



Richard Jackson
Engineering Consultants

SITE SPECIFIC FLOOD RISK ASSESSMENT

Haven Banks, Exeter

Welbeck CP

June 2022

Project no: 61645

Document Review Sheet: -

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FINAL



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Title: SITE SPECIFIC FLOOD RISK ASSESSMENT
 Project: Haven Banks, Exeter
 Client: Welbeck CP
 Project No.: 61645

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1. Introduction

- 1.1. Richard Jackson Ltd has been appointed by Welbeck CP to undertake a Flood Risk Assessment to support a planning application for a mixed commercial and residential development at Haven Road, Exeter. This assessment will follow the checklist published as part of the National Planning Policy Framework (NPPF 2021) website, also the Devon County Council (DCC) SuDS guidance for drainage design.

2. Development Site and Location

- 2.1. The site is approximately 1.67ha in area and lies to the west/centre of Exeter in the St Thomas district. The site is surrounded by a mixture of commercial and residential buildings and is within proximity of the River Exe, approximately 130m to the north and east of the site. The postcode is EX2 8BY and approximate grid reference SX 91981 91839.
- 2.2. The existing site is currently occupied by Tenpin Exeter bowling centre, retail outlets, access road and associated parking. A site location plan is provided in Appendix A.
- 2.3. The Environment Agency (EA) flood mapping provided in Appendix B shows the site being in Flood Zone 3 for fluvial flooding, an area that also partially benefits from flood defences.
- 2.4. The current site has a suitable surface water drainage system in place, a Ø225 mm combined sewer located on the northwest periphery of the site, which also dissects the site withing the northeast boundary. This sewer directs the combined flow northeast to southwest into Water Lane Road. Gullies are located on the surface of the site which can be seen on the topographical survey in Appendix C.
- 2.5. The site is relatively flat with levels across the overall site ranging from approximately 7.10m AOD to 7.90m AOD north to south respectively. See the topographic survey in Appendix C.

3. Development Proposals

- 3.1. It is proposed to construct a mixed-use development which seeks to extend the vibrant mix and variety of uses including residential, small workshops, shops, cafes, restaurants, bars and artisan shops across Haven Road into the site to form a short pedestrian loop from north of the climbing centre to re-emerge further south onto Haven Road where the Basin Branch rail line ran (currently a footpath linking to Chandlers Walk – a residential area - and to the Haven Banks public car park).
- 3.2. The proposed site use is for residential and commercial development, residential development is defined by the NPPF as being more vulnerable to flood risk and commercial is less vulnerable. A design life of 100 years has been assumed for the purposes of this assessment.

4. Sequential Test

- 4.1. The aim of the sequential test is to direct development to locations of lesser flood risk. The sequential test can be applied in several ways –

outlined below. This site is centrally located within a vibrant city. The sequential test should be applied only to similar sites that share the opportunities to be connected to similar facilities. The site is within walking distance of a rail station with national connections, and very good bus connection. A wide range of facilities is available also within walking distance. To compare this site with other less well connected and sustainable sites would not be appropriate.

- 4.2. The site is currently occupied by commercial uses. Appendix 3 of the NPPF defined commercial uses as being at low vulnerability to flooding. As these uses already exist at the site there is no need for the sequential test to consider the proposed commercial element of the proposal and the sequential test for this use is passed.
- 4.3. The proposals also include residential homes. As noted above these will be located within walking distance of the city centre and its excellent facilities. The sequential test for residential use should be limited in its scope to other such well-located sites that are able to provide a similar number of dwellings.
- 4.4. The sequential test should be limited to sites that are reasonably available and appropriate for the use proposed. The site sits within the Water Lane regeneration area as cited in the Exeter City Council Adopted Core Strategy (2012). The area has been identified in the adopted Core Strategy for "comprehensive mixed-use redevelopment" referenced in the Exeter Local Plan. A sequential test search area is shown in Appendix O. The area being earmarked for regeneration coupled with the lack of other identifiable sites for this development supports the case that there are no other sites that can accommodate these proposals which are located with the same catchment of the city centre. Mitigations to the residual flood risk that can be put in place to facilitate this development, and these are discussed in sections 8 and 9.
- 4.5. It is the applicants view that the sequential test is passed for these proposals.

5. Climate Change

- 5.1. The NPPF defines climate change allowances that should be considered for various development proposals across the nation. For this proposed use at this site (more vulnerable) the NPPF advice states that the higher central climate change over a 100-year design life period should be considered as set out below.

Rainfall uplift 45%

Watercourse flow: 46%

6. Site Specific Flood Risk

Groundwater Flood Risk

- 6.1. The geology of the site according to the BGS database is Alphington Breccia Formation overlain by Alluvium (Clay, silt, sand and gravel). Borehole records located on site, indicate that no groundwater was struck

up to a maximum depth of 3.5m below ground level (bgl), however gravels becoming damp from 2.5m bgl, see Appendix E.

- 6.2. The depth of the ground water is such that ground water flooding could be a risk at this site. However, given the proximity to the River Exe, ground water levels are likely to fluctuate in line with the water level adjacent to the site and will discharge to the watercourse before flooding the site.

Surface Water Flood Risk (Appendix

- 6.3. Flood risk mapping for the High Risk 1 in 30-year (3.33%) return period the Medium Risk 100-year (1%) return period and the Low Risk (0.1%) 1000-year event shows that the site is currently not at any significant risk from surface water flooding. See Appendix F1

Fluvial & Tidal Flood Risk

- 6.4. The Gov.UK mapping shows most of the site to be at a medium risk (1%) for fluvial/tidal, see Appendix F2.
- 6.5. The EA has been contacted to provide the best available flood information for this site, as shown in Appendix F3. It is noted that the information provided is based on the EA's 2011 fluvial flood model for a range of events for the 1 in 10 year up to the 1 in 1000 year events, including climate change for the 1 in 100 year event. Since this study, the defences along this stretch of the River Exe have been enhanced and therefore the flood risk shown in this data is likely to be overestimated. At the time of writing this assessment updated modelling of the Exe was not available, however, it is anticipated that a new model will be released in the summer of 2022 (see Appendix N) and that the results are likely to change due to the reassessment in climatic change allowances. This assessment is therefore based on the 2011 model for the purposes of planning. In a pre app meeting with the EA, officers reported that the depth and extent of flooding will be reduced by the new flood defences. The extent of this reduction is not clear and will not be clear until the new model is released.
- 6.6. The provided EA fluvial flood mapping shows that the site is in flood zone 3, however it also shows that the site did not flood in any of the historic floods from 1950 to 1993. Water Lane to the immediate west of the site did flood in the 1960 event.
- 6.7. The best currently available data has been compared against the EA's defended modelled extents mapping. Table 2 below shows the potential water levels in the Exe channel during a defended event scenario with water levels taken from the nearest node (Node 66) that is likely to have the most impact on the site due to flooding, using a typical site level of 7.50m AOD. This assessment of depths on site ignores the impact of the new flood defences.
- 6.8. Feedback on the draft FRA from the EA cites that "*...node 65 is much closer and would represent the main direction of flood water getting to the site*" and should be used to assess that flood levels for the site. It is noted,

however, that the EA's Defended Modelled Fluvial Extent Map suggests that node 66 is a more likely direction for flooding based on the modelled events, notably, from the 1 in 50 year event (2%) where the flooding is more pronounced as opposed to Node 65 where there is only a very small chance of flooding for the 1 in 1000 year (0.1%) event and no flooding reaching the site for the more high risk events. Additionally, the Defended Modelled Fluvial Extent Map plus CC suggests that there is little risk of flooding for the 1% AEP +CC directed from Node 65. It is therefore concluded that Node still 66 best represents the main direction of flood reaching onto the site.

Event	1:20 (5%)	1:75 (1.33%)	1:100 (1%)	1:1000 (0.1%)	1:100 + CC
Level (m AOD)	7.59	8.07	8.07	8.61	8.02
Depth (m)	0.09	0.57	0.57	1.11	0.52

Table 1 – Water levels of node 66 during a defended scenario using a site level of 7.50m AOD ignoring the new defences.

Event	1:20 (5%)	1:75 (1.33%)	1:100 (1%)	1:1000 (0.1%)	1:100 + CC
Level (m AOD)	7.78	8.31	8.32	8.91	8.25
Depth (m)	0.28	0.81	0.82	1.41	0.75

Table 2 – Water levels of node 65 during a defended scenario using a site level of 7.50m AOD ignoring the new defences.

- 6.9. Undefended data has only been provided for the 1 in 100 and 1 in 1000-year events as undefended modelling scenarios do not represent the real-world situation these levels have not be used further in this assessment.

Event	1:100 (1%)	1:1000 (0.1%)
Level (m AOD)	7.79	8.32
Depth (m)	0.29	0.82

Table 3 – Water levels of node 66 during a breach scenario using a site level of 7.50m AOD

- 6.10. The recently constructed defences have a crest level of between 9.00m AOD and 9.46m AOD. These defences are therefore sufficiently high that they will defend the site from all events up to and including the 1 in 1000 year and the 1 in 100 plus climate change. The current flood defences suggests a freeboard of between 0.39m and 0.85m for the 1 in 1000 year event (Node 66)

- 6.11. The flood data provided does not include any breach assessment of the new defences. The defences include manually operated gates which are noted by the EA to be in very good condition. A gate failure is the most likely defence failure mechanism, however wall failure is also possible. Given the age of these defences the risk of failure is very low. It is also anticipated that the new flood modelling will consider breaching and failure of the defences and that flood depths will be predicted. As it stands, a high-level assessment suggests that as the gate widths are relatively narrow and the crest of the soft defence below the gate is higher than the former ground levels, that the volume of water that could flow into The Haven area will be much lower than what the 2011 modelling shows. Flood depths at the site will reduce as acknowledged by the EA officers.
- 6.12. Given that the development site area is potentially at risk of flooding, it is important to keep the ground levels as close as possible to the existing levels. This will avoid potentially displacing water to other nearby locations offsite.
- 6.13. The site as previously discussed is within FZ3, defined in the NPPF as having a high probability of flooding, however, considering the implementation of the flood defences discussed in 6.9 and 6.10, we can conclude that the hazards/risks of flooding will have been significantly lessened due to the new flood defence scheme and we consider the residual risk to be medium.
- 6.14. There remains the residual risks of defence failure and even more extreme events that could overtop the new defences. This new proposal should be managed by a Flood Warning and Evacuation Plan (FWEP) at Appendix G. The EA provides a flood warning service for the Exe. If an extreme event is predicted and the EA issue severe flood warnings, the residents and staff of this site will be able to leave the site as per the FWEP.

Reservoir and Artificial Flooding

- 6.15. The Gov.UK flood mapping (Appendix F4) shows that flooding from a reservoir failure will reach the boundary of this site. However, the risk is very small as reservoirs are well managed within the UK.
- 6.16. There are southwest water/private sewers and water supplies within the site and in the highway and areas to the north as shown in Appendix H. A failure of this infrastructure may result in localised flooding.

7. Surface Water Management

- 7.1. The site is currently served by a private surface water drainage system. This system is assumed to outfall to the adopted sewers in Water Lane at an unrestricted rate. The site comprises 100% impermeable surface.
- 7.2. The LLFA policy for brownfield sites would be to aim for a greenfield run-off rate for the 1 in 1-year storm event or 50% of the brownfield run off rate. Based on the existing site area of 1.67ha, this equates to 232l/s for the 1 in 1 year brownfield runoff (using a conservative rainfall intensity of 50mm as defined by CIRIA SuDS Manual C753, equation 24.5)

- 7.3. The level of discharge from the site needs to be reduced to meet the requirements of the LLFA and local flood planning guidance. It is proposed to reduce the surface water discharge from the redeveloped site to 5.0 l/s as per the LLFA's guidance, providing a 98% reduction in surface water flows off site, with excess flows being attenuate for the 1 in 100-year event plus 45% climate change. The proposed discharge stated above is pending a pre-development enquiry with Southwest Water (SWW).
- 7.4. The proposed site will have an approximate total impermeable area of 1.17ha. Preliminary FLOW calculations of the proposed storage can be seen in Appendix J for the proposed 1 in 1 year discharge rate of 4.7 l/s provisioned by a vortex flow control chamber. It is proposed that a 680m² of proprietary storage crates to a depth of between 1.5m and 2.4m will be required. This storage in conjunction with additional SuDS features such as rain gardens and permeable paving will accommodate, and store all flows up to the 1 in 100 year + 45% CC event. The proposed drainage strategy drawing 61645-RJL-XX-XX-DR-C-0001 can be seen at Appendix I
- 7.5. It is proposed that all parts of the drainage system will be managed and maintained by a company appointed by the developer. A maintenance schedule is attached at Appendix L
- 7.6. To improve the water quality of the proposed roof run-off collected by the proposed drainage system serving the new development, a proprietary treatment device will be provided prior to the discharge off site like that shown at Appendix M. Water quality for the car park areas is provided by the permeable pavements

Land Use	TSS	Metals	Hydrocarbons
<300/day	0.5	0.5	0.4
>300/day	0.7	0.6	0.7

Table 1: Pollution indices (Table 26.2 SuDS Manual)

SuDS Component	TSS	Metals	Hydrocarbons
Permeable Paving	0.5	0.5	0.6
Attenuation	0.25	0.25	0.3

Table 2: SuDS mitigation indices (Table 26.3 SuDS Manual)

- 7.7. Foul flows have been calculated in accordance with British Water Flows and Loads 4 providing a discharge rate of 12l/s. The foul water will discharge into the Ø750mm combined sewer in Water Lane Road. The foul water calculation is shown at Appendix K.

8. Occupants and Users of the development

- 8.1. The existing site is occupied by commercial uses and parking. This will be occupied during business opening times and the number of occupants and

visitors will peak at retail and leisure times such as Saturday lunchtime. Overnight the site is likely to be almost unoccupied.

- 8.2. The commercial elements of the proposals will continue with a similar occupancy pattern and numbers as the existing use.
 - 8.3. The proposed residential use will be always occupied; hence, this will increase the number of people that are potentially at risk should a flood occur. As noted above, based on the information available the site is protected from flooding in the design event and therefore the residents will not be inconvenienced should such an event occur, and the defences perform as designed.
 - 8.4. The EA has suggested that the FFL of the residential areas and substations be set at 1.05m (700mm and 350mm freeboard) above the average existing site level. External levels are as described in paragraph 2.5; the average level is therefore 7.50m AOD. The external areas of the proposed site have been reduced as far as practical to reduce the potential for the new arrangements to displace water during a flood event. The buildings have been designed to allow water pass below the floor slabs of the residential areas.
 - 8.5. The FFL of the commercial areas has been set at 50mm above existing floor levels. It is accepted that this is a modest betterment over the existing situation. There are several constraints on the commercial areas not least of which is access for mobility impaired from the adjacent hard paved areas. The point made above regarding the lifting of the building also apply to these areas.
 - 8.6. Should a design flood event occur this site would be protected by the new defences. The commercial units can be closed and left unoccupied while the risk of breach or overtopping is high, this is very similar to the current situation. The residents will be able to go about their usual business as water should be entering The Haven area.
 - 8.7. If an event of larger scale is predicted and the risk of defence failure or overtopping is high, then the site can be evacuated in accordance with the Flood Warning and Evacuation Plan (FWEP) at appendix G. Residents can be relocated to the nearby city centre which is much higher than the riverside area.
 - 8.8. In the extremely unlikely event that an un-warned flood overtops or breaches the defences and water within The Haven area is such that it is not safe for residents to move about they can take refuge in their dwellings until the situation normalises.
- 9. Exception test.**
- 9.1. These proposals will bring wider benefits to the community by increasing trade at an underused site, which will offer employment and taxation benefits locally.
 - 9.2. The proposals will also provide much needed housing types comprising of one, two and three-bedroom apartments including a three-bedroom

townhouse that will provide 'Build-to-Rent' 'and Co-living' accommodation in a very sustainable location.

- 9.3. The site is at a residual risk of fluvial flooding from extreme events that could overtop or breach the new flood defences, however there are further mitigations that can be provided for the users, residents and the buildings as discussed in this report.
- 9.4. Flood resilience is described in the EA/DeFRA technical manual Improving the flood performance of new buildings – Flood resilient construction, (2007) as “*sustainable measures that can be incorporated into the building fabric, fixtures and fittings to reduce the impact of floodwater on the property. This allows easier drying and cleaning, ensures that the structural integrity of the building is not compromised and reduces the amount of time until the building can be re-occupied.*” Therefore, the FFLs for the commercial units will be provided up to 7.95m AOD to allow these premises to be reoccupied quickly should a flood occur providing a flood resilient construction (water entry strategy) in accordance with the definition above. This FFL is above the current 7.90m AOD threshold levels. The FFLs for the residential units will be set above the design flood levels at 8.50m AOD to provide flood resistance, preventing floodwater from entering these areas and therefore, all residential areas should remain dry. These levels have been carefully considered with respect to the impact on the overall floor to floor and height restrictions already imposed upon the development by the Local Planning Authority (LPA). There is a possibility of an even more extreme event occurring, and so, all the residents will have access to a refuge at higher floor levels.
- 9.5. By reducing the surface water outflow rate to the receiving system these proposals will reduce flood risk on and offsite.
- 9.6. The Exception test is therefore passed in the applicant's view.

10. Residual Risk

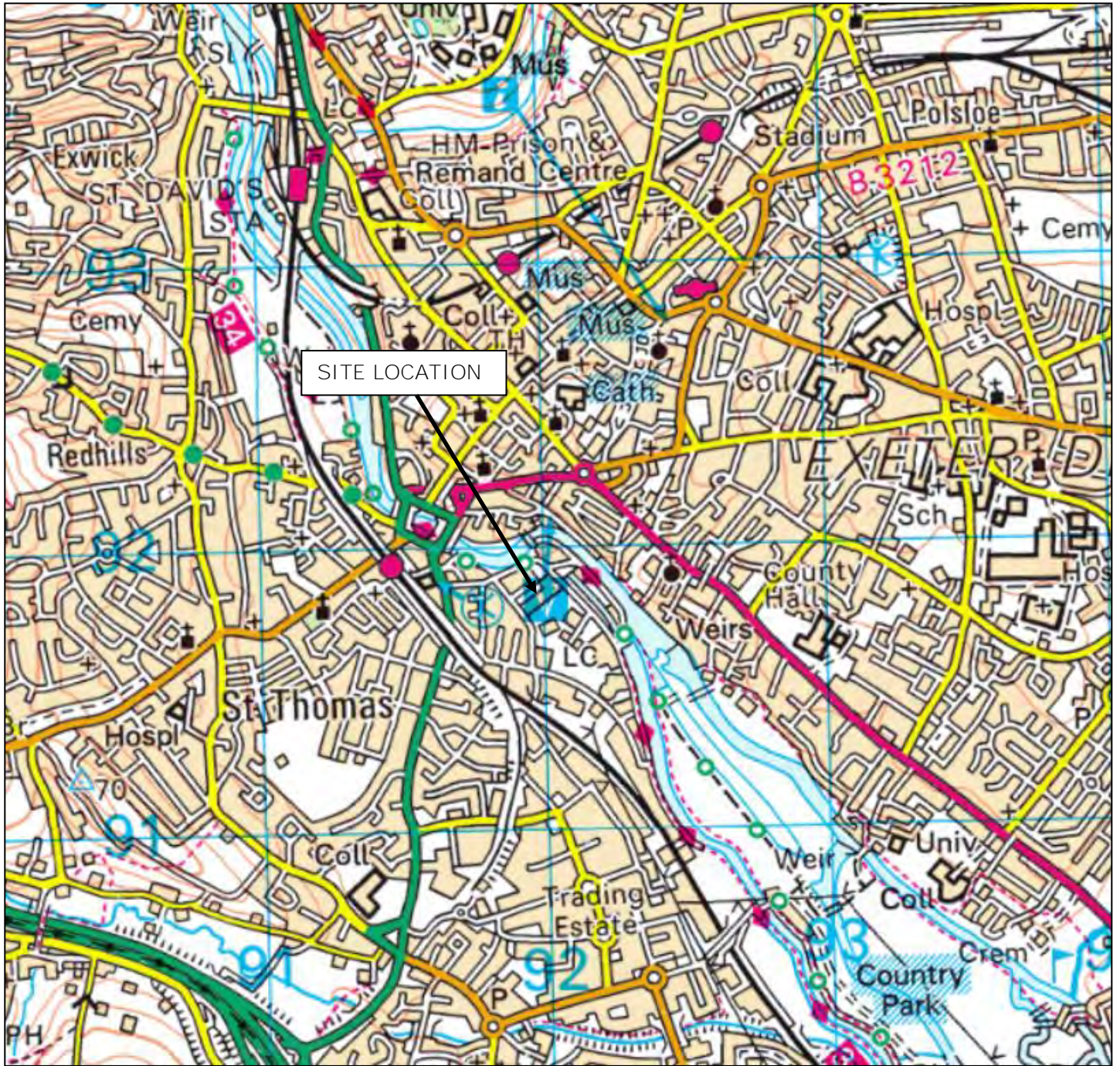
- 10.1. Residual risks at this site include but are not limited to:
- 10.2. Extreme rainfall events that exceed the capacity of the drainage system, reservoir failure or flooding from the River Exe should the new defences be overtopped by a very extreme event, or the defences were to fail. Currently, the finished floor levels of the residential buildings have been set above the predicted 2011 water levels, with due consideration for possible changes in the proposed EA revised fluvial flood model and building height restrictions discussed in paragraph 9.4. It is, however, anticipated that it may be possible to reduce the FFLs pending release the revised modelling of the new flood defences. The thresholds of all the commercial buildings, discussed in paragraph 9.4 will be designed to ensure that water standing or flowing over the adjacent land surface is not able to freely enter for more information see the Flood Warning & Evacuation Plan (FWEP) in Appendix G.

Appendices

Title:	SITE SPECIFIC FLOOD RISK ASSESSMENT
Project:	Haven Banks, Exeter
Client:	Welbeck CP
Project No.:	61645

Appendix A

Site Location Plan



REPRODUCED FROM ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE, © CROWN COPYRIGHT RICHARD JACKSON LTD – ACC No. 100002572



consulting civil & structural engineers
 847 The Crescent, Colchester, CO4 9YQ
 Tel: 01206 228 800

Haven Road, Exeter, EX2 8BY

FIGURE 1

SITE LOCATION PLAN

SCALE: N.T.S.

JOB NO: 61645

Appendix B

Environment Agency Flood Map for Planning

Flood map for planning

Your reference
Haven Rd

Location (easting/northing)
291968/91817

Created
8 Feb 2022 14:37

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

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

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

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

Your reference

Haven Rd

Location (easting/northing)

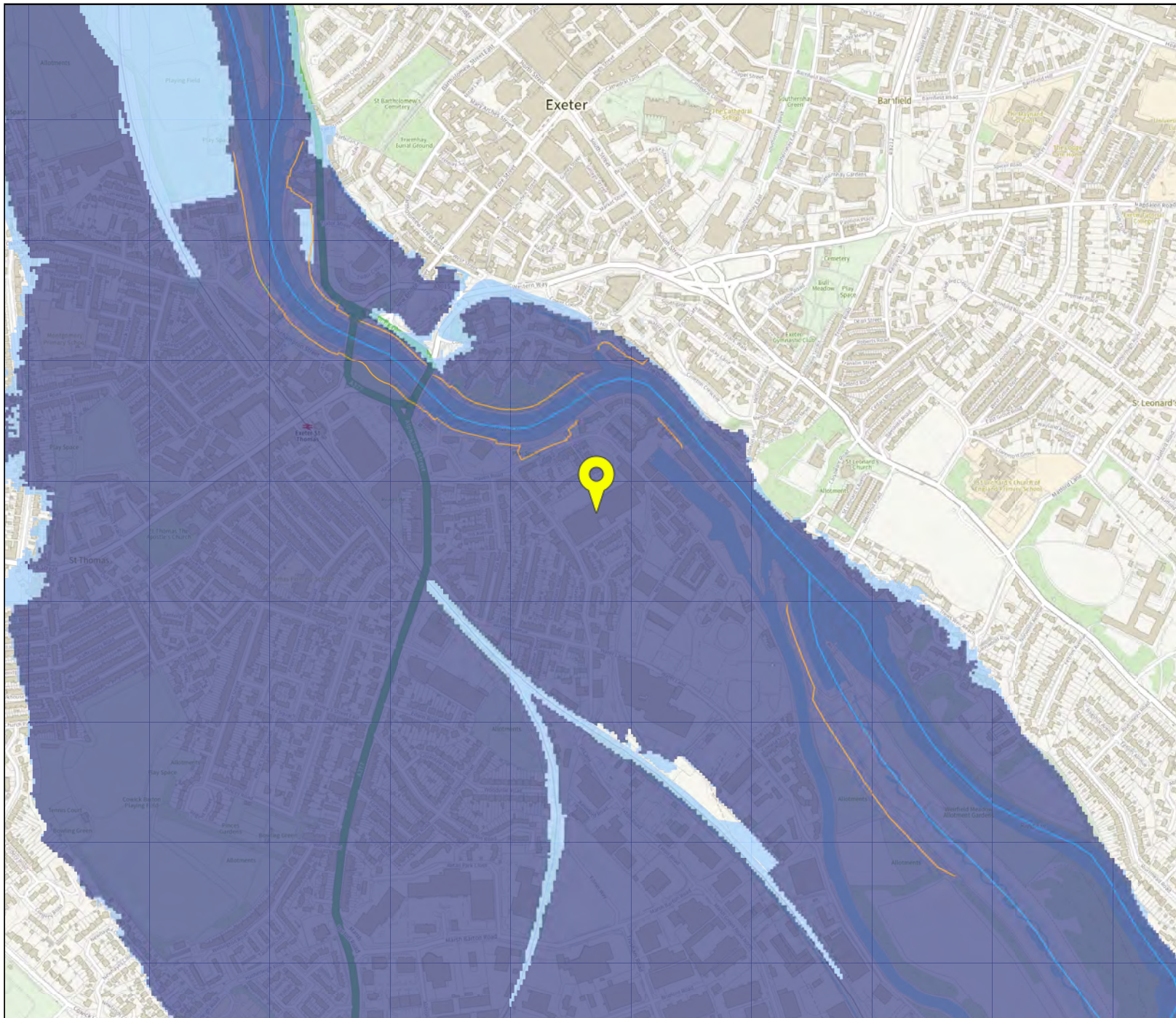
291968/91817

Scale

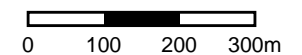
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Created

8 Feb 2022 14:37

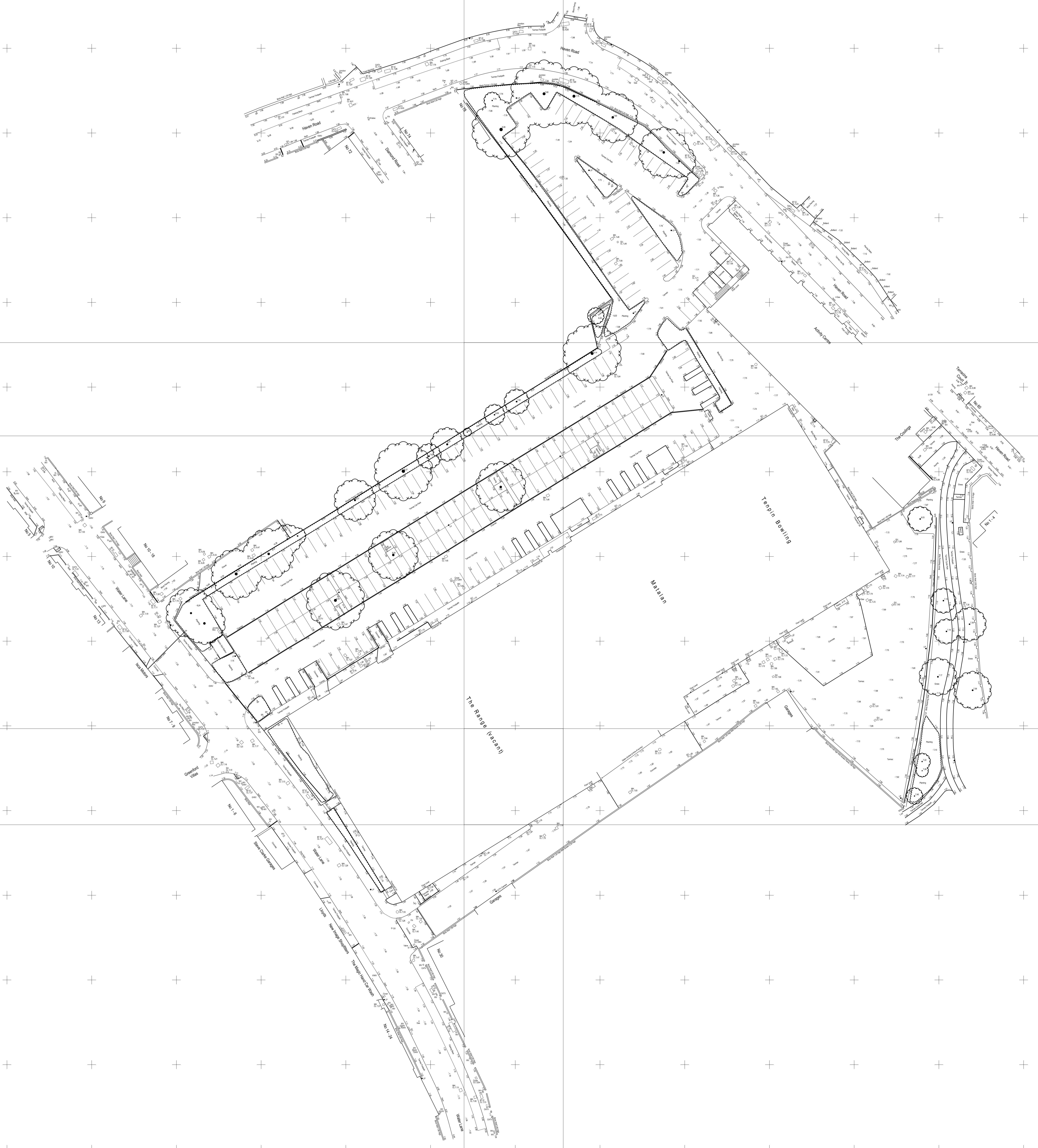


-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



Appendix C

Topographical Survey



Appendix D

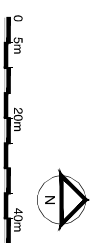
Proposed Site Plan



Part Comments

Date	By	Comments
21/03/2022	AM	Final Design
15/03/2022	AM	Final Design
04/03/2022	AM	Final Design
17/02/2022	AM	Final Design
17/02/2022	AM	Final Design

Drawn: AM
 Checked: AM
 Date: 21/03/2022
 Scale: 1:1500
 Project: Haven Road, Exeter
 Client: PFI
 Drawing: Ground Floor Plan
 Ref: 20021

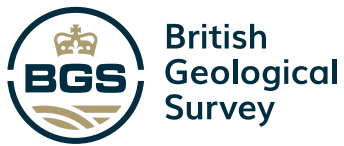


Client: Haven Road, Exeter
 Project: Haven Road, Exeter
 Drawing Title: Proposed Site Layout
 Ground Floor Plan
 Date: 21/03/2022
 Scale: 1:1500
 Drawing No: 20021

PFIER WHITEBECK
 Planning & Architecture
 100 High Street, Exeter, Devon, EX1 1AA
 Tel: 01392 266000
 Email: info@pfiwhitebeck.co.uk
 Website: www.pfiwhitebeck.co.uk

Appendix E

BGS Borehole Record

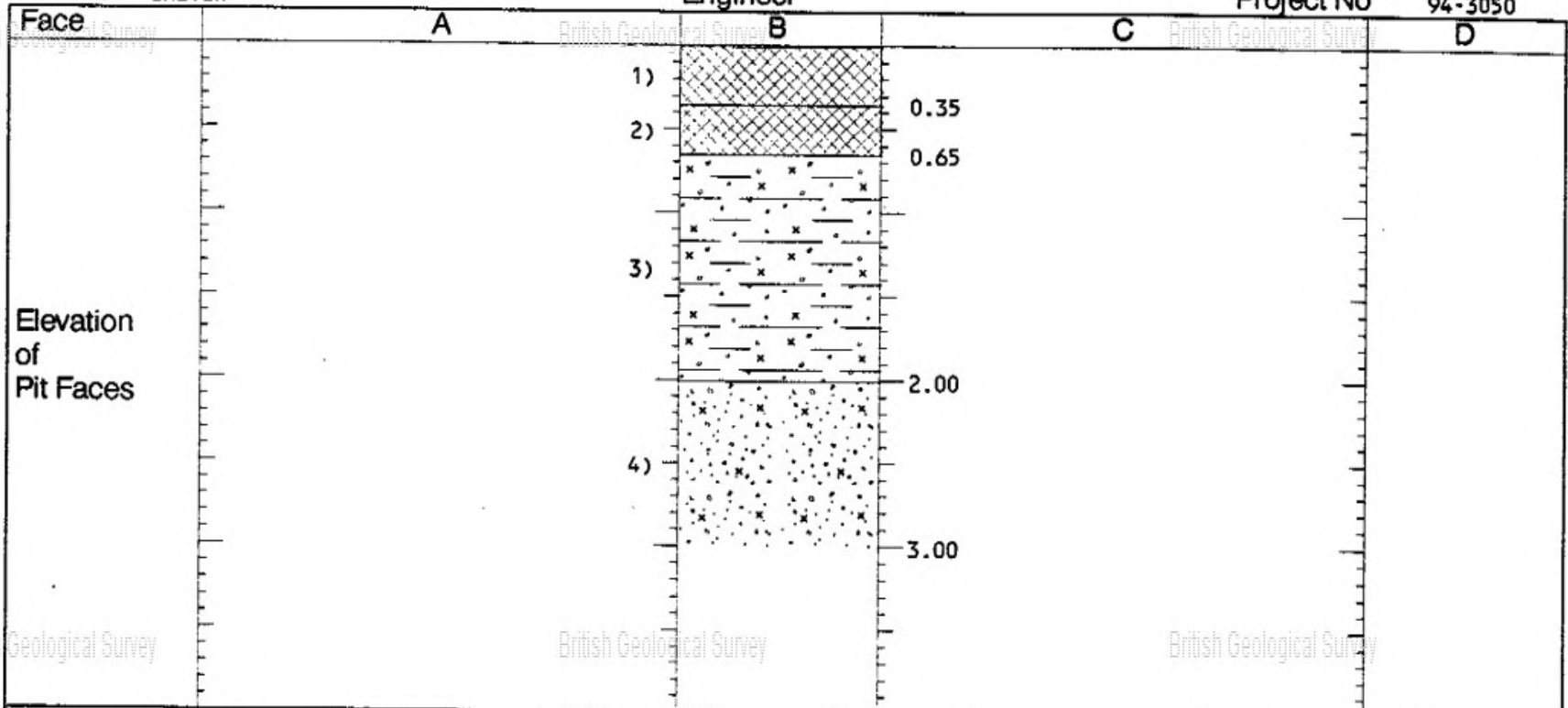


[Report an issue with this borehole](#)

TRIAL PIT RECORD

SX99SW/370

Project HAVEN ROAD Client KNAPP NEW HOMES LTD Trial Pit 2
Date 02/11/94
Location EXETER Engineer Project No 94-3050



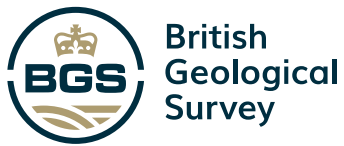
Samples and Tests		Strata		
Depth	Type	Strength kN/m ²	Reference and Face B Depth	Description
			1) 0.35	MADE GROUND consisting of gravel sub-base with some brick rubble.
0.40	J		2) 0.65	MADE GROUND consisting of dark brown slightly sandy silty clay with some shell debris, charcoal and brick fragments.
0.70 0.90 1.00	V J V	25.0 27.0	3) 2.00	Soft to firm red brown slightly fine sandy silty CLAY with occasional to some sub-angular to rounded gravel. ALLUVIUM
2.70	B		4) 3.00	Loose to moderately dense red brown slightly silty very sandy rounded to sub-rounded GRAVEL. Gravels locally black stained below 2.5m. ALLUVIUM

Plant	JCB 3CX	Dimensions B = 0.6 A C = 1.8 D Bearing: 035° ↑	Location Sketch Plan
Shoring	NONE USED		
Stability	Collapsing below 2.0m.		
Groundwater	None encountered, gravels damp below 2.5m.		

Remarks



Logged by: DLJ Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres. Vert.Scale:1:50



[Report an issue with this borehole](#)

TRIAL PIT RECORD

SX99SW1375

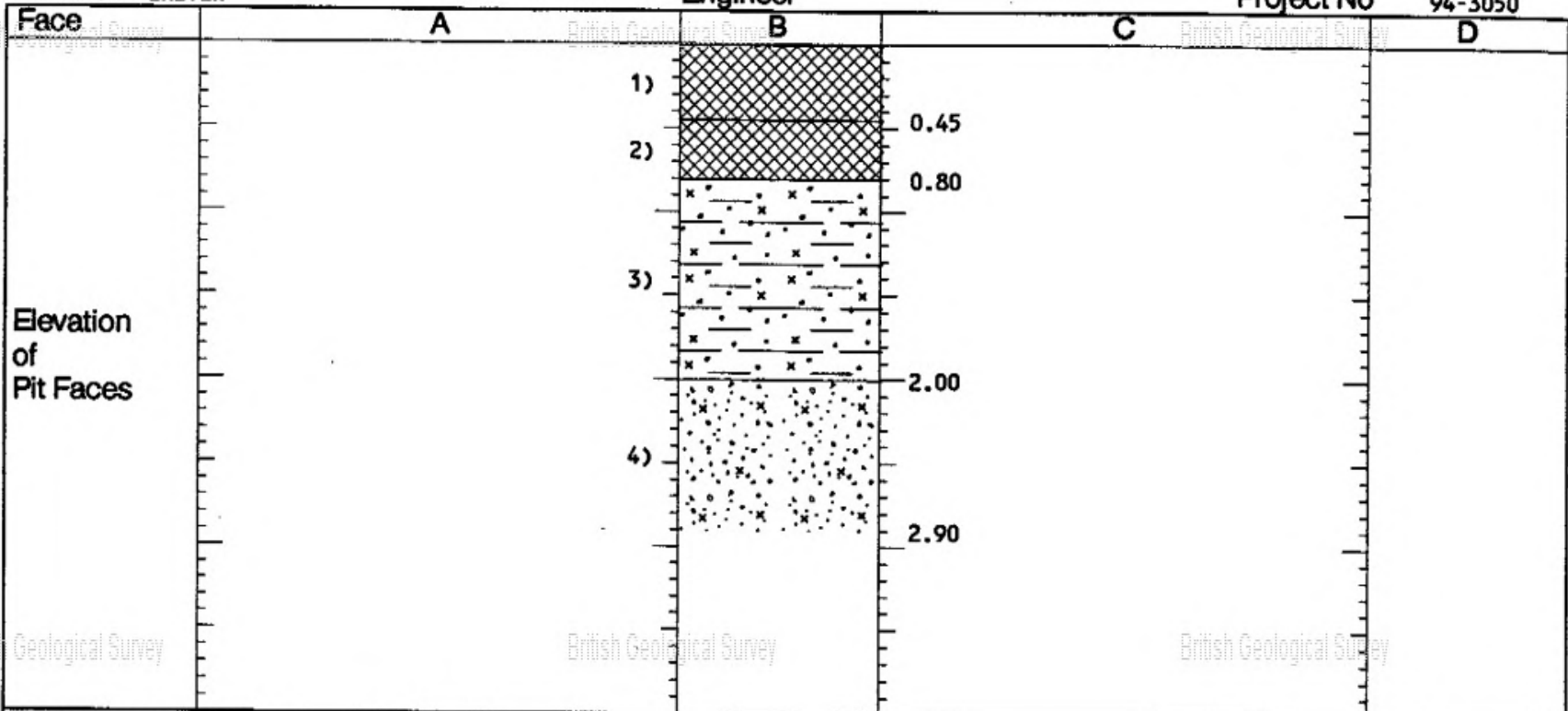
Project HAVEN ROAD Client KNAPP NEW HOMES LTD Trial Pit 7

Date 02/11/94

Location EXETER

Engineer

Project No 94-3050

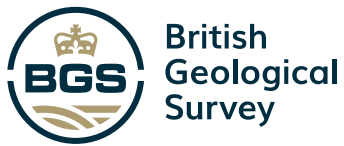


Samples and Tests			Strata	
Depth	Type	Strength kN/m ²	Reference and Face B Depth	Description
0.30	J		1) 0.45	MADE GROUND consisting of red brown and dark grey brown silty clay with some gravel rubble, shell debris and polythene.
			2) 0.80	MADE GROUND consisting of brown silty clay with shell debris and charcoal.
1.00 1.00	J V	25.0	3) 2.00	Soft to firm red brown slightly fine sandy silty CLAY with occasional to some rounded to sub-rounded gravel. ALLUVIUM
			4) 2.90	Loose moderately dense brown slightly silty very sandy sub-rounded to rounded GRAVEL. Some local black staining.

Plant	JCB 3CX	Dimensions B = 0.6 C = 1.9 D Bearing: 050° ↑	Location Sketch Plan
Shoring	None Used		
Stability	Collapsing below Ground Level.		
Groundwater	None encountered		

Remarks Central zone of trial pit disrupted by earlier excavation.

Logged by: DLJ Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres. Vert.Scale:1:50

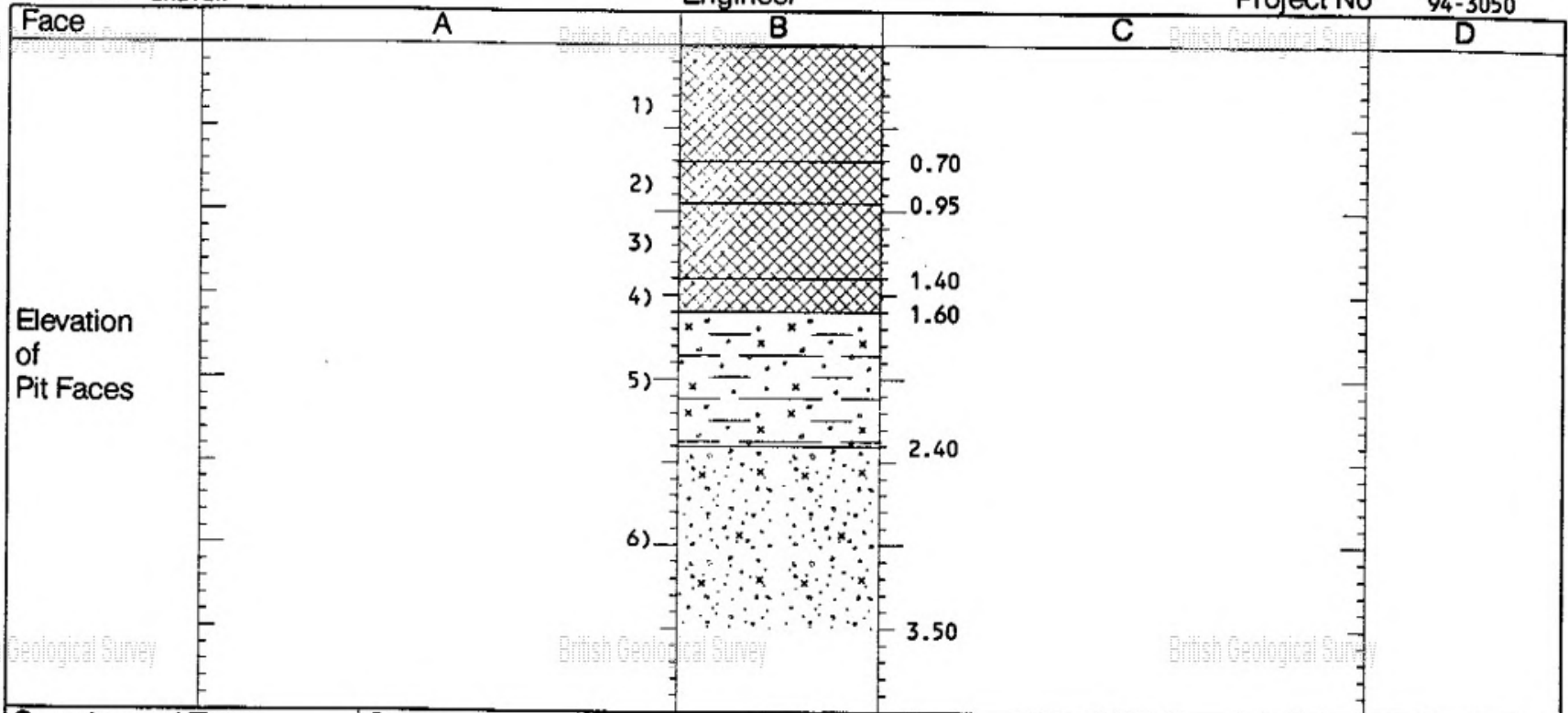


[Report an issue with this borehole](#)

TRIAL PIT RECORD

SX99SW1376

Project HAVEN ROAD Client KNAPP NEW HOMES LTD Trial Pit 8
Date 02/11/94
Location EXETER Engineer Project No 94-3050



Samples and Tests			Strata	
Depth	Type	Strength kN/m ²	Reference and Face B Depth	Description
0.50	B		1) 0.70	MADE GROUND consisting of dark brown and black clayey gravel with tarmac, slate and brick rubble. Creosote/oil odour.
			2) 0.95	MADE GROUND consisting of brown silty clay with some shell debris, charcoal and pottery.
1.00	V	22.0	3) 1.40	MADE GROUND consisting of soft red brown slightly fine sandy silty clay with some gravel.
			4) 1.60	MADE GROUND consisting of dark grey brown and black silty clay with much mortar and concrete fragments.
2.00	J		5) 2.40	Soft red brown and grey-black mottled silty CLAY with occasional gravel and some organic speckling. ALLUVIUM
			6) 3.50	Loose to moderately dense brown slightly silty very sandy rounded to sub-rounded GRAVEL. ALLUVIUM

Plant	JCB 3CX	Dimensions B = 0.6 Bearing: 150° ↑	Location Sketch Plan
Shoring	None Used		
Stability	Collapsing below 0.9m.		
Groundwater	Damp at 3.5m. No clear strike		

Remarks



Logged by: DLJ Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres. Vert.Scale:1:50

Appendix F1

Surface Water Flood Risk Mapping

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

Location

High risk: depth

EX2 8BY



Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected

[View the flood risk information for another location \(/postcode\)](#)

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

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

Location

Medium risk: depth

EX2 8BY



Surface water flood risk: water depth in a medium risk scenario
Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected

[View the flood risk information for another location \(/postcode\)](#)

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

Learn more about this area's flood risk

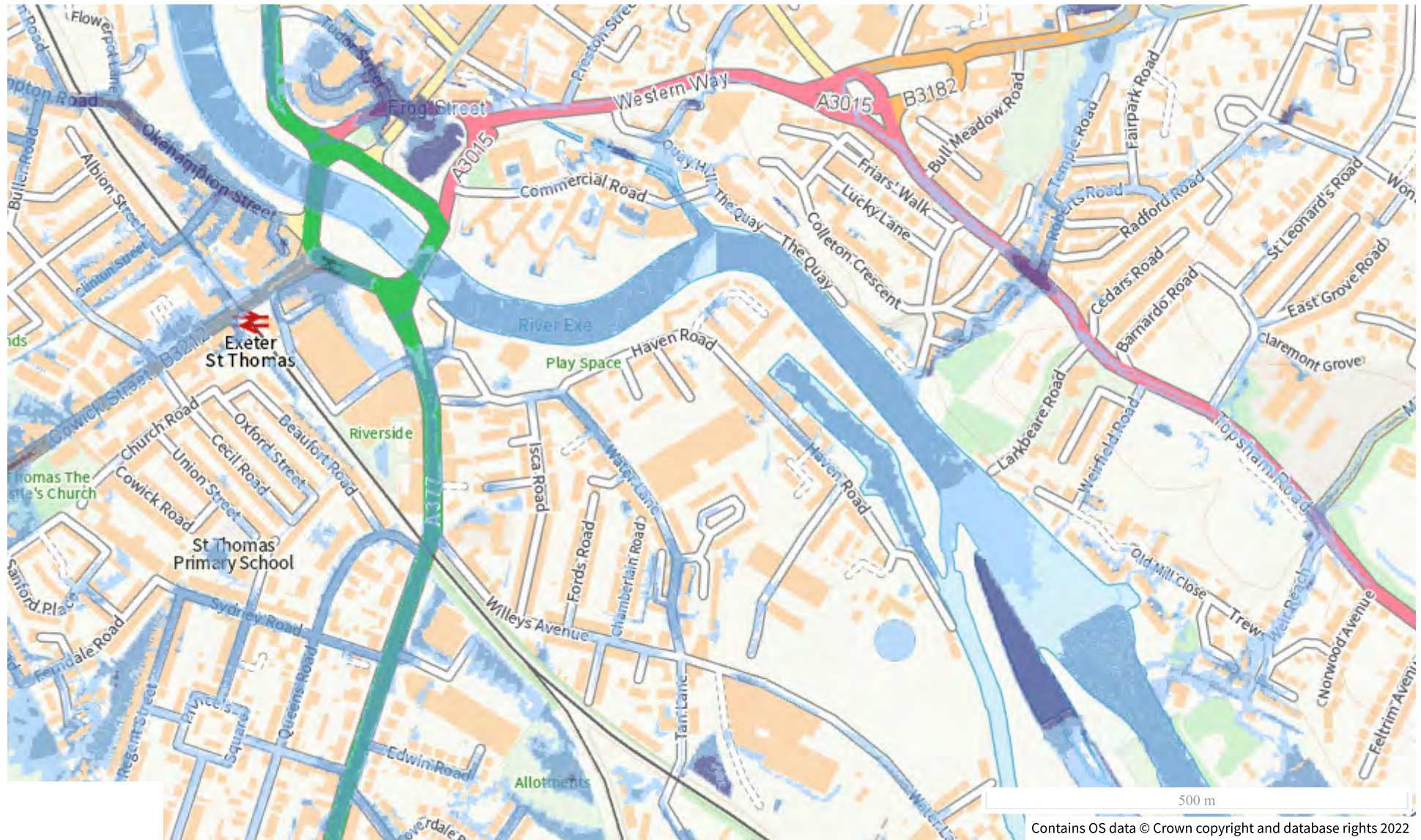
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Location

Low risk: depth

EX2 8BY



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

[View the flood risk information for another location \(/postcode\)](#)

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

Appendix F2

Fluvial Flood Risk Mapping

Learn more about this area's flood risk

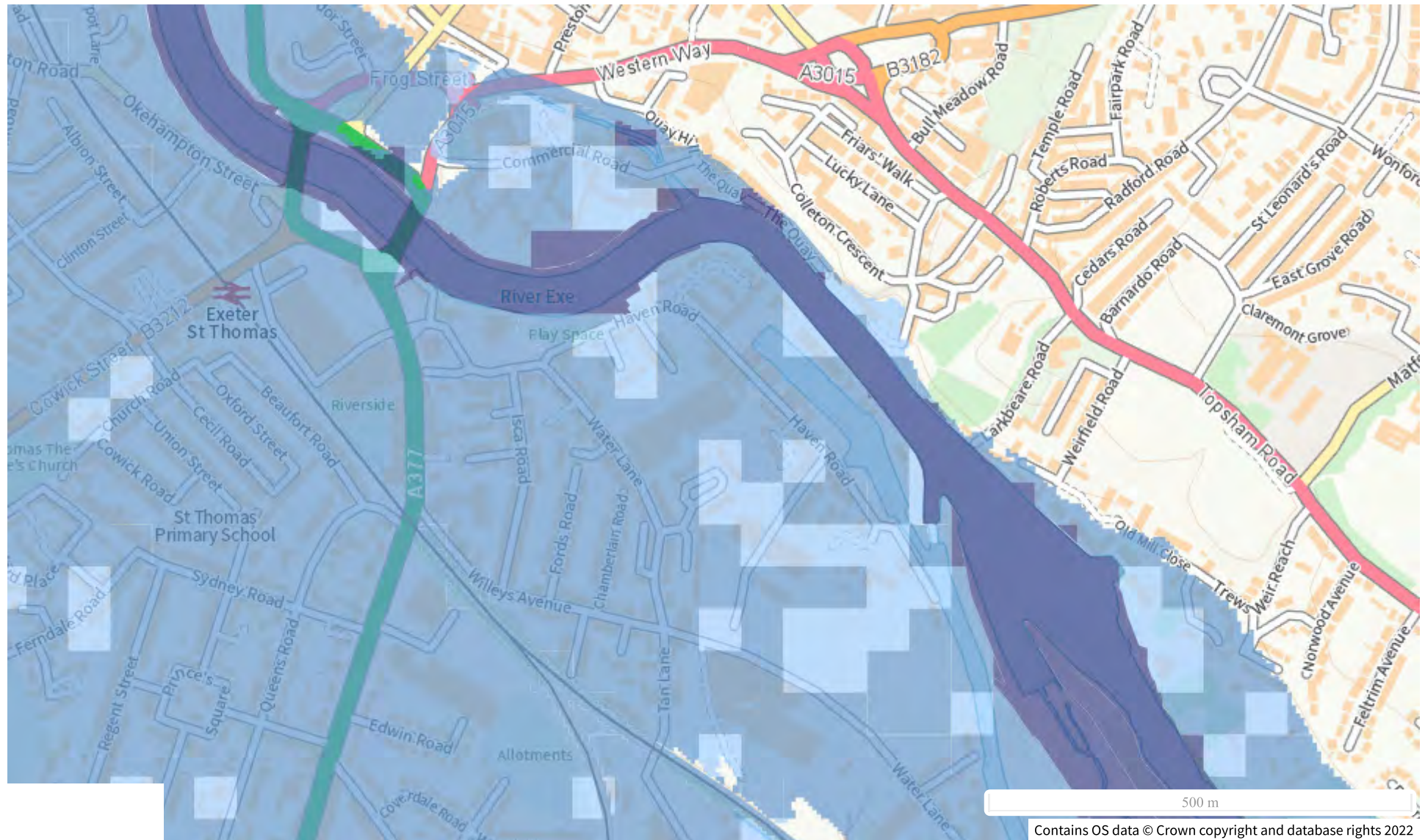
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Location

Extent of flooding

EX2 8BY



Extent of flooding from rivers or the sea

[High](#) [Medium](#) [Low](#) [Very low](#) Location you selected

[View the flood risk information for another location \(/postcode\)](#)

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