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stomor
CIVIL ENGINEERING CONSULTANTS

FLOOD RISK ASSESSMENT

LAND BEHIND BROADFIELDS,

WIVENHOE, ESSEX

GRID REF: 604550E,223229N

Prepared for

TAYLOR WIMPEY EAST LONDON

MARCH 2021

REFERENCE: ST2981/FRA-2009
REVISION 2

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Revision	*Author*	*Checked by*	*Issue Date*
0	*JN*	*SJB*	*02/09/2020*
1	*JN*	*BDR*	*26/02/2021*
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CONTENTS

APPENDICES

1. Introduction

1.1.1. Stomor Ltd have been commissioned by Taylor Wimpey East London to prepare a Flood Risk Assessment (FRA) associated with the construction of residential development (Use Class C3), access, landscaping, public open space, and associated infrastructure works.

1.1.2. The site is located in the north of Wivenhoe, on the eastern side of Richards Avenue. A Site Location Plan is provided in **Appendix A**.

1.2. Policy Context

1.2.1. The FRA has been prepared in accordance with relevant national, regional and local planning policy and guidance on flooding as follows:

- The National Planning Policy Framework (NPPF) by Department for Communities and Local Government (DCLG), and the accompanying National Planning Practice Guidance (NPPG).
- Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency (EA) published Guidance for Planning Applications: Assessing Flood Risk (March 2014).
- The EA Flood Risk Standing Advice (FRSA) version 3.1 (April 2012).
- The EA's Approach to Groundwater Protection (March 2017).
- The Colchester Borough Council (CBC) Local Plan 2010, policies: DP1 Design and Amenity and DP20: Flood Risk Management of Surface Water Drainage.
- CBC Emerging Local Plan, 2017- 2033.
- CBC Local Plan 2013-2033 Section 1 North Essex Authorities' Shared Strategic Section 1 Plan (Adopted February 2021).
- Wivenhoe Neighbourhood Plan (March 2019).

1.2.2. Furthermore, the FRA follows the methodology prescribed in Construction Industry Research and Information Association (CIRIA) document C624: Development and Flood Risk (2004), Guidance for the Construction Industry.

1.3. Flood Risk Vulnerability and the NPPF Sequential Test

1.3.1. The Indicative Floodplain Map obtained from the EA website is provided in **Figure 1.1**. This shows that the site lies within Flood Zone 1.

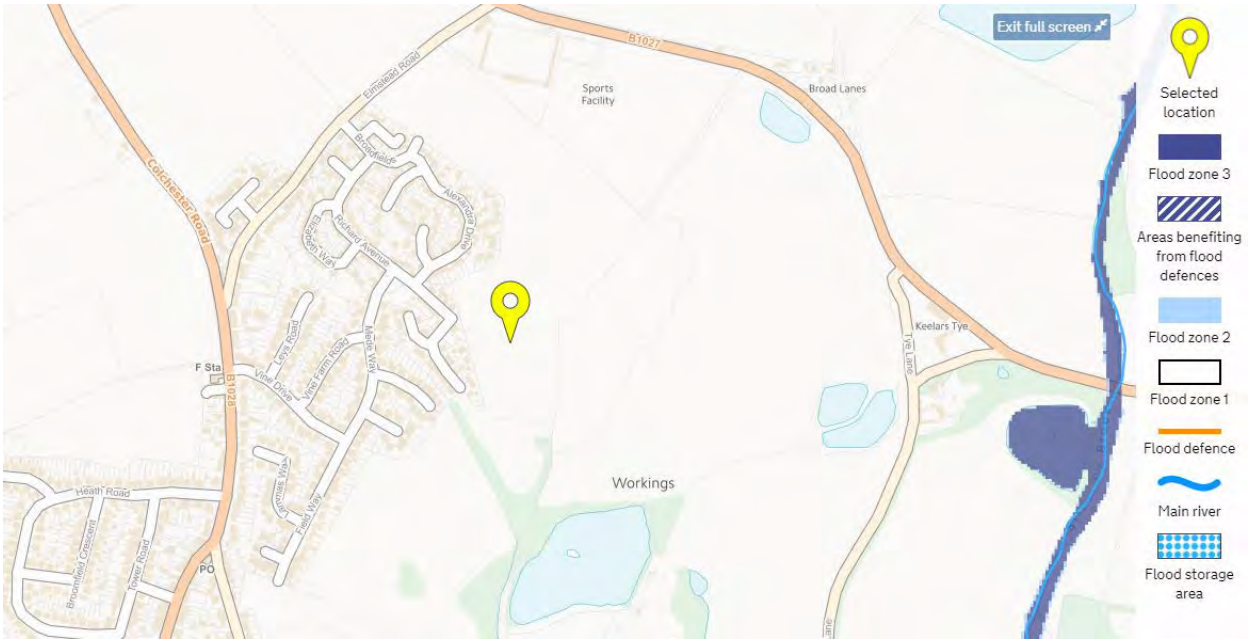


Figure 1.1 - Environment Agency Indicative Floodplain Map

1.3.2. The difference between Flood Zones 1, 2 and 3 are described in the table below:

Zone 1 Low Probability	Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)
Zone 2 Medium Probability	Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.55% – 0.1%) in any year.
Zone 3a High Probability	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Zone 3b The Functional Floodplain	Land where water has to flow or be stored in times of flood. (Land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood or at another probability to be agreed between the LPA and the EA including water conveyance routes).

1.3.3. The Flood Risk and Coastal Change Category (ID 7) of the NPPG and associated documents identifies that a Flood Risk Assessment is required for developments of more than 1ha within Flood Zone 1.

1.3.4. The Flood Risk and Coastal Change Category of the NPPG and associated documents identify that site-specific flood risk assessments should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

1.3.5. The residential dwellings proposed would have a NPPF flood risk vulnerability classification of ‘More Vulnerable’. The proposed development area of the site will be situated wholly within Flood Zone 1. NPPG identifies that all uses of land are appropriate within this Flood Zone.

2. Site Location & Surrounding Area

2.1.1. The site covers an area of 11.58ha and is currently greenfield arable land. It is bounded by properties fronting Alexandra Drive, Richard Avenue and Henrietta Close to the west, sports fields to the north and south, and agricultural land with to the east.

2.1.2. Existing ground levels vary within the site. The land generally falls towards the south, with site levels ranging from approximately 32.68m AOD near the north western corner and 29.76m AOD near south eastern corner.

2.1.3. The nearest CBC designated Ordinary Watercourse is located in a nearby field approximately 200m to the south of the site. This watercourse runs southwards through the east of Wivenhoe to connect to the River Colne.

2.1.4. The nearest EA designated Main River is located approximately 900m east of the site. This watercourse is named Sixpenny Brook and flows southwards, joining the River Colne via Alresford Creek.

2.1.5. The site is located within a Groundwater Source Protection Zone 3 (Total Catchment). A copy of the EA Groundwater Source Protection Zone map is provided in **Appendix B**.

3. Site Background

3.1.1. Level 1 Strategic Flood Risk Assessments (SFRA) for the area were prepared by AECOM in August 2016. The SFRA is used as a desk based study to map all forms of flood risk to provide an evidence basis to locate new development primarily within low risk areas. The information allows the planning authority to identify the level of detail required for site-specific Flood Risk Assessments.

3.1.2. Inspection of the British Geological Survey (BGS) website identifies that the underlying ground conditions of the majority of the site comprise the Kesgrave catchment subgroup sand and gravel underlain by the Thames group bedrock. In the north of the site, the BGS information indicates that the ground conditions comprise cover sand, again underlain by the Thames group bedrock.

3.1.3. Geotechnical investigations carried out by REC Ltd on behalf of Taylor Wimpey have confirmed that ground conditions were generally consistent with the geological records. Groundwater was encountered at depths between 0.35mbgl and 2.5mbgl.

4. Existing Drainage

4.1. Surface Water Drainage

4.1.1. Surface water runoff from the site currently drains either to ground or overland to land drainage ditches which are currently in place along the field boundaries. The topographical survey shows the ditch along the eastern boundary running southwards, with no confirmed connection downstream. The ditch on the western boundary is also shown running southwards where it appears to connect to the public surface water sewer to the south.

4.1.2. Anglian Water Services (AWS) sewer records have been obtained which identify a 150mm diameter public surface water sewer running southwards, adjacent to the eastern site boundary. This sewer connects to a 610mm diameter public surface water sewer to the south east of the site. From here, the 610mm diameter sewer runs in a south eastwards direction. A copy of the AWS sewer records are provided in **Appendix C**.

4.1.3. Greenfield runoff rates have been calculated based upon the IH124 Method, using a contributing developable area of 4.9ha to be positively drained. A copy of the calculation sheet is provided in **Appendix D**, which gives flow rates as follows:

Greenfield Runoff (l/s)		
1 in 1 year	Q1	15.23
1 in 30 years	Q30	41.21
1 in 100 years	Q100	57.15

4.2. Foul Drainage

4.2.1. There currently is no foul water drainage infrastructure on the site.

4.2.2. AWS sewer records identify public foul water sewers to the west of the site, running along Richard Avenue and Henrietta Close. These sewers connect to a foul water pumping station at the southern end of Henrietta Close.

5. Proposed Development

5.1.1. Current development proposals comprise the construction of residential development (Use Class C3), access, landscaping, public open space, and associated infrastructure works.

5.1.2. Vehicular access to the site will be taken from the west, from Richards Avenue. Additional pedestrian/cycle access will be available from the north of the site via a pedestrian/cycle path.

5.1.3. The proposed residential dwellings would have a NPPF flood risk vulnerability classification of ‘More Vulnerable’. The site is located within Flood Zone 1, where all types of development are appropriate.

6. Proposed Site Drainage

6.1. General

6.1.1. Environment Agency (EA) Flood Risk Assessment (FRA) Guidance Note 1 - Development within a Critical Drainage area or greater than 1 hectare (ha) in Flood Zone 1 (Dated April 2012) states that the applicant should submit, "*Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development"*.

6.2. Surface Water Drainage

6.2.1. The site is currently undeveloped and as such the proposed development will significantly increase the impermeable area of the site. Based upon the proposed layout, the residential development would be expected to generate an impermeable area of approximately 3.4ha, which includes an allowance for urban creep.

6.2.2. In accordance with EA Guidance, the order of consideration for the disposal of surface water runoff from a development should be as follows; infiltration methods, watercourses then public sewer network.

6.2.3. With regard to infiltration methods, geotechnical investigations on the site identifies that there is a high underlying groundwater table, which would make infiltration methods infeasible for the discharge of surface water.

6.2.4. The nearest designated watercourse to the site is an Ordinary Watercourse located approximately 200m to the south. However, a connection to this watercourse would require crossing third party land and an existing public surface water sewer.

6.2.5. There are existing drainage ditches on the eastern and western boundaries of the site. However, a gravity connection to these ditches does not appear to be feasible. In addition, it has not been ascertained whether these ditches have an outfall at their southern end due to existing siltation and overgrown vegetation. Therefore, for the purposes of this assessment, it is considered that a connection to a nearby watercourse is not suitable for the development.

6.2.6. It is therefore considered that a connection to the public surface water sewer to the south of the site is the most suitable outfall arrangement for the development. A pre-planning assessment enquiry was sent to AWS to confirm whether a connection to the public surface water sewer to the south of the site from the development would be

acceptable. In their response dated 4th June 2020, AWS confirmed that a connection to the public surface water sewer to the south of the site would be acceptable at a maximum discharge rate of 15l/s. The AWS pre-planning assessment response is provided in **Appendix E**.

6.2.7. A proposed drainage strategy for the site is provided in **Appendix F**, Drawing ST-2981-01**.** The strategy demonstrates a proposed layout of SuDS to provide sufficient source control and storage to reflect greenfield runoff rates and to avoid flooding within the site during all storms up to and including the 1 in 100 year storm event plus 40% allowance for climate change.

6.2.8. The proposed drainage strategy has been modelled using Micro Drainage. Copies of Micro Drainage output files for the development are provided in **Appendix G**, demonstrating that the proposed SuDS features provide sufficient storage to avoid flooding during the 1 in 100 year storm event plus 40% allowance for climate change.

6.2.9. The indicative drainage strategy incorporates SuDS features which will need to have clear, enforceable maintenance regimes in place so that they provide effective flood protection and water treatment for the long term.

6.2.10. The CIRIA SuDS Manual C753 promotes the use of the Simple Index Approach as a method of determining water quality risk management and is generally regarded as the accepted method within the industry.

6.2.11. Table 26.2 of the SuDS Manual gives pollution hazard indices for different land use classifications. A summarised version of this table is reproduced below:

Land use	Pollution hazard level	Total suspended solids	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Residential driveways, low traffic roads and non-residential car parking with infrequent change (i.e. <300 traffic movements/day)	Low	0.5	0.4	0.4
All roads except low traffic roads and trunk roads/motorways (i.e. >300 traffic movements/day)	Medium	0.7	0.6	0.7

6.2.12. Table 26.3 of the SuDS Manual provides typical treatments levels from various different SuDS features discharging to surface waters. The following SuDS features will be included as part of the surface water drainage proposals for the development:

	Mitigation Indices		
Type Of SuDS Component	**TSS**	**Metals**	**Hydrocarbons**
Swale	0.5	0.6	0.6
Permeable Pavement	0.7	0.6	0.7
Filter Drain	0.4	0.4	0.4
Detention Basin	0.5	0.5	0.6
Wetland	0.8	0.8	0.8

6.2.13. To deliver adequate treatment, the selected SuDS components should have a total mitigation indices that equals or is greater than the pollution hazard index. Where a single SuDS component is insufficient, additional components in a series would be required, where:

Total SuDS mitigation index = mitigation index$_1$ + 0.5 (mitigation index$_n$)

6.2.14. Surface water runoff from all aspects of the development will, as a minimum, pass through a wetland. Therefore, from the above tables it can be seen that the SuDS proposed on the development would provide an adequate level of water treatment for the potential pollution hazards generated by the land uses.

6.3. Foul Drainage

6.3.1. A proposed development of up to 120No. residential units would be expected to generate a peak foul flow rate of approximately 5.55l/s, based upon 4000 litres/unit dwelling/day, in accordance with Sewers for Adoption.

6.3.2. A proposed strategy for the discharge of foul water flows from the development has been prepared and is shown in principle on Drawing ST-2981-01 attached in **Appendix F**.

6.4. Detailed Design and Approvals

6.4.1 The proposed drainage strategy is subject to approval by the EA, LLFA and ECC; approval from AWS will be required where connections to the public sewer network are proposed.

6.4.2 Proposed drainage systems will need to be modelled in Micro Drainage to confirm required pipe sizes and storage volumes.

6.4.3 Overland flow routes have been shown on the drainage strategy through the development, to identify proposed flow paths for surface runoff during extreme storm events. Final external levels will be designed to prevent overland flow routes from entering buildings.

6.5. Maintenance of Drainage Features

6.5.1. The design process should consider the maintenance of the components (access, waste management etc.) including any corrective maintenance to repair defects or improve performance of SuDS. Inlets, outlets, control structures or other below ground features should be as shallow as reasonably possible to allow easy access for maintenance and to reduce safety risks, while ensuring that sufficient depth is maintained for structural stability.

6.5.2. A SuDS Management Plan must be provided at detailed design stage which will identify the following:

- The function of SuDS;
- How and why it works on the site;
- Impacts on amenity and wildlife, indicating how they can be enhanced;
- Health and safety issues;
- Long-term expectations for the SuDS on site.

6.5.3. Usually SuDS components are on or near the surface and most can be managed using landscape maintenance techniques. Typical inspection and maintenance requirements for surface SuDS features are identified below:

Activity	Indicative frequency	Typical tasks
Routine/regular maintenance	Monthly (for normal care of SuDS)	• litter picking • grass cutting (cuttings to compost, wildlife piles or removed from site) Height and frequency dependent upon amenity of grass area. • inspection of inlets, outlets and control structures.
Occasional maintenance	Annually (dependent on the design)	• silt control around components • vegetation management around components • suction sweeping of permeable paving in autumn after leaf fall • silt and debris removal from inlets, outlets, gratings, catchpits, control chambers, soakaways and cellular storage. • trim wet swale or pond edges in September to October or 3-year rotation for wildlife value • wetland vegetation to be cut to 30% height annually and to 100mm on a 3 year rotation • remove overhanging trees or growth within SuDS features
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism)	• inlet/outlet repair • erosion repairs • reinstatement of edgings • reinstatement following pollution • removal of silt build up.

6.5.4. For below-ground SuDS such as permeable paving, the manufacturer or designer should provide maintenance advice. This should include routine and long-term actions that can be incorporated into the SuDS Management Plan.

6.5.5. Funding for the maintenance of SuDS systems on the site should be resolved at the start of the development process to ensure that the management company employed to oversee the development, have sufficient resources to maintain the systems in the long-term.

7. Potential Sources of Flooding

7.1. Flooding from Rivers or Sea

7.1.1. Inspection of the topographical survey identified that existing ground levels generally fall towards the south. Levels on site are generally between 32.20m AOD, and 29.40m AOD.

7.1.2. The EA Indicative Floodplain Map, shown in Figure 1.1, identifies that the sites lies wholly within Flood Zone 1.

7.1.3. The nearest watercourse to the site is an Ordinary Watercourse location approximately 200m to the south of the site. However, the EA long-term flood risk map and the SFRA do not indicate any fluvial flood risk associated with this watercourse.

7.1.4. The SFRA identified a number of historic flooding events within the borough of Colchester. However, the historical flooding was primarily in the vicinity of the River Colne and none of the affected areas are within the vicinity of the site.

7.2. Flooding from Land (Surface Water)

7.2.1. Flooding from land occurs when intense rainfall is unable to soak into the ground or enter drainage systems. Local topography and built form can have a strong influence on the direction and depth of flow.

7.2.2. The EA indicative surface water flood map shows that the site is predominantly at a very low risk of flooding from surface water. However, the mapping data shows that there are areas of low flood risk along the south eastern boundary of the site and on the western boundary linking into Henrietta Close. Henrietta Close itself is shown as being at a high risk of surface water flooding. The junction of Henrietta Close and Richard Avenue is also affected by surface water flooding, with a medium risk. A copy of the EA indicative surface water flood map is provided in **Appendix H**.

7.2.3. No dwellings are proposed within the areas shown at a low risk of surface water flooding.

7.2.4. Overland flow paths will be taken into account in design of levels for the proposed development to direct overland flows away from buildings. Overland flow routes are shown on the Indicative Drainage Strategy.

7.2.5. On-site drainage systems will be designed to accommodate runoff volume from a 1 in 100 year plus 40% climate change rainfall event, so as to minimise overland flow routes in storms above this event.

7.3. Flooding from Groundwater

7.3.1. Groundwater flooding occurs when water levels in the ground rise above surface elevations. Groundwater flooding events are most likely to occur in low lying areas underlain by permeable rocks (aquifers).

7.3.2. SFRA Mapping identifies that the site and immediate area has a less than 25% susceptibility to groundwater flooding. However, adjacent to the site, land is shown to have between 25%-50% susceptibility. A copy of the map showing this is provided in **Appendix I**.

7.3.3. The SFRA states that there have been no historic cases of flooding due to groundwater in the borough of Colchester. London Clay dominates the geology in the area.

7.3.4. Geotechnical information for the site indicates that there is a high groundwater table underneath the development site. It is recommended that groundwater monitoring is undertaken to inform the surface water strategy at the detailed design stage.

7.3.5. Overland flow routes will be taken into account in the design of levels for the proposed development and, should groundwater flooding occur on the site, flows will tend to run overland towards drainage features situated at the low area of the site.

7.4. Flooding from Sewers

7.4.1. There are no existing public sewers within the site. Sewers associated with the overall development will be designed in accordance with Local Authority and Water Authority requirements.

7.4.2. The SFRA identified three sewer flooding incidents within the Colchester borough. However, a sewer flooding history enquiry has been carried out with AWS who confirmed that they hold no records of flooding which can be attributed to the capacity limitations of the public sewer network within the vicinity of the site. A copy of their response is provided in **Appendix J**.

7.4.3. The development layout will be designed with consideration of flood routing, to ensure that new buildings and occupants of the site will not be subject to detrimental impacts in the event of flooding from infrastructure failure within or upstream of the site.

7.5. Flooding from Reservoirs, Canals and Other Artificial Sources

7.5.1. Inspection of the EA flood maps confirms the site is not at risk of flooding from reservoirs, canals or other artificial sources.

7.5.2. No other non-natural or artificial sources of flooding where water is retained above natural ground level, operational and redundant industrial processes including mining, quarrying and sand and gravel extraction, would appear to be located in the vicinity of the site which may cause increase floodwater depths or velocities.

8. Summary and Recommendations

8.1 Stomor Ltd have been commissioned by Taylor Wimpey East London to prepare a Flood Risk Assessment associated with the construction of residential development (Use Class C3), access, landscaping, public open space, and associated infrastructure works.

8.2 The whole site area comprises 11.58ha of undeveloped greenfield arable land, located in the north of Wivenhoe, on the eastern side of Richard Avenue.

8.3 The nearest watercourse to the site is an Ordinary Watercourse located approximately 200m to the south.

8.4 There is a public surface water sewer running adjacent to the eastern site boundary which connects to a 610mm diameter public surface water sewer to the south east of the site.

8.5 There are public foul water sewers within Henrietta Close and Richards Avenue, to the west of the site. These sewers connect to the pumping station at the southern end of Henrietta Close.

8.6 The site is located within a Groundwater Source Protection Zone 3 (outer zone).

8.7 Geotechnical investigations have indicated that there is a high groundwater table underlying the site which would make infiltration methods infeasible. It is recommended that groundwater monitoring is undertaken to inform the detailed design stage.

8.8 The proposed residential dwellings would have a NPPF flood risk vulnerability classification of ‘More Vulnerable’. The site is located within Flood Zone 1, where all development types are appropriate.

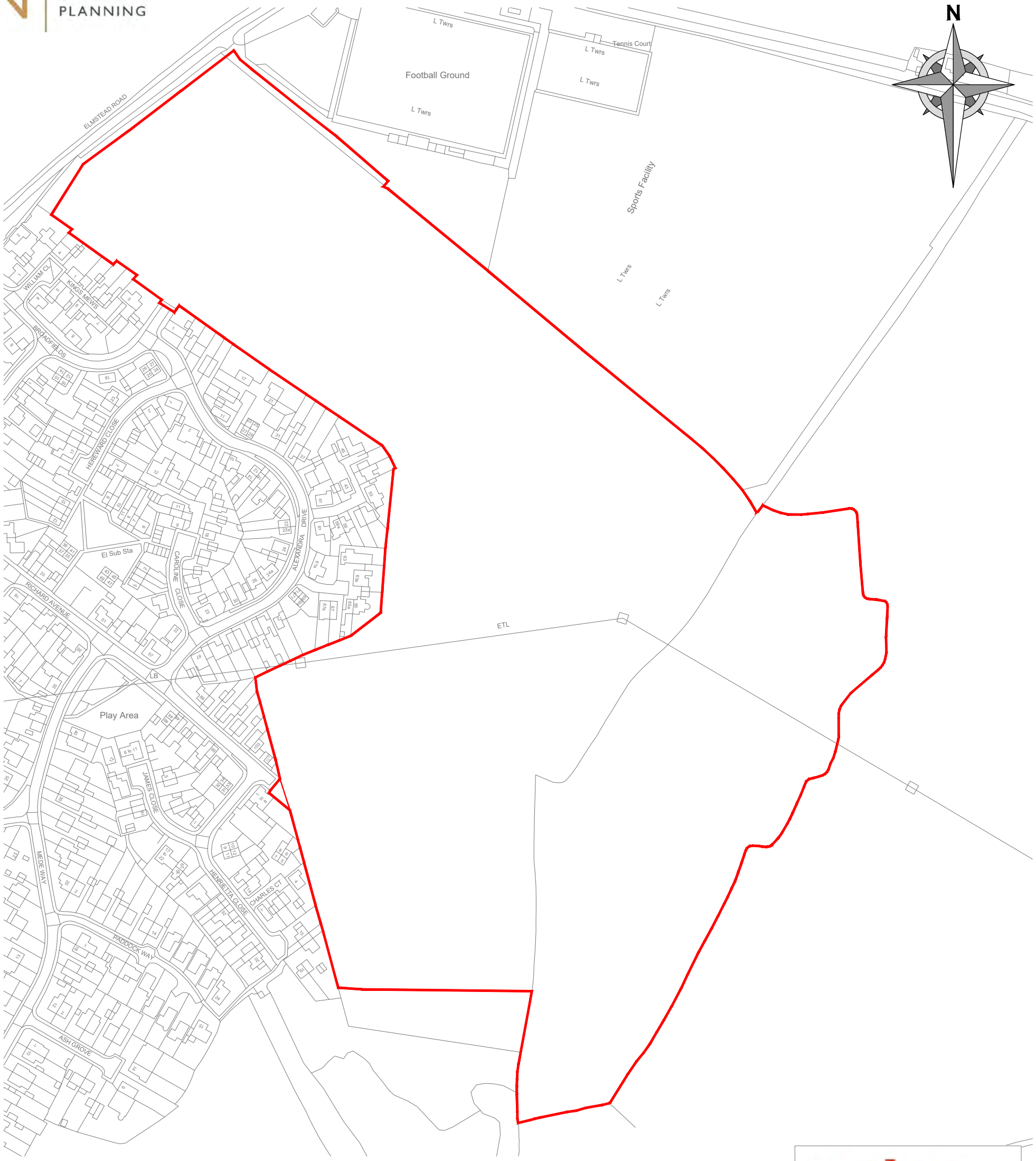
8.9 The EA indicative surface water flood map shows that site is predominantly at a very low risk of flooding from surface water, with small, localised areas shown at a low risk.

8.10 It is considered that the site would not be at risk of flooding from fluvial sources, sewers, groundwater, or artificial sources.

8.11 Overland flow paths will be taken into account in design of levels for the proposed development to direct overland flows away from buildings.

8.12 The proposed surface water drainage strategy for the site demonstrates a system of SuDS and attenuation features to provide sufficient storage to avoid flooding within the site during the 1 in 100 year storm event + 40% allowance for climate change.

JCN DESIGN & PLANNING



Key:

Site Boundary

0 100 200 metre

Taylor Wimpey

Project:-

Wivenhoe, Land South of Elmstead Road, off Richard Avenue

Description:-

Location Plan

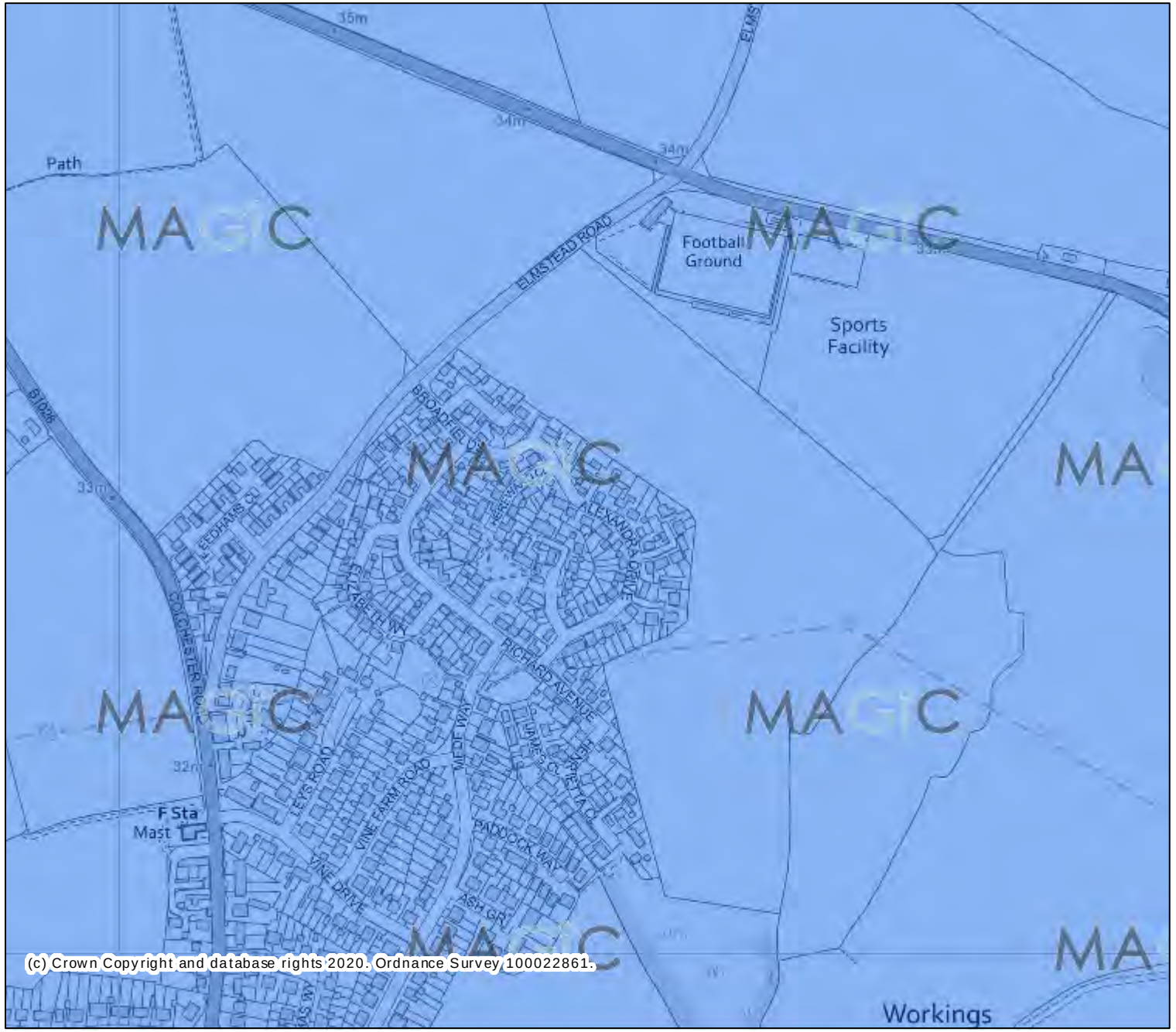
Scale:- 1-2500 @ A3

Date:- Mar 2021

Drg no:- TW027-PL01-01

Revision:- 00

Magic Map



Legend

Source Protection Zones merged (England)

- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest

Projection = OSGB36
xmin = 603200
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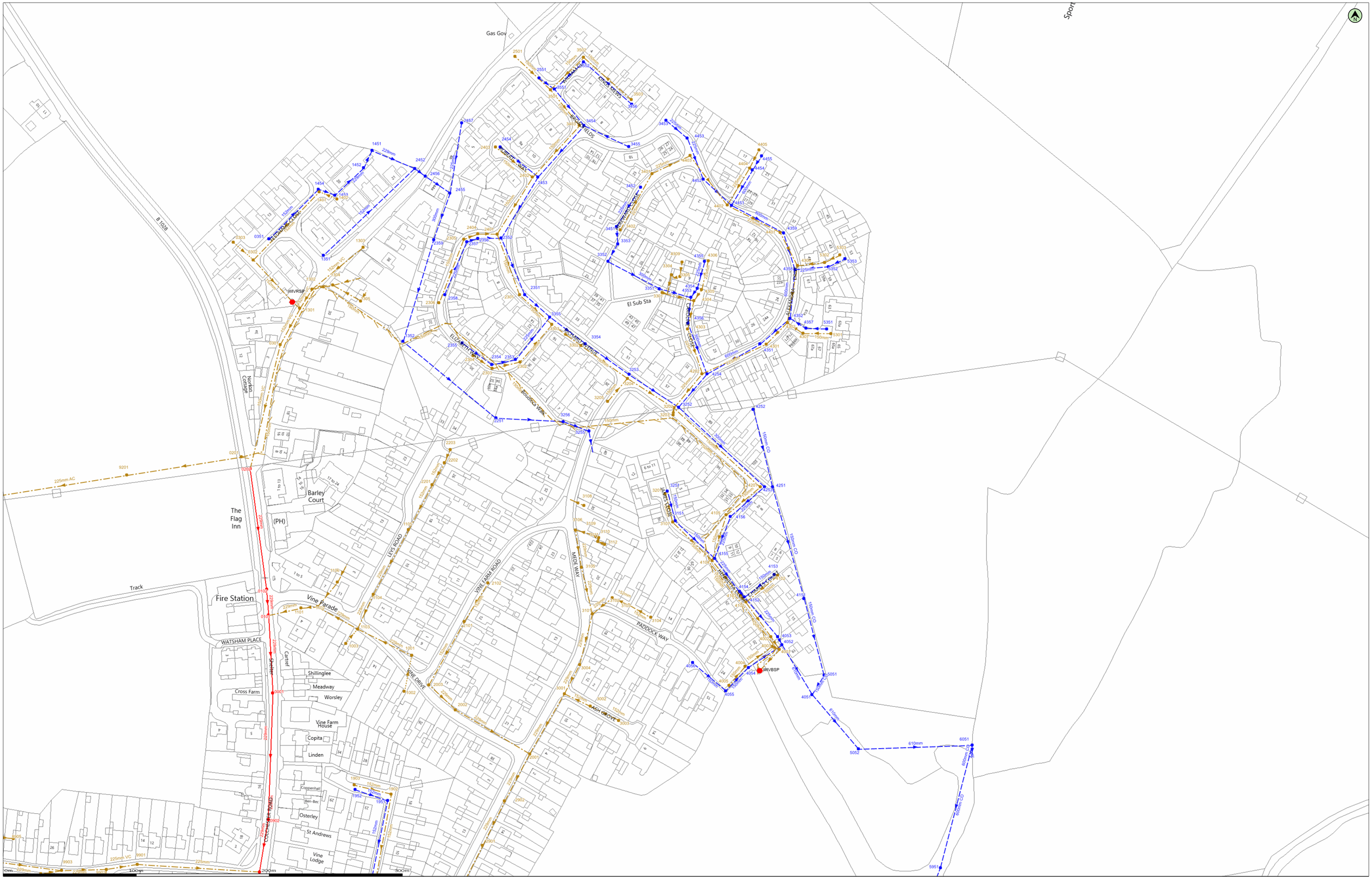
xmax = 605700
ymax = 224100

0 0.1 0.2
km

Map produced by MAGIC on 4 September, 2020.



Date: 17/06/20

Scale: 1:1250

Map Centre: 604404,223247

Data updated: 01/06/20

Our Ref: 397533 - 1

Wastewater Plan A1

Foul Sewer	Outfall*	Sewage Treatment Works	
Surface Sewer			
Combined Sewer			
Final Effluent	Inlet*	Public Pumping Station	
Rising Main*			
Private Sewer*	Manhole*	Decommissioned Pumping Station	
Decommissioned Sewer*			

*(Colour denotes effluent type)

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Wivenhoe

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	604093	223057	C	32.01	30.3	1.71
0101	604090	223115	C	-	-	-
0102	604089	223134	C	32.43	30.72	1.71
0202	604076	223225	C	33.45	31.18	2.27
0901	604084	222922	C	31.67	29.4	2.27
0902	604090	222962	C	31.91	29.9	2.01
0201	604070	223234	F	32.94	30.31	2.63
0301	604099	223318	F	-	-	1.36
0302	604079	223382	F	-	-	2.28
0303	604064	223395	F	-	-	0.96
1001	604198	223085	F	-	-	1.15
1002	604192	223058	F	-	-	1.02
1003	604148	223094	F	-	-	0.85
1101	604115	223120	F	-	-	1.45
1102	604127	223121	F	-	-	1.4
1103	604157	223105	F	-	-	1.24
1104	604169	223131	F	-	-	1.24
1105	604196	223179	F	-	-	1.11
1106	604142	223140	F	-	-	-
1301	604114	223345	F	-	-	0.96
1302	604123	223360	F	-	-	0.88
1303	604161	223391	F	-	-	0.55
1304	604139	223363	F	-	-	-
1305	604160	223351	F	-	-	-
1401	604128	223433	F	-	-	1.5
1402	604142	223428	F	-	-	1.1
1902	604182	222981	F	30.57	29.16	1.41
1903	604155	222988	F	30.462	29.432	1.03
2001	604286	223011	F	31.76	29.71	2.05
2002	604231	223044	F	-	-	2.03
2003	604211	223063	F	32	30	2
2101	604237	223110	F	31.66	30.19	1.47
2102	604255	223139	F	31.44	30.3	1.14
2201	604213	223213	F	-	-	0.86
2202	604222	223229	F	-	-	0.72
2203	604227	223239	F	-	-	0.65
2301	604279	223356	F	-	-	-
2302	604279	223305	F	31.76	29.7	2.06
2303	604258	223300	F	31.9	29.9	2
2304	604244	223310	F	31.98	30.08	1.9
2305	604237	223397	F	31.07	29.21	1.86
2306	604218	223350	F	32.24	30.72	1.52
2401	604262	223401	F	-	29.4	-
2402	604289	223444	F	-	-	-
2403	604261	223467	F	-	-	-
2404	604247	223401	F	32.12	29.92	2.2
2501	604275	223535	F	-	-	-
2901	604251	222942	F	30.555	28.325	2.23
2902	604268	222975	F	-	29.57	-
3001	604313	223056	F	31.56	29.86	1.7
3002	604332	223047	F	-	-	1.51
3003	604353	223036	F	-	-	1.2
3004	604324	223078	F	-	-	1.53
3101	604334	223116	F	31.15	30.05	1.1
3102	604348	223128	F	32.92	31.15	1.77
3103	604361	223123	F	-	-	0.55
3104	604377	223114	F	-	-	0.4
3105	604325	223151	F	31.5	30.38	1.12
3106	604321	223179	F	32.89	31.84	1.05
3107	604394	223185	F	30.48	28.54	1.94
3108	604327	223197	F	-	-	-
3109	604332	223176	F	-	-	-
3110	604339	223173	F	-	-	-
3111	604338	223170	F	-	-	-
3112	604343	223168	F	-	-	-
3201	604388	223206	F	30.57	28.78	1.79
3202	604395	223271	F	-	-	-
3203	604394	223266	F	-	-	-
3204	604360	223293	F	-	29.63	-
3205	604345	223276	F	31.76	30.01	1.75
3301	604386	223357	F	31.97	29.55	2.42
3302	604325	223317	F	-	-	-
3303	604303	223333	F	-	29.14	-
3304	604393	223371	F	-	-	-
3305	604399	223369	F	-	-	-
3401	604378	223447	F	32.36	30.21	2.15
3402	604355	223404	F	32.03	30.77	1.26
3403	604324	223483	F	-	-	-
3501	604302	223510	F	-	-	-
3502	604327	223534	F	-	-	-
3503	604363	223502	F	-	-	-
4001	604474	223089	F	28.85	26.4	2.45
4002	604468	223099	F	-	-	-
4003	604469	223092	F	29.4	27.2	2.2
4004	604448	223077	F	29.4	27.59	1.81
4005	604436	223062	F	29.501	27.921	1.58
4101	604449	223125	F	-	27.66	-
4102	604473	223145	F	29.86	28.22	1.64
4103	604445	223130	F	29.7	27.66	2.04
4104	604423	223156	F	30.43	27.86	2.57
4105	604434	223190	F	30.795	27.905	2.89
4201	604460	223211	F	30.742	28.002	2.74
4202	604416	223296	F	31.31	28.49	2.82
4301	604464	223319	F	31.6	28.7	2.9
4302	604480	223335	F	31.84	28.92	2.92
4303	604405	223330	F	31.49	29.01	2.48
4304	604410	223351	F	31.66	29.36	2.3
4305	604416	223359	F	31.68	29.61	2.07
4306	604421	223381	F	32.04	30	2.04
4307	604492	223327	F	32.08	29.13	2.95
4308	604488	223378	F	32.1	29.2	2.9
4309	604401	223380	F	-	-	-
4401	604475	223403	F	32.31	29.36	2.95
4402	604435	223423	F	32.48	29.61	2.87
4403	604407	223460	F	32.58	29.85	2.73
4404	604452	223451	F	32.29	29.79	2.5
4405	604459	223464	F	32.4	29.88	2.52
5301	604513	223327	F	31.95	29.25	2.7
5302	604508	223380	F	31.98	29.58	2.4
5303	604520	223386	F	31.87	30.37	1.5
8905	603899	222947	F	-	-	-
9201	603984	223220	F	32.75	29.86	2.89
9901	603992	222928	F	31.42	29.67	1.75
9902	603968	222924	F	-	-	1.68
9903	603935	222923	F	30.6	29.2	1.4
9904	603919	222921	F	-	-	-
0351	604091	223397	S	-	-	0.58
1351	604131	223385	S	-	-	0.7
1352	604191	223321	S	-	-	-
1451	604168	223464	S	-	-	-
1452	604162	223451	S	-	-	-
1453	604140	223430	S	-	-	-
1454	604128	223435	S	-	-	0.8
1951	604180	222976	S	-	-	-
1952	604155	222984	S	-	-	-
2251	604261	223263	S	-	-	-
2351	604283	223356	S	-	-	-
2352	604265	223398	S	-	30.14	-
2353	604276	223307	S	31.71	30.11	1.6
2354	604258	223303	S	31.9	30.25	1.65
2355	604236	223320	S	32.11	30.41	1.7
2356	604247	223398	S	32.09	30.29	1.8
2357	604239	223395	S	31.99	30.53	1.46
2358	604223	223356	S	32.18	30.83	1.35
2359	604214	223397	S	-	-	-
2452	604200	223450	S	-	-	1.13
2453	604293	223444	S	-	-	-
2454	604264	223467	S	-	-	-
2455	604227	223432	S	-	-	-
2456	604208	223445	S	-	-	-
2457	604235	223485	S	-	-	-
2551	604294	223518	S	-	-	-
3151	604396	223186	S	30.43	29.06	1.37
3251	604390	223208	S	30.69	29.29	1.4
3252	604398	223271	S	-	29.2	-
3253	604361	223296	S	-	-	-
3255	604331	223253	S	-	-	-
3256	604312	223260	S	-	-	-
3351	604384	223360	S	32	30.1	1.9
3352	604345	223381	S	32.07	30.24	1.83
3353	604353	223394	S	32.19	30.28	1.91
3354	604328	223319	S	-	-	-
3355	604302	223339	S	-	29.95	-
3451	604352	223407	S	32.07	30.37	1.7
3452	604370	223437	S	32.31	30.65	1.66
3453	604389	223487	S	32.38	30.83	1.55
3454	604327	223483	S	-	-	30.66
3455	604361	223467	S	32.32	30.77	1.55
3456	604363	223499	S	-	-	-
3551	604305	223510	S	-	-	-
3552	604327	223531	S	-	-	-
4051	604499	223056	S	-	-	-
4052	604476	223093	S	-	-	-
4053	604473	223099	S	29.25	27.9	1.35
4054	604451	223076	S	29.798	28.308	1.49
4055	604434	223058	S	29.996	28.596	1.4
4056	604409	223079	S	29.698	28.918	0.78
4151	604493	223128	S	30	29.11	0.89
4152	604448	223129	S	-	28.55	-
4153	604470	223145	S	29.84	28.69	1.15
4154	604444	223133	S	-	-	-
4155	604425	223158	S	-	28.72	-
4156	604437	223189	S	-	-	-
4251	604469	223212	S	31	29.8	1.2
4252	604454	223270	S	31.65	30.64	1.01
4253	604463	223212	S	-	-	-
4254	604420	223296	S	31.36	29.21	2.15
4351	604460	223319	S	31.55	29.54	2.01
4352	604482	223338	S	31.87	29.63	2.24
4353	604408	223354	S	31.71	30.01	1.7
4354	604412	223360	S	31.72	30.17	1.55
4355	604418	223381	S	32	30.4	1.6
4356	604405	223334	S	31.55	29.95	1.6
4357	604494	223330	S	32.07	30.13	1.94
4358	604486	223374	S	32.12	29.72	2.4
4359	604477	223402	S	32.28	30.83	1.45
4451	604438	223423	S	32.43	29.93	2.5
4452	604417	223443	S	32.63	30.49	2.14
4453	604405	223473	S	32.57	30.72	1.85
4454	604454	223449	S	32.24	30.01	2.23
4455	604461	223460	S	32.2	30.06	2.14
5051	604508	223070	S	29.7	28.6	1.1
5052	604534	223015	S	-	-	-
5351	604510	223330	S	31.97	30.54	1.43
5352	604511	223377	S	31.98	30.42	1.56
5353	604523	223383	S	31.85	30.75	1.1
5951	604595	222925	S	29.18	26.1	3.08
6051	604619	223018	S	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Josh Newman
Site name:	Richard Avenue
Site location:	Wivenhoe

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.87040° N
Longitude:	0.96962° E
Reference:	403073977
Date:	Feb 26 2021 13:49

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 4.9

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	1	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	552	552
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.62	17.92
1 in 1 year (l/s):	0.53	15.23
1 in 30 years (l/s):	1.43	41.21
1 in 100 year (l/s):	1.99	57.15
1 in 200 years (l/s):	2.33	67.01

Pre-planning Assessment Report

WIVENHOE, LAND SOUTH OR RICHARD AVENUE

InFlow Reference: **PPE- 0072760**

Assessment Type: **Used Water**

Report published: **04/06/2020**

This report supersedes the previous version published on 25/11/2019

Thank you for submitting a pre-planning enquiry.

This report has been produced for Taylor Wimpey East London

Your InFlow reference number is PPE- 0072760

If you have any questions upon receipt of this report, please contact the Pre-development team on **03456 066 087** or email planningliaison@anglianwater.co.uk.

Section 1

Proposed Development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Dwellings	120

The anticipated build rate is:

Year	Y1	Y2	Y3
Build rate	50	50	20

Development type: Greenfield

Planning application status: Pending Consideration

Site grid reference number: TM0459123178

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 Assets affected

Our records indicate that there are no public water mains/public sewers or other assets owned by Anglian Water within the boundary of your development site. However, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and influent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Colchester Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site.

The nearest practicable connection is to the 150mm diameter sewer at manhole 4201 in Henrietta Close at National Grid Reference NGR TM 04458 23211. Anglian water has assessed the impact of gravity flows from the planned development to this point and unfortunately there is insufficient capacity in this sewer to accommodate your site.

We have therefore considered an alternative connection point and can confirm that there is sufficient capacity for a connection at or downstream of manhole TM0423 4001, located in Henrietta Close, at National Grid Reference TM 04474 23089.

This is the recommended connection point. Anglian Water will reimburse reasonable costs incurred in connecting to the recommended connection point, over and above those required to connect to the nearest point of connection. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows

Surface water disposal

In principle, your proposed method of surface water disposal is acceptable to Anglian Water. It is our understanding that the evidence to confirm compliance with the surface water hierarchy is not yet available. Once the evidence has been confirmed, then a connection point may be made at or downstream of manhole TM0423 4051, located in land south of the development site, at a rate of 15l/s.

It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed.

This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an infrastructure charge for each new property connecting to the public sewer that benefits from Full planning permission.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the public sewer.

Infrastructure charge for water recycling: **£570.00**

The total infrastructure charge payable for your site for water is:

Infrastructure charge	Number of units	Total
£570.00	120	£ 68,400.00

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non- household premises, the fixed element is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge.

Details of the relevant multiplier for each fitting can be found at our website.

It has been assumed that the onsite used water network will be provided under Section 104 of the Water Industry Act

It is recommended that you also budget for connection costs.

Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 4 Map of proposed connection points

Figure 1: Your used water point of connection

Figure 2: Surface water point of connection

Section 5 Useful information

Water Industry Act – Key Used Water Sections:

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or our Development Services team on 03456 066 087.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term.

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfer

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharge to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection.

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website at http://anglianwater.co.uk/developers/encroachment.aspx

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat.

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging Arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website.

Section 6 Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

Proposed bund to prevent runoff from the adjacent field entering the development.

ALEXANDRA DRIVE

ETL

Cycle / Footpath

Swales between the North and South parcels of the site can be used to drain excess flow, whilst utilising the green band beneath the overhead cables

Porous Paving to be used for all private driveways to provide water quality treatment in accordance with CIRIA Guidelines

Proposed filter trench will drain runoff from shared private drives where possible.

Connection to Woodland

Potential Future Connection

BASIN TO BE SUITABLY LINED TO PREVENT INGRESS OF GROUNDWATER. PERMANENT WET AREA OR BIORETENTION AREA REQUIRED TO PROVIDE SUFFICIENT WATER TREATMENT

Top of Bank = 30.2m
Bed Level = 27.60m
Attenuation Volume = 2720m³

PROPOSED FLOW CONTROL DEVICE LIMITING SW DISCHARGE TO 15L/S IN FOR ALL STORMS IN ACCORDANCE WITH ANGLIAN WATER REQUIREMENTS

3rd PARTY LAND OWNER APPROVAL OR SEWER REQUISITION REQUIRED FOR FW SEWERS LAID OUTSIDE OF SITE BOUNDARY

3rd PARTY LAND OWNER APPROVAL OR SEWER REQUISITION REQUIRED FOR SW SEWERS LAID OUTSIDE OF SITE BOUNDARY

PROPOSED FW SEWER CONNECTION. SECTION 106 APPROVAL REQUIRED FROM ANGLIAN WATER. IT MAY BE NECESSARY TO CONSTRUCT A NEW MANHOLE UPSTREAM DUE TO THE EXISTING NUMBER OF SEWER CONNECTIONS. TO BE DETERMINED AT DETAILED DESIGN.

PROPOSED SW SEWER CONNECTION SECTION 106 APPROVAL REQUIRED FROM ANGLIAN WATER FOR SEWER CONNECTION

SCALE BAR 1:500
0 5 10 15 20 25m

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER MANHOLE
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- PROPOSED LINED FILTER DRAIN
- PROPOSED LINED POROUS PAVING
- PROPOSED SW ATTENUATION BASIN
- PROPOSED LINED SWALE
- PROPOSED BUND
- OVERLAND FLOW ROUTES
- EXCEEDANCE FLOW ROUTES

DUE TO THE PRESENCE OF HIGH GROUNDWATER ALL SuDS FEATURES ARE TO BE SUITABLY LINED. THE ATTENUATION BASIN IS LIKELY TO REQUIRE A PUDDLED CLAY LAYER TO PREVENT INGRESS OF GROUNDWATER. SPECIALIST ADVICE FROM GEOTECHNICAL ENGINEER REQUIRED

THIS IS AN INDICATIVE DRAINAGE STRATEGY AND SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. DRAINAGE PROPOSALS INCLUDING PIPE SIZES & INVERT LEVELS ARE SUBJECT TO DETAILED DESIGN. THE ACTUAL POSITION AND DETAILS OF ANY EXISTING SERVICES ARE SUBJECT TO A DETAILED SURVEY.

Rev	Description	Date	Drawn	Checked	Apvd.
B	Drainage Strategy Updated to Suit Revised Layout	11.03.21	JJN	BDR	SJB
A	Drainage Strategy Updated to Suit Revised Layout	12.02.21	JJN	BDR	

Project

Wivenhoe, Land Off Richard Avenue

Drawing Description

Indicative Drainage Strategy

Drawing Number	Scale	Date	Drawn	Checked	Approved
ST-2981-01-B	1:500@A1	21.07.20	BDR	SJB	XXX

Client: Taylor Wimpey

Architect: stomor — CIVIL ENGINEERING CONSULTANTS

Suite 2, First Floor, Portmill House, Portmill Lane, Hitchin, Herts, SG5 1DJ
www.stomor.com | 01462 615433 | info@stomor.com

Existing Network Details for Surface Network 1

* - Indicates pipe has been modified outside of System 1
\# - Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
* 1.000	56.894	0.285	199.6	0.129	5.00	0.600	o	300	Pipe/Conduit
* 2.000	12.781	0.060	213.0	0.129	5.00	0.600	o	300	Pipe/Conduit
* 1.001	46.862	0.231	202.9	0.129	0.00	0.600	o	525	Pipe/Conduit
* 3.000	28.687	0.691	41.5	0.129	5.00	0.600	o	300	Pipe/Conduit
* 1.002	21.380	0.117	182.7	0.129	0.00	0.600	o	525	Pipe/Conduit
* 1.003	14.401	0.057	252.6	0.129	0.00	0.600	o	525	Pipe/Conduit
* 1.004	26.193	0.105	249.5	0.129	0.00	0.600	o	525	Pipe/Conduit
* 1.005	32.331	0.129	250.6	0.129	0.00	0.600	o	600	Pipe/Conduit
* 1.006	16.111	0.065	247.9	0.129	0.00	0.600	o	600	Pipe/Conduit
* 4.000	25.696	0.128	200.8	0.129	5.00	0.600	o	300	Pipe/Conduit
* 4.001	24.030	0.236	101.8	0.129	0.00	0.600	o	375	Pipe/Conduit
* 1.007	18.451	0.061	302.5	0.129	0.00	0.600	o	675	Pipe/Conduit
* 1.008	20.972	0.070	299.6	0.129	0.00	0.600	o	675	Pipe/Conduit
* 1.009	9.310	0.031	300.3	0.129	0.00	0.600	o	750	Pipe/Conduit
* 5.000	16.482	0.110	149.8	0.129	5.00	0.600	o	300	Pipe/Conduit
* 5.001	28.395	0.284	100.0	0.129	0.00	0.600	o	300	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* 1.000	S1	31.880	30.050	1.530	31.800	29.765	1.735		1200
* 2.000	S2	31.800	29.900	1.600	31.800	29.840	1.660		1200
* 1.001	S3	31.800	29.615	1.660	31.744	29.384	1.835		1500
* 3.000	S4	31.858	30.300	1.258	31.744	29.609	1.835		1200
* 1.002	S5	31.744	29.384	1.835	31.764	29.267	1.972		1500
* 1.003	S6	31.764	29.267	1.972	31.731	29.210	1.996		1500
* 1.004	S7	31.731	29.210	1.996	31.590	29.105	1.960		1500
* 1.005	S8	31.590	29.030	1.960	31.222	28.901	1.721		1500
* 1.006	S9	31.222	28.901	1.721	31.209	28.836	1.773		1500
* 4.000	S10	30.868	29.500	1.068	31.039	29.372	1.367		1200
* 4.001	S11	31.039	29.297	1.367	31.209	29.061	1.773		1500
* 1.007	S12	31.209	28.761	1.773	31.264	28.700	1.889		1500
* 1.008	S13	31.264	28.700	1.889	31.272	28.630	1.967		1500
* 1.009	S14	31.272	28.555	1.967	31.222	28.524	1.948		1800
* 5.000	S16	31.336	29.900	1.136	31.203	29.790	1.113		1200
* 5.001	S17	31.203	29.790	1.113	30.912	29.506	1.106		1200

Existing Network Details for Surface Network 1

	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
*	5.002	27.353	0.751	36.4	0.129	0.00	0.600	o	375	Pipe/Conduit
*	1.010	58.684	0.147	399.2	0.129	0.00	0.600	o	900	Pipe/Conduit
*	6.000	19.570	0.085	230.2	0.129	5.00	0.600	o	300	Pipe/Conduit
*	6.001	39.462	0.158	249.8	0.129	0.00	0.600	o	375	Pipe/Conduit
*	1.011	17.591	0.327	53.8	0.129	0.00	0.600	o	900	Pipe/Conduit
*	7.000	54.222	0.217	249.9	0.129	5.00	0.600	o	375	Pipe/Conduit
*	1.012	33.812	0.085	397.8	0.129	0.00	0.600	o	900	Pipe/Conduit
*	8.000	32.323	0.324	99.8	0.129	5.00	0.600	o	300	Pipe/Conduit
*	1.013	17.073	0.042	406.5	0.129	0.00	0.600	o	900	Pipe/Conduit
*	1.014	10.000#	0.000	0.0	0.170	0.00	0.600	o	300	Pipe/Conduit
*	1.015	10.000#	0.100	100.0	0.000	0.00	0.600	o	225	Pipe/Conduit

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	5.002	S18	30.912	29.431	1.106	31.222	28.680	2.167		1500
*	1.010	S19	31.222	28.374	1.948	30.876	28.227	1.749		1800
*	6.000	S20	30.570	29.070	1.200	30.844	28.985	1.559		1200
*	6.001	S21	30.844	28.910	1.559	30.876	28.752	1.749		1500
*	1.011	S22	30.876	28.227	1.749	30.805	27.900	2.005		1800
*	7.000	S23	30.276	28.642	1.259	30.805	28.425	2.005		1500
*	1.012	S24	30.805	27.900	2.005	30.686	27.815	1.971		1800
*	8.000	S25	30.511	28.712	1.499	30.686	28.388	1.998		1200
*	1.013	S26	30.686	27.815	1.971	30.200	27.773	1.527		1800
*	1.014	Basin	30.200	27.600	2.300	30.300	27.600	2.400		1800
*	1.015	F/C	30.300	27.600	2.475	29.114	27.500	1.389	Hydro-Brake®	1200

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	31.880	30.050	1.530	Open Manhole	1200
2.000	o	300	S2	31.800	29.900	1.600	Open Manhole	1200
1.001	o	525	S3	31.800	29.615	1.660	Open Manhole	1500
3.000	o	300	S4	31.858	30.300	1.258	Open Manhole	1200
1.002	o	525	S5	31.744	29.384	1.835	Open Manhole	1500
1.003	o	525	S6	31.764	29.267	1.972	Open Manhole	1500
1.004	o	525	S7	31.731	29.210	1.996	Open Manhole	1500
1.005	o	600	S8	31.590	29.030	1.960	Open Manhole	1500
1.006	o	600	S9	31.222	28.901	1.721	Open Manhole	1500
4.000	o	300	S10	30.868	29.500	1.068	Open Manhole	1200
4.001	o	375	S11	31.039	29.297	1.367	Open Manhole	1500
1.007	o	675	S12	31.209	28.761	1.773	Open Manhole	1500
1.008	o	675	S13	31.264	28.700	1.889	Open Manhole	1500
1.009	o	750	S14	31.272	28.555	1.967	Open Manhole	1800
5.000	o	300	S16	31.336	29.900	1.136	Open Manhole	1200
5.001	o	300	S17	31.203	29.790	1.113	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	56.894	199.6	S3	31.800	29.765	1.735	Open Manhole	1500
2.000	12.781	213.0	S3	31.800	29.840	1.660	Open Manhole	1500
1.001	46.862	202.9	S5	31.744	29.384	1.835	Open Manhole	1500
3.000	28.687	41.5	S5	31.744	29.609	1.835	Open Manhole	1500
1.002	21.380	182.7	S6	31.764	29.267	1.972	Open Manhole	1500
1.003	14.401	252.6	S7	31.731	29.210	1.996	Open Manhole	1500
1.004	26.193	249.5	S8	31.590	29.105	1.960	Open Manhole	1500
1.005	32.331	250.6	S9	31.222	28.901	1.721	Open Manhole	1500
1.006	16.111	247.9	S12	31.209	28.836	1.773	Open Manhole	1500
4.000	25.696	200.8	S11	31.039	29.372	1.367	Open Manhole	1500
4.001	24.030	101.8	S12	31.209	29.061	1.773	Open Manhole	1500
1.007	18.451	302.5	S13	31.264	28.700	1.889	Open Manhole	1500
1.008	20.972	299.6	S14	31.272	28.630	1.967	Open Manhole	1800
1.009	9.310	300.3	S19	31.222	28.524	1.948	Open Manhole	1800
5.000	16.482	149.8	S17	31.203	29.790	1.113	Open Manhole	1200
5.001	28.395	100.0	S18	30.912	29.506	1.106	Open Manhole	1500

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.002	o	375	S18	30.912	29.431	1.106	Open Manhole	1500
1.010	o	900	S19	31.222	28.374	1.948	Open Manhole	1800
6.000	o	300	S20	30.570	29.070	1.200	Open Manhole	1200
6.001	o	375	S21	30.844	28.910	1.559	Open Manhole	1500
1.011	o	900	S22	30.876	28.227	1.749	Open Manhole	1800
7.000	o	375	S23	30.276	28.642	1.259	Open Manhole	1500
1.012	o	900	S24	30.805	27.900	2.005	Open Manhole	1800
8.000	o	300	S25	30.511	28.712	1.499	Open Manhole	1200
1.013	o	900	S26	30.686	27.815	1.971	Open Manhole	1800
1.014	o	300	Basin	30.200	27.600	2.300	Open Manhole	1800
1.015	o	225	F/C	30.300	27.600	2.475	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.002	27.353	36.4	S19	31.222	28.680	2.167	Open Manhole	1800
1.010	58.684	399.2	S22	30.876	28.227	1.749	Open Manhole	1800
6.000	19.570	230.2	S21	30.844	28.985	1.559	Open Manhole	1500
6.001	39.462	249.8	S22	30.876	28.752	1.749	Open Manhole	1800
1.011	17.591	53.8	S24	30.805	27.900	2.005	Open Manhole	1800
7.000	54.222	249.9	S24	30.805	28.425	2.005	Open Manhole	1800
1.012	33.812	397.8	S26	30.686	27.815	1.971	Open Manhole	1800
8.000	32.323	99.8	S26	30.686	28.388	1.998	Open Manhole	1800
1.013	17.073	406.5	Basin	30.200	27.773	1.527	Open Manhole	1800
1.014	10.000#	0.0	F/C	30.300	27.600	2.400	Open Manhole	1200
1.015	10.000#	100.0	S29	29.114	27.500	1.389	Open Manhole	1200

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.015	S29	29.114	27.500	0.000	1200	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: F/C, DS/PN: 1.015, Volume (m³): 3.7

Unit Reference	MD-SHE-0156-1500-2300-1500
Design Head (m)	2.300
Design Flow (l/s)	15.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	156
Invert Level (m)	27.600
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	15.0	Kick-Flo®	1.393	11.8
Flush-Flo™	0.683	15.0	Mean Flow over Head Range	-	13.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.6	0.800	14.9	2.000	14.0	4.000	19.5	7.000	25.5
0.200	11.9	1.000	14.5	2.200	14.7	4.500	20.6	7.500	26.4
0.300	13.4	1.200	13.6	2.400	15.3	5.000	21.7	8.000	27.2
0.400	14.3	1.400	11.9	2.600	15.9	5.500	22.7	8.500	28.0
0.500	14.7	1.600	12.6	3.000	17.0	6.000	23.7	9.000	28.8
0.600	14.9	1.800	13.3	3.500	18.3	6.500	24.6	9.500	29.6

Storage Structures for Surface Network 1

Tank or Pond Manhole: Basin, DS/PN: 1.014

Invert Level (m) 27.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	290.0	0.601	572.0	1.601	1095.0
0.600	433.0	1.600	904.0	2.600	1521.0

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000
Region	England and Wales	Ratio R	0.400
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm)	250.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	S1	15	31.880	30.147	-0.203	0.000	0.23	0.105	0.9	17.2	OK
2.000	S2	15	31.800	30.008	-0.192	0.000	0.28	0.117	0.8	16.9	OK
1.001	S3	15	31.800	29.755	-0.385	0.000	0.16	0.249	1.0	47.6	OK
3.000	S4	15	31.858	30.366	-0.234	0.000	0.11	0.069	1.5	17.0	OK
1.002	S5	15	31.744	29.579	-0.330	0.000	0.29	1.473	1.1	77.0	OK
1.003	S6	15	31.764	29.502	-0.290	0.000	0.41	1.654	1.0	90.9	OK
1.004	S7	15	31.731	29.447	-0.288	0.000	0.42	1.267	1.1	103.9	OK
1.005	S8	15	31.590	29.268	-0.362	0.000	0.32	1.240	1.1	114.7	OK
1.006	S9	15	31.222	29.167	-0.334	0.000	0.41	2.986	1.1	126.9	OK
4.000	S10	15	30.868	29.600	-0.200	0.000	0.24	0.108	0.8	16.7	OK
4.001	S11	15	31.039	29.405	-0.267	0.000	0.18	0.198	1.2	31.3	OK
1.007	S12	15	31.209	29.073	-0.363	0.000	0.43	1.535	1.0	164.3	OK
1.008	S13	15	31.264	29.013	-0.362	0.000	0.44	2.493	1.1	175.3	OK
1.009	S14	15	31.272	28.915	-0.390	0.000	0.46	2.807	0.9	185.1	OK
5.000	S16	15	31.336	29.996	-0.204	0.000	0.22	0.103	0.9	17.0	OK
5.001	S17	15	31.203	29.905	-0.185	0.000	0.31	0.285	1.3	31.4	OK
5.002	S18	15	30.912	29.530	-0.276	0.000	0.16	0.169	2.0	45.8	OK
1.010	S19	15	31.222	28.698	-0.576	0.000	0.28	1.086	1.1	230.3	OK
6.000	S20	15	30.570	29.176	-0.194	0.000	0.26	0.114	0.8	16.7	OK
6.001	S21	15	30.844	29.043	-0.242	0.000	0.27	0.315	0.9	31.3	OK
1.011	S22	15	30.876	28.504	-0.623	0.000	0.21	6.141	1.6	265.9	OK
7.000	S23	15	30.276	28.737	-0.280	0.000	0.15	0.159	0.8	17.1	OK
1.012	S24	240	30.805	28.417	-0.383	0.000	0.10	4.954	0.6	78.7	OK
8.000	S25	15	30.511	28.794	-0.218	0.000	0.16	0.088	1.1	16.7	OK
1.013	S26	240	30.686	28.406	-0.309	0.000	0.14	12.985	0.6	81.4	OK
1.014	Basin	240	30.200	28.400	0.500	0.000	0.56	343.663	0.3	16.8	SURCHARGED
1.015	F/C	360	30.300	28.405	0.580	0.000	0.35	1.506	1.1	14.9	SURCHARGED

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000
Region	England and Wales	Ratio R	0.400
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm)	250.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	S1	15	31.880	30.212	-0.138	0.000	0.54	0.178	1.1	40.3	OK
2.000	S2	15	31.800	30.083	-0.117	0.000	0.68	0.202	0.9	41.6	OK
1.001	S3	15	31.800	29.945	-0.195	0.000	0.40	1.405	1.3	119.6	OK
3.000	S4	15	31.858	30.406	-0.194	0.000	0.27	0.114	1.9	41.7	OK
1.002	S5	15	31.744	29.884	-0.025	0.000	0.70	8.701	1.2	182.8	OK
1.003	S6	15	31.764	29.810	0.018	0.000	0.97	4.958	1.1	214.5	SURCHARGED
1.004	S7	15	31.731	29.757	0.022	0.000	1.00	3.592	1.3	247.9	SURCHARGED
1.005	S8	15	31.590	29.647	0.017	0.000	0.73	6.152	1.3	260.6	SURCHARGED
1.006	S9	15	31.222	29.543	0.042	0.000	0.90	9.486	1.2	281.2	SURCHARGED
4.000	S10	15	30.868	29.668	-0.132	0.000	0.58	0.185	1.0	40.9	OK
4.001	S11	15	31.039	29.502	-0.170	0.000	0.49	0.629	1.5	83.8	OK
1.007	S12	15	31.209	29.438	0.002	0.000	0.95	6.747	1.2	363.9	SURCHARGED
1.008	S13	15	31.264	29.376	0.001	0.000	0.97	6.822	1.3	387.6	SURCHARGED
1.009	S14	360	31.272	29.305	0.000	0.000	0.20	8.295	0.7	81.3	OK
5.000	S16	15	31.336	30.059	-0.141	0.000	0.54	0.175	1.1	41.6	OK
5.001	S17	15	31.203	30.006	-0.084	0.000	0.84	0.800	1.6	84.4	OK
5.002	S18	15	30.912	29.607	-0.199	0.000	0.44	0.402	2.6	128.1	OK
1.010	S19	360	31.222	29.259	-0.015	0.000	0.12	6.747	0.8	102.3	OK
6.000	S20	15	30.570	29.249	-0.121	0.000	0.65	0.197	1.0	40.9	OK
6.001	S21	480	30.844	29.180	-0.105	0.000	0.08	1.101	0.6	9.3	OK
1.011	S22	480	30.876	29.180	0.053	0.000	0.07	41.142	1.2	96.2	SURCHARGED
7.000	S23	480	30.276	29.179	0.162	0.000	0.04	0.940	0.6	4.6	SURCHARGED
1.012	S24	480	30.805	29.179	0.379	0.000	0.14	19.092	0.5	105.1	SURCHARGED
8.000	S25	480	30.511	29.178	0.166	0.000	0.05	0.521	0.8	4.7	SURCHARGED
1.013	S26	480	30.686	29.178	0.463	0.000	0.20	25.999	0.5	114.1	SURCHARGED
1.014	Basin	480	30.200	29.177	1.277	0.000	0.56	939.867	0.3	16.9	SURCHARGED
1.015	F/C	480	30.300	29.187	1.362	0.000	0.35	2.390	1.1	14.9	SURCHARGED

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 19.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.400	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	250.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	S1	15	31.880	31.596	1.246	0.000	0.76	1.742	1.2	56.5	SURCHARGED
2.000	S2	15	31.800	31.504	1.304	0.000	0.91	1.808	1.0	55.8	SURCHARGED
1.001	S3	15	31.800	31.412	1.272	0.000	0.53	7.902	1.3	158.9	SURCHARGED
3.000	S4	15	31.858	31.506	0.906	0.000	0.44	1.358	2.1	69.0	SURCHARGED
1.002	S5	15	31.744	31.312	1.403	0.000	1.01	15.151	1.2	265.3	SURCHARGED
1.003	S6	15	31.764	31.204	1.412	0.000	1.42	7.718	1.5	312.9	SURCHARGED
1.004	S7	15	31.731	31.048	1.313	0.000	1.45	6.032	1.7	361.3	SURCHARGED
1.005	S8	15	31.590	30.821	1.191	0.000	1.14	8.502	1.5	409.1	SURCHARGED
1.006	S9	15	31.222	30.635	1.134	0.000	1.47	11.773	1.6	460.5	SURCHARGED
4.000	S10	15	30.868	30.631	0.831	0.000	0.87	1.273	1.1	60.7	FLOOD RISK
4.001	S11	15	31.039	30.554	0.882	0.000	0.65	3.934	1.6	111.5	SURCHARGED
1.007	S12	15	31.209	30.393	0.957	0.000	1.59	9.496	1.7	611.7	SURCHARGED
1.008	S13	15	31.264	30.157	0.782	0.000	1.66	8.632	1.9	661.6	SURCHARGED
1.009	S14	480	31.272	30.041	0.736	0.000	0.30	10.682	0.7	118.3	SURCHARGED
5.000	S16	15	31.336	30.538	0.338	0.000	0.97	0.716	1.1	74.6	SURCHARGED
5.001	S17	15	31.203	30.437	0.347	0.000	1.47	1.807	2.1	147.3	SURCHARGED
5.002	S18	480	30.912	30.043	0.237	0.000	0.09	2.963	1.6	25.4	SURCHARGED
1.010	S19	480	31.222	30.038	0.764	0.000	0.18	10.378	0.8	149.5	SURCHARGED
6.000	S20	480	30.570	30.040	0.670	0.000	0.13	1.091	0.6	8.1	SURCHARGED
6.001	S21	480	30.844	30.037	0.752	0.000	0.14	3.271	0.7	15.7	SURCHARGED
1.011	S22	480	30.876	30.033	0.906	0.000	0.13	44.948	1.2	172.1	SURCHARGED
7.000	S23	960	30.276	29.991	0.974	0.000	0.04	2.375	0.5	4.6	SURCHARGED
1.012	S24	960	30.805	29.991	1.191	0.000	0.14	21.161	0.5	107.8	SURCHARGED
8.000	S25	960	30.511	29.991	0.979	0.000	0.05	1.440	0.7	4.7	SURCHARGED
1.013	S26	960	30.686	29.990	1.275	0.000	0.20	28.066	0.5	116.8	SURCHARGED
1.014	Basin	960	30.200	29.989	2.089	0.000	0.56	1953.561	0.3	16.9	FLOOD RISK
1.015	F/C	960	30.300	29.996	2.171	0.000	0.35	3.305	1.1	15.2	SURCHARGED

Learn more about this area's flood risk

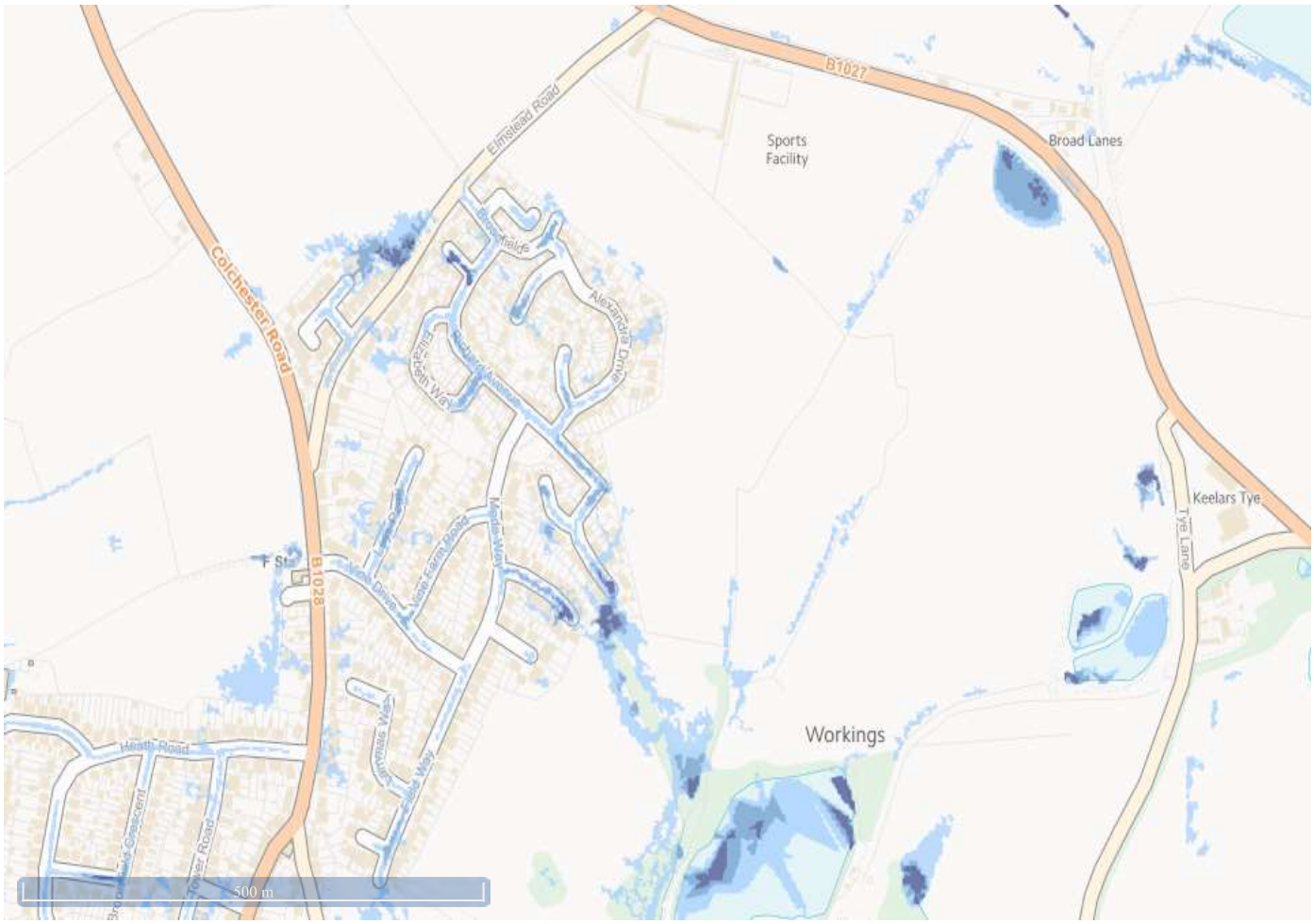
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

wivenhoe



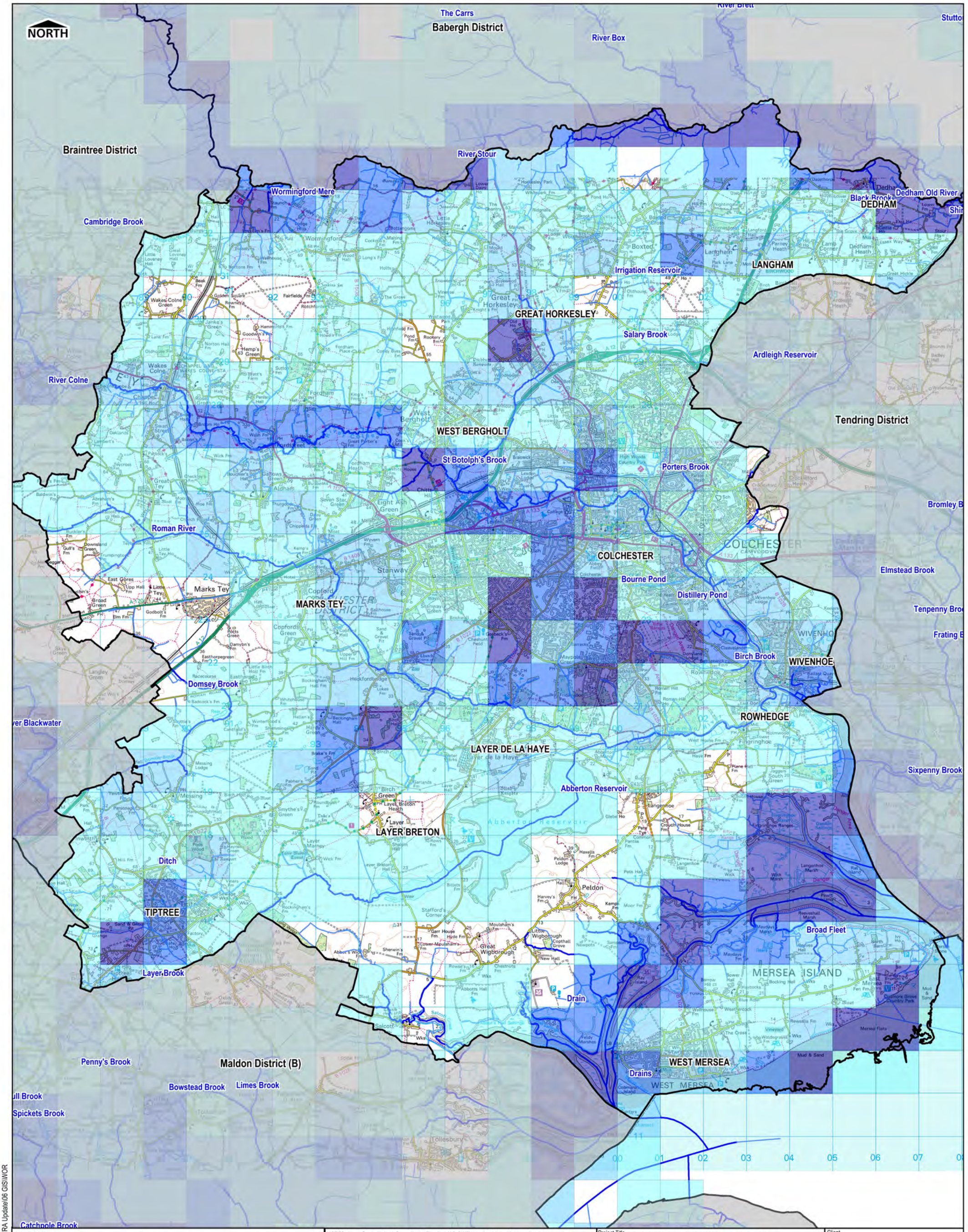
Extent of flooding from surface water

- High
- Medium
- Low
- Very low

Location you selected

View the flood risk information for another location (/long-term-flood-risk/postcode)

This information meets the requirements of the EU Floods Directive 2007/60/EC



LEGEND

- Administrative Boundaries
- Main River
- Ordinary Watercourse

Areas Susceptible to Groundwater Flooding

Area classification (proportion of each 1km square that is susceptible to groundwater flood emergence). Absence of values for any grid squares means that no part of that square is identified as being susceptible to groundwater emergence. See notes for further guidance.

- >= 75%
- >= 50% <75%
- >= 25% <50%
- <25%

NOTES Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. It was developed specifically by the Environmental Agency for use by LLFAs for use in Preliminary Flood Risk Assessment (PFRA) as required under the Flood Risk Regulartions. The was produced to annotate indicative Flood Risk Areas for PFRA with information to allow LLFAs to determine whether there may be a risk of flooding from groundwater.

The data has used the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map and thus covers consolidated aquifers (chalk, sandstone etc., termed 'cleanwater' in the data attributes) and superficial deposits.It does not take account of the chance of flooding from groundwater rebound. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that ground water might emerge. The susceptible areas are represented by one of four area catergories (listed above) showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwarer flooding occuring.

In common with the majority of datasets showing areas which may experience groundwater emergence, this dataset covers a large area of land, and only isolated locations within the overallsusceptible area are actually likley to suffer the consequences of groundwater flooding.

Project Title
COLCHESTER BOROUGH COUNCIL
STRATEGIC FLOOD RISK ASSESSMENT UPDATE

Drawing Title
AREAS SUSCEPTIBLE TO
GROUNDWATER FLOODING

Client
Colchester, the place to live, learn, work, and visit

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Drawn	SB	Version	1
Checked	EG	Date	Aug 2016
Approved	SK	Scale at A3	1:80,000

Drawing Number: FIGURE 5
Rev: 01

N:\Water\Current Projects\47075262 Colchester BC SFRA Update\06 GIS\WOR

Josh Newman

From: Planning Liaison <planningliaison@anglianwater.co.uk>
Sent: 19 June 2020 11:58
To: Josh Newman
Subject: RE: Land at Richard Avenue, Wivenhoe, Colchester

Follow Up Flag: Follow up
Flag Status: Completed

Good morning Josh,

I hope you are well.

Anglian Water is able to confirm that we have no records of flooding in the vicinity that can be attributed to capacity limitations in the public sewerage system. It is possible that other flooding may have occurred that we do not have records of, other organisations such as the Local Authority, Internal Drainage Board or the Environment Agency may have records.

Kind regards,
Charlotte

Planning Liaison

Telephone: 0345 606 6087

Anglian Water Services Limited
Thorpe Wood House, Thorpe Wood, Peterborough, Cambridgeshire, PE3 6WT

From: Josh Newman <j.newman@stomor.com>
Sent: 18 June 2020 12:46
To: Planning Liaison <planningliaison@anglianwater.co.uk>
Subject: Land at Richard Avenue, Wivenhoe, Colchester

Good afternoon,

I can confirm we have been commissioned to undertake a Flood Risk Assessment associated with the proposed development of Land at Richard Avenue, Wivenhoe, Colchester. Site details are as follows:

Land at Richard Avenue
Wivenhoe
Colchester
CO7 9HY
Grid Reference: 604550, 223229

I would be grateful if you could forward on information regarding sewer flooding history for the area in the vicinity of the site. Please let me know if you require any further information.

Kind regards,

Josh Newman
TRAINEE ENGINEER

j.newman@stomor.com
01462 615433

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