

Gladman Developments Limited

UTILITY LAW SOLUTIONS

**Proposed Development -
Land off Arundel Road, Angmering**

Foul Drainage Analysis

March 2018

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Proposed Development of Land off Arundel Road, Angmering

Foul Drainage Analysis

A. Executive Summary

Utility Law Solutions (ULS) specialises in water and sewerage law and how it relates to the housebuilding industry. Gladman Developments Ltd has appointed ULS to review foul drainage matters relevant to its proposed development of land off Arundel Road, Angmering and provide this analysis.

This report outlines how the proposed development can be effectually drained and sets out the legal framework that governs foul drainage matters applicable to new development generally. Evaluating foul drainage requirements for new development involves:

- ⊗ Identifying a point of connection on the public sewerage network to which foul water can be discharged.
- ⊗ Establishing the technical requirements for conveying foul water to the identified point of connection.
- ⊗ Liaison with the relevant sewerage undertaker to determine the impact of discharging foul water to its sewerage network.

A drainage system designed in accordance with industry standards and relevant statutory procedures will be constructed on this site to serve a proposed development of up to 200 residential dwellings. The developments waste water will be discharged to the public sewerage network owned and operated by Southern Water (the Sewerage Undertaker).

The Sewerage Undertaker has assessed development proposals for this site and the associated impact of discharging its foul water to the public sewerage network. A hydraulic modelling study concluded that public sewer improvements (network reinforcement) will be required to accommodate this developments foul water.

The Sewerage Undertaker is fully funded to complete network reinforcement to accommodate new development and must do so to comply with statutory duties prescribed by Section 94 of the Water Industry Act 1991. On 1st April 2018, the Sewerage Undertaker will implement revised charging arrangements for the connection of new developments to public sewer networks. These arrangements follow statutory rules issued by Ofwat that amongst other matters, require network reinforcement to be funded solely by infrastructure charges. The Sewerage Undertaker will collect an infrastructure charge for every new dwelling connected to its sewerage network. The investment required for improving the public sewerage system to accommodate housing growth is therefore spread equally across all new development.

In recent years, sewerage undertakers have often requested planning conditions that effectively forced developers to fund network reinforcement through sewer requisitions (section 98 of the Water Industry Act 1991). Network reinforcement charges can no longer be included in public sewer requisitions as the charging rules issued by Ofwat specifically preclude this.

Estimated timescales for securing planning consents and the subsequent implementation of this development demonstrate that its foul water will not be discharged to the public sewerage network until 2021 at the earliest. This allows sufficient time for the Sewerage Undertaker to take any action it deems necessary to ensure its systems can accommodate this developments foul water.

In summary, this report clearly demonstrates how the proposed development can be drained by discharging its foul water to the public sewerage network. The Sewerage Undertaker has identified action it may need to take to ensure this development will not cause detriment to the performance of the receiving sewerage system. The Sewerage Undertaker has sufficient time to improve its systems as necessary and is funded to do so. Matters relating to foul drainage are comprehensively addressed in other primary legislation, meaning there is no impact which would make the development unacceptable in planning terms. Adopting the tests at paragraph 206 of the National Planning Policy Framework (NPPF), any condition related to foul drainage is unnecessary, irrelevant to planning and unreasonable.

B. Drainage Strategy for the Development

- B.1 A foul drainage system connected to the public foul sewer network as detailed below will be constructed to serve this development. All sewers and ancillaries will be built in accordance with the national industry guidance entitled “Sewers for Adoption” and will ultimately be adopted by the Sewerage Undertaker through an agreement pursuant to section 104 of the Water Industry Act 1991. This will ensure the long-term maintenance of all new sewers and is standard practice for new development.
- B.2 Records received from the Sewerage Undertaker indicate the nearest public sewer to be situated to the south east of the site in Arundel Road. It is proposed that this developments foul water will be discharged at an existing manhole adjacent to St. Margaret’s Primary School. Offsite development sewers can be constructed in public highway between the site and the proposed point of connection.
- B.3 A developer can serve notice on the Sewerage Undertaker pursuant to section 106 of the Water Industry Act 1991 to connect at a point of its choosing. This notice cannot be refused by the Sewerage Undertaker, but it can compel a developer to connect at an alternative location using its powers under section 112 of the Water Industry Act 1991. The Sewerage Undertaker can therefore dictate the point of connection on the public sewerage network to ensure there is no detriment to its existing performance. Section 112 enables sewerage undertakers to instruct a developer to construct drainage systems in a specified manner to ensure any impact on the public sewerage network is minimised either on a permanent or temporary basis.
- B.4 The site falls naturally in a westerly direction with ground levels decreasing from 22.5 metres AOD to 11.5 metres AOD. Cover and invert levels of the public sewer at the proposed point of connection are 14.0 metres AOD and 12.85 metres AOD respectively. It is clear from the topography of the site that it will not be feasible to drain the majority of the site under gravity. Foul water will be collected at a pumping station in the west of the site and conveyed to the public sewerage network through a rising main (pipe under pressure). Detailed design of the development will determine whether the rising main should connect direct to the public sewer in Arundel Road, or outfall to a gravity network constructed to drain a small portion of the development in the east of the site with an associated offsite gravity sewer extending to the proposed point of connection. The detail of the drainage strategy will be agreed with the Sewerage Undertaker and included in a sewer adoption agreement pursuant to section 104 of the Water Industry Act 1991.

- B.5 Details of development proposals for this site and the drainage strategy outlined in this report were submitted to the Sewerage Undertaker for evaluation. An initial response from the Sewerage Undertaker confirmed that capacity is available in the public sewerage network 1.7 kilometres to the east at Clapham Wastewater Treatment Works. Construction of 1.7 kilometres of offsite sewer to convey foul water to this location is clearly not a viable solution for draining this development and has been discounted as an option. A feasibility study was therefore commissioned to allow the Sewerage Undertaker to evaluate how it can accommodate a connection to the local network as outlined in B.2 above.
- B.6 The Sewerage Undertakers feasibility study report is included at Appendix 1 along with its earlier comments. This study hydraulically modelled the developments impact on the downstream public sewer network, to determine the likely level of network reinforcement required to accommodate discharging developments flows to the public sewer in Arundel Road. It is solely a matter for the Sewerage Undertaker to determine its preferred solution for accommodating foul water from this development in its sewerage system and the feasibility study has provided details of action it may need to take to comply with its duty under Section 94 of the Water Industry Act 1991. The Sewerage Undertaker will complete further studies to establish its preferred solution and the timing of its implementation once a planning consent has been issued for this development.
- B.7 The site boundary is shown edged red on the plan at Appendix 3 and the proposed point of connection on the public sewerage network is indicated at Appendix 2. These can be referenced against the Development Framework Plan that forms part of the planning application.
- B.8 In summary, it is proposed that this developments foul water will be discharged to the adjacent public sewerage network. The Sewerage Undertaker is required to take action as necessary to ensure existing network performance is not detrimentally affected.

C. Development Timescales

- C.1 Presuming this outline planning application is approved, the following minimum timescales are envisaged for construction of the developments drainage system and the subsequent discharge of foul water to the public sewerage network:
- ⊗ The site will be marketed for sale to a developer by the end of 2018.
 - ⊗ Subsequent sale of the site anticipated in early to mid-2019.
 - ⊗ The developer that purchases the site will complete detailed designs to facilitate submission of a reserved matters planning application before the end of 2019.
 - ⊗ Determination of a reserved matters planning application may take approximately 3-6 months, i.e. Full planning permission granted by early to mid-2020.
 - ⊗ The developments foul drainage system will be constructed as part of initial on-site groundworks commencing in late 2020, allowing a few months for enabling works etc.
 - ⊗ Foul water from the development will not be discharged to the public sewer network until initial occupations commence in mid-2021.
 - ⊗ Development will continue over approximately a 5 to 6 year period with sales/occupations at around 40 dwellings per annum.
 - ⊗ Site completion and full foul water flows estimated in 2026.
- C.2 As demonstrated by this timeline, the discharge of foul water to the public sewerage network is anticipated to begin in 2021. This allows more than two years for the Sewerage Undertaker to take whatever action it deems necessary to ensure it can meet the needs of this development.
- C.3 The network reinforcement suggested by the Sewerage Undertakers feasibility study involves laying 255 metres of new sewer, upsizing 32 metres of existing sewer and the construction of associated manholes. It is clear that works of this magnitude could easily be designed, planned and implemented by the Sewerage Undertaker in the two years between issuing an outline planning consent and the discharge of development flows to the public sewer network.
- C.4 It would be inappropriate to prevent this development from proceeding on the grounds of sewerage or sewage treatment capacity and unnecessary to apply any restrictive planning condition. For example, a condition that prevented the commencement of development or occupation of premises until network reinforcement was completed would be unreasonable given the timescales for its implementation and the options available to the Sewerage Undertaker.

D. Sewerage Undertaker Funding

- D.1 Ofwat (the water and sewerage industry regulator) has issued statutory rules that will amend how sewerage undertakers charge for activities associated with the connection of new developments to public sewerage networks. Each sewerage undertaker has published charging arrangements that will implement these rules from 1st April 2018. The relevant document for the sewerage undertaker in whose operating area this development is located is included at Appendix 6. As this development will not commence until after 1st April 2018, these charging arrangements will apply.
- D.2 As well as detailing charges for site specific activities, the new charging arrangements set out how network reinforcement required to accommodate new development is funded. From 1st April 2018, the Sewerage Undertaker will collect an infrastructure charge for every new dwelling connected to its sewerage network, the purpose of which is to fund network reinforcement in its operating area. The Sewerage Undertaker will receive infrastructure charge payments for connections that do not necessitate network reinforcement as well as for those that do. This ensures that the cost of providing additional capacity in the public sewerage network to accommodate housing growth is spread equally across all new development.
- D.3 In recent years, sewerage undertakers have often requested planning conditions for new development that effectively forced developers to fund network reinforcement through sewer requisitions (section 98 of the Water Industry Act 1991). Network reinforcement charges can no longer be included in public sewer requisitions as the charging rules issued by Ofwat specifically preclude this. All new developments will contribute towards network reinforcement through infrastructure charges, allowing sewerage undertakers to fully comply with statutory duties prescribed by Section 94 of the Water Industry Act 1991.
- D.4 As sewerage undertakers will have a properly defined funding stream for improving public sewer networks to accommodate new development, it would be unreasonable to impose planning conditions relating to foul drainage where it can be demonstrated that development timescales allow any necessary action to be taken. Sewerage undertakers have a statutory duty to improve networks and must do so within a reasonable timeframe to ensure much needed new housing is not delayed.
- D.5 Any improvements necessary to the operation of sewage treatment facilities, including works required to accommodate new development, are funded through the general sewerage charge levied on all premises within a sewerage undertakers operating area.

- D.6 All costs relating to onsite foul drainage networks, the construction of new sewers and ancillaries as well as connection to the public sewer network are borne in full by the developer. Charges associated with these activities are detailed in the Sewerage Undertakers recently published revised charging arrangements.
- D.7 The simplified charging arrangements for new development allow sewerage undertakers to take a more holistic approach to improving the capacity of public sewerage networks. Rather than catering for the needs of individual developments on a piecemeal basis, sewerage undertakers can now consider all potential development in a particular area and devise solutions to accommodate the cumulative impact. It may also allow sewerage undertakers to better address existing capacity constraints alongside network reinforcement that caters for growth. Previously this was rarely the case where funding was provided by a specific development as it was not permitted to charge developers to address existing issues.
- D.8 Construction of the onsite sewerage system for this development and its connection to the public sewer network will be funded by the developer. Its design will be vetted by the Sewerage Undertaker following payment of the appropriate fees set out in the charging arrangements.
- D.9 Infrastructure Charges for the 200 dwellings proposed will be paid to the Sewerage Undertaker at a rate of £765.00 per property (fixed until 31st March 2019 and then reviewed annually). This will provide the Sewerage Undertaker with £153,000.00 towards the general costs of improving the public sewerage network where it is necessary to accommodate the foul water flows from new development.
- D.10 The addition of 200 new customer households will provide additional annual income to the Sewerage Undertaker. The current average sewerage charge in the Sewerage Undertaker's area is £265.00 per property, providing £53,000.00 (rising in line with future price increases) annually on completion of the development.

E. Water Industry Legislative Framework, Duties and the Planning Regime

- E.1 ULS has consistently maintained that planning conditions relating to foul drainage are unnecessary for new residential development and the planning appeal decisions detailed at Appendix 5 and summarised below support this view. The actual impact on the environment of a proposed development must always be evaluated with due regard to the statutory provisions set out in the Water Industry Act 1991 (WIA1991).
- E.2 A summary of the relevant sections of the WIA1991 is set out at Appendix 4 together with the full wording of those sections.
- E.3 A detailed analysis of the interaction between the water industry statutory framework and the planning regime is set out at Appendix 5.
- E.4 When evaluating foul drainage during a planning application, the correct approach in law should be as follows:
- ⊗ To have regard to a developer's absolute right to connect to the public sewerage system, while taking into account the general duty that section 94 of the WIA1991 imposes on sewerage undertakers.
 - ⊗ To consider whether there is any impact on the environment that would justify refusing permission and if so whether this could be mitigated by a planning condition.
 - ⊗ To determine whether any planning condition would meet the policy tests detailed in the NPPF and Planning Practice Guidance (PPG).
- E.5 Conditions relating to sewerage and sewage treatment must be justified against the tests set out in the NPPF and the PPG. In particular, given the rights and duties in the WIA1991, careful consideration is required as to the timescales involved in implementing a permission for residential development. It is reasonable to expect the Sewerage Undertaker to provide the necessary infrastructure to avoid adverse effects, and it is funded to do so through charges it collects specifically for this purpose.
- E.6 The principles set out in this report that demonstrate planning conditions relating to foul drainage are unnecessary have been considered at a number of planning appeals. The reference numbers for these appeal decisions are listed in Appendix 5 along with extracts relevant to foul drainage. It was determined by the Planning Inspectors presiding over these cases that the imposition of a planning condition relating to foul drainage was either unnecessary or unreasonable. The reasons given by the Planning Inspectors for this decision were similar in each case and can be summarised as follows:

- ⊗ Sewerage undertakers have a statutory duty prescribed by the Water Industry Act 1991 to provide sewer connections. There is no need for planning conditions to duplicate powers available under other legislation.
- ⊗ Sewerage Undertakers have a statutory duty prescribed by the Water Industry Act 1991 to improve its existing systems if necessary. A condition relating to foul drainage is unnecessary as it is the subject of other legislation.
- ⊗ In general conditions relating to foul water drainage are unnecessary, given the requirements of legislative provisions separate to the land use planning regime.
- ⊗ A condition relating to the completion of off-site network reinforcement would be unreasonable where development timescales provide the sewerage undertaker adequate time to implement any necessary improvement measures to the public sewerage network.

Case law has set a precedent relating to the consistency of decision making by planning authorities or inspectors, confirming that whilst a decision maker can depart from a previous decision which considered the same or similar facts, they must fully justify the reasons for doing so. (Fox Vs SoS [2012] EWCA Civ 1198).

E.7 Although it has been established that the Sewerage Undertaker may need to improve its sewer network to accommodate this development, it can be demonstrated that it would be unreasonable to impose a planning condition relating to foul drainage for the following reasons:

- ⊗ It is solely a matter for the Sewerage Undertaker to complete any network reinforcement necessary to accommodate this developments foul water. Developers have no control over the design, planning and implementation of network reinforcement. A planning condition requiring submission of such details by the applicant would be unenforceable.
- ⊗ The Sewerage Undertaker has a duty to take any action it deems necessary to ensure its systems are properly managed to accommodate new development. It is funded to do so and has sufficient time to undertake any works required. A condition requiring restriction of the commencement and/or occupation of this development is therefore unnecessary.
- ⊗ All matters relating to the design and construction of sewerage systems for new development as well as connection to existing networks are covered by the provisions of primary legislation (WIA1991). A planning condition requiring submission of same to the planning authority would be an unnecessary duplication and therefore unreasonable.

F. Summary

- F.1 It is clear from the above analysis of both legal and technical aspects relating to foul drainage, that this development can be effectually drained without causing detriment to the public sewerage network.
- F.2 Section B of this report demonstrates how this development can be drained, with an onsite sewerage system constructed and connected to the public sewerage network.
- F.3 Section C of this report sets out the timescales for implementation of this development and how this affords sufficient time for the Sewerage Undertaker to ensure it can make appropriate provision for accepting and treating its foul water flows.
- F.4 Section D of this report explains how the Sewerage Undertaker is funded to make any necessary alterations to its sewer network to accommodate this development.
- F.5 Section E of this report highlights the separate legislative regimes that operate within the planning system and the water industry and demonstrate that a foul drainage planning condition is not required. Matters pertaining to foul drainage and sewage treatment for this development are fully addressed by water industry legislation.
- F.6 The developer has a right to connect to the public sewerage network at a point of its choosing and the Sewerage Undertaker has a duty to carry out any works necessary to accommodate associated foul water flows (s106 and s94 of the WIA1991).
- F.7 If the Sewerage Undertaker requires construction of foul drainage works for this site to be carried out in an alternative manner or connection at a different location to that proposed by the developer, it can compel the developer (through s112 of the WIA1991) to carry out the additional works to achieve this.
- F.8 Planning appeal decisions have confirmed that conditions relating to foul drainage are unnecessary and/or unreasonable. Case law has set precedent relating to the consistency of decision making by planning authorities or inspectors, confirming that whilst a decision maker can depart from a previous decision which considered the same or similar facts, they must fully justify the reasons for doing so. (Fox Vs SoS [2012] EWCA Civ 1198).
- F.9 Applying the tests at NPPF paragraph 206 and following the approaches taken in the planning appeal decisions detailed in E.6 above, any condition relating to foul drainage is unnecessary and/or unreasonable. Despite this, a

sewerage undertaker will often suggest that a development may cause detriment to the public sewerage system unless a condition is imposed. It is understandable that this would be of concern to a planning authority and is no doubt the reason that planning conditions put forward by sewerage undertakers have tended to be routinely applied. In reality, the “risk” is not created by the development and would only occur if a sewerage undertaker failed to undertake its fully funded statutory obligations to carry network reinforcement, if required, in a timely manner. The request by a sewerage undertaker for development to be delayed until it is prepared to make the necessary investment, is in effect a private company seeking to dictate when homes which are required to meet housing need, can be delivered.

- F10 The casual imposition of unnecessary/unreasonable foul drainage conditions on planning permissions requiring prior approval of drainage schemes or hydraulic modelling, can add considerable delay to the implementation of permissions and the delivery of new homes. This is not a practice that should be perpetuated within the planning system.
- F.11 The grant of outline planning permission for this development will give the Sewerage Undertaker sufficient certainty that it will go ahead. This will allow it to update its records and ensure that its systems can meet the demands of all existing and proposed developments in this area.
- F.12 In summary, this report clearly demonstrates how the proposed development can be effectually drained without causing any detriment to the public sewerage system. Matters relating to foul drainage have been properly assessed and are comprehensively addressed in other primary legislation, meaning there is no impact which would make the development unacceptable in planning terms in the absence of a condition. Adopting the tests at NPPF paragraph 206, any condition related to foul drainage is unnecessary, irrelevant to planning and unreasonable.

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Utility Law Solutions – Company Overview

ULS is owned and operated by Philip Day and Alex Day and was incorporated in 2007. Since its inception, ULS has provided advice and assistance to developers, landowners and other bodies operating in the house building sector on issues relating to foul drainage, sewage treatment and associated infrastructure matters.

Prior to the formation of ULS Philip Day and Alex Day were both employed in the Water & Sewerage Industry by Severn Trent Water, being one of the largest sewerage undertakers in the UK. Philip and Alex therefore have first-hand knowledge of the operation of sewerage undertakers and how they interact with developers and others in the house building industry.

Before leaving Severn Trent Water to set up Utility Law Solutions, Philip was their Principal Legal Advisor for Asset Management matters. In this role Philip's responsibilities were wide ranging and included the provision of legal advice and support to the business in relation to all asset management issues arising out of the company activities in sewage treatment, water supply and networks (water main and sewerage systems). During his time with Severn Trent Water, Philip was inter alia directly responsible for all legal aspects relating to:-

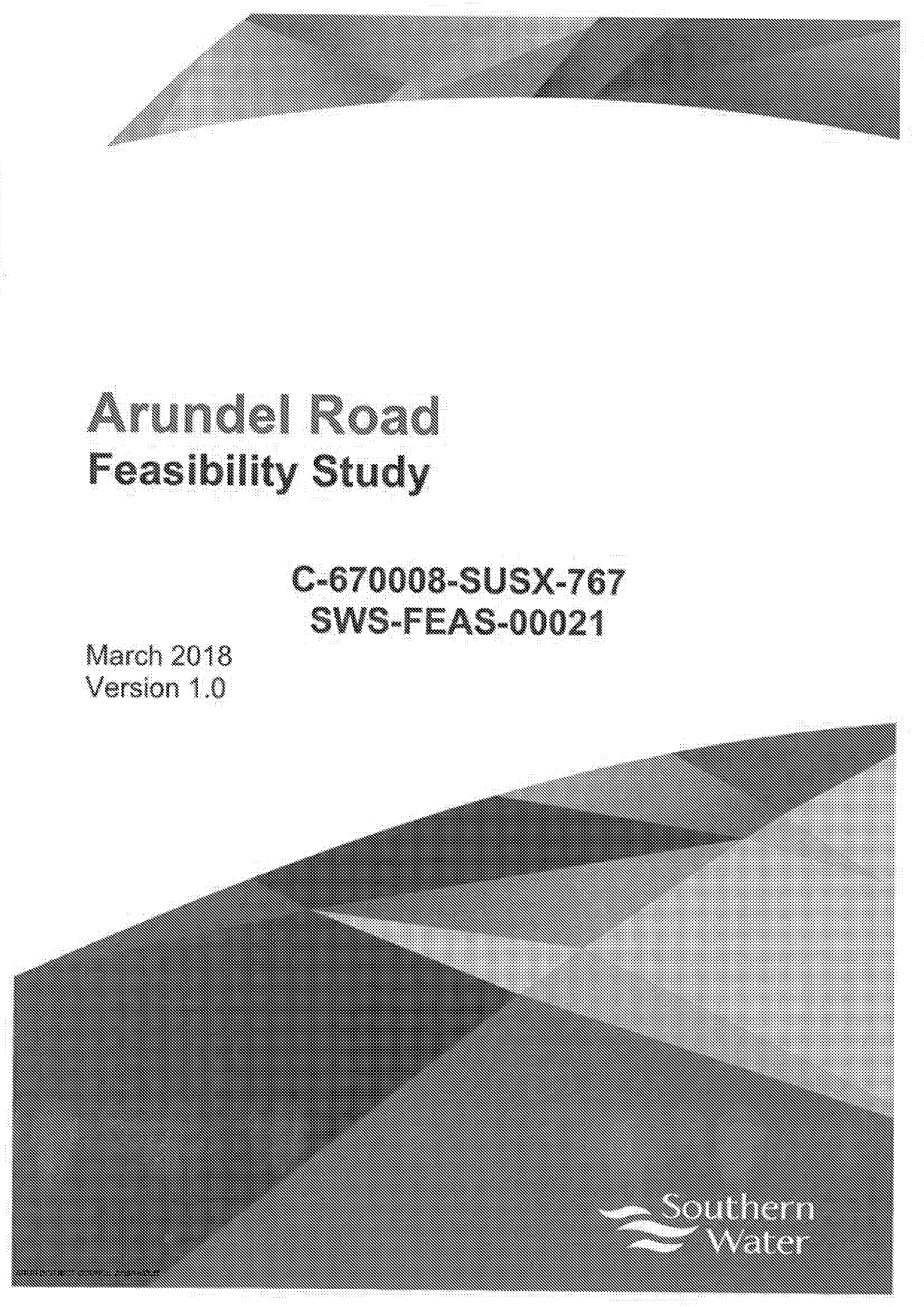
- ✿ Advice on the effects of the Water Industry Act 1991 and related legislation
- ✿ Obligations of sewerage undertakers in relation to the section 94 duty
- ✿ Formulation of policies and procedures in relation to the connection of infrastructure to new developments including resolution of development related problems/disputes
- ✿ Sustainable Drainage Systems (SuDS) - Member of the National SuDS Working Group providing legal support which culminated in the Interim Code of Practice for Sustainable Drainage Systems
- ✿ Sewers for Adoption – Provision of legal support for Sewers for Adoption 5 and 6, including creating a new national agreement
- ✿ Development through Water UK involvement, of water company positions in relation to Private Sewers legislation, New Roads and Street Works and Traffic Management Acts, Environmental Liability Directive, Section 101A (rural sewers) applications and processes and Environmental Information Regulations

Alex was employed by Severn Trent Water in its Developer Services and New Connections department with duties including assessing and communicating the impact of new developments on existing sewerage networks and evaluating sewer designs proposed by developers in accordance with industry standards. Alex worked in close collaboration with the Asset Protection and the Legal departments in Severn Trent providing an important link for his own team to ensure that all activities relating to new development complied with both statutory provisions and protected the technical requirements of the company. Alex also spent 4 years prior to joining ULS working as a consultant to developers providing advice on matters including the impact of proposed developments on sewerage networks and acting as an agent in communicating with sewerage undertakers.

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Appendix 1

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Arundel Road Feasibility Study

C-670008-SUSX-767
SWS-FEAS-00021

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Version 1.0

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Record of Issue

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1. Background

This report is in response to an application for a feasibility study to allow the proposed development on Arundel Road to connect to the existing foul network. The proposed development lies in Littlehampton (LITT) catchment.

The developer, Utility Law Solutions Ltd is proposing to construct a residential development of 215 dwellings on land to the west of Arundel Road, Angmering, W Sussex, (BN16 4ET). The proposed development site is partly brownfield, consisting of an auto services premises and grass field area. The developer has proposed to construct an onsite pumping station pumping flows at 6l/s into existing manhole TQ06057101.

This high level study aims to outline the future design of proposed sewer works, highlighting potential risks and concerns which may otherwise arise at SL2 stage.

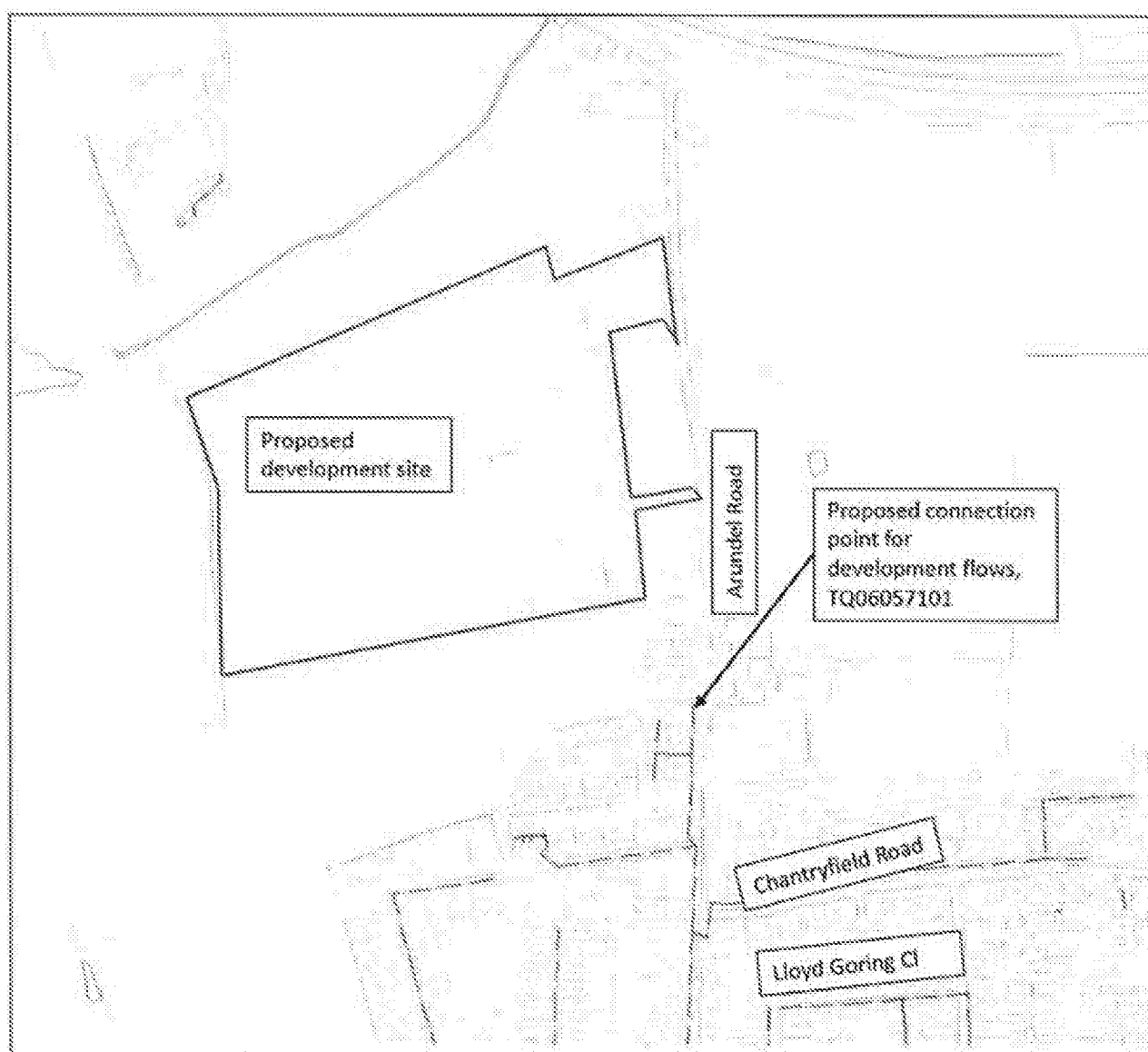


Figure 1 – Proposed Development Site

1.1. Southern Water Catchment Development Strategy

At the initial stage of this investigation no contact has been made with the Southern Water Catchment Development team. This shall be carried out at SL2 stage.

1.2. Level 2 Capacity Check of existing network

A level 2 capacity check was carried out in October 2017 and it was found that there was inadequate capacity within the foul sewerage network to accommodate flows from the development, at manhole TQ06057101. The proposed development site will increase flows to the public sewer and will increase the risk of flooding to existing properties. It was concluded that additional off-site sewers, or improvements to existing sewers, will be required to provide sufficient capacity to service the development.

The recommended nearest point which had the capacity was at Clapham WTW, which is located approximately 1.7km east of the proposed development site.

1.3. Additional Hydraulic Modelling

The developer is proposing to construct an onsite pumping station and pump foul flows at 6l/s into the existing manhole TQ06057101.

The development was added to the base model with a total design flow of 2.31 l/s, using the standard 3DWF calculation (3PG + I). A Development creep of 4m² per house was applied to the 215 houses.

A Population Equivalent of 6 address points have been removed from the existing subcatchment in the model, this is where the proposed development site overlaps existing land use. This equated to a population of 14.4 being removed. No existing surface water run off areas have been removed from the model.

Following the inclusion of the development, flooding detriment totalling 105m² was predicted at seven manhole locations;

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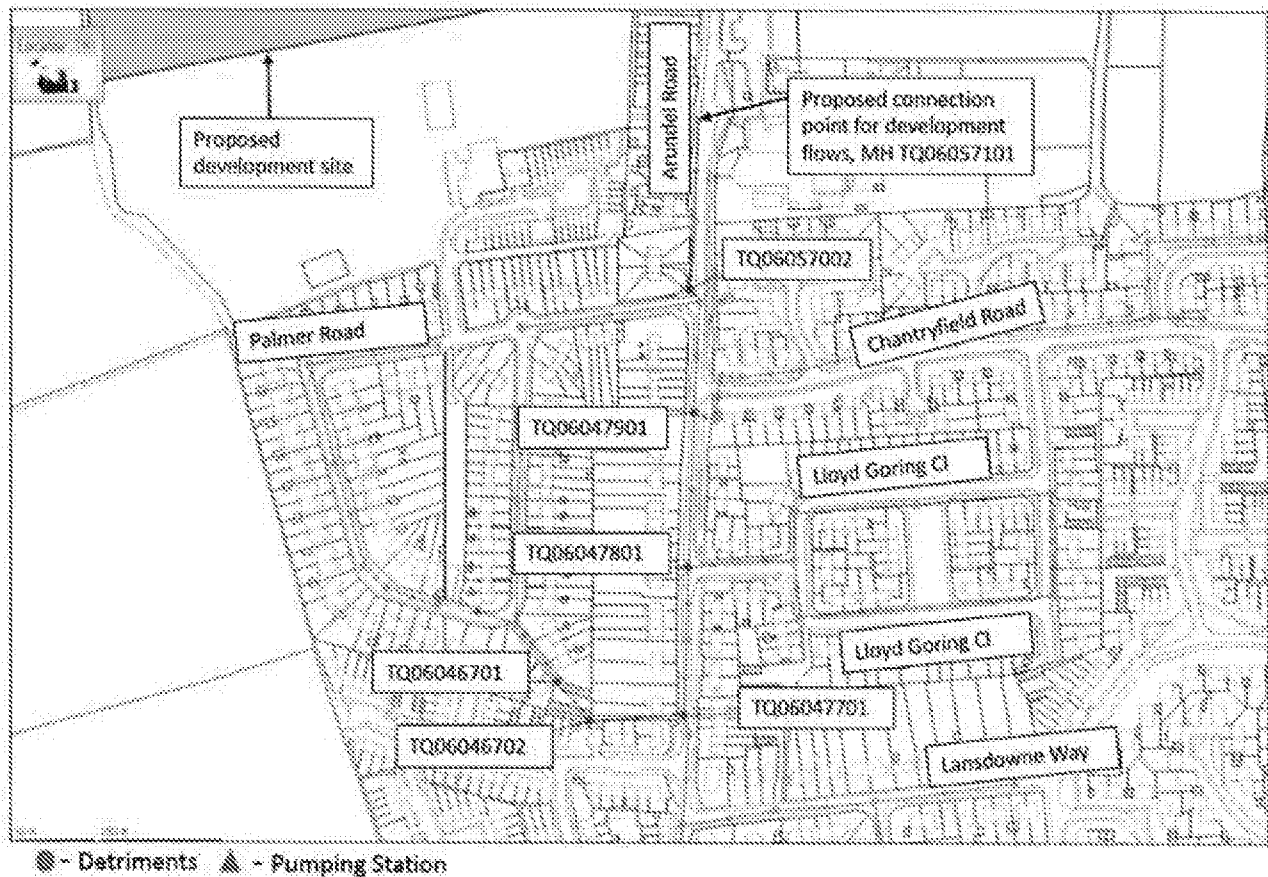


Figure 3: Zoomed view of 6 detriment manholes near to development

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Feasibility Study

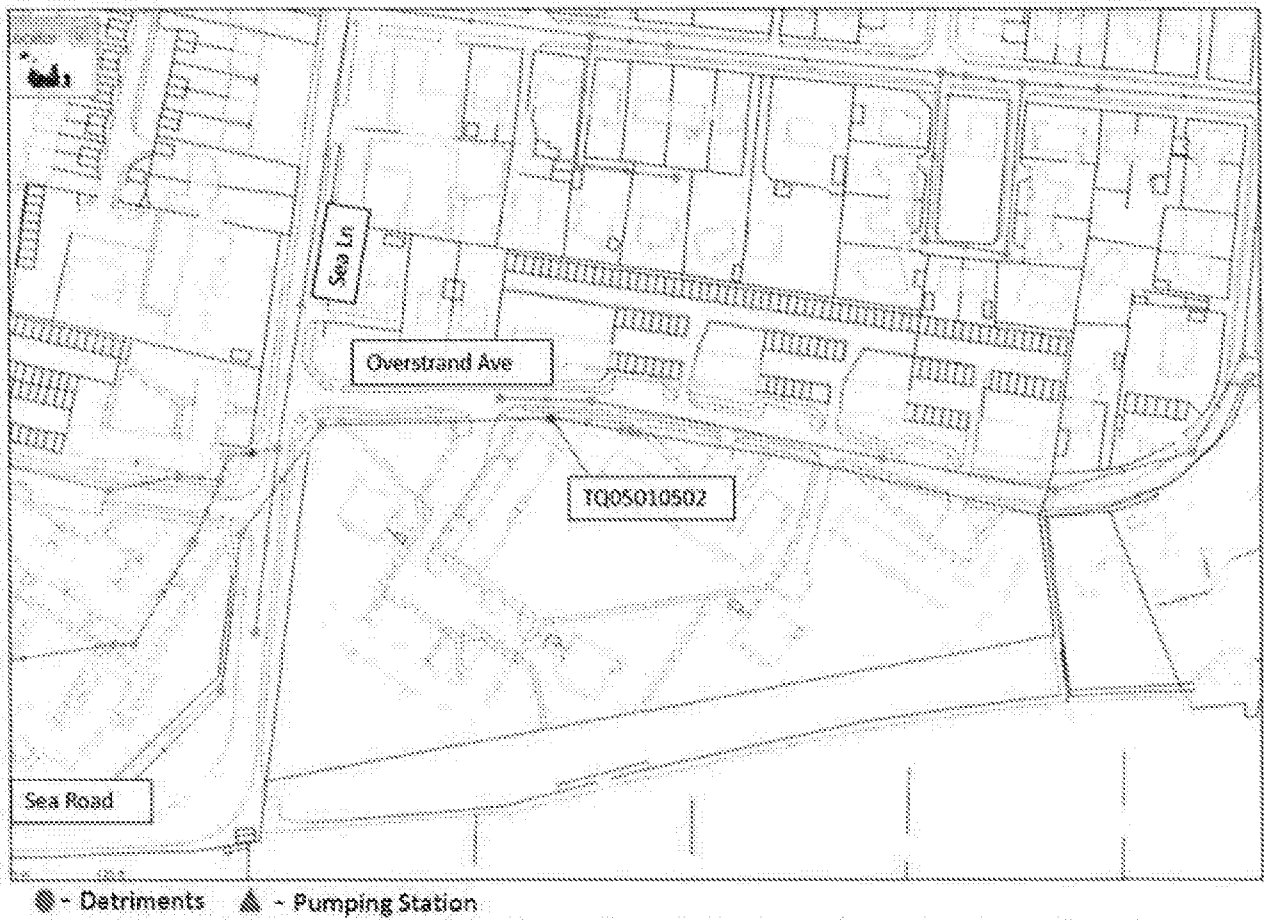


Figure 4: Zoomed view of detriment manhole downstream in the catchment

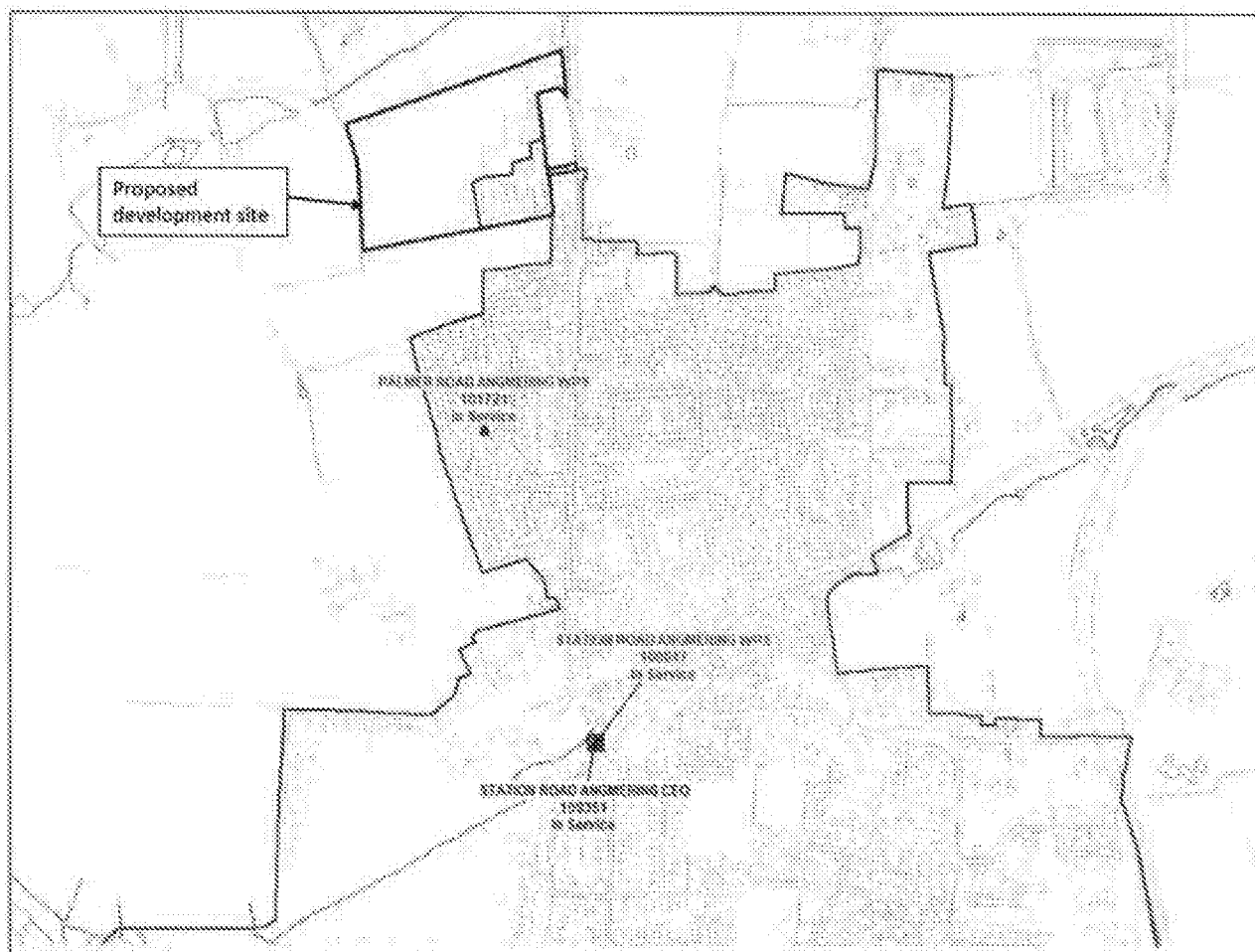


Figure 5- Location of Station Road CEO and Pumping Stations

There is one CEO (Combined Emergency Overflow) that could potentially be affected by the development flows, which is Station Road Angmering CEO. However the spill analysis showed that, there were no spills for the 1 in 5 year return period storm events, when the development flow was added.

The mitigation solution is designed to prevent the risk of flooding increase in a 1 in 30 year storm event plus climate change.

The mitigation solution comprises of providing a high level overflow chamber into a 1050mm dia sewer with a flap valve on the outlet within Arundel Road and in addition, the existing 750mm dia sewer located in the car park of Littlehampton Swimming and Sports Centre to be upsized to 900mm dia sewer. This option is explicitly explained in Section 2.1.

Another alternative solution of upsizing the sewers along Arundel Road was considered, however it increased the pass forward flow and caused new flooding detriment upstream of Station Road Angmering WPS. At SL2 stage a combination of sewer upsizing and storage or increasing pass forward flow at Station Road Angmering WPS could be considered.

Should this project progress to SL2, the following model updates are required to improve model confidence.

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Feasibility Study

- Survey of Station Road Angmering WPS;
- Short-term flow survey upstream of Station Road Angmering WPS. 2 No FMs (Flow Monitors), 1 No DM (Depth Monitor);
- Manhole survey of key manholes between the development and Station Road Angmering WPS;
- Update the model with survey data, re-run option model, undertake SL2 optioneering and reporting.

2. Options Analysis

2.1. Options

This feasibility study has been undertaken to ascertain the options for connection of the proposed new development, and subsequent associated works.

The following proposed options have been considered in order to mitigate the detriment.

2.1.1 Option 1: Offline storage tank and upsizing existing sewer

This option involves construction of a 255m long, 1050mm dia offline tank sewer within Arundel Road. It is proposed to lay a 3m long, 150mm dia high level overflow sewer from the existing manhole TQ06057003 to a proposed new 2100mm dia manhole, MH01 as shown in Figure 8 and Figure 9. Laying of the tank sewer is facilitated by provision of 5No. of new 2100mm dia manholes. The flows will connect back into the existing network via 5m long, 150mm dia sewer at proposed new 1200mm dia manhole, MH06 which will have a flap valve arrangement to ensure no back flow into the offline tank sewer. For details refer Figure 8.

In addition, the solution also proposes an existing 32m long, 750mm dia sewer to be upsized to 900mm dia sewer, located within the car park of Littlehampton Swimming and Sports Centre as shown in Figure 10.

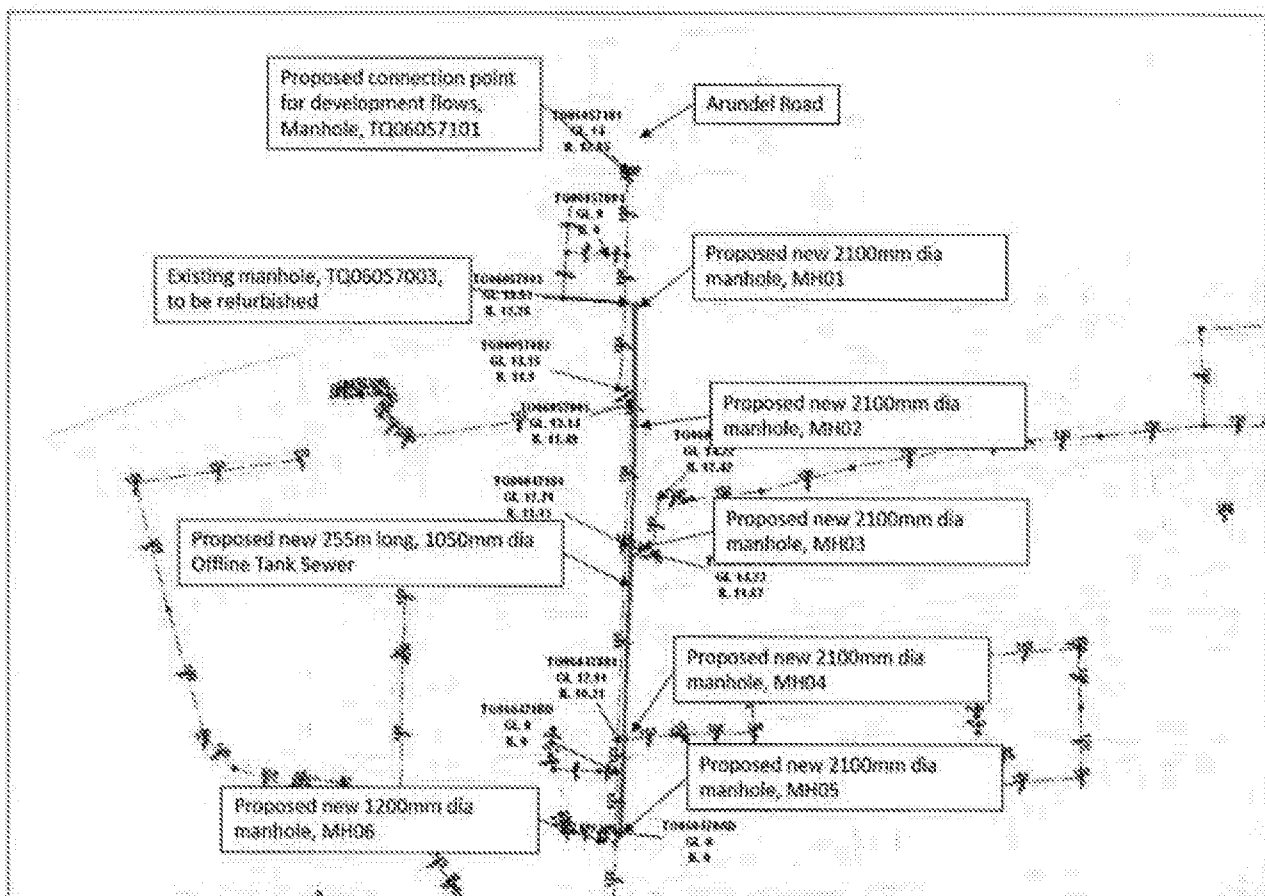


Figure 8: Proposed Offline Storage Tank

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Feasibility Study

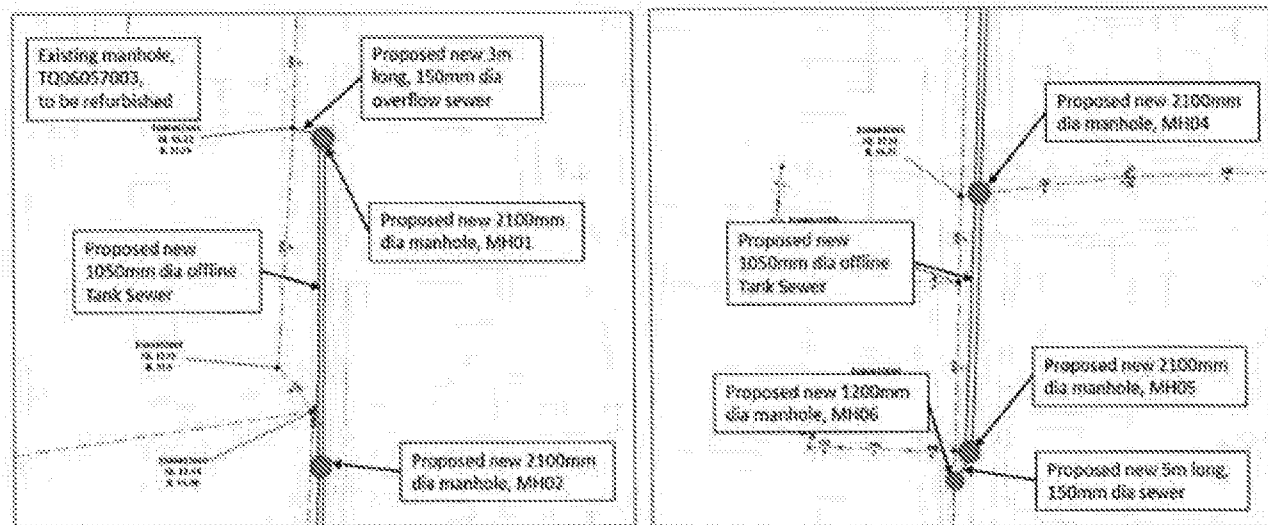


Figure 9: Proposed Offline Storage Tank- detailed view of overflow and connecting sewer

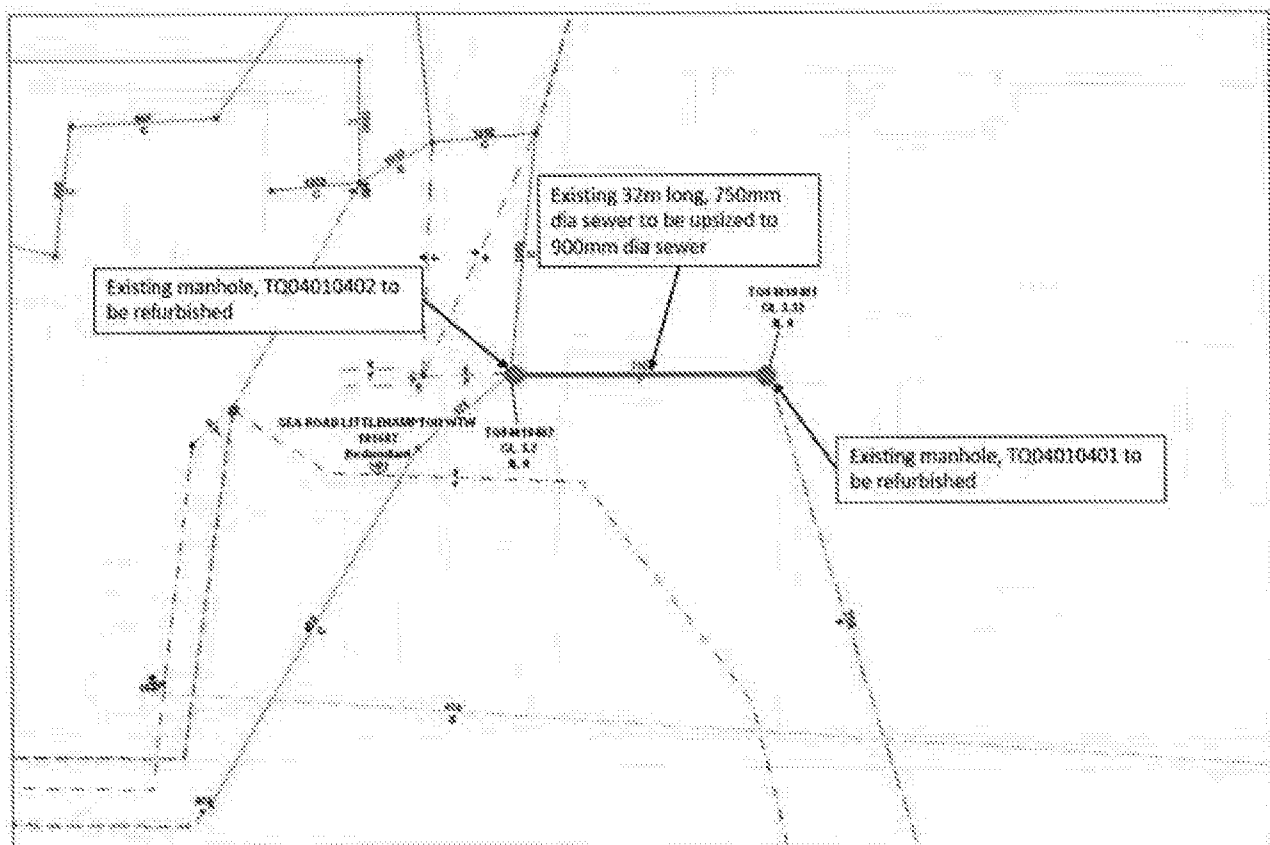


Figure 10: Proposed Upsizing works within in Car Park of Littlehampton Swimming and Sports Centre

Advantages

- Increase capacity of existing network

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Disadvantages

- Works within Arundel Road may cause inconvenience to local residents (assumed single lane closure)
- Proposed works located near to tree root zone within Arundel Rd
- Upsizing works within car park may cause inconvenience to the users
- Upsizing works within private land, hence compensation/ land negotiation may be required

Risks

- There is a risk that the existing 150mm dia foul sewer in Arundel Road will require diversion due to the location of the proposed offline tank sewer.
- Due to insufficient geotechnical information there is a risk of unsuitable ground conditions in the area of the proposed works which would lead to delays and additional costs.
- Due to insufficient information regarding existing utilities there is a risk that diversion of buried services or changes to the proposed route might be required which would lead to delays and add costs to the scheme.
- Due to environmental information not being available at this stage, there is a risk that extensive enabling works, including seasonally constrained ecological surveys, are required.

2.1.2 Option 2: Storage within the developers pumping station

This option proposes to have storage within the developers pumping station, which will pump back into the network when capacity is available. The results of modelling this option showed that an inhibit duration of approximately 1.5 days would be required before the flows can be pumped back into the network. This is based on the water level in the manhole with the greatest volume of detriment (TQ06047901) as shown in Figure 11. With the current modelled development flow of 2.31l/s plus runoff from urban creep, this would equate to an on-site storage requirement of approximately 360m³. Since this option involved a large amount of storage and also a longer inhibit duration, this option was discarded.

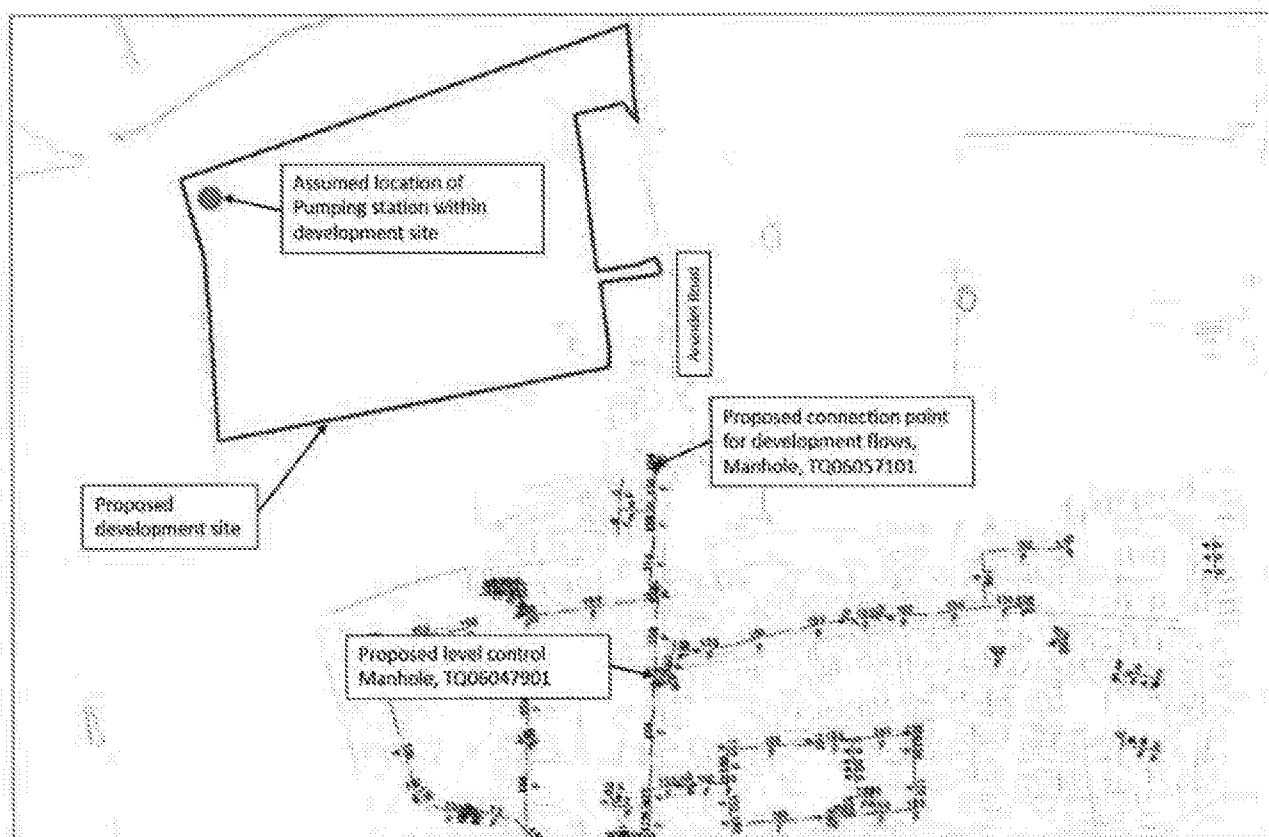


Figure 11: Proposed developers Pumping Station and level control manhole (TQ06047901) within Arundel Road

Advantages

- Minimal works within Highways
- Minimal environmental impact
- Avoid work within private land

Disadvantages

- Large storage volume required in developers pumping station
- Long pump inhibit duration
- Potential for septicity within the developers wet well

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- Complex control philosophy required

Risks

- there is risk septicity within in the wet well due to 1.5 day inhibit requirement,
- Due to insufficient geotechnical information there is a risk of unsuitable ground conditions in the area of the proposed works which would lead to delays and additional costs.
- It is required to store a volume of 360m³ in an onsite pumping station, however there is a risk that there may be insufficient space available for its construction.

Option 1 and 2 were considered for mitigating the detriments, however option 1 is the recommended option as it is hydraulically feasible and avoids construction of storage on site.

2.2. Site Survey

A site walkover of the proposed scheme was undertaken on the 17th November 2017.

2.3. Assumptions and Comments

- The proposed solution has been based on MapInfo data and a site walkover. The extent of works will have to be confirmed and amended accordingly during SL2 stage when detailed modelling is carried out and topographical information will be available.
- It is assumed that further environmental assessment will take place during SL2 stage to confirm the extent of the environmental constraints. The exact costs associated with the environmental surveys to be determined after completion of the Phase 1 Walkover (PEA).
- The proposed works within Arundel Road will require traffic management / Lane closure the closure will need to be agreed with the Local Highways.
- The developer will build an onsite pumping station and rising main to connect the flows into the existing foul network at manhole TQ06057101.
- No Geotechnical Information is available at this stage. At SL2 stage ground investigation works shall be carried out.
- The proposed upsizing works within the car park may effect access and consultation with land owner will be required.
- A utility search has not been carried out at this stage. At SL2 stage a utility search shall be carried out to confirm location of any 3rd party services
- The proposed works may require the diversion of the existing 150mm dia foul sewer in Arundel Rd. There is the possibility that the tank sewer would be able to be laid online with a limited pass forward flow on the outlet, however this has not been modelled due to time constraints and should be looked at in the SL2 stage.

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3. Scope of works

3.1. Infrastructure Requirements

This budget estimate proposes construction of an offline tank sewer within Arundel Road and upsizing existing sewer and manholes within the car park of Littlehampton Swimming and Sports Centre.

The scheme requirements are as follows:

Pipework

- Laying an offline tank sewer within Arundel Road for a storage of 220m³.
- Upsizing the existing sewer within the car park of Littlehampton Swimming and Sports Centre.

U/S MH	D/S MH	Existing Diameter (mm)	Proposed Diameter (mm)	Approx. Depth (m)	Total Length (m)	Cover	Method
TQ06057003	MH01	-	150	0.8	3	Road	Open Cut
MH01	MH02	-	1050	2.1	52	Road	Open Cut
MH02	MH03	-	1050	1.9	54	Road	Open Cut
MH03	MH04	-	1050	1.8	90	Road	Open Cut
MH04	MH05	-	1050	1.8	58	Road	Open Cut
MH05	MH06	-	150	1.0	5	Road	Open Cut
TQ04010401	TQ04010402	750	900	4.0	32	Footpath (Car park)	Open Cut

Manholes

- Refurbishment of existing manholes, TQ06057003, TQ04010402 and TQ04010401
- 5 no. 2100mm dia new manholes
- 1 no.1200mm dia new manhole

Manhole	MH type	Existing Diameter (mm)	Proposed Diameter (mm)	Cover	depth (m)
TQ06057003	1	1360	1360	Road	1.2
TQ04010402	2	Not available	-	Footpath(car park)	4.0
TQ04010401	2	Not available	-	Footpath(car park)	4.0
MH1	1	N/A	2100	Road	2.1
MH2	1	N/A	2100	Road	1.9
MH3	1	N/A	2100	Road	1.8
MH4	1	N/A	2100	Road	1.8
MH5	1	N/A	2100	Road	2.0
MH6	1	N/A	1200	Road	2.0

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- Existing manhole sizes obtained from Asset Miner

Additional Infrastructure

- Installation of flap valve within new 1200mm dia manhole MH06

3.2. Required Surveys and investigation for works

Non-intrusive

- Land and easement search
- Service/Utilities Trace
- Topographical Survey
- SL2 DE3PPA
- Geotechnical Deskstudy
- Preliminary Environmental Appraisal (PEA)
- UXO Survey

Intrusive

- Trial Holes – Locating critical existing services following utilities trace
- Geotechnical sample pits (trial pits)- window sample
- Flow survey – Flow monitors, Depth monitors
- Manhole surveys
- Pumping Station Survey-Station Road Angmering WPS

3.3. Planning and consent

- The scheme runs through public highway therefore New Roads and Streetworks Act (NRSWA) consent is required and consultation with local highway
- Any lane closure or public right of way access affected along the proposed route of the new foul sewer will have to be agreed with the local authority.
- There are properties along the route that may be affected during the construction phase. It is advised that early communications are made with the local community to inform of impending works.

3.4. Environmental issues

As the proposed works are within the highway Southern Water has not carried out a Desktop Environmental, Third Party and Planning Appraisal (DE3PPA)/Simple Project Environmental Constraints (SPEC) assessment at this stage. However, it is recommended to carry out a DE3PPA/SPEC at SL2 stage.

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4. Cost

4.1. Cost Model

A – Project Management	£42,268.00
B – Concept	N/A
C – Budget Estimate Cost (SL1)	included in F
D – SL2 Design Cost	£68,190.00
Surveys	£22,750.00
E – Procurement	included in F
F – Construction (at SL3)	£ 845,355.00
G – Construction Supervision (at SL3)	included in F
H – Commissioning	included in F
I – Land & Compensation	£ 30,000.00
J – Contingency and Risk	253,607.00
K – Administration	£10,000.00
Total Cost Estimate	£
(to be issued to developer)	1,272,169.00

General Constructability Assumptions:

- No allowance has been made for Night Time or Out of Hours Working
- No allowance has been made for Third Party Service (Known or Unknown) Diversion or relocation of overhead cables
- Complex Traffic Management Arrangements have not been allowed for.
- Only nominal allowances have been made for dewatering & over pumping to cover what would typically be expected of this type of works.
- It is assumed that Trial Holes and Utility trace will take place prior to construction works in order to confirm the exact route and depth of services in the vicinity.
- No allowance has been made for disposal of contaminated ground.
- No allowance has been made for diversion of the existing 150mm dia foul sewer if required

4.2. Risks

- Due to insufficient geotechnical information, there is a risk of unsuitable ground conditions in the area of the proposed works which would lead to delays. This will be reviewed at SL2 stage following a detailed Geotechnical Investigation. This is a **medium** risk.
- Works in Arundel Road, will require a single lane closure. Any closure will need to comply with Section 278 of the Highway act (1980) and an application to the local highway authority will be necessary. This is a **medium** risk.
- The offline tank sewer is shallow in depth and utility searches have not been carried out. Hence there is a risk of utility diversions or redesign of the solution. This will have an impact on cost and schedule of the project. This is a **medium** risk.

- Southern Water assets have been taken from MapInfo Asset Miner there is a **low risk** that the location and size may be incorrect.
- There is a **medium risk** that the adjacent 150mm dia foul sewer will need to be diverted to facilitate construction of the proposed 1050mm dia tank sewer. Alternatively the proposed tank may be constructed on line subject to modelling checks at SL2 stage.
- In locations the offline sewer has only 750mm cover and there is a **medium risk** that this will not be accepted by the local highways and the solution will have to be re designed.
- The proposed upsizing works are located near to the sea, hence there is a **medium risk** of high ground water table and saline water. This needs to be further investigated at SL2 stage when a Geotechnical Desk Study will be carried out.

5. Programme

5.1. Programme

- An allowance of 65 weeks has been made for the completion of the SL2 detailed design.
- This is inclusive of 6 weeks for flow surveys and 4 weeks for geotechnical investigations
- The programme for SL3 stage is to be confirmed by SWS's appointed contractor.

5.2. Programme Constraints

The following constraints have been identified which could affect the construction programme:

- If surveys are not procured in time there is the potential for the scheme to be delayed.
- Further seasonal ecological studies may be required, which would cause delays to the proposed works.
- Unforeseen environmental constraints found during the surveys are likely to have a significant cost and time impact on the project.
- Easements will have to be agreed in good time to avoid delays to the scheme.
- Notice will need to be given to Southern Water Services to enable them to arrange for the connections ahead of these works.
- Any closures of a public rights of way will require approval and consent from the local council and will require approximately six weeks' notice before any closures. Any temporary closures of a public rights of way will require an alternative route to be made.
- Approvals from Local Highways Authority for single lane closure of Arundel Road, may cause delays to the proposed works.

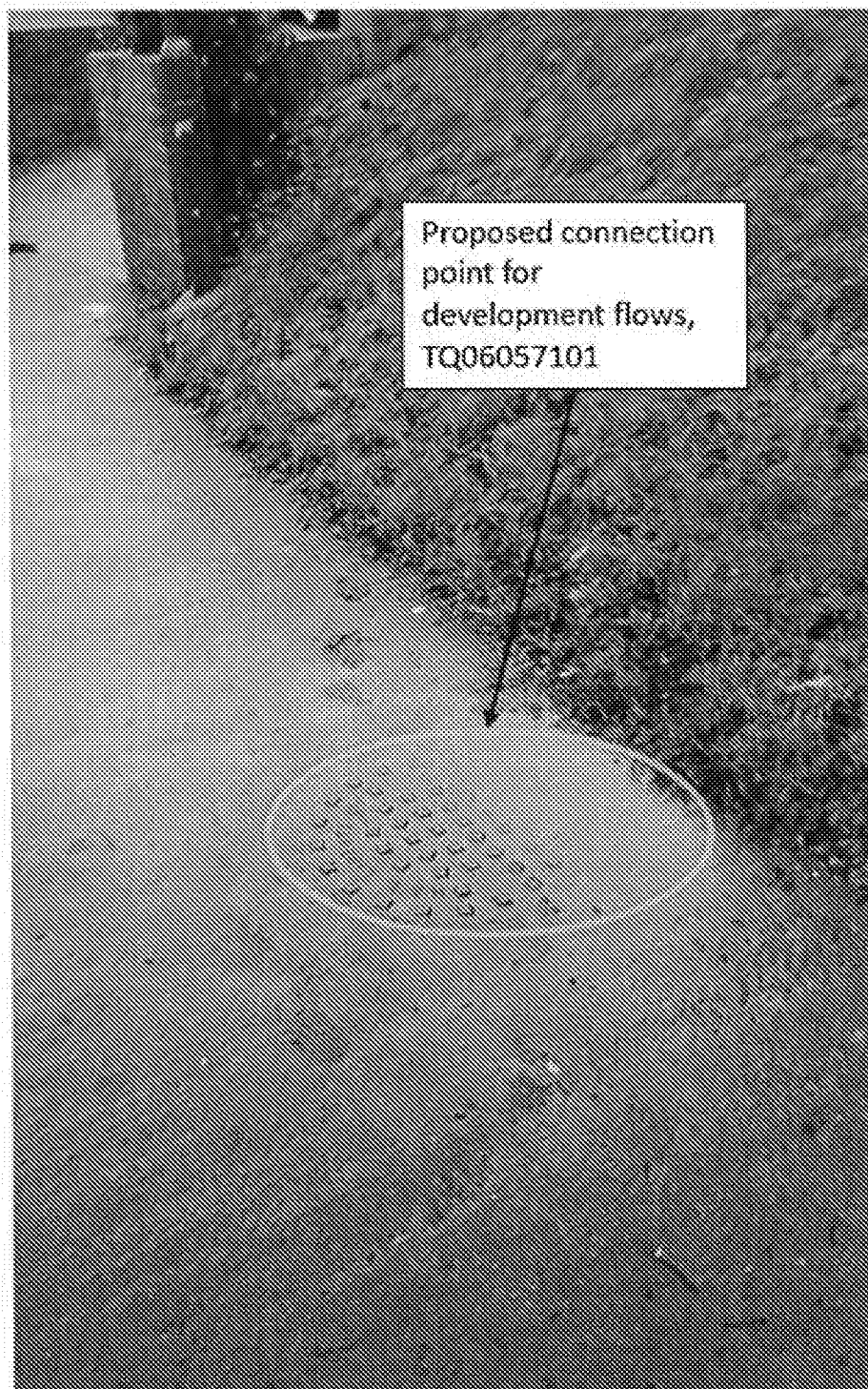
6. Conclusion

This feasibility study has been undertaken to ascertain the options for connection of the proposed new development, and subsequent associated works.

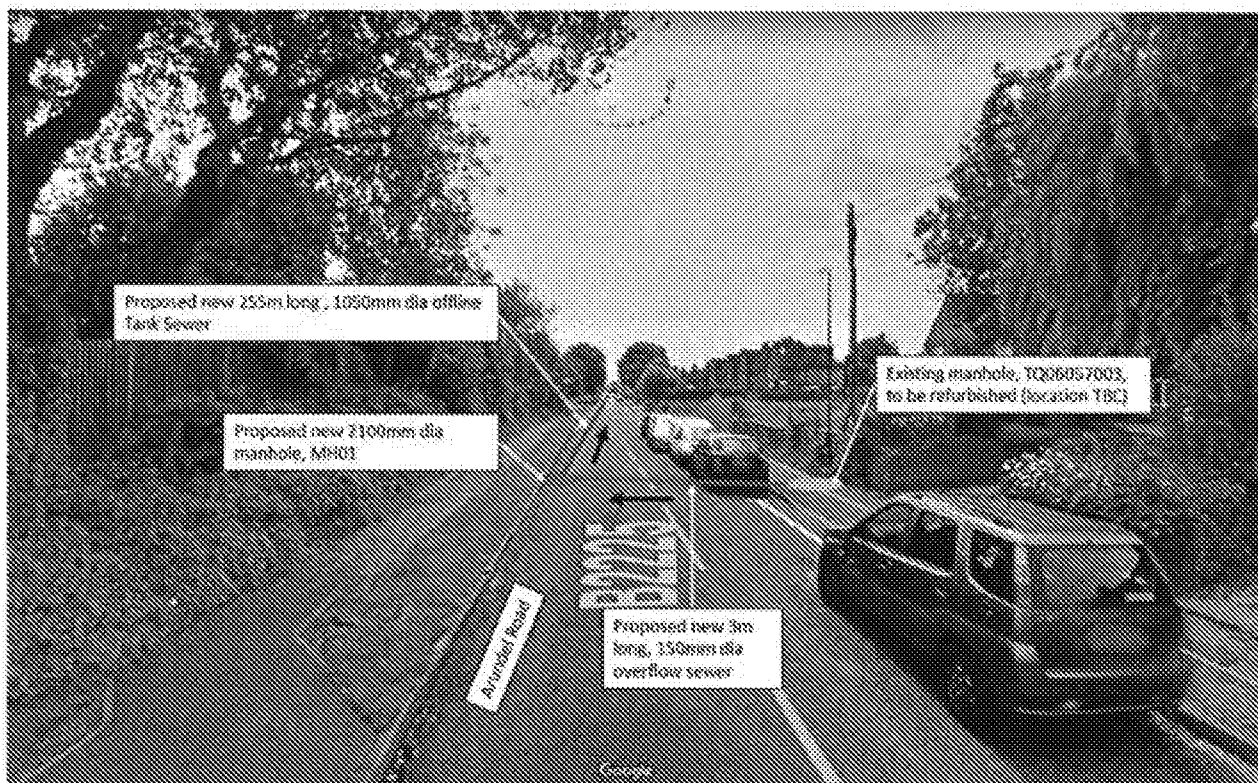
Two options were considered for mitigating the detriments, of which Option 1 is the recommended option.

Option 1 involves laying a new 255m long 1050mm dia offline storage tank within Arundel Road and the upsizing of the existing 32m long 750mm dia sewer to 900mm dia within the car park of Littlehampton Swimming and Sports Centre in addition to associated connectivity pipework and manholes.

7. Photographs

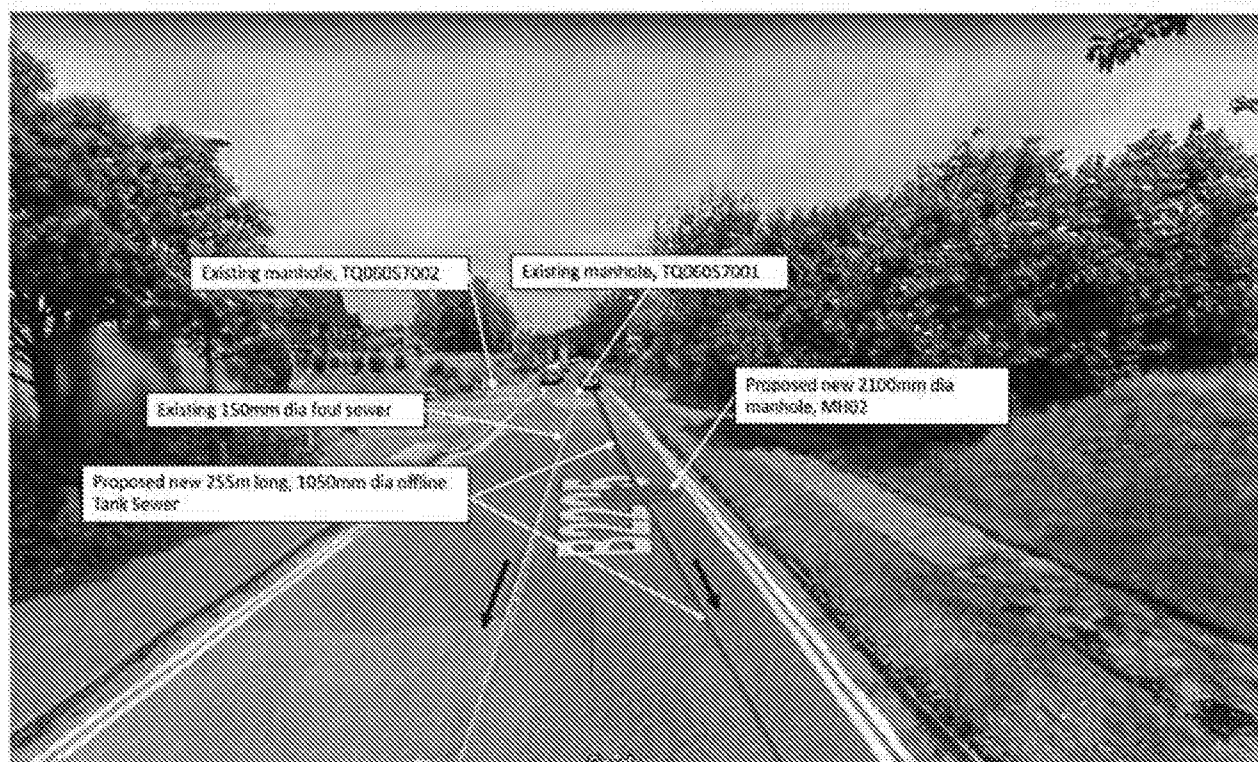


Photograph 01 – Proposed connection manhole



Photograph 02 – Proposed works within Arundel Road

Image from Google Street View © 2018

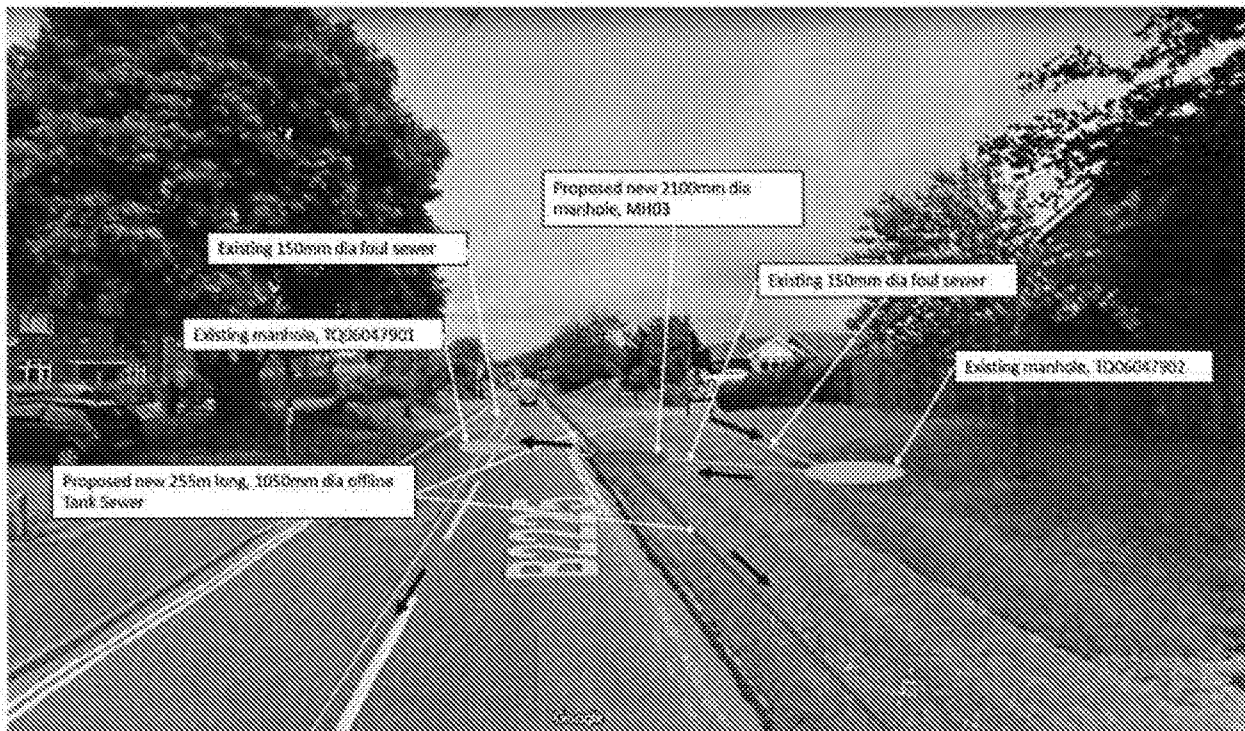


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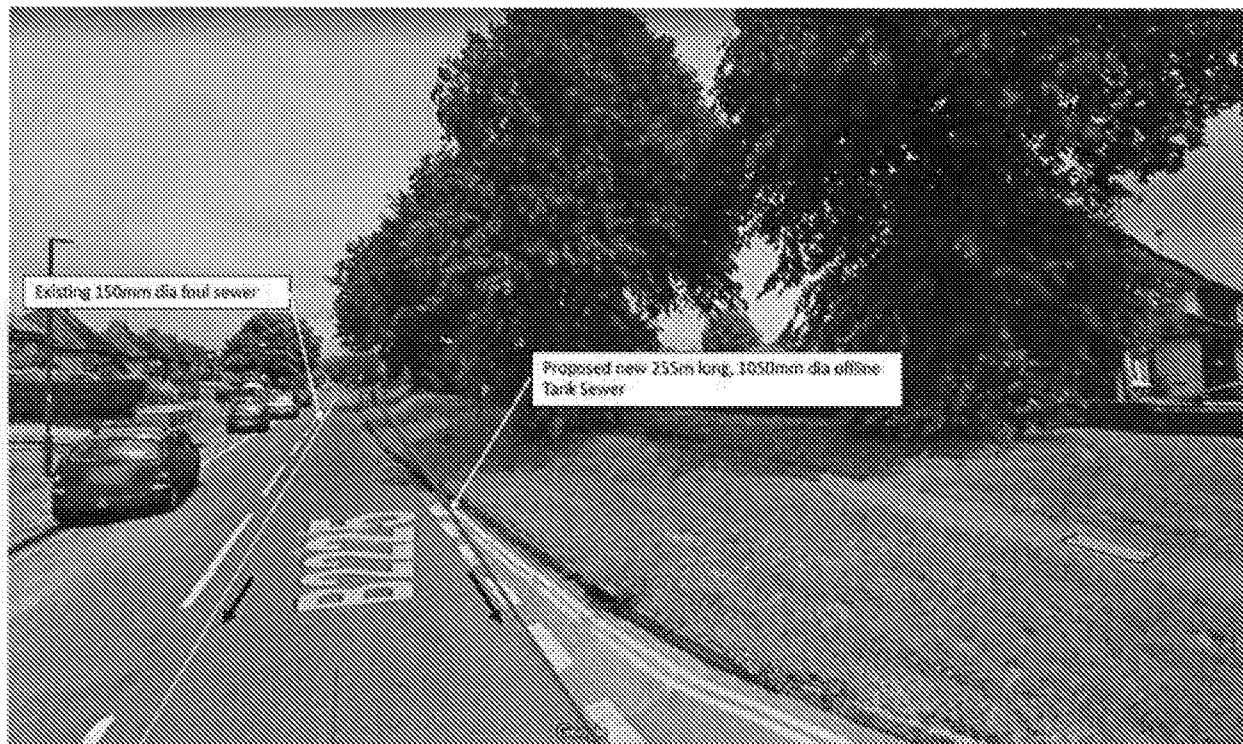
Photograph 03 – Proposed works within Arundel Road

Image from Google Street View © 2018



Photograph 04 – Proposed works within Arundel Road

Image from Google Street View © 2018

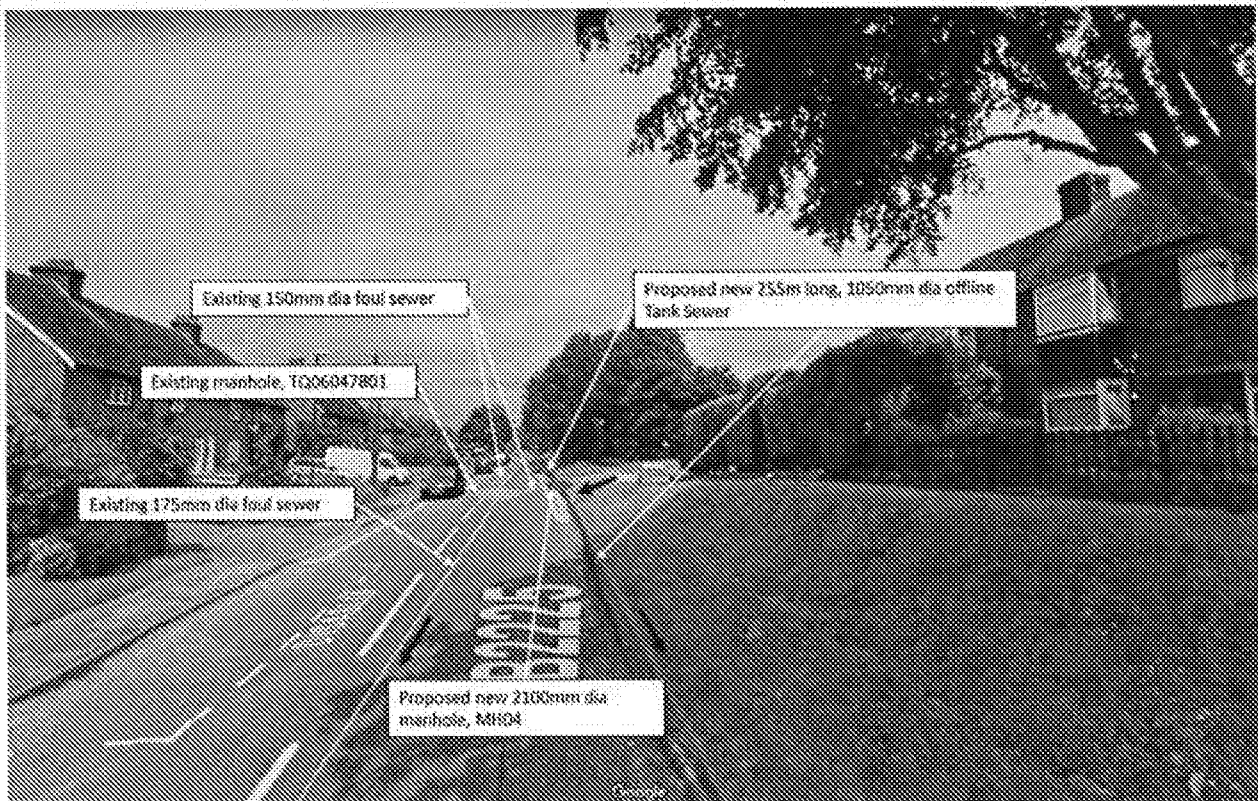


Photograph 05 – Proposed works within Arundel Road

Image from Google Street View © 2018

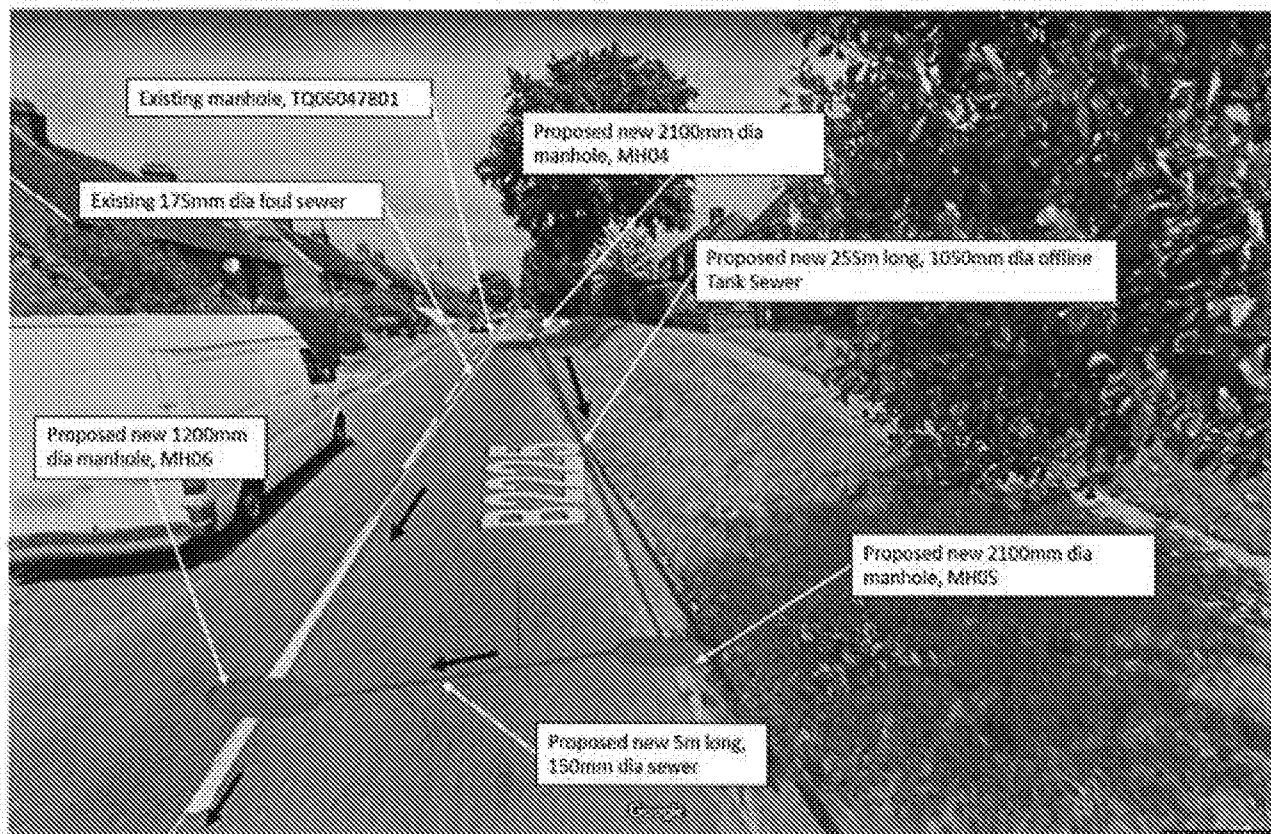
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Photograph 06 – Proposed works within Arundel Road

Image from Google Street View © 2018



Photograph 07 – Proposed works within Arundel Road

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Photograph 08 – Proposed works within the car park of Littlehampton Swimming and Sports Centre

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