface Water Drainage Strategy

As part of the new drainage strategy, the following is proposed:

- The system is designed not to flood any part of the site in a 1:100+cc year return period design storm.
- The development drainage system will be a non-infiltration system with a few SuDS components within the development demise.
- **During the detailed design process**, the proposed network will be simulated by the industry standard drainage design computer software, analysing each drainage component on an individual basis for all storm durations between 15 and 1440 mins (1 day)

Assumptions:

- Design Criteria site with average ground slope less than 1%
- Global time of entry 5 mins
- Minimum velocity 0.75m/sec
- All roof areas and hardscaping to be 100% impermeable.
- Hydraulic pipe roughness 0.6 Ks.

Part H of the Building Regulations and current best practice requires a sequential approach for the disposal of surface water and requires the first choice of surface water disposal to be discharge to infiltration systems where practicable.

The drainage strategy for the development will therefore seek to limit flow rates to those calculated above to minimise the impact on peak flows during storm events. As such, it will be necessary to provide attenuation within the site drainage systems to accommodate the increased run-off from the development.

The calculation has been completed for the anticipated impermeable development area based on an initial estimated impermeable development for the residential catchment areas with a 10% allowance for urban creep.

6.4 Volumetric Run-off

Wherever possible, the volumes of run-off should also be assessed to the predevelopment discharge rates.

The volume comparison is generally made for a 1 in 100-year storm of 6 hours duration; this storm has

been assessed as having the most severe effect on downstream watercourses. Given the reduction in the impermeable area associated with the proposed development with the introduction of a landscaped /amenity area to the side elevation, this volume will slightly decrease for the same storm in the post-developed condition.

Given the topography of the site, it will not be possible to provide separate attenuation for long-term storage within the site boundary. Therefore, the drainage system will be designed to provide enough attenuation to limit flows from the development at the following discharge rates for the pre-developed condition for all storm return periods: Ref Drg No 14657-500-H and 501-H

- Typical House Plot impermeable area = 0.62 l/sec at orifice flow control at MH S1-3, S2-3, S3-3, S4-3, S5-3, S6-3, S7-3, S8-3, S9-3, S10-4
- Total managed flow rate passing forward 6.2 l/sec

The principal flow rate passing forward to the offsite surface water sewer will be limited in total to 6.2 l/sec via a vortex flow controls (Hydrobrake).

6.5 Attenuation Sizing

The design intent will be to restrict flows from the individual catchments to the QBAR flow rate for all storms up to the 1 in 100-year return period, plus 40% allowance for climate change to provide alleviation to existing off-site flooding.

Surface Water attenuation calculations have been undertaken using Micro Drainage for the two systems listed below;

Ref Drg 14657-C501-H

Plot 1-9 Sub catchment = Storage : 9 No X 9m³ = 81m³

Plot 10 Sub catchment split in 2 no storage units 3m³ + 6m³ = 9m³

Full design parameters and Micro Drainage model outputs are included in the project Surface Water Drainage Calculations Doc: 14657-SW01

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7.0 SITE SPECIFIC SuDS DESIGN PROCESS

7.1 Site Description

Medium density residential development. The site will be developed with a surface water discharging via geocellular storage. A strategic drainage system will collect runoff from the developed surfaces of plot sub-catchments and convey to the SuDS storage for the site prior to discharging to the offsite sewer at a regulated flow rate.

7.2 Strategic Surface Water Management Objectives

Table 1: Strategic surface water management objectives.

Delivery Area	Strategic Objectives
Water resources	There are insufficient drivers for rainwater harvesting systems. The site is not in an area of water stress and there are no infiltration opportunities for much of the site. Standard roof downpipes to attenuation tanks via RW system. Storage by attenuation tanks
Flood risk	Rates and volumes of surface water discharge from the site to be controlled by a series of SuDs components to a reduce predeveloped brownfield discharge rate.
Water quality	The site will discharge surface water sewer into the SuDS attenuation system, and the appropriate treatment measures of surface water will be required and implemented with the permanent works.
Amenity.	Amenity is not the main driver for this sub-catchment
Habitat and the biodiversity	Due to the site constraints a limited site-specific retrofitting of biodiversity within development proposals and the planting opportunity is limited within the site demise
Climate resilience	The development is in a low-key residential environment. Urban cooling is not a factor. However, water resources, flood risk, habitat and biodiversity of the development proposal will all contribute to climate resistance.
Approval/adoption	NPTCBC are the approving body for the surface water management system and will approve the scheme against the Welsh Government mandatory standards. The adoption of some of the system components is to be agreed in those areas of the development that are considered to be eligible for maintenance by the local authority. The site drainage within the development plot will be owned and maintained by the school or relevant management company and included within a property O & M manual.

7.3 Development characterisation outcomes

The proposed land use will form part of the development layout with limited landscaping and given the limited opportunity and constraints of the development characteristics a bespoke site-specific surface water management system of integrated SuDS components is proposed.

Table 2: Site characterisation outcomes

Delivery Area	Strategic Objectives
Site topography	The areas of the site are described in Section 3.1
Potential for infiltration	Field testing has been undertaken to BRE 365
S.W. destination	To priority level 4 (private surface water sewer)
Site flood risk	There is no known existing groundwater, coastal/fluvial or pluvial flood risk adjacent to the site: Ref NRW DAMs
Existing land use	Previously /existing developed site- Brownfield classification.
Site infrastructure	The building plots will have a separate foul and surface water drainage system prior to connection to the spur connection within the offsite network.
Existing Soils	The existing subsoil are not suitable for Infiltration SuDS components, and the testing results has confirmed the reasons
Biodiversity	The level of urbanisation with the site in a principally suburban zone has a low ecosystem/habitat.

7.4 SuDS delivery design criteria for the site

7.4.1 Water quantity

- The use of rainwater harvesting is an unlikely driver.
- Control peak runoff rates for the critical 1:100-year event (to meet the water quantity control standard) using appropriate sub-catchment and strategic system flow controls to include 40% climate chance and urban creep has not been factored into the assessment as the developed area of the site has been maximised.
- Control runoff volumes from the site for an appropriate 1:100-year event (to meet water quantity standards)
- Control peak runoff rates for the site for 1:1-year return period event (to meet water quantity standard)
- Deliver interception of all hard surfaces on the site (to meet water quantity standards)
- Ensure the SuDS components drain sufficiently quickly so that the system is prepared to manage further rainfall.
- Ensure that all surface water is retained within the SuDS components for events up to the critical 1:100-year event and contained within appropriate exceedance routes.
- Provide treatment of surface water runoff to meet the requirements of the water quality standards.

7.4.2 Amenity

- Amenity is not the key driver for this catchment area

7.4.3 Biodiversity

- Due to the site constraints a limited site-specific biodiversity within development proposals and the planting opportunity is not possible within the site demise

Water Quantity	Roof runoff collection standard downpipe to a below ground attenuation tanks. Storage: Detention basin (1:100+cc) Conveyance: pipework to SuDS components Exceedance: overland flow for events over and above the 100year +cc	Direct rainfall collection by attenuation tanks and porous paving. For small events less than 5mm would be lost through infiltration within the SuDS components through infiltration/evapotranspiration and runoff from these frequent small events for all surfaces will usually pass through the attenuation systems with limited or no control. Storm events for 100 years + 40% attenuated in the SuDS components and connecting pipes.
Water Quality	Discharge to surface water sewer Ground water protection measures	Priority Level 4 Low hazard indices with slit traps prior to discharge into attenuation tanks.
Amenity	Residential runoff	Limited landscaping
Biodiversity	Residential runoff	Limited landscaping

7.4.4 Design Approach

The existing predeveloped site area is totally impermeable hardstanding, and the standard is set for 1:1 year and 1:100 year +40%--- urban creep has not been factored as the developed has been maximised.

As the candidate site is smaller the 50ha the approach and method used to calculate the pre-developed peak runoff rate (GFR) from the site is: The ICP SuDS function in the *Micro Drainage* software. This uses the IH Report 124 method for site up to 50ha, adjusted pro-rata by area for specific site (0.1ha) as recommended in Code of Practice for Sustainable Drainage Systems.

The hydrological characteristics for the Swansea Region area

SAAR (mm)	1090
SOIL factor	.320
Hydrometric Area	9

7.4.5 Interception Design

The proposed SuDS interception design can be assumed compliant for zero runoff for the first 5mm of rainfall for 80% of summer event an 50% for winter rainfall events.

8.0 POLLUTION CONTROL/WATER TREATMENT

The design of the drainage system will need to consider treatment of the surface water run-off to allow for removal of pollution from the flow prior to discharge from the site. The selection of separate stages of treatment will be necessary to ensure enough removal of pollutants based on the designation of the area being drained.

Initial capture of the run-off from impermeable areas is likely to be completed using sump units at the termination point of the line drainage upstream of the geocellular storage tanks.

The proposed surface water drainage system will improve the water quality from the development proposals, entering the public sewer. This will be done by using a treatment chain where each subsequent system within the proposed drainage network is treated to improve water quality.

Infiltration drainage methods are unsuitable for this development and therefore treatment of surface water prior to entering the SuDS components has been considered and that the use of the gullies and silt traps will provide a degree of treatment.

The surface water treatment stage will depend on the potential hazards on the site and the sensitivity of the receiving surface water drain to possible pollution.

SuDS Component Management Train Approach

Do the SuDS /Treatment Practices achieve the following water quality treatment processes.

SuDS/Treatment Practices	Pollution Prevention /Interception	Primary Treatment Process	Secondary Treatment Process	Tertiary Treatment Process
Permeable pavement/surface	Yes	Yes		
Infiltration systems	N/A	N/A		
Green Roof	N/A	N/A		
Rainwater Harvesting System	N/A			
Filter Strips	N/A	N/A		
Swale	N/A	N/A		
Bioretention Surface	N/A	N/A	N/A	
Detention Basin	N/A	N/A	N/A	
Pond			N/A	
Wetland			N/A	N/A
Attenuation Storage	Yes			

Water Quality Standard

Land Use	Pollution Hazard Level	Water Quality Treatment for Discharges for Development (CIRIAC753: Table 26.2)
House Plot Roof Area	Very Low	TSS=0.2. Metals=0.2. Hydrocarbons 0.05
Hard standing Areas surrounding the building	Low	TSS=0.8. Metals=0.8. Hydrocarbons=0.9

SuDS components for the management train for the development site exceeds the pollution hazard index.

Therefore, the SuDS mitigation indices for discharging to surface water within the management train will capture, convey and store surface water runoff while delivering interception and pollution risk management.

SuDS components for the management train for the development site exceeds the pollution hazard index.

Roof water from the development plots is considered low risk and by discharging the roof water into the SuDS components within the drainage system i.e., geocellular storage units, raised planters, catch pits /gullies will capture the pollutants provides further pollutant removal and treatment and a gradual improvement to the water quality entering the offsite system and is therefore deemed to be sufficient.

9.0 EXCEEDANCE FLOW

In line with the design criteria of dealing with exceedance flows the proposed building will not flood for storm events with a return period greater than 100 years plus climate change.

In accordance with best practice (CIRIA C635 Designing for Exceedance), flood waters from storm events that exceed the design storm of 100 years +cc will be channelled toward highway curtilage adjacent to the site boundary. The proposed network modelling results based on the Simulation Criteria for a 100-year storm return period for a range of storm durations with the network at pipe full capacity, will indicate the points of storm water escape from the proposed drainage network.

The exceedance overland surface conveyance of the flood pathways (default pathways) is directed by design to effectively convey exceedance flow away from the building to areas in the development low spots where temporary storage can be incorporated.

The potential points of exceedance escape would be from the interaction between the major and minor drainage system which is as follows:

- Flooding from manholes and other connections to the minor drainage system due to blockage or other defects.
- Excess surface water runoff that cannot enter the system due to the limited capacity.
- Flooding caused by the high levels of surface water in the onsite/offsite sewer preventing the site from drainage.

10.0 STATUS OF OWNERSHIP OF SuDS DRAINAGE SYSTEM

The Welsh Government Statutory Standards for SuDS places a duty on authorities to adopt SuDS features that serve more than one property, therefore as the proposed unit and the associated external falls under the definition of one property and therefore any SuDS that drain the building and the external areas will not fall under the duty to adopt and will remain in private ownership.

11.0 FLOODING

The NRW Development Advice Map for the site indicate that site area is outside the Flood Zone 3 and 2 flood envelopes, in an area of little to no flood risk.



- ▼ ☒ Rivers and Sea
 - Flood Zone 3
 - Flood Zone 2
- ▼ ☒ Surface Water and Small Watercourses
 - Flood Zone 3
 - Flood Zone 2
- ▼ ☒ Recorded Flood Extents
 -

Extract from NRW Development Advice Maps (DAMs)

12.0 FOUL WATER DRAINAGE STRATEGY

12.1 Foul Drainage Principles

The foul water drainage system serving the development proposals will be offered for adoption under Section 104 WIA 91 at the demarcation manhole

The proposed foul water layout serving the development expectations will be based on Sewers for Adoption 7TH Edition where the offsite gravity drain will be a demarcation chamber at the site boundary and will be offered for adoption under the provisions of a Section 104 Water Industry Act 1991 (WIA91). The legal right of connection under a Section 106 of the WIA91 will not exist until a Section 104 Agreement is in place for the lateral drain.

12.2 Public Sewers

The sewer records obtained from Dwr Cymru Welsh Water (DCWW) indicate that the existing site is served by a well-established public foul drainage network, with future proofed connection to the site provided under the original industrial estate development from which the site drainage will take benefit from.

There are existing offsite DCWW sewerage assets available to support the development proposals.

After site clearance, a new gravity drainage system serving the development proposals will be constructed

12.3 Existing Site Dry Weather Flow Discharge Rate

There is a separate foul and surface water sewerage network serving the development, and the foul water drainage from the proposed unit accommodation will discharge to the existing onsite foul water drainage at the site boundary. A connection to the existing onsite foul water drainage has been established and the redevelopment proposal will seek to utilise the existing site drainage to discharge foul waste by gravity.

12.4 Proposed Site Dry Weather Flow Discharge Rate

The new foul water system drainage will be designed in accordance Part H1 and H2 of the Building Regulations and BS EN 752:2008.

In the proposed scheme, no surface water drainage will be discharging into proposed foul water drainage system.

Two approaches have been considered to estimate the peak flow.

- A fixed 6 DWF multiple to BS EN 752-4 or
- Discharge Unit Method.

The choice of method used is the population method as the probability method to BS EN 752-4 will result in pipe sizes larger than DN 150mm e.g.

*Calculate the design flow rate using the Discharge Unit Method, assuming frequency of use is **kdu 0.5**.*

The choice of method used is the population method as the probability method to BS EN 752-4 will result in pipe sizes larger than DN 150mm e.g.

*Calculate the design flow rate using the Discharge Unit Method, assuming frequency of use is **kdu 0.5**.*

- Discharge Unit for Appliances /dwelling= (3 no wc=5.7, 3 no whb=0.9)

Q = 0.5 kdu $\sqrt{20}$ = 2.2 l/sec therefore use water consumption/capita

The hydraulic design of the domestic water component generated by the development proposal has been based on the current code of practice produced by the British Water flows and loads-sizing criteria, treatment capacity for sewage treatment systems, which is based on the relationship between water

usage and wastewater production. Adequate cover and protection will be provided to the proposed foul water drainage system.

12.5 Design Flow Rates from Proposed Redevelopment

Category of Building: Residential

Wastewater Flows based

The residential units with a peak flow multiple for sewage treatment plant of 6 DWF (Dry Weather Flow) and 10% infiltration based on 4000 litres per dwelling per day (based on 3 persons/dwelling 200 litres per head per day): 0.046 litres/second: *Sewers for Adoption 7TH Edition B5.1*

(200 l/hd/day x 3 = 600 l/day x 6 DWF = 3,600 l/day x 10% = 3,960 l/day /house: Round up to 4,000 l/day per house /24hrs x 60 min x 60sec = 0,046 l/sec /house

Dwr Cymru Welsh Water wastewater profile assessment use the design figure per capita return to sewer flow of 180l/hd/day design standard.: 0.042 l/sec **

Therefore, applying the same maxim to the proposed development

Assessing Design Flow Rates from Proposed Development

Category of Building: Residential House

Wastewater Flows based

Total Number of apartments

10 No residential dwellings @ 0.042/sec = 0.42 l/sec.

Total daily flow = 36,288. litres per day

Therefore, the total daily foul water flow emanating from the building based on 90% of cold-water demand is: 36,288 l/day x 0.90 = 32,660 l/day (0.042 l/sec) ** *This figure is a design peak flow rate and not an average water usage and represents the peak flow rate from a number of appliances.*

32,660 l/day total flow / 1000 = 32 cubic metres per day effluent discharge to public sewerage system

Design note:

Peak flow rate may also be determined by the application of a diurnal wastewater flow pattern resulting in a variable peak factor so that attenuation and diversification effects tend to reduce peak flow, and so the ratio of peak to average flow generally decreases from top to bottom of the new drainage network.

13.0 CONCLUSIONS & RECOMMENDATIONS

13.1 Surface Water

Details of the existing and offsite drainage network, and any other water bodies have been obtained. A detailed surface water drainage scheme has been developed. Surface water discharge flows have been calculated based on the redevelopment proposals.

Discharge flows from the development will be limited to 6.2l/sec discharge rate for the contributing area of the redevelopment proposals for all storms due to limited opportunities within the site to provide long term storage.

The scheme includes a SuDS management train approach and includes geocellular storage for each respective plot.

13.2 Foul Water

Details of the existing public sewer network have been obtained from the both DCWW and an drainage survey by specialist cctv company (*Metrorod*)

The expected foul water discharge flows have been determined based on the redevelopment proposals.

13.3 Recommendations

A detailed Ground Investigation has been carried out to inform geological, hydrological, and ground conditions on the site.

Surface water discharge from development proposals should be limited to the assessed permissible discharge rate for all design storms pro-rata from the site.

The development of SuDS captures, and conveyance of flows should be developed in conjunction with the SAB in accordance with Schedule 3 of the Flood and Water Management Act.

The layout of the proposed development and the design of the new on-site surface water drainage system should allow for the excess runoff from an exceptionally intense local rainstorm to be confined for the duration of the storm within the site.

The detailed design of the on-site surface water drainage system has considered the possible effects of climate change on storm runoff over the next one hundred years.

14.0 SURFACE WATER DRAINAGE OPERATION AND MAINTENANCE STRATEGY

The operation and maintenance of the approved SuDS system and the inspections and the maintenance required for the SuDS components within the system to function as designed in meeting the required performance levels will be detailed in a standalone document *Titled: Management and Maintenance Plan for Sustainable Drainage (SuDS)* which sets out that the home owner is responsible for inspection and maintenance of the SuDS components the surface water drainage system.

Conventional surface water drainage features such as gullies, channels, and manholes should be inspected as an absolute minimum annually, and where practicable after intense storm events, with silt removal.

S6 -Design for Construction, operation, and maintenance.

Maintenance plan for the proposed SuDS system is contained within a standalone document titled: "Management and Maintenance Plan". The maintenance and management of all the SuDS components applicable to the surface water drainage is contained within the referenced document.

Construction: It is anticipated the proposed development will be a D & B form of procurement for the buildings with the sequence and timings for section of construction work forming part of the successful contractor overall construction programme, and given the nature of the construction project on a site with boundary constraints the position of a tower crane, site accommodation ,material lay -down areas and construction access and H+S Plan will be a primary consideration .As a consequences compliance with Standards S6 of the WGSNSSuDS should be developed by the contractor and therefore this SAB element can be conditioned under G6.3 and the condition to be satisfied prior to the commencement of construction work.

Appendix A
Development Drainage Concept Plan



DRAINAGE LEGEND

- ADOPTABLE SURFACE WATER DRAINAGE
- ADOPTABLE FOUL WATER DRAINAGE
- EXISTING DRAINAGE TO BE ABANDONED
- EXISTING COMBINED DRAINAGE
- EXISTING SURFACE WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE
- DENOTES PRIVATE FW DRAINAGE
- DENOTES PRIVATE SW DRAINAGE
- PROPOSED RAINWATER PIPE
- PROPOSED SOIL & VENT PIPE
- DRAINAGE CHANNEL WITH SUMP OUTLET AND RODDING ACCESS
- GEO-CELLULAR STORAGE TANK Aquacell Plus OR SIMILAR APPROVED
- DENOTES FLOW CONTROL DEVICE - 23mm DIA ORIFICE PLATE
- SERVICES ZONE 1m WIDE
- SITE BOUNDARY
- CCTV NOTES
- CCTV DRAINAGE SURVEY NOTES
- TRAPPED GULLY SURFACING LEGEND
- VEHICULAR CROSSOVER TO BE AGREED WITH COUNCIL HIGHWAYS DEPARTMENT
- DRIVEWAY TO ARCHITECTS DETAILS
- PATH/PATIO TO ARCHITECTS DETAILS
- LANDSCAPED AREAS TO ARCHITECTS DETAILS
- RELOCATED LAMP POST AND LIGHTING COLUMN
- GRAVEL STRIP TO REAR OF PATIO (CLEAN STONE)
- DENOTES RAISED PLANTERS WITH GULLY RECEIVING RWPS AT HIGH LEVEL AND THRESHOLD DRAINAGE AT LOW LEVEL - REFER TO DETAIL

- NOTES:
- MH COVERS AND FRAMES TO CONFORM TO BS EN 124: HIGHWAYS AND FOOTWAYS TO FRONT OF BUILDINGS (D400) - FOOTWAYS TO REAR OF BUILDINGS (C250)
 - TYPE S BEDDING AND SURROUND TO ALL PIPES EXCEPT IN THE FOLLOWING CIRCUMSTANCES, IN WHICH TYPE Z BEDDING AND SURROUND ARE TO BE USED:
 - IN BACK GARDENS OF HOUSES WHERE DEPTH TO CROWN OF PIPE IS LESS THAN 0.35m.
 - IN AREAS OF THE REAR OF FLATS AND PARKING WHERE DEPTH TO CROWN IS LESS THAN 0.9m.
 - IN AREAS OF ROAD WHERE DEPTH IS LESS THAN 1.2m.
 - ALL EXISTING MANHOLE INVERTS TO BE CHECKED AND REPORTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF DRAINAGE WORKS. EXISTING PIPE CONNECTIONS ARE TO BE CCTV SURVEYED AND INSPECTED BY THE ENGINEER AND LOCAL AUTHORITY. IF THE PIPE CONNECTION IS FOUND TO BE DAMAGED OR IN DISTRESS, THE CONTRACTOR IS TO CARRY OUT REMEDIAL WORKS OR PROVIDE A NEW CONNECTION TO THE EXISTING SEWER (PIPE SIZE AND GRADIENT TO BE DETERMINED BY THE ENGINEER.
 - THE GRADIENTS INDICATED AGAINST THE DRAIN RUNS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL INSTALL DRAINS TO THE INVERT LEVELS SHOWN FOR EACH MANHOLE OR OTHER INDICATED POSITION.
 - ALL PLOT FOUL DRAINAGE TO BE MINIMUM 100mm DIAMETER AND LAID AT 1 IN 40 UNLESS OTHERWISE NOTED.
 - ALL ADOPTABLE THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PARTY CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm DIA. SHALL HAVE A SHORT-TERM RING STIFFNESS OF NOT LESS THAN 8kN/m² (SN8).
 - ALL JOINTING IN ACCORDANCE WITH MANUFACTURERS TECHNICAL ADVICE & SPECIFICATION.
 - ALL NON ADOPTABLE DRAINAGE TO BE THE STANDARD UPVC 110mm, 160mm DRAINAGE AND MANUFACTURED TO BS-EN 1401 AND BS 4660 UNLESS NOTED OTHERWISE.
 - ALL PERMEABLE PAVING CELLS TO HOUSE LATERAL FIN DRAIN ALONG LOWER EDGE WITH 1500 CONNECTION PIPE.
 - ALL STORM WATER DRAINAGE TO BE A MINIMUM OF 150mm DIAMETER UNLESS OTHERWISE NOTED.
 - SOIL & VENT PIPE LOCATION AND NUMBER TO BE CONFIRMED WITH ARCHITECT.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS. TOGETHER WITH THEIR LATEST SPECIFICATIONS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER (VALE CONSULTANCY) AS SOON AS POSSIBLE.
 - FIGURED DIMENSIONS ONLY TO BE USED. ANY QUERIES OR DISCREPANCIES TO BE REFERRED TO THE ENGINEER (VALE CONSULTANCY) IMMEDIATELY.
 - PRIOR TO ORDERING ANY MATERIALS THE CONTRACTOR IS TO CONFIRM MANUFACTURE/PIPE MATERIAL AND GRADE PROPOSED WITH WATER AUTHORITY.
 - TEMPORARY WORKS DESIGN BY OTHERS.
 - DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

SAB Approval

	H	G	F	E	D	C	B	A		
	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG
	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP
	MJ	MJ	MJ	MJ	MJ	MJ	MJ	MJ	MJ	MJ
	26.819	26.819	26.819	26.819	26.819	26.819	26.819	26.819	26.819	26.819
	Layout amended for SAB Approval									
	Plot 10 SW amended to suit on site Findings EXTGMHB									
	ORIFICE SIZE ADDED									
	EXISTING MHS A&B SITE DIPPED									
	SW REVISED TO SUIT SITE CONSTRAINTS									
	PIPE SIZES ADDED FOR CLARITY									
	GARASTOR AMENDED TO ORIFICE PLATE. FOUL DRAIN FROM GARAGE STACK AMENDED									
	CONSTRUCTION ISSUE									
	CAD FILES RECEIVED - LAYOUT REDRAWN TO INCLUDE SITE INFORMATION (AS BUILT)									
	PRELIMINARY ISSUE									
rev.	drawn	checked	approved	approved	date	description				

Client
CHARTER HOMES
Construction Issue
Project
CHURCH STREET DEVELOPMENT
PONTARDAWE
NEATH PORT TALBOT

Title
SITE DRAINAGE PLAN

ValeConsultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked	approved
11.05.22	RGP	LR	MJ
scale @ A1	1:200	project no.	14657
status	drw. no.	rev.	
A	14657/C500	H	

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

Appendix B
Site Drainage Records



Project

Project Name: Charter Homes Ltd - 441226
Project Description: CCTV Survey
Project Number: 441226
Project Status: Complete
Project Date: 19/07/2022
Inspection Standard: MSCC3 Sewers & Drainage GB (SRM4 Scoring)

Table of Contents

Project Name	Project Number	Project Date
Charter Homes Ltd - 441226	441226	19/07/2022

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Section Summary	P-4
Section: 1; MH1 > OUTFALL (MH1X)	1
Section: 2; SMH1 > OUTFALL (SMH1X)	5
Section: 3; CMH1 > OUTFALL (CMH1X)	23

Project Information

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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Site

Street: Church Street
Town or City: Pontardawe
County: NPT
Post Code: SA8 4JB

Contractor

Company: Metro Rod Swansea
Contact: Luke Cleaves
Street: Unit 15 / 16 Swansea Valley Business Park
Town or City: Ystalyfera
County: NPT
Post Code: SA9 2EB
Phone: 01792 863923
Email: swansea@metrorod.co.uk

Scoring Summary

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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Structural Defects

- Grade 3: Best practice suggests consideration should be given to repairs in the medium term.
- Grade 4: Best practice suggests consideration should be given to repairs to avoid a potential collapse.
- Grade 5: Best practice suggests that this pipe is at risk of collapse at any time. Urgent consideration should be given to repairs to avoid total failure.

Section	PLR	Grade	Description
1	MH1X	4	Fractures, multiple at joint from 8 o'clock to 4 o'clock
2	SMH1X	4	Broken sewer from 9 o'clock to 3 o'clock
3	CMH1X	3	Multiple defects

Service / Operational Condition

Section	PLR	Grade	Description
All inspected pipes are in an acceptable service condition (< grade 3).			

Abandoned Surveys

Section	PLR	Description
All inspections complete, none are abandoned.		

Information

These scoring summaries are based on the SRM grading from the WRc.

Section Profile

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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Circular, 150 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
1	MH1	OUTFALL	19/07/2022		Vitrified clay	7.04 m	7.04 m

Total: 1 Inspection x Circular 150 mm = 7.04 m Total Length and 7.04 m Inspected Length

Circular, 225 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
2	SMH1	OUTFALL	19/07/2022		Vitrified clay	56.56 m	56.56 m

Total: 1 Inspection x Circular 225 mm = 56.56 m Total Length and 56.56 m Inspected Length

Circular, 525 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
3	CMH1	OUTFALL	19/07/2022		Vitrified clay	58.61 m	58.61 m

Total: 1 Inspection x Circular 525 mm = 58.61 m Total Length and 58.61 m Inspected Length

Total: 3 Inspections = 122.21 m Total Length and 122.21 m Inspected Length

Section Summary

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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Number of sections	3
Total length of sewer network	122.21 m
Total length of inspections	122.21 m
Total length of abandoned inspections	0.00 m
Total abandoned inspections	0
Number of section inspection photos	90
Number of section inspection videos	3
Number of section inspection scans	0
Number of section inclination measurements	0

PLR:	MH1X	Upstream Node:	MH1
Inspection Direction:	Downstream	Downstream Node:	OUTFALL
Inspected Length:	7.04 m	Dia/Height:	150 mm
Total Length:	7.04 m	Pipe Material:	Vitrified clay

No.	m+	Code	Observation
1	0.00	ST	Start of survey
2	0.00	WL	Water level, 5% of sewer height
3	0.97	CLJ	Crack, longitudinal at joint at 1 o'clock
4	0.97	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
5	1.44	CLJ	Crack, longitudinal at joint at 12 o'clock
6	1.89	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
7	3.72	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
8	4.35	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
9	5.04	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
10	5.44	WL	Water level, 20% of sewer height
11	5.66	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
12	5.81	FMJ	Fractures, multiple at joint from 8 o'clock to 4 o'clock
13	5.95	BJ	Broken sewer at joint from 7 o'clock to 4 o'clock
14	7.04	FH	Finish survey

PLR:	SMH1X	Upstream Node:	SMH1
Inspection Direction:	Downstream	Downstream Node:	OUTFALL
Inspected Length:	56.56 m	Dia/Height:	225 mm
Total Length:	56.56 m	Pipe Material:	Vitrified clay

No.	m+	Code	Observation
1	0.00	ST	Start of survey
2	0.00	WL	Water level, 5% of sewer height

Section Summary

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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No.	m+	Code	Observation
3	0.00	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
4	2.88	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
5	3.89	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
6	4.74	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
7	6.43	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
8	7.65	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
9	8.79	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
10	9.63	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
11	10.44	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
12	11.33	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
13	13.65	JN	Junction at 3 o'clock, 150mm diameter
14	14.95	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
15	15.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
16	16.76	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
17	17.81	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
18	19.44	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
19	21.39	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
20	22.32	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
21	23.15	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
22	26.11	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
23	27.03	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
24	27.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
25	28.71	BJ	Broken sewer at joint from 9 o'clock to 1 o'clock
26	28.94	JN	Junction at 3 o'clock, 150mm diameter
27	28.98	CLJ	Crack, longitudinal at joint at 4 o'clock
28	29.34	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
29	30.19	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
30	31.26	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
31	31.95	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
32	32.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
33	33.78	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
34	35.52	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
35	36.50	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
36	36.70	JN	Junction at 9 o'clock, 150mm diameter
37	38.11	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
38	39.13	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
39	40.03	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
40	40.83	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
41	41.79	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
42	42.70	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
43	43.34	EHJ	Encrustation, heavy at joint from 9 o'clock to 2 o'clock
44	43.49	B	Broken sewer from 9 o'clock to 3 o'clock
45	46.15	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Summary

Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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No.	m+	Code	Observation
46	47.13	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
47	47.98	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
48	48.90	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
49	49.82	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
50	50.70	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
51	51.75	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
52	52.82	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
53	53.90	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
54	54.53	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock
55	55.34	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
56	55.34	CMJ	Cracks, multiple at joint from 9 o'clock to 3 o'clock
57	56.56	FH	Finish survey

PLR:	CMH1X	Upstream Node:	CMH1
Inspection Direction:	Downstream	Downstream Node:	OUTFALL
Inspected Length:	58.61 m	Dia/Height:	525 mm
Total Length:	58.61 m	Pipe Material:	Vitrified clay

No.	m+	Code	Observation
1	0.00	ST	Start of survey
2	0.00	WL	Water level, 5% of sewer height
3	1.44	CMJ	Cracks, multiple at joint from 9 o'clock to 5 o'clock
4	2.37	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)
5	3.15	CLJ	Crack, longitudinal at joint at 6 o'clock
6	6.83	CMJ	Cracks, multiple at joint from 12 o'clock to 6 o'clock
7	10.46	FLJ	Fracture, longitudinal at joint at 6 o'clock
8	14.54	FLJ	Fracture, longitudinal at joint at 7 o'clock
9	20.08	JN	Junction at 2 o'clock, 225mm diameter
10	22.79	CLJ	Crack, longitudinal at joint at 5 o'clock
11	23.32	CLJ	Crack, longitudinal at joint at 1 o'clock
12	25.63	CMJ	Cracks, multiple at joint from 11 o'clock to 7 o'clock
13	26.75	CLJ	Crack, longitudinal at joint at 12 o'clock
14	28.48	CLJ	Crack, longitudinal at joint at 12 o'clock
15	29.21	JN	Junction at 10 o'clock, 225mm diameter
16	31.81	CLJ	Crack, longitudinal at joint at 12 o'clock
17	32.39	FLJ	Fracture, longitudinal at joint at 7 o'clock
18	34.42	FLJ	Fracture, longitudinal at joint at 6 o'clock
19	39.14	CMJ	Cracks, multiple at joint from 2 o'clock to 9 o'clock
20	40.97	CMJ	Cracks, multiple at joint from 9 o'clock to 4 o'clock
21	43.81	CM	Cracks, multiple from 7 o'clock to 10 o'clock
22	44.46	CMJ	Cracks, multiple at joint from 10 o'clock to 4 o'clock
23	45.32	CLJ	Crack, longitudinal at joint at 8 o'clock
24	47.01	CMJ	Cracks, multiple at joint from 9 o'clock to 3 o'clock
25	47.79	CMJ	Cracks, multiple at joint from 7 o'clock to 5 o'clock
26	49.70	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock

Section Summary

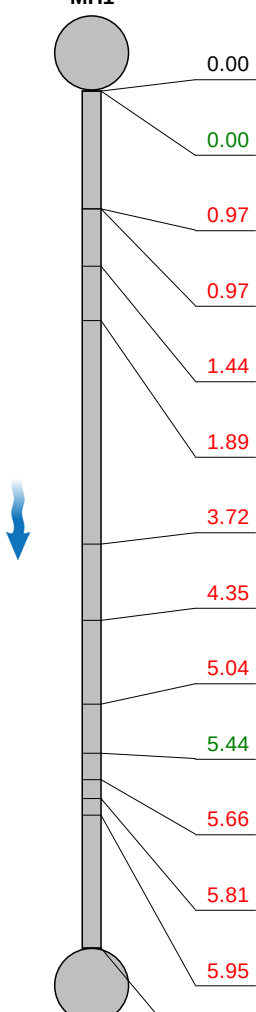
Project Name Charter Homes Ltd - 441226	Project Number 441226	Project Date 19/07/2022
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No.	m+	Code	Observation
27	50.07	CMJ	Cracks, multiple at joint from 7 o'clock to 5 o'clock
28	51.21	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock
29	53.50	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock
30	55.24	WL	Water level, 15% of sewer height
31	55.39	CMJ	Cracks, multiple at joint from 7 o'clock to 9 o'clock
32	57.31	CMJ	Cracks, multiple at joint from 8 o'clock to 11 o'clock
33	58.61	FH	Finish survey

Section Inspection - 19/07/2022 - MH1X

Section 1	Inspection 1	Date 19/07/22	Time 10:16	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR MH1X
Operator Not Specified	Vehicle Not Specified	Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified		

Town or Village:	Inspection Direction: Downstream	Upstream Node:	MH1
Road:	Inspected Length: 7.04 m	Upstream Pipe Depth:	1.100 m
Location:	Total Length: 7.04 m	Downstream Node:	OUTFALL
Surface Type:	Joint Length: 0.00 m	Downstream Pipe Depth:	
Use: Combined	Pipe Shape: Circular		
Type of Pipe:	Dia/Height: 150 mm		
Year Constructed:	Pipe Material: Vitrified clay		
Flow Control:	Lining: No Lining		
Inspection Purpose:	Lining Material: No Lining		
Comments:			
Recommendations:			

Scale: 1:62	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.10 m MH1  OUTFALL Depth: m						
	0.00	ST	Start of survey	00:00:00		
	0.00	WL	Water level, 5% of sewer height	00:00:09		
	0.97	CLJ	Crack, longitudinal at joint at 1 o'clock	00:00:14		2
	0.97	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:14	MH1X_b7 44a960-7a 20-4b56-8	1
	1.44	CLJ	Crack, longitudinal at joint at 12 o'clock	00:00:18	MH1X_93 28158e-ab 0f-47cd-8b	2
	1.89	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:22	MH1X_09 a68e6f-ac 20-44e5-b	1
	3.72	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:31	MH1X_bfa 6a2ae-05b 9-4013-94	1
	4.35	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:34	MH1X_60 254934-20 c9-4a15-b	1
	5.04	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:36	MH1X_47 7a9be3-cc 3c-4335-a	1
	5.44	WL	Water level, 20% of sewer height	00:00:39		
	5.66	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:40	MH1X_e2 2f26e8-9fe a-4220-a7	1
	5.81	FMJ	Fractures, multiple at joint from 8 o'clock to 4 o'clock	00:00:42	MH1X_4c4 6204d-912 3-4a63-8f5	4
	5.95	BJ	Broken sewer at joint from 7 o'clock to 4 o'clock	00:00:43	MH1X_5d 2a9960-5d 72-4562-b	
	7.04	FH	Finish survey: Drops into main storm line.	00:00:54		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
9	81.0	17.8	106.0	4.0	0	0.0	0.0	0.0	1.0

Section Pictures - 19/07/2022 - MH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	MH1X		441226



MH1X_b744a960-7a20-4b56-8a30-1d33e5686fc5_20220719_102008_611.jpg, 00:00:14, 0.97 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



MH1X_9328158e-ab0f-47cd-8b6a-c4d7b4eede58_20220719_102027_722.jpg, 00:00:18, 1.44 m
Crack, longitudinal at joint at 12 o'clock



MH1X_09a68e6f-ac20-44e5-bb86-31d93af89045_20220719_102045_537.jpg, 00:00:22, 1.89 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



MH1X_bfa6a2ae-05b9-4013-944a-ce73e46ab4cb_20220719_102126_708.jpg, 00:00:31, 3.72 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - MH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	MH1X		441226



MH1X_60254934-20c9-4a15-bc4b-028e3730e26f_20220719_102146_948.jpg, 00:00:34, 4.35 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



MH1X_477a9be3-cc3c-4335-ad93-83c09bcec28f_20220719_102453_801.jpg, 00:00:36, 5.04 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



MH1X_e22f26e8-9fea-4220-a785-75829cdce594_20220719_102536_335.jpg, 00:00:40, 5.66 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



MH1X_4c46204d-9123-4a63-8f59-36ef4e7a8eda_20220719_102558_320.jpg, 00:00:42, 5.81 m
Fractures, multiple at joint from 8 o'clock to 4 o'clock

Section Pictures - 19/07/2022 - MH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	MH1X		441226



MH1X_5d2a9960-5d72-4562-b4e2-6fcc3b41231b_20220719_102617_849.jpg, 00:00:43, 5.95 m
Broken sewer at joint from 7 o'clock to 4 o'clock

Section Inspection - 19/07/2022 - SMH1X

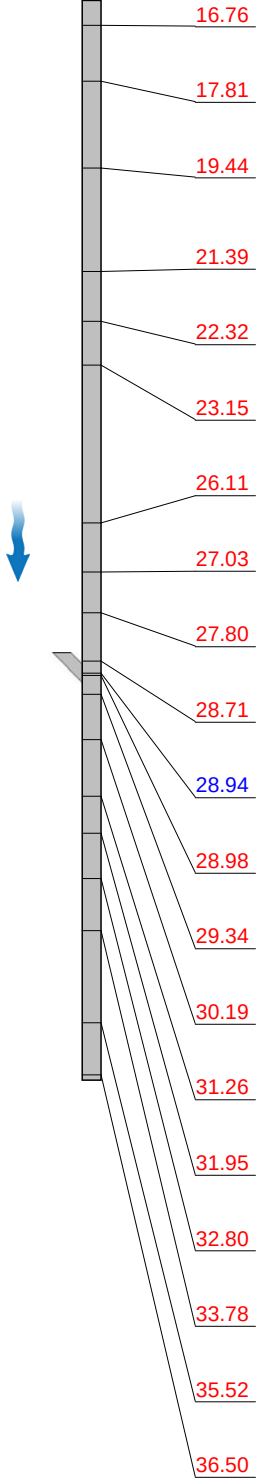
Section 2	Inspection 2	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR SMH1X
Operator Not Specified	Vehicle Not Specified	Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified		

Town or Village:	Inspection Direction: Downstream	Upstream Node:	SMH1
Road:	Inspected Length: 56.56 m	Upstream Pipe Depth:	0.890 m
Location:	Total Length: 56.56 m	Downstream Node:	OUTFALL
Surface Type:	Joint Length: 0.00 m	Downstream Pipe Depth:	
Use: Surface water	Pipe Shape: Circular		
Type of Pipe:	Dia/Height: 225 mm		
Year Constructed:	Pipe Material: Vitrified clay		
Flow Control:	Lining: No Lining		
Inspection Purpose:	Lining Material: No Lining		
Comments:			
Recommendations:			

Scale: 1:142	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 0.89 m SMH1	0.00	ST	Start of survey	00:00:00		
	0.00	WL	Water level, 5% of sewer height	00:00:05		
	0.00	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:08	SMH1X_2 7336a56-5 22b-4651-	1
	2.88	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:24	SMH1X_1 0fa04fc-0d ad-4e25-bf	1
	3.89	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:28	SMH1X_7 0d79d51-0 544-4eb7-	1
	4.74	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:32	SMH1X_5 4d83d16-8 560-4a24-	1
	6.43	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:40	SMH1X_1 09c643d-8 534-4107-	1
	7.65	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:44	SMH1X_e 2e71973-f b86-492d-	1
	8.79	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:48	SMH1X_9 91156c6-c 930-4b20-	1
	9.63	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:52	SMH1X_b 6ae0802-6 0d5-42e0-	1
	10.44	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:56	SMH1X_e 0576ba8-e 0aa-4faa-9	1
	11.33	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:01:00	SMH1X_d bc57efe-1 33d-4789-	1
	13.65	JN	Junction at 3 o'clock, 150mm diameter: Gully coming into main storm line.	00:01:15	SMH1X_4 52ded66-a 8bd-45a6-	
	14.95	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:05	SMH1X_c 3fad6ed-9 ebf-464a-9	1
	15.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:10	SMH1X_a 4b786aa-a ada-440b-	1

Section Inspection - 19/07/2022 - SMH1X

Section 2	Inspection 2	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR SMH1X
Operator Not Specified		Vehicle Not Specified		Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale:	1:142	Position [m]	Code	Observation	MPEG	Photo	Grade
		16.76	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:15	SMH1X_e66e2efe-ef7a-4176-b	1
		17.81	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:21	SMH1X_f92ca79e-53b3-4d47-8	1
		19.44	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:30	SMH1X_a0ced1a6-50c7-44e5-	1
		21.39	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:38	SMH1X_404774b4-7bc8-4237-	1
		22.32	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:42	SMH1X_6e6eee67-03a5-4569-	1
		23.15	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:46	SMH1X_1abaea34-1a1e-4df7-b	1
		26.11	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:02:58	SMH1X_1e58390e-cf59-4aef-8	1
		27.03	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:02	SMH1X_e41a8240-e70e-4052-	1
		27.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:06	SMH1X_e19cb6c7-7e76-420b-	1
		28.71	BJ	Broken sewer at joint from 9 o'clock to 1 o'clock	00:03:11	SMH1X_08197eb3-2e41-4746-	
		28.94	JN	Junction at 3 o'clock, 150mm diameter: Gully coming into main line.	00:03:15	SMH1X_6ba71695-2bea-4a47-	
		28.98	CLJ	Crack, longitudinal at joint at 4 o'clock	00:03:42	SMH1X_73e46936-366e-4f46-b	2
		29.34	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:44	SMH1X_1692e9d7-1544-4d12-	1
		30.19	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:48	SMH1X_164c7e03-0102-4565-	1
		31.26	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:52	SMH1X_97de5456-2bc5-4c01-	1
		31.95	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:03:57	SMH1X_2b70a0d3-c696-4d11-	1
		32.80	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:01	SMH1X_d89dceba-2ce3-49bd-	1
		33.78	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:05	SMH1X_a4788e83-cee5-4cde-	1
		35.52	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:13	SMH1X_1e9fa716-6acc-4fff-82	1
		36.50	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:18	SMH1X_65fb6c3c-8730-4cdc-	1

Section Inspection - 19/07/2022 - SMH1X

Section 2	Inspection 2	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR SMH1X
Operator Not Specified		Vehicle Not Specified		Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale:	1:1	Position [m]	Code	Observation	MPEG	Photo	Grade
		<u>36.70</u>	JN	Junction at 9 o'clock, 150mm diameter: Point where MH1 discharges into main line.	00:04:19	SMH1X_2 e7141a8-7 bc3-45fc-b	
		<u>38.11</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:26	SMH1X_7 8db930b-f e2f-441f-a	1
		<u>39.13</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:31	SMH1X_c 65ede0b-e 1af-4908-a	1
		<u>40.03</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:35	SMH1X_2 9679ca9-a d34-4a37-	1
		<u>40.83</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:39	SMH1X_3 5a003be-0 2b4-492a-	1
		<u>41.79</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:44	SMH1X_d c0d7541-3 b11-405c-	1
		<u>42.70</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:04:49	SMH1X_a 768c2ae-1 ae9-4f7c-a	1
		<u>43.34</u>	EHJ	Encrustation, heavy at joint from 9 o'clock to 2 o'clock	00:04:52	SMH1X_0 991fb30-f8 cd-45af-9b	1
		<u>43.49</u>	B	Broken sewer from 9 o'clock to 3 o'clock	00:04:58	SMH1X_3 ea32942-d 369-4b15-	4
		<u>46.15</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:11	SMH1X_7 a0b6572-1 750-4ca7-	1
		<u>47.13</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:17	SMH1X_3 83e1833-1 a0e-4eb0-	1
		<u>47.98</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:21	SMH1X_c 7a08e48-b a4d-49e2-	1
		<u>48.90</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:26	SMH1X_1 b7e65f5-9 742-48ba-	1
		<u>49.82</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:30	SMH1X_9 445edbe-f ada-433b-	1
		<u>50.70</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:35	SMH1X_c 9756ae9-7 474-49f5-a	1
		<u>51.75</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:41	SMH1X_d bea6608-f 440-4ef0-b	1
		<u>52.82</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:46	SMH1X_8 b9ede2b-9 78f-4b99-a	1
		<u>53.90</u>	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:06:50	SMH1X_d 65338a0-2 705-48da-	1
		<u>54.53</u>	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock	00:06:55	SMH1X_d ccfc1e-3d cc-433e-a	3

Section Inspection - 19/07/2022 - SMH1X

Section 2	Inspection 2	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR SMH1X
Operator Not Specified		Vehicle Not Specified		Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale:1:142

Position [m]

55.34

55.34

56.56

OUTFALL

Depth: m

Code

Observation

MPEG

Photo

Grade

JDM

Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

00:06:59

SMH1X_f6
aff482-66a
f-443c-86e

1

CMJ

Cracks, multiple at joint from 9 o'clock to 3 o'clock

00:06:59

3

FH

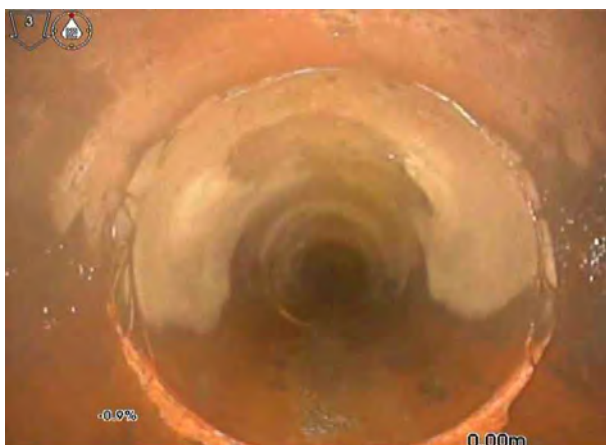
Finish survey

00:07:09

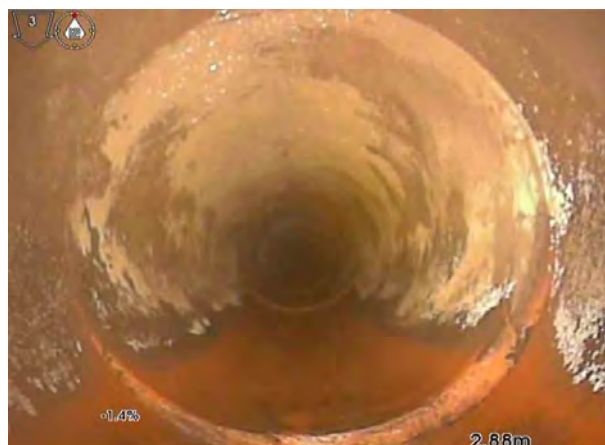
Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
49	80.0	3.8	215.0	4.0	1	0.0	0.0	0.0	1.0

Section Pictures - 19/07/2022 - SMH1X

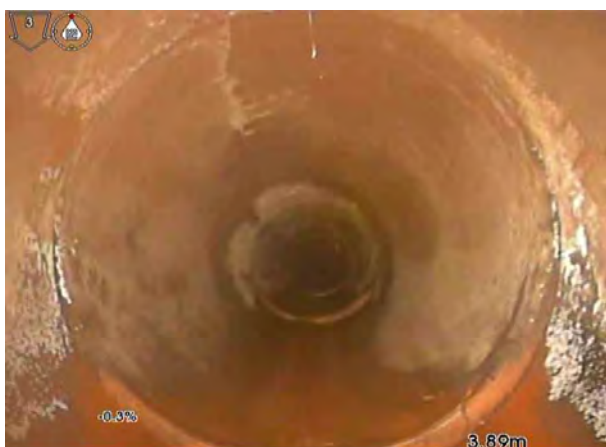
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



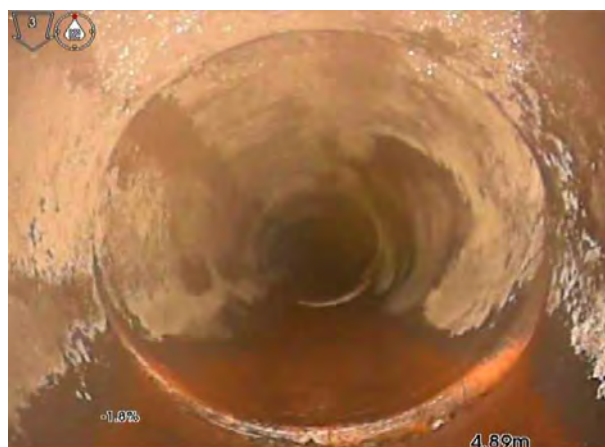
SMH1X_27336a56-522b-4651-8169-3b901e2e0125_20220719_102857_899.jpg, 00:00:08, 0.00 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_10fa04fc-0dad-4e25-bf15-e7ac65d3d780_20220719_102928_427.jpg, 00:00:24, 2.88 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



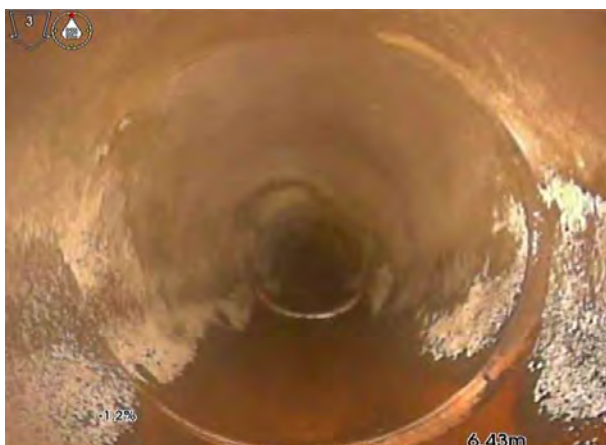
SMH1X_70d79d51-0544-4eb7-b540-ec9cca6362c8_20220719_102947_314.jpg, 00:00:28, 3.89 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



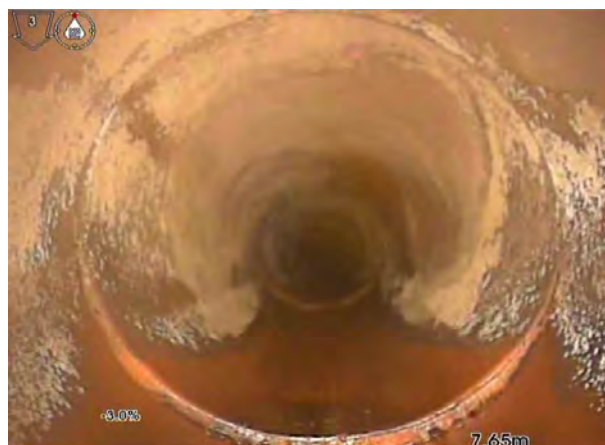
SMH1X_54d83d16-8560-4a24-b56d-faf8a5fa4b24_20220719_103007_703.jpg, 00:00:32, 4.74 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



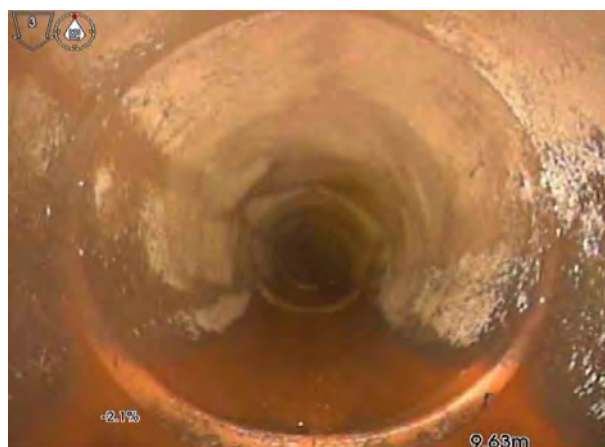
SMH1X_109c643d-8534-4107-b2aa-3dc1ab32b643_20220719_103047_012.jpg, 00:00:40, 6.43 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_e2e71973-fb86-492d-a2f2-34fa6c51fd3e_20220719_103104_256.jpg, 00:00:44, 7.65 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



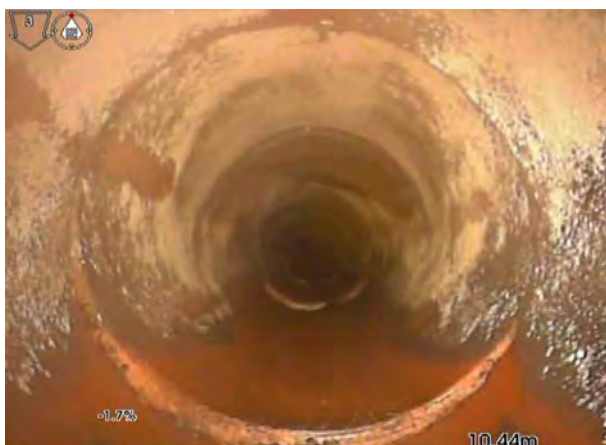
SMH1X_991156c6-c930-4b20-a70c-0a7b7d79ccfb_20220719_103122_509.jpg, 00:00:48, 8.79 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



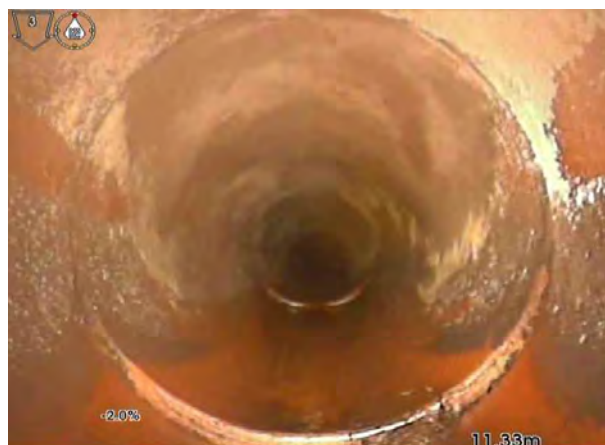
SMH1X_b6ae0802-60d5-42e0-81d1-dfb58abb8124_20220719_103144_217.jpg, 00:00:52, 9.63 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



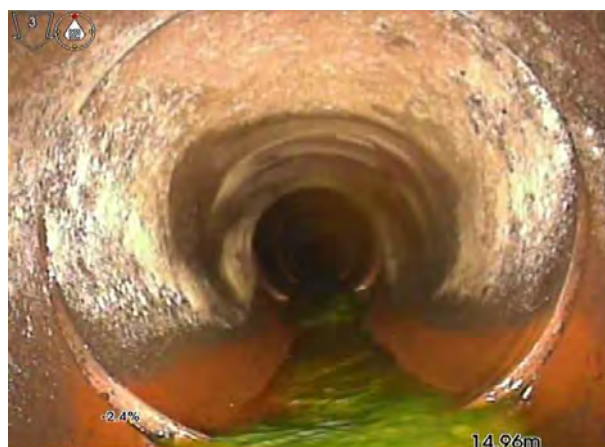
SMH1X_e0576ba8-e0aa-4faa-9af2-ea3f7ae97b46_20220719_103207_578.jpg, 00:00:56, 10.44 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_dbc57efe-133d-4789-90ac-87ee3d659b3f_20220719_103229_956.jpg, 00:01:00, 11.33 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



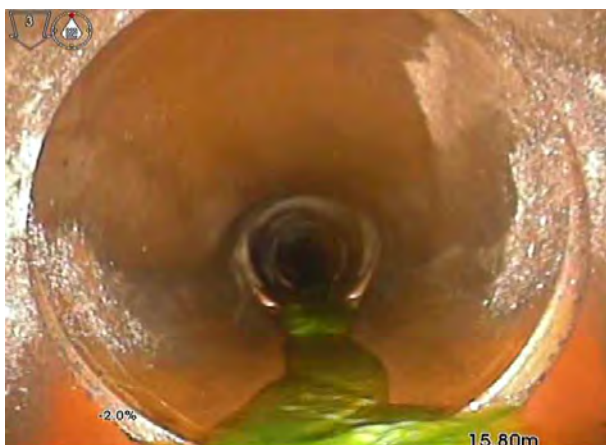
SMH1X_452ded66-a8bd-45a6-bf06-2eabbaf84c40_20220719_103405_437.jpg, 00:01:15, 13.65 m
Junction at 3 o'clock, 150mm diameter, Gully coming into main storm line.



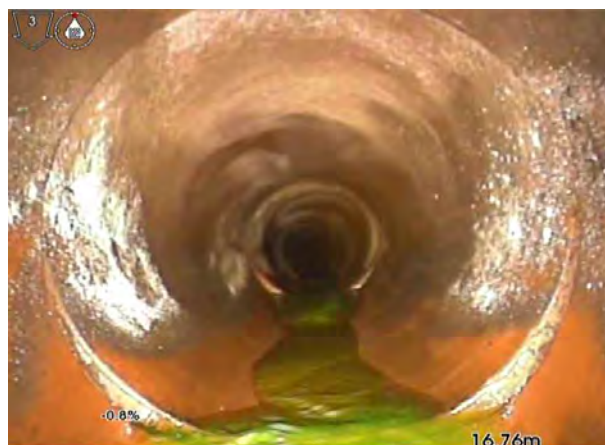
SMH1X_c3fad6ed-9ebf-464a-904e-1f7e9f373799_20220719_103433_670.jpg, 00:02:05, 14.95 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



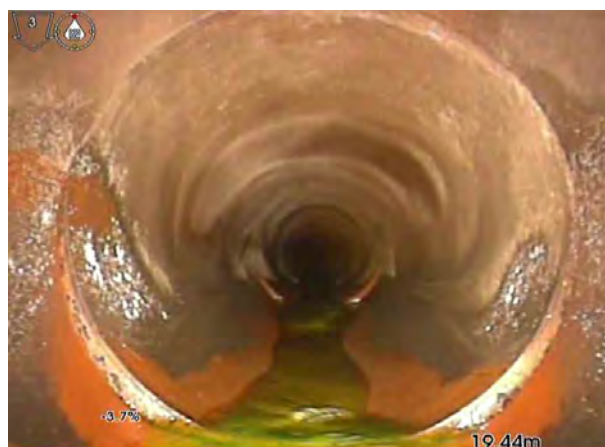
SMH1X_a4b786aa-aada-440b-bef9-02dfd23186c9_20220719_103453_178.jpg, 00:02:10, 15.80 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_e66e2efe-ef7a-4176-b16a-2864d28f2134_20220719_103513_611.jpg, 00:02:15, 16.76 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



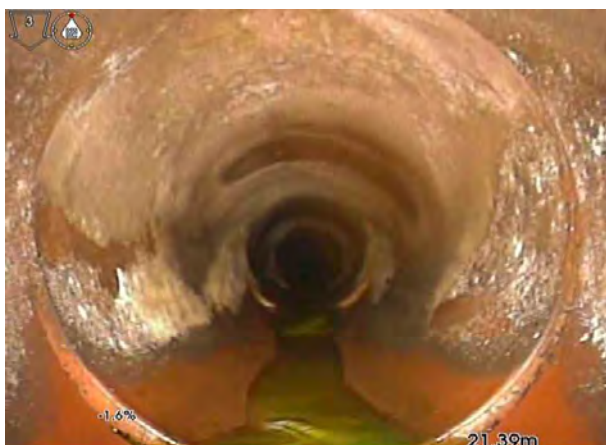
SMH1X_f92ca79e-53b3-4d47-887d-68a5be7a452c_20220719_103536_333.jpg, 00:02:21, 17.81 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



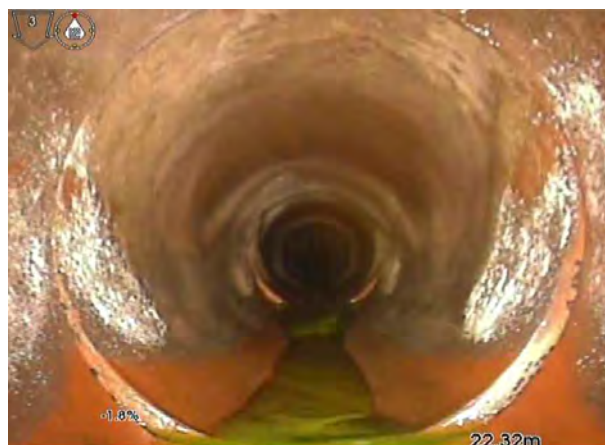
SMH1X_a0ced1a6-50c7-44e5-a5b0-7039c71ed398_20220719_103603_399.jpg, 00:02:30, 19.44 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

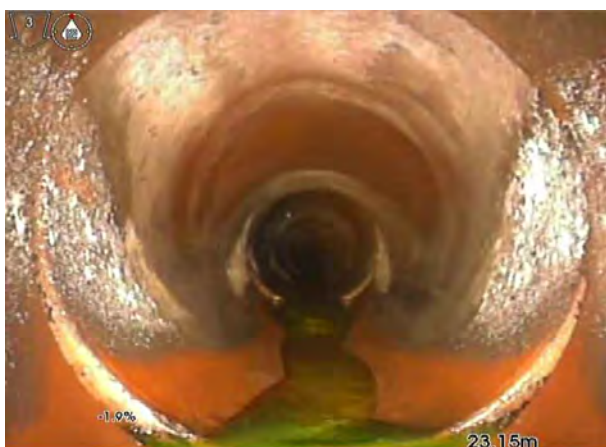
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



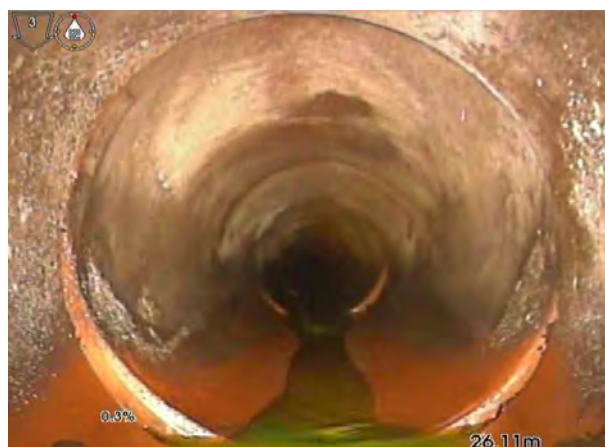
SMH1X_404774b4-7bc8-4237-8a26-80a59bfff81c_20220719_103655_331.jpg, 00:02:38, 21.39 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_6e6eee67-03a5-4569-b87a-727456479041_20220719_103714_290.jpg, 00:02:42, 22.32 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_1abaea34-1a1e-4df7-bbf8-45d1515c0615_20220719_103733_650.jpg, 00:02:46, 23.15 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



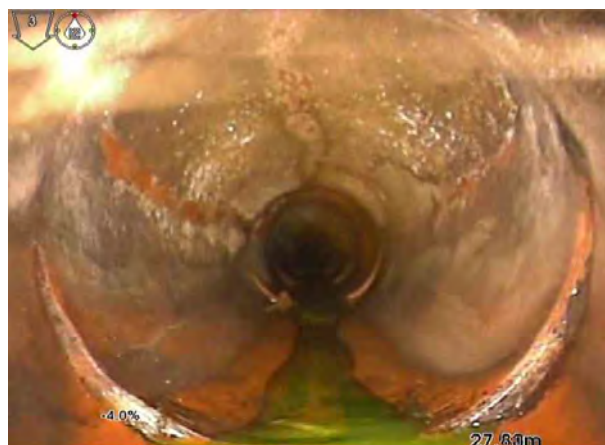
SMH1X_1e58390e-cf59-4aef-8bb1-72285a36bdf9_20220719_103820_631.jpg, 00:02:58, 26.11 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



SMH1X_e41a8240-e70e-4052-a5ad-5f6b7a93ade9_20220719_103837_582.jpg, 00:03:02, 27.03 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_e19cb6c7-7e76-420b-b679-632de8533151_20220719_103858_369.jpg, 00:03:06, 27.80 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



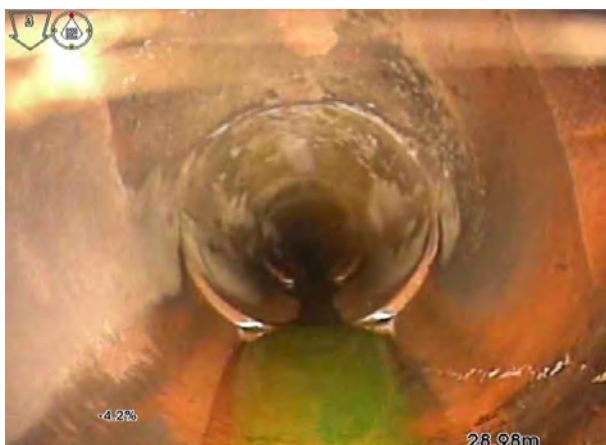
SMH1X_08197eb3-2e41-4746-a179-c65fda0d987c_20220719_103938_946.jpg, 00:03:11, 28.71 m
Broken sewer at joint from 9 o'clock to 1 o'clock



SMH1X_6ba71695-2bea-4a47-8214-2e20b8661d8e_20220719_104032_953.jpg, 00:03:15, 28.94 m
Junction at 3 o'clock, 150mm diameter, Gully coming into main line.

Section Pictures - 19/07/2022 - SMH1X

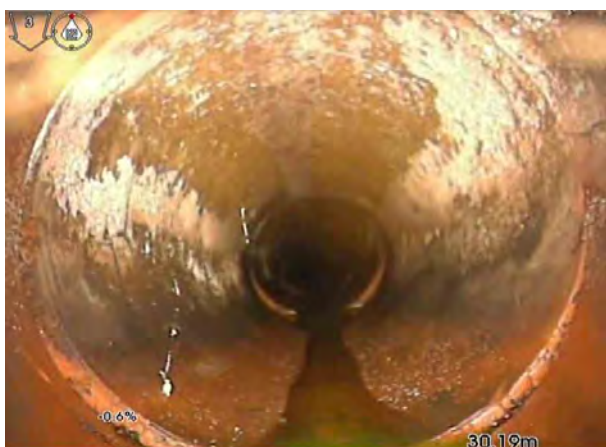
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



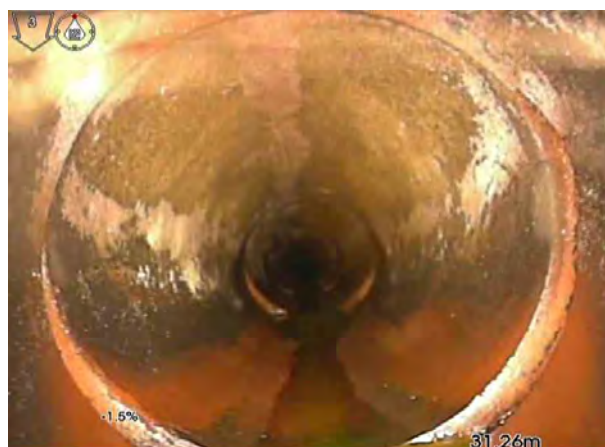
SMH1X_73e46936-366e-4f46-bd5f-876d9ce7df8d_20220719_104102_067.jpg, 00:03:42, 28.98 m
Crack, longitudinal at joint at 4 o'clock



SMH1X_1692e9d7-1544-4d12-bd03-7b4c074ad418_20220719_104117_898.jpg, 00:03:44, 29.34 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_164c7e03-0102-4565-86e4-5ef5885f2bd9_20220719_104135_154.jpg, 00:03:48, 30.19 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_97de5456-2bc5-4c01-9d80-c03e2c802a85_20220719_104203_001.jpg, 00:03:52, 31.26 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



SMH1X_2b70a0d3-c696-4d11-8617-8eababdb2951_20220719_104219_865.jpg, 00:03:57, 31.95 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_d89dceba-2ce3-49bd-9031-cc1f10aed6ff_20220719_104239_588.jpg, 00:04:01, 32.80 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_a4788e83-cee5-4cde-a058-6b5fc3e018d6_20220719_104258_520.jpg, 00:04:05, 33.78 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_1e9fa716-6acc-4fff-8261-7748a058d3a6_20220719_104320_722.jpg, 00:04:13, 35.52 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



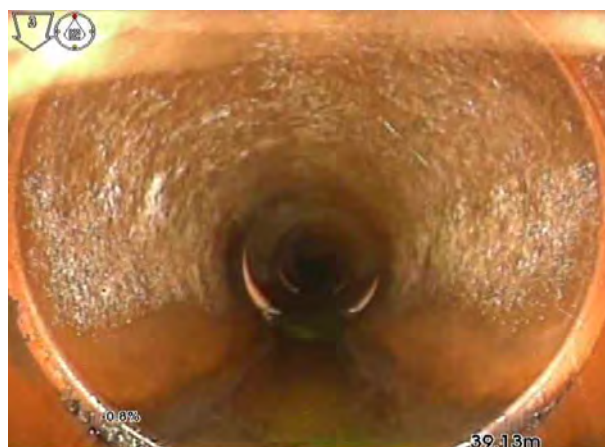
SMH1X_65fb6c3c-8730-4cdc-a917-0f07e01c94da_20220719_104340_110.jpg, 00:04:18, 36.50 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_2e7141a8-7bc3-45fc-bbb0-ae63c5aebb67_20220720_082312_618.jpg, 00:04:19, 36.70 m
Junction at 9 o'clock, 150mm diameter, Point where MH1 discharges into main line.



SMH1X_78db930b-fe2f-441f-a342-35a0c260ba97_20220719_104519_999.jpg, 00:04:26, 38.11 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_c65ede0b-e1af-4908-a6e2-36e19cfbebf8_20220719_104537_089.jpg, 00:04:31, 39.13 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



SMH1X_29679ca9-ad34-4a37-aa49-2cf5cfe874d0_20220719_104600_597.jpg, 00:04:35, 40.03 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_35a003be-02b4-492a-8c26-50edb8210f50_20220719_104640_575.jpg, 00:04:39, 40.83 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_dc0d7541-3b11-405c-b168-d97b198af2e2_20220719_104710_814.jpg, 00:04:44, 41.79 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_a768c2ae-1ae9-4f7c-a708-5cb530ed3402_20220719_104728_997.jpg, 00:04:49, 42.70 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



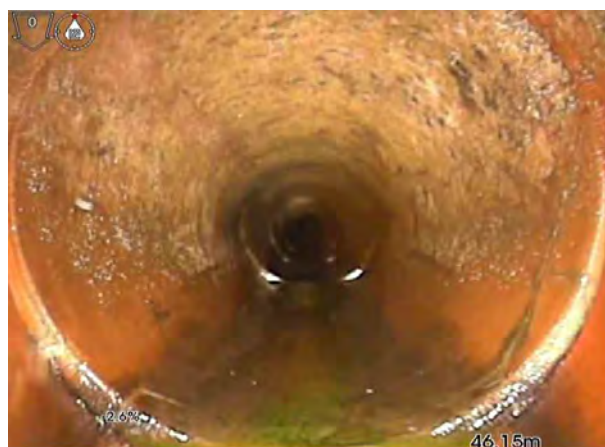
SMH1X_0991fb30-f8cd-45af-9bb6-baa5ac977309_20220719_105414_798.jpg, 00:04:52, 43.34 m
Encrustation, heavy at joint from 9 o'clock to 2 o'clock



SMH1X_3ea32942-d369-4b15-8271-72f77b7ee6fc_20220719_105543_877.jpg, 00:04:58, 43.49 m
Broken sewer from 9 o'clock to 3 o'clock



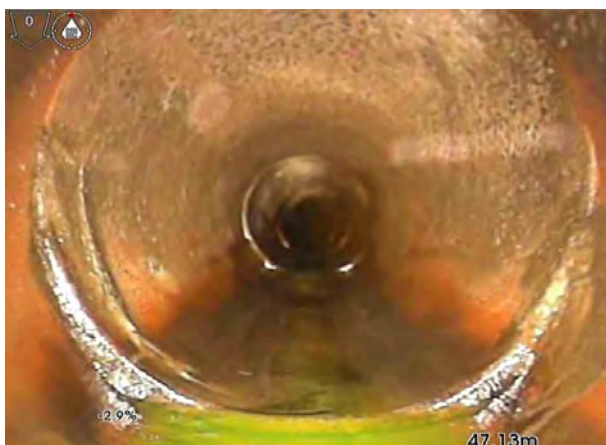
SMH1X_4996abcc-367f-4644-a34a-1bcbda12a709_20220719_105612_839.jpg, 00:04:58, 43.49 m
Broken sewer from 9 o'clock to 3 o'clock



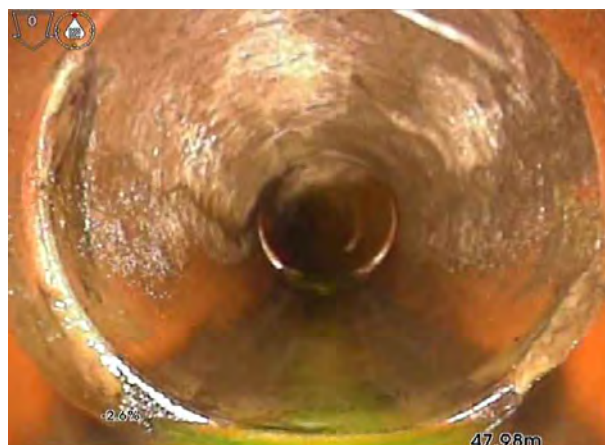
SMH1X_7a0b6572-1750-4ca7-82de-42d270b3e1c8_20220719_105720_787.jpg, 00:06:11, 46.15 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

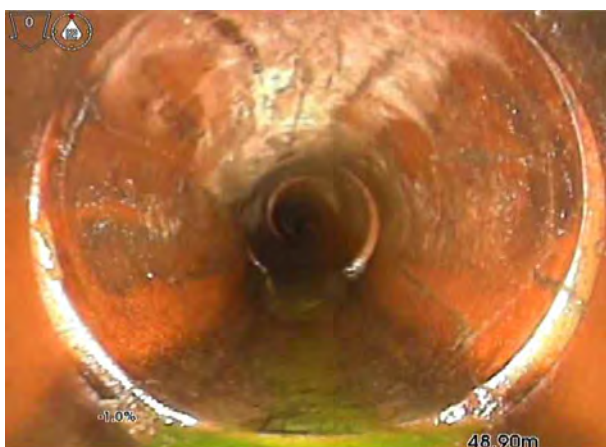
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



SMH1X_383e1833-1a0e-4eb0-8253-52bcdab9cccb_20220719_105741_139.jpg, 00:06:17, 47.13 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_c7a08e48-ba4d-49e2-adf9-a96dd479cd06_20220719_105812_363.jpg, 00:06:21, 47.98 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_1b7e65f5-9742-48ba-a258-4f1ea8421377_20220719_105829_401.jpg, 00:06:26, 48.90 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_9445edbe-fada-433b-998c-6e3624088dc6_20220719_105901_218.jpg, 00:06:30, 49.82 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

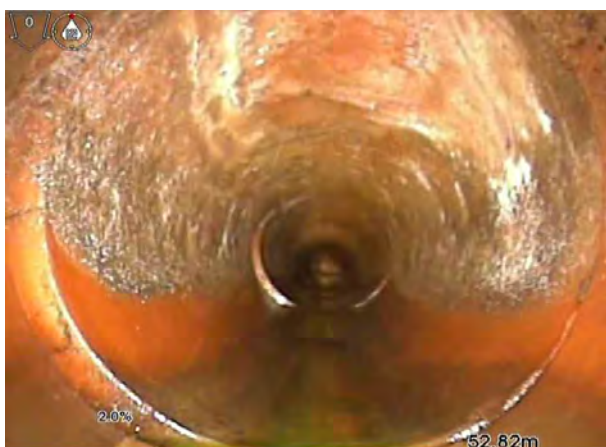
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



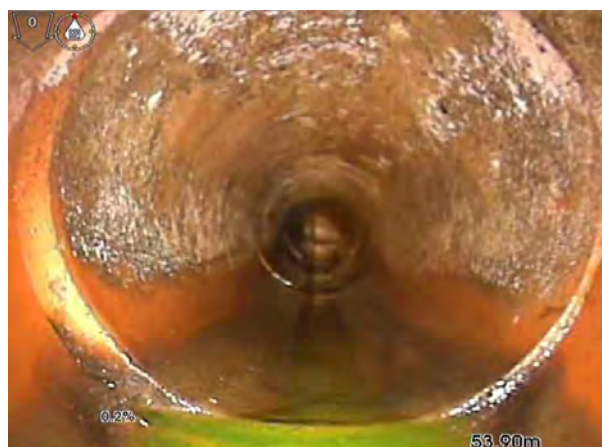
SMH1X_c9756ae9-7474-49f5-a008-c138a565df65_20220719_105926_330.jpg, 00:06:35, 50.70 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_dbea6608-f440-4ef0-bffc-94a86a080fee_20220719_10021_131.jpg, 00:06:41, 51.75 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



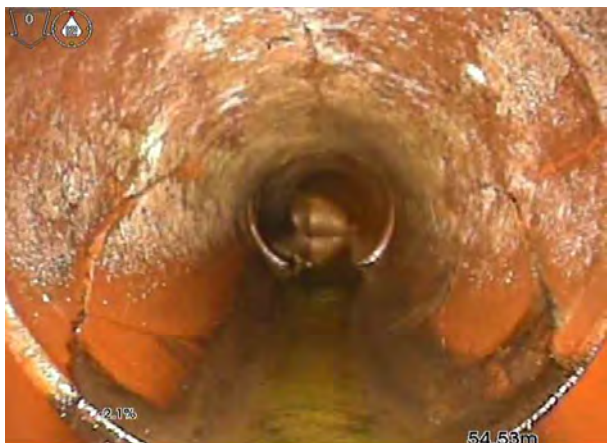
SMH1X_8b9ede2b-978f-4b99-a56d-364b158975bc_20220719_110124_686.jpg, 00:06:46, 52.82 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



SMH1X_d65338a0-2705-48da-af9e-088992759318_20220719_110144_698.jpg, 00:06:50, 53.90 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Pictures - 19/07/2022 - SMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SMH1X		441226



SMH1X_dcccfc1e-3dcc-433e-ab59-1cd0e9db81a3_20220719_110357_780.jpg, 00:06:55, 54.53 m
Cracks, multiple at joint from 7 o'clock to 4 o'clock



SMH1X_f6aff482-66af-443c-86ea-92f373434d74_20220719_110428_546.jpg, 00:06:59, 55.34 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)

Section Inspection - 19/07/2022 - CMH1X

Section 3	Inspection 3	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR CMH1X
Operator Not Specified		Vehicle Not Specified		Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Inspection Direction:	Downstream	Upstream Node:	CMH1
Road:	Inspected Length:	58.61 m	Upstream Pipe Depth:	1.500 m
Location:	Total Length:	58.61 m	Downstream Node:	OUTFALL
Surface Type:	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular	
Type of Pipe:		Dia/Height:	525 mm	
Year Constructed:		Pipe Material:	Vitrified clay	
Flow Control:		Lining:	No Lining	
Inspection Purpose:		Lining Material:	No Lining	
Comments:				
Recommendations:				

Scale: 1:266	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: 1.50 m CMH1						
	0.00	ST	Start of survey	00:00:00		
	0.00	WL	Water level, 5% of sewer height	00:00:06		
	1.44	CMJ	Cracks, multiple at joint from 9 o'clock to 5 o'clock	00:00:17	CMH1X_7 9a3eba9-7 235-4626-	3
	2.37	JDM	Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)	00:00:21	CMH1X_ef 37a51c-af 84-4ed1-8	1
	3.15	CLJ	Crack, longitudinal at joint at 6 o'clock	00:00:25	CMH1X_e 4d0d78b-e efa-4dd0-a	2
	6.83	CMJ	Cracks, multiple at joint from 12 o'clock to 6 o'clock	00:00:41	CMH1X_8 997ad55-c cd9-499a-	3
	10.46	FLJ	Fracture, longitudinal at joint at 6 o'clock	00:00:57	CMH1X_fd 2ca93c-05 ea-45de-a	3
	14.54	FLJ	Fracture, longitudinal at joint at 7 o'clock	00:01:15	CMH1X_0 0444615-4 956-41af-8	3
	20.08	JN	Junction at 2 o'clock, 225mm diameter	00:01:43		
	22.79	CLJ	Crack, longitudinal at joint at 5 o'clock	00:01:55	CMH1X_e d703122-7 2fe-4839-8	2
	23.32	CLJ	Crack, longitudinal at joint at 1 o'clock	00:01:59	CMH1X_a d714475-2 f4b-4942-9	2
	25.63	CMJ	Cracks, multiple at joint from 11 o'clock to 7 o'clock	00:02:09	CMH1X_4 d5620eb-5 315-4bd6-	3
	26.75	CLJ	Crack, longitudinal at joint at 12 o'clock	00:02:15	CMH1X_7 eb7d20c-6 b28-4b7d-	2
	28.48	CLJ	Crack, longitudinal at joint at 12 o'clock	00:02:24	CMH1X_a 0a59138-7 ce7-414b-	2
	29.21	JN	Junction at 10 o'clock, 225mm diameter	00:02:28		

Section Inspection - 19/07/2022 - CMH1X

Section 3	Inspection 3	Date 19/07/22	Time 10:17	Client's Job Ref Not Specified	Weather Not Specified	Pre Cleaned Not Specified	PLR CMH1X
Operator Not Specified		Vehicle Not Specified		Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale: 1:266	Position [m]	Code	Observation	MPEG	Photo	Grade
	31.81	CLJ	Crack, longitudinal at joint at 12 o'clock	00:02:39	CMH1X_1 aa01f2c-4 35b-4161-	2
	32.39	FLJ	Fracture, longitudinal at joint at 7 o'clock	00:02:45	CMH1X_fe 776423-a6 62-4269-9	3
	34.42	FLJ	Fracture, longitudinal at joint at 6 o'clock	00:02:57	CMH1X_c 5f1144c-7 e4d-465e-	3
	39.14	CMJ	Cracks, multiple at joint from 2 o'clock to 9 o'clock	00:00:02	CMH1X_3 5cd4f78-6 29d-4758-	3
	40.97	CMJ	Cracks, multiple at joint from 9 o'clock to 4 o'clock	00:00:13	CMH1X_d 52fe99e-2 010-4b86-	3
	43.81	CM	Cracks, multiple from 7 o'clock to 10 o'clock	00:00:30	CMH1X_a 97d0145-a b8f-497c-a	3
	44.46	CMJ	Cracks, multiple at joint from 10 o'clock to 4 o'clock	00:00:35	CMH1X_d deff060-e5 12-4663-b	3
	45.32	CLJ	Crack, longitudinal at joint at 8 o'clock	00:00:41	CMH1X_4 5e314fc-b 6c1-4f8e-8	2
	47.01	CMJ	Cracks, multiple at joint from 9 o'clock to 3 o'clock	00:00:50	CMH1X_0 40c94a9-e bbf-4727-a	3
	47.79	CMJ	Cracks, multiple at joint from 7 o'clock to 5 o'clock	00:00:59	CMH1X_a 04f5816-3 44b-4a80-	3
	49.70	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock	00:01:12	CMH1X_3 43aa71f-1 ccd-4dd4-	3
	50.07	CMJ	Cracks, multiple at joint from 7 o'clock to 5 o'clock	00:01:18	CMH1X_e 1258b56-a b67-4f49-9	3
	51.21	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock	00:01:24	CMH1X_1 48c7fbd-f4 da-4757-b	3
	53.50	CMJ	Cracks, multiple at joint from 7 o'clock to 4 o'clock	00:01:47	CMH1X_7 ab2d673-9 d39-4eeb-	3
	55.24	WL	Water level, 15% of sewer height	00:02:09		
	55.39	CMJ	Cracks, multiple at joint from 7 o'clock to 9 o'clock	00:02:10	CMH1X_c 25398c8-9 cab-414a-	3
	57.31	CMJ	Cracks, multiple at joint from 8 o'clock to 11 o'clock	00:03:15	CMH1X_d a2fb8fe-7d 74-4e1c-b	3
	58.61	FH	Finish survey	00:04:09		

OUTFALL

Depth: m

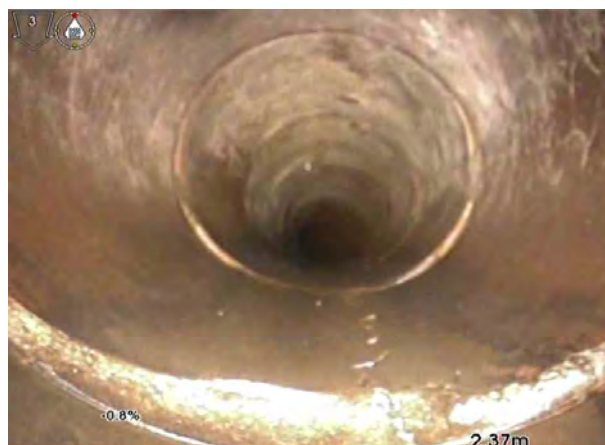
Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
27	50.0	14.2	831.0	3.0	0	0.0	0.0	0.0	1.0

Section Pictures - 19/07/2022 - CMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



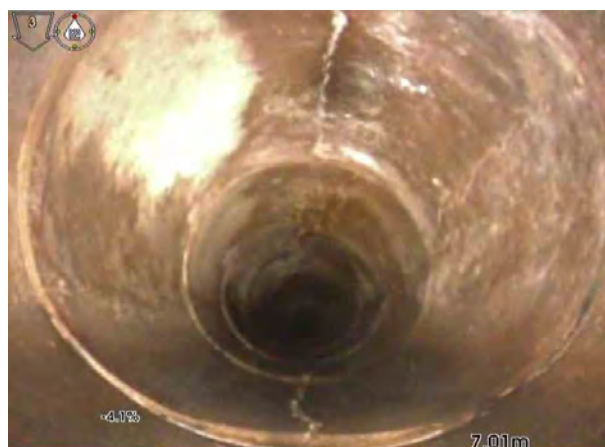
CMH1X_79a3eba9-7235-4626-9a07-8de68ec9bb5c_20220719_132455_071.jpg, 00:00:17, 1.44 m
Cracks, multiple at joint from 9 o'clock to 5 o'clock



CMH1X_ef37a51c-af84-4ed1-8943-546ec4163a7e_20220719_132512_245.jpg, 00:00:21, 2.37 m
Joint displaced, medium (between 1.0 and 1.5 times the pipe wall thickness)



CMH1X_e4d0d78b-eefa-4dd0-a6c2-c070fd18919c_20220719_132531_413.jpg, 00:00:25, 3.15 m
Crack, longitudinal at joint at 6 o'clock



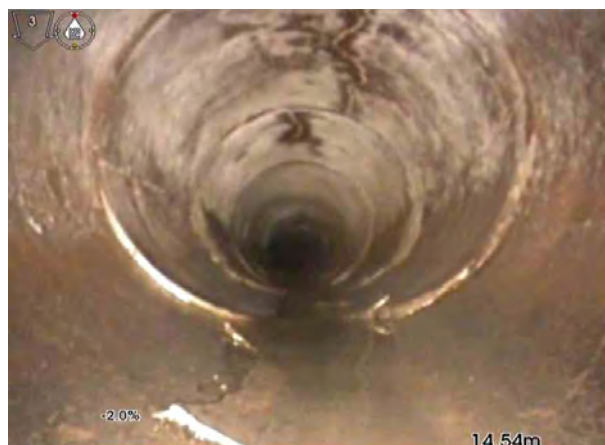
CMH1X_8997ad55-ccd9-499a-880b-e716c83caf12_20220719_132607_227.jpg, 00:00:41, 6.83 m
Cracks, multiple at joint from 12 o'clock to 6 o'clock

Section Pictures - 19/07/2022 - CMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



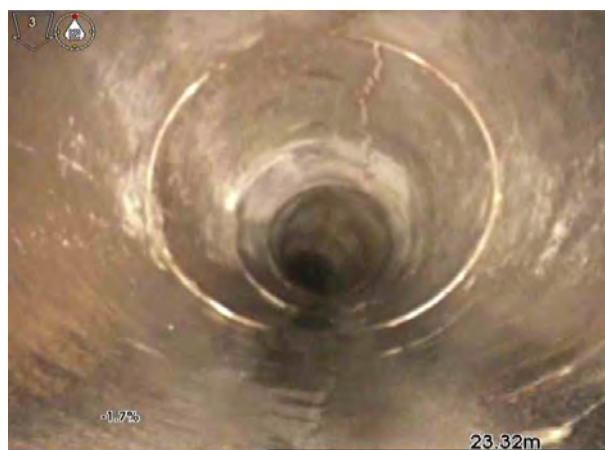
CMH1X_fd2ca93c-05ea-45de-a7db-d6ecc455912a_20220719_132641_868.jpg, 00:00:57, 10.46 m
Fracture, longitudinal at joint at 6 o'clock



CMH1X_00444615-4956-41af-8fcc-f04c7107dc30_20220719_132745_312.jpg, 00:01:15, 14.54 m
Fracture, longitudinal at joint at 7 o'clock



CMH1X_ed703122-72fe-4839-898c-2d52828b7e33_20220719_132933_843.jpg, 00:01:55, 22.79 m
Crack, longitudinal at joint at 5 o'clock



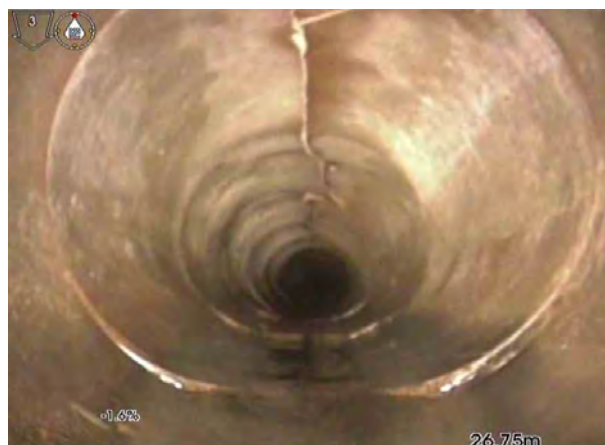
CMH1X_ad714475-2f4b-4942-9f89-7ec39a8bdb61_20220719_132950_768.jpg, 00:01:59, 23.32 m
Crack, longitudinal at joint at 1 o'clock

Section Pictures - 19/07/2022 - CMH1X

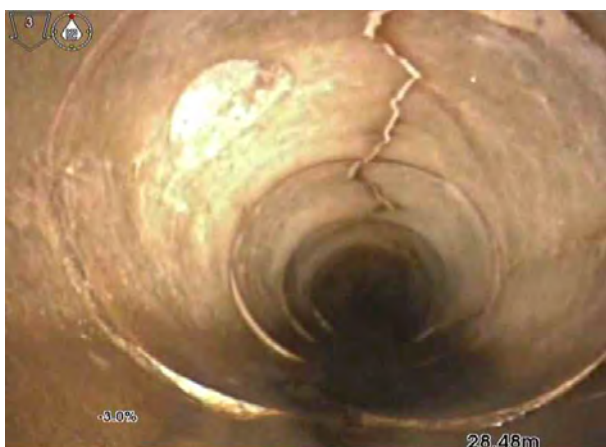
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



CMH1X_4d5620eb-5315-4bd6-baee-b84f84f942d3_20220719_133024_340.jpg, 00:02:09, 25.63 m
Cracks, multiple at joint from 11 o'clock to 7 o'clock



CMH1X_7eb7d20c-6b28-4b7d-9813-b2213ec00246_20220719_133046_365.jpg, 00:02:15, 26.75 m
Crack, longitudinal at joint at 12 o'clock



CMH1X_a0a59138-7ce7-414b-8f9c-463ba7bba052_20220719_133115_138.jpg, 00:02:24, 28.48 m
Crack, longitudinal at joint at 12 o'clock



CMH1X_1aa01f2c-435b-4161-b06c-21360a938e73_20220719_133157_987.jpg, 00:02:39, 31.81 m
Crack, longitudinal at joint at 12 o'clock

Section Pictures - 19/07/2022 - CMH1X

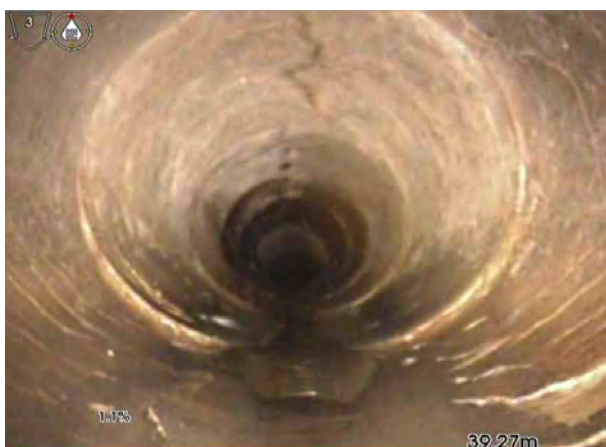
Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



CMH1X_fe776423-a662-4269-934e-854f3dabd5ca_20220719_133225_674.jpg, 00:02:45, 32.39 m
Fracture, longitudinal at joint at 7 o'clock



CMH1X_c5f1144c-7e4d-465e-89df-0abc384fcca8_20220719_133255_624.jpg, 00:02:57, 34.42 m
Fracture, longitudinal at joint at 6 o'clock



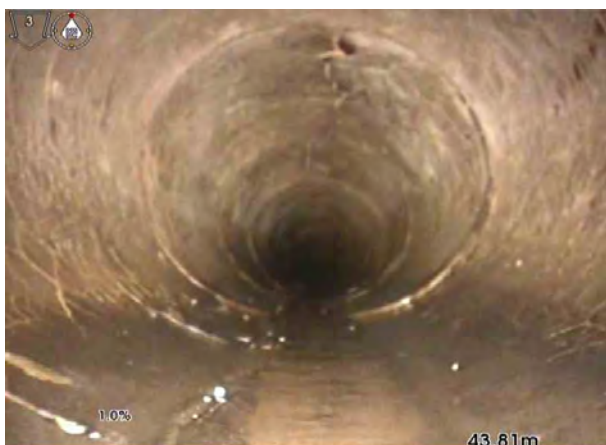
CMH1X_35cd4f78-629d-4758-8e63-fde4e433247e_20220719_111325_999.jpg, 00:00:02, 39.14 m
Cracks, multiple at joint from 2 o'clock to 9 o'clock



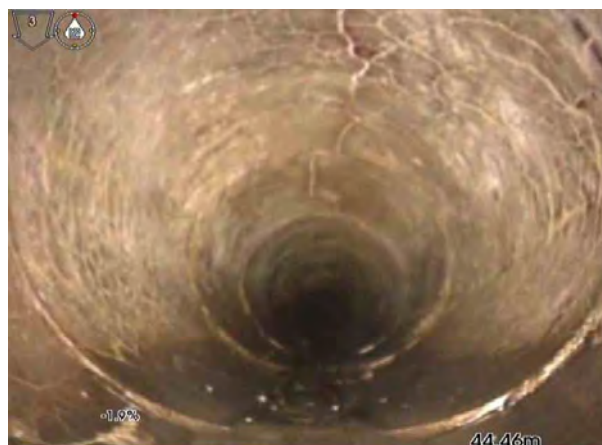
CMH1X_d52fe99e-2010-4b86-b3a5-692ec5cfc662_20220719_111404_809.jpg, 00:00:13, 40.97 m
Cracks, multiple at joint from 9 o'clock to 4 o'clock

Section Pictures - 19/07/2022 - CMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



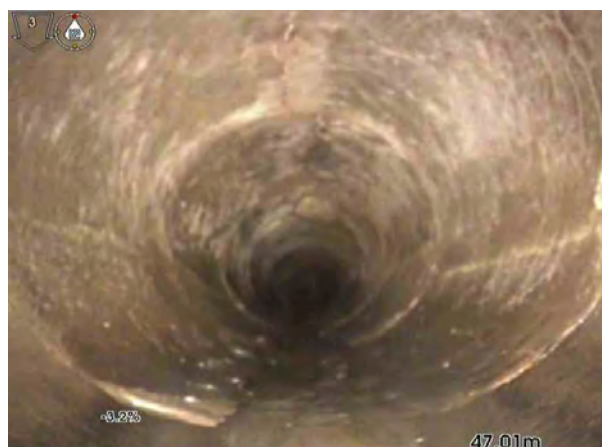
CMH1X_a97d0145-ab8f-497c-a5d7-504c1bed0e2c_20220719_111740_935.jpg, 00:00:30, 43.81 m
Cracks, multiple from 7 o'clock to 10 o'clock



CMH1X_ddeff060-e512-4663-bd59-37b68b76606a_20220719_111803_843.jpg, 00:00:35, 44.46 m
Cracks, multiple at joint from 10 o'clock to 4 o'clock



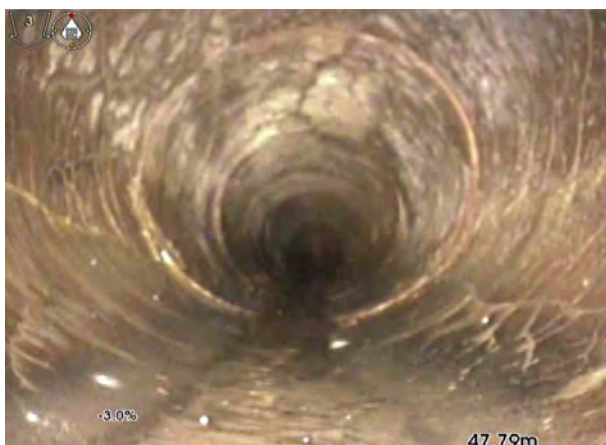
CMH1X_45e314fc-b6c1-4fbe-8aae-eed6d34c8893_20220719_122749_513.jpg, 00:00:41, 45.32 m
Crack, longitudinal at joint at 8 o'clock



CMH1X_040c94a9-ebbf-4727-a95e-ebda1f2ac502_20220719_122822_618.jpg, 00:00:50, 47.01 m
Cracks, multiple at joint from 9 o'clock to 3 o'clock

Section Pictures - 19/07/2022 - CMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



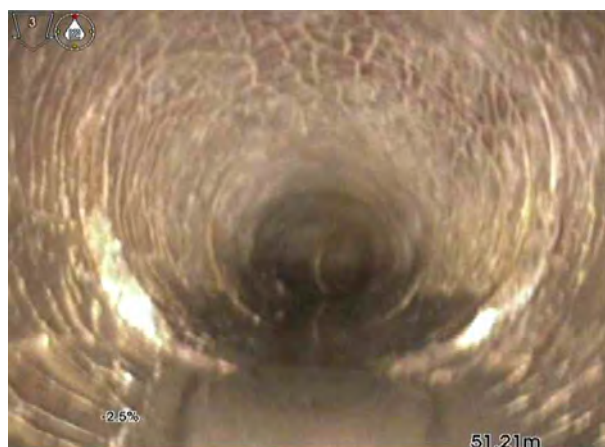
CMH1X_a04f5816-344b-4a80-ab05-ad9116e96dcf_20220719_122849_854.jpg, 00:00:59, 47.79 m
Cracks, multiple at joint from 7 o'clock to 5 o'clock



CMH1X_343aa71f-1ccd-4dd4-b85a-2276139aa498_20220719_131510_744.jpg, 00:01:12, 49.70 m
Cracks, multiple at joint from 7 o'clock to 4 o'clock



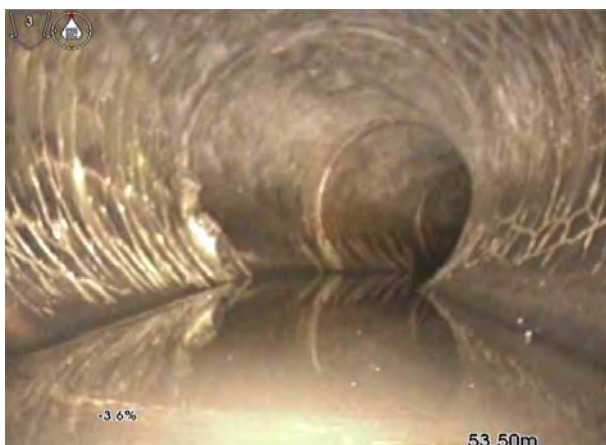
CMH1X_e1258b56-ab67-4f49-964f-38183c96be60_20220719_131533_565.jpg, 00:01:18, 50.07 m
Cracks, multiple at joint from 7 o'clock to 5 o'clock



CMH1X_148c7fbd-f4da-4757-b591-d462b5a055b9_20220719_131602_082.jpg, 00:01:24, 51.21 m
Cracks, multiple at joint from 7 o'clock to 4 o'clock

Section Pictures - 19/07/2022 - CMH1X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
3	Downstream	CMH1X		441226



CMH1X_7ab2d673-9d39-4eeb-bbcf-17450d26a246_20220719_131749_110.jpg, 00:01:47, 53.50 m
Cracks, multiple at joint from 7 o'clock to 4 o'clock



CMH1X_c25398c8-9cab-414a-9f26-2a7f2fc9a407_20220719_132036_588.jpg, 00:02:10, 55.39 m
Cracks, multiple at joint from 7 o'clock to 9 o'clock



CMH1X_da2fb8fe-7d74-4e1c-b099-19255886b6ae_20220719_132209_613.jpg, 00:03:15, 57.31 m
Cracks, multiple at joint from 8 o'clock to 11 o'clock



- PRELIMINARY**

DRAWING STATUS
A - Approval AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

Appendix C

Existing Site Plan



- NOTES:**
- MH COVERS AND FRAMES TO CONFORM TO BS EN 124:
-HIGHWAYS AND FOOTWAYS TO FRONT OF BUILDINGS (D400)
-FOOTWAYS TO REAR OF BUILDINGS (C250)
 - TYPE S BEDDING AND SURROUND TO ALL PIPES EXCEPT IN THE FOLLOWING CIRCUMSTANCES, IN WHICH TYPE 2 BEDDING AND SURROUND ARE TO BE USED:
-IN BACK GARDENS OF HOUSES WHERE DEPTH TO CROWN OF PIPE IS LESS THAN 0.35m.
-IN AREAS OF THE REAR OF FLATS AND PARKING WHERE DEPTH TO CROWN IS LESS THAN 0.9m.
-IN AREAS OF ROAD WHERE DEPTH IS LESS THAN 1.2m.
 - ALL EXISTING MANHOLE INVERTS TO BE CHECKED AND REPORTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF DRAINAGE WORKS. EXISTING PIPE CONNECTIONS ARE TO BE CCTV SURVEYED AND INSPECTED BY THE ENGINEER AND LOCAL AUTHORITY. IF THE PIPE CONNECTION IS FOUND TO BE DAMAGED OR IN DISTRESS, THE CONTRACTOR IS TO CARRY OUT REMEDIAL WORKS OR PROVIDE A NEW CONNECTION TO THE EXISTING SEWER (PIPE SIZE AND GRADIENT TO BE DETERMINED BY THE ENGINEER.
 - THE GRADIENTS INDICATED AGAINST THE DRAIN RUNS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL INSTALL DRAINS TO THE INVERT LEVELS SHOWN FOR EACH MANHOLE OR OTHER INDICATED POSITION.
 - ALL PLOT FOUL DRAINAGE TO BE MINIMUM 100mm DIAMETER AND LAID AT 1 IN 40 UNLESS OTHERWISE NOTED.
 - ALL ADOPTABLE THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 AND WIS 4-35-01 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PARTY CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm DIA. SHALL HAVE A SHORT-TERM RING STIFFNESS OF NOT LESS THAN 8kNm² (SN8).
 - ALL JOINTING IN ACCORDANCE WITH MANUFACTURERS TECHNICAL ADVICE & SPECIFICATION.
 - ALL NON ADOPTABLE DRAINAGE TO BE THE STANDARD UPVC 110mm, 160mm DRAINAGE AND MANUFACTURED TO BS-EN 1401 AND BS 4660 UNLESS NOTED OTHERWISE.
 - ALL PERMEABLE PAVING CELLS TO HOUSE LATERAL FIN DRAIN ALONG LOWER EDGE WITH 1500 CONNECTION PIPE.
 - ALL STORM WATER DRAINAGE TO BE A MINIMUM OF 150mm DIAMETER UNLESS OTHERWISE NOTED.
 - SOIL & VENT PIPE LOCATION AND NUMBER TO BE CONFIRMED WITH ARCHITECT.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS, TOGETHER WITH THEIR LATEST SPECIFICATIONS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER (VALE CONSULTANCY) AS SOON AS POSSIBLE.
 - FIGURED DIMENSIONS ONLY TO BE USED. ANY QUERIES OR DISCREPANCIES TO BE REFERRED TO THE ENGINEER (VALE CONSULTANCY) IMMEDIATELY.
 - PRIOR TO ORDERING ANY MATERIALS THE CONTRACTOR IS TO CONFIRM MANUFACTURER/PIPE MATERIAL AND GRADE PROPOSED WITH WATER AUTHORITY.
 - TEMPORARY WORKS DESIGN BY OTHERS.
 - DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

Construction Issue

A	RGP	LR	MJ	11.05.22	CONSTRUCTION ISSUE
01	RGP	LR	MJ	11.05.22	PRELIMINARY ISSUE
rev.	drawn	chd.	approved	date	description

Client
CHARTER HOMES

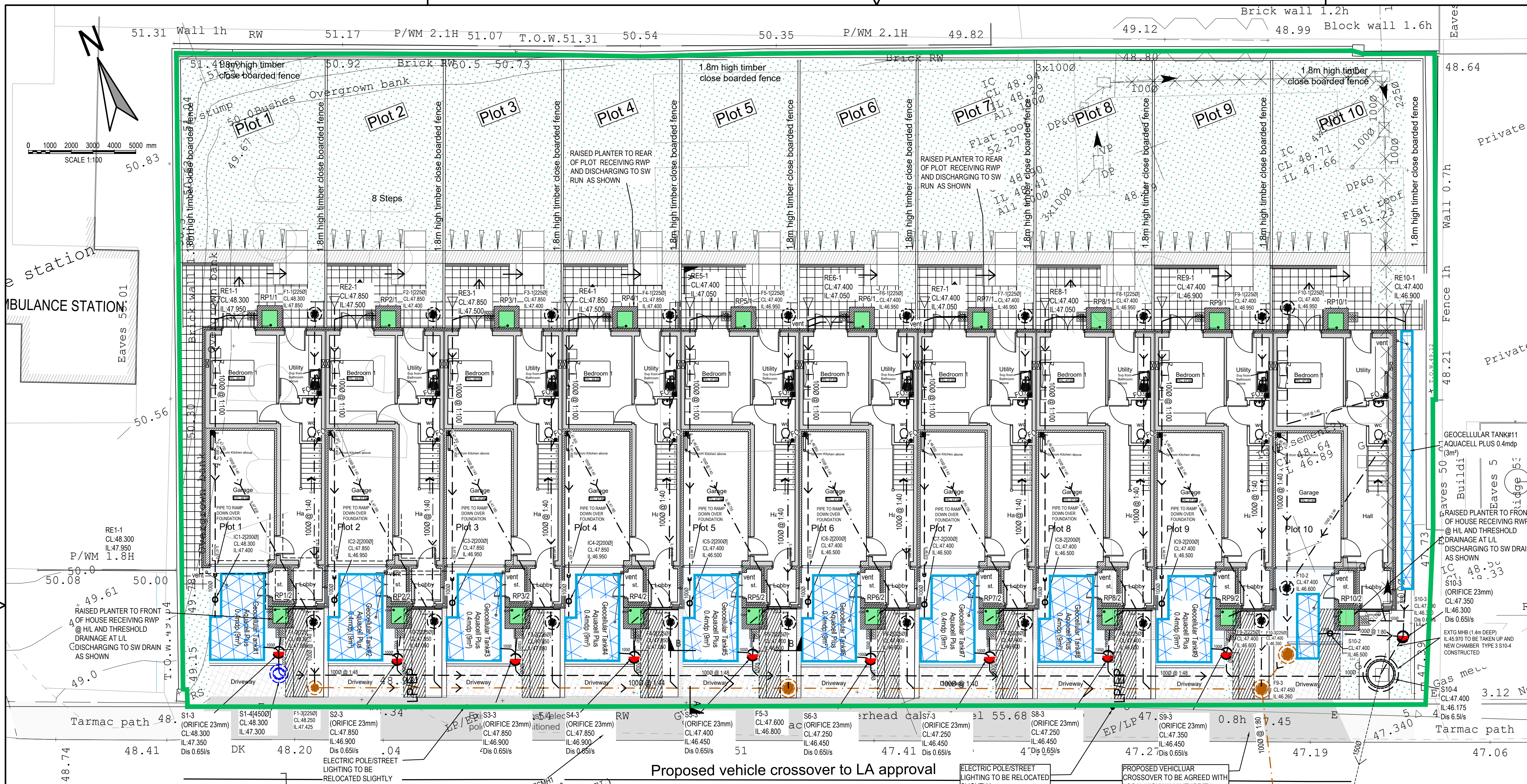
Project
**CHURCH STREET DEVELOPMENT
PONTARDAWE
NEATH PORT TALBOT**

Title
**TOPOGRAPHICAL SURVEY
OVERLAID WITH OS MAP**

**Vale Consultancy**
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked	approved
11.05.22	RGP	LR	MJ
scale @ A1	1:200	project no.	14657
status	dirg. no.	rev.	
C	14657/C100	A	

Appendix D
Proposed Site Plan



- NOTES:**
1. MH COVERS AND FRAMES TO CONFORM TO BS EN 124- HIGHWAYS AND FOOTWAYS TO FRONT OF BUILDINGS (D400)
-FOOTWAYS TO REAR OF BUILDINGS (C250)
 2. TYPE S BEDDING AND SURROUND TO ALL PIPES EXCEPT IN THE FOLLOWING CIRCUMSTANCES, IN WHICH TYPE Z BEDDING AND SURROUND ARE TO BE USED:
-IN BACK GARDENS OF HOUSES WHERE DEPTH TO CROWN OF PIPE IS LESS THAN 0.35m.
-IN AREAS OF THE REAR OF FLATS AND PARKING WHERE DEPTH TO CROWN IS LESS THAN 0.9m.
-IN AREAS OF ROAD WHERE DEPTH IS LESS THAN 1.2m.
 3. ALL EXISTING MANHOLE INVERTS TO BE CHECKED AND REPORTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF DRAINAGE WORKS. EXISTING PIPE CONNECTIONS ARE TO BE CTVY SURVEYED AND INSPECTED BY THE ENGINEER AND LOCAL AUTHORITY. IF THE PIPE CONNECTION IS FOUND TO BE DAMAGED OR IN DISTRESS, THE CONTRACTOR IS TO CARRY OUT REMEDIAL WORKS OR PROVIDE A NEW CONNECTION TO THE EXISTING SEWER (PIPE SIZE AND GRADIENT TO BE DETERMINED BY THE ENGINEER.
 4. THE GRADIENTS INDICATED AGAINST THE DRAIN RUNS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL INSTALL DRAINS TO THE INVERT LEVELS SHOWN FOR EACH MANHOLE OR OTHER INDICATED POSITION.
 5. ALL PLOT FOUL DRAINAGE TO BE MINIMUM 100mm DIAMETER AND LAID AT 1 IN 40 UNLESS OTHERWISE NOTED.
 6. ALL ADAPTABLE THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 AND WIS 4-35-01 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PARTY CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm dia. SHALL HAVE A SHORT-TERM RINGS STIFFNESS OF NOT LESS THAN 8kN/m² (S_{NR}).
 7. ALL JOINTING IN ACCORDANCE WITH MANUFACTURERS TECHNICAL ADVICE & SPECIFICATION.
 8. ALL NON ADAPTABLE DRAINAGE TO BE THE STANDARD UPVC 110mm, 160mm DRAINAGE AND MANUFACTURED TO BS-EN 1401 AND BS 4660 UNLESS NOTED OTHERWISE.
 9. ALL PERMEABLE PAVING CELLS TO HOUSE LATERAL FIN DRAIN ALONG LOWER EDGE WITH 1500 CONNECTION PIPE.
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 13. FIGURED DIMENSIONS ONLY TO BE USED. ANY QUERIES OR DISCREPANCIES TO BE REFERRED TO THE ENGINEER (VALE CONSULTANCY) IMMEDIATELY.
 14. PRIOR TO ORDERING ANY MATERIALS THE CONTRACTOR IS TO CONFIRM MANUFACTURE/PIPE MATERIAL AND GRADE PROPOSED WITH WATER AUTHORITY.
 15. TEMPORARY WORKS DESIGN BY OTHERS.
 16. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

SAB Approval

ev.	drawn	checked	approved	date	description				
01	02	A	B	C	D	E	F	G	H
RGP	RGP	RGP	RGP	RGP	RGP	RGP	RGP	RGP	RGP
11/05	24/03	31/05	11/06	08/06	30/06	21/08	23/08	28/08	27/07
2002	2002	2002	2002	2002	2002	2002	2002	2002	2002
LAYOUT AMENDED FOR SAB APPROVAL									
PLOT 10 SW AMENDED TO SUIT ON SITE FINDINGS: EXTGMHB									
ORIFICE SIZE ADDED									
EXISTING MHS A&B SITE DIPPED									
SW REVISED TO SUIT SITE CONSTRAINTS									
PIPE SIZES ADDED FOR CLARITY									
GARASTOR AMENDED TO ORIFICE PLATE. FOUL DRAIN FROM GARAGE STACK AMENDED									
CONSTRUCTION ISSUE									
CAD FILES RECEIVED - LAYOUT REDRAWN TO INCLUDE SITE INFORMATION (AS BUILT)									
PRELIMINARY ISSUE									

Client
CHARTER HOMES

Project
CHURCH STREET DEVELOPMENT
PONTARDAWE
NEATH PORT TALBOT

PLOT DRAINAGE PLAN



29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
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date	drawn	checked	approved
11.05.22	RGP	LR 11.05.22	MJ 11.05.22
scale @ A1		project no.	
1:100		14657	
status	drg. no.		rev.
A	14657/C501		H

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender