PLANNING PORTAL

This form is specifically designed to be printed and completed offline.
Please complete this form in block capitals using black ink to facilitate scanning.

You are advised to read the accompanying guidance notes and per-question help text.

If you would rather make this application online, you can do so on our website: https://www.planningportal.co.uk/apply

Application for Planning Permission

Town and Country Planning Act 1990 (as amended)

Privacy Notice

This form is provided by Planning Portal and based on the requirements provided by Government for the sole purpose of submitting information to the Local Planning Authority in accordance with the legislation detailed on this form and 'The Town and Country Planning (Development Management Procedure) (England) Order 2015 (as amended).

Please be aware that once you have downloaded this form, Planning Portal will have no access to the form or the data you enter into it. Any subsequent use of this form is solely at your discretion, including the choice to complete and submit it to the Local Planning Authority in agreement with the declaration section.

Upon receipt of this form and any supporting information, it is the responsibility of the Local Planning Authority to inform you of its obligations in regards to the processing of your application. Please refer to its website for further information on any legal, regulatory and commercial requirements relating to information security and data protection of the information you have provided.

Local Planning Authority details:

Gloucester City Council
Transforming Your City

Development Control
Gloucester City Council
PO Box 3252, Gloucester, GL1 9FW
01452 396396
development.control@gloucester.gov.uk
www.gloucester.gov.uk/planning

Publication on Local Planning Authority websites

Information provided on this form and in supporting documents may be published on the authority's planning register and website.
Please ensure that the information you submit is accurate and correct and does not include personal or sensitive information.
If you require any further clarification, please contact the Local Planning Authority directly.

1. Applicant Name and Address

Title:	Mr
First name:	ANDREW
Last name:	WARNER
Company (optional):	ROOFTOP HOUSING GROUP
Unit:	
House number:	70
House suffix:	
House name:	ROOFTOP HOUSING GROUP LTD
Address 1:	HIGH STREET
Address 2:	
Address 3:	
Town:	EVESHAM
County:	
Country:	
Postcode:	WR11 4YD

2. Agent Name and Address

Title:	MR
First name:	ANDRE
Last name:	GARDNER
Company (optional):	BM3 ARCHITECTURE LTD
Unit:	
House number:	28
House suffix:	
House name:	
Address 1:	DICKFORD STREET
Address 2:	
Address 3:	
Town:	BIRMINGHAM
County:	
Country:	
Postcode:	B5 5QH

3. Description of the Proposal

Please describe the proposed development, including any change of use:

CHANGE OF USE FOR THE CREATION OF NEW PUBLIC OPEN SPACE WITH PEDESTRIAN ACCESS AND ASSOCIATED WORKS.

Has the building, work or change of use already started? ☐ Yes ☒ No

If Yes, please state the date when building, work or use were started (DD/MM/YYYY): _____ (date must be pre-application submission)

Has the building, work or change of use been completed? ☐ Yes ☒ No

If Yes, please state the date when the building, work or change of use was completed (DD/MM/YYYY): _____ (date must be pre-application submission)

Reference number of permission in principle being relied on (technical details consent applications only): _____

Is the proposal for public service infrastructure development (within the meaning of article 2 of S.I. 2015/595 as amended by article 3 of S.I. 746/2021)? ☐ Yes ☒ No

4. Site Address Details

Please provide the full postal address of the application site.

Unit: _____ House number: _____ House suffix: _____

House name: FORMER SITE OF NORVILLE OPTICAL

Address 1: HATHERLEY ROAD

Address 2: TREDWORTH

Address 3: _____

Town: GLOUCESTER

County: _____

Postcode (optional): _____

Description of location or a grid reference.
(must be completed if postcode is not known):

Easting: 384008 Northing: 217119

Description:

SITE OF THE NOW DEMOLISHED NORVILLE OPTICAL CO. LTD, NORTH OF THE SUD BROOK WATERCOURSE.

5. Pre-application Advice

Has assistance or prior advice been sought from the local authority about this application? ☐ Yes ☒ No

If Yes, please complete the following information about the advice you were given. (This will help the authority to deal with this application more efficiently).

Please tick if the full contact details are not known, and then complete as much as possible: ☐

Officer name: _____

Reference: _____

Date (DD/MM/YYYY): _____
(must be pre-application submission)

Details of pre-application advice received?

6. Pedestrian and Vehicle Access, Roads and Rights of Way

Is a new or altered vehicle access proposed to or from the public highway? ☐ Yes ☒ No

Is a new or altered pedestrian access proposed to or from the public highway? ☒ Yes ☐ No

Are there any new public roads to be provided within the site? ☐ Yes ☒ No

Are there any new public rights of way to be provided within or adjacent to the site? ☐ Yes ☒ No

Do the proposals require any diversions /extinguishments and/or creation of rights of way? ☐ Yes ☒ No

If you answered Yes to any of the above questions, please show details on your plans/drawings and state the reference of the plan (s)/drawings(s)

70939 - D900 LANDSCAPE PLAN

7. Waste Storage and Collection

Do the plans incorporate areas to store and aid the collection of waste? ☐ Yes ☒ No

If Yes, please provide details:

Have arrangements been made for the separate storage and collection of recyclable waste? ☐ Yes ☒ No

If Yes, please provide details:

8. Authority Employee / Member

It is an important principle of decision-making that the process is open and transparent. For the purposes of this question, "related to" means related, by birth or otherwise, closely enough that a fair-minded and informed observer, having considered the facts, would conclude that there was bias on the part of the decision-maker in the local planning authority.

Do any of the following statements apply to you and/or agent? ☐ Yes ☒ No

With respect to the authority, I am:
(a) a member of staff
(b) an elected member
(c) related to a member of staff
(d) related to an elected member

If Yes, please provide details of their name, role and how you are related to them.

9. Materials

If applicable, please state what materials are to be used externally. Include type, colour and name for each material:

	Existing (where applicable)	Proposed	Not applicable	Don't Know
Walls			☒	☐
Roof			☒	☐
Windows			☒	☐
Doors			☒	☐
Boundary treatments (e.g. fences, walls)	RED BRICK WALL	RED BRICK WALL AND BLACK POWDER COATED RAILING	☐	☐
Vehicle access and hard-standing	UNREINFORCED CONCRETE SLAB AND BITUMEN MACADAM SURFACE, BARE GROUND.	SELF-BINDING GRAVEL, LAWN AND LANDSCAPE PLANTING.	☐	☐
Lighting			☒	☐
Others (please specify)			☒	☐

Are you supplying additional information on submitted plan(s)/drawing(s)/design and access statement? ☒ Yes ☐ No

If Yes, please state references for the plan(s)/drawing(s)/design and access statement:

70999 DESIGN AND ACCESS STATEMENT SUD BROOK GARDEN, TODDWORTH, GLOUCESTER
70939 001 SITE LOCATION 70939 - D500 LANDSCAPE PLAN

10. Vehicle Parking

Please provide information on the existing and proposed number of on-site parking spaces:

Type of Vehicle	Total Existing	Total proposed (including spaces retained)	Difference in spaces
Cars	0	0	-
Light goods vehicles/ public carrier vehicles	0	0	-
Motorcycles	0	0	-
Disability spaces	0	0	-
Cycle spaces	0	0	-
Other (e.g. Bus)	0	0	-
Other (e.g. Bus)	0	0	-

11. Foul Sewage

Please state how foul sewage is to be disposed of:

- ☐ Mains sewer
- ☐ Cess pit
- ☐ Septic tank
- ☒ Other
- ☐ Package treatment plant

Are you proposing to connect to the existing drainage system? ☐ Yes ☒ No

If Yes, please include the details of the existing system on the application drawings and state references for the plan(s)/drawing(s):

12. Assessment of Flood Risk

Is the site within an area at risk of flooding? (Refer to the Environment Agency's Flood Map showing flood zones 2 and 3 and consult Environment Agency standing advice and your local planning authority requirements for information as necessary.) ☒ Yes ☐ No

If Yes, you will need to submit a Flood Risk Assessment to consider the risk to the proposed site.

Is your proposal within 20 metres of a watercourse (e.g. river, stream or beck)? ☒ Yes ☐ No

Will the proposal increase the flood risk elsewhere? ☐ Yes ☒ No

How will surface water be disposed of?

- ☒ Sustainable drainage system
- ☐ Existing watercourse
- ☐ Soakaway
- ☐ Pond/lake
- ☐ Main sewer

13. Biodiversity and Geological Conservation

To assist in answering the following questions refer to the guidance notes for further information on when there is a reasonable likelihood that any important biodiversity or geological conservation features may be present or nearby and whether they are likely to be affected by your proposals.
Having referred to the guidance notes, is there a reasonable likelihood of the following being affected adversely or conserved and enhanced within the application site, or on land adjacent to or near the application site?

a) Protected and priority species:

- ☐ Yes, on the development site
- ☐ Yes, on land adjacent to or near the proposed development
- ☒ No

b) Designated sites, important habitats or other biodiversity features:

- ☐ Yes, on the development site
- ☐ Yes, on land adjacent to or near the proposed development
- ☒ No

c) Features of geological conservation importance:

- ☐ Yes, on the development site
- ☐ Yes, on land adjacent to or near the proposed development
- ☒ No

14. Existing Use

Please describe the current use of the site:

THE SITE IS CURRENTLY USED AS A SECURE LOCATION FOR CONSTRUCTION MATERIALS AND COMPRISES HARD PAVED BUILDING SLAB AND OTHER SURFACES REMAINING FROM PRIOR DEMO.

Is the site currently vacant? ☐ Yes ☒ No

If Yes, please describe the last use of the site:

When did this use end (if known)? DD/MM/YYYY (date where known may be approximate)

Does the proposal involve any of the following? If yes, you will need to submit an appropriate contamination assessment with your application.

Land which is known to be contaminated? ☐ Yes ☐ No

Land where contamination is suspected for all or part of the site? ☐ Yes ☐ No

A proposed use that would be particularly vulnerable to the presence of contamination? ☐ Yes ☐ No

15. Trees and Hedges

Are there trees or hedges on the proposed development site? ☐ Yes ☒ No

And/or: Are there trees or hedges on land adjacent to the proposed development site that could influence the development or might be important as part of the local landscape character? ☐ Yes ☒ No

If Yes to either or both of the above, you may need to provide a full Tree Survey, at the discretion of your local planning authority. If a Tree Survey is required, this and the accompanying plan should be submitted alongside your application. Your local planning authority should make clear on its website what the survey should contain, in accordance with the current 'BS5837: Trees in relation to design, demolition and construction - Recommendations'.

16. Trade Effluent

Does the proposal involve the need to dispose of trade effluents or waste? ☐ Yes ☒ No

If Yes, please describe the nature, volume and means of disposal of trade effluents or waste

17. Residential Units (Including Conversion)

Does your proposal include the gain, loss or change of use of residential units? ☐ Yes ☒ No
If Yes, please complete details of the changes in the tables below:

Proposed Housing

Market Housing	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	A

Social, Affordable or Intermediate Rent	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	B

Affordable Home Ownership	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	C

Starter Homes	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Bedsit/studios	☐						c
Other	☐						d
						Totals *(a + b + c + d) =*	D

Self Build and Custom Build	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Bedsit/studios	☐						c
Other	☐						d
						Totals *(a + b + c + d) =*	E

Total proposed residential units *(A + B + C + D + E) =* ____

Existing Housing

Market Housing	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	F

Social, Affordable or Intermediate Rent	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	G

Affordable Home Ownership	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Sheltered housing	☐						c
Bedsit/studios	☐						d
Cluster flats	☐						e
Other	☐						f
						Totals *(a + b + c + d + e + f) =*	H

Starter Homes	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Bedsit/studios	☐						c
Other	☐						d
						Totals *(a + b + c + d) =*	I

Self Build and Custom Build	Not known	Number of Bedrooms 1	2	3	4+	Unknown	Total
Houses	☐						a
Flats/maisonettes	☐						b
Bedsit/studios	☐						c
Other	☐						d
						Totals *(a + b + c + d) =*	J

Total existing residential units *(F + G + H + I + J) =* ____

TOTAL NET GAIN or LOSS of RESIDENTIAL UNITS (Proposed Housing Grand Total - Existing Housing Grand Total): ____

18. All Types of Development: Non-residential Floorspace

Does your proposal involve the loss, gain or change of use of non-residential floorspace? ☐ Yes ☒ No

If you have answered Yes to the question above please add details in the following table:

Use class/type of use		Not applicable	Existing gross internal floorspace (square metres)	Gross internal floorspace to be lost by change of use or demolition (square metres)	Total gross internal floorspace proposed (including change of use)(square metres)	Net additional gross internal floorspace following development (square metres)
A1	Shops	☐				
	Net tradable area:	☐				
A2	Financial and professional services	☐				
A3	Restaurants and cafes	☐				
A4	Drinking establishments	☐				
A5	Hot food takeaways	☐				
B1 (a)	Office (other than A2)	☐				
B1 (b)	Research and development	☐				
B1 (c)	Light industrial	☐				
B2	General industrial	☐				
B8	Storage or distribution	☐				
C1	Hotels and halls of residence	☐				
C2	Residential institutions	☐				
D1	Non-residential institutions	☐				
D2	Assembly and leisure	☐				
OTHER		☐				
Please Specify		☐				
	Total					

In addition, for hotels, residential institutions and hostels, please additionally indicate the loss or gain of rooms

Use class	Type of use	Not applicable	Existing rooms to be lost by change of use or demolition	Total rooms proposed (including changes of use)	Net additional rooms
C1	Hotels	☐			
C2	Residential Institutions	☐			
OTHER		☐			
Please Specify		☐			

19. Employment

Please complete the following information regarding employees:

	Full-time	Part-time	Total full-time equivalent
Existing employees	0	0	0
Proposed employees	0	0	0

20. Hours of Opening

If known, please state the hours of opening (e.g. 15:30) for each non-residential use proposed:

Use	Monday to Friday	Saturday	Sunday and Bank Holidays	Not known

21. Site Area

Please state the site area in hectares (ha) 7.74

22. Industrial or Commercial Processes and Machinery

Please describe the activities and processes which would be carried out on the site and the end products including plant, ventilation or air conditioning. Please include the type of machinery which may be installed on site:

Is the proposal a waste management development? ☐ Yes ☐ No

If the answer is Yes, please complete the following table:

	Not applicable	The total capacity of the void in cubic metres, including engineering surcharge and making no allowance for cover or restoration material (or tonnes if solid waste or litres if liquid waste)	Maximum annual operational throughput in tonnes (or litres if liquid waste)
Inert landfill	☐		
Non-hazardous landfill	☐		
Hazardous landfill	☐		
Energy from waste incineration	☐		
Other incineration	☐		
Landfill gas generation plant	☐		
Pyrolysis/gasification	☐		
Metal recycling site	☐		
Transfer stations	☐		
Material recovery/recycling facilities (MRFs)	☐		
Household civic amenity sites	☐		
Open windrow composting	☐		
In-vessel composting	☐		
Anaerobic digestion	☐		
Any combined mechanical, biological and/or thermal treatment (MBT)	☐		
Sewage treatment works	☐		
Other treatment	☐		
Recycling facilities construction, demolition and excavation waste	☐		
Storage of waste	☐		
Other waste management	☐		
Other developments	☐		

Please provide the maximum annual operational throughput of the following waste streams:	
Municipal	
Construction, demolition and excavation	
Commercial and industrial	
Hazardous	

If this is a landfill application you will need to provide further information before your application can be determined. Your waste planning authority should make clear what information it requires on its website.

23. Hazardous Substances

Does the proposal involve the use or storage of any of the following materials in the quantities stated below? ☐ Yes ☐ No ☒ Not applicable

If Yes, please provide the amount of each substance that is involved:

Acrylonitrile (tonnes)	Ethylene oxide (tonnes)	Phosgene (tonnes)
Ammonia (tonnes)	Hydrogen cyanide (tonnes)	Sulphur dioxide (tonnes)
Bromine (tonnes)	Liquid oxygen (tonnes)	Flour (tonnes)
Chlorine (tonnes)	Liquid petroleum gas (tonnes)	Refined white sugar (tonnes)

Other: Other:

Amount (tonnes): Amount (tonnes):

24. Ownership Certificates and Agricultural Land Declaration

One Certificate A, B, C, or D, must be completed with this application form

CERTIFICATE OF OWNERSHIP - CERTIFICATE A

Town and Country Planning (Development Management Procedure) (England) Order 2015 Certificate under Article 14

I certify/The applicant certifies that on the day 21 days before the date of this application nobody except myself/ the applicant was the owner* of any part of the land or building to which the application relates, and that none of the land to which the application relates is, or is part of, an agricultural holding**

NOTE: You should sign Certificate B, C or D, as appropriate, if you are the sole owner of the land or building to which the application relates but the land is, or is part of, an agricultural holding.

** "owner" is a person with a freehold interest or leasehold interest with at least 7 years left to run.*
*** "agricultural holding" has the meaning given by reference to the definition of "agricultural tenant" in section 65(8) of the Act.*

Signed - Applicant:	Or signed - Agent:	Date (DD/MM/YYYY):
	[redacted]	10/12/2021

CERTIFICATE OF OWNERSHIP - CERTIFICATE B

Town and Country Planning (Development Management Procedure) (England) Order 2015 Certificate under Article 14

I certify/ The applicant certifies that I have/the applicant has given the requisite notice to everyone else (as listed below) who, on the day 21 days before the date of this application, was the owner* and/or agricultural tenant** of any part of the land or building to which this application relates.

** "owner" is a person with a freehold interest or leasehold interest with at least 7 years left to run.*
*** "agricultural tenant" has the meaning given in section 65(8) of the Town and Country Planning Act 1990*

Name of Owner / Agricultural Tenant	Address	Date Notice Served

Signed - Applicant:	Or signed - Agent:	Date (DD/MM/YYYY):

24. Ownership Certificates and Agricultural Land Declaration (continued)

CERTIFICATE OF OWNERSHIP - CERTIFICATE C

Town and Country Planning (Development Management Procedure) (England) Order 2015 Certificate under Article 14

I certify/ The applicant certifies that:

- Neither Certificate A or B can be issued for this application
- All reasonable steps have been taken to find out the names and addresses of the other owners* and/or agricultural tenants** of the land or building, or of a part of it, but I have/ the applicant has been unable to do so.

** "owner" is a person with a freehold interest or leasehold interest with at least 7 years left to run.*
*** "agricultural tenant" has the meaning given in section 65(8) of the Town and Country Planning Act 1990*

The steps taken were:

Name of Owner / Agricultural Tenant	Address	Date Notice Served

Notice of the application has been published in the following newspaper (circulating in the area where the land is situated):

On the following date (which must not be earlier than 21 days before the date of the application):

Signed - Applicant:

Or signed - Agent:

Date (DD/MM/YYYY):

CERTIFICATE OF OWNERSHIP - CERTIFICATE D

Town and Country Planning (Development Management Procedure) (England) Order 2015 Certificate under Article 14

I certify/ The applicant certifies that:

- Certificate A cannot be issued for this application
- All reasonable steps have been taken to find out the names and addresses of everyone else who, on the day 21 days before the date of this application, was the owner* and/or agricultural tenant** of any part of the land to which this application relates, but I have/ the applicant has been unable to do so.

** "owner" is a person with a freehold interest or leasehold interest with at least 7 years left to run.*
*** "agricultural tenant" has the meaning given in section 65(8) of the Town and Country Planning Act 1990*

The steps taken were:

Notice of the application has been published in the following newspaper (circulating in the area where the land is situated):

On the following date (which must not be earlier than 21 days before the date of the application):

Signed - Applicant:

Or signed - Agent:

Date (DD/MM/YYYY):

25. Planning Application Requirements - Checklist

Please read the following checklist to make sure you have sent all the information in support of your proposal. Failure to submit all information required will result in your application being deemed invalid. It will not be considered valid until all information required by the Local Planning Authority (LPA) has been submitted.

- The original and 3 copies* of a completed and dated application form: ☑
- The original and 3 copies* of the plan which identifies the land to which the application relates drawn to an identified scale and showing the direction of North: ☑
- The original and 3 copies* of other plans and drawings or information necessary to describe the subject of the application: ☑
- The correct fee: ☑
- The original and 3 copies* of a design and access statement, if required (see help text and guidance notes for details): ☑
- The original and 3 copies* of a fire statement, if required (see help text and guidance notes for details): ☑
- The original and 3 copies* of the completed, dated Ownership Certificate (A, B, C or D – as applicable) and Article 14 Certificate (Agricultural Holdings): ☑

*National legislation specifies that the applicant must provide the original plus three copies of the form and supporting documents (a total of four copies), unless the application is submitted electronically or, the LPA indicate that a smaller number of copies is required. LPAs may also accept supporting documents in electronic format by post (for example, on a CD, DVD or USB memory stick). You can check your LPA's website for information or contact their planning department to discuss these options.

Plans can be bought from one of the Planning Portal's accredited suppliers: https://www.planningportal.co.uk/buyaplanningmap

26. Declaration

I/we hereby apply for planning permission/consent as described in this form and the accompanying plans/drawings and additional information. I/we confirm that, to the best of my/our knowledge, any facts stated are true and accurate and any opinions given are the genuine opinions of the person(s) giving them.

Signed - Applicant: [redacted]

Date (DD/MM/YYYY): 10/12/21 (date cannot be pre-application)

[redacted]

29. Site Visit

Can the site be seen from a public road, public footpath, bridleway or other public land? ☑ Yes ☐ No

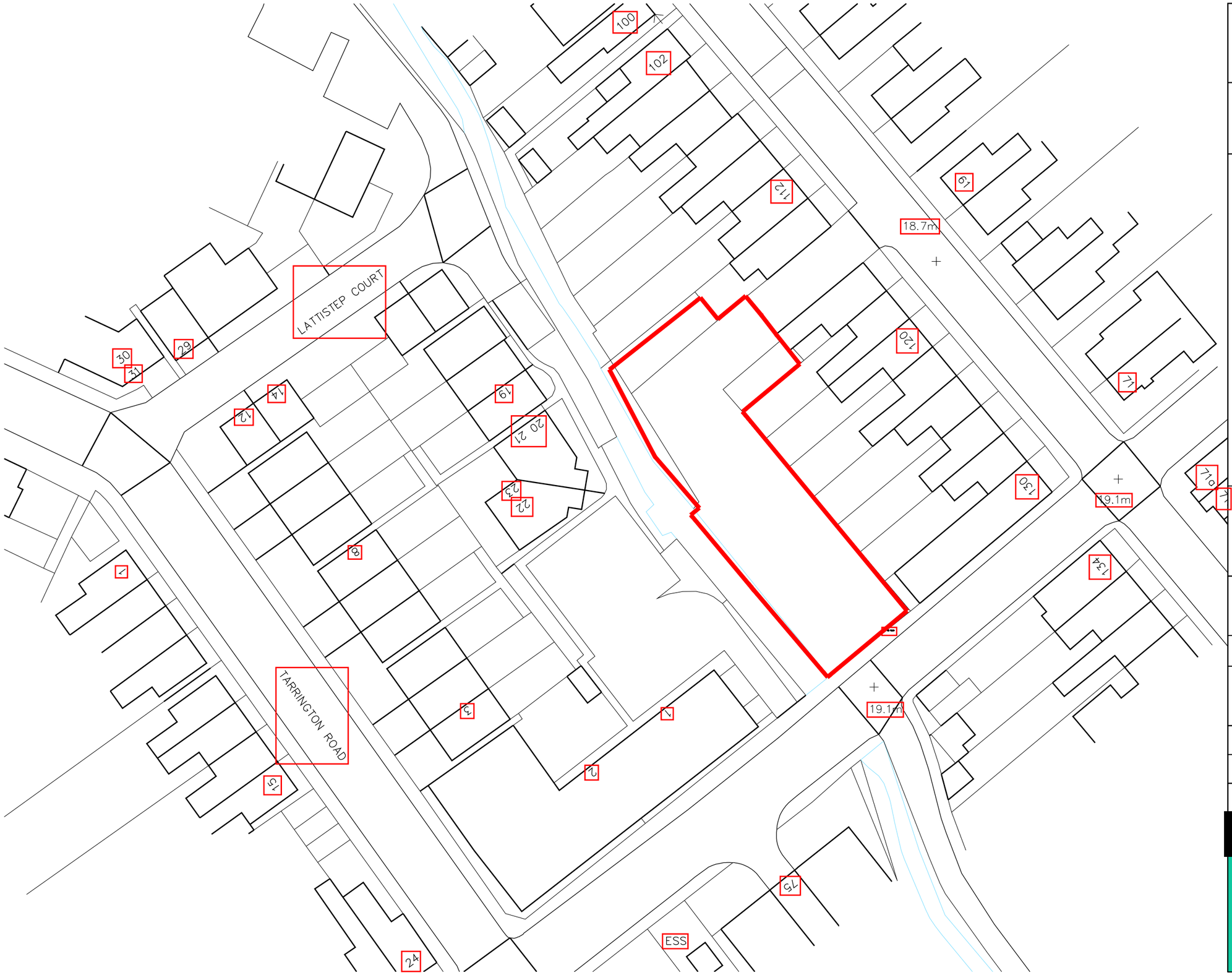
If the planning authority needs to make an appointment to carry out a site visit, whom should they contact? *(Please select only one)* ☐ Agent ☒ Applicant ☐ Other (if different from the agent/applicant's details)

If Other has been selected, please provide:

Contact name:

Telephone number:

Email address:



Notes

- Copyright in this drawing remains the property of BM3 Architecture Limited.
- Do not scale this drawing. Work to figured dimensions only.
- Contractors and consultants are to advise BM3 Architecture Limited of any discrepancies.

Revision	Date	By	Chkd
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PLANNING

Client

Project
SUDBROOK GARDEN
TREDWORTH
GLOUCESTER

CiSfb Element

Drawing
SITE LOCATION PLAN
--
--

Drawn by	Checked	
ARG	JH	
Scale	Dated	
1:500	10.12.2021	
Job No.	Drawing No.	Revision
70939	D01	-

BM3

Sudbrook Garden, Gloucester

Detail Landscape Plan

LEGEND

- **Proposed Tree** - *Tree planted into 900x900x 750mm tree pit backfilled with 70/30 BS3882 topsoil and compost with Osmocote standard fertiliser. To include under ground guy, mulch mat, water spout and 50mm depth bark mulch.*
- **Specimen Shrub** - *10L to 15L sized shrub adding highlight to planting bed. Will vary between large bushy shrub to small tree where space is adequate.*
- **Hedge (H1)** - *All hedges to be trough grown to height specified in the planting schedule. See schedule for species & other details.*
- **Native Hedge (NH)** - *All hedges to be trough grown to height specified in the planting schedule. See schedule for species & other details.*
- **Shrub Mix A** - *A mix of low maintenance evergreen & ornamental species. See schedule for details.*
- **Shrub Mix B** - *A mix of low maintenance evergreen & ornamental species. See schedule for details.*
- **Shrub Mix C** - *A mix of low maintenance evergreen & ornamental species. See schedule for details.*
- **Shrub Mix D** - *A mix of low maintenance evergreen & ornamental species. See schedule for details.*
- **Shrub Mix E** - *A mix of low maintenance evergreen & ornamental species suitable for the shade. See schedule for details.*
- **Open Ground** - *Open ground left for community to plant up and develop over time.*
- **Amenity Lawn** - *Grassed area to be turfed with a general amenity sward. To be cut regularly as amenity turf.*
- **Rough Grassland** - *Grassed area to be turfed with general amenity sward and allowed to grow. To be managed long term as wildflower meadow - single cut per season.*
- **Bench** - *5no. benches to pathways. Sheldon All Timber Bench SBN309, treated softwood finish, root fixed. L: 1800 x D:380 x H:450mm. Supplier: Langley Design Street Furniture or similar approved.*
- **Raised Timber Planter** - *2000 L x 1000 W x 700mm H treated softwood timber sleepers. Planter wall should be lined on the inside with polyethylene sheets, stapled on. Planters filled with 100mm gravel drainage layer on the bottom and approx. 500mm of topsoil. To be left for community to plant up and develop over time.*
- **Foot paths** - *Self-binding (Breedon) gravel paths.*
- **Timber Edging** - *Treated timber edging, fixed to stakes at 1.5m centres. Timber pressure treated for external use - D 150mm x W 22mm.*
- **Retaining Wall with Railing** - *Existing retaining wall to edge of Brook. 100mm upstand with 1000mm height railing fixed to top of wall. Railing style and black powder coated to match adjacent development. Constructed to Engineers specification and details.*
- **Existing Herritage Wall Retained** - *Wall to be retained and made good. Wall to be surveyed and repaired in consultation with Structural Engineer.*
- **Steel Gate** - *Double entrance gateway to existing wall along Hatherly Road and Access from East. Gate to be fixed to wall and be lockable. Railing style and black powder coated to match adjacent development.*
- **1800mm Height Steel Railings** - *Steel railings to secure access from Melbourne St East. Black-powder-coated to match adjacent development.*
- **Sud Brook** - *Existing brook, retaining culvert walls to be partially reconstructed subject to consultation with engineers.*
- **Litter Bin** - *Greengate Litter Bin, circular galvanised steel litter bin with a raised lid, root fixed to manufacturers recommendations. Clad in treated vertical timber slats. H: 700mm x D: 384mm. Supplier - External Works or similar approved.*
- **2 no. Grey Wagtail and Dipper Nest Box** - *Boxes fixed to retaining walls along Sud Brook. Vivaro Pro Woodstone Grey Wagtail and Dipper Nest box or similar approved. Supplier NHBS or similar.*
- **3 no. Log Pile** - *Old log, various sizes from various species; also stones, old bricks etc. In a shady area undisturbed, piled up randomly, bark left on if possible.*
- **4 no. Insect Block** - *Boxes fixed to existing boundary treatments. Woodstone Insect Block. Supplier NHBS or similar approved.*
- **1 no. Bug Pallet Hotel** - *Multi-storey pallets filled with various natural materials to provide habitat for lots of species. See RSBP - "Build a Bug Hotel" guide. Potential for community engagement; local school, charity or residents to help build it.*

Maintenance Access gates.

37.9m² Mix A

GRASS IN THIS AREA LEFT TO GROW WILD AND MOWED ONCE PER YEAR AS WILDFLOWER MEADOW

6.6m² Mix B

8.2m² Mix B

13.8m NH

9.5m² Mix B

11.2m H1

2.7m² Mix A

1.5m² Mix D

5m H1

5.2m² Mix A

21.8m H1

4.5m² Mix C

1.5m² Mix D

4.5m² Mix C

5.2m² Mix A

1.5m² Mix D

4.5m² Mix C

5.2m² Mix A

1.5m² Mix D

2.6m² Mix A

4.5m² Mix C

14.9m² Mix E

Existing wall retained and made good.

New Gates to Existing Wall

1:20

19.1m

HATHERLEY ROAD

PLANTING SCHEDULE

Trees

Species	Specification	Girth	Height	No
T1 Betula utilis jacquemontii	Extra Heavy Standard: 3x: RB: Clear Stem min. 200cm	16-18cm	400-450cm	4
T2 Acer campestre	Extra Heavy Standard: 5 brks: 3x: RB: Clear Stem min. 200cm	14-16cm	400-450cm	3
T3 Malus domestica 'Worcester Pearmain'	Bushy :3/5 brks :BR :M9 rootstock	10-12cm	175-200cm	2
T4 Prunus damascena 'Shropshire Prune'	Bushy :3/5 brks :BR :VVA-1 rootstock	10-12cm	175-200cm	1
T5 Prunus domestica 'Victoria'	Standard: Myrobalan B rootstock: 3 brks: 2x: B: Clear Stem 150-175cm	8-10cm	250-300cm	1

Hedges

Species	Specification	Height	Length	No.
H1 Elaeagnus x ebbingei	Branched: 6 brks: C	40-60cm	38m	97 -

Hedges - Mixed (NH)

Species	Specification	Height	Mix %	Length	No.
Corylus avellana	1+2: Transplant - seed raised: Branched: 4 brks: B	80-100cm	5%	0.7m	4 -
Crataegus monogyna	1+2: Transplant - seed raised: B	80-100cm	45%	6.2m	32 -
Fagus sylvatica	1+2: Transplant - seed raised: B	80-100cm	15%	2.1m	11 -
Ilex aquifolium	Leader with Laterals: RB	80-100cm	10%	1.4m	7 -
Prunus spinosa	1+2: Transplant - seed raised: Branched: 3 brks: B	80-100cm	20%	2.8m	14 -
Rosa canina	1+1: Transplant - seed raised: Provenance UK Area 304: B	80-100cm	5%	0.7m	4 -

Specimen Shrubs

Species	Pot Size	Height	Specification	No.
S1 Amelanchier canadensis	10L	100-125cm	Branched: 6 brks: C	5 -
S2 Viburnum x bodnantense 'Dawn'	15L	100-125cm	Branched: 6 brks: C	3 -
S3 Pyracantha 'Orange Glow'	10L	125-150cm	Caned: Leader with Laterals: 6 brks: C	1 -
S4 Calamagrostis acutiflora 'Karl Foerster'	5L			6 -

Mix A

Species	Height	Pot Size	Density	Mix %	No.
Escallonia 'Iveyi'	60-80cm	5L	3/m²	100%	179 -

Mix B

Species	Height	Pot Size	Density	Mix %	No.
Cistus purpureus 'Alan Fradd'	30-40cm	2L	3/m²	20%	15 -
Nepeta faassenii		2L	3/m²	20%	15 -
Rosa 'Kent'	30-40cm	3L	3/m²	20%	15 -
Salvia nemorosa 'Caradonna'		2L	3/m²	20%	15 -
Stipa tenuissima		2L	3/m²	20%	15 -

Mix C

Species	Height	Pot Size	Density	Mix %	No.
Stipa arundinacea		2L	2/m²	100%	36 -

Mix D

Species	Height	Pot Size	Density	Mix %	No.
Cornus alba 'Sibirica Variegata'	60-80cm	3L	2/m²	100%	12 -

Mix E

Species	Height	Pot Size	Density	Mix %	No.
Ajuga reptans 'Atropurpurea'		0.5L	3/m²	5%	3 -
Anemone nemorosa		0.5L	3/m²	5%	3 -
Asplenium scolopendrium		1.5-2L	3/m²	5%	3 -
Astilbe 'Deutschland'		2L	3/m²	15%	7 -
Astrantia major rosea		2L	3/m²	15%	7 -
Bergenia 'Bressingham Ruby'		2L	3/m²	15%	7 -
Dryopteris affinis 'Cristata The King'		1.5-2L	3/m²	5%	3 -
Dryopteris filix-mas		1.5-2L	3/m²	5%	3 -
Epimedium perralderianum		2L	3/m²	10%	5 -
Helleborus orientalis		2L	3/m²	10%	5 -
Osmunda regalis		1.5-2L	3/m²	5%	3 -
Polystichum setiferum		1.5-2L	3/m²	5%	3 -

Revision	Date	By	Chkd

Project	Drawing	Client
SUDBROOK GARDEN TREDWORTH GLOUCESTER	DETAIL LANDSCAPE PLAN	

Scale	Dated	Job No.	Drawing No.	Drawn by	Checked	CiSfb Element	Revision
1:100 @A1	DEC '21	70939	D900	CH	ARG	PLANNING	-

BM3

Infrastruct CS Ltd
Consulting Civil and Structural Engineers

[redacted]
Web: www.infrastructcs.co.uk

Flood Risk Assessment and Drainage Statement

Site reference

Norvilles
Paul Street
Gloucestershire
GL1 4NR

Client

Markey Construction

Date

June 2016

Report No.

2191-07-01 Rev B

Revision	Compiled by	Checked by	Issue date
First issue	[redacted]		June 2016
Rev A			July 2016
Rev B			August 2016

Table of Contents

Contents

1.0 Summary

This Flood Risk Assessment (FRA) and drainage statement is to support proposed re-development of Norvilles, Paul Street, Gloucester and finds the following –

SOURCE OF FLOODING	RISK
Fluvial	*High*
Overland Flow to the Site	*Low*
Rising Groundwater	*Low*
The Local Sewerage Network	*Low*
Reservoirs, Canals And Other Artificial Sources	Medium

- *Nature Of Development*

The proposed re-development of the Norvilles site is to provide a mix of 63 residential flats and houses with associated open space, hard standing and access road.

- *Flood Risk*

Product 4 flood data has been obtained from the Environment Agency that shows the 95% of the site can be classified as flood zone 1, which is land at low risk of flooding.

There is a small area (5%) at the north east corner where the flood maps show encroachment into the site and is classified as flood zone 2 and 3a, however, it should be noted that this area was previously culverted and therefore the accuracy of the flood extents in to this area is questionable.

- Sequential test

As part of the site is classified as flood zone 2/3a the sequential and exception test are appropriate. It is the conclusion of the sequential test in this report that no suitable or available alternative sites within a lower flood risk zone or the same flood risk zone appropriate for the proposed residential development are available therefore the exception test is appropriate.

- Exception test

The development satisfies the requirements of the exception test.

- *Impermeable area*

The existing site area is 7753 sqm which is entirely impermeable. The proposed site impermeable area is 4193sqm which constitutes a reduction of 46%. This reduction in

impermeable are in itself will result in a significant decrease in both runoff rates and volumes.

- *Proposed surface water drainage*

The proposed development will be served by 3No flow controlled discharge points of 5 l/s for the 1 in 100 year plus 30% climate change storm event (combined total of 15 l/s which compares to the 1 in 100 year existing runoff figure of 267 l/s

The design takes in to account the preferences detailed in the Gloucestershire SuDs Design & Maintenance Guide (April 2015).

SuDS techniques employed by the proposed development include –

Tanked permeable paved adoptable highway discharging into Sud Brook providing a high level of water quality management by 1) retention of suspended solids 2) breakdown of hydro carbons 3) retention of heavy metals.

Tanked permeable paving for private parking and hard standing areas with discharge into Sud Brook

Rain water butts SuDS features designed to contain the peak storm event for a 1 in 100 year event with an allowance of 40 % for climate change.

The proposed significant decrease in impermeable area will proportionately result in a reduction of up to 46 % in both volume and runoff rates and therefore the implementation of sustainable drainage techniques (SuDs) will further reduce the runoff rates close an urbanised greenfield runoff rate for the site.

Potential risks associated with the quality of surface water runoff have been addressed by the implementation of tanked permeable paving for hard surfaced areas which will address potential contamination from fuel spillages and will also provide a degree of attenuation. Rain water butts will be provided to encourage water reuse.

- *Development layout in relation to flood zones*

All the new dwellings with the exception of plot in the north east corner detailed below are placed outside of the flood zone and are therefore not at risk.

The one exception is the end flat of plots 01 – 18 in the north east corner of the site. It should be noted that where this plot is located there was previously a warehouse building which has since been demolished. The watercourse was culverted beneath this building so the encroachment of the flood zone 3 as indicated on the flood map into this area is in view of this information is open to question.

The calculated 1 in 100 year +CC flood level in this area is 18.75 – 18.85 compared to the previous slab level of 18.70. Given the flood level has a climate change allowance it is doubtful that this area was subject to flood zone 3 flooding. The new proposals now liberate much of this area for flood storage as the footprint of the warehouse was far greater than proposed dwellings.

- Floor Levels

The maximum modelled flood level provided by the Environment agency for the 1 in 100 year storm event with an additional allowance for climate change are 18.85mAOD upstream of the weir on the watercourse, and 18.42mAOD below the weir.

In comparison generally existing site levels range from 21.00mAOD to 18.60mAOD approx.

Proposed floor levels will vary from 21.30mAOD to 19.30mAOD.

This places all floor levels for the proposed dwellings above the maximum flood level (including the extreme 1 in 1000 year flood level of 18.97m AOD).

- Private parking Levels

Where new parking is provided adjacent to Sud Brook, proposed levels will be set 300mm above the maximum flood levels to ensure vehicles are not subject to overland flood flows that might cause cars to be swept into the watercourse and block the downstream culvert system. These proposed levels are lower than the existing site levels so there is no detrimental impact on flood storage.

- Flood compensation

Calculations demonstrate that there is no loss of flood storage and there is some betterment. The calculations are conservative as they ignore a significant additional volume of flood storage that will be liberated by the demolition of the warehouse adjacent to Sud Brook.

- Betterment to the area

The redevelopment of the Norvilles site provides significant betterment to the area in terms of flood risk.

The existing Sud Brook watercourse is inaccessible for much of its length through the site. The new development opens out access for its entire length and in doing so will provide –

De-culverting of upstream section of watercourse where Sud Brook emerges beneath Hatherley Road
'Naturalising' banks to provide ecological benefit.
Provision of a wild life corridor
Accessibility for maintenance of the upstream and downstream culvert structures.
Recreational benefit.
Improved flood routing.
Improved flood water storage.

- Proposed foul drainage

The site will discharge via a gravity drainage system in to the adjacent Severn Trent Foul Water sewerage system manhole reference 9024 located in Paul Street adjacent to the site, subject to connection consent.

2.0 Introduction

2.1 Commission

Markey Construction has commissioned Infrastruct CS Ltd to prepare a Flood Risk Assessment (FRA) and drainage statement to support a planning application for the re-development of Norvilles, Paul Street, Gloucester. The proposed planning layout drawing 7720/1 is contained in appendix A.

2.2 Guidance

This flood risk assessment has been compiled in accordance with the recommendations of the National Planning Policy Framework and the Technical Guidance to the National Planning Policy Framework.

2.3 Aims and Objectives

The purpose of this flood risk assessment is to assess the potential flood risks by and to the proposed development. It will identify the flood risk zone, potential sources of flood risk, consider the proposed drainage and will be used to support the proposed planning application.

3.0 Site Details

3.1 Location

Norvilles is located approximately 2.5km south east of the centre of Gloucester.

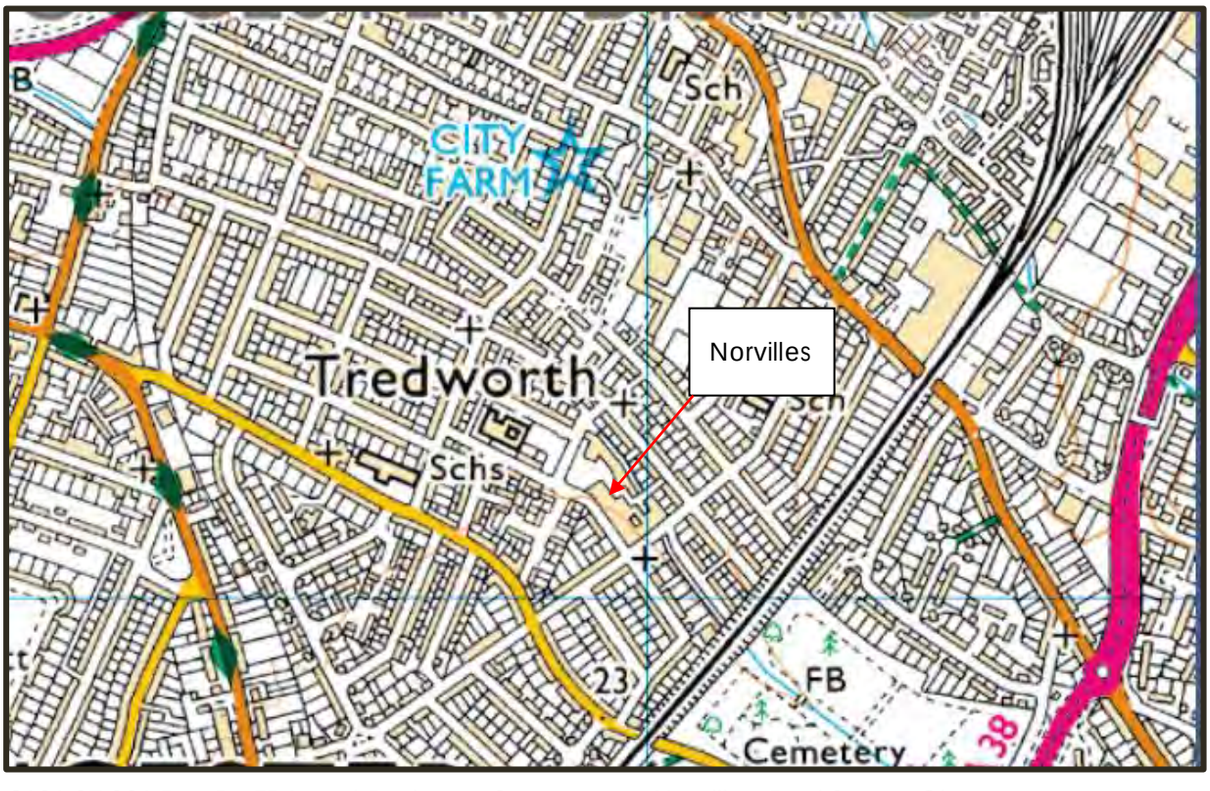


Fig 3.1 – Site Location Plan

3.2 Grid reference

The approximate ordnance survey national grid reference for the centre of the development site is 383962 E, 217132 N (SO 83962 17132).

3.3 Site description

Norvilles is a disused commercial site that was formally used as a distribution and head office for the Norville optician group. The total area is 8712 sqm 0.87ha and is virtually all impermeable surfacing either consisting of warehouse buildings or external concrete and asphalt hard standing surfacing.

Running along the eastern boundary is Sud Brook which is classified as main river by the Environment Agency. To the north west is Paul Street, along the western boundary is Tarrington Road and along the southern boundary Heatherley Road. All these streets are residential.

There are two large warehouse units, of which the larger is the western unit. The north eastern unit is bounded by Sud Brook which runs alongits eastern elevation.

General view of south west Tarrington Road warehouse

General view of eastern warehouse

General view of southern warehouse backing on to Hatherley Road

General view of eastern warehouse gable backing on to Sud Brook

3.4 Topography

The site generally falls from Tarrington Road on the west side down to Sud Brook on the east converging to the center of Sub Brook along the east boundary.
Tarrington Road levels vary from 21.30mAOD to the south and 20.60mAOD to the north junction with Paul Street . Paul Street levels fall from 20.60mAOD down to 18.90mAOD. The levels along Hatherley Road fall from 21.40mAOD to 19.20mAOD where it crosses Sud Brook.

The western warehouse unit which is approximately 2500sqm in area has a slab level of 21.119mAOD. There are two basement areas within the warehouse that has a level of 18.723m AOD.
The eastern unit which is 1390sqm approximately has a slab level of 19.234mAOD.

The topographic survey for the development site can be found in Appendix B.

3.5 Geology

A ground investigation has been undertaken but the results are not yet available for this report, however, the informal feedback is that Lias clays were encountered. This backed up by the geology maps that indicate clays and non-permeable mudstone.

3.6 Existing Surface Water Drainage description

The surface water runoff from the existing site is collected by a gravity drainage system that discharges directly into Sud Brook . There are also rainwater down pipes which serve the existing buildings that discharge directly into the brook.
An investigation has been undertaken and manholes lifted and inspected to confirm the whole site discharges into this water course.
The area discharging into the watercourse will therefore be in the order of 8,717sqm.

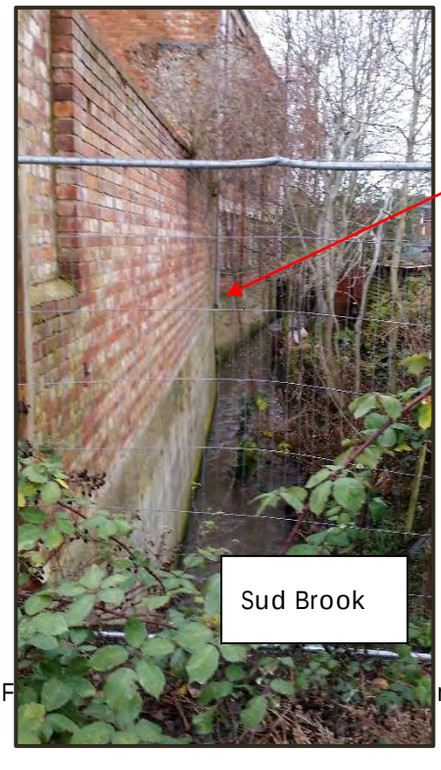


Photo showing down pipe discharge into Sud Brook

Photo showing surface water drainage system that discharges into Sud Brook

3.7 Existing Foul Drainage description

The site is surrounded on three sides by Severn Trent Water combined sewers. There is an existing 225mm foul sewer in Tarrington Road and 450mm sewer in Paul Street A copy of the sewer records is contained in Appendix G.

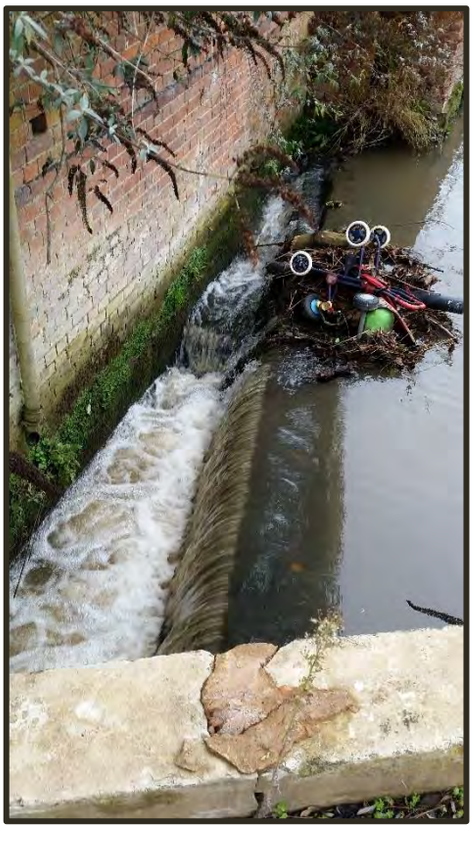
3.8 Local rivers and water courses

Sud Brook, which is classified as a main river watercourse, runs in a south to north direction along the eastern boundary of the site. The brook enter the site via an open span culvert beneath Hatherley Road to the south and then runs within a brick sided channel for a length of approximately 27m prior to meeting a diagonal weir where there is a cascade to a lower level. The brook then runs via a channel for approximately 14m beneath the floor slab of a now demolished building.

After emerging from this bridged section the brook flows alongside the northern warehouse structure which forms a vertical brick side. The opposite side backs on to residential gardens associated with Melbourne Street East. The brook leaves the site via a culvert beneath existing buildings that do not form part of the development site. This culverted watercourse extends in a northerly direction for approximately 150m off-site before emerging again.

Sud brook and Hatherley Road culvert where brook enters site. Note brick channel walls

Weir and demolished building slab crossing (building slab to be removed).



Weir looking south

Sud Brook looking downstream

3.9 Proposed development

The proposed re-development of the Norvilles site is to provide a mix of 63 residential dwellings with associated open space, hard standing and access road. The proposed planning layout drawing 52460 D01 Rev N produced by BM3 Architects is shown in appendix A. The new development opens access to Sud Brook through the development improving maintenance accessibility. An existing crossing of the Sud Brook will be removed as part of the re-development

4.0 Flood Risk Policy

4.1 Flood zone definition

The National Planning Policy Framework and the accompanying Technical Guidance gives guidance for development with respect to flooding. These documents promote a sequential approach in order to encourage development away from areas that may or are susceptible to flooding. In doing so it categorises flood zones in the context of their probability of flooding, as shown in the table below.

4.2 Flood zone definition

The National Planning Policy Framework Definition of Flood Zones

Flood zone	Fluvial	Tidal	Probability of flooding
1	< 1 in 1000 year (<0.1 %)	<1 in 1000 year (<0.1 %)	Low probability
2	Between < 1 in 1000 year (<0.1 %) and 1 in 100 year 1%	Between <1 in 1000 year (<0.1 %) and 1 in 200 year 0.5%	Medium Probability
3a	> 1 in 100 year 1% (>1.0%)	> 1 in 200 year (>0.5%)	High probability
3b	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Functional flood plain

4.3 Flood Zones – Table 1 NPPG

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - Low Probability
Definition
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Appropriate uses
All uses of land are appropriate in this zone.
FRA requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.
Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques
Zone 2 - Medium Probability
Definition
This zone comprises 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 (0.5% – 0.1%) in any year.
Appropriate uses
Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in (Table 2 NPPF) are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in Table 2 are only appropriate in this zone if the Exception Test is passed.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a - High Probability
Definition
This zone comprises 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.
Appropriate uses
The water-compatible and less vulnerable uses of land in (Table.2 NPPF) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in time of flood.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and relocate existing development to land with a lower probability of flooding.
Zone 3b - The Functional Floodplain
Definition
This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But 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, should provide a starting point for consideration and discussions to identify the functional floodplain.
Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to: – remain operational and safe for users in times of flood; – result in no net loss of floodplain storage; – not impede water flows; and – not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and relocate existing development to land with a lower probability of flooding.

4.4 Flood Risk Vulnerability Classification – Extract from Table 2 NPPG

More Vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

4.5 Flood Risk Vulnerability & Flood Zone Compatibility Table

Vulnerability classification flood zone	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
1	√	√	√	√	√
2	√	√	Exception test required	√	√
3a	Exception test required	√	x	Exception test required	√
3b	Exception test required	√	x	x	x

√ Development is appropriate x development is not appropriate

The above table, taken from NPPG (table 3), confirms that residential development within flood zones 1 is acceptable.

4.6 Environment Agency Flood Map

Environment Agency Flood modelled data information has been obtained and this gives data for the adjacent Sud Brook water course.

This data when compared to the topographic survey and flood map show that 76% of the site is located within flood zone 1 which is classified as land at low risk of flooding. The south east corner does suffer from flooding and can be classified as flood zone 2 and 3a.

It should be noted that the flood maps show flooding extending into the warehouse that is directly adjacent to Sub Brook. This flooding is not possible in reality as the wall of the warehouse forms a solid boundary/ barrier preventing floodwater from entering the site. In addition the slab level of the warehouse is in the order of 1000mm above the modelled level showing that the extent of flooding is incorrect in that area. Warehouse slab level 19.250mAOD compared to flood levels in the order of 18.33mAOD.

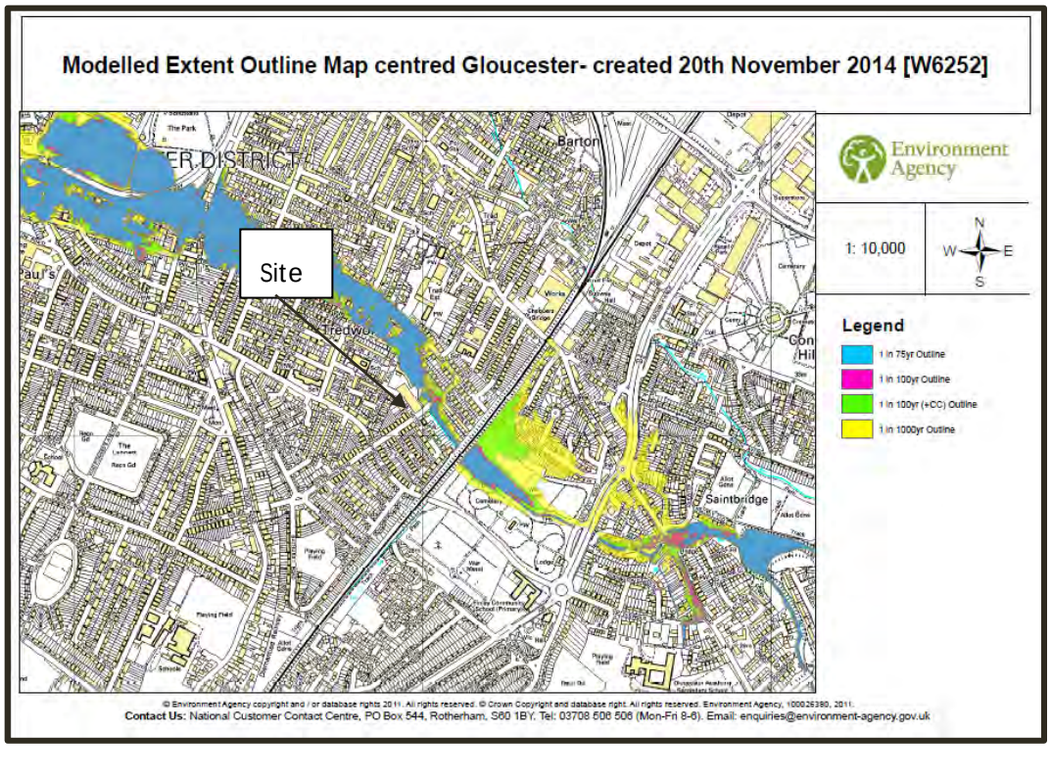


Fig 4.6 – Environment Agency Flood Zone map

4.7 Surface water Flooding

Reference to the Environment Agency surface water flooding maps shows Sud Brook adjacent to the site is subject to surface water flooding but this does not enter the site. This in part is a result of the warehouse walls that form the brook sidewall and also the slab level that is some 1000mm above the 1 in 100 year +CC flood level.

The culverted section of Sud Brook beneath Hatherley Road forms a throttle on flows into the site.

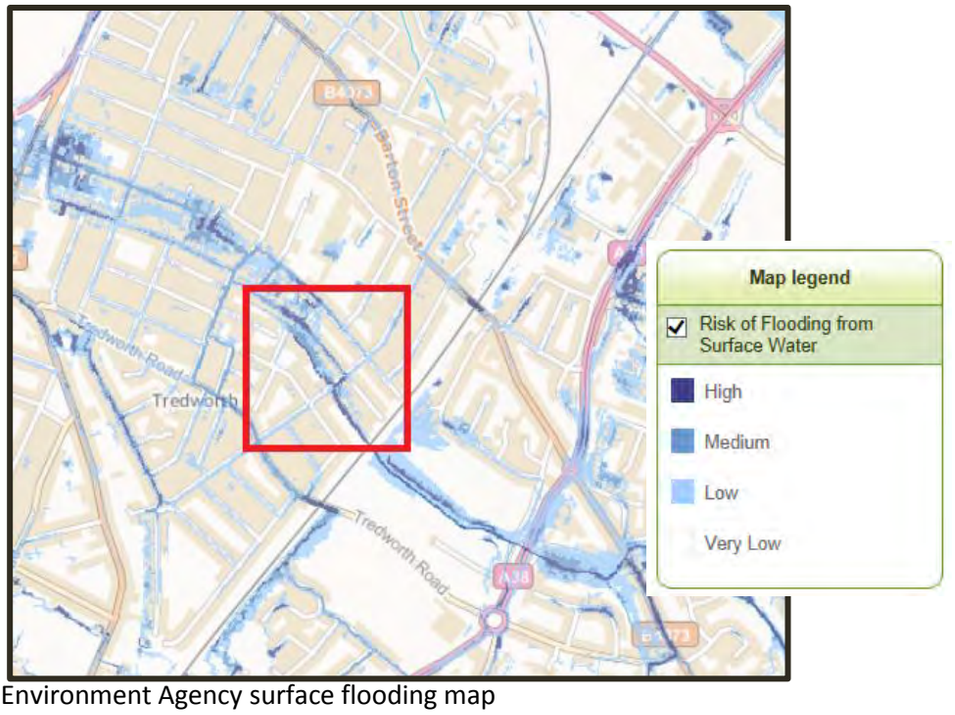


Fig 4.7 – Environment Agency surface flooding map

4.8 Environment Agency Groundwater and Aquifer Protection

Reference to the Environment Agency Groundwater protection zone map shows the area is not sited in a ground water protection zone. The Environment Agency have defined Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which occasionally is applied, to a groundwater source.

The Environment Agency use the zones to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.

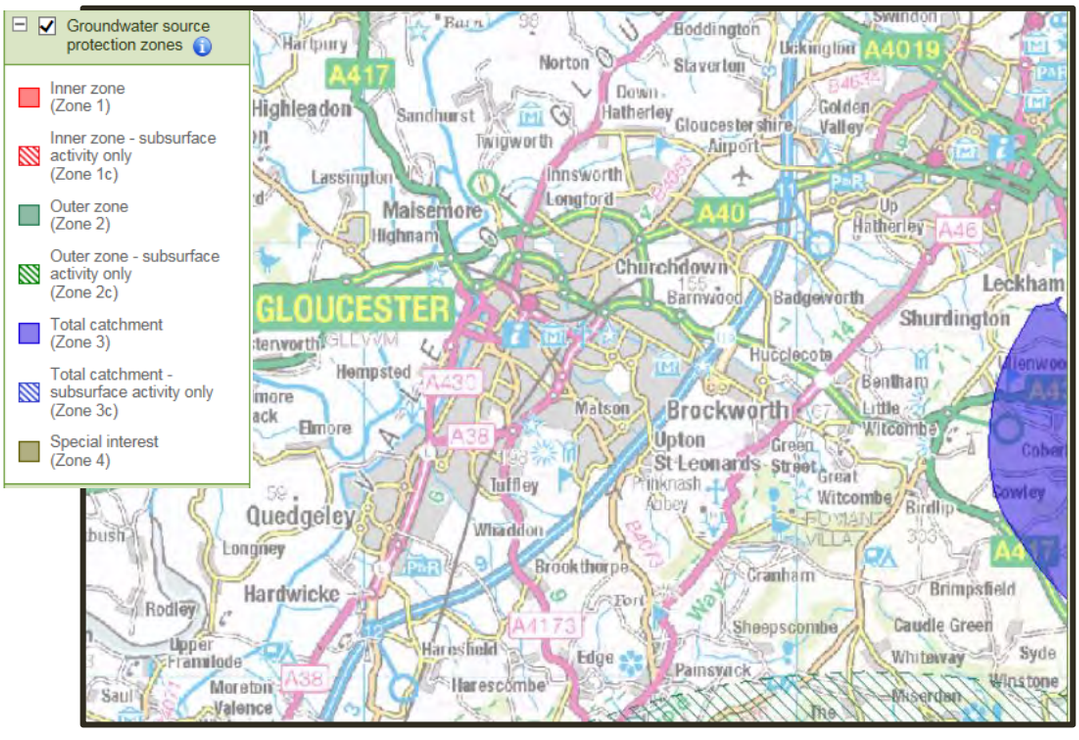
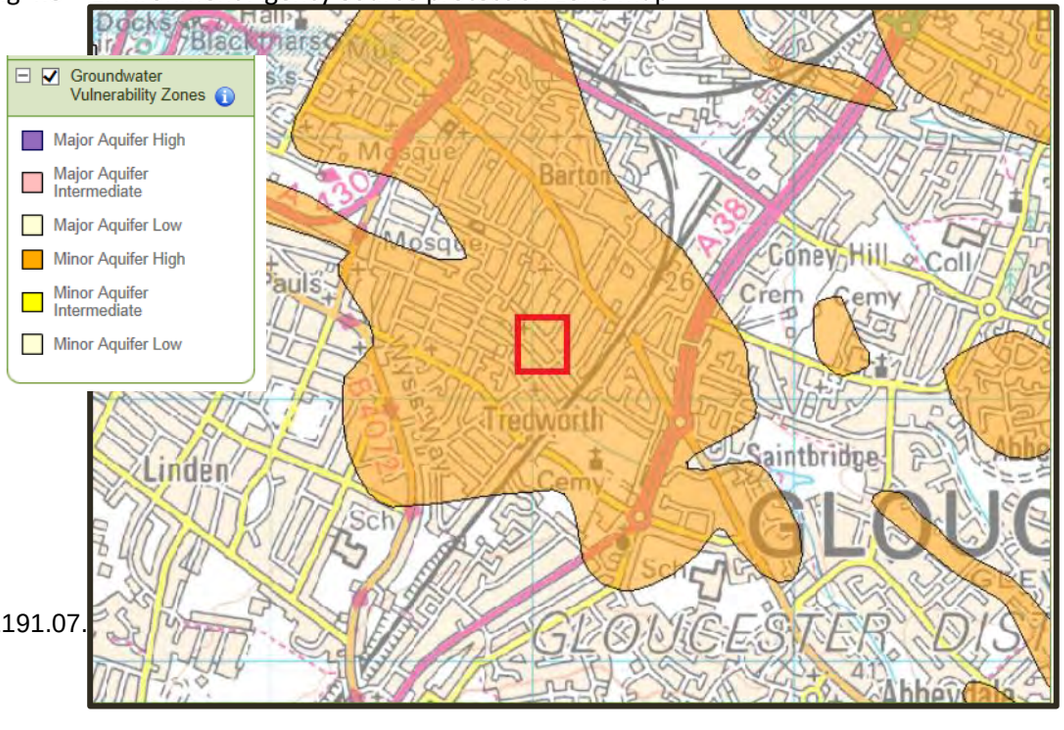


Fig 4.8 – Environment Agency Source protection zone map



5.0 Flood Risk To The Development

5.1 Other Flooding Mechanisms

In addition to the potential for assessing flooding from fluvial and tidal sources the National Planning Policy Framework also requires that consideration is given to other mechanisms for flooding -

- Flooding from land – intense rainfall, often in short duration, that is unable to soak into the ground or enter drainage systems, can run rapidly off land and result in local flooding.
- Flooding from groundwater – occurs when water levels in the ground rise above the surface elevations.
- Flooding from sewers – In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water sewers known as combined sewers. Flooding can result causing surcharging when the sewer is overwhelmed by heavy rainfall
- Flooding from reservoirs, canals and other artificial sources – Non-natural or artificial sources of flooding can result from sources such as reservoirs, canals lakes etc, where water is held above natural ground levels.

5.2 Flooding From Fluvial Sources

Product 4 flood level information for the development site has been obtained from the Environment Agency (Appendix F).
The data contains a range of modeled flood levels along the boundary of the site.
These flood levels range from 18.85mAOD (Node point SB01759-DS3) upstream of the weir section of Sud Brook watercourse,18.26mAOD (Node point SB01606) where the watercourse is culverted under Paul Street.
This information shows the majority (95%) of the developable site lies within flood zone 1 which is classified as land assessed as having a low probability of flooding.

These levels are the 1 in 100 year storm event with an allowance for climate change.

The south east corner does have encroachment of the 1 in 100 year flood zone and can be classified as flood zone 2 and 3a. One property falls within the area classified as flood zone 2/3a and therefore the exception test applies.

The topographic survey in Appendix C has been marked up to show the flood level depths and extent of flooding.

It is therefore the consideration of this FRA that whilst the majority of the site is at low risk of flooding from fluvial sources there is one property that are at risk and therefore the exception test is applied.

5.3 Flooding From Overland Flows To The Site

The surface water flooding maps show overland flows running down Sud Brook but not entering the development site.

It should be noted that the flood maps show flooding extending into the warehouse that is directly adjacent to Sub Brook. This flooding is not possible in reality as the wall of the warehouse forms a solid boundary/ barrier preventing floodwater from entering the site. In addition the slab level of the warehouse is in the order of 1000mm above the modelled level showing that the extent of flooding is incorrect in that area. Warehouse slab level 19.250mAOD compared to flood levels in the order of 18.33mAOD.

It is therefore the consideration of this FRA that the development is at medium risk from surface water flows through the site..

5.4 Flooding From Rising Groundwater

Ground investigation indicates that the site has underlying Lias clay strata and therefore not susceptible to rising groundwater and is not an issue.

It is therefore the consideration of this FRA that the site has a low risk of flooding from rising groundwater levels.

5.5 Flooding From The Local Sewerage Network

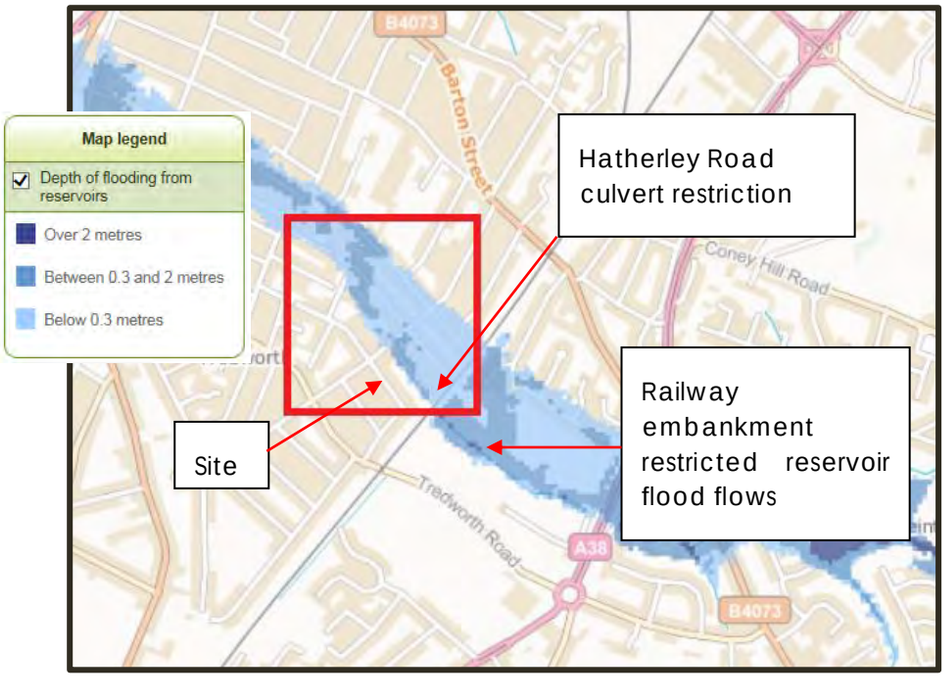
The public foul and surface water sewers in the proximity are of small diameter and are maintained by Severn Trent Water Authority and therefore do not constitute any significant risk to the development. The low point on the sewer network is Severn Trent manhole reference 9204. Should this manhole surcharge flood flows will head in a northerly direction towards Melbourne East Road

It is therefore the consideration of this FRA that the site has a low risk of flooding by surcharging of the local sewer network.

5.6 Flooding From Reservoirs, Canals & Other Artificial Sources

Review of the Environment Agency risk of flooding from reservoir maps shows that the site is at risk should a major breach occur of the Saintbridge Balancing Pond 2 which is owned and maintained by the Environment Agency. The flooding is routed along Sub Brook, however the maps show minimal incursion into the development site and will be contained within the new landscaped area created by the scheme. It is also anticipated that the culverted section of Sud Brook beneath Hatherley Road effectively acts as restriction on extreme flood flows and should there be a reservoir breach the flows would overtop into Hatherley Road which falls away to the north. It can therefore be expected that the majority of reservoir flows would be along Hatherley Road and also into the gardens backing on to this upstream section of watercourse. The development is therefore given additional protection from reservoir breach flows by the Hatherley Road culvert restriction. There is also a railway embankment to the east that provides another defence to flood flows.

It is therefore the consideration of this FRA that the site has a medium risk of flooding by reservoirs,



6.0 Flood Risk As A Result Of The Development

6.1 Effect Of The Development Generally

Development by its nature usually has the potential to increase the impermeable area with a resultant increased risk of causing rapid surface water runoff to watercourses and sewers, thereby causing surcharging and potential flooding. There is also the potential for pollutants to be mobilised and consequently flushed into the receiving surface water system. Increases in both the peak runoff rate (usually measured in litres per second l/s) and runoff volume (cubic metres m^3) can result, however, in this case there is a 60 % reduction in impermeable area so peak runoff rate and volume will be reduced even before the introduction of sustainable measures.

6.2 Surface Water Drainage & Sustainable Drainage Systems

Sustainable Drainage techniques (SuDS) covers a range of approaches to manage surface water runoff so that-

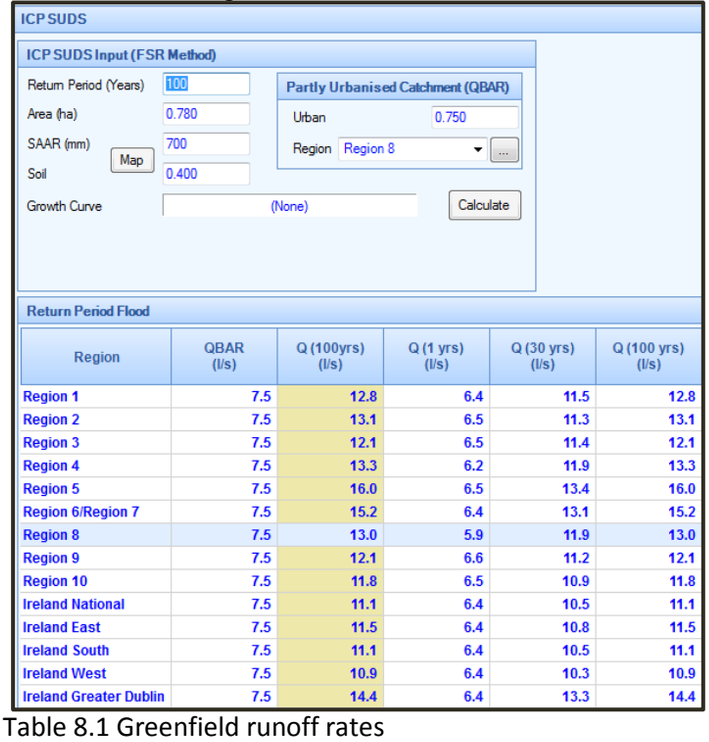
'Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the flood risk assessment.'

6.3 Peak Storm Design Criteria

The proposed sustainable drainage techniques for the development should accommodate the peak rainfall event for a 1 in 100 year storm event with an additional allowance for climate change. Table 5 of NPPG recommends for developments that have a life expectancy beyond 2085 that an additional factor of 30% is applied to the peak volume of runoff.

6.4 Existing surface water runoff rateS and greenfield rates

The existing development site area is approximately 0.78ha and is totally impermeable. The runoff rate is calculated as detailed in the table below.
The green field runoff rates are detailed below, however, the existing drainage is piped with direct discharge into SuD brook and the discharge rates in table 8.2 are considered to be closer to actual figures



Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	7.5	12.8	6.4	11.5	12.8
Region 2	7.5	13.1	6.5	11.3	13.1
Region 3	7.5	12.1	6.5	11.4	12.1
Region 4	7.5	13.3	6.2	11.9	13.3
Region 5	7.5	16.0	6.5	13.4	16.0
Region 6/Region 7	7.5	15.2	6.4	13.1	15.2
Region 8	7.5	13.0	5.9	11.9	13.0
Region 9	7.5	12.1	6.6	11.2	12.1
Region 10	7.5	11.8	6.5	10.9	11.8
Ireland National	7.5	11.1	6.4	10.5	11.1
Ireland East	7.5	11.5	6.4	10.8	11.5
Ireland South	7.5	11.1	6.4	10.5	11.1
Ireland West	7.5	10.9	6.4	10.3	10.9
Ireland Greater Dublin	7.5	14.4	6.4	13.3	14.4

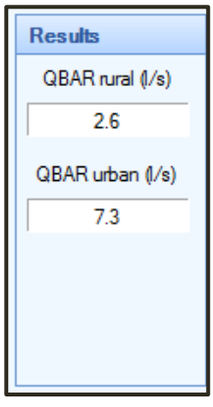


Table 8.1 Greenfield runoff rates

Existing impermeable runoff rate estimation

Return period	Runoff rate l/s
l in 2 year	115.2
1 in 30 year	211.3
1 in 100 year	267.2

Table 8.2 Existing runoff rates based on a piped discharge

6.5 Proposed surface water runoff rateS

The proposed development site area is approximately 0.34ha impermeable.
The runoff rates are calculated as detailed in the table below.

Proposed impermeable runoff rate estimation

Return period	Runoff rate l/s
l in 2 year	15 l/s
1 in 30 year	15 l/s
1 in 100 year	15 l/s

Table 8.3 Proposed runoff rates

Discharges to Sud Brook will be controlled by Hydrobarake or similar flow control devices

6.6 Infiltration testing

Initial feedback from soil investigations undertaken indicate non-permeable Lias clays. Therefore infiltration techniques for surface water disposal will not be viable.

6.7 Surface Water Drainage And Sustainable Drainage Systems

Sustainable Drainage techniques (SuDS) covers a range of approaches to manage surface water runoff, such that -

'Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the flood risk assessment.'

6.8 Sustainable Drainage Hierarchy

A hierarchical approach has been undertaken in consideration of the application of SUDS in relation to the development. This is in order to meet the design philosophy of ensuring that surface water run-off is managed as close to its source as possible and the existing situation is replicated as closely as possible.

The following drainage hierarchy has been undertaken with reference to the procedures set out in the SUDS Manual (CIRIA C697, 2007) to assess the viability of the application of SUDS techniques to this scheme:

1. store rainwater for later use
2. use infiltration techniques, such as porous surfaces in permeable strata areas
3. Attenuate rainwater in ponds or open water features for gradual release to a watercourse.
4. attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse,
5. discharge rainwater direct to a watercourse

6. discharge rainwater to a surface water drain
7. discharge rainwater to the combined sewer.

The sustainable drainage hierarchy shown above is intended to ensure that all practical and reasonable measures are taken to manage surface water higher up the hierarchy (1 being the highest) and that the amount of surface water managed at the bottom of the hierarchy is minimised.

Sustainable urban drainage systems have been considered for this development unless there are practical reasons for not doing so. Such reasons include the local ground conditions or density of development..

The site specific drainage hierarchy check list considered for the drainage design for this development is detailed in the table 8.4 on the next page.

SUDS OPTIONS	Comments	Potential for flow rate control	Volume reduction	Maintenance requirement	Space requirement	Cost	Included in final detailed design
Rainwater harvesting	Rainwater from roof runoff collected for re-use. Cost benefit considerations	L	M	H	L	H	N
Water butts	Rainwater collection from roof runoff. Included in final design	L	L	L	L	L	Y
Living roofs	Vegetated roofs that reduce runoff volume and rate	M	L	M	L	H	N
Bio-retention	Shallow vegetated areas to retain and treat runoff.	L	L	M	M	L	Pos
Constructed wetlands	Waterlogged areas that can support aquatic vegetation. Replicates existing conditions and provides ecological benefit.	M	L	H	H/M	M	N
`Swales	Shallow grassed drainage channels. Replicates existing conditions	H	M	L	M/H	L	Pos

Soakaways	Sub surface structures that dispose of water via infiltration.	H	H	L	L	M	N
Permeable pavements	Surface that infiltrate through surface. Retains pollutants.	H	H	M	L	M	Y*
Tanked storage systems	Oversized pipes or cellular storage.	H	L	L	M	M/H	Y
Infiltration basins	Depressions in the ground to store and release water through infiltration	H	H	H/M	H	M/L	N
Detention basins	Temporary retention of runoff with controlled discharge	H	L	M	H	M/L	N

- Tanked permeable paving with outflow (not infiltration).

Table 7.7 Drainage design hierarchy (SUDS techniques considered for use on this scheme)

It should be noted that where the SUDS techniques are noted as feasible or possible it does not necessarily follow that they will all be used. Reference should be made to the drainage strategy drawing in Appendix D which indicates the proposed strategy.

The consideration of the SUDS hierarchy demonstrates that given the limitations in the application of infiltration techniques that the proposed on-site drainage can include a significant proportion of SUDS techniques that address water discharge quantity and quality.

6.9 SuDs techniques employed

On a local level the surface water drainage strategy for the development site employs the f SuDS techniques outlined in section 6.9 (below) to address water quality and quantity and to manage surface water runoff where possible at source. The SUDS techniques employed are set out below.

The proposed drainage strategy is set out in Infrastruct CS Ltd Drainage Strategy drawing ICS-2191-03-01 contained in Appendix D.

6.10 Surface water drainage strategy & design

This FRA is not intended to provide a detailed design for the drainage system to serve the proposed development, but to show that a proposed system is feasible in principle given the storage volume required and land availability. A detailed drainage scheme will be submitted to the Local Planning Authority (LPA) prior to the commencement of development and/or to discharge the appropriate planning condition.

The main contributory factor to surface water runoff is usually from the hard standing associated with driveways and roof areas.

There is an overall 46% reduction in the impermeable area as a result of the new development.

The implementation of SuDSs techniques will further reduce runoff rates.

Tanked Infiltration permeable paving

External hard standing areas will be constructed from tanked permeable paving adoptable highway discharging into Sud Brook thereby providing 3 levels of water quality management 1) retention of suspended solids 2) breakdown of hydro carbons 3) retention of heavy metals.

Tanked permeable paving for private parking and hardstanding will discharge into Sud Brook subject to an attenuated flow rate controlled by a Hydrobrake or similar (Appendix I for Microdrainage calculations).

Rain water butts –are to be installed in the rear gardens of all the dwellings. These will reduce clean water demand and to a lesser extent volume of runoff.

6.11 Water quality

To protect groundwater and receiving watercourses it is essential to capture, control and treat pollution. Using SuDS treatments help to replicate natural drainage regimes and minimize impact.

Guidance contained in the Gloucestershire County Council's 'SuDS Design and maintenance guide' Section 7 'SuDs and water quality' requires that water treatment is provided for surface water runoff dependent on the potential type of pollutant and sensitivity of the receiving water course and ground water.

The tanked permeable paving immediately in front of the proposed dwellings and the adopted road have high ratings to provide –

- Filtration of silt and attached pollutants – the majority of silt is trapped within the top 30mm of the jointing material between the blocks
- Biodegradation of organic pollutants, such as petrol and diesel within the pavement construction.
- Absorption of pollutants
- Settlement and retention of solids

6.12 SuDs maintenance

The owners and occupiers of the properties will be responsible for maintaining the private SuDs features. All owners utilising the private surface water drainage will be provided with instruction manuals that detail the frequency and type of maintenance required for all the SuDs features employed.

Where SuDS featrues such as the access road are adopted by the highway authority they will be responsible for the on-going maintenance. They will be issued with a maintenance manual detailing the type and frequency of maintenance required.

7.0 Sequential & exception test for development in flood risk areas

7.1 Aim of the sequential test

The aim of the sequential test set out in Planning Policy Framework is to steer new development towards areas with the lowest probability of flooding. However, where this is not possible the exception test as set in paragraph 102 of the framework, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

The sequential test for this site is a matter for local planning policy, therefore this report focuses on the exception test required for the two proposed dwellings (plots 1 & 2) that encroach into flood zone.

7.2 Strategic Assessment of Land Availability (SALA)

The National Planning Practice Guidance (2014) requires authorities to consider capacity within their areas with regard to the availability of land to accommodate housing and employment development. These studies have now superseded the former Strategic Housing/Employment Land Availability Assessments (SHLAAs and SELAA's).

A Strategic Assessment of Land Availability (SALA) does not determine or make recommendations as to whether a particular site should be allocated for housing or employment purposes, nor does it determine whether planning permission should be granted, these matters are for statutory plan and decision making processes.

The Norvilles site is referenced in appendix 2 of the Gloucester SALA 2013 report, and is described as recommended redevelopment for residential and as unsuitable as being unsuitable for employment potential dus to its proximity in a residential area.

7.3 Identification of the appropriate area of search

The Norvilles site is located within the residential area of Tredworth to the south east of Gloucester city centre. Given the need for regeneration of this site it is the sequential test considers similar sized sites within the Gloucester City boundary. A sequential test has not been carried out for this development at Local Plan level.

The proposed development is classified as 'more vulnerable'. The majority of the site can be classified as Flood Zone 1 to which development is appropriate. A small part of the site is flood zone 3a in which development is not appropriate.

The area over which the test has been applied is the City of Gloucester as this is considered appropriate given the proximity of the site within Gloucester City.

The Strategic Assessment Of Land Availability (SALA) January 2015 has been used as the source to identify 'reasonably available' alternative sites.

Sites have been compared with Environment Agency Flood Risk Maps and also local plan status, capacity, constraints on availability and environmental conditions.

7.4 Potential alternative sites compared to the application site

The Gloucester SALA 2013 identifies 14no sites in the area, identified in the report as shown in the table below

Allocation	Location	Status	Comments
HA12	Former telecom House	0.6ha 25 dwellings	Recommended best use was employment or mixed use. Flood zone 1 Capacity inadequate. Not considered an appropriate alternative.
HA18	Adj Drydocks	1.34ha 65 dwellings	Flood zone 3 Not considered an appropriate alternative.
HA29	Norville site Tarrington Road	0.86ha 30 dwellings	2012 SELAA panel recommended redevelopment for residential Flood zone 1 & 3a Not considered an appropriate alternative.
EA01	Long stay car park. Rail station	0.49ha	Flood zone 1 Site unlikely to be made available.
EA04	Land at southwest bypass	0.7ha site recommended for employment	Part flood zone 2 Considered suitable for employment use Not considered an appropriate alternative.
EA11	West of Tesco filling station	0.84ha	Part of flood zone 3b Site not available.
FS09	Rear of Smith & Choyce, Upton Street	Housing potential 2	Site not suitable for residential use
SUB15	Tuffley Resources Centre	0.6ha occupied and functioning educational facility 14 dwellings	Part Flood zone 2 Not considered an appropriate alternative because of dwelling numbers.
SUB 19	Bohanam house	1.15ha 15 dwellings	Part flood zone 2 & 3 Not considered an appropriate alternative because of dwelling numbers.
SUB 38	Land at Griggs Timber, Bristol Road	0.5ha 16 dwellings	Flood zone 1 & adj 2 Not considered an appropriate alternative because of dwelling numbers.

SUB 46	277-279 Bristol Road	1.0ha	Flood zone 1 Site recommended for employment use.
SUB47	Gardner Denver site, Barton Street	Housing potential 82	Site being built out
SUB 49	Gospal Hall, Matson lane	1.3ha	Area of 'High' landscape value Functioning community facility. Not considered suitable alternative
SUB 54	Land at Rea, Lane	1.2ha 35 dwellings	Access constraints at this site. Flood zone 1 Not considered an appropriate alternative because of dwelling numbers.
FS02	Southgate moorings car park	0.5ha 40 dwellings	Flood zone 1 Site recommended retained for employment purposes
FS09	Rear of Smith & Choyce, Upton Street	0.54ha	Flood zone 1 Site not available
FS11	Kemble Close	0.55ha 8 dwellings	Flood zone 1 Not considered an appropriate alternative because of dwelling numbers.
FS12	St James' Close	0.56ha	Flood zone 1 Not considered an appropriate alternative because of dwelling numbers.
FS13	Land adj St Aldates	0.5ha	Flood zone 1 Not considered an appropriate alternative because of dwelling numbers.

It is the conclusion of the sequential test in this report that no suitable or available alternative sites within a lower flood risk zone or the same flood risk zone appropriate for the proposed residential development.

Therefore an exception test is required

7.5 Exception test

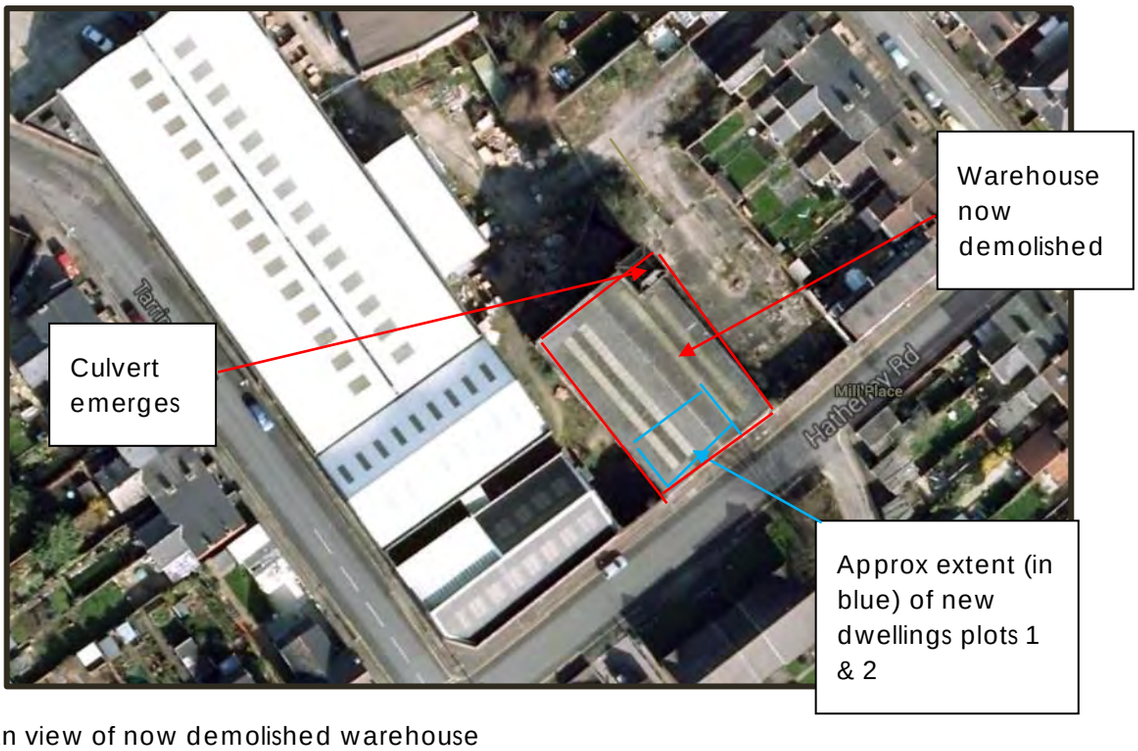
The NPPG states that following application of the sequential test, if it is not possible for the development to be located in a zone of a lower probability of flood risk, then the exception test must be applied to assess if the flood risk can be managed whilst still allowing necessary development to occur.

There are two parts of the test that are required to show that development will provide sustainable benefits to the community that outweigh flood risk, and that will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

7.6 Development Layout In Relation To Flood Zones

All the new dwellings with the exception of one plot are placed outside of the flood zone and are therefore not at risk.

The exception is the end flat of flats 01-18. It should be noted that where this flat is located there was previously a warehouse building which has since been demolished. The watercourse was culverted beneath this building so the encroachment of the flood zone 3 as indicated on the flood map into this area is in view of this information doubtful. The calculated 1 in 100 year +CC flood level in this area is 18.75 – 18.85 compared to the previous slab level of 18.70. Given the flood level has a climate change allowance it is doubtful that this area was subject to flood zone 3 flooding. The new proposals now liberate much of this area for flood storage as the footprint of the warehouse was far greater than the proposed dwellings.



Plan view of now demolished warehouse

7.7 Benefits to the community

The Norvilles site consists of commercial warehouses and offices with associated car parking situated in a residential area. The development is therefore inconsistent with the residential area and imposes significant vehicular traffic movements on a road network not designed to accommodate such traffic.
The development is also such that the site bank of Sud Brook which runs along the north eastern boundary consists of a vertical engineered brick wall which is both environmentally detrimental and also is a major constraint on the brook capacity and ditch flows.

The redevelopment of the site therefore gives the opportunity to improve the residential area by removing the commercial development but also from flood risk perspective will improve the flood capacity of Sud Brook and improve the ecology. The removal of the warehouse adjacent to Sub Brook means that an ecological corridor is established that will also improve flood capacity without impacting on the new development.

7.8 Safe for its lifetime

Wider issues of safety for the development lifetime have been considered and the new development is such that all the new dwellings are above the maximum flood level. It can be expected that the demolition and removal of the warehouse adjacent to the brook will reduce the flood levels still further.

7.9 Floor levels

The maximum modelled flood level provided by the Environment agency for the 1 in 100 year storm event with an additional allowance for climate change are 18.85mAOD upstream of the weir on the watercourse, and 18.42mAOD below the weir.

In comparison generally existing site levels range from 21.00mAOD to 18.60mAOD approx.

Proposed floor levels will vary from 21.40mAOD to 19.30mAOD.

This places all floor levels for the proposed dwellings above the maximum flood level (including the extreme 1 in 1000 year flood level of 18.97m AOD).

7.10 Private parking levels

Where new parking is provided adjacent to Sud Brook, proposed levels will be set 300mm above the maximum flood levels to ensure vehicles are not subject to overland flood flows that might cause cars to be swept into the watercourse and block the downstream culvert system. These proposed levels are lower than the existing site levels so there is no detrimental impact on flood storage.

7.11 Safe Access and Egress

All residential dwellings associated with the proposed development have a dry means of access on to the public highway. The surrounding roads that are adjacent to the development are not affected by flood water and therefore emergency services have unrestricted access.

7.12 Flood Resilience

Flood resilient measures are not required to the dwellings as all finished floor levels are above the maximum flood level.

7.13 Flood Warning

It is not considered that the new dwellings will be at risk from flooding, however, owners and occupiers of the properties adjacent to Sud Brook can be made aware in the owners handbook that they can sign up for either telephone, mobile, email SMS text message which gives warning of potential flooding events. Environment Agency operates a flood watch scheme called Floodline 0845 988 1188 (24 hour service) or Type talk 0845 602 6340.

7.14 Flood Compensation

The presence of the Sud Brook weir within the site has resulted in an elevated modelled flood level in the south east corner where the Hatherley Road culvert emerges. The modelled flood level for this area is 18.83m AOD max.
The proposed flat forming part of plots 01 – 18 (north east corner) sit within flood zone 2 The finished floor levels of these plots are 20.10mAOD approximately 1270mm above the 100 year plus cc flood level. As this plot sit within the modelled flood zone it is necessary to provide flood compensation.

Digital ground models of the proposed and existing levels

Level band considered	Existing flood storage	Proposed flood storage	Increase in storage capacity provided by proposed scheme
18.80	348.9cum	387.9 cum	39cum
18.60	141.8cum	181.9cum	40.1cum
18.40	103.7cum	113.5cum	9.8cum

The storage is mostly provided by lowering the existing ground levels in the landscape area in the south east corner of the site. This area is currently covered by a concrete slab. Garden levels to the rear of the end flat set as close to the existing levels as is possible.

The calculations are conservative as the ignore a significant additional volume of flood storage that will be liberated by the demolition of the redundant warehouse adjacent to Sud Brook. The slab level of this building is in the order 19.250mAOD compared to the flood level of 18.26mAOD approx.

In addition, where de-culverting works are to take place along with 'softening' of banks this will create additional storage. This is not quantified in this report but will obviously provide overall storage benefit.

7.15 Residual Flood Risk & Exceedance

In extreme storm events that exceed the 1 in 100 year storm event, the proposed dwelling floor levels and external levels will be such that properties will not be at risk from flooding or flood routing as site topography generally is from Tarrington Road down to Sud Brook and there is sufficient open space between buildings such that flood flow routes would not be obstructed.

8.0 Foul drainage strategy

8.1 Proposed foul drainage

It is proposed to serve the development by a gravity drainage system discharging into the combined sewer Severn Trent manhole ref 9024 that is located in Paul Street. The depth of the sewer at this point is approximately 2.27m deep.

Proposed development consists of – a mix of 63 No residential dwellings.

Estimated flows

63 No Residential dwellings @4000 l/day	= 2.92 l/s
Total proposed discharge rate	= 2.92 l/s

9.0 General

9.1 Benefits to the community

The existing Norvilles site consists of commercial buildings and hardstanding. The entire site is enclosed by perimeter walls and building walls. The new development provides landscaped open space for the residents and opens up access to Sud Brook watercourse thereby providing valuable amenity to the local population.

9.2 Benefits to ecology

Currently the section of Sub Brook adjacent to the development site is heavily engineered consisting of brick side walls. As part of the development it is envisaged that 'pocket's will be introduced into the brick walls that will encourage wildlife ecology. An existing slabbed culvert over the brook will be removed as part of the development to enhance the wildlife corridor.

9.3 Benefits to maintenance

Much of Sud Brook is currently inaccessible and hidden from view. The new development will allow the brook to be more easily monitored and also significantly improve accessibility for maintenance particularly where the brook disappears into the culverted section downstream. The removal of the mid section of culvert will decrease the risk of blockages.

9.4 Reduction of rapid surface runoff

Currently the entire development site has an unrestricted surface water discharge into Sud Brook, this has the potential to cause the flood flows in the brook to be 'flashy' i.e. fluctuate in level, volume and velocity rapidly. The new development reduces the impermeable area significantly and also introduces, tanked permeable paving that will provide a degree of attenuation and significantly reduce runoff quantity.

9.5 Water quality

The proposed tanked permeable paving provide two levels of water quality treatment which will benefit the ecology of Sud Brook.

References & Bibliography

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- The Technical Guidance to the National Planning Policy Framework March 2012.
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- Environment Agency indicative ground water source protection zone maps http;//maps.environment- agency gov.uk
- Environment Agency indicative Aquifer designation maps http;//maps.environment-agency gov.uk
- CIRIA 2007, The Sustainable drainage Systems (SUDS) Manual C753
- Sewers for adoption 6th Edition and interim guidance prior to the introduction of sewers for adoption 7th edition WRC
- Strategic Flood Risk Assessment for Gloucester
- Gloucester SALA 2013 report
- Gloucestershire SuDS Design & Maintenace Guide April 2015

Appendix A – Proposed development plan

Appendix B – Topographic survey

Appendix C – Topographic survey with flood data indicated

Appendix D – Proposed drainage strategy

Appendix E – Existing & proposed impermeable areas

Appendix F – Environment Agency Product 4 Flood level data

Appendix G – Severn Trent Water sewer asset records

Appendix H – Extract from Gloucester City Strategic Assessment Of Land Availability

Appendix I – MIcrodrainage calculations

Schedule of Accommodation

Units

Ref	Unit Type	Area m²	No.
Type A/A1	1B/2P Flat	46 - 52m²	6
Type B	1B/2P Flat	50 - 55m²	6
Type C	1B/2P Flat	51 - 52m²	4
Type E	2B/4P Flat	70.0m²	5
Type E1	2B/4P Flat (Disabled)	70.0m²	1
Type H	2B/3P Flat	62 - 68m²	15
Type J	2B/3P House	70.0m²	12
Type N/N1	2B/3P House	70.0m²	3
Type P	2B/4P House	78.5m²	4
Type K	3B/5P House	93.6m²	4
Type G	3B/5P House	85.4m²	2
Type M *	4B/6P House (Wheelchair accessible)	140.0m²	1

Total Units	**63**
Site **Area (m²)**	**7753**
Site **Area (ha)**	**0.7753**
Residents Parking	**60**
Visitor **Parking**	**2**
On-street **Parking**	**12**
Total **Parking**	**74**

SITE LAYOUT PLAN Scale 1:500

Revision		Date	By	Chkd
J	Site layout revised following comments from LPA	20.05.16	AK	MA
L	Site layout revised with 3 more J type, 3 less P type and 1 extra visitor parking space.	24.05.16	AK	MA
M	Site layout revised following comments from LPA.	09.06.16	AK	MA
N	Site layout revised following comments from LPA.	27.06.16	AK	MA

Project	Drawing	Client
NORVILLES, PAUL STREET GLOUCESTER	PROPOSED SITE LAYOUT	[redacted]

Scale	Dated	Job No.	Drawing No.	Drawn by	Checked	CISfb Element	Revision
1:500@A2	20.10.14	52460	D01	AK	MA	SITE LAYOUT	N

BM3

A0

RES SUR-VEYING

Survey information localised and does not relate to GPS co-ordinates

REV	DESCRIPTION	DATE

ADDRESS

Old Norvilles Factory Site
Tarrington Road
Tredworth, Glos.

DRAWING

Topographic Survey

PROJECT NO	SUR.1118
DATE	18/11/2014
DRAWN BY	KL
CHECKED BY	NG

L01

SCALE	1:200 @ A1

SURVEY INFORMATION
RES Surveying Ltd - 01452 506079
DRG NUMBER: SUR.1118 L01 DATE RECEIVED: 19/11/2014

ARCHITECT SITE PLAN INFORMATION
BM3 Architects - 0121 633 0000
DRG NUMBER: 52460 - D01 - N DATE RECEIVED: 28/06/2016

NOTES

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5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Rev	Drawn by	Chk'd by	Comments	Date
REV	NJ	DJ	First issue	01/07/16

DRAWING TITLE
Flood Extents Plan

PROJECT
Norvilles Factory Site
Tarringon Road
Tredworth
Glos

DESIGNED BY	DRAFTED BY	APPROVED BY
DJ	NJ	TST

DATE 16/06/2016 STATUS **PRELIMINARY**

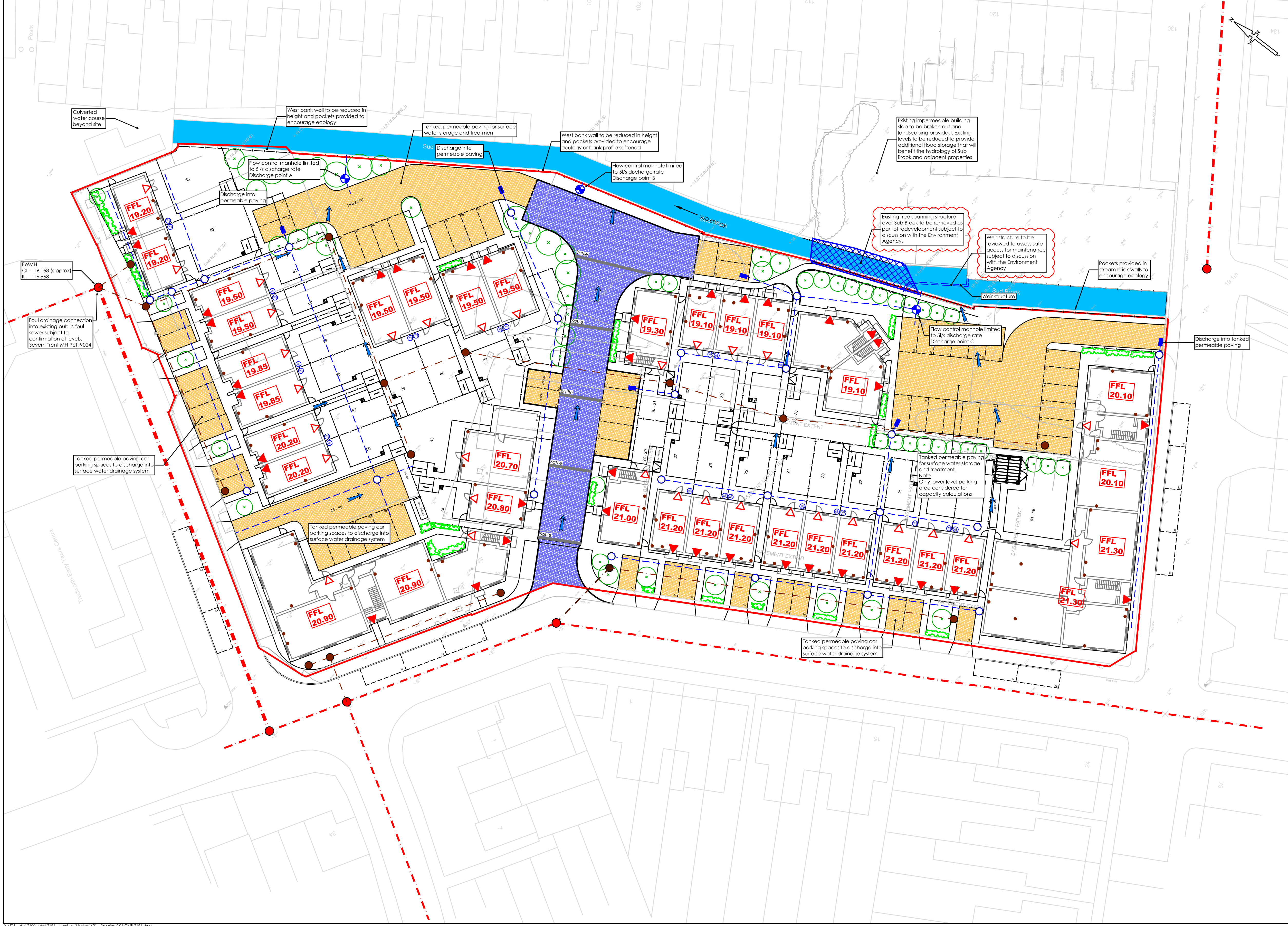
SCALE 1:250 @ A1 — 0m 6.25m 12.5m Scale bar @ 1:250

CLIENT
Markey Construction
Infrastruct CS Ltd

JOB NUMBER	DRAWING NUMBER	REVISION
ICS-2191	90	P01

Infrastruct CS Ltd: The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk: www.infrastructcs.co.uk

K:\ICS Jobs\2100 Jobs\2191 - Norvilles (Markey)\01 - Drawings\01 Civil\2191.dwg



BURIED UTILITIES RISK NOTE
• Buried utilities are present on and in the vicinity of the site. • The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place. • Any RAMS shall address safe procedures for protection and working in the proximity of services.

DESIGNERS CDM NOTE - RESIDUAL RISKS **NOT** IDENTIFIED
The design Engineer(s) have assessed this design as the scheme has been developed in order to identify if there are any residual risk hazards (i.e. unusual, unexpected, abnormal or difficult). No residual risks have been identified for this scheme and therefore no entries were added to the risk register. This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

SURVEY INFORMATION
RES Surveying Ltd - 01452 506079
DRG NUMBER: SUR.1118 L01 DATE RECEIVED: 19/11/2014

ARCHITECT SITE PLAN INFORMATION
BM3 Architects - 0121 633 0000
DRG NUMBER: 52460 - D01 - N DATE RECEIVED: 28/06/2016

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Drainage Key

Sewers

	Foul water drain (private/non adoptable)
	Surface water drain (private/non adoptable)
	Foul water sewer (Adoptable)
	Surface water sewer (Adoptable)
	Existing combined water sewer (Adopted)

Chamber Key

FW	SW	
		PPIC - 475mmØ *
		Manhole Depth 1.25 to 1.5m * Depth 1.55 to 3.0m *

* General note
(Refer to standard details & long sections for chamber sizes.
Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

	Soil vent pipe/soil stack
	RWP cellular discharge/collection unit
WB	Rain water butt
	Baffle to prevent rapid through flow of water through permeable paving
FFL XX.XX	Finished Floor Level (FFL)
	Tanked permeable paving (Adoptable)
	Tanked permeable paving (Private)
	Flood exceedance - Arrows indicate flood flows should the 1 in 100 year storm plus 30% climate change be exceeded

Drainage Strategy

Foul Drainage

Gravity system discharging into existing Severn Trent Water foul sewer at Manhole Ref: 9024.

On site drainage to be offered for Section 104 adoption.

Surface Water Drainage

There is an overall reduction in impermeable area of 46%
- Existing = 7753m²
- Proposed = 4193m²

Therefore runoff volume and rate is reduced.
Roof runoff will discharge into a piped surface water system that discharge into tanked permeable paving before discharging via an attenuated discharge rate into Sud Brook.
Hard standing private parking areas will be formed from tanked permeable paving to address water quality issues and provide a degree of attenuation. Adoptable highway to be tanked permeable paving draining into swale and then dischange the water course providing robust 2 stage treatment of water quality

Rev	Drawn by	Chk'd by	Comments	Date
P03	NJ	DJ	Minor changes to notes as clouded	24/08/16
P02	NJ	DJ	Outfalls detailed	22/07/16
P01	NJ	DJ	First issue	01/07/16

DRAWING TITLE
Proposed Drainage Plan

PROJECT
Old Norvilles Factory Site
Tarringon Road
Tredworth
Glos

DESIGNED BY	DRAFTED BY	APPROVED BY
DJ	NJ	TST

DATE 16/06/2016
STATUS **PRELIMINARY**

SCALE 1:250 @ A1
0m 6.25m 12.5m
Scale bar @ 1:250

CLIENT
Markey Construction

Infrastruct CS Ltd

JOB NUMBER	DRAWING NUMBER	REVISION
ICS-2191	03	P03

Infrastruct CS Ltd: The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk: www.infrastructcs.co.uk

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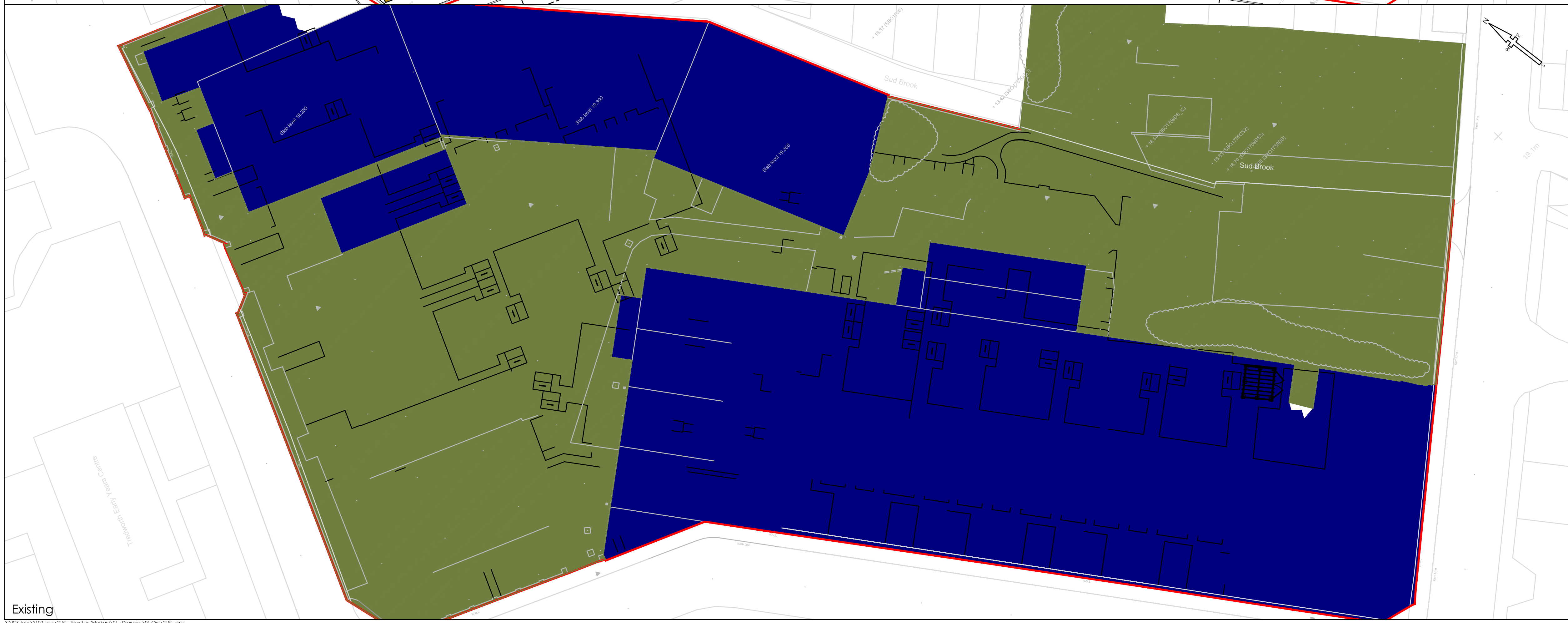
Proposed

Impermeable Areas

Buildings	Buildings = 2,365.2
Parking	Parking = 1,376
Access Road	Access Road = 446.9

Total Areas: 4,188.1



Existing

Existing Buildings	Existing Buildings = 4,187.0
Existing Hard Surface	Existing Hard Surface = 4,530.6

Total Areas: 8,717.6

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SURVEY INFORMATION
RES Surveying Ltd - 01452 506079
DRG NUMBER: SUR.1118 L01 DATE RECEIVED: 19/11/2014

ARCHITECT SITE PLAN INFORMATION
BM3 Architects - 0121 633 0000
DRG NUMBER: 52460 - D01 - N DATE RECEIVED: 28/06/2016

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Rev	Drawn by	Chk'd by	Comments	Date
P01	ATD	RJW	Initial issue	16/06/16

DRAWING TITLE
Impermable Area Plan

PROJECT
Old Norvilles Factory Site
Tarringon Road
Tredworth
Glos.

DESIGNED BY	DRAFTED BY	APPROVED BY
DJ	ATD	TST

DATE 16/06/2016 STATUS **PRELIMINARY**

SCALE 1:250 @ A1 — 0m 6.25m 12.5m Scale bar @ 1:250

CLIENT
Markey Construction
Infrastruct CS Ltd

JOB NUMBER	DRAWING NUMBER	REVISION
ICS-2191	06	P01

Infrastruct CS Ltd: The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk: www.infrastructcs.co.uk

W6252

Please see attached Detailed FRA Map.

A flood plain is an area of land over which river or sea water flows or is stored in times of flood, or would flow but for the presence of flood defences where they exist. This is a precautionary approach in case flood defences are overtopped or breached.

We use historical flood records, river flow data and computer models to estimate specific flood events; on rivers, this will normally be the greater of the 1 in 100 year return period or the highest known water level. In the coastal areas the 1 in 200 year flood or the highest known flood will be used, whichever is the greater. Information from these models is also used to show the need for flood alleviation measures in certain areas and to advice on development within the floodplain. The flood zones refer to the land at risk of flooding and do not refer to single properties. It is possible for a property to be built at a level above the floodplain but still fall within the risk area.

The Flood Map does not reflect future predicted changes in climate. Nor does it provide information on flood depth, speed or volume of flow. Flooding can also occur from other sources such as groundwater or sewers, which are the responsibilities of other organisations.

According to our published flood map which provides a general estimate of the **likelihood** of flooding across England & Wales, the site is shown to be within **Flood Zone 3** (1% chance of flooding in any given year) not taking into account the presence of flood defences. This means that the site/ area lies within the 1 in 100 year flood zone. Please note that the flood plain does not provide an indicator of flood risk at an individual property level.

Modelled Levels

Please see below modelled levels

Please see attached modelled extent outlines

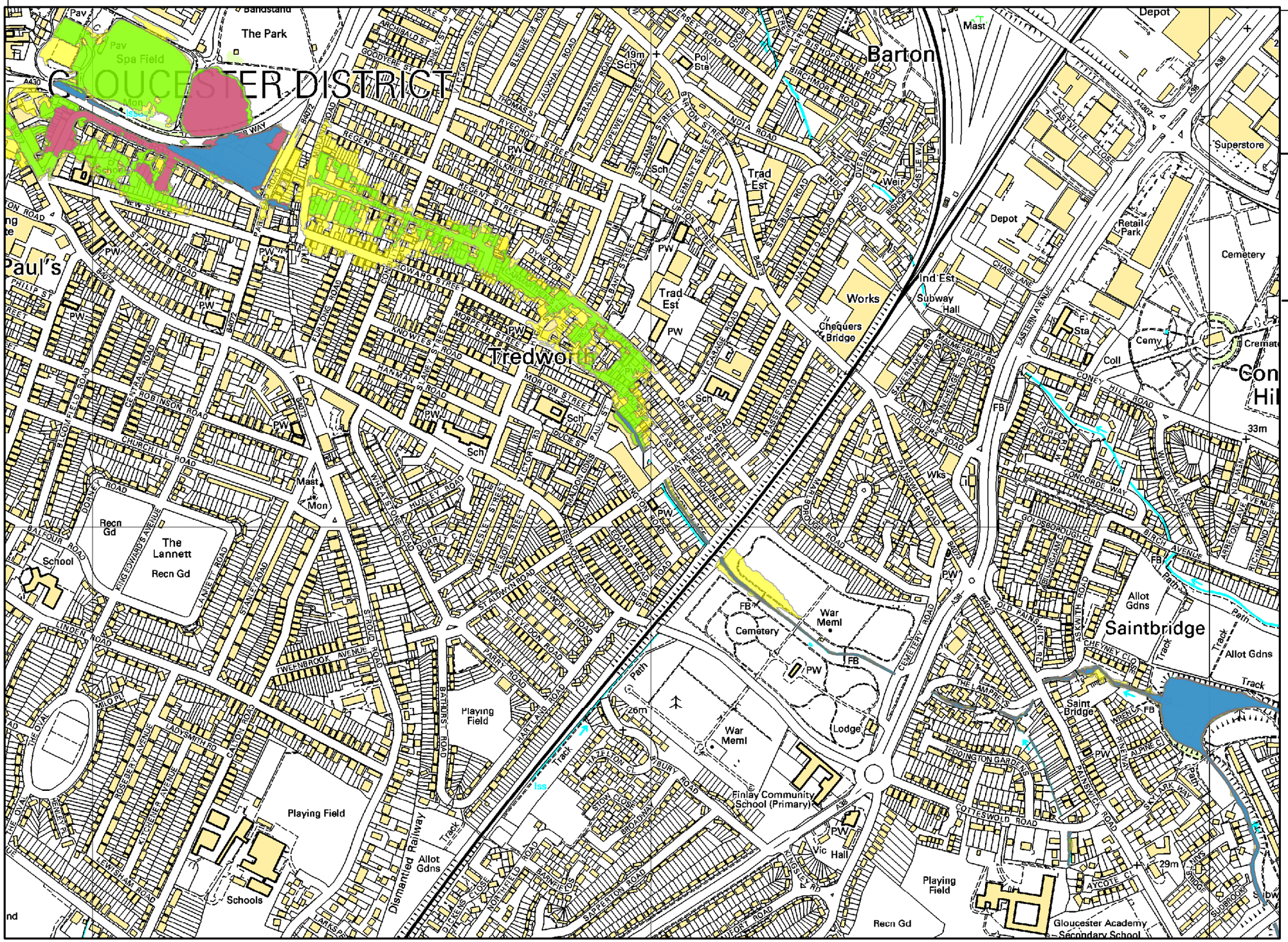
	Level (mAOD)							
NODE	**1 in 5yr**	**1 in 10yr**	**1 in 20yr**	**1 in 50yr**	**1 in 75yr**	**1 in 100yr**	**1 in 100yr (+CC)**	**1 in 1000yr**
SB01606	16.80	17.10	18.02	18.15	18.18	18.21	18.26	18.39
SB01656	17.23	17.47	18.14	18.26	18.30	18.32	18.37	18.52
SB01656_I	16.87	17.16	18.04	18.14	18.16	18.18	18.22	18.33
SB01656_I2	16.83	17.13	18.03	18.14	18.16	18.19	18.22	18.31
SB01656_I3	16.97	17.24	18.06	18.17	18.20	18.22	18.26	18.37
SB01759	17.93	18.13	18.61	18.89	19.01	19.07	19.20	19.40
SB01759_DS2	17.84	18.02	18.47	18.66	18.73	18.76	18.83	18.95
SB01759_DS3	17.65	17.86	18.39	18.55	18.62	18.65	18.70	18.82
SB01759DS	17.84	18.03	18.48	18.66	18.73	18.77	18.85	18.97
SB01759DS_I	17.37	17.61	18.20	18.30	18.37	18.38	18.42	18.52
SB01759DS_I2	17.52	17.75	18.30	18.43	18.49	18.51	18.54	18.62
SB01823_I3	18.00	18.17	18.63	18.91	19.02	19.07	19.19	19.35

Source: Sud Brook model produced in 2009 using ISIS TuFLOW 1D 2D

mAOD definition

The term 'mAOD (N)' means 'metres above Ordnance Datum (at Newlyn, Cornwall)'. Ordnance Datum is the National standard datum of the Ordnance Survey from which all levels, relative to sea level, are quoted and has been used in Great Britain since 1936.

Modelled Extent Outline Map centred Gloucester- created 20th November 2014 [W6252]



1: 10,000

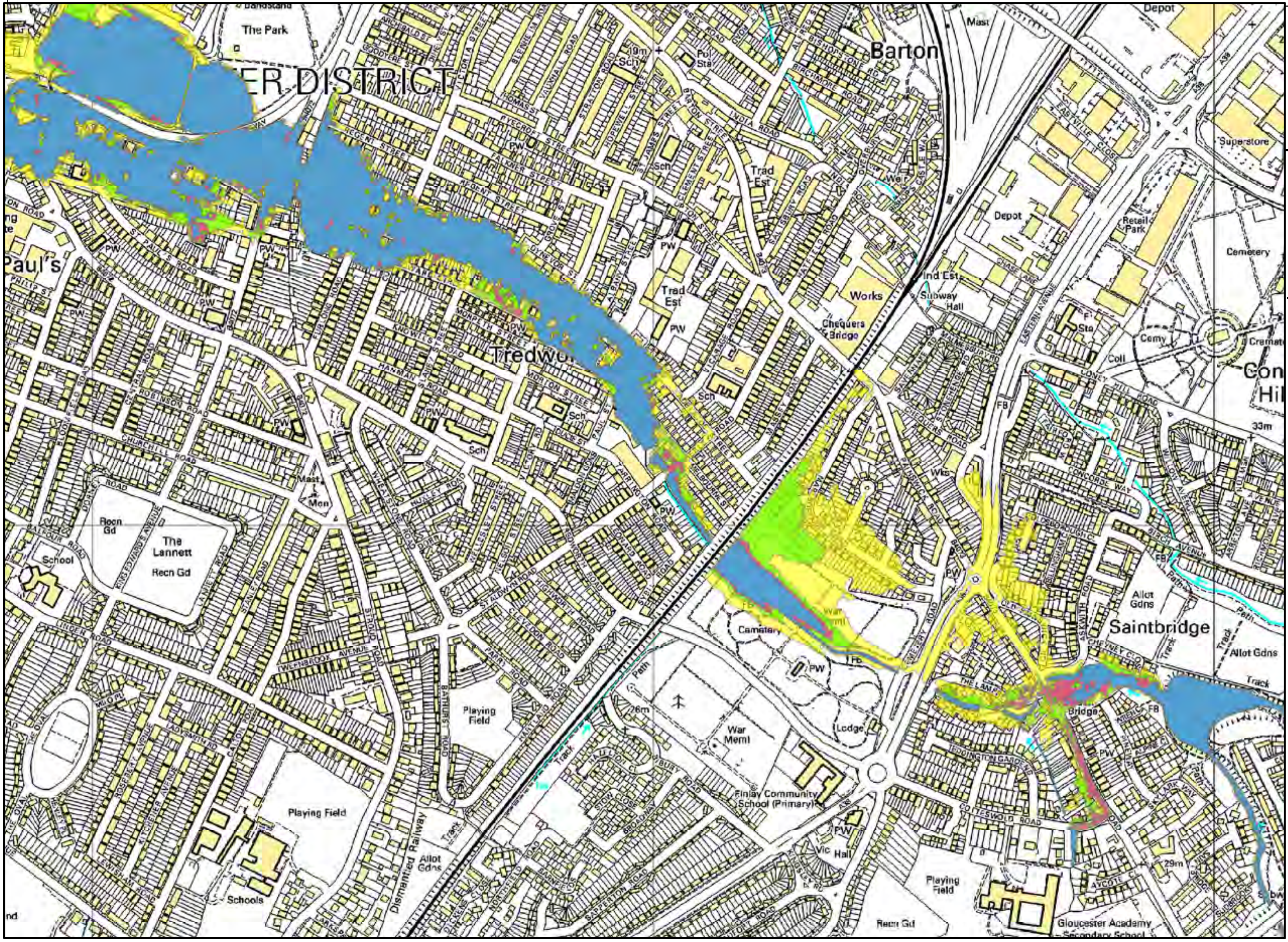
N
W E
S

Legend

- 1 in 5yr Outline
- 1 in 10yr Outline
- 1 in 20yr Outline
- 1 in 50yr Outline

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled Extent Outline Map centred Gloucester- created 20th November 2014 [W6252]



Environment Agency

1: 10,000

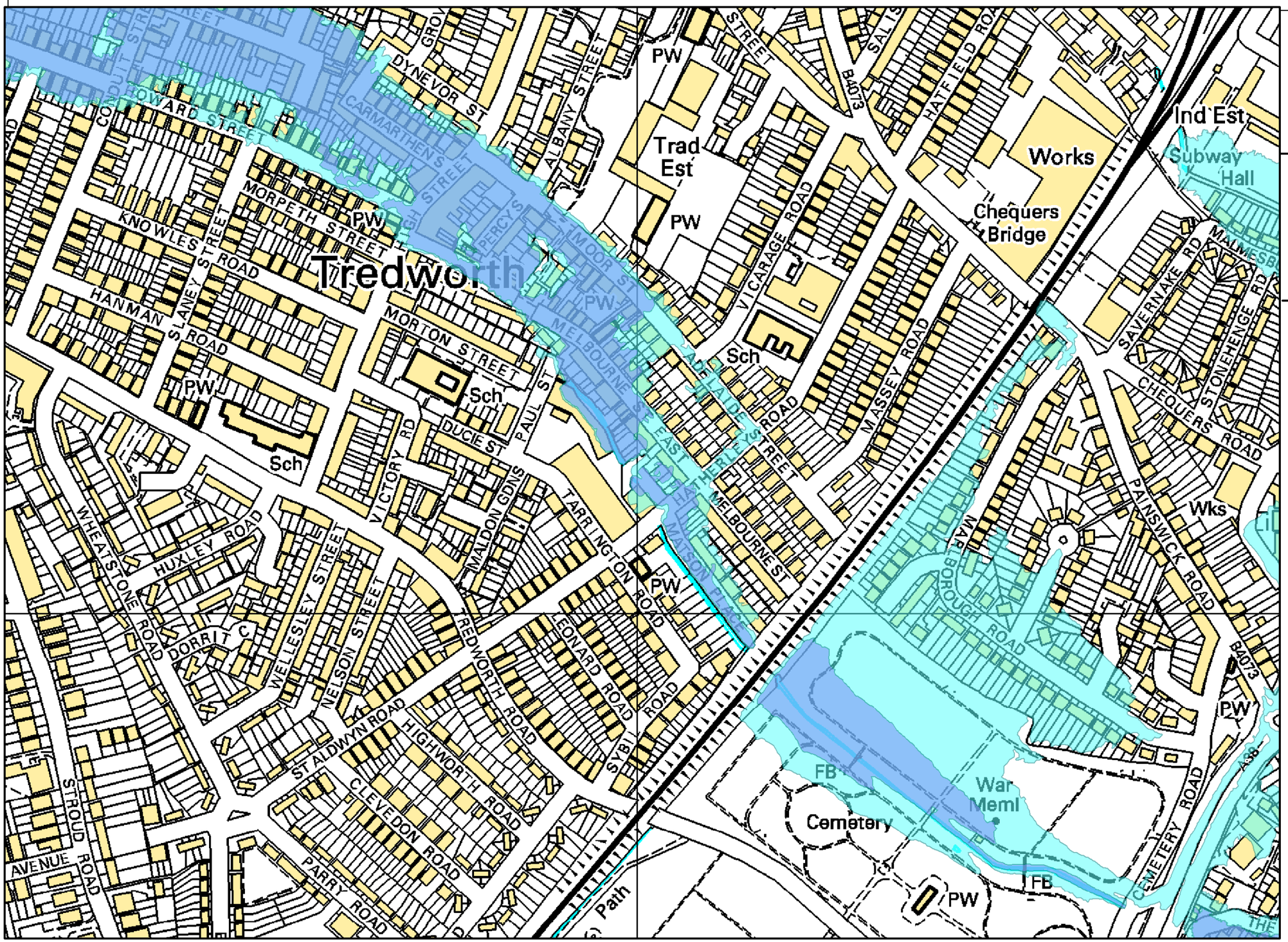
N
W E
S

Legend

- 1 in 75yr Outline
- 1 in 100yr Outline
- 1 in 100yr (+CC) Outline
- 1 in 1000yr Outline

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

FRA Map centred Gloucester- created 20th November 2014 [W6252]



Environment Agency

1: 5,000

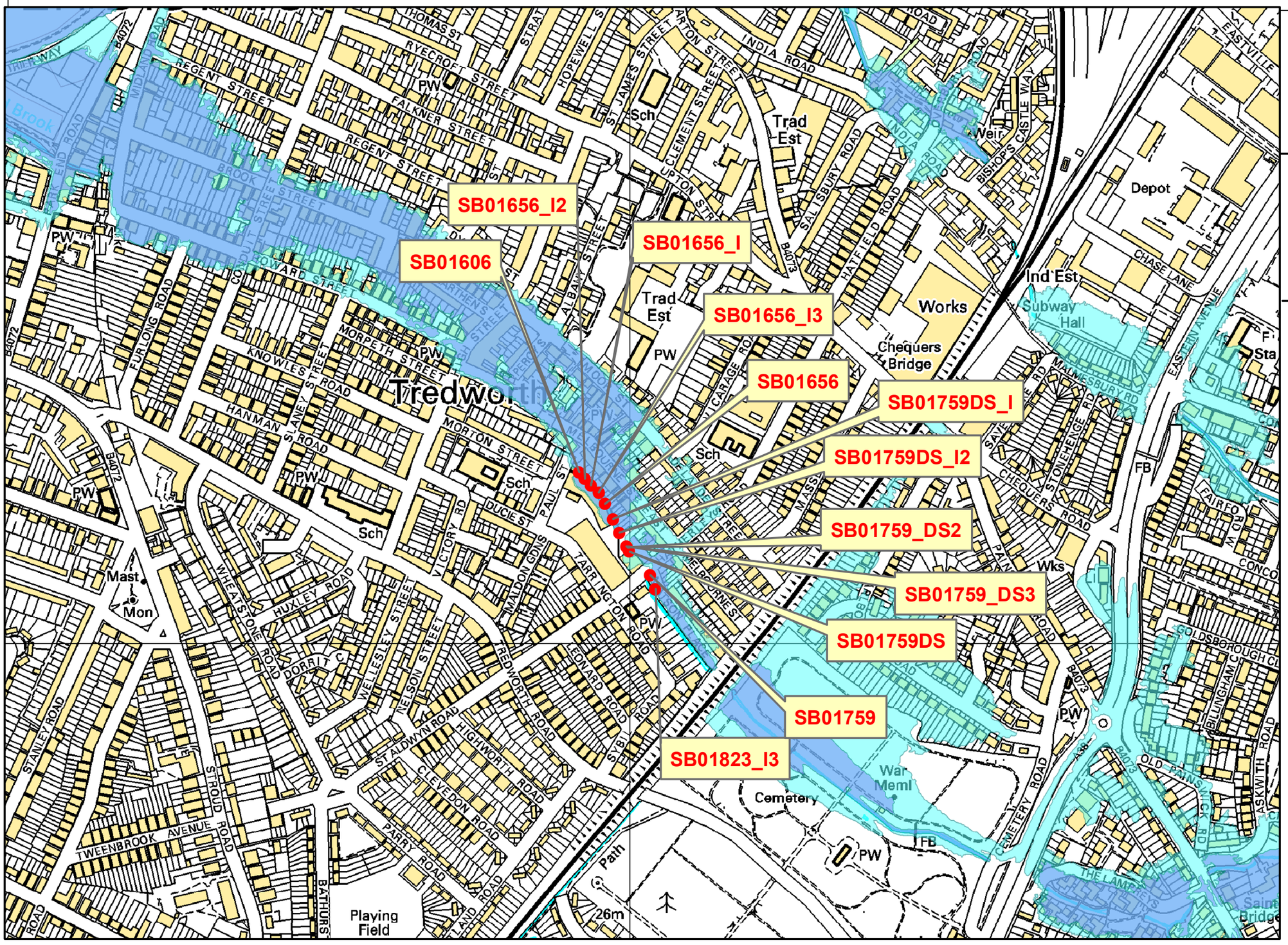
N
W E
S

Legend

- Flood Zone 3 (1% 1 in 100 Yr)
- Flood Zone 2 (0.1% 1 in 1000 Yr)

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Detailed FRA Map centred Gloucester- created 20th November 2014 [W6252]



Environment Agency

1: 15,000

N
W E
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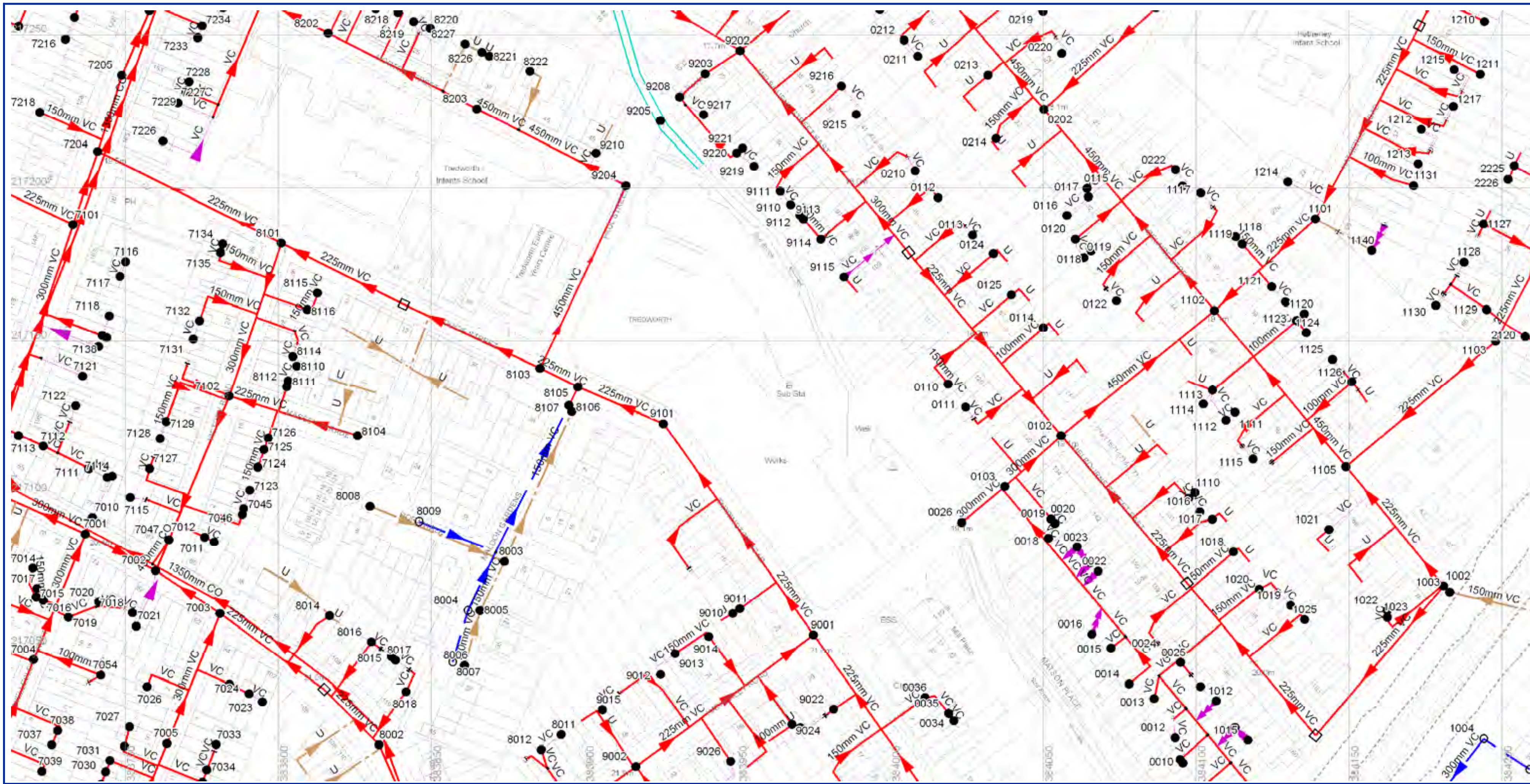
Legend

- Node Points
- floodmap_defences_010k
- floodmap_areasbenefit_010k
- floodmap_fsa_010k
- Flood Zone 3 (1% 1 in 100 Yr)
- Flood Zone 2 (0.1% 1 in 1000 Yr)

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Abandoned Gravity Sewer
Private Combined Gravity Sewer
Private Foul Gravity Sewer
Private Surface Water Gravity Sewer
Public Combined Gravity Sewer
Public Foul Gravity Sewer
Public Surface Water Gravity Sewer
Trunk Combined Gravity Sewer
Trunk Foul Use Gravity Sewer
Trunk Surface Water Gravity Sewer
Combined Use Pressurised Sewer
Foul Use Pressurised Sewer
Surface Water Pressurised Sewer
Highway Drain
Combined Lateral Drain (SS)
Foul Lateral Drain (SS)
Surface Water Lateral Drain (SS)

All Private Sewers are shown in magenta
All section 104 sewers are shown in green
All Sewers that have been transferred to Severn Trent Water after the 1st October 2011, but have not been surveyed and confirmed by Severn Trent Water are shown in orange

Culverted Watercourse
Cable, Earthing
Cable Junction
Cable, Optical Fibre/Instrumentation
Cable, Low Voltage
Cable, High Voltage
Cable, Other
Housing, Building
Housing, Kiosk
Disposal Site
Sewage Treatment Works
Housing, Other
Pipe Support Structure
Sewage Pumping Facility
Sewer Facility Connection Inlet / Outlet

Blind Shaft
Combined Use Manhole
Flushing Chamber
Foul Use Manhole
Grease Trap
Head Node
Hydrobrake
Lamphole
Outfall
Overflow
Penstock
Petrol Interceptor

Sewer Chemical Injection Point
Sewer Junction
Sewerage Air Valve
Sewerage Hatch Box Point
Sewerage Isolation Valve
Soakaway
Surface Water Manhole
Vent Column
Waste Water Storage
Pre-1937 Properties

MATERIALS

- \- NONE
- AC - ASBESTOS CEMENT
- BR - BRICK
- CC - CONCRETE BOX CULVERT
- CI - CAST IRON
- CO - CONCRETE
- CSB - CONCRETE SEGMENTS (BOLTED)
- CSU - CONCRETE SEGMENTS (UNBOLTED)
- DI - DUCTILE IRON
- GRC - GLASS REINFORCED CONCRETE
- GRP - GLASS REINFORCED PLASTIC
- MAC - MASONRY IN REGULAR COURSES
- MAR - MASONRY RANDOMLY COURSED
- PE - POLYETHYLENE
- PF - PITCH
- PP - POLYPROPYLENE
- PSC - PLASTIC STEEL COMPOSITE
- PVC - POLYVINYL CHLORIDE
- RPM - REINFORCED PLASTIC MATRIX
- SI - SPUN (GREY) IRON
- ST - STEEL
- U - UNKNOWN
- VC - VITRIFIED CLAY
- XXX - OTHER

SHAPE

- C - CIRCULAR
- E - EGG SHAPED
- O - OTHER
- R - RECTANGLE
- S - SQUARE
- T - TRAPEZOIDAL
- U - UNKNOWN

CATEGORIES

- W - WEIR
- C - CASCADE
- DB - DAMBOARD
- SE - SIDE ENTRY
- FV - FLAP VALVE
- BD - BACK DROP
- S - SIPHON
- HD - HIGHWAY DRAIN
- S104 - SECTION 104

PURPOSE

- C - COMBINED
- E - FINAL EFFLUENT
- F - FOUL
- L - SLUDGE
- S - SURFACE WATER

N
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S

SEVERN
TRENT
WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD

O/S Map scale: ï æî ëð

Date of issue: ðî ö î ö ì

This map is centred upon:
O / S Grid reference:

x : í èí çêî

y : î ï éï í î

Appendix 2

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
HA01	-	Gloucester Quays	Housing allocation	Urban dockside development with outline permission for 1000 units. Numerous Listed buildings and within Docks Conservation Area. SFRA 2 Flood Zone 3a. Included in commitments in housing trajectory.	Good accessibility to services, facilities and employment.	Yes	Yes	6-10	5.42	1000 (-300)	Whole site suitable for employment related development	Commitment. - Part of Gloucester Quays outline consent Developer considers residential development will start to deliver within 6 -10 years	Should market pick up site may yield some apartments towards the end of the plan period.
HA02	WN4	'Kings Quarter' Bus station; Market Parade & Kings Square	Housing allocation	Town centre, bus station, office and retail uses, subject to development brief for retail lead redevelopment of area with residential. Within area of principle archaeological interest and adjacent to City Centre Conservation Area. Scheduled Monument within site area. Further heritage assessment required. Multiple ownerships, requires a comprehensive regeneration approach.	Good access to services, facilities and employment.	Yes	Yes	6-10	4.5	50	Yes - retail led regeneration 20,000sqm gross retail floor space	Kings Quarter is the City Council's top regeneration priority Kings Quarter Concept Statement adopted by Council in January 2013 Stanhope are the Council's preferred development partner	Residential will fit in around a predominantly retail led regeneration scheme.
HA03	-	RAF Quedgeley, Kingsway	Housing allocation	Outline and full permissions in place for comprehensive redevelopment of site for residential, employment and community uses. Much of site complete and under construction. Contamination issues been/being dealt with. Will be included in commitments in housing trajectory. Within the area is the site of Manor Farm and associated barns which are designated as both listed buildings and scheduled monument.	Good access to public transport and employment. Good access to services and facilities in Quedgeley. Additional services and facilities to come forward on site.	Yes	Yes	0-5 6-10	139	3300 (Sept 14 -2417 dwellings complete 853 to complete)	Yes - Extant consent on Framework 5 - 15 Ha of employment land	More development activity on Framework 4 with parcels delivering residential units again. Approx 3 parcels on Fmwk 4 still to obtain reserved matters consent Second primary school within Kingsway now complete.	Completing the remaining 1,000 units on the site in the next 5 years would be optomistic - but reasonable to expect delivery within the whole plan period. Given LEP desire to identify employment land across the County we do not want to loose the existing 15ha at Kingsway
HA04	-	Land junction Barnwood Road and bypass		Derelict land with permission for hotel, commercial and residential development. Small amount of residential on part of site. Outline planning permission granted. Site is complete	Good access to public transport and employment. Access to services within Barnwood.	Yes	No	-	1.3	-		Site complete as of April 2012 14 dwellings & 9 flats, hotel and coroners court.	Agree
HA05	-	Former Industrial Sites Bristol Road	Housing Allocation	Derelict and Vacant employment site. Outline permission subject to S106 agreement for comprehensive redevelopment for employment and residential. Contamination from previous uses. Included with commitments in housing trajectory.	Fair access to public transport, services, facilities and employment.	Yes	Yes	0-5 6-11	9.1	235	Yes - small area for employment included in outline consent	Outline consent subject to S.106 for 235 dwellings	Agree
HA06	-	Part St Michael's Square		City centre location, part of site SFRA flood zone 2, surrounding area has listed buildings and conservation area and Article 4 directive. Area of Principle Archaeological Interest. Area purchased by local residents and developed as garden. Land not available for development.	Good access to public transport, services, facilities, employment and city centre uses/	No	No	No	0.1	-		Site not likely to come forward for residential purposes - in use as a community garden	Agree
HA07	-	Corner Southgate Street and Trier Way	Housing allocation	Derelict land adjacent to Gloucester Quays and Gloucester park. SFRA flood zone 2 and 3a. Site located within the Southgate Street Conservation Area See section 9.2 management recommendations for site policy CA2/5.	Good access to public transport, services, facilities and employment.	Yes	Yes	0-5	0.2	12	Dementia care home will provide employment – 24hr care facility	Site subject to S.106 for dementia care home plus 12 assisted living flats on 3rd floor Site now under construction.	Agree
HA08	WN5	Car Park Hampden Way	Housing allocation	##########	Good access to public transport, services, facilities and employment.	Yes	Yes (longer term)	6-10	0.2	15	Site not suitable for office development	This is a well used car park lcoated in close proximity to the City Centre, Could yield 15 flats at 80 dph.	Queried whether site would come forward for residential given it is a well used parking space – this is a residential rather than employment related development site
HA10	-	Bus depot London Road		Urban location, operational bus depot for main bus operator. Subsequent to Local Plan process the bus operator has expressed intention to retain the depot for operational purposes. Site located adjacent to London Road and Denmark Road Conservation Area. Possible contamination from transport uses.	Good access to public transport, services, facilities and employment.	Yes	No	No	0.7	-		Bus station do not intend to relocate from site in forseable future	Agree
HA11	WS10	Part oil storage depot Hempsted Lane	Housing allocation	Surrounding area subject to redevelopment. Contamination on site. Part of site housing allocation. SFRA 2 identifies part of site in flood zones 3a and 3b. Site adjacent to Newark House - listed building impact on setting and that of the conservation area designated. Site within area currently subject to an application for Neighbourhood Area designation.	Poor to fair access to public transport, services, facilities and employment.	Yes	Yes	0-5 6-10	3.89	85	No	Planning application submitted for 101 dwellings, subject to S106 negotiations. (12/00725/OUT) Revised application going to February 2015 committee for 85 units	Part of site subject to flooding Proposed scheme access is off Hempsted Lane – all development proposed outside Flood plain.
HA12	KW6	Former Telecom House Great Western Road	Housing allocation	Urban area, vacant buildings and associated parking area. Allocated for magistrates court in 2002 2nd Deposit Draft Local Plan.	Good access to public transport, services, facilities and employment.	Yes	No	6-10 11-15	0.6	25	Possible mixed use scheme with Wessex House	SHLAA panel 2012 stated best use of site was employment or mixed use in conjunction with adjacent Wessex House site. Site inlcuded in City Plan Sites Consultation 2013 No commitment from MOJ over future use of site	Agree
HA14	-	Kingsholm Rugby Club		Urban area, occupied and functioning rugby club. SFRA flood zone 3b. Site adjacent to Worcester Street and Kingsholm Conservation Areas Subsequent to Local Plan publication the Rugby Club have declared intention to remain at the site.	Good access to public transport, services, facilities and employment.	Yes	No	No	2.6	-		Rugby club do not intend to relocate from site.	Agree
HA16	-	Greater Greyfriars inc. Gloscat main site and media site.	Housing allocation	City centre. Vacant college buildings and surrounding area. Development brief, master planning and approved planning permission for comprehensive redevelopment of the area. Listed buildings, located within City and Eastgate and St Michaels conservation areas and archaeological constraints. To be included in commitments in housing trajectory.	Good access to public transport, services, facilities and employment.	Yes	Yes	0-5	7.91	254	Commercial units on Main College site and possible PCT building as part of Media Studies site	Site is subject to permission for 254 dwellings as part of a mixed use scheme including commercial Demolition undertaken and archaeological work complete on Media Studies site. Both sites now under construction.	Agree Media Studies Site to deliver 71 units in 14/15 monitoring period Main site 91 units in 15/16 and 92 units 16/17
HA17	WN3	Greater Blackfriars	Housing allocation	City centre car parks, vacant and derelict buildings, county council offices, prison, police station, listed buildings and scheduled monument and located within Barbican and City Centre conservation areas. Multiple owners and interests. Development brief and master planning for comprehensive redevelopment of the area. Area includes the Fleece Hotel – the subject of an adopted Concept Statement (Feb 2012) Part of site within Floodzone 3a & 3b Prison is listed in part and the site of former Gloucester Castle .Area of Principal Archaeological Interest & Scheduled Monuments. Further built heritage assessment required.	Good access to public transport, services, facilities and employment.	Yes	Yes	0-5 06-10	11.76	300	Opportunity to deliver new City centre office accommodation & assembly & leisure facilities	Site includes Quayside blocks within County Council estate. Need for a primary school in the City centre - could be accommodated on this site Site requires a comprehensive master plan approach. Prison recently sold to 'City & Country'	Agree Delivery timescale to also include years 11-15
HA18	WN6	Adj Dry Dock	Housing allocation	Dock side location adjacent to existing flats and employment uses. Setting of listed buildings and Docks conservation area, area of archaeological interest. Previous suggestion of apartment development. SFRA 2 indicates flood zone 3a & 3b.	Good access to public transport, services, facilities and employment.	Yes	Yes	0-5 6-10	1.34	65	Possible ground floor uses with apartments/flats above	Site in ownership of Canals and Rivers Trust and adjacent to land used in association with Dry Dock by Neilson's for ship and boat repairs and refurbishment	Agree Provide more parking as part of any redevelopment

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
				Site currently used for car parking. Wider site area may be subject to contamination Further archaeological and heritage assessment required									
HA19	-	Westgate Quay		City centre and waterside location. Occupied by retail, office, car sales and engineering. Subsequent to Local Plan the owners have expressed an interest not to pursue redevelopment of the area for the foreseeable future. Recent improvements and extension to retail offer. Subject to draft planning brief which is on hold. Archaeological interest. SFRA flood zone 3a	Good access to public transport, services, facilities and employment.	Yes	No	No	2.35	-		Site not being pursued.	Agree
HA20	KW8	Railway Corridor: Great Western Road Sidings	Landowner	Currently underused sidings, employment / commercial uses and car parking. Site included within City Plan Sites consultation 2013 for mixed use development to include employment & residential. Noise constraints for development adjacent to railway. Development of northern triangle has opened up access to allow existing sidings on Great Western Road to be moved to southern triangle. Area of Principal Archaeological Interest	Good access to public transport, services, facilities and employment, as well as city centre.	Yes	Yes – after freight sidings have been relocated to southern triangle	0-5 6-10	4.5	150 -50	Aspiration to deliver Biomedical HIC related employment on part of the site Whole site may lend itself well to employment	Site identified by SELAA panel for mixed use development including biomedical HIC park. Biomedical aspiration still being pursued by University, NHS Trust & City Council partnership	Agree Delivery within 0-5 years considered optimistic given Network Rail ownership of land Flexibility is the key to bringing this site forward
HA20	-	Railway Corridor: Horton Rd Sidings		See SUB45 below.		-	-	-	4.26			Site continues to be built up and used for storage and screening of aggregate	
HA20	-	Railway Corridor: Northern Triangle		See SUB03 below		-	-	-	8.61			Site away for Supermarket and employment related development	Agree
HA20	-	Railway Corridor: Southern Triangle		See SUB08 below		-	-	-	4.22			Site required for operational railway purposes	Agree
HA21	-	Land between canal and Bristol Road		Occupied and functioning industrial and commercial land along canal side with accesses from Bristol Road. Numerous land owners and tenants in place. Some areas SFRA flood zone 2 and 3b. Some areas with contamination issues. May require relocation of existing uses. Would need comprehensive development approach. Possible industrial heritage of local significance – requires survey. Further built heritage assessment required as area has potential for local industrial heritage assets.	Good access to public transport, services, facilities and employment.	Yes	No	11-15	23.81	600 0	Area well utilised by existing businesses. Few voids	2012 SELLA panel advised to retain as employment land for plan period. Site to be kept in SHLAA but capacity not in trajectory Site not included as a potential development opportunity in 2013 City Plan sites consultation	Market adjustment should be zero These sites lie in multiple ownerships and therefore are not available or achievable
HA23	-	Clifton Road Triangle		Vacant land allocated within Site Allocation DPD. Surrounded by commercial and residential uses. SFRA flood zone 2 and 3b.	Good access to public transport, services, facilities and employment.	Yes	No	No	0.7	-	Site subject to current application for 1600 sqm gross retail floorspace	New retail store now open and trading on the site.	Agree
HA24	-	Land at Clearwater Drive	Landowner submission	See SUB18 below		-	-	-					
HA25	-	Mayos Land		See SUB32 below		-	-	-					
HA26	L2	Land at Leven Close and Paygrove Lane	Landowner submission	Greenfield site surrounded by residential uses. Access to the site is locked, therefore not public open space. Allocated for development on part of site, with remainder for public open space. Comprehensive SUDS scheme would be required as part of any development proposals.	Fair to good access to public transport, local services and facilities.	Yes	Yes	0-5	0.4	15	No - small site within a residential area	Site approved by Cabinet of County Council for disposal however site still constrained by access.	Agree Access constrains possible development of this site
HA27	-	Land at Hammond Way, Barnwood	Housing allocation	Car parking, hard standing, vacant land. Surrounded by residential, leisure and employment uses. Not promoted through SHLAA, but not further constraints to development.	Good access to public transport an local services and facilities within Barnwood.	Yes	No	No	0.22	8	Site currently used for car park - not suitable for employment	Site not being promoted.	Agree
HA28	-	Blackbridge Allotments		See SUB13 below.		-	-	-				Site now has permission subject to S.106 for resi.	
HA29	BT1	Norville site Tarrington Road	Housing allocation	Vacant industrial site, identified as housing allocation in draft DPD. Not promoted through SHLAA. Surrounded by residential. Approximately 1/3 of site within flood zone 3b.	Good access to local services and facilities.	Yes	Yes	0-5	0.86	30	2012 SELAA panel identified as unsuitable for employment as within a residential area	2012 SELAA panel recommended redevelopment for residential Site included in City Plan Site Consultation Summer 2013 Current developer interest in bringing site forward.	Site in private ownership and owner now looking to progress development at site
HA30	-	Former B&Q, Trier Way	Housing allocation	Bulky goods retail unit with car parking. Subject to draft DPD allocation for mixed-use development including residential. Surrounded by retail, leisure and residential. Part of the site located in flood zone 3B. The unit has now been renovated and occupied by a new bulky goods retailer (2010). Located adjacent to Barton Street and Eastgate and St Michaels Conservation Areas	Good access to public transport, services, facilities and city centre.	Yes	No	No	1.14	-	Site currently in use by bulky goods retailer	Existing unit renovated for new bulky goods retailer on a long lease.	Agree
EA01	-	Long stay car park, railway station	Emplymt allocation	Functioning long stay car park for railway station users. Noise issues with proximity to rail. Surrounded by employment and transport uses. Site not available – required for continued use by railway users.	Good access to public transport, services, facilities and city centre.	No	No	No	0.49	-	No	Site required by Network Rail for surface parking for customers 2012 SELAA – site unlikely to come forward in plan period.	Site unlikely to bring forward either office related development or decked car parking within the plan period
EA02	-	RMC site, Waterwells Bus Park		Vacant land surrounded by employment uses and park and ride site. Allocated for employment in Local Plan, site has planning permission for 37 office and industrial warehouse units.	Good access to public transport and employment. Poor access to education, health and leisure.	No	No	No	1.1	-	Site all consented for employment	Site has outline and reserved matters consent for employment development – partly built out – 2012 SELAA panel agreed most suitable use is employment	Agree
EA03	QF1	Land east of Waterwells Business Park		Greenfield land previously allocated for employment uses within Local Plan and draft DPD. Subject to planning brief adopted by the Council for development control purposes. Surrounded by employment, agriculture and some residential uses. Only small part of site suitable for residential development – requires full financial evaluation to demonstrate contribution to viability of wider scheme. Area of Principal archaeological Interest. Further built heritage and archaeological asessment required.	Poor access to public transport, service and facilities. Good access to employment.	Yes	No	11-15	15.1	150	All options at site are employment led	2012 SELAA panel agreed most suitable use is employment - this area is the City's only strategic release of employment land remaining Four options for consideration of this site included in City Plan Sites Consultation Summer 2013	Waterwells Drive is considered to be an adequate approach for either residential or employment development. Site suitable for both. The key to bringing this area forward is legal intervention with the landowners.
EA04	WS11	Land at southwest bypass (Secunda Way Industrial Estate)	See SUB37	See SUB37 below.		No	Yes	No	0.7	-	2012 SELAA panel stated most suitable use is employment – possible road side uses	2012 SELAA panel stated most suitable use is employment Site included in City Plan Site Consultation Summer 2013	Agree Shape of site might be restricitng its development potential
EA05	-	Land north of Naas Lane, IM Group	See SUB30	See SUB30 below.		-	-	-					
EA06	-	Land south junction between Eastern Ave and Barnwood Road	Emplymt allocation	##	Good access to public transport, services, employment and facilities.	Yes	No	11-15	0.7	23	Currently constrained by access but could deliver offices	2012 SELAA panel – site needs to come forward as part of a larger redevelopment but TA has a long lease on the site – not likely to come forward in plan period. Site sold by County & now in ownership of a house builder	Agree
EA07		British Gas (Transco)	Emplymt allocation	Vacant land adjacent and to rear of Gas site. Surrounded by industrial and employment uses. Allocated for employment uses. Severe contamination issues. SFRA flood zone 3b.	Poor access to services and facilities, good access to local employment.	No	No	No	10.09	-	Site now in use for open storage in accordance with planning permission	Site has been remediated and bought forward for B8 open storage uses. Not suitable, available or achievable for resi. Various consents on site being taken up for employment purposes.	Agree

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
EA08	-	BT Depot		Occupied and functioning depot and storage site. Subject to draft allocation for employment uses. Within cordon sanitaire and SFRA flood zone 3b. Would require relocation of existing employment uses.	Poor access to public transport and employment. Poor access to services and facilities.	No	No	No	3.03	-	Site currently in employment use	Site required for operational purposes by BT. 2012 SELAA panel stated best use of site was employment.	Remove from table as site in active employment use and not being promoted
EA09	-	Cedar House, Spa Road		Occupied and functioning office building. Subject to LDF draft allocation for employment uses. Surrounded by residential and office uses. Within Spa Conservation area and setting of listed buildings. Relocation of existing user required. Site not available, required for continued employment uses. TPO's on site	Good access to employment, services and facilities.	Yes	No	11-15	0.38		Site currently in employment use	Site not available, nor is it being promoted - required for continued employment uses. Resi capacity at 60dph refelcting surrounding flat developments	Remove from table as site in active emplyment use and not being promoted
EA10	B1	Land adj to Walls factory	Emplymt allocation	Vacant Greenfield site adjacent to industrial uses and railway line, would not create an appropriate environment for residential development. Allocated for employment use. Contamination investigation required. Access issues. Edge of site SFRA flood zone 3b. Opportunity to improve biodiversity value of site and to improve GI particularly access under railway. Site not available for residential as required for employment use. Area of Principal Archaeological Interest	Good access to employment. Fair access to public transport, services and facilities within local area.	No	No	No	5.85	-	Option in City Plan Sites consultation 2013 for employment	2012 SELAA panel stated best use of site was employment Current outline application submitted on the site for employment purposes B1/B2/B8	Good site for employment despite the left in/ left out existing access arrangements
EA11	-	West of Tesco filling station, Quedgeley		Open space along footpath, road and retail development. Allocated for an extension to Quedgeley district centre. Surrounded by retail and medical centre uses. Site not available, required for extension to retail development.	Good access to public transport, employment, services and facilities.	No	No	No	0.84	-		Extension to car park and Tesco store now complete – site no longer available	Agree
NLUD01	-	Rear of 2 to 28 Hempsted Road	NLUD site	Surrounded by employment and industrial uses, electric sub station and land fill site. Part of site SFRA flood zone 3b. Access and ownership issues to overcome. Setting of Hempsted Conservation Area and impact on Newark House Listed Building.	Poor to fair access to facilities and services.	No	No	No	2.54	-	Whole site suitable for employment related development	2012 SELLA panel identified site as most suitable for employment. Site now coming forward for employment permissions Historic outline permission for use of site for employment New Hobbs Oils storate facility complete on site plus a recycling facility.	Agree
NLUD03	-	Land to rear of 5 to 15 Kemble Road		Garages and vacant land to rear of residential properties. Surrounded by residential. Difficult shape to develop, multiple ownership with multiple access rights. Further built heritage and archaeological assessment required.	Poor to fair access to public transport, local services, employment and facilities.	Yes	Yes	0-5	0.27	9	Site within a residential area not suitable for employment	City Council site with residential development potential site constrained by its shape Site subject to current planning application by Gloucester City Homes for 9 units	Configuration of the site means it is unlikely to yield the 5 dwellings required to be a SHLAA site - remove from table
NLUD04	-	Land Registry, Bruton Way	NLUD site	Occupied and functioning B1 office building. Surrounded by road links and city centre uses. Not available, required for continued employment use. Adjacent to Eastgate and St Michaels Conservation Area Area of Principle Archaeological Interest.	Good access to public transport, employment, services, facilities and city centre.	Yes	No	11-15	1.27		Site currently in employment use	Existing use is for employment – change of use would need to be justified against policy Land registry have long lease on site – redevelopment potential could yield office and residential accommodation in a sustainable central location. Site not being promoted	Try to retain this as a long term mixed use development opportunity site
SUB01	-	Joseph Rice, 26 Hempsted Lane	Landowner	Surrounded by industrial employment and landfill site. SFRA flood zone 3b. Potential contamination issues. Setting of Hempsted Conservation Area and impact on Newark House Listed Building.	Poor to fair access to public transport, employment, services and facilities.	No	No	No	1.14	-	Site currently in employment use	2012 SELLA panel agreed most suitable use to be employment	Agree
SUB02	-	GWRSA Social Club	Agent Submission	Building on the site occupied by a church and land managed as car parking areas. Surrounded by employment uses, residential, hospital and railway line at an elevated level.. Change in levels is a constraint. Area of Principal Archaeological Interest.	Good access to public transport, employment, services and facilities. Area of Primary Archaeological Interest	Yes	No	6-10	0.4	30	Site could yield a mixed use development given its sustainable location	Site now occupied by a church and land used for car parking Site currently not being promoted to City Council. Site not included in City Plan Sites Consultation 2013.	Active community use and adjacent to railway. Site could come forward for higher density flats/apartments
SUB03	-	Railway Triangle North	Agent Submission	Site surrounded by railway lines, raised road and embankment. Industrial and residential uses beyond. Noise, access and contamination issues. Subject to draft planning brief for mixed-use development. Morrisons now delivered and new access to the site.	General area has good access to employment, services and facilities.	No	No	No	8.61	-	Yes	Morrisons store and petrol station delivered and now trading at the site and new access provided from Metz Way. Rest of site to come forward for employment - site predominantly consented with reserved matters.	Agree
SUB04	E2	Helipebs, Sisson Road	Agent Submission	Occupied and functioning industrial site. Contamination issues. Surrounded by industrial, rail, residential uses and public open space. Loss of existing employment use would need to be justified against policy. Impact on local industrial heritage.	Good access to public transport, employment, services and facilities in the wider area.	Yes	Yes	0-5	1.6	53	Site lies within a residential area – most suitable redevelopment would be residential	2012 SELLA panel agreed most suitable use to be residential Site included in City Plan Site Consultation Summer 2013	Agree
SUB05 (not SUB28)	-	Land at St Oswalds	Agent Submission	Greenfield site, surrounded by open countryside and residential uses. New highways access would be required. Most of site affected by floodzone 3 rendereing access unachievable Area of known archaeology	Poor to fair access to public transport, employment, services and facilities.	No	No	No	1			Site not being promoted & not included in City Plan 2013 Sites consultation owing to flooding constraints	Remove from table & as a source of housing supply
SUB06	WS12	Land east of Hempsted	Agent Submission	Greenfield open countryside. Surrounded by playing field and residential uses. Landscape sensitivity, prime biodiversity area, old orchard and good ridge and furrow. Landscape constraints need to be addressed. Would impact on setting of listed buildings . and setting of Hempsted Conservation Area see section 9.2 Management recommendations, Section 9.2 of Hempsted CAA&MP refers to the above and applies, including section on important views - adopted Sept 2007 as SPD for DC purposes. Site included in 2013 City Plan Sites consultation City Council Landscape Report (Dec 2013) indicates that part of site is suitable for development	Fair to poor access to public transport, employment, services and facilities.	Yes	Yes	0-5	1.26	50	Site located within a residential area	Current evidence shows the site is subject to landscape sensitivity and this needs to be carefully addressed through any potential scheme in consultation with the local community. Site identified as potential development opportunity site in 2013 City Plan sites consultation 2013 landscape evidence reduces the developable area of the site Site within area submitted as an application for designation as a Neighbourhood Area Outline Planning application for residential development approved in December 2014 subject to S.106.	Suggested a 90% developable area given reduced site area from landscape evidence.
SUB07	-	Frogcastle Farm	Agent submission	Greenfield site, surrounded by open countryside and residential uses. Access issues. Remote location. Nature Conservation Area with two key wildlife sites plus other biodiversity rich habitats. Medium to low landscape sensitivity. SFRA flood zone 3a & b precludes conventional development. Constraints cannot be overcome. Area of known archaeology Part of strategic GI corridor of the Severn and its washlands.	Fair access to transport, employment, services and facilities/	No	Yes	No	3.12	-	-		Site floods – unsuitable for residential or employmentdevelopment - remove from table
SUB08	-	Southern Railway Triangle		Required to be retained for operational purposes by Network Rail and site is not developable.	No access to the site at present. General area has good access to employment, services and facilities.	No	No	No	3.24	-	-	Site required for operational purposes by Network Rail, is not suitable, available or achievable Access to site has been provided by northern triangle development	Agree
SUB09	A2	Land at The Wheatridge	Owner submission	Greenfield vacant land, surplus school site. Surrounded by residential development. Site included in 2013 City Plan Sites consultation Unknown archaeological potential - further archaeological assessment required.	Fair access to public transport, local services and facilities. Access to employment in wider area.	Yes	Yes	0- 5	2.28	50	No - Site located within a residential area	City Council Draft Open Space Strategy identifies a shortfall of public open space in Abbey ward Site included in 2013 City Plan Sites consultation to inlcude POS & residential development Site agreed for disposal by County Council Cabinet.	Agreed that site would be best allocated for residential development & POS
SUB10		Hillfield House, Denmark Road	Owner Submission	Occupied and functioning office building. Listed building over looking public open space and gardens, within London Road conservation area. Trading standards service has relocated from this site which is now vacant. Area of Principal Archaeological Interest.	Good access to public transport and city centre facilities and services.	Yes	No	No	0.23	0	Site could be reused as offices – no net gain	Vacant office building Response received. Site still being promoted and information held up-to-date. No change. Existing office could be converted to flats plus scope for a possible new build for flats. Site now in private ownership and in use as a single family dwelling.	Agree
SUB11		Heathfields, Denmark Road	Owner Submission	Occupied and functioning office building for education and social care facilities. Surrounded by residential. Within Denmark Road Conservation Area, identified as a positive focal building..	Good access to public transport and city centre facilities and services.	No	No	-	0.16	-		Site no longer owned by GCC	Agree

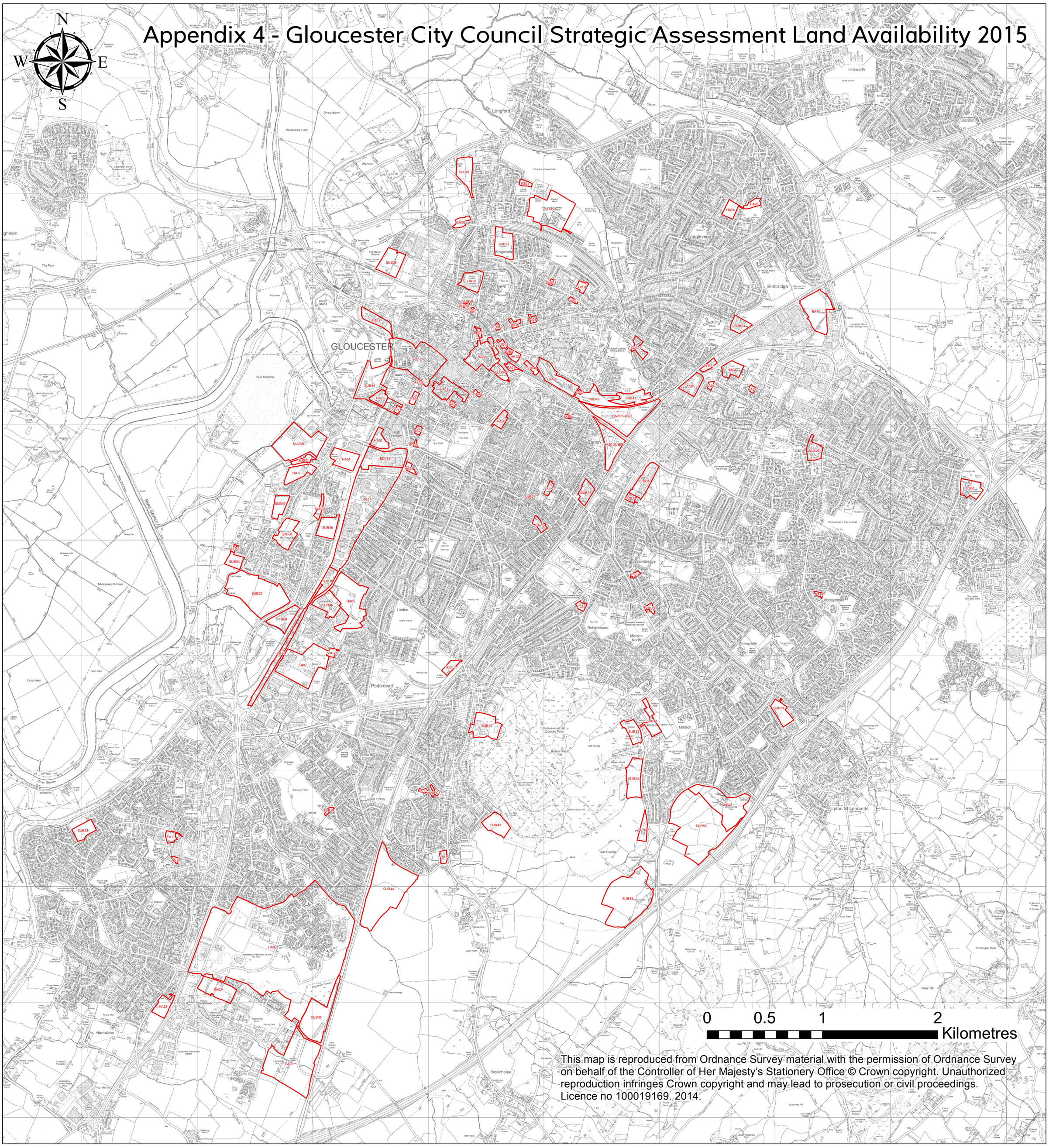
SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
				3 self contained flats completed 11/12 and noted in April 2012 housing monitoring report.								Permission for 3 flats has been implemented.	
SUB12		Saintbridge House, Painswick Road	Owner Submission	Existing use (care home) has ceased and site is now vacant. Surrounded by residential. Saintbridge House is a listed building. Further built environment and archaeological assessment required.	Fair access to public transport and city centre facilities and services.	Yes	No	-	0.43	-	In use as a care facility	Site no longer owned by GCC – sold to a care provider – no longer being promoted	Agree
SUB13		Blackbridge Allotments	Owner Submission	Public open play space and under used allotments. Surrounded by residential, open space and railway line. Access issues. Part of area housing allocation in Local Plan. Sports and play space provision required. Biodiversity value along line of old railway. Potential to provide betterment for surface water runoff downstream. Site included in committments	Fair to poor access to public transport, local services and facilities. Access to employment beyond immediate area and city centre.	Yes	Yes	0-5	8.68	14	No - Site located within a residential area	Part of site subject to extant permission for resi for 14 dwellings Subject to S.106	Agree
SUB14		Car park at Tuffley Library	Owner Submission	Car park for local library, shops and schools. Surrounded by public open space, school, local shops and residential uses. Entrance acts as roundabout for junction, would need complete redesign of access to bring site forward.	Good access to public transport, local services and facilities. Access to employment beyond immediate area and city centre.	Yes	No	6-10	0.2	7	No - Site located within residential area	Site still available	Agree
SUB15		Tuffley Resource Centre, Grange Road	Owner Submission	Occupied and functioning education facility. Surrounded by residential uses and open countryside and edge of city development. Would require relocation of existing use. Loss of existing community use would need to be justified against policy. Part of site in floodzone 3. Local heritage asset and unknown archaeological implications.	Fair to poor access to public transport to enable access to services, facilities and employment beyond.	Yes	Yes	0-5	0.6	14	No - Site located within residential area	Site agreed for disposal by County Council Cabinet - have had pre-app with the City. Outline application anticipated in New Year.	Agree
SUB17	B3	Fire Station, Eastern Avenue	Owner Submission	Former fire station site now vacant. Surrounded by retail, commercial and employment uses. Panel opinion that it is not a desirable location for residential development – detached from other residential uses. Loss of employment land would need to be justified against policy. Vehicular access is a potential constraint at this site	Fair to poor access to employment, retail and local services. Access to public transport within the area.	Yes	No	6-10 11-15	0.55	18	Site well located for employment uses	Operational Fire Station has relocated to Shepherd Road. Pre-app in Summer 2012 for possible use by police. 2012 SELLA panel considered site should be allocated for employment purposes. Site now in ownership of Gloucestershire Constabulary	Site could be bought forward for either residential or employment development
SUB18	QSV1	Land at Clearwater Drive	Owner Submission	Greenfield land, surplus school site. Surrounded by residential development and canal. Half of site SFRA flood zone 2. Wildlife and nature conservation considerations to north west of site. Gloucestershire County Council confirm the site is no longer required for educational uses and the site is therefore available.	Fair to good access to public transport, local services, facilities and employment in the Quedgeley area.	Yes	Yes	0-5 6-10	2.09	30	No - Site located within a residential area	Site inlcuded in City Plan Sites Consultation 2013 Site to bring forward POS as well as residential development Site now being considered by County for educational purposes - part of site may still yield residential development.	Panel suggested extent of floodzone at site be determined in order to ascertain residential capacity
SUB19	E1	Bohanam House & adjoining Elmscroft Community Centre Barnwood Road	Owner Submission	##	Good access to public transport. Access to local services, facilities and city centre.	Yes	No	6-11	1.15	15	No - Site located within a residential area	Site included in City Plan Sites Consultation 2013 Bohanam House to be retained by Order of St John for care purposes - Community Centre and backland area could still yield residential development & a new community centre.	Site already used for employment - if redevelopment possible it should be for resi purposes
SUB20		Land at Posy Lane		Greenfield vacant land surrounded by residential development. Dwellings to be included with commitments in housing trajectory.	Good access to public transport. Access to local services, facilities and city centre.	Yes	Yes	Yes	0.68	15		Site complete	Agree
SUB21	MR1	Land at Corncroft Lane	Agent submission	Greenfield agricultural land and farm. Site has a complex of listed buildings, setting issues will require consideration. Possible key wildlife site with mosaic of biodiverse habitats inlcuding historic orchards. Landscape character of medium sensitivity. Site has been identified to assist flooding further downstream in draft surface water management plan by provision of a balancing structure. Improvements to GI to Cotswolds AONB to east required. Tree Preservation Orders at site Area of Principle Archaeological Interest Urban fringe location Site bounded by M5 to east - noise issues	Access to public transport, local services & facilities.	Yes	Yes	0-5 6-10	4.04	145 (@ 40dph)	No - site located adjacent to residenital area	Site subject of pre-app by owner & developer Site inlcuded in City Plan Sites Consultation 2013 Landscape Report December 2013 identifies further non developable area at site. Extant permission on farm building complex A better indication of true developable area and potential capacity of site will be achieved through masterplanning work. Urban fringe location may require a lower density than JCS methodology. Site should be masterplanned inconjunction with site to south - Land at Winneycroft Lane SUB53 Outline application for up to 250 dwellings validated in January 2015	Potential housing capacity to be revisited with a higher multipier owing to discounting required for landscape and flood attenuation work. Mulitplier of 90% used for purpose of SALA.
SUB22		Land south of Hempsted	Agent submission	Greenfield agricultural land, with little biodiversity interest – potential for enhancement along black ditch. Medium to low landscape character. SFRA zone 3 along immediate brook corridor. Adjacent strategic GI of Severn corridor and wash lands. Overlooking sewage works and effected by cordon sanitaire. Sloping land makes development of site prominent. Further built heritage and archaeological assessment required.	Poor access to public transport, local services and employment in wider area and city centre.	No	Yes	No	12.2		No	Site not suitable or achievable City Landscape Report 2013 idenitifes developable area at site but whole site included in Cordon Sanitiatire so not suitable for development	Agree
SUB23		Land adjacent ski centre	Agent submission	Part greenfield , some hard standing. Poor steep access to steeply sloping, prominent site. Development would impact on setting of listed building and heritage features. Area of Principal Archaeological Interest 2 good ponds and veteran trees, great crested newts and other amphibians on site. Good habitat of Robinswood Hill adjacent. High landscape character sensitivity. Adjacent to Robinswood Hill strategic GI asset. Difficult and costly to develop. Further built heritage and archaeological assessment required.	Fair to poor access to public transport, local services and facilities.	No	Yes	No	2.16	-	No	Response received. Site still being promoted and information held up-to-date. No change. Site not suitable or achievable Site identified as of 'High' landscape importance in JCS evidence and in City Landscape Report 2013. Appeal lost for erection of 2 dwellings at site on hardstanding	Agree
SUB24		Land south ski centre	Agent submission	Greenfield site with poor access, steeply sloping, prominent site. Development would impact on setting of listed building, landscape sensitivity. Difficult and costly to develop. Area of Principal Archaeological Interest ##	Poor access to public transport, local services and facilities.	No	Yes	No	4	-	No	Site identified as of 'High' landscape importance in JCS evidence and in City Landscape Report 2013 Site not suitable or achievable	Agree

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
SUB25		Manor Gardens, Barnwood	Agent submission	Occupied and functioning sheltered retirement accommodation. Nursing home not included within area submitted. Development within curtilage of listed building and would impact on setting of listed building. Part of site in SFRA flood zone 2. Redevelopment of existing housing resulting in no net gain. Area of high archaeological potential - Further built heritage and archaeological assessment required.	Fair access to public transport. Access to services and facilities within local area and employment beyond.	Yes	Yes	Yes	1.91	No net gain	No - Residential area		Agree
SUB26		Land at Milton Avenue	Owner submission	Vacant land between industrial and residential development. Severe concerns regarding contamination.	Poor access to employment, services and facilities in wider area.	No	Yes	No	2.08	-	No - Residential area	Site inlcuded in City Plan Sites Consultation Summer 2013	Agree
SUB27		Land at corner of Laurels and Percy Street	Owner Submission	Vacant land used for car parking for local shops. Surrounded by residential and local retail uses.	Good access to public transport, local services and facilities, with employment beyond and in city centre/	Yes	Yes	0-5	0.05	2	No - Residential area	City Council owned site Below SHLAA site threshold size	Agree
SUB28		Rear of former cattle market	Owner Submission	Vacant land surrounded by retail development. Residential development under construction adjacent to site. Could form continuation of these developments.	Fair to poor access to public transport and employment. Good access to services and facilities and city centre.	Yes	Yes	0-5	2.5	65	Site has potential for assisted living or B1/B8 uses	City Council jointly own part of site Part of site to be used as compound for Tesco extension	Site could bring forward either employment or residential uses
SUB29	WN5	Hare Lane car park	Owner Submission	##########	Good access to public transport, employment, services and facilities within city centre.	Yes	No	6-11	0.32	12	No site is too small	City Council owned site City Council Release of site dependent on preparation of City Council Car parking Strategy	Potential of site determined by intensity of its use as a car park.
SUB30		IM Group Distribution, Naas Lane	Agent Submission	Surrounded by agricultural land, railway line and some residential. Kingsway development to north and west will encroach on site. Site identified as employment allocation. Contamination issues on site. Currently in use for employment. Loss of employment land would need to be justified against policy. Area of Principal Archaeological Interest	Poor access to public transport, local services or facilities. Good access to employment.	Yes	No	11-15	8.1	-	Site is In current use as emplyt land	An existing employment site. Site no longer being promoted by new owner	Site has potential as both an employment or residential site however contamination will affect the viability of the site for residential purposes.
SUB31		Lynton Fields, east of Waterwells – Cross ref with land east of Waterwells	Agent Submission	Greenfield, agricultural / small holding. Surrounded by open agricultural land, employment development and some residential. Included within land east of Waterwells allocation. Site subject to a planning brief that has been adopted by the Council for development control purposes. Currently subject to employment allocation, justification for the loss of allocated employment land would be required against policy.	Poor access to public transport, local services or facilities. Good access to employment.	-	-	-	1.91	-		Double counting with land east of Waterwells employment allocation	Agree
SUB32		Mayos Land, Quedgeley	Agent Submission	Greenfield site, surrounded by residential and road network. Allocation for housing in Local Plan and LDF. Other half of site submitted to Stroud DC SHLAA. Firm commitments will be included in housing trajectory	Fair access to public transport, local services and facilities, with access to reemployment beyond.	Yes	Yes	0-5	1.9	49		Permission granted for 49 dwellings subject to S.106 Site under construction	Agree
SUB33		Land at Snow Capel farm	Agent Submission	Greenfield site adjacent M5, with high to medium Landscape sensitivity. Traditional semi improved grassland with good hedges and good isolated standard trees. Betterment for flooding issues downstream may be required. Site includes a scheduled monument, therefore impacts on heritage. Site is remote from any existing development. Landscape, environmental, sustainability and biodiversity together make the site unsuitable. Area of Principal Archaeological Interest further built heritage and archaeological assessment required.	Poor access to public transport and any services and facilities.	No	Yes	No	20.26	-	Not suitable	City Landscape report identifies part of site as unsuitable for devlopment on landscape grounds Site is also distant from services and facilites and does not relate well to existing residential areas	Agree
SUB34		West Quay	Agent Submission	Area of land submitted includes warehouses, the dock basin, dockside, car park and nature reserve. Development would impact on heritage and listed buildings. SFRA flood zone 3b Area also covered by SUB35 and HA18.	Fair to good access to services, facilities and employment.	No	Yes	No	7.19	-	Yes in any redevelopment	Lock Warehouse has come forward in 2012. Warehouses currently used for employment with additional capacity for more employment to come forward in any redevlopment SUB35 & HA18 included in site	Site in ownership of British Waterways
SUB35	WN6	Land adjacent Llanthony Warehouse	Agent Submission	Area included within above submission. Currently car parking for museum. Development would impact upon Docks conservation area and listed buildings. SFRA flood zone 3b – though this has been overcome for other dockside developments. Area of Principl Archaeological Interest	Good access to public transport, and city centre facilities and services.	No	Yes	No	0.75	-	No - now an important public open space	2012 SELLA panel stated site required for operational car parking for The Docks Site not suitable or achievable Area also used as an external performance & market space during Quays festivals	Agree
SUB36		Travis Perkins	Agent Submission	Former timber merchant yard, surrounded by housing development and canal. Planning permission granted for 104 dwellings to be included in commitments in housing trajectory.	Fair to poor access to public transport, services, facilities and city centre.	Yes	Yes	0-5	6.6	101		Planning permission granted for 104 residential dwellings - site under construction	Agree
SUB37	WS11	Secunda Way Industrial Estate	Agent Submission	Vacant land within curtilage of small development of employment units. Surrounded by residential, public open space and employment uses. Allocated in Local Plan for employment use – would need to demonstrate not required for this use.	Fair to poor access to public transport, employment, local services and facilities.	No	Yes	No	-	-	Yes	2012 SELAA panel stated most suitable use was for employment – possible roadside use	Duplicate of EA04
SUB38		Land at Griggs Timber, Bristol Road	Agent Submission	Existing timber merchant site, part of site submitted. Access issues, due to potential ransom strip between site and Bristol Road. SFRA Flood zone 3B. Loss of employment would need to be justified against policy Should be cross referenced with HA21 as site lies within this area.	Good access to public transport, services, facilities and employment.	Yes	No	11-15	0.5	16	Existing employment site	2012 SELAA panel stated most suitable use was for whole area was for employment purposes Site would be inlcuded in Land between Canal and Bristol Rd capacity.	Agree
SUB39		Land at Commercial Road	Agent Submission	Currently vacant office, surrounded by offices, some residential and city centre uses, backing onto the Docks Conservation Area. Listed building and design constraints require resolution.	Good access to public transport, services, facilities and employment.	Yes	Yes	0-5	0.01	3		Building could be converted to provide 3 dwellings units Below methodlogy site size threshold	Remove from table
SUB40		The Knoll, Stroud Road	Agent Submission	Occupied and functioning elderly persons care home. Surrounded by residential development and Robinswood Country Park. Grassland and good supply of mature and veteran trees adjacent Robinswood Hill key wildlife site pond. Within high landscape sensitivity area. Development would impact on setting of listed building. Steeply sloping land. Only 1.5 hectares of the site indicated as developable by proposer. Environmental, landscape and biodiversity issues cannot be overcome. Sloping nature of land would make development at site prominent. Area of Principal Archaeological Interest - further built heritage and archaeological assessment required.	Poor access to public transport. Access to services and facilities within Tuffley area and employment beyond.	Brownfield footprint	No	11-15	1.5	15	No - Unsuitable topography and residential location Site already in employment use as a care home	Site not suitable or achievable. JCS landscape evidence states site within area of 'High' landscape value. Subdivision of existing building and use of brownfield footprint could be considered.	It was suggested that a residential capacity reflecting conversion of existing building or redevelopment of the brownfield site be considered .
SUB41		Former Selwyn School Site Land Matson Lane	Agent Submission	Occupied and functioning school buildings and grounds. Traditional landscape conservation area. Small ornamental pond and good mature tree structures for biodiversity. Also an area of principle archaeological interest and a listed building with formal garden within grounds of house. Further built heritage and archaeological assessment required.	Poor access to local services and facilities. Access to public transport in the wider area and employment beyond.	No	No	No	2.2	_	Site already used for care home purposes	Site is no longer used as a school but for care purposes. Site not suitable or achievable.	Site could be reused for alternative care purposes

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
SUB42		Land Woods Orchard, Tuffley	Owner submission	Greenfield agricultural land improved grassland with good ridge and furrow adjacent to Robinswood Hill, steeply sloping, with high landscape sensitivity. Surrounded by open countryside, country park school and some residential. Environmental, landscape and biodiversity issues cannot be overcome. Sloping nature of land would make development at site prominent. In proximity of known Roman remains - unknown archaeological potential.	Poor access to public transport, local services and facilities.	No	Yes	No	2.82	-	No - residential location & poor access	Site not suitable or achievable JCS landscape evidence states site within area of 'High' landscape value	Agree
SUB43		Allstone, Myers Road	Agent submission	Occupied and functioning aggregate and waste facility. Surrounded by industry / employment, residential, railway line and public open space. Noise issues and contaminated land require resolution. Relocation of existing uses to an appropriate alternative site required to make the site available for development. Area of Principal Archaeological Interest	Good access to public transport, local services and facilities.	Yes	No	'15-20	6.49	164	Existing employment site	Possible contamination issues require further investigation	Site would be suitable for residential development as not suitable for employment owing to poor access. Contaminiation may affect viability
SUB44		Land south Grange Road, Tuffley	Developer submission	Greenfield agricultural land – improved grassland, generally poor biodiversity value. Medium to low landscape character. Betterment will be sought in terms of surface water management for Whaddon Brook. Part of a larger site submitted to Stroud DC. Part of site SFRA flood zone 3b. Unkown archaelogical implications.	Fair to poor access to public transport, services and facilities.	Yes	Yes	0-5 6-11	6.27	198 (@35dph)	Green field site not well located to strategic arterial highway network in City	City Plan Landscape report 2013 reduces developable area owing to landscape constraints. St.Barnabas roundabout identified as a very congested junction in JCS highway capacity work.	It was suggested that a higher density multiplier be used given site area to be reduced owing to landscape work. 90% mulitplier used
SUB45		Horton Road Sidings	Owner submission	Site being used for screening, crushing and storage of aggregate	Good access to city centre services and facilities.	Yes	No	No	4.34	-	Existing employment site	Possible contamination issues require further investigation & concerns over viability owing to amount of crushing and screening that has taken place on the site.	Site would be suitable for residential development as not suitable for employment owing to poor access. Contamination may affect viability
SUB46		277-279 Bristol Road	Owner submission	Occupied and functioning employment land, surrounded by industrial, employment and commercial uses. Land contamination issues, SFRA flood zone 3b with known flood events.	Poor access to local services and facilities.	No	Yes	No	1	-	Existing employment site	2012 SELLA panel recommended site be retained for employment purposes	Panel agreed that site should be retained for employment purposes - not suitable fort residnential
SUB47		Gardner Denver site, Barton Street	Owner submission	Recently vacated employment site, surrounded by residential uses and bounded to the east by a railway line. (Not in commitments as permission granted after April 2012 – in trajectory)	Good access to services, facilities and employment.	Yes	Yes	0-5	1.83	82		Planning permission submitted for 82 dwellings. Site all but complete.	Agree
SUB48	KW7	Warehouse, Great Western Road (former Pickfords)	Agent submission	Access to site through commercial development. Surrounded by offices, railway lines and parking. Needs to be considered in wider masterplan process.	Good access to services, facilities and employment.	No	No	No	0.55	-	Currently used for warehousing - retain for employment purposes	2012 SELAA panel recommended site could come forward as part of a wider redevelopment	Site not available on long lease as a warehouse
SUB49		Gospel Hall, Matson Lane	Owner submission	Functioning place of worship with parking, surrounded by golf course, open countryside and some residential. Within landscape sensitivity, nature conservation area and located at prominent viewpoint. Would need careful design and layout following relocation of occupier. Area of Principal Archaeological Interest	Poor access to public transport, services and employment.	No	Yes	No	1.3			JCS landscape evidence states site within area of 'High' landscape value Functioning community facility	Agree
SUB50	L1	Site of former Bishops College, Oxstalls	Owner submission	Mixed greenfield/brownfield site located towards the northern periphery of Gloucester. Loss of playing field and education facility would need to be justified against policy. High archaeological potential with Roman cemetry adjacent to site.	Good access to services, facilities and employment.	Yes	Yes	0-5 6-10	3	108	No - site not attractive for employment purposes - residential area	New site submitted by Gloucestershire County Council Part of temporary wider Plock Court provision for sports facilities in the City . Residential development possible on brownfield part of site subject to overcoming any access constraints Site included in City Plan Sites consultation summer 2013 Site approved for disposal by County Council Cabinet.	Need to look at capacity carefully as site includes playing fields. 90% multiplier used Playing fields and sports hall currently managed by Aspire Trust at Plock Court. Brownfield area comprises approx 3Ha.
SUB51	KW5	Wessex House	Owner submission	Vacant / former electrical wholesalers, Gloucestershire Royal Hospital to north, Telecom House to east and Gloucester station to south. Identified in Railway Corridor Development Brief adopted March 2011. Area of Principal Archaeological Interest	Central location very close to public transport interchanges, shops and services.	Yes	No	06-10	0.3	20	Yes - as part of a mixed use scheme	2012 SHLAA panel identified that site could come forward with Telecom House site for a possible mixed use emplyt/resi scheme that might include key worker accommodation. Site inlcuded in City Plan consultation summer 2013	Agree
SUB52	KW1	Civil Service Sports Club Estcourt Road	Developer submission	Former sports club including social club buildings, playing pitch & bowling green. Site is bounded by Denmark Road & Kingsholm Conservation Area to west, south and east.	Good access to services, facilities and employment. Use for residential will need to be justified against private playing field policy.	Yes	Yes	0-5	3.6	60	No - in a residential area	Potential housing yield based on identified need for POS in wider area. City Council revised playing pitch strategy will inform any development at the site	Panel agreed site was not suitable for employment
SUB53	MR2	Land at Winneycroft Farm	Agent submission	Greenfield agricultural land. Medium landscape sensitivity. Improvements to GI to Cotswolds AONB to east required. Mosaic of biodiverse habitats. Site identified as of medium to high landscape value in JCS Landscape evidence. Area of Principal Archaeological Interest with Schedueld Monument lying to south of site. Tree Preservation Orders and network of historic hedges on site Site could accommodate flood attenuation structures to improve down stream flooding. Site bounded by M5 to east - noise issues	Poor access to public transport, local services or facilities.	Yes	Yes	0-5 6-11	7.17	258 (@40dph)	No - Site not well located to strategic highway network	Capacity based on SHLAA submission City Landscape Report 2013 constrains developable area owing to landscape constraints Site included in City Plan sites consultation 2013 A better indication of true developable area and potential capacity of site will be achieved through masterplanning work. Urban fringe location may require a lower density than JCS methodology. Site should be masterplanned inconjunction with site to north - Land at Corncroft Lane SUB21 Outline application submitted for up to 420 dwellings at site.	Panel agreed site was not suitable for employment - suggested that density mulitplier was revisited owing to discounting required for landscape. 90% multiplier used for SALA purposes
SUB54	WS14	Land at Rea Lane	Agent submission	Site on southern western edge of Hempsted village. Agricultural improved grassland bounded by species poor hedge. High to medium landscape sensitivity. Adjacent strategic GI of Severn and wash lands. Impact on Hempsted Conservation Area. Topography of site constrains development. Potential archaeological implications. Site lie adjacent to Cordon Sanitaire.	Poor access to public transport, services and facilities.	Yes	Yes	0-5 6-10	1.2	35 (@35dph)	No - Site not well located to strategic highway network	New site submitted 2011/12 Site included in City Plan sites consultation 2013 Site considered by City Council Landscape report which slightly constrains the developable area. Site also lies adjacent to Cordon Sanitaire which may constrain development.	Capacity should be reduced owing to the access constraints at this site.
SUB55		Rectory Lane Hempsted	Agent submission	Site on southern western edge of Hempsted village. Site with former agricultural buildings and hardstanding, now overgrown, dwellings to north , open land on other sides, surrounded by nature hedges. High to medium landscape sensitivity. Adjacent strategic GI of Severn and wash lands. Impact on Hempsted Conservation Area. Further built heritage and archaeological assessment required.	Poor access to public transport, services and facilities.	Yes	Yes	0-5	0.2	4	No - site not well located to strategic highway network.	New site submitted 2011/12 Capacity constrained owing to shape of site Site potential yielding below site threshold capacity	Agree

SHLAA Ref	City Plan Ref	Site	Source	Character / Constraints / Assessment summary	Accessibility	Suitable	Available (first five years?)	Achievable	Unconstrained site area (Ha)	Housing Potential (Market adjustment)	Employment Potential	2014 Update	2013 Panel comments
SUB57		Newark Farm Hempsted	Agent submission	Site lies in Hempsted village on the western finge and is accessed from Hempsted Lane. Archaeological and landscape constraints affect the site.	Fair to poor access to public transport, services and facilities.	Yes	Yes	0-5	1.6	48 (@30 dph)	No - Site not well located to strategic highway network & adjacent to residential area	2013 Landscape Report identifies developable area.	Panel suggested reducing density to 30 dph or less owing to surrounding urban form - confirmed that site is not suitable for employment
SUB58		30 St Catherine Street	Agent submission	Site lies adjacent to Worcester Stret Conservation Area. Half of site covered by Floodzone 2. Employment to north and predominantly residential to south Area of archaeological potential	Good access to public transport, services and facilities in city centre.	Yes	Yes	0-5	0.05	5	Not a strategic employment site although comprises part of employment land supply in central area	New small site located in central area & submitted during the year - only yiled 5 dwellings if bought forward at very high density. Flood constraints would beed to be adequately addressed	Agree
SUB59		9-11 St. Catherine Street	Agent submission	Site partly affected by floodzone 2. Railway lies to south of site . Employment to north and predominantly residenital to the west Area of archaeological potential	Good access to public transport, services and facilities in city centre.	Yes	Yes	0-5	0.06	6	Not a strategic employment site although comprises part of employment land supply in central area	New small site located in central area & submitted during the year - only yiled 5 dwellings if bought forward at very high density.	Agree
FS01		GALA Club, Fairmile Gardens	Officer found site	Occupied and functioning social club and sports facilities. Not proposed by owner to SHLAA process. High archaeological potential with adjacent Roman cemetry.	Poor access to public transport, services and facilities.	Yes	No	No	1.89	0	No - site adjacent to residential area	Flood constraints would beed to be adequately addressed	Panel suggested revisiting capacity given site is a private playing field & also queried whether the site was required for community purposes.
FS02	WN6	Southgate Moorings and Car Park	Officer found site	Utilised car park within the Docks. Interest to develop for office use. Not promoted to SHLAA. Subject to a draft allocation for employment uses. Loss of draft allocation for employment uses would need to be justified against policy. Located in Southgate Street Conservation Area and setting of numerous listed buildings. Area of Principal Archaeological Interest, further built heritage assessment required.	Good access to public transport, services and facilities in city centre.	Yes	Yes	0-5 6-10	0.5	40 (@80 dph)	City Council aspiration ro deliver offices on the site Yes - site suitable for a mixed use scheme	2012 SELAA panel recommended site be retained for employment purposes Site is well located for employment and would help redress employment/resi mix in the Docks	Site currently used for car parking by City Council Site is suitable for a mixed use scheme inlcuding car parking 80dph used owing to central location and adjacent apartment development
FS03		Former Courts and Dunelm		Both these buildings have been renovated for office purposes and are now occupied	Good access to public transport, services and facilities in city centre.	No	No	No	0.56	-		Sites are now occupied for employment purposes and should be retained as such. .	Agree
FS04		Garden centre Painswick Road		Privately owned garden centre, fully functioning. Site within flood zone 3B. Surrounded by residential. Not promoted to SHLAA.	Fair access to public transport, employment and local services.	No	No	No	0.28	-		Site not being promoted and is not available.	Agree
FS05/SUB56	B2	Royal Mail Distribution Centre, Eastern Avenue	Agent submission	Currently occupied and functioning Royal Mail sorting office and distribution centre with recent announcement of closure. Surrounded by employment uses and railway line. Not promoted to SHLAA. Loss of existing employment use would need to be justified against policy. No connectivity to existing residential communities. Local heritage value and potential archaeological implications.	Fair access to public transport, employment and local services.	No	Yes	No	2.25	-	Existing employment site with good potential for re-use or redevelopment for employment	Site would result in a poor residential environment & has little connectivity to other residential areas	Panel agreed that site should be retained for employment purposes - not suitable fort residential
FS06	H1	Hucclecote Resource Centre	Officer found site	Adjacent to existing residential development, possible archaeological constraints and shortage of POS in ward. Dwelling numbers to be included in committments .	Fair to poor access to public transport and local services. Access to employment in wider area.	Yes	Yes	0 – 5	2.45	53		Site has outline permission for resi subject to S.106. Commitment to be included in housing trajectory. Site now under construction.	Agree
FS07		Irish Club, Horton Road		Occupied and functioning social club, community facility. In multiple ownership, with intentions to remain on site. Not promoted to SHLAA.	Good access to public transport, employment, local services and city centre.	Yes	No	11-15	0.13	4		Site is not available Site below threshold therefore removed	Agree
FS08		Colwell Community Centre, Derby Road	Officer found site	Occupied and functioning community facility. Not promoted to SHLAA. Loss of existing community use would need to be justified against policy.	Good access to public transport, employment, local services and city centre.	Yes	No	No	0.17		No - not suitable as within a residential area	Site is not available currently required by County Council for operational purposes	Agree
FS09		Rear of Smith & Choyce, Upton Street	Officer found site	Occupied and functioning employment premises. Not promoted to SHLAA. Loss of existing employment use would need to be justified against policy.	Good access to public transport, employment, local services and city centre.	Yes	No	No	0.54	-	Best use of site is local employment related uses	Site is not available	Agree
FS10		104 Northgate Street	Officer found site	Vacant/derelict site located in Gloucester City Centre. Subject to an extant planning permission for residential development. Located within London Road Conservation Area and adjacent to Listed Building. Area of Principal Archaeological Interest	Excellent, located in Gloucester City Centre.	Yes	No	6-10	0.16	20	Possible commercial use on ground floor in any redevelopment	Site subject to expired planning permission. Now officer identified site through SHLAA.	Reduce capacity figure as site is small. Capacity of site reduced to reflect inner city
FS11		Kemble Close	Officer found site	Site situated in residential area opposite a local centre in south of City. Site currently Public Open Space. Loss of site would need to be justitifed against policy.	Fair access to public transport, employment and local services.	Yes	No	6-10	0.55	8	No - Predominantly a residential area	New site in City Council ownership	Site would seem to be suitable for residential purposes
FS12		St. James' Close	Officer found site	Located adjcent to existing sheltered housing and to south of Quedgeley District Centre. Site lies adjacent to Listed Building of The Old Rectory. Archaeological potential further assessment required.	Good access to shops and services in Quedgeley District Centre and to public transport .	Yes	Yes	0-5	0.56	8	No - Predominantly a residential area	New site in City Council ownership	Site would seem to be suitable for residential purposes
FS13		Land adj St. Aldates	Officer found site	Adjacent to Grade II* Listed Building. Loss of existing community facility to be assessed against policy.	Site lies on bus route but not immediately adjacent to shops, services or local facilities.	Yes	Yes	0-5	0.5	16	No - Predominantly a residential area	Site subject to developer interest	Site would seem to be suitable for residential purposes
FS14		Mead Road	Officer found site	Site adjacent to existing residential , POS, and Abbeymead local centre at Mead Road	Adjacent to local centre and to Abbeymead Avenue for bus route to Brockworth District Centre and Gloucester City Centre	Yes	Yes	0-5	0.23	8	No -Predominantly a residential area	New site in City Council ownership	Site would seem to be suitable for residential purposes
ED011		Former Kwik Save	From employment land availability study	Site in City Centre location close to services and facilites. Site is situated in Conservation Area and subject to archaeological constraints.	Excellent, located in Gloucester City Centre.	Yes	Yes	0-5	0.3	119	Commercial uses on ground floor permitted or possibility for a mixed use scheme	Site is subject to an expired consent for flats and commercial uses on ground floor	Site added to table subsequent to site panel - non delivery of previous scheme may suggest there are issues around viability or may just be a function of current economic climate .
ED012	KW2	Industrial Units , Alvin Street	From employment land availability study	##	Excellent, located in Gloucester City Centre close to public transport interchanges.	Yes	Yes	0-5	0.2	10	Site currently in use for employment purposes	Site subject to pre-app for residential redevelopment	Site currently in use for employment purposes
ED013		Peel Centre	From employment land availability study	Gloucester Quays to the north. Emplopyment uses to the south. Small scale retail and vacant employment site to east. Gloucester Sharpness canal to west with residential development beyond.	Good located adjacent to primary transport routes with good public transport routes adjacent.	Yes	No	No	5.3	0	Site currently in use for large format retail sheds	Currently not available Extant consent for new retail sheds on site of former cinema	Site currently in use for employment purposes
ED033		Keyway's Site Barnwood Point	From employment land availability study	Site bounded by Barnwood Road to the south and the A38 Corinium Avenue to the east. Railway line to the west. Employment uses to the north east.	Excellent - located adjacent to A38 and in close proximity to high frequency bus routes.	No	Yes	No	6.9	0	Site currently being marketed for employment purposes	Site currently being marketed for employment uses	Not suitable for residential purposes - lies between railway and dual carriageway and does not relate well to existing residenital areas.
ED036		Gloucester Retail Park	From employment land availability study	Residential uses to north and east. Employment and retail units to the south. Site abuts A38 Eastern Avenue to the west with employment and retail uses beyond.	Excellent - located adjacent to A38 Eastern Avenue and in relatively close proximity to high frequency bus routes.	No	No	No	2.9	0	Site currently in use for large format retail sheds	Site currently in use for large format retail sheds	Site should be retained for employment purposes

Appendix 4 - Gloucester City Council Strategic Assessment Land Availability 2015



Key to Sites (please note that sites where residential development has been completed have not been included)

HA01 - Gloucester Quays
HA02 - King's Quarter
HA03 - RAF Quedgeley, Kingsway
HA04 - Land at junction of Barnwood Road and bypass
HA05 - Former Industrial Sites, Bristol Road
HA06 - Part of St Michael's Square
HA07 - Corner of Southgate Street and Trier Way
HA08 - Car park Hampden Way
HA10 - Bus depot, London Road
HA11 - Part of oil storage depot, Hempsted Lane
HA12 - Former Telecom House, Great Western Road
HA14 - Kingsholm Rugby Club
HA16 - Greater Greyfriars incl. Gloscat main & media site
HA17 - Greater Blackfriars
HA18 - Land adj. Dry Dock
HA19 - Westgate Quay
HA20 - Railway Corridor: Great Western Sidings
HA20/SUB45 - Railway Corridor: Horton Road Sidings
HA20/SUB03 - Railway Corridor: Northern Triangle
HA20/SUB08 - Railway Corridor: Southern Triangle
HA21 - Land between canal and Bristol Road (incl. SUB38)
HA23 - Clifton Road Triangle
HA24/SUB18 - Land at Clearwater Drive
HA25/SUB32 - Mayo's Land
HA26 - Land at Levens Close and Paygrove Lane
HA27 - Land at Hammond Way, Barnwood
HA28/SUB13 - Blackbridge Allotments
HA29 - Norville site, Tarrington Road
HA30 - Former B&Q, Trier Way
EA01 - Long stay car park, railway station

EA02 - RMC site, Waterwells Bus Park
EA03 - Land east of Waterwells Business Park (incl. SUB31)
EA04/SUB37 - Land at south west bypass (Secunda Way Industrial Estate)
EA05/SUB30 - Land north of Naas Lane, IM Group
EA06 - Land south of junction between Eastern Av. and Barnwood Rd.
EA07 - British Gas (Transco)
EA08 - BT Depot
EA09 - Cedar House, Spa Road
EA10 - Land adj. to Walls factory
EA11 - West of Tesco filling station, Quedgeley
ED011 – Fomer Kwik Save Site
ED012 – Industrial Units Alvin St
ED013 – Peel Centre
ED033 – Keyway Site, Barnwood Point
ED036 – Gloucester Retail Park
ED044 – 67-69 London Road
NLUD01 - Rear of 2 to 28 Hempsted Lane
NLUD03 - Land to rear of 5 to 15 Kemble Road
NLUD04 - Land Registry, Bruton Way
SUB01 - Joseph Rice, 26 Hempsted Lane
SUB02 - GWRSA Social Club
SUB04 - Helipebs, Sisson Road
SUB05 - Land at St Oswalds
SUB06 - Land east of Hempsted
SUB07 - Frogcastle Farm
SUB09 - Land at The Wheatridge
SUB10 - Hillfield House, Denmark Road
SUB11 - Heathfields, Denmark Road
SUB12 - Sainbridge House, Painswick Road
SUB13 - Blackbridge Allotments

SUB14 - Tuffley Library
SUB15 - Tuffley Resource Centre, Grange Road
SUB17 - Fire Station, Eastern Avenue
SUB18 - Land at Clearwater Drive
SUB19 - Bohanam House, Barnwood Road
SUB20 - Land at Posy Lane
SUB21 - Land at Corncroft Lane
SUB22 - Land south of Hempsted
SUB23 - Land adj. Ski Centre
SUB24 - Land south Ski Centre
SUB25 - Manor Gardens, Barnwood
SUB26 - Land at Milton Avenue
SUB27 - Land at corner of Laurels and Percy Street
SUB28 - Rear of former cattle market
SUB29 - Hare Lane car park
SUB30 - IM Distribution, Naas Lane
SUB31 - Lynton Fields, east of Waterwells
SUB33 - Land at Snow Capel farm
SUB34 - West Quay
SUB35 - Land adjacent Llanthony Warehouse
SUB36 - Travis Perkins
SUB37 - Secunda Way Industrial Estate
SUB38 - Land at Griggs Timber, Bristol Road
SUB39 - Land at Commercial Road
SUB40 - The Knoll, Stroud Road
SUB41 - Land at Matson Lane
SUB42 - Land at Woods Orchard, Tuffley
SUB43 - Allstone, Myers Road
SUB44 - Land south of Grange Road, Tuffley
SUB45 - Horton Road sidings

SUB46 - 277 to 279 Bristol Road
SUB47 - Gardner Denver site, Barton Street
SUB48 - Warehouse, Great Western Road (former Pickfords)
SUB49 - Gospel Hall, Matson Lane
SUB50 - Site of former Bishops College, Oxstalls
SUB51 - Wessex House
SUB52 - Civil Service Sports Club
SUB53 - Winneycroft Farm
SUB54 - Land at Rea Lane
SUB55 - Land at Rectory Lane
SUB57 - Land at Newark Farm, Hempsted
SUB58 - 30 St Catherine Street
SUB59 - 9-11 St Catherine Street
FS01 - GALA Club, Fairmile Gardens
FS02 - Southgate Moorings and car park
FS03 - Former Courts and Dunelm
FS04 - Garden Centre, Painswick Road
FS05 - Royal Mail Distribution Centre, Eastern Avenue
FS06 - Hucclecote Resource Centre
FS07 - Irish Club, Horton Road
FS08 - Colwell Community Centre, Derby Road
FS09 - Rear of Smith & Choyce, Upton Street
FS10 - 104 Northgate Street
FS11 – Kemble Close
FS12 – St. James' Close
FS13 – Land adj St. Aldates
FS14 – Mead Road

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 97 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	18.912	0.312	0.0	5.0	5.0	28.1	O K
30 min Summer	19.012	0.412	0.0	5.0	5.0	37.1	O K
60 min Summer	19.095	0.495	0.0	5.0	5.0	44.5	O K
120 min Summer	19.136	0.536	0.0	5.0	5.0	48.2	O K
180 min Summer	19.138	0.538	0.0	5.0	5.0	48.4	O K
240 min Summer	19.125	0.525	0.0	5.0	5.0	47.3	O K
360 min Summer	19.083	0.483	0.0	5.0	5.0	43.5	O K
480 min Summer	19.039	0.439	0.0	5.0	5.0	39.5	O K
600 min Summer	18.996	0.396	0.0	5.0	5.0	35.6	O K
720 min Summer	18.956	0.356	0.0	5.0	5.0	32.0	O K
960 min Summer	18.887	0.287	0.0	5.0	5.0	25.9	O K
1440 min Summer	18.802	0.202	0.0	5.0	5.0	18.2	O K
2160 min Summer	18.758	0.158	0.0	3.9	3.9	14.2	O K
2880 min Summer	18.730	0.130	0.0	3.3	3.3	11.7	O K
4320 min Summer	18.699	0.099	0.0	2.5	2.5	8.9	O K
5760 min Summer	18.680	0.080	0.0	2.0	2.0	7.2	O K
7200 min Summer	18.667	0.067	0.0	1.7	1.7	6.1	O K
8640 min Summer	18.659	0.059	0.0	1.5	1.5	5.3	O K
10080 min Summer	18.652	0.052	0.0	1.3	1.3	4.7	O K
15 min Winter	18.955	0.355	0.0	5.0	5.0	31.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	109.059	0.0	32.2	23
30 min Summer	73.366	0.0	43.8	36
60 min Summer	47.182	0.0	56.8	62
120 min Summer	29.362	0.0	71.0	98
180 min Summer	21.949	0.0	79.8	132
240 min Summer	17.740	0.0	86.1	166
360 min Summer	13.035	0.0	95.0	234
480 min Summer	10.480	0.0	101.9	300
600 min Summer	8.842	0.0	107.5	364
720 min Summer	7.691	0.0	112.2	426
960 min Summer	6.166	0.0	119.9	546
1440 min Summer	4.508	0.0	131.4	766
2160 min Summer	3.288	0.0	143.6	1128
2880 min Summer	2.626	0.0	152.6	1480
4320 min Summer	1.908	0.0	165.8	2208
5760 min Summer	1.520	0.0	175.4	2936
7200 min Summer	1.273	0.0	183.0	3672
8640 min Summer	1.101	0.0	189.2	4408
10080 min Summer	0.974	0.0	194.7	5136
15 min Winter	109.059	0.0	36.2	23

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	19.070	0.470	0.0	5.0	5.0	42.3	O K
60 min Winter	19.167	0.567	0.0	5.0	5.0	51.1	Flood Risk
120 min Winter	19.213	0.613	0.0	5.0	5.0	55.2	Flood Risk
180 min Winter	19.210	0.610	0.0	5.0	5.0	54.9	Flood Risk
240 min Winter	19.187	0.587	0.0	5.0	5.0	52.9	Flood Risk
360 min Winter	19.120	0.520	0.0	5.0	5.0	46.8	O K
480 min Winter	19.049	0.449	0.0	5.0	5.0	40.4	O K
600 min Winter	18.982	0.382	0.0	5.0	5.0	34.4	O K
720 min Winter	18.922	0.322	0.0	5.0	5.0	29.0	O K
960 min Winter	18.829	0.229	0.0	5.0	5.0	20.6	O K
1440 min Winter	18.766	0.166	0.0	4.1	4.1	14.9	O K
2160 min Winter	18.724	0.124	0.0	3.1	3.1	11.1	O K
2880 min Winter	18.700	0.100	0.0	2.5	2.5	9.0	O K
4320 min Winter	18.673	0.073	0.0	1.8	1.8	6.6	O K
5760 min Winter	18.659	0.059	0.0	1.5	1.5	5.3	O K
7200 min Winter	18.649	0.049	0.0	1.2	1.2	4.4	O K
8640 min Winter	18.642	0.042	0.0	1.1	1.1	3.8	O K
10080 min Winter	18.638	0.038	0.0	0.9	0.9	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	73.366	0.0	49.3	36
60 min Winter	47.182	0.0	63.8	62
120 min Winter	29.362	0.0	79.8	110
180 min Winter	21.949	0.0	89.6	144
240 min Winter	17.740	0.0	96.7	182
360 min Winter	13.035	0.0	106.6	254
480 min Winter	10.480	0.0	114.4	324
600 min Winter	8.842	0.0	120.6	388
720 min Winter	7.691	0.0	126.0	448
960 min Winter	6.166	0.0	134.6	554
1440 min Winter	4.508	0.0	147.5	774
2160 min Winter	3.288	0.0	161.2	1136
2880 min Winter	2.626	0.0	171.3	1500
4320 min Winter	1.908	0.0	186.2	2212
5760 min Winter	1.520	0.0	197.1	2936
7200 min Winter	1.273	0.0	205.7	3672
8640 min Winter	1.101	0.0	212.8	4408
10080 min Winter	0.974	0.0	219.0	5088

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.165

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.055	4	8	0.055	8	12	0.055

Model Details

Storage is Online Cover Level (m) 19.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	83.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.600	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 18.600

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 20 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	18.686	0.136	0.0	3.4	3.4	5.9	O K
30 min Summer	18.717	0.167	0.0	4.2	4.2	7.2	O K
60 min Summer	18.732	0.182	0.0	4.5	4.5	7.8	O K
120 min Summer	18.726	0.176	0.0	4.4	4.4	7.6	O K
180 min Summer	18.712	0.162	0.0	4.1	4.1	7.0	O K
240 min Summer	18.698	0.148	0.0	3.7	3.7	6.4	O K
360 min Summer	18.676	0.126	0.0	3.1	3.1	5.4	O K
480 min Summer	18.660	0.110	0.0	2.7	2.7	4.7	O K
600 min Summer	18.648	0.098	0.0	2.4	2.4	4.2	O K
720 min Summer	18.638	0.088	0.0	2.2	2.2	3.8	O K
960 min Summer	18.624	0.074	0.0	1.9	1.9	3.2	O K
1440 min Summer	18.607	0.057	0.0	1.4	1.4	2.5	O K
2160 min Summer	18.593	0.043	0.0	1.1	1.1	1.9	O K
2880 min Summer	18.585	0.035	0.0	0.9	0.9	1.5	O K
4320 min Summer	18.576	0.026	0.0	0.6	0.6	1.1	O K
5760 min Summer	18.571	0.021	0.0	0.5	0.5	0.9	O K
7200 min Summer	18.567	0.017	0.0	0.4	0.4	0.7	O K
8640 min Summer	18.565	0.015	0.0	0.4	0.4	0.6	O K
10080 min Summer	18.563	0.013	0.0	0.3	0.3	0.6	O K
15 min Winter	18.703	0.153	0.0	3.8	3.8	6.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	109.059	0.0	7.8	21
30 min Summer	73.366	0.0	10.8	29
60 min Summer	47.182	0.0	14.1	46
120 min Summer	29.362	0.0	17.7	78
180 min Summer	21.949	0.0	19.9	110
240 min Summer	17.740	0.0	21.5	140
360 min Summer	13.035	0.0	23.8	202
480 min Summer	10.480	0.0	25.5	262
600 min Summer	8.842	0.0	26.9	324
720 min Summer	7.691	0.0	28.1	384
960 min Summer	6.166	0.0	30.0	504
1440 min Summer	4.508	0.0	32.9	744
2160 min Summer	3.288	0.0	35.9	1108
2880 min Summer	2.626	0.0	38.1	1472
4320 min Summer	1.908	0.0	41.2	2204
5760 min Summer	1.520	0.0	43.5	2920
7200 min Summer	1.273	0.0	45.2	3672
8640 min Summer	1.101	0.0	46.6	4368
10080 min Summer	0.974	0.0	47.8	5136
15 min Winter	109.059	0.0	8.9	21

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	18.737	0.187	0.0	4.7	4.7	8.1	O K
60 min Winter	18.746	0.196	0.0	4.9	4.9	8.5	O K
120 min Winter	18.729	0.179	0.0	4.5	4.5	7.8	O K
180 min Winter	18.708	0.158	0.0	3.9	3.9	6.8	O K
240 min Winter	18.689	0.139	0.0	3.5	3.5	6.0	O K
360 min Winter	18.662	0.112	0.0	2.8	2.8	4.8	O K
480 min Winter	18.644	0.094	0.0	2.4	2.4	4.1	O K
600 min Winter	18.632	0.082	0.0	2.0	2.0	3.5	O K
720 min Winter	18.622	0.072	0.0	1.8	1.8	3.1	O K
960 min Winter	18.609	0.059	0.0	1.5	1.5	2.5	O K
1440 min Winter	18.594	0.044	0.0	1.1	1.1	1.9	O K
2160 min Winter	18.582	0.032	0.0	0.8	0.8	1.4	O K
2880 min Winter	18.576	0.026	0.0	0.6	0.6	1.1	O K
4320 min Winter	18.569	0.019	0.0	0.5	0.5	0.8	O K
5760 min Winter	18.565	0.015	0.0	0.4	0.4	0.6	O K
7200 min Winter	18.563	0.013	0.0	0.3	0.3	0.5	O K
8640 min Winter	18.561	0.011	0.0	0.3	0.3	0.5	O K
10080 min Winter	18.560	0.010	0.0	0.2	0.2	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	73.366	0.0	12.2	30
60 min Winter	47.182	0.0	15.9	48
120 min Winter	29.362	0.0	19.9	82
180 min Winter	21.949	0.0	22.4	114
240 min Winter	17.740	0.0	24.2	146
360 min Winter	13.035	0.0	26.7	208
480 min Winter	10.480	0.0	28.7	268
600 min Winter	8.842	0.0	30.3	328
720 min Winter	7.691	0.0	31.6	390
960 min Winter	6.166	0.0	33.8	510
1440 min Winter	4.508	0.0	37.0	750
2160 min Winter	3.288	0.0	40.4	1104
2880 min Winter	2.626	0.0	42.9	1472
4320 min Winter	1.908	0.0	46.4	2168
5760 min Winter	1.520	0.0	49.0	2944
7200 min Winter	1.273	0.0	51.0	3672
8640 min Winter	1.101	0.0	52.6	4328
10080 min Winter	0.974	0.0	54.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.042

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.014	4	8	0.014	8	12	0.014

Model Details

Storage is Online Cover Level (m) 19.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	24.0
Max Percolation (l/s)	40.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.550	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 18.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 111 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	18.589	0.389	0.0	5.0	5.0	31.0	O K
30 min Summer	18.714	0.514	0.0	5.0	5.0	41.0	O K
60 min Summer	18.819	0.619	0.0	5.0	5.0	49.4	O K
120 min Summer	18.870	0.670	0.0	5.0	5.0	53.5	Flood Risk
180 min Summer	18.872	0.672	0.0	5.0	5.0	53.6	Flood Risk
240 min Summer	18.857	0.657	0.0	5.0	5.0	52.4	Flood Risk
360 min Summer	18.806	0.606	0.0	5.0	5.0	48.4	O K
480 min Summer	18.753	0.553	0.0	5.0	5.0	44.1	O K
600 min Summer	18.701	0.501	0.0	5.0	5.0	39.9	O K
720 min Summer	18.651	0.451	0.0	5.0	5.0	36.0	O K
960 min Summer	18.564	0.364	0.0	5.0	5.0	29.0	O K
1440 min Summer	18.442	0.242	0.0	5.0	5.0	19.3	O K
2160 min Summer	18.375	0.175	0.0	4.4	4.4	13.9	O K
2880 min Summer	18.344	0.144	0.0	3.6	3.6	11.5	O K
4320 min Summer	18.308	0.108	0.0	2.7	2.7	8.6	O K
5760 min Summer	18.288	0.088	0.0	2.2	2.2	7.0	O K
7200 min Summer	18.274	0.074	0.0	1.8	1.8	5.9	O K
8640 min Summer	18.264	0.064	0.0	1.6	1.6	5.1	O K
10080 min Summer	18.257	0.057	0.0	1.4	1.4	4.5	O K
15 min Winter	18.642	0.442	0.0	5.0	5.0	35.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	109.059	0.0	35.4	23
30 min Summer	73.366	0.0	48.1	36
60 min Summer	47.182	0.0	62.3	62
120 min Summer	29.362	0.0	77.8	102
180 min Summer	21.949	0.0	87.4	136
240 min Summer	17.740	0.0	94.3	170
360 min Summer	13.035	0.0	104.0	238
480 min Summer	10.480	0.0	111.5	304
600 min Summer	8.842	0.0	117.7	370
720 min Summer	7.691	0.0	122.8	434
960 min Summer	6.166	0.0	131.3	554
1440 min Summer	4.508	0.0	143.9	780
2160 min Summer	3.288	0.0	157.2	1124
2880 min Summer	2.626	0.0	167.2	1476
4320 min Summer	1.908	0.0	181.7	2208
5760 min Summer	1.520	0.0	192.4	2936
7200 min Summer	1.273	0.0	200.9	3672
8640 min Summer	1.101	0.0	207.9	4400
10080 min Summer	0.974	0.0	214.0	5136
15 min Winter	109.059	0.0	39.8	24

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	18.785	0.585	0.0	5.0	5.0	46.7	O K
60 min Winter	18.909	0.709	0.0	5.0	5.0	56.5	Flood Risk
120 min Winter	18.971	0.771	0.0	5.0	5.0	61.6	Flood Risk
180 min Winter	18.967	0.767	0.0	5.0	5.0	61.2	Flood Risk
240 min Winter	18.942	0.742	0.0	5.0	5.0	59.2	Flood Risk
360 min Winter	18.862	0.662	0.0	5.0	5.0	52.9	Flood Risk
480 min Winter	18.778	0.578	0.0	5.0	5.0	46.2	O K
600 min Winter	18.696	0.496	0.0	5.0	5.0	39.6	O K
720 min Winter	18.621	0.421	0.0	5.0	5.0	33.6	O K
960 min Winter	18.494	0.294	0.0	5.0	5.0	23.5	O K
1440 min Winter	18.382	0.182	0.0	4.6	4.6	14.6	O K
2160 min Winter	18.336	0.136	0.0	3.4	3.4	10.9	O K
2880 min Winter	18.310	0.110	0.0	2.7	2.7	8.7	O K
4320 min Winter	18.280	0.080	0.0	2.0	2.0	6.4	O K
5760 min Winter	18.264	0.064	0.0	1.6	1.6	5.1	O K
7200 min Winter	18.254	0.054	0.0	1.3	1.3	4.3	O K
8640 min Winter	18.246	0.046	0.0	1.2	1.2	3.7	O K
10080 min Winter	18.241	0.041	0.0	1.0	1.0	3.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	73.366	0.0	54.1	37
60 min Winter	47.182	0.0	69.9	64
120 min Winter	29.362	0.0	87.4	116
180 min Winter	21.949	0.0	98.1	146
240 min Winter	17.740	0.0	105.8	184
360 min Winter	13.035	0.0	116.7	258
480 min Winter	10.480	0.0	125.1	328
600 min Winter	8.842	0.0	132.0	396
720 min Winter	7.691	0.0	137.8	458
960 min Winter	6.166	0.0	147.3	572
1440 min Winter	4.508	0.0	161.4	770
2160 min Winter	3.288	0.0	176.4	1132
2880 min Winter	2.626	0.0	187.6	1492
4320 min Winter	1.908	0.0	204.0	2208
5760 min Winter	1.520	0.0	216.1	2936
7200 min Winter	1.273	0.0	225.6	3672
8640 min Winter	1.101	0.0	233.5	4408
10080 min Winter	0.974	0.0	240.5	5088

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.180

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.060	4	8	0.060	8	12	0.060

Model Details

Storage is Online Cover Level (m) 19.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	19.0
Max Percolation (l/s)	73.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	18.200	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 18.200

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

December 2021

Planning Design & Access Statement

Sud Brook Garden, Hatherley Road, Tredworth.

BM3

Contents

1 Introduction

1.1 Introduction

This Planning, Design and Access Statement is submitted in support of a full planning application for creation of open space in the form of a new public garden on derelict brownfield land at the former Norville Optical Co. site. The site is accessed from Hatherley Road and Melbourne Street East, in Tredworth, approximately 1.2 miles from Gloucester City Centre.

The purpose of this Planning, Design and Access Statement is to describe and demonstrate the design principles, process and evolution of the proposals. It describes the design and layout of the site and presents a final detailed design. It also sets out the planning history of the site before providing the planning policy context and assessing its merits.

This has been produced on behalf Rooftop Housing Group.

The development of the site into a new area of public open space will bring the following benefits:

- Provision of 775m2 of new public open space providing an informal space for community involvement.
- Bolstering of the local Green Infrastructure network
- Habitat enhancements along the edge of the Sudbrook Park river course.
- Improved pedestrian connectivity locally.
- Reduction in total hard paved area to permeable surfaces, reducing surface water run-off.
- Regeneration and re-use of brownfield land

1.2 Supporting Documentation

The following supporting has been submitted in support of the application:

- Archeological Desk Based Assessment
- Ecological Assessment
- Revised Flood Risk Assessment
- Ground Investigation Report
- Topographical Survey

2 Site Location & Description

2.1 The Site

The site is located in Tredworth, a historic suburb of south of Gloucester city centre. It is an old industrial site, with a rich history starting in the late Victorian period when the site was home to the Hatherley Works, producers of the Lattisteps step ladders, to its acquisition by the Ministry of Aircraft Production during World War II, when it may have been used or production of components for the Hurricane Typhoon.

Situated adjacent to the Sud Brook, the site is well overlooked by the adjacent new development at Lattistep Court on Tarrington Road to the south-west, and despite its somewhat sensitive location behind two storey terraced properties of Melbourne Street East to the north-east, the site is considered to be an ideal location for tranquil garden space for use by the local community.

As part of the of Paul Street development to the south, the Sud Brook river course was opened up and the culvert demolished, with various measures to enhance the river course and its suitability as a wildlife corridor.

The local population is culturally rich and diverse. The ward is the most ethically diverse in the City. The area is well served by community facilities and active community groups.

2.2 Former Commercial Use

The application site and the adjacent now Paul Street development was originally in commercial use, occupied by Norville Optical Co., a manufacturer of spectacle lenses. Given the demand for housing for social rent in the Barton and Tredworth area it was deemed appropriate that the Paul Street site was to be reused for residential accommodation, while the application site given site constraints was earmarked for creation of new open space. Norville Optical ceased manufacturing at the site in 2002, moving to alternative premises on Madala Road Gloucester. The site was targeted by arsonists in 2012, where most of the buildings suffered extensive damage.

Site History

1888 - Hatherly Works

Lattisteps step

Hatherley Works old tramy system remains.

1942 - Gloster Aircraft Company & Ministry of Aircraft Production

Hurricane Typhoon.

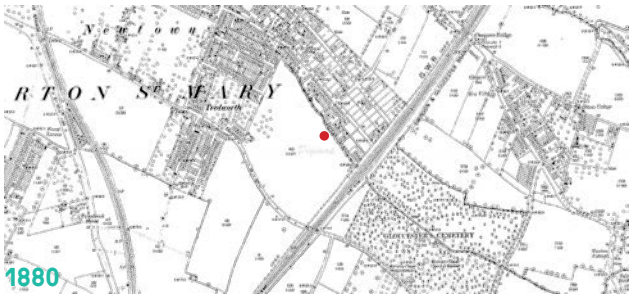
1950 & 60s - Gloucester Railway Carriage and Wagon Company, then Gloucester Engineering Company Ltd.

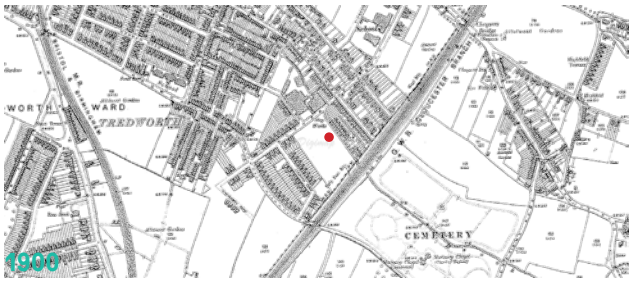
G-Series Red Rocket, produced for Toronto Subway.

1980s & 90s - Norville Optical Company Ltd

2012 - Old Norville Works Warehouse Fire

2020 - Construction of Sudbrook Garden?





2 Site Location & Description

2.3 Site photos

View from Paul Street development.

View from Hatherley Road, including access door.

View from Hatherley Road.

View of access from Melbourne Street East

The site is a derelict former industrial site comprising areas of hard standing building slab and bitumen macadam as well as areas of colonising scrub. The site is now largely devoid of vegetation which can be see on site photograph 5.

The Sud Brook runs along the south-western edge of the site. It is bordered by terraced residential housing along the Melbourne Street East, which back on to the site. The surrounding area is predominately urban although a railway line and open cemetery are present 150m to the east.

2 Site Location & Description

2.4 Topography

The site access from the Hatherley Road is at AOD 18.963 at the footway, with levels within the site dropping to AOD 18.647. Levels rise slightly northwards with levels at the entrance from on Melbourne Street East reaching AOD 18.790. The low variability in levels across the site reflects its current condition as a derelict site, with much of the site formed by hard-standing former building slab or bitmac drive surface.

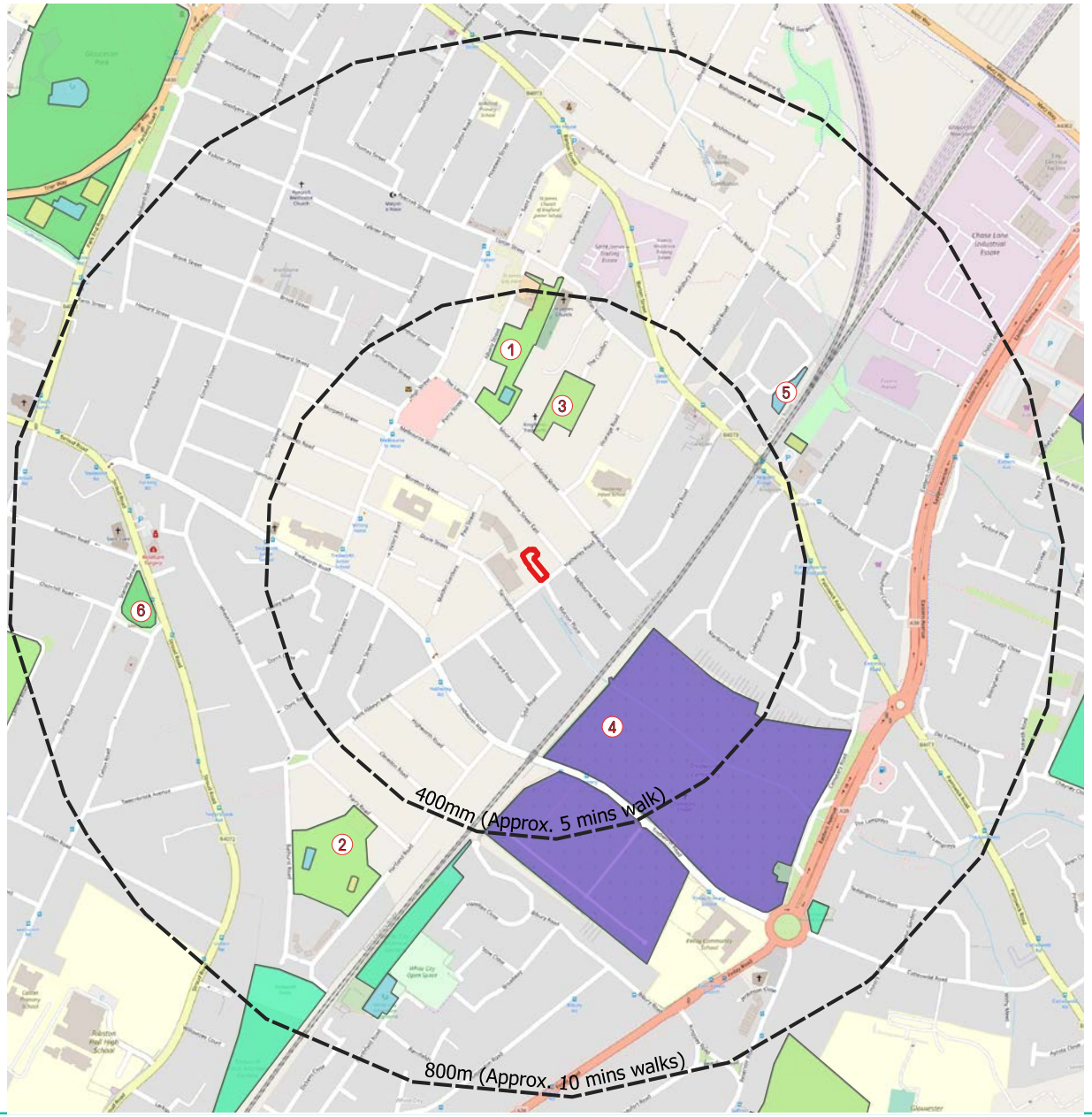
3 Site Context

The site is surrounded by various areas of public or semi-public open spaces of various types and categories, including public parks and gardens, playing fields, play spaces, allotments and cemeteries.

It can be seen from the diagram adjacent that there is a gap in available open green spaces within approximately 5 minutes walk of the of the development site, particularly to the south of the catchment area. This is particularly true if the Tredworth Raod Cemetery is excluded, and which is likely to only be available for certain types of activities during limited parts of the day.

Other notable areas of open space within approximately 10 minutes walk from the development site include:

1. St James' Park & Play Space
2. Isac's Endz & Parry Field Play Area
3. Kingfisher Church Playing Field
4. Tredworth Road Cemetary
5. Diamond Jubilee Close Play Space
6. Nelson Foster Memorial



4 Planning Policy Context

Relevant Planning Policy is set out below which has been considered throughout the development of the design.

4.1 National Planning Policy Framework

The National Planning Policy Framework sets out the government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

Paragraph 84 states that 'Planning policies and decisions should enable: ... 'd) the retention and development of accessible local services and community facilities, such as local shops, meeting places, sports venues, open space, cultural buildings, public houses and places of worship ...'

Paragraph 93 states that 'To provide the social, recreational and cultural facilities and services the community needs, planning policies and decisions should: a) plan positively for the provision and use of shared spaces, community facilities (such as local shops, meeting places, sports venues, open space, cultural buildings, public houses and places of worship) and other local services to enhance the sustainability of communities and residential environments;

Paragraph 98 states that 'Access to a network of high quality open spaces and opportunities for sport and physical activity is important for the health and well-being of communities, and can deliver wider benefits for nature and support efforts to address climate change. Planning policies should be based on robust and up-to-date assessments of the need for open space, sport and recreation facilities (including quantitative or qualitative deficits or surpluses) and opportunities for new provision. Information gained from the assessments should be used to determine what open space, sport and recreational provision is needed, which plans should then seek to accommodate.'

4.2 Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011 - 2031

Policy SD4: Design Requirements - States that 'Where appropriate, proposals for development ... will need to clearly demonstrate how the following principles have been incorporated:

i. Context, Character and Sense of Place ... New development should respond positively to, and respect the character of, the site and its surroundings ...

ii. Legibility and Identity ... This should be achieved through a well-structured and defined public realm, with a clear relationship between uses, buildings, routes and spaces ...

iv. Public Realm and Landscape ... New development should ensure that the design of landscaped areas, open space and public realm are of high quality, provide a clear structure and constitute an integral and cohesive element within the design.

vi. Inclusiveness and Adaptability ... New development should provide access for all potential users, including people with disabilities ...

Policy INF3: Green Infrastructure - States that:

1. The green infrastructure network of local and strategic importance will be conserved and enhanced, in order to deliver a series of multifunctional, linked green corridors across the JCS area by:

i. improving the quantity and/or quality of assets

ii. improving linkages between assets in a manner appropriate to the scale of development, and

iii. designing improvements in a way that supports the cohesive management of green infrastructure.

Policy INF4: Social and Community Infrastructure - States that:

3. Social and community infrastructure should be centrally located to the population it serves and be easily accessible on foot and by bicycle ... In the case of open space, 'easily accessible' means it is located within reasonable walking distance of the development it serves.

4.3 Second Stage Deposit Local Plan 2002

Policy OS.4 Design of Public Open Space

Proposals for new housing development should incorporate high quality public open space in accordance with the following criteria:

1. it should be in an accessible location to serve the residents and users of the development; (policy BE.6) and,

2. it should be provided in areas of at least 0.2 ha (½ acre), and be of a usable shape and size for recreation; and,

3. it should be overlooked by surrounding properties; and,

4. it should be properly landscaped; (policy BE.12) and,

5. it should be designed to take account of community safety considerations (Policy BE.5).

4.4 Gloucester City Plan (Not yet adopted)

Examination has taken place with clarifications submitted to the Planning Inspectorate. However, the Plan has not yet been adopted. In accordance with the NPPF, the weight to be attached to its polices should be proportionate to its stage of adoption.

Policy C3: Public open space, playing fields and sports facilities states that:

The need for new open space and playing fields within new development will be determined in accordance with the aims and recommendations of the City Council's Open Space Strategy and Playing Pitch Strategy.

4 Planning Policy Context

Development proposals to enhance or provide new open spaces, playing fields or built sports facilities will be supported where they deliver the aims and recommendations of the Council's Open Space Strategy, Playing Pitch Strategy and Built Sports Facilities Strategy, or any future iterations.

Policy F1: Materials and finishes states that:

Development proposals should achieve high quality architectural detailing, external materials and finishes that are locally distinctive. Developments should make a positive contribution to the character and appearance of the locality and respect the wider landscape.

Policy F2: Landscape and planting states that:

Major development proposals must be accompanied by a landscape scheme, incorporating hard landscape and planting details. Such plans must:

'1. Exhibit a design and choice of hard materials, boundary treatment and planting appropriate to the particular location and existing landscape character, or create a new and distinctive character where this is currently lacking; and

2. Retain and incorporate existing natural features such as trees, hedges and watercourses, where possible; and

3. Ensure, in appropriate developments, especially housing schemes, that adequate space is provided for the planting and maturing of suitable large-scale trees; and indicate areas of public open space and amenity land that are proposed for adoption and provide full details of who will be adopting and maintaining the spaces. Where appropriate, the use of native species in planting schemes will be required.'

4.5 Joint Core Strategy - Green Infrastructure Strategy

The GI Strategy of the wider regional Joint Core Strategy identifies the following relevant policies:

'Connectivity: Through the development plan, the connectivity of the GI asset should be addressed. The plan should look to promote opportunities to increase connectivity, especially where identified in the GI plans for the urban areas in the appendices of this strategy. Large scale development opportunities provide the prospect of delivering connectivity through the site and links to the surrounding area.'

'Health: Development plans should address preventative measures that take on board the causes of ill health and use Health Impact Assessments (HIAs) to aid decision making. HIAs should be used to show how new development can use GI to mitigate against unhealthy lifestyles through the provision of multifunctional open space, pedestrian and cycle connectivity through the site, and connections to the wider natural environment.'

'Public Open Space (POS): LPAs should consider progressing POS strategies or similar that allow for the provision of a quantum of open space as part of new development or off site contributions. Open space should be of an appropriate quality, address GI interests and be adopted by the local authority.'

'Trees: Trees are important GI assets especially within dense urban areas. Local Plans should protect existing trees and promote new planting for local amenity value and because of the contribution they make to the wider GI asset.'

4.6 Gloucester City Open Space Strategy 2021-2026

The following relevant objectives are established in the Gloucester City Open Space Strategy:

'... ensure that planning policies are in place in the council's City Plan (and the Joint Core Strategy) to retain and protect existing open spaces and playing fields, to create high-quality open spaces, link new communities and provide effective green infrastructure for new housing developments, both within and just beyond the city boundary.'

'... encourage greater community and partnership involvement in managing and developing the city's green spaces especially through Friends and other community groups.'

'... support the health & well-being agenda and help address health inequalities, by improving existing open space facilities in areas of the city where there is a deficit in the provision of open space, and where the scope to provide additional open space is limited.'

' ... continue to protect, maintain, develop and invest in high quality, accessible open spaces and facilities, including heritage assets, utilising external funding wherever possible.'

The site is located in the Barton & Tredworth Ward, and the Open Strategy identifies that the ward has only 2.55 ha of open spaces in the form Parks & Gardens, Amenity open spaces and Formal play and youth is available in total, the lowest level of provision among the City's 18 wards; the report also states that the Barton & Tredworth Ward has the highest population of all 18 Wards of Gloucester, with an estimated population of 11,493 (2017).

5 Design - Introduction

5.1 Introduction

We propose the creation of a characterful 'secret' garden that takes design queues from the Victorian origins of the neighbourhood. Retention and refurbishment of the existing wall at Hatherley Road will create an inviting entrance, contributing to the street scene. Upon arrival, user will have a choice of heading straight to the waterfront to lean against the railings and watch the Grey Wagtails feed along the river course, lie on the south facing lawn area or take a seat within the garden court yard.

The garden will offer a valuable and safe space for informal play, with a circular path and lawn area. Meanwhile, adults and older children can chose cultivate planting beds. Raised beds are proposed to ensure full inclusivity for more elderly individuals as well as those on wheelchair.

All proposed surfaces are at least partly permeable, so this flood prone site will serve to attenuate surface-water run off.

We envisage the gardens as a key part of the community, offering much needed amenity in a dense and very urban part of the City of Gloucester. Results from our consultation process confirm

5.2 Proposals aims

- Enhance local character & provide much needed green space for local residents
- Encourage wildlife habitats
- Create opportunity to cultivate ornamental plants, herbs and vegetables; promote physical activity
- Provide space for young people to discourage anti-social behaviour
- Provide space for community activity generally

5 Design- Key Elements

Courtyard Garden

Garden courtyard space with river frontage providing a place to meet and be social with neighbours. Surrounding planted areas with low maintenance shrubs and herbaceous perennials, as well as beds to be cultivated by the community.

Community Involvement

Empty beds will provide opportunities for local community, schools and organisations such as the local wildlife trust and gardening groups get involved and make the space their own, fostering good long-term stewardship of the space.

Sud Brook

The Sud Brook watercourse has been enhanced as part adjacent development. We propose creating a safe and approachable edge with railings to allow users of the garden to interact and enjoy the brook. Nesting boxes for Grey Wagtails will provided to further encourage this species, which currently frequents the location.

Entrances & Access

Te site will be access from both Hatherley Road and Melbourne Street East, with primary access envisaged from Hatherley Road through the retained heritage wall.

5 Design - Visuals

View from Melbourne Street East

View from Hatherley Road

5 Design - Soft Landscape

Tree planting

Betula utilis var. jacquemontii

Acer campestre

Malus domestica 'Worcester Pearmain'

Prunus damascena 'Shropshire Prune '

Ornamental Shrub & Perennial Planting

Anemore nemorosa

Cistus 'Alan Fradd'

Stipa tenuissima

Rosa 'Kent'

Specimen Shrub Planting

Amelanchier lamarcki

Escallonia 'Iveyi'

Calamagrostis acutiflora 'Karl Foerster'

Elaeagnus x ebbingei

5.3 Trees

Small stature trees have been selected to give the new garden some height maturity from day one. Betula utlis va. jacquemontii will establish a formal avenue of trees, while aiding in establishing a partial privacy screen for neighbouring properties.

Acer campestre will be used as specimen trees, reinforcing the courtyard focal point of the garden and introducing a native tree of value for biodiversity, including invertebrates and nesting birds.

A small orchard with a selection of fruiting trees is proposed adjacent to the Melbourne Street East entrance, including varieties from the West of England such as Malus 'Worcester Pearmain' and Prunus 'Shropshire Prune', as wells as Prunus 'Victoria'.

5.4 Planting Design

The community garden is intended first and fore-most to provide new high quality grow-space for the local residents to grow their own ornamentals, herbs and even vegetables. Therefore the proposed planting scheme is predominantly intended to provide a framework of structure planting that defines a series of grow beds to be cultivated by the community.

The planting choices assure year round interest whilst also focussing on providing a rich habitat for pollinators The planting plans show species choice and location in more detail which consists a diverse mixture of tree planting and hedges throughout the site,

Elaeagnus hedge planting species are used to create structure , thresholds and 'rooms' within the gardens. A small length of native species hedge will provide valuable local wildlife habitat.

5 Design - Hard Landscape

Surface & Boundaries

Self binding (Breedon) gravel path

Ball-top Railings to Form Various Boundaries

Existing heritage wall to be retained and made-good

Street Furniture

Simple treated

Litter Bin

Raised planters

Wildlife Features & Boxes

Grey Wagtail and Dipper Nest Box

Insect Block

Bug hotel

5.5 Surface & Boundary Treatments and Street Furniture

All paths of the garden will be constructed with timber edged self-biding gravel, providing an attractive and semi-permeable surface that is steady underfoot and suitable for use by wheelchair users.

As well low lying beds, new 700mm height soft-wood timber raised beds will be created to allow wheelchair and less able-bodied individuals easy access to grow-beds for cultivation.

The site boundary will be formed by making good existing walls and an by introducing new 1800mm height ball top railings to entrances with double leaf gates, as well as 1100mm height railings to the Sud Brook, ensuring users can approach the rivers edge safely.

5.6 Street Furniture, Wildlife Features & Boxes

Simple timber benches are proposed to encourage users to sit and enjoy the garden comfortably. Litter bins will be provided and managed and maintained by the Local Authority.

A bug hotel will be created within the gardens to provide habitat for a variety of species. Whilst also providing new opportunities for community engagement, for example asking local schools, charities or residents to help build it.

Nest and insect boxes have also been placed throughout the site to create additional habitats features and encourage wildlife.

6 Access

The proposals will establish two points of pedestrian access only into the site.

Gates will be provided at the entrance from Hatherley Road and from Melbourne Street East. Access from Hatherley Road will be facilitated by a 1:20 ramp down from the back of the footway, making the access into the site suitable for wheelchair users and less able-bodied individuals.

7 Consultation

7.1 Introduction

Information was gathered through two consultation sessions, one physical which was held on Thursday 7th October 2021 (appendix attached) and one virtual which was held on Thursday 14th October 2021. From this, 17 formal responses to the survey were collected along with lots of informal conversations.

7.2 Consultation Analysis

Consultees were asked if they support the proposed use of the site for a community garden:

Yes	100%
No	0%

All consultees support the proposal.

Consultees were asked if they think the garden has been designed well:

Yes	64%
No	0%
I don't know	36%

No consultees disagree with the design, some are just unsure on their opinion.

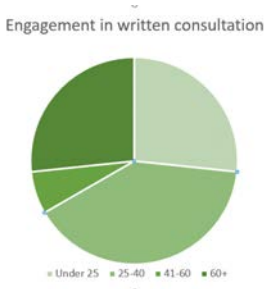
Consultees were asked if the area will benefit from a new community garden:

Yes	100%
No	0%

All consultees believe the area will benefit from the garden.

All age groups, under 25, 25-40, 41-60 and over 60 feel the same way about the community garden. Four people under the age of 25 responded to the survey, six people between the ages of 25-40, one person aged between 41-60 and four people aged 60 and above. This mix in ages is crucial when taking data, as people from all ages are able to share their different views on the garden as it will impact their lives differently.

As shown by the pie chart the biggest segment is the people within the age group between the ages of 25-40.



Although more people responded to the surveys aged 25-40, the people aged under 25 were most engaged, as they had the highest numbers for written feedback on the survey forms.

100% of people of all ages agree that the area will benefit from a new community garden, however only 9 people agree that yes the garden was designed well, the other 5 people who took part in the physical session who filled out the survey 'don't know' whether the community garden was designed well. Fortunately, no one said it wasn't designed well, but there was two formal responses which weren't recorded in the survey and one person who didn't respond to this part of the survey. But overall, no one disagrees with the design.

7.3 Consultation Analysis

A few people have given their opinions on what they would like to see in and around the garden:

Under 25	Keen to have eco-friendly furniture and lots of objects made from recycled materials. Would like fruit trees and herb plants.
60+	Wants the garden to be simple and have a open design.

7.4 Overall Suggestions

Consultees think that people should be mindful of the potential anti-social behaviour. Others say that the more people it attracts the better for the community.

8 Assessment of Planning Merits

The proposals for the site have been developed taking into account a wide range of factors to the determine the most appropriate use for its use, including the site context and characteristics, local needs and existing site or policy constraints.

8.1 Principle of Development

Section 38(6) of the Planning and Compulsory Purchase Act 2004, requires planning applications to be determined in accordance with the development plan, unless other material considerations indicate otherwise.

The application site is located within the development/ settlement boundary of the City of Gloucester.

The site not located within a Conservation Area and there are no listed buildings within its immediate surroundings. However, the site is located within flood zone 2 and 3a.

The site will provide a new area of high quality public open space totalling approximately 774m^2 (or 0.08ha) and is in alignment with various local and national policies as follows:

National Planning Framework Policy:

In line with NPPF, the proposed development constitutes open space accessible to all; comprises a positive plan for creation of a form of social, recreational and cultural facility and contributes to the creation of an accessible network of high quality open spaces, with opportunity for informal sport and physical activity, which will be of benefit to the welfare and health of the local community, as well as providing wider benefits for nature. The NPPF makes clear that opportunities for new provision should form part of planning policy and the proposals accord with NPPF.

Joint Core Strategy 2017:

In line with Policy SD4: Design Requirements, the proposals will enhance the character, context and sense of place of the locality, improve legibility and local identity, for a new area of public realm and landscape and be inclusive and adaptable

In line with Policy INF3: Green Infrastructure, the proposals will enhance the local infrastructure recognised of strategic importance in the local GI strategy, improving linkages, access and overall quality of the Sud Brook riparian corridor.

In line with Policy INF4: Social and Community Infrastructure, the proposals will form part of the local community infrastructure, providing easily accessible open space within reasonable walking distance for a substantial catchment area of the Tredworth neighbourhood.

Joint Core Strategy Green Infrastructure Strategy:

The proposal will improve connectivity of the Sud Brook riparian corridor, in line with the wider Joint GI Strategy, providing a piece of green infrastructure that can have preventative health benefits, while contributing to the local overall quantum of public open space within the Joint Core Strategy jurisdiction. The proposals also include the planting of 11no. new trees, in lines with its policy regarding trees.

Second Stage Deposit Local Plan 2002:

Although the proposal will not constitute new housing development, they align with Policy OS.4 Design of Public Open Space in that the new open space will be available for use by recent adjacent new development, be well overlooked by surrounding properties and properly landscaped with high quality low maintenance planting, and will account for community safety considerations by provision of suitable boundary treatments and avoiding features that may restrict natural surveillance.

Gloucester City Plan:

In line with Policy C3: Public open space, playing fields and sports facilities, the site will help with various objectives of the Gloucester City Council's Open Space Strategy including (i) provision 0.08ha of new public open spaces within the Barton & Tredworth Ward, the Gloucester City Ward with the lowest total amount of public open space; (ii) promotion of greater community and partnership involvement in managing the city's green spaces; (iii) investment to develop accessible open spaces and facilities.

Also, in line with Policy F1: Materials and finishes, the materiality of the development will be high quality and appropriate for the type of the development, respecting the local character and context.

In addition, with respect to Policy F2: Landscape and planting, the proposal include new high quality landscape planting appropriate for the location, while incorporating sites assets as appropriate, e.g. the Sud Brook watercourse and site heritage wall.

It is therefore considered that the principle of development is secure.

8.2 Social Benefits

The development would deliver a range of social, economic and environmental benefits. Key benefits that will be delivered as a result of the development include:

The proposal will deliver the several social benefits:

New high quality open space (Approx 0. 078ha) for higher quality of life for local residents.

Local community facility for gatherings, activity and community growing, with associated health and community building benefits.

Access to nature and enjoyment of the Sudbrook watercourse, again with known health benefits.

8.3 Environmental Benefits

Use of derelict brownfield site not available for development due to location in high flood risk zone.

Improvement to the setting of the Tredworth local area through provision of the public open space

Bolstering of Green Infrastructure associated with the Sudbrook watercourse, in line with wider Joint GI Strategy.

Creation of new areas of habitat, including enhancement of the Sudbrook habitat corridor and introduction of wildlife-beneficial landscape planting and wildlife features.

Reduction in total of hard-standing surfaces, reducing surface water run-off locally.

8.4 Economic Benefits

Development of the site will also create temporary jobs during the construction phase of the development, as well as long-term jobs during the occupational phase of the development, associated with management and maintenance of the new open space.

8.5 Other Technical Considerations

Archaeology

The desk-based archaeology report prepared by Archaeological Landscape Investigation has identified that the site has Low potential to reveal evidence of prehistoric remains and Low to Moderate potential to reveal evidence of Roman or Medieval remains. The report identifies that there is a High potential that the site may reveal evidence of buildings associated with the former Hatherley Step Works, which was established in 1885. However, it is determined that remains from the early part of the works history are likely to have been heavily impacted by later 20th century development on site.

The Hatherley Step Works was a manufacturing works specialising in the production of step ladders and furniture established in 1885 and which expanded rapidly during the 1890s/early 1900s. During the Second World War, part of the works buildings were requisitioned for use as an aircraft factory and alterations were made (including the construction of three air raid shelters which were demolished in 1947) (Archaeological Landscape Investigation, 2014).

Ecology

All Ecology Environmental Consultancy has determined through the Ecological Appraisal (2014) that the Site is considered to have low ecological value, but recognises that the site has potential to support foraging bats and nesting birds, which are protected under various legislation. The report goes on to recommend that any vegetation clearance is carried out outside of bird-nesting season, which is typically considered to be between March to August. Additional recommendations are made in relation to the adjacent watercourse and in terms of features that will enhance the site for biodiversity such as recommendations about plant species selection and introduction of wildlife boxes.

Site Investigation

A site investigation report by Wilson Associates was carried out in 2015 through intrusive survey identified a surface of hard-standing over made ground, overlying river terrace deposits and localised alluvium along the course of the Sud Brook, all underlain by a 'bedrock' of clay. The site was identified as unsuitable for soak-away drainage. A detailed contamination risk assessment revealed that the site is 'relatively uncontaminated, with only localised perceived risk to human health'. Routine remedial/ mitigation measures are recommended, eg. clean capping of 300mm thickness imported topsoil.

Flood Risk

A flood risk assessment report was prepared by Infrastruct CS Ltd. It determines that much of the site lies within Environment Agency flood zone 2 and 3a, although the accuracy of the plans is questioned due to the adjacent Sud Brook watercourse originally being culverted.

The report determines that the reduction in impermeable surfaces as a result of the development proposals will result in a significant reduction in surface water run-off rates.

The proposed development is considered to be 'water-compatable development' in line with government guidelines with regard to developments in flood risk zones 2 and 3a, and will comprise 'amenity open space, nature conservation and biodiversity, outdoor sports and recreation.'

BM3

[redacted]

www.bm3.co.uk

Desk Based Assessment

Former Norville Factory Site, Tarrington Road, Tredworth, Gloucester

NGR: SO 839 171

This report has been prepared by Archaeological Landscape Investigation for Markey Developments

ARCHAEOLOGICAL LANDSCAPE INVESTIGATION

Report Date: 11/10/14

[redacted]

Website: http://www.alinvestigation.co.uk

Non-Technical Summary

This archaeological desk-based assessment of the former Norvilles Factory, Tarrington Road, Tredworth, Gloucester, based on a detailed examination of the available documentary sources, historic mapping and sources of archaeological information, has sought to identify the potential nature and significance of the archaeological resource within the study area, which may be summarised as below:

- **Prehistoric**: The potential for encountering remains of prehistoric date within the site has been assessed as **Low**, reflecting the negative evidence for prehistoric activity in the archaeological record for this area.

- **Roman**: The potential for revealing evidence of Roman activity in the immediate locality of the study area has been assessed as **Low to Moderate**. This assessment is based on the mostly negative results of watching briefs undertaken in the vicinity of the site; however it does take into account the evidence for burial activity previously identified at St Paul's Road and find-spots of Roman coins recorded in the immediate locality of the site.

- **Medieval**: The potential for encountering evidence of medieval settlement and associated field systems has been assessed as **Low to Moderate**. Little archaeological or documentary evidence for medieval occupation has been identified in the vicinity of the site, which appears to have remained predominantly rural, sparsely settled and undeveloped until the mid-19th century. There is limited potential for revealing buried evidence of cultivation features or field boundaries of medieval date in the vicinity of the site, although it is likely that these will have been obscured or entirely truncated by late 19th/20th century industrial development.

- **Post-Medieval**: The potential for revealing evidence of early post-medieval archaeological remains in the immediate vicinity of the site has been assessed as **Low to Moderate**. Documentary and cartographic sources reveal that the study area lay within an enclosed arable field forming part of the open field of Upper Tredworth which remained essentially undeveloped until the mid-late 19th century. There is **High** potential for encountering buried remains and standing buildings associated with the Hatherley Step Works, a substantial manufacturing works specialising in the production of step ladders and furniture established in 1885 and which expanded rapidly during the 1890s/early 1900s. Buried remains from the late 19th activity on the site, however, are likely to have been heavily impacted by later 20th century activity and the construction of concrete yardage.

Summary: The archaeological record for this area is sparsely documented and consequently any conclusions drawn must be regarded as tentative; however the potential for revealing evidence of prehistoric remains has been assessed as **Low**, while the likelihood of encountering evidence of Roman and medieval occupation has been assessed as **Low to Moderate**. There is **High** potential of encountering evidence of buildings (both in terms of extant structures and buried remains) associated with the former Hatherley Step Works, established in 1885, although buried remains from the early part of the works history are likely to have been heavily impacted by later 20th century development of the site.

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Front cover: External elevation of southwestern site frontage. View – NW

Report Details:

Author: TW – 5th Revision 17/11/14

Checked by: KM – 17/11/14

1. Introduction

Archaeological Landscape Investigation has been instructed by Markey Developments to undertake an archaeological desk-based assessment of the former Norvilles Factory site located on the N side of Tarrington Road, Tredworth, Gloucester – Planning Ref: 14/00774/PREAPP (NGR SO 839 171).

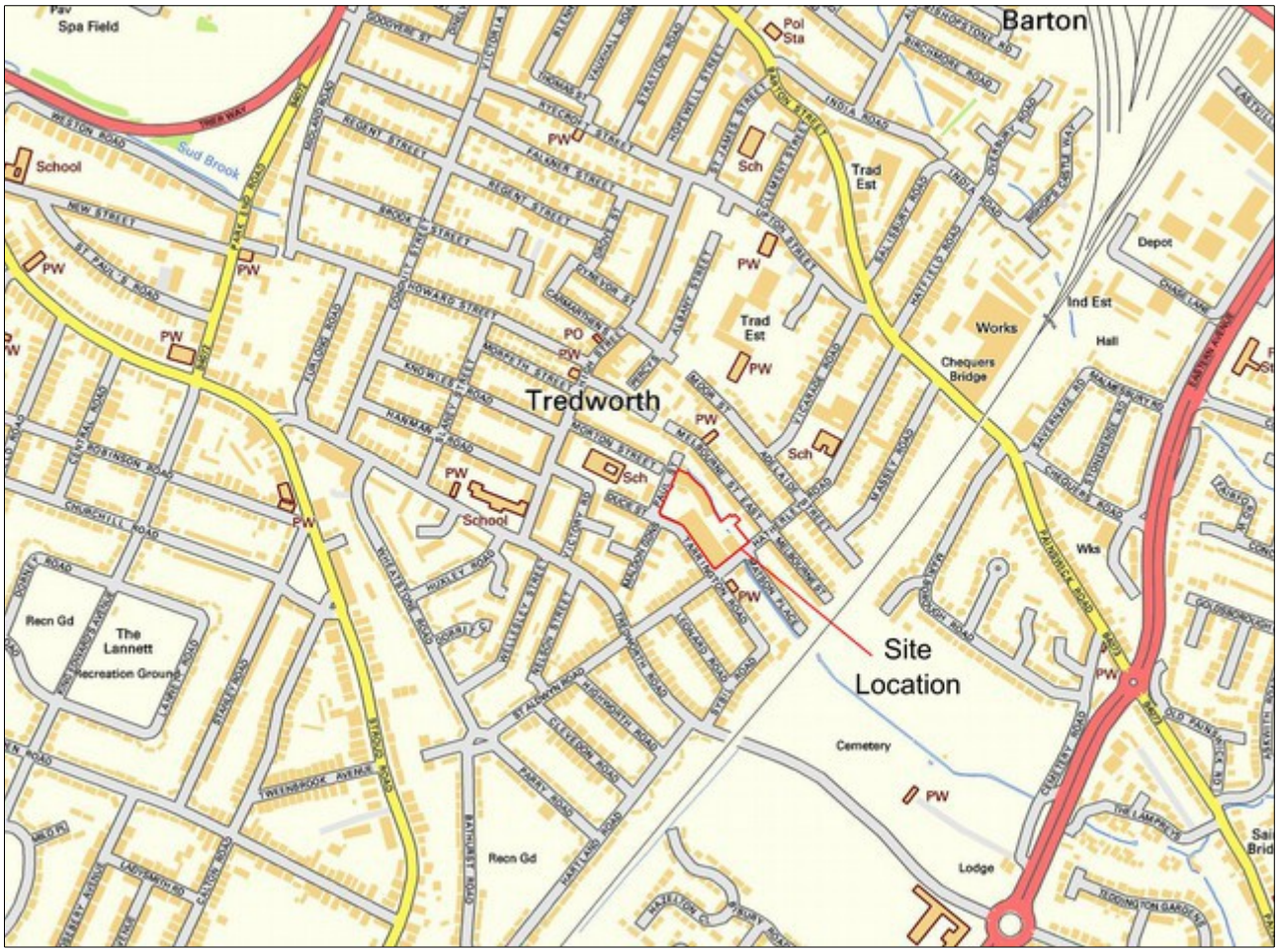

Fig. 1: Site Location on Open OS data mapping. Contains Ordnance Survey data © Crown copyright and database right 2014

This desk-based assessment has been prepared by Thomas Wellicome BSc MA AIfA, for submission to Andrew Armstrong, City Archaeologist, Gloucester City Council (GCC). The study area consists of an extensive complex of industrial buildings formerly built to accommodate the Hatherley Step Works and has more recently been occupied by Norville's optical lens works. The site is bordered to N by Melbourne Road, to the S by Tarrington Road, to the W by Paul Street and to the SE by Hatherley Road.

Soils and Geology

The study area lies within a heavily urbanized and industrialized suburb of Gloucester and has not been surveyed in the Soil Survey of England and Wales. Consequently, no information is available regarding the geology of the specific study area. (SSEW, 1983).

2. Project Aim

This archaeological desk-based assessment seeks to identify any known or potential archaeological resource within the study area and establish its character, extent, quality and importance in a local, regional and national context.

3. Methodology

Archaeological Assessment

Research Methods

The research carried out for this archaeological desk-based assessment consisted of the following elements:

Evaluation and study of archaeological databases

The National Monuments Record Centre at Swindon and the Gloucester City Council Historic Environment Record were both consulted and lists obtained of all known archaeological sites, listed buildings and scheduled ancient monuments in the study area (defined as 1km radius centred on SO 839 171).

Evaluation and study of cartographic and other pictorial evidence

A detailed map regression analysis of the study area was carried out, examining various historic maps of the specific study area, dating back to the late 18th century. These maps were obtained from Gloucestershire Archives and the National Archives. Collections of 19th/20th century photographs relating to the study area were consulted at Gloucestershire Archives

Evaluation and study of primary written evidence

Original medieval and post-medieval records relating to the study area were consulted at Gloucestershire Archives and the National Archives, including property deeds, estate surveys and trade directories.

Evaluation and study of secondary (published) sources

All published and unpublished works relating to sites and structures of archaeological and historical interest within the study area were evaluated, including relevant volumes of the *Transactions of the Bristol and Gloucestershire Archaeological Society and Glenevis*.

Site Visit

Site visits were carried out on 9th of September and the 3rd October 2014 to further assess the potential for archaeology on the site.

4. Historical and Archaeological Background

Prehistoric

No recorded evidence of prehistoric activity has been identified in the vicinity of the study area, based on a consultation of the GCC Historic Environment Record (within a 1km radius centred on NGR SO 839 171). However, in view of the fact that Gloucester is the lowest crossing point on the River Severn the possibility that evidence of later prehistoric activity might be encountered within the study area cannot wholly be discounted.

Conclusion: The potential for encountering remains of prehistoric date within the site has been assessed as **Low**, reflecting the negative evidence for prehistoric activity in the archaeological record.

Roman

The study area is located approximately 1.3km SE of the Roman colonia of Glevum (Gloucester), which was founded in about AD 96-98 on the site of an earlier legionary fortress established in about AD 60 (Wacher,1995, 150-151). Located approximately 370m NE of the study area is the line of a probable Roman road which followed the course of present-day Barton Street; however, only limited evidence has been found for Roman suburban settlement activity extending to the S of Barton Street.

Evidence of Roman activity recorded in the locality of the study area largely consists of stray finds of coins. A ‘Constantinopolis’ coin of Constantine I was found in the rear garden of a property on Tredworth Road in 1946 (HER Record No. 1107; NGR SO 8384 1700) while an ‘As’ of the reign of either Claudius or Nero was found in the garden of a property at No.68 Marlborough Road in 1974 (HER Record No. 1109; NGR SO 8434 1693).

The results of watching briefs undertaken in the immediate locality of the study area have largely produced negative results, however, monitoring of road construction works at Painswick Road in 1975 revealed a sequence of three buried road surfaces, possibly of Roman origin, although this remains unproven (HER Record No. 1211; NGR SO 8457 1690). A ditch of uncertain date, containing a single sherd of Roman pottery, was also identified during an evaluation and watching brief undertaken at 227 Barton Street (HER Record No. 2170; NGR SO 8407 1776).

Evidence of burial activity of Roman date has previously been identified to the NW and W of the study area. In 1847, an inhumation of Roman date within a lead coffin was found in Barton Street (HER Record No. 20; SO 8354 1799) while another lead coffined inhumation was discovered in Park End Road in 1860 (HER Record No. 387; SO 833 176). At St Paul’s Road, excavations for the construction of a house there in 1891 revealed an inhumation within a stone coffin, adjacent to which was an unenclosed burial lying parallel to the coffin (HER Record No. 496; Phillimore, 1894-95, 184). It has been assumed that these inhumations represent isolated groupings probably associated with nearby farmsteads or villa sites rather than forming part of an extensive extra-mural cemetery extending along

the line of Barton Street to the SE of the colonia (Heard & Pugh, 2009, 14). However the possibility that these burials could represent evidence of an extra-mural burial ground of Roman date cannot be altogether discounted.

Conclusion: The potential for revealing evidence of Roman activity in the immediate locality of the study area has been assessed as **Low to Moderate**. This assessment is based on the mostly negative results of watching briefs undertaken in the vicinity of the site; however it does take into account the evidence for burial activity previously identified at St Paul's Road and find-spots of Roman coins recorded in the immediate locality of the site.

Medieval

Little evidence of pre-Conquest occupation has been identified in the vicinity of the study area. Although the status of Gloucester as an important regional urban centre had been renewed by its re-foundation as a burh by Ethelfleda of Mercia in the early 10th century, there is little evidence of suburban development until after the Norman Conquest (Herbert, 1988). A stray find of a Saxon scramasax knife found in Chequers Road in 1938 represents the only definite evidence of pre-Conquest occupation in the immediate locality of the study area (HER Record No. 1108; NGR SO 8454 1715).

In parochial terms, the study area lay within the extensive parish of St Mary de Lode, an ancient land division which appears to have represented the demesne estate of Gloucester Abbey. Little evidence of settlement activity in the vicinity of the site has been recorded prior to the early 13th century, when a small settlement appears to have been established along Barton Street, so named because it bordered the two 'bartons' or demesne estates of Gloucester Abbey and the Crown (Herbert, 1988). Further to the E along Barton Street, where the road forked at the point where it crossed the Sud Brook, a hermitage or chapel dedicated to St Mary had been established by the late medieval period.

Limited archaeological evidence of medieval occupation has been recorded along the section of Barton Street to the N of the study area, represented by a pit containing 11th-13th century pottery identified during an evaluation and watching brief undertaken at No. 227 Barton Street in 2013 (HER Record No. 2170; NGR SO 8407 1776).

Later medieval and early post-medieval documentary sources indicate that the study area then lay within the field of Upper Tredworth, a large open field of medieval origin extending along the N side of the Tredworth Road, its N boundary marked by Barton Street. The corresponding open field to the S of the Tredworth Road was known as Lower Tredworth. The open field was divided into individual strips or larger fields of varying sizes, held by numerous individual landholders. Some of the land within Upper Tredworth also belonged to several different parishes, including St Mary de Lode, Matson and Upton St Leonards.

Conclusion: The potential for encountering evidence of medieval settlement and associated field systems has been assessed as **Low to Moderate**. Little archaeological or documentary evidence for medieval occupation has been identified in the vicinity of the site, which appears to have remained predominantly rural, sparsely settled and undeveloped until the mid-19th century. There is limited potential for revealing buried evidence of cultivation features or field boundaries of medieval date in the vicinity of the site, although it is likely that these will have been obscured or entirely truncated by late 19th/20th century industrial development.

Post-Medieval (c.1600 to present)

Cartographic evidence shows that the study area remained predominantly rural in character until the mid-late 19th century and this may well account for the lack of archaeological features of early post-medieval date recorded in the Gloucester City Council HER in the immediate locality of the site. A post-medieval boundary ditch and tree throw were recorded during an evaluation on the site of the former Hatherley Road Day Care Centre in 2012 (HER Record No. 2012; NGR SO 8415 1729).

By the late 1870s, suburban housing development gradually extending southwards from Barton Street had encroached upon the N and W boundaries of the site, which lay within the northern part of a large enclosed arable field bordered to the N by the Sud Brook and to the S by Tredworth Road. In 1885, the site was occupied by the Hatherley Step Works, a business founded by a local solicitor and inventor, Charles Allan Moore, for the production of his patented step ladders.

By the late 1890s/early 1900s, the Hatherley Works was exporting 'Lattisteps' not only within the United Kingdom but also abroad, and also specialised into the manufacture of folding tables, cycle stands, trestles and even poultry house. The rapid growth of the business is evidenced by substantial alterations to the works buildings made during the late 19th-early 20th century. Further alterations to the Hatherley Works were made during WWII when part of the site was requisitioned for use as an aircraft manufactory operated by the Gloster Aircraft Company.

Conclusion: The potential for revealing evidence of early post-medieval archaeological remains in the immediate vicinity of the site has been assessed as **Low to Moderate**. Documentary and cartographic sources reveal that the study area lay within an enclosed arable field forming part of the open field of Upper Tredworth which remained essentially undeveloped until the mid-late 19th century. There is **High** potential for encountering buried remains and standing buildings associated with the Hatherley Step Works, a substantial manufacturing works specialising in the production of step ladders and furniture established in 1885 and which expanded rapidly during the 1890s/early 1900s.

5. Site Specific Analysis (including Map Regression)

c.1750 – 1850

The study area is not particularly well covered by historic maps and documentary sources prior to the late 18th century. This may be partly due to the location of the site within the extensive extra mural suburb of Barton Street (or Barton St Mary), a sparsely occupied largely agricultural hamlet extending to the SE of the City of Gloucester. The site lies outside the area covered by Hall and Quinnell's 1780 map of the borough of Gloucester.

The earliest detailed map to show the study area in appreciable detail is the map accompanying the inclosure award for Gloucester and its extra mural suburbs, dated 1799 (GA Ref. Q/RI 70) (Figure 2).

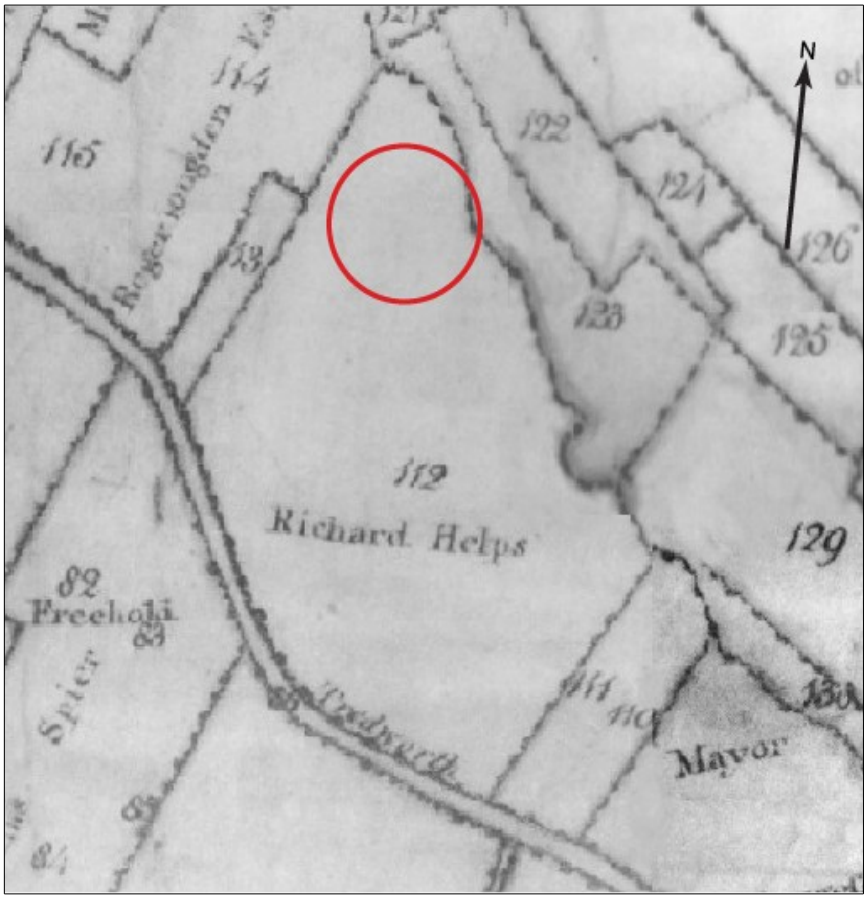

Fig. 2: Extract from the 1799 inclosure map for Gloucester (Reproduced by courtesy of Gloucestershire Archives)

The inclosure map shows that almost all of the study area lay within a large irregularly shaped field bordered to the S by Tredworth Road and to the N by the Sud Brook. The field, marked as Plot No. 112 on the map, is listed in the accompanying inclosure award as 'allotment in Upper Tredworth', forming a component of what was originally an extensive open field of medieval origin lying to the N of the Tredworth road. The fields to the S of Tredworth Road lay within another large open field known as Lower Tredworth. Plot No. 112 is listed in the inclosure award as belonging to Richard Helps, a

woolstapler of Gloucester, and is recorded as comprising 13 acres 3 rods and 36 perches. No indication is given as to land use but it was probably under arable cultivation, as were most of the neighbouring fields. The northernmost portion of the site, extending just to the N of the Sud Brook, is shown on the 1799 inclosure map as lying within a narrow sinuous field marked on the inclosure map as Plot No. 123 and listed in the accompanying award as 'The Green', forming part of the extensive estate belonging to Viscount Sydney, the principal landowner in Tredworth and Matson.

Richard Helps died in 1804 and by his will (proved on 5th August of that year) he left his properties in Barton Street and various other lands in Upper and Lower Tredworth fields to his wife and several children (GA Ref. D3117/4004). Listed among these lands is 'an enclosed piece of arable containing 15 acres 1 rood in Tredworth, Barton St Mary, brook on north; corporation land on east, road on south, land of Roger Longden on west', which was bequeathed to his youngest son, also named Richard. The boundary description almost certainly corresponds to Plot No. 112 and the narrow strips immediately to the E (marked as Plot Nos. 110 and 111, also in the possession of Richard Helps senior). Richard Helps the younger was still in possession of this same enclosed arable field in Upper Tredworth in 1820, as attested by a deed dated 1 March of that year (D3117/1039), by which Thomas Helps released Richard from obligation to pay an annual sum for this estate and various other properties, including a mansion house in Barton Street, as charged by his father's will.

An Ordnance Survey drawing of Gloucester and its suburbs surveyed by Lt. Robert Dawson R.N. in 1811 (Figure 3) provides a somewhat simplified depiction of the field enclosure pattern in the vicinity of the site. The study area is shown as lying within the northern part of a large irregularly shaped field bordered to the N by the Sud Brook and to the S by Tredworth Road. Limited evidence of settlement activity is depicted along Barton Street to the N of the Sud Brook, including the Chequers Inn and a group of cottages located further to the NW on the S side of Barton Street.

Fig. 3: Fig. 3: Extract from an OS surveyors drawing of Gloucester and district dated 1811(Reproduced by courtesy of Gloucestershire Archives)

There is a marked lack of detailed historical maps of the study area covering the middle decades of the 19th century. The study area is not covered by the 1840 tithe map for the parish of St Mary de Lode, which chiefly covers the hamlet of Tuffley; this was presumably due to the fact that the tithes had largely been commuted in this specific area as a result of the inclosure award of 1799.

Causton's detailed map of the borough of Gloucester, surveyed in 1843, unfortunately only covers part of the Barton Street suburb to the N of the Sud Brook (Figure 4). A slightly enlarged version of the map, which appears to have been drawn up to show lands belonging to James Helps Esq (son of Richard Helps senior), shows lands to the SW and SE of Barton Street but unfortunately does not extend its coverage to include lands to the S of the Sud Brook. Causton's map shows limited housing development extending southwards along both sides of Barton Street, however the character of the Barton Street suburb was still predominantly rural at that time.

Fig. 4: Extract from an enlarged version of Causton's Map of Gloucester (1843) showing the estates of Thomas Helps in the Barton Street suburb of Gloucester(Reproduced by courtesy of Gloucestershire Archives)

c.1850-1940

During the mid-late 19th century, the character of the study area changed significantly, with the arrival of the railways and the emergence of Gloucester as an important junction station for major routes from London to South Wales and from the Midlands to South West England. The Bristol to Gloucester railway was constructed in 1844, and in 1845 the line connecting Gloucester to the Great Western Railway mainline at Swindon via Stroud and Standish was completed. The line of the Gloucester to Swindon railway bisected the eastern part of the large field at Upper Tredworth marked as Plot 112 on the 1799 inclosure map.

Fig. 5: Extract from Cadle's Map of Gloucester (1877)(Reproduced by courtesy of Gloucestershire Archives)

Cadle's map of Gloucester dated 1877 (Figure 5) shows that considerable suburban housing development had taken place in the vicinity of the study area, with the laying out of residential streets immediately to the N of the Sud Brook (Adelaide Street, Melbourne Street and Sydney Street) and encroaching upon the western boundary of the site (Paul Street, Ducie Street and Moreton Street). In spite of the gradual encroachment of residential development, the study area is still shown as undeveloped, lying within the NW corner of a large enclosed field, extending E to the railway and to the S as far as Tredworth Road.

The OS 1st edition 25 inch map of 1884 (Figure 6) shows that the study area still remained undeveloped land. However, since 1877 further house building activity had taken place along the S side

of Melbourne Street and another street had been laid out further to the S of Melbourne Street, immediately N of the Sud Brook (Matson Street, later Matson Place).

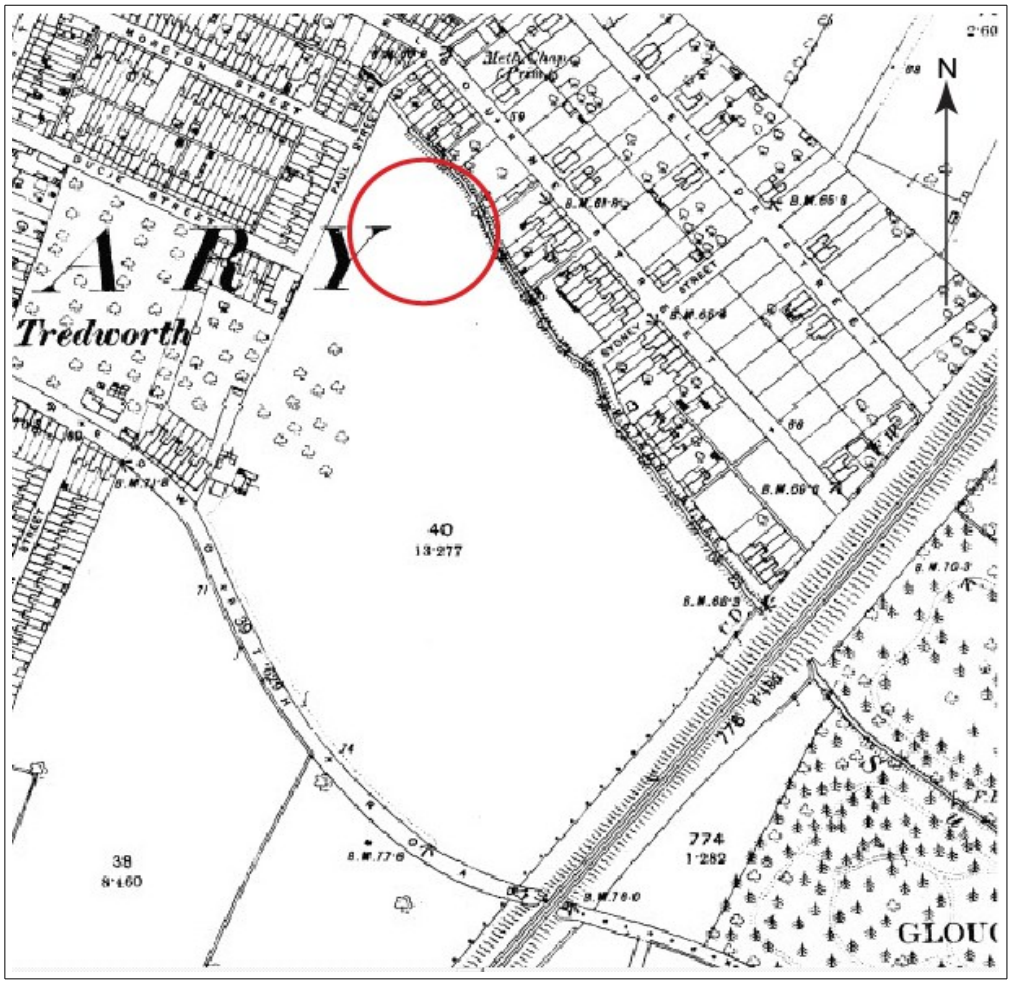

Fig. 6: Extract from the OS 1st edition 25 inch map of 1884(Reproduced by courtesy of Gloucestershire Archives)

Shortly after the OS 1st edition map was published, the pattern of land use in the immediate locality of the study area changed dramatically with the establishment of the Hatherley Step Works, founded in 1885 by Charles Allan Jones of Hatherley Court, for the manufacture of his patent step ladders, known as 'Lattisteps'. The business was originally started on a small scale without the use of mechanical equipment; the workshop being housed in a small building measuring 40 feet by 25 feet. In 1888, Allan Jones obtained a 14-year lease of property to the S of Melbourne Street and established his 'Lattistep' manufacturing works there, which rapidly expanded in popularity.

In 1892, the site occupied by C. Allen Jones's manufacturing premises was put up for sale. An advertisement in the Gloucester Citizen dated 30 August 1892 refers to 'the valuable trade premises and extensive yards situate in Melbourne Street known as 'The Hatherley Works', comprising a boiler house fitted with an 8 hp Cornish boiler, horizontal engine and stack, workshops and stores of three floors, machine shop, office, grinding house etc. Also the brick built freehold dwelling house known as No. 116 Melbourne Street...together with the wood erection of two floors (now used as a stable and loft) in the rear and adjoining'. The premises were purchased by a Mr J.H. Jones (presumably a relation of

C. Allan Jones) for £750. From the description of the premises contained in the advertisement, it is clear that substantial building activity on the site had taken place between 1888 and 1892. A record of a planning application granted by Gloucester City Council for extensions to the Hatherley Works in April 1890 relates to the construction of the mill and adjoining workshops (GA Ref. GBR/L20/2/1890/46).

By the late 1890s/early 1900s, the Hatherley Works was exporting 'Lattisteps' not only within the United Kingdom but also abroad, and also specialised into the manufacture of folding tables, cycle stands, trestles and even poultry house. The rapid growth of the business is reflected in substantial alterations to the works buildings made during the late 19th-early 20th century.

In 1897, a planning application was granted for the construction of new buildings on the works site, consisting of a range of new stores constructed adjacent to what is marked on the application plan as the 'Old Mill', located on the S side of Melbourne Road and immediately N of the Sud Brook. It appears that the mill had been relocated to the S of the Sud Brook, with a bridge providing access the brook from the new mill to the old mill which had been converted into a storeroom (GA. GBR/L20/2/1897/55).

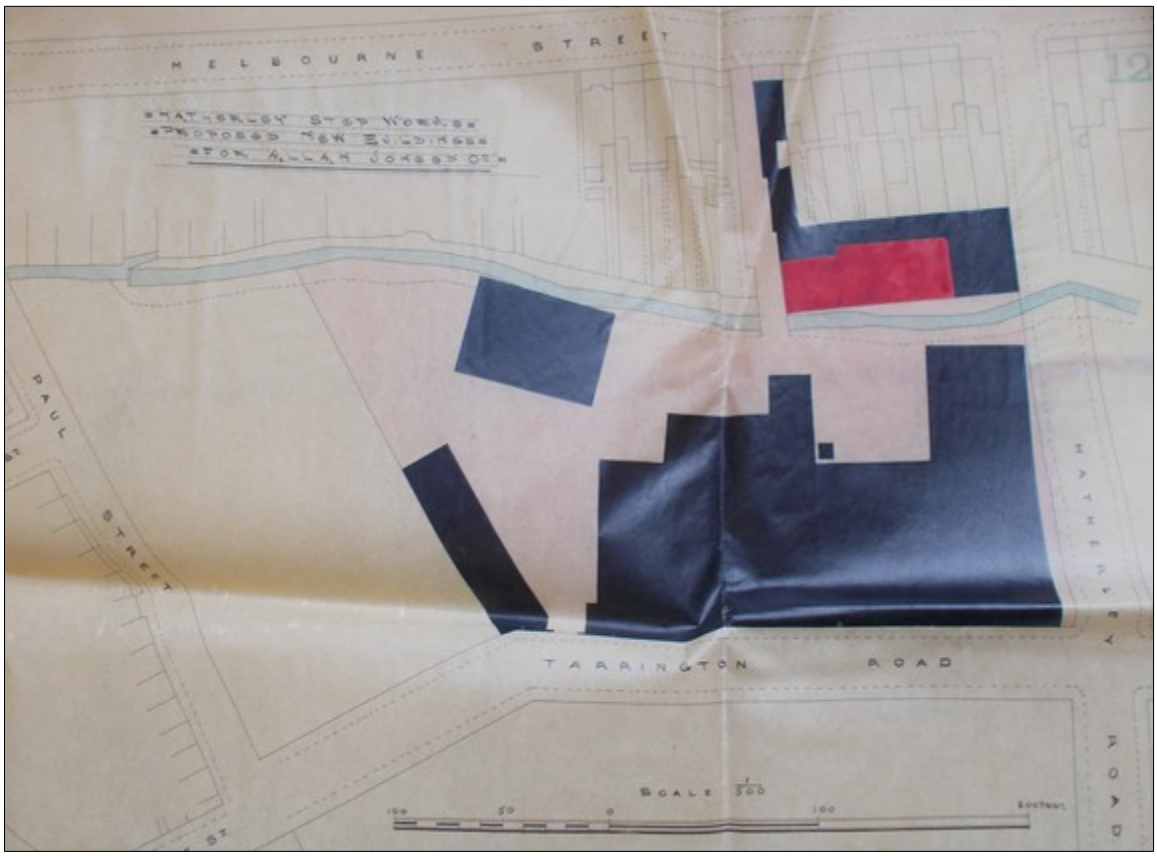

Fig. 7: Extract from a planning application dated 1897 relating to proposed new buildings at the Hatherley Works (denoted in red)(Reproduced by courtesy of Gloucestershire Archives)

Detailed information as to the layout of the Hatherley Works premises in the early decades of the 20th century is supplied by the OS 2nd edition and 3rd edition 25 inch map of 1902 and 1923 respectively (Figure 8) and plans attached to two building applications relating to additional buildings constructed in 1907 and 1909, supplemented by a brief description of the works buildings dated 1904 and a more

detailed valuation of the Hatherley Works compiled in July 1918 (Industrial Gloucester in Gloucester Journal 1904) just prior to the sale of the company to two aircraft manufacturers named G.H. Humphrey and R.H. Bleakley (see Appendix B for full text of 1904 and 1918 descriptions of the site).

Fig. 8: Extract from the OS 2nd edition 25 inch map of 1902(Reproduced by courtesy of Gloucestershire Archives)

The 1918 valuation (GA Ref. D2299/1589) describes how the premises are accessed via a covered approach to along the side of No. 116 Melbourne Street, leading to a storeroom and a valve house, which were located within the rectangular building on the N side of the Sud Brook shown on the plan attached to the 1897 application. On the first floor of the same building were two offices, a store, warehouse and packing room, while on the second floor was another office and storeroom.

A covered way provided access from the office/warehouse building to the N of the Sud Brook to the main mill premises, comprising a boiler house fitted with two Lancashire boilers 22 feet in length and an engine house. This building is described in the 1904 account of the Hatherley Works as measuring 170ft long by 90ft wide. In front of the mill, according to the 1918 valuation, was a capstan, covered by a wooden shed which may be identified with a small square structure visible on plans dated 1897 and 1907. Adjacent to the main building was a machine shop and joiners shop, a ‘traverser shed’ for shunting trucks, a foreman’s office and a new, smaller mill building. Located to the W of this complex, the 1918 description refers to five timber drying sheds, four of which were located in a group towards the W end of the site. Two of these four sheds appear to have been reconstructed, based on the evidence of a planning application dated 1907 (GA Ref. GBR/L20/2/1907/35). Located between the main mill building and the group of four sheds at the W end of the site was a detached timber shed referred to as a ‘Z’ shed with a corrugated iron roof.

Located separately from the main mill building, adjacent to the Sud Brook, was an ironmonger’s store which may be identified with a large rectangular building to the NW of the main mill building that is shown on the plan attached to the 1907 planning application. This building had a blacksmith’s forge at

ground floor level with a varnishing shop above and a polishing shop on the second floor. Another, slightly smaller oblong range, also used as a storeroom, was constructed at the W end of this building in 1909 (GA Ref. GBR/L20/2/1909/30). The main mill complex was linked to all of the surrounding buildings by what is described in the 1904 account as 'a*n elaborate and unique tramway system by which the product is carried on trucks through every department from the timber yard to all floors of the warehouse without lifts*'. At the hub of the tramway system was the capstan, which drew the tramways up to the mill floors. All elements of the tramway system had been designed and built on site. The 1904 account also notes that the site had its own power generation and was fitted with a 'Grinnel' sprinkler system.

Fig. 9: Planning application map for the construction of new timber drying sheds at the Hatherley Works (1907)(Reproduced by courtesy of Gloucestershire Archives)

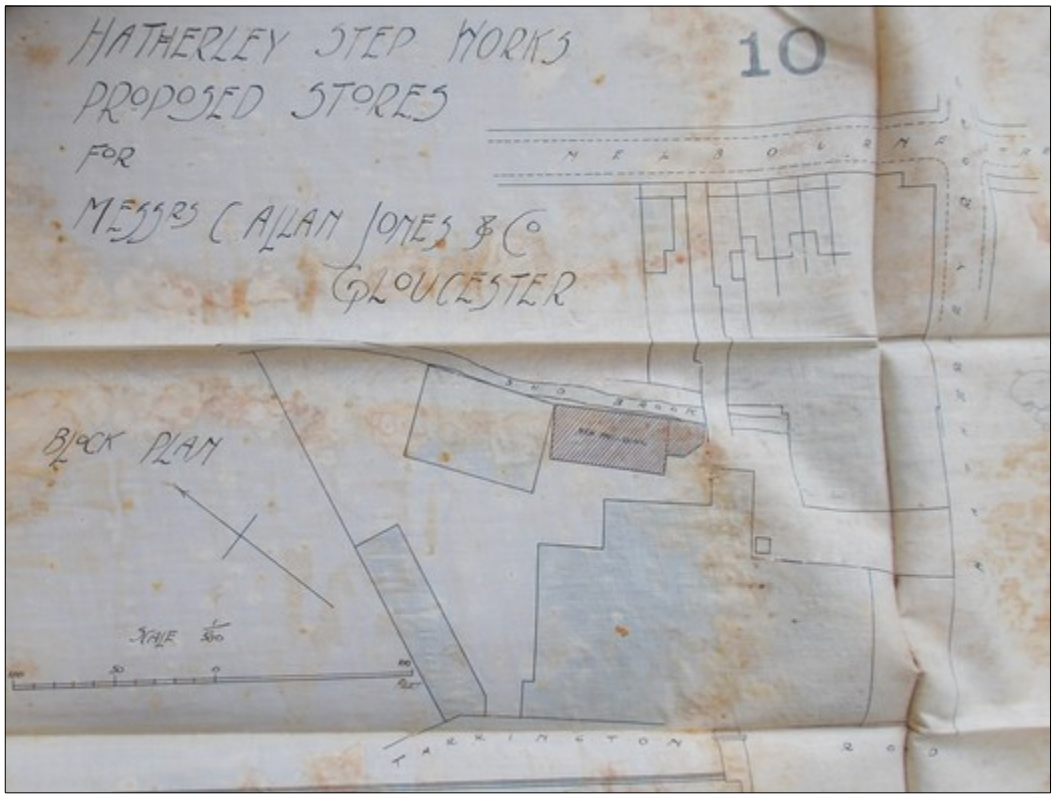

Fig. 10: Planning application map for the construction of a new store house at the Hatherley Works (1909) (Reproduced by courtesy of Gloucestershire Archives)

The purchase of the Hatherley Works by Humphrey and Bleakley appears to have resulted in further diversification into the manufacture of aircraft and hangars; however the core business remained focused on the production of step ladders and foldaway furniture, in particular easels, folding chairs and bedsteads (a patent was obtained for the manufacture of folding beds in 1925). The OS 3rd edition map of 1923 shows that the main mill building and adjoining workshops and offices had remained largely unaltered; however the storehouse range attached to the E end of the ironmongers store had been demolished and the four timber sheds at the W end of the site also appear to have been taken down.

By 1936, as shown on the OS 4th edition 25 inch map of that date, the timber sheds at the W end of the site appear to have been reconstructed and the tramway system connecting the main mill building with the other structures on the site appears to have been reinstated (or at least the mapping is detailed enough to record it again).

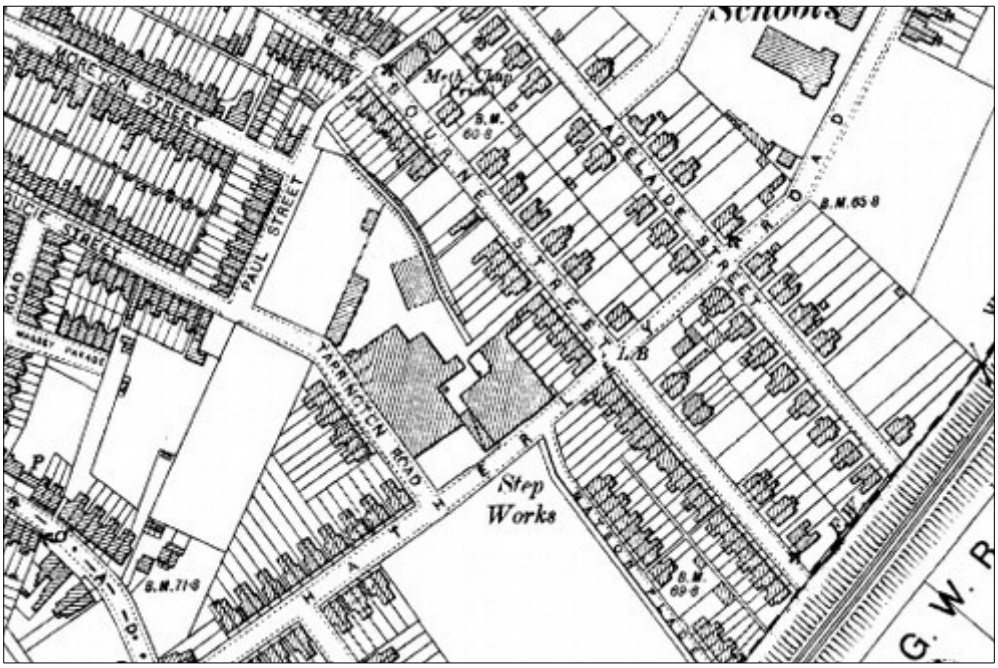

Fig. 11: Extract from the OS 3rd edition 25 inch map of 1923
(Reproduced by courtesy of Gloucestershire Archives)

Fig. 12: Extract from the OS 4th edition 25 inch map of 1936
(Reproduced by courtesy of Gloucestershire Archives)

c.1940 to present

With the onset of WWII, significant changes to the use of the Hatherley Works buildings took place. Part of the premises was requisitioned for use used as an Auxiliary Fire Station by no later than 1942.

Further alterations to the layout of the Hatherley Works buildings took place during the latter years of WWII. In August 1942, a substantial portion of the Hatherley Works was requisitioned by the Ministry of Aircraft Production and the premises were taken over by the Gloster Aircraft Company, who retained use of the works buildings until 1945. During this period, extensive internal alterations and new building works took place, which are recorded in a lengthy schedule of repairs submitted by the original proprietors for the restoration of the works buildings to their previous state in 1947 (amounting to the sum of £1878).

In addition to various repairs within the works buildings (including repair to paintwork and fittings and the removal of all electric lighting installed during the period when the buildings were used as an aircraft manufactory, the schedule makes reference to the demolition of three brick and reinforced concrete air raid shelters, at a cost of £450. The precise location of the air raid shelters is unclear (the schedule states that the shelters were located in the yard between buildings 13 and 20 but no accompanying plan has survived); however it appears likely that they were situated in the yard to the NW of the main works building. In connection with this, it is worth noting that a RAF vertical photograph of study area dated 23 March 1946 (RAF/106G/UK/1293 Lib. No. 241 Frame No, 674) shows a row of three small rectangular structures in the NW corner of the site, bordering the Sud Brook to the N and abutting the four large timber sheds at the W end of the site.

Fig. 13: Extract from the OS provisional edition 25 inch map of 1956 (Reproduced by courtesy of Gloucestershire Archives)

Following the Second World War, the Hatherley Works appear to have become a subsidiary of the Gloucester Railway Carriage and Wagon Company Ltd (later Wingets Ltd), presumably producing fittings and furnishings for railway carriages. However, step ladders and cabinets were still being manufactured at the Hatherley Works site until as late as the 1950s, based on the evidence of local newspaper advertisements.

The evidence of aerial photographs of the site dated 1950 and 1951 (RAF 58/447 Lib No. 3326 Frame No. 5524; RAF/58/625; Lib No. 3326; Frame No. 5057) indicates that the layout of the works buildings had changed relatively little since before WWII, the principal mill building and the five timber sheds occupying the W half of the site are still shown as intact, while the rectangular storeroom and workshop abutting the Sud Brook also appears to have survived. Alterations to have occurred to the works buildings by the late 1950s, as shown on an OS map of 1956 (Figure 13) and an aerial photograph taken in 1959 (F. 21 58/RAF/2956 Frame No. 0063) the narrow shed range located between the main mill building and the four timber sheds appears to have been demolished and replaced by a double range of sheds, while the ironmonger's store on the N side of the site had been extended to the SE.

On 20th May 1966, Wingets sold the Hatherley Works to Slumberland Ltd for the sum of £45000. An OS 1:10000 map of the area dated 1971 shows that the storeroom and workshop building and the four large timber sheds at the W end of the site had been demolished and replaced by two long building ranges extending along the N edge of the site adjoining the Sud Brook. The premises have more recently been occupied by Norvilles, a local manufacturer of optical lenses. The principal surviving buildings of late 19th- early 20th century Step Works comprise the main mill building located within the E half of the site, although these have been subject to extensive alteration in the mid-late 20th century.

In 2012 an arson attack on structures within the main mill building led to extensive damage and the demolition of part of this structure.

6. Site Visit

Two site visits were made to the proposed development on the 9th of September and the 3rd of October 2014. The visit suggests many of the surviving buildings on site date to the 20th century, although a small number of late 19th structures appear to have survived, some heavily altered by later 20th century use.

Plate 1: Southern elevation of northwest range of buildings. View - N.

The buildings on the site were in a generally poor condition and were in many cases lacking roofs, were lacking in repair and the eastern range of buildings had recently been demolished. The yardage space in between the buildings was covered for the most part in a concrete surface. On the north side of the site this yardage was heavily overgrown. It is likely, given that this yardage is at the probable height of the original ground level and would overlie a bedding material, that its construction may have removed most of the ephemeral evidence for earlier activity within these areas. This would probably include any rail/ tramway tracks marked on the 2nd and 4th edition OS maps, and may also have impacted on any earlier foundations in these areas. The buildings comprising the eastern range of structures on the site had been subjected to arson in 2012, which had resulted in one of the buildings along the eastern frontage being demolished. This demolition appeared to be quite extensive, with evidence that the foundations for the building had also been grubbed out (Plate 2).

The yardage space in between the buildings was covered, for the most part, in a concrete hard standing surface. On the north side of the site this yardage was heavily overgrown. It is likely, given that this yardage is at the probable height of the original ground level and would overlie a bedding material, that its construction may have removed most of the ephemeral evidence for earlier activity within areas

where it has been inserted. This would probably include any rail/ tramway tracks marked on the 2nd and 4th edition OS maps, and may also have impacted on any earlier foundations in these areas (Plates 1 and 2).

Plate 2: Demolished section of eastern range of buildings. View - SE

Plate 3: Southern elevations of southern range of buildings. View - SE

The Sud brook runs through a fairly well preserved brick lined channel across the northern half of the site, overlain in several places by surviving 19th and early 20th century buildings (Plate 4).

Plate 4: Leat carrying the Sud brook through the site. View - SE

Part of the outer wall of now demolished late 19th/ early 20th century structures recorded on early OS mapping in the northeast corner of the site were visible along the rear garden walls of terracing lying north of the site (Plate 5).

Plate 5: Surviving outer walls of late 19th/early 20th century structure in northeast quadrant of site. View - E

Access to the buildings themselves during either site visit could not be gained due to the structures being sealed off to prevent vandalism, as well as health and safety aspects regarding sharps and unsound structures. Assessing the survival of interior fixtures and fittings where visible through windows and in consultation with the land owner seems to suggest the buildings have been completely stripped of any original fixtures and fittings (Plate 6).

Plate 6: Interior of building in southern range. View - SE

Cellarage is known to exist under the southern range of buildings and appears to extend partially underneath Tarrington Road, possibly indicating it differs in date from the existing buildings. Again, access could not be gained to this area during the site visit.

7. Conclusions

This archaeological desk based assessment of the site of the former Norvilles factory site, Tarrington Road, Tredworth, Gloucester, has reached the following conclusions regarding the nature and significance of the archaeological resource in the vicinity of the site:

- **Prehistoric**: Little evidence of prehistoric activity has been identified in the vicinity of the study area and consequently the likelihood of encountering remains of prehistoric date within the site has been assessed as **Low**.
- **Roman**: Limited evidence for Roman occupation has been identified in the locality of the study area, chiefly consisting of find-spots of Roman coins. Evidence of Roman settlement activity has been identified along Barton Street, a routeway of probable Roman origin (about 370m N of the site), however no definite evidence for a roadside suburb has been identified, neither has it been proven to have extended to the S of Barton Street. Limited evidence of burial activity of Roman date has been identified on the W and NW periphery of the study area, represented by several inhumations of Roman date (some in stone and lead coffins) found in the vicinity of Barton Street and St Paul's Road/Park End Street; however no clear evidence has been found to positively indicate the presence of a more extensive extra-mural cemetery in this area. The potential for encountering evidence of funerary and settlement activity of Roman date has therefore been assessed as **Low to Moderate**.
- **Medieval**: The potential for encountering evidence of medieval settlement and associated field systems has been assessed as **Low to Moderate**. Throughout the medieval period, the study area lay within the extensive open field of Upper Tredworth, one of several open fields to the S of Barton Street. Little archaeological or documentary evidence for medieval occupation has been identified in the vicinity of the site, which appears to have remained predominantly rural, sparsely settled and undeveloped until the mid-19th century. There is limited potential for revealing buried evidence of cultivation features or field boundaries of medieval date in the vicinity of the site.
- **Post-Medieval**: The potential for revealing evidence of early post-medieval archaeological remains in the immediate vicinity of the site has been assessed as **Low to Moderate**. Documentary and cartographic sources reveal that the study area lay within an enclosed arable field forming part of the open field of Upper Tredworth which remained essentially undeveloped until the mid-late 19th century. There is **High** potential for encountering standing buildings and buried remains associated with the Hatherley Step Works, a substantial manufacturing works specialising in the production of step ladders and furniture established in 1885 and which expanded rapidly during the 1890s/early 1900s. During the Second World War, part of the works buildings were requisitioned for use as an aircraft factory and alterations were made (including the construction of three air raid shelters which were demolished in 1947). The buried remains from this early period of the works are likely, however, to have been heavily impacted in areas where later 20th century buildings have been constructed over earlier buildings and areas and by the construction of concrete yardage has been inserted.

- **Summary**: The archaeological record for this area is sparsely documented and consequently any conclusions drawn must be regarded as tentative; however the potential for revealing evidence of prehistoric remains has been assessed as **Low**, while the likelihood of encountering evidence of Roman and medieval occupation has been assessed as **Low to Moderate**. There is **High** potential of encountering evidence of buildings (both in terms of extant structures and buried remains) associated with the former Hatherley Step Works, established in 1885. It is possible that buried evidence of air raid shelters constructed in 1942 when the works was requisitioned for use as an aircraft factory might also be encountered within the site, although these were recorded as being demolished in 1947. Early remains from this period on the site are likely to have been impacted by later 20th century alterations to the site layout and the construction of concrete yardage.

8. Copyright

9. Acknowledgements

The author gratefully acknowledges the assistance provided by Andrew Armstrong, City Archaeologist, the Gloucester City Council Historic Environment Record and the staff of Gloucestershire Archives.

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11. Cartography & Aerial Photography

Cartography

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Causton's Map of Gloucester (1843)

Cadle's Map of Gloucester (1877)

OS 1st edition 1:500 scale map (1884)

OS 1st edition 25 inch map (1884)

OS 1st edition 6 inch map (1891)

OS 2nd edition 25 inch map (1902)

OS 2nd edition 6 inch map (1903)

OS 3rd edition 25 inch map (1923)

OS 3rd edition 6 inch map (1923)

OS 4th edition 25 inch map (1936)

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Sortie No.SO 8417 /21; Film/Frame No. AFL 61359/ EAW001649 (12 July1946)

Appendix A: Selected Gazetteer of Archaeological Sites in the vicinity of the study area (centred on NGR SO 839 171)

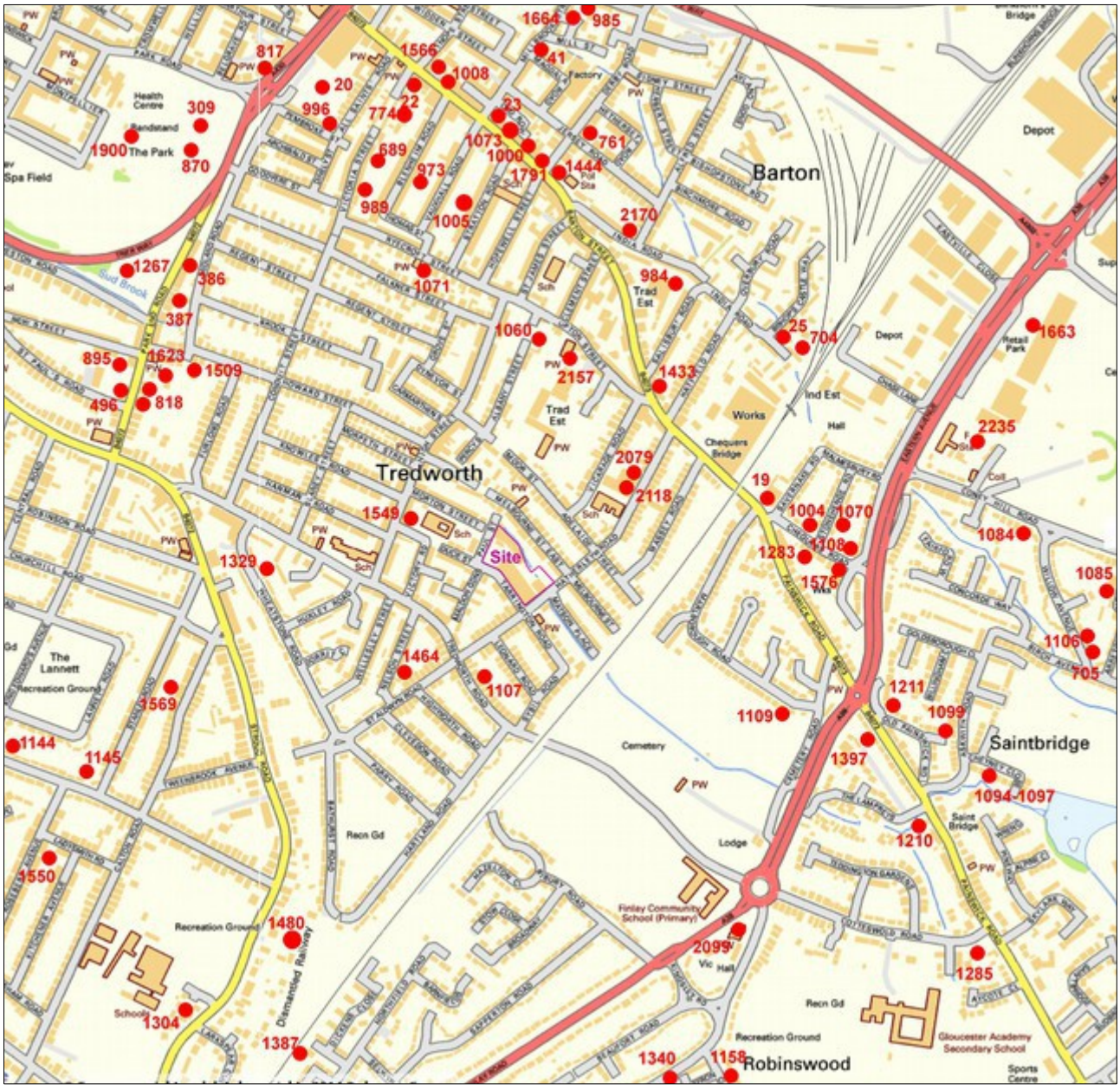

Fig. 14: HER Site Locations

Gazetteer of Monuments and Events

HER No.	Description	NGR
19	386 Barton Street: Findspot of Roman coin	SO 8432 1727
20	Barton Street/Park Road: (inhumation of Roman date in lead coffin found in 1847)	SO 8354 1799
23	151-153 Barton Street (finds of Roman pottery including Jar, beaker, tegula, RPG stamped tegula)	SO 8385 1800
25	India Road: Site of Brown's Mill on the River Twyver (Medieval)	SO 8440 1756
41	Millbrook Road (Site of Morin's mill – mentioned 1224)	SO 8401 1808
309	The Park (Terracotta mask of a satyr – possibly Roman, found in 1875)	SO 833 178
386	7 Park End Road (coin of Constantine I found in 1937)	SO 8337 1768
387	Park End Road (inhumation of Roman date in lead coffin found in 1860 - 'containing bones and two bottles of large size)	SO 833 176
388	32 Park End Road Findspot (coin of Vespasian found in 1970)	SO 8324 1741
496	St Paul's Road (Painswick stone coffin containing skeleton adjacent to unenclosed burial found in 1891)	SO 832 174
689	49 Victoria Street: Watching Brief in 1979 (19th century soak-away – mortared oolite walls revealed)	SO 8370 1788
704	India Road: Site of Kennerden's Mill (Medieval)	SO 8439 1758
705	47 Highfield Road, Barnwood: Site of Fisher's Mill (Medieval)	SO 8491 1699
761	Derby Road / Jersey Road: Watching brief in 1997 (Results negative)	SO 8406 1791
817	59-61 Park Road Watching brief in 1985 (Short length of 'U' profile slot or ditch along east of property, 1st-2nd century pottery in fill)	SO 8342 1805
818	71 Park End Road Watching brief in 1985 (Brick built well and 19th century brick wall footings)	SO 8330 1750
870	Gloucester Road: Watching brief in 1988 (Medieval pit, containing bones and pottery, cutting natural)	SO 8330 1750
965	118a Millbrook Street: Watching brief in 1993 (Shallow undated pit – possibly Medieval, 19th century brick foundations)	SO 8417 1812
973	41 Vauxhall Road: Watching brief in 1993 (Results negative)	SO 8384 1781
984	24-36 India Road: Watching brief in 1994 (Post medieval pits and wells revealed)	SO 8417 1769
989	76 Victoria Street: Watching brief in 1994 (Post-medieval well)	SO 8365 1784
996	2a Pembroke Street: Watching brief in 1995 (Large undefined ditch (or gravel working) backfilled with 4th century demolition rubble etc.)	SO 8355 1793
1000	173 Barton Street: Watching brief in 1995 (Medieval ploughsoil horizon)	SO 8390 1796
1004	Chequers Road/Marlborough Road Watching Brief in 1998 (Results negative)	SO 8440 1722

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HER No.	Description	NGR
1005	24 Stratton Road: Watching brief in 1995 (Results negative)	SO 8389 1782
1008	136 Barton Street: Watching brief in 1995 (Successive 18th-19th century cambered surfaces)	SO 8376 1802
1060	Albany Street: Watching brief in 1997 (Results negative)	SO 8399 1753
1070	3 Chequers Road: Watching Brief in 1998 (Results negative)	SO 8445 1722
1071	23 Ryecroft Street: Watching Brief in 1998 (Results negative)	SO 8371 1775
1073	155 Barton Street: Watching brief in 1998 (Results negative)	SO 8386 1799
1084	Site of Wood's Mill, Barnwood (Medieval/17th century)	SO 8477 1724
1085	Coney Hill: Findspot (As of Nero)	SO 8491 1713
1094	Cheyney Close: Findspot (Barbarous radiate of Victorinus)	SO 8480 1680
1095	Cheyney Close: Findspot (Quinarius of Allectus (AD293-296)	SO 8480 1680
1096	Cheyney Close: 12 Roman coins (4th century AD) found in 1952	SO 8480 1680
1099	Medieval Hermitage or Chapel of St Mary, Old Painswick Road	SO 8472 1680
1107	Tredworth Road Findspot (Constantinopolis pierced with two holes for suspension, found in 1946)	SO 8384 1700
1108	Chequers Road: Findspot (Scramasax of Saxon/Medieval date found in 1938)	SO 8454 1715
1109	68 Marlborough Road: Findspot (Coin of Claudius found in 1974)	SO 8434 1693
1144	101 Linden Road: Findspot (Antoninianus of Victorinus (AD268-270))	SO 8296 1685
1147	129 Linden Road: Findspot (Antoninianius of of Postumus (AD259-267))	SO 8309 1679
1158	Robinswood Hill: Watching brief in 1974 (Evidence of Roman occupation (ditches) contemporary with Kingsholm and Iron Age pottery)	SO 8412 1592
1210	The Lampreys: Watching brief in 1975 (Undated feature, possible palaeochannel)	SO 8462 1663
1211	Painswick Road Watching brief in 1975 (sequence of three buried road surfaces, possibly of Roman origin although this remains unproven)	SO 8457 1690
1283	22 Painswick Road: Watching Brief in 1993 (Victorian well found)	SO 8440 1720
1285	64 Cotteswold Road: Watching Brief in 1993 (Results negative)	SO 8472 1640
1287	2a Blenheim Road: Watching brief in 1993 (Results negative)	SO 8380 1795
1329	1-5 Godwin Court: Watching brief in 1995 (remains of modern railway track)	SO 8343 1711
1340	63 Reservoir Road Matson: Watching Brief in 1995 (Footings of modern army barracks)	SO 8418 1615
1387	Morelands Grove: Watching Brief in 1997 (Results negative)	SO 8348 1630
1397	Dickens Close: Watching Brief in 1997 (Results negative)	SO 8367 1631

ALIDBA14152 – Former Norvilles Factory, Tarrington Road, Tredworth, Gloucester

HER No.	Description	NGR
1433	300 Barton Street: Watching Brief in 1999 (Results negative)	SO 8415 1754
1444	195 Barton Street: Watching Brief in 2000 (Results negative)	SO 8394 1791
1464	Nelson Street Watching Brief in 2000 (Results negative)	SO 8373 1691
1480	279-281 Stroud Road: Watching Brief in 2000 (remains of modern railway track)	SO 8355 1645
1509	Farm Street: Watching Brief in 2004 (Results negative)	SO 8333 1749
1549	167 High Street: Evaluation in 2002 (Results negative)	SO 8376 1718
1550	17 The Oval: Watching Brief in 2002 (Results negative)	SO 8301 1667
1566	1 Sinope Street: Watching brief in 2002 (Results negative)	SO 8378 1804
1569	47 Stanley Road: Watching Brief in 2002 (Results negative)	SO 8331 1691
1576	20 Chequers Road: Watching Brief in 2002 (Results negative)	SO 8452 1713
1588	180a Barton Street: Watching brief in 2003 (18th century forge / workshop and sand quarry)	SO 8393 1790
1623	Park End Road: Desk Based Assessment (2009)	SO 8326 1748
1663	Eastern Avenue: Evaluation in 1992 (Results negative)	SO 8489 1755
1664	65 Millbrook Street: Watching Brief in 1999 (Results negative)	SO 8413 1817
1791	176 Barton Street: Watching brief in 2002 (Possible sunken road alignment parallel to Barton Street)	SO 8390 1792
1900	Gloucester Park (19th century bandstand)	SO 8326 1793
1973	Land at Barton Street: Desk Based Assessment (2011)	SO 8437 1741
1993	Land at Barton Street: Desk Based Assessment (2011)	SO 8386 1802
2009	St Aldates Church Desk Based Assessment (2012)	SO 8433 1644
2079	Former Hatherley Road Day Centre:Desk Based Assessment (2012)	SO 8414 1729
2118	Former Hatherley Road Day Centre: Evaluation in 2012 (post medieval ditch and tree throw)	SO 8415 1729
2119	Land off Barton Street: Watching brief in 2012 (Results negative)	SO 8435 1741
2150	India House Barton Street (building recording in 2012)	SO 8404 1776
2157	St James's Church Barton: Built Heritage assessment (2010)	SO 8405 1752
2170	227 Barton Street Evaluation and watching brief in 2013 (Ditch containing Roman pottery and pits containing pottery of 11th-13th century date)	SO 8407 1776
2235	Evaluation of Former Fire Station Site Barnwood (Results negative)	SO 8475 1737

Appendix B: Historical Descriptions of the Hatherley Works

Extract from 'Industrial Gloucestershire' (Gloucester Journal, 1904)

In 1885 Mr Charles Allan Jones, the founder and present sole proprietor of the Hatherley Step Works, began the manufacture of his patent step ladders, which have since become so widely known throughout Great Britain and the colonies under the word 'Lattisteps'. The industry was begun on a very small scale, with a nominal capital, and without mechanical equipment, in a building forty feet by twenty-five feet.

Today the works, which are noticeable by reason of their excellent arrangement and construction, as well as their size, cover 2½ acres of ground, while the wood-working machinery is of the most complete character. One department alone, the mill, is 170ft long by 90ft wide, and others are scarcely inferior. As the business grew, other originalities were added, including various type of folding tables, cycle stands, trestles, poultry houses etc., although the 'Lattisteps' remain the leading feature of the works, and 15000 of them are always kept in stock, a figure which gives some idea of the enormous number manufactured and sold.

It should be added that Mr Jones is now not only the largest manufacturer of step ladders in the world, but that he was the first at least in Great Britain, to make the manufacture of this one article – registered trade mark 'Alhathlat' – the basis of a separate industry.

In several respects the Hatherley Step Works may be fairly taken as a type of our best industries. This is particularly true as to the attention given to promoting the comfort and efficiency of the work people. All of the departments are light, clean and roomy and are steam heated, the operatives working under the best conditions attainable. It is a pleasure to state that in the history of the industry there has never been a labour dispute and what is even more remarkable, no operative has ever been suspended for want of work. In all of the departments labour is highly specialized, each man confining himself to that operation for which training or natural aptitude has best fitted him.

The works are conveniently placed, having entrances in three streets. They are provided throughout with a most unique and original tram system, by which the product is carried on trucks through every department from the timber yards to all floors of the warehouse without lifts. All the trucks, points, crossings, turntables etc are specially designed and manufactured on the premises, the rule being that all the materials in the process of manufacture shall remain on wheels until finally deposited in the warehouse.

All departments are lighted by electricity generated on the premises. The Grinnell sprinkler system is installed, and in the smallest detail, even in the office methods, the industry has been developed along the most progressive lines, nothing being left undone which could promote economy or despatch. Mr Jones personally supervises the works, while Mr R. D. Wyatt General Manager, attends to the commercial interests.

In addition to the large ware rooms at the works, store depots are maintained in London, Liverpool, Leeds and Glasgow, and an agency has been established at Durban, Natal, with Mr W. Percy Williams as representative.

Valuation of the Hatherley Works belonging to Messrs Allan Jones & Co. Ltd dated 3rd July 1918 undertaken by Bruton Knowles & Co. (Gloucestershire Archives Ref. D2299/1589)

(Note – There appears to have been an additional inventory and map accompanying this valuation but it was not found among the bundle of correspondence including this valuation held at Gloucestershire Archives)

In accordance with your instructions we have made an inspection and valuation of the Hatherley Works and other freehold properties in the City of Gloucester belonging to Messrs Allan Jones & Co. Limited. The properties are freehold and comprise:

1. The Hatherley Works together with the dwelling house No. 116, Melbourne Street
2. Land lying between the GWR and Hatherley Road, about one acre in extent, and on a portion of which has been erected the Ice Works
3. Two freehold dwellings known as 36 and 38 Sybil Road with garden land attached thereto.
4. A dwelling house known as 28 Tarrington Road and the dwelling house known as 121 Tredworth Road, together with outbuildings and land adjoining the said dwelling houses.
5. The semi-detached dwelling house known as 119 Tredworth Road with outbuildings and garden.

The following are the detailed particulars:

No. 1: The dwelling house 116 Melbourne Street, contains two sitting rooms, pantry, kitchen, back-kitchen, scullery 3 bed rooms, bathroom and attic. Adjoining the dwelling house is a messroom now used as a coal store. Access to the Works is through a covered approach enclosed by double doors. The works comprise on the ground floor, a Store, the dimensions of which are 28ft 6in × 16ft; 60ft 3in × 11ft and 58ft × 33ft. A miscellaneous store, 28ft × 18ft 6in, in which is a safe, and one end of which is fitted with bins. The Valve house, enclosed by wood partition is included in the above dimensions of the store.

On the first floor, with pay-box at foot of stairs leading thereto, is an Office 24ft 6 in × 16ft in which are two ledger desks, a second office, store, warehouse and packing room. The total floor space is 8748 feet, not including the general office. On the second floor are stores of similar capacity, and an office fitted up with pitch pine and heated by radiators, and a W.C.

A goods lift connects the ground floor with the floors above. Connected with the fore-described warehouses and offices by a covered way – which is used as a goods dispatching depot – and having a travelling gantry and double-doors giving access to Hatherley Road – are the Mill and premises, which comprise a boiler-house fitted with two Lancashire Boilers by Danks, each 23 feet long; an engine house with a Tangye horizontal engine with cylinder 14in × 30in; an electric light engine by Tangye 9in × 18in. In front of the Mill is the Capstan covered with a wooden shed 24ft × 14ft; Machine shop 120ft × 60ft, joiners' shop adjoining 120ft × 27ft, traverser shed for shunting trucks, 88ft × 50ft, foreman's office and womens' cloakroom, and a new mill 90ft × 50ft.

Near to the last mentioned block of buildings is a joiners' shop 108ft × 23ft. In a separate building near to the Sudbrook is an ironmongers' store 60ft × 30ft, beneath which is a soft-water tank extending the

whole length of the building, 60ft × 15ft. The store is fitted throughout with bins and shelves. In the corner of the store is a soft-water pump and a grinding machine driven by electricity and also a blacksmith's forge with one fire. The first floor is a varnishing shop, 30ft × 60ft; on the second floor is a polishing shop of similar dimensions. Overhead tramways connect the Mill with the warehouse and the varnishing shop. There are five timber sheds. A detached one known as 'Z', the remaining four are near and adjoining each other. The 'Z' shed is span-roofed, timber built with seven latticed principals, covered with corrugated iron; side-sheeted with inch-boarding with large weather boarded apron over each gable end; size of shed, 70ft × 50ft and 15ft to wall plate. The four sheds are similar in construction to the 'Z' shed but in one row and only one side is sheeted down. The roofs of three are covered with corrugated iron, the remaining shed with boards and felt. There is a weather boarded apron projecting 6ft at each end. Each shed is 70ft × 40ft with an average height of 16ft to the wall plate. In the shop near the 'Z' shed is a rack-saw bench driven by electricity. In all the before-mentioned buildings tramways are laid, all gravitating to one centre, when the capstan rope draws them up to the mill floors. All the buildings, with the exception of the timber sheds, are fitted with automatic sprinklers, connected with the City water supply, and there is a water tower, the cistern of which is filled from the brook by an electric pump, the base of the cistern being 20 feet above the level of the highest sprinkler. The total area of this portion of the property is about 9980 square yards.

No. 2 is the piece of building land coloured brown on the plan, containing about an acre and bounded on the North side by the Sudbrook stream and with a frontage on the East to the GWR, and with frontages to Tarrington and Hatherley Roads. On the North-eastern side and adjoining the Sudbrook, a portion of the land has been let to the Ice Works on lease for 21 years from 25th March 1904 at the yearly rent of £25, but the Lessee has the right at any time during the lease to purchase the site at £250. If however the Lessee lets the lease run out, he may remove the buildings on restoring the site to its original condition. The land on the South of the Ice Works is let at allotments and has access by a four-foot way into the remaining portion of the property, which is a pasture field. The said pasture field together with a piece of garden ground is let to Mr Artus at £3 4s 0d; the allotment land being let at 12s.

No. 3 comprises two dwelling houses known as 36 and 38 Sybil Road, each house containing two sitting rooms, kitchen, three bedrooms and bathroom, together with a coal house and W.C. in garden. They are in the occupation of K.L. Cameron and Hector Willis at rents amounting to £39 13s 0d, tenants paying rates. There is a good garden abutting on the GWR embankment. This portion is coloured pink on the plan.

Nos. 2 & 3 from their extent and situation must be regarded as very valuable sites for the extension of the Works and as they abut on the GW Railway would facilitate negotiations with the GW Railway Company for the construction of a siding.

No. 4: A semi-detached dwelling house known as 28 Tarrington Road, in the occupation of Mr W.J. Townsend, containing two sitting rooms, larder, kitchen, back kitchen, a large store (formerly used as a slaughter house) and four bathrooms, and the outbuildings near thereto comprising a long cellar with loft over; stable for two; and coach house with loft above; and also a detached dwelling house known as 121 Tredworth Road, in the occupation of Mr David Francis, containing sitting room, kitchen, small office, pantry, three bedrooms, boxroom and W.C. The outbuildings comprise a barn (formerly used as a slaughter house) stable adjoining and loose-box, all of which are brick and tiled; and also a lean-to timber and tiled shed adjoining the barn. Adjoining and lying between these two dwelling houses is a large extent of garden, with important building frontages, to Ducie Street and Tarrington and Tredworth Roads. The total area of this portion is about 9050 square yards, and the total rents payable by Mr Townsend and Mr Francis – each occupying a portion of the garden ground- amount to £55. The land

was purchased as it was regarded as a most desirable acquisition as a saw yard for conversion of English timber, and as giving easy supply to the works on the opposite side of the road.

No. 5: No. 119, Tredworth Road, a semi-detached dwelling house in the occupation of Mr. R.H. Wiggins, containing two sitting rooms, kitchen, back kitchen, and three bedrooms, and with long garden to the rear, let at £30 3s 0d a year. This was purchased as the garden in the rear would be of considerable assistance in developing the land in the occupation of Townsend for manufacturing purposes.

The Hatherley Works have been most substantially erected and are exceptionally well designed and so constructed as to ensure economy of labour in all directions. The floors of the various buildings are laid with tramways. All possible precautions have been taken to guard against fire and its prompt extinction should one arise. Great foresight, in our opinion, has been shown in the acquisition of desirable properties close to the Works, admitting of the extension of the latter and thus facilitating the development of the Company's operations. Practical proof of additional premises being required for the further extension of the Company's operations is shown by the steady increase of the profits since the formation of the company in 1908, up to the year 1917. We understand these figures have been communicated to you. So greatly had the trade developed that the Company felt that a time had arrived for the construction of the new Mill.

The areas of the properties are as follows:

No. 1 – 9980 square yards

Nos. 2 & 3 – 7260 square yards

Nos. 4 & 5 – 9830 square yards

Total – 27070 square yards

A Schedule of the Machinery, an inventory of the Office Furniture and a tracing of the properties accompany this report.

We estimate the value of the whole property as a going concern and inclusive of Machinery, Plant and Office Furniture, at the sum of £30166.

ALL ECOLOGY
Environmental Consultancy

[redacted]

Web: www.allecology.co.uk

Old Norville Site, Tarrington Rd, Gloucester GL1 4PE.

Ecological Appraisal

October 2014

Notice to readers:

The results of the survey and assessment work undertaken by All Ecology are representative at the time of surveying.

Every endeavour has been made to identify the presence of protected species on site, where this falls within the agreed scope of works.

The flora and fauna detailed within this report are those noted during the field survey and from anecdotal evidence. It should not be viewed as a complete list of flora and fauna species that may frequent or exist on site at other times of the year.

Up to date standard methodologies have been used, which are accepted by Natural England and other statutory conservation bodies. No responsibility will be accepted where these methodologies fail to identify all species on-site.

All Ecology cannot take responsibility where Government, national bodies or industry subsequently modify standards.

All Ecology cannot accept responsibility for data collected from third parties.

Reference to sections or particular paragraphs of this document taken out of context may lead to misrepresentation.

Non-technical Summary

In October 2014 All Ecology was commissioned to undertake an Ecological Appraisal of a site known as the Old Norville Site, Tarrington Rd, Gloucester GL1 4PE.

The site is a derelict industrial site close to the centre of Gloucester comprising large industrial buildings in various states of repair, surrounded by areas of hard standing as well as areas of colonising scrub. A small stream is present along the northeast edge of the site.

The site is the subject of a planning application to permit the demolition of all buildings on site and general site clearance followed by the construction of a new housing development.

The site is considered to be of low ecological value in terms of the habitats present. There is potential for protected species to occur including foraging bats and nesting birds.

A nesting bird survey would be required if demolition works, or scrub and tree clearance were to take place during the nesting season from March to August.

Recommendations are made for the protection of the watercourse on site as well as suggestions for possible ecological enhancement of the site as part of the proposed development.

Contents

1.0 Introduction

Background

1.1 All Ecology was commissioned to undertake an Ecological Appraisal of a site known as the Old Norville Site, Tarrington Rd, Gloucester, GL1 4PE. The site is a derelict industrial site close to the centre of Gloucester comprising large industrial buildings in various states of repair, surrounded by areas of hard standing as well as areas of colonising scrub. A small stream is also present along the northeast edge of the site. The site is bordered by terraced residential housing to the northeast with roads on all other aspects. The surrounding area is predominately urban although a railway line and open cemetery are present 150 m to the east.

1.2 The site is the subject of a planning application to permit the demolition of all buildings on site and general site clearance followed by the construction of a new housing development.

1.3 The aim of the survey was to identify features of ecological interest, undertake a basic search of habitats present for evidence of use, or potential use, by protected species, and to identify any other possible ecological constraints to the development. Given the nature of the proposed works it was necessary to carry out a detailed internal and external inspection survey of the buildings for bat roost potential as part of the assessment.

Site Location

2.0 Methodology

Desk Study

2.1 In order to compile background information on the site and immediate surroundings Gloucestershire Centre for Environmental Records (GCER) was contacted.

2.2 Information requested was as follows:

- Statutory site designations on or within 1 km of the site
- Non-statutory site designations on or within 1 km of the site.
- Records of protected species within the 1 km of the site.
- Records of rare or notable species within the 1 km of the site.

2.3 Additionally, MAGIC (Multi-Agency Geographic Information for the Countryside, 2014) was used to establish the distance and direction of designated sites within the search area.

Habitat Survey

2.4 The site was visited on the 8th October 2014 and surveyed in accordance with the Joint Nature Conservation Committee (JNCC) Phase I Habitat Survey methodology (JNCC, 2010). This technique provides an inventory of the basic habitat types present and allows identification of areas of greater potential that might warrant further study.

2.5 The survey was carried out by James Godbeer BSc Hons MCIEEM, an ecologist with over 7 years experience working as a consultant. He has extensive experience of managing environmental contracts, and particular experience in surveying, assessment and mitigation for rare and protected species. He has considerable knowledge of the development and planning process including Ecological Impact Assessments, sustainable ecological design and he has completed ecology chapters of Environmental Statements. James holds protected species licences for bats (all species, all counties, Licence No. CLS01752), as well as Great Crested Newts (Licence No. CLS001752), Dormice (Licence No. 20131156) and Barn Owls (Licence No. 20123107).

Fauna

2.6 The habitats on site were searched for obvious signs of faunal activity, *e.g.* presence of badger setts, mammal tracks or herpetofauna under refugia. A detailed internal and external inspection survey for bat roost potential was also carried out on the buildings to assess the potential for roosting bats and whether there was any evidence of use by nesting birds.

2.7 All bat species resident in the UK have been recorded using buildings and built structures as roosts at some time during the year (Hundt, 2012). The building was inspected externally and internally following the methodology set out in the Bat Conservation Trust – Good Practice Guidelines (Hundt, 2012). Equipment used to aid the survey included low and high-powered torches, ladders, endoscope and binoculars.

2.8 In summary the buildings were searched externally and then internally for any evidence of use by bats and notes were made on the following:

- Location and number of any live bats.
- Location and number of any corpses or skeletons.
- Location and number of droppings.
- Notes on relative freshness, shape and size of droppings.
- Location and quantity of feeding remains.
- Location of clean, cobweb-free timbers, crevices and holes.
- Location of characteristic staining from urine and/or grease marks.
- Location of known and potential access points to the roost.
- Location of the characteristic smell of bats if no other evidence is recorded.

2.9 Notes were also made on the characteristics and features of the buildings as follows.

- Type, age and aspect.
- Wall construction, in particular the type of brick or stone used to build the walls and whether it has cavity walls or rubble- filled walls.
- Form of the roof, in particular the presence of gable ends, hipped roofs, etc. and the nature and condition of the roof covering.
- Presence of hanging tiles, weather boarding or other forms of cladding.
- Nature of the eaves, in particular if they are sealed by a soffit or boxed eave and the tightness of the fit to the exterior walls.
- Presence and condition of lead flashings.
- Gaps under eaves, around windows, under tiles, lead flashings etc.
- Presence and type of roof lining.
- Presence of roof insulation.
- Presence of water tanks in loft (note if covered or uncovered).
- Structure of the roof including the truss type, age and nature of timber work.
- Information or evidence of work having been undertaken that could affect use of the structure by bats.

Assessment

2.10 The surveyed buildings have been evaluated to assess which of the following categories they fall into, if any (Mitchell-Jones, 2004 & Hundt, 2012):

- **Transitional roost** (April-September/October) - On waking from hibernation or in the period prior to hibernation, bats search for roosts in which they stay for only a few days or on some occasions several weeks. These transitional roosts can be occupied by a few individuals or occasionally small groups. The transitional roosts

used prior to hibernation are generally cool and thus may allow bats to reduce their energy requirements before going into hibernation.

- **Maternity roost** (May-August) - Breeding females gather together around the beginning of May to form nursery colonies. During this period gestation begins with births typically occurring between June and July. The females and their young remain within the maternity roost until the young are weaned and independent (late July-August). These roosts tend to break up between August and September. Adult males are rarely found within these colonies. However, the adult males of long-eared bats, Daubenton's, Natterer's, and horseshoe bats can be found roosting within maternity colonies with their numbers increasing throughout the active season.
- **Satellite roost** (May-August) - Breeding females may have alternative roost sites in close proximity to the main nursery colony. These are referred to as 'satellite roosts'. The numbers of bats using these roosts can vary greatly, from a few individuals, to small groups.
- **Mating roost** (September-November) - All British bats are polygynous i.e. males mate with several females. Mating generally takes place from late summer and can continue through the winter. A number of different mating strategies are used by bats, though males of some species establish mating roosts, whereby they defend territory and display/call to females to mate.
- **Hibernation roost** (October-March) - Depending on the weather and food availability, bats tend to move to hibernation sites from October. Hibernation roosts can vary greatly in terms of the number of individuals and the diversity of species that occupy them. However, they tend to have a constant cool temperature and high humidity, which allows the bats to use less energy regulating their temperature. Bats will wake occasionally during hibernation to drink and feed.
- **Night roost** (March-November) - Bats may use roosts other than traditional day roosting sites to rest in during the night. These roosts vary in their conservation significance. Night roosts may be used by a single individual on occasion or they could be used regularly by the whole colony. Studies have shown that night roosts may be of particular importance to some species i.e. the Lesser Horseshoe, providing key resting places within core foraging areas.
- **Day roost** (March-November) - These roosts are used during the day to rest in. Males of most British species spend the summer roosting alone or in small groups with other males in such roosts. Bats may regularly use a number of day roosts, switching between them on a daily basis, though conversely they may occupy the same roosting site for several weeks.
- **Feeding roost** (May-November) - These roosts can be occupied by a single animal or a few individuals throughout the active season. They vary in their significance as they may be used by the whole colony or just a few individuals to feed, to shelter from the weather or to rest temporarily. Feeding roosts are often used by long-eared and horseshoe species.
- **Other considerations, Swarming sites** - Swarming takes place between August and November, whereby large numbers of bats from several species gather, generally around caves and mines. They are often dominated by the Myotis species and appear to be important mating sites with some bats travelling several kilometres

to reach these areas. A proportion of the bats that travel to these sites will remain to hibernate.

Valuation of Ecological Features

2.11 The valuation process used in this report follows the guidance on ecological evaluation and assessment from the Chartered Institute of Ecology and Environmental Management (CIEEM, 2006).

2.12 The value of areas of habitat and plant communities has been measured against published criteria where available. Biodiversity Action Plans (BAPs) have been searched to identify whether action has been taken to protect all areas of a particular habitat and to identify current factors causing loss and decline of particular habitats. The presence of injurious and legally controlled weeds has also been taken into account.

2.13 When assigning a level of value to a species, its distribution and status (including a consideration of trends based on available historic records) has been taken into account. Other factors influencing the value of a species are: legal protection, rarity and Species Action Plans (SAPs). Guidance, where it is available, for the identification of populations of sufficient size for them to be considered of national or international importance has also been taken into account.

3.0 Results

Desk Study

3.1 There are no statutory designated sites within 1 km of the site.

3.2 There is one non-statutory designated sites located within 1 km of the site. This is:

- Saintbridge Balancing Pond Local Nature Reserve (965 m W)

3.3 The citation for this designated site states that Saintbridge Pond is a rare oasis of water and wildlife hidden close to the heart of Gloucester. Ponds or small lakes of this size are scarce in the city of Gloucester. Located within a busy urban area, this site is heavily used by local people. With the open water, and its observable wildlife such as ducks and swans it holds considerable appeal.

3.4 The development site is directly connected to this pond via Sud Brook, which flows through part of the site through a brick channel before entering a subterranean culvert. However the site is located almost 1 km from the pond and is situated downstream. This being the case any impacts to this designated site as a result of the development would be negligible and no further consideration is given.

3.5 GCER provided the following records for protected and notable species within 1 km of the site boundary:

Mammals – Hedgehog, unspecified species of bat (field observation).

Birds – Red Kite, House Sparrow, Starling.

Amphibians – Common Frog, Smooth Newt, Palmate Newt.

Reptiles – Slow-worm.

Habitats

3.6 The following habitats or vegetation types were identified on the site during the course of the habitat survey:

- Buildings
- Hard standing
- Scattered scrub
- Poor semi-improved grassland
- Introduced shrub
- Running water
- Walls

Buildings

3.7 The site was dominated by former factory buildings in various states of repair. Detailed descriptions of the buildings are provided in sections 3.14 to 3.19.

Photograph 1: General site view.

Hard standing

3.8 Large expanses of tarmac and concrete hard standing were present across the site. They were largely devoid of vegetation although small gaps have been colonised by species such as Yorkshire-fog, Bristly Ox-tongue, Common Ragwort, Dandelion and Groundsel.

Photograph 2: View of largest area of hard standing.

Scattered Scrub

3.9 Areas of scattered scrub were present around the site. These were dominated by either Bramble or Butterfly-bush with ruderals such as Common Nettle, Broad-leaved Willowherb, Common Ragwort, Creeping Thistle and Broad-leaved Dock. Other species included Creeping Bent, Yorkshire-fog, Groundsel, Ribwort Plantain, Hedge Bindweed, Perennial Sow-thistle, False Oat-grass and rare individuals of Herb-Robert.

Photograph 3: View of largest area of scattered Butterfly-bush scrub.

Photograph 4: View of scattered Bramble scrub around the edges of some of the buildings.

Poor semi-improved grassland

3.10 Poor semi-improved grassland was present in small patches around the site generally between areas of scattered scrub. Cock's-foot, False Oat-grass or Yorkshire-fog dominated. White Clover was abundant and locally dominant and there was also frequent, White Dead-nettle, Cleavers and Ribwort Plantain. Occasional species included Red Fescue, Dandelion, Broad-leaved Dock, Creeping Bent, Ground–ivy, Yarrow, Red Hemp-nettle and Creeping Thistle (see Photograph 4).

Introduced shrub

3.11 A narrow border of neglected introduced shrub was present along the northwest boundary of the site. Species included hydrangea varieties, Butterfly-bush, Hawthorn, Pendulous Sedge, willowherb spp., Wood Avens and Holly. Trees of Cherry and Sycamore were also present.

Photograph 5: View of introduced shrub and trees along the northwest boundary.

Running water

3.12 A brick wall channel of running water was present in the east corner of the site. It was approximately 2.5 m wide and 0.5 m deep. There was no aquatic or marginal vegetation although some of the surrounding scattered scrub was overhanging into the water. The flow was from southeast to northwest where a weir was present before the water course went under a bridge and then ran along the northeast boundary of the site before entering into a subterranean culvert.

Photograph 6: Running water.

Walls

3.13 The boundaries of the site were formed by walls of the factory buildings and low brick walls with brick posts and iron railings.

Photograph 7: Perimeter walls and railings.

Fauna

Bats

3.14 There were two main buildings on site with two smaller lock ups and the remains of a former building that previously burnt down.

Building 1

3.15 Building 1 was a large factory building constructed with brick walls. The roof of the main part of the building and a smaller end section was no longer present and only the steel structure remains. A small section of the building still has a roof of gable end construction formed by steel trusses and covered with corrugated sheet metal. There were no separate roof voids; a basement was also present but no access was available. This part of the building was well lit through numerous window openings. Large accumulations of pigeon droppings were present and the potential for day roosting bats is negligible. A small number of side rooms were also present but these were well lit and also unsuitable for bats. There is potential for the roofed section and side rooms to be used as night roosts or feeding roosts but no evidence such as droppings or feeding remains was found.

Photograph 8: Main section of Building 1 with missing roof.

Photograph 9: Small roofed section of Building 1.

Photograph 10: End section of Building 1 with missing roof.

Photograph 11: One of the side rooms of Building 1.

Photograph 12: Exterior view of Building 1.

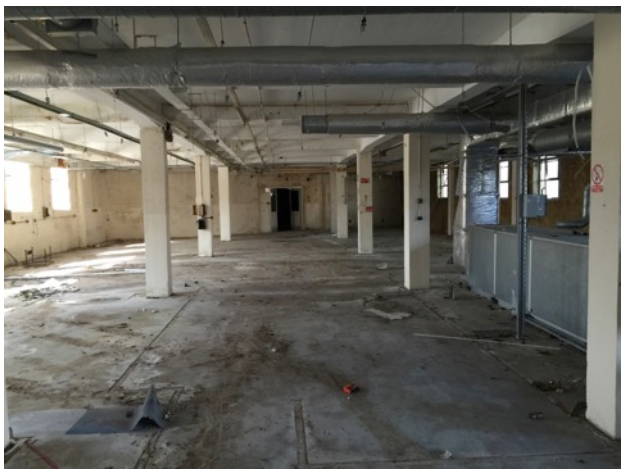
Building 2

3.16 Building 2 was a large three storey factory building constructed with brick walls. It was divided into three sections. The north section of the building formerly had a pitched roof of gable end

construction but the roof is now absent and only the gable walls and steelwork remain. The central section has a flat roof and the south section has a shallow arched roof covered with tiles; a central pitched skylight is also present. The eaves are sealed with fascia boards with guttering. The ground and first floor windows are covered with security mesh but the second floor windows are uncovered and the majority are smashed allowing easy access for bats into the interiors. However, there were no separate roof voids with the rooms below open all the way to the underside of the roof. The tiles on the tiled section were sat on sarking boards but no gaps in the tiles were noted that could allow bats into what would be a very minimal void between tiles and boards. The interior was well lit through out with the exceptions of a small number of side rooms and former lavatories. The majority of these were used by pigeons and no evidence of bats was discovered to indicate that these rooms are used by bats for either day or night roosting.

Photograph 13: Exterior view of Building 2.

Photograph 14: First floor interior of Building 2.



Photograph 15: Second floor interior of Building 2.

Photograph 16: One of the side rooms in Building 2.

Buildings 3 and 4

3.17 Two brick single storey flat roof lock ups were present next to Building 2. These were not accessible but had no potential entry points for bats, which are therefore likely to be absent from these buildings.

Photograph 17: View of lock up in front of Building 2.

Building 5

3.18 This building is no longer present as such and only the external brick walls remain. A small number of gaps and missing bricks in these walls appear to provide suitable roosting sites for crevice-dwelling species such as pipistrelles. However, a close inspection of these found that they did not extend far into the walls no evidence of bats was found.

Photograph 18: View of holes in the southeast wall of former Building 5.

3.19 Opportunities for hibernating bats are minimal. There are only a limited number of cavities cavities that could be use by species such as pipistrelles and although the basement below the former main building is likely to provide suitable conditions for hibernating bats, no means of entry was noted. There were no other accessible basements or other areas that would be well isolated from extreme temperatures in the winter months.

3.20 None of the trees appeared to have any suitable features such as rot holes or split limbs that could be used by roosting bats.

3.21 GCER provided a single field record of an unidentified species of bat within 1 km of the site. The heavily urbanised nature of the surroundings is likely to restrict any bats to small numbers of common species such as Common Pipistrelle. The site includes the buildings surrounded mainly by open areas of hard standing and small areas of scattered scrub; these are not optimal foraging habitats but nevertheless at least some bats are expected to forage on site.

Badgers

3.22 GCER did not provide any records of Badgers within 1 km of the site, which is generally unsuitable for this species. The site is completely surrounded by high walls and fencing that would not allow access for Badgers. In any case the habitats on site are unsuitable for the construction of setts and areas of scattered scrub and grassland which have colonised areas of compacted hardcore and hard standing are sub-optimal in terms of foraging habitat. A thorough search of the site and immediate surroundings did not reveal any evidence of Badgers such as hairs, dung pits, latrines, snuffle marks or setts, confirming they are absent from the site.

Water Voles and Otters

3.23 There are no records Otters or Water Voles within 1 km of the site. The water course is generally unsuitable for these species. Water Voles tend to prefer sites with wide swathes of riparian vegetation, both growing from the banks and from the water. This serves as both their food and shelter. Water Voles also prefer slow-flowing, relatively deep (over 1 m depth) water courses (Strachan & Moorhouse, 2006). The stream was relatively shallow on the day of the survey with no aquatic vegetation; conditions that Water Voles tend to avoid. The surrounding brick walls would prevent the construction of burrows and there were no areas in which to search for evidence of Water Voles. While this species has been recorded using habitats that appear to be unsuitable it is highly likely that they are absent from this site.

3.24 Although Otters have been recorded using rivers and streams of all sizes, the general situation and characteristics of the stream makes their presence unlikely and no evidence of Otters such as holts, hovers, spraints or footprints was discovered.

Other mammals

3.25 The site is in an urban setting with only limited vegetative habitats. The site is expected to support vermin and a small number of common small mammals but the potential for other protected species of mammals is regarded as negligible.

Birds

3.26 GCER provided records of Red Kite, House Sparrow and Starling within 1 km of the site. Woodpigeon and Carrion Crows were recorded on site during the survey as well a number of Feral Pigeons using parts of Building 1 and Building 2. A nest containing three chicks was recorded on a ledge above the main stairwell in Building 2. Other potential nesting sites were present within this building in locations such as the top of old heating ducts and various other ledges and alcoves.

3.27 Areas of scrub and trees around the site provide limited potential nesting habitats for urban bird species and the vegetative habitats in general are likely to provide only minimal foraging habitat. The surrounding area is expected to support a variety of urban bird species.

Photograph 19: View of pigeon nest containing three chicks.

Reptiles

3.28 There is a record of a Slow-worm from Tredworth Cemetery 300 m to the southeast of the site. The site is completely isolated in the surrounding landscape by inner city housing and roads. Areas of scattered scrub and piles of debris provide only limited suitable habitat for reptiles and these have only established relatively recently with no opportunities for reptiles to have colonised these. It has therefore been concluded that reptiles are likely to be absent from the site.

Amphibians

3.29 GCER provided records of Common Frog, Smooth Newt and Palmate Newt within 1 km of the site. The areas of scrub provide limited terrestrial habitat for amphibian species but there are no ponds on site. With regard to the specially protected Great Crested Newt, there are no ponds shown on maps of the area within 500 m of the site, the nearest being Saintbridge Balancing Pond located nearly 1 km to the east. It is therefore unlikely that this species would be present on site and no impacts to this species are predicted.

Invertebrates

3.30 GCER did not provide any records of protected or notable invertebrate species. Large portions of the site are buildings and hard standing, which are unlikely to support significant numbers of invertebrates with negligible potential to support rare invertebrates. The areas of scrub with tall ruderal vegetation have higher potential to support a range of invertebrate species and Butterfly–bush, which is present in abundance, is known to attract butterflies. However, overall the habitats on site are common habitat types and do not provide much potential for rare invertebrate species; it is mostly common species that are expected to be present.

4.0 Development Constraints and Recommendations

4.1 The site is the subject of a planning application to permit the demolition of all buildings on site and general site clearance followed by the construction of a new housing development. Possible ecological constraints and recommendations with regard to the potential development are discussed below as well as suggestions for the enhancement of the site.

Habitats

4.2 The is generally of low ecological value in terms of the habitats present and none are likely to qualify as UK BAP Priority Habitats (JNCC, 2014). The watercourse is considered to be the most important habitat on site although it was not particularly noteworthy. However, any changes to the stream could have adverse effects on the flora and fauna within, as well as have a detrimental effect on areas further downstream. The following suggestions are made for the protection of the stream during the construction phase of the project but it should be noted that it is likely that assurances and provision will need to be made to address the long-term potential impacts to this stream by providing sufficient measures to ensure that the hydrology of the site is not changed to the detriment of the stream and that potential pollutants from new residents (detergents, nutrient enrichment etc.) can be avoided.

4.3 During the construction phase of the project on no account should any chemicals, including vehicle fuels or lubricants be left on site at night where they might be accessed by accident or deliberately (e.g. vandals) resulting in spillage to the stream. Any contractors engaged in works on the site should have in place secure storage facilities and an agreed pollution prevention plan. Appropriate pollution control equipment should be available at the site to control spillages if they do occur. This equipment could include the installation of a surface run off drainage gully and a petrol interceptor to prevent spillages entering the stream as well emergency oil absorbent booms to contain and absorb hydrocarbon spills into the stream should this occur.

4.4 No importance is attached to the loss of the small areas of scattered scrub on site and overall the establishment of small residential gardens are expected to provide a small increase in the overall biodiversity value of the site.

4.5 There are a small number of mature trees on the boundary of the site but the majority are relatively young. None are considered to be over-mature or veteran trees and while none are considered to be of high ecological value, it is recommended that as many be retained within the landscape proposal as possible. Any new planting on site should aim to use native species of local provenance or those recognised for their value to wildlife.

Protected and Notable Species

Bats

4.6 The buildings are generally unsuitable for bats and do not provide any opportunities for day roosting bats beyond minor gaps and crevices; the building interiors are too well lit to be used by free hanging bats. Although the buildings could be used as night/feeding roosts, no evidence such as droppings or feeding remains was recorded and the types of bats that use buildings as night or feeding roosts, such as long-eared and horseshoe bats, are unlikely to be

present in the area. It has been concluded that roosting bats are likely to be absent and no further surveys are recommended.

Legal Compliance

4.7 The Wildlife and Countryside Act 1981 as amended by The CRoW Act 2000 and The Conservation of Habitats and Species Regulations 2010 makes it illegal to recklessly damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection, whether the bat is occupying the shelter at the time or not. The above can only be carried out under a European Protected Species (EPS) licence granted by Natural England. Based on the results of the present survey it has been concluded that roosting bats are likely to be absent from the site and an EPS licence will not be required to permit the development.

Care and Vigilance during Works

4.8 The contractor should be advised to adhere to the following procedures in the highly unlikely event bats are found during demolition works:

- If the roost is still in the structure and bats are not injured, stop work and contact a licensed ecologist. If help is not available, allow bats to fly out of harm's way.
- If material containing a roost has been removed, the roost is not exposed and the bats are not injured, temporarily seal and isolate the roost, stop work and seek advice from a licensed ecologist. If advice is not readily available, re-open it and allow bats to relocate of their own accord.
- If the roost has been exposed, and especially if bats have been injured, stop work, collect bats in a secure box or bag (using a glove) and contact a licensed ecologist.

4.9 None of the trees on site appeared to have features that could be used by roosting bats. If any trees require felling or surgery works then it is recommended that the following procedures be employed in the unlikely event that a bat or bats are discovered:

- If the roost is still on the tree and bats are not injured, seek advice from a licensed ecologist. If help is not available, allow bats to fly out of harm's way.
- If the timber is felled, the roost is not exposed and the bats are not injured, temporarily seal and isolate the roost and seek advice from a licensed ecologist. If advice is not readily available, position the roost off the ground, re-open it and allow bats to relocate of their own accord.
- If the roost has been exposed, and especially if bats have been injured, collect bats in a secure box or bag (using a glove) and contact a licensed ecologist.
- Note the date, locality, type of tree, situation in tree and bat species if known.

Provision for Bats

4.10 No impacts to roosting bats on site are predicted, as they are likely to absent. The site is likely to be frequented by foraging bats but the urban situation of the site probably limits this to small numbers of Common Pipistrelles. This species is particularly tolerant of increased light levels and while no specific restrictions on external lighting are recommended, as a general rule external lighting should be kept to a minimum in line with current best practice. There are no

linear features on site except the edges of the buildings and the watercourse is not a continuous feature; if possible this should remain unlit.

4.11 No further provision for bats is required in this instance but the proposed development provides an opportunity to enhance the site for bats by incorporating purpose made roost sites into the new buildings. The provision of open roof spaces with access for bats would not be worthwhile considering the location of the site. External features could be incorporated into the buildings or installed on completion to provide roosting sites for Common Pipistrelles, the most likely species to be present in the area. Special panels such as the Schwegler Bat Access Panel 1FE or the Schwegler Bat Roost 1FQ are some of the methods used to enhance a building's potential for use by bats.

Other mammals

4.12 The potential for other species of protected or notable mammal species to use the site is deemed to be low. No constraints are predicted as a result of the likely presence of common small mammals. As a precaution it is recommended that during the construction phase of the project any trenches and other excavations should be back-filled before nightfall or a ramp left to allow animals to easily exit.

Birds

4.13 The survey was carried out in October, which is generally regarded to be outside the nesting season. Nevertheless an active Feral Pigeon nest containing three chicks was recorded in Building 2 and potential nesting sites were present in the majority of the buildings as well as in small areas of scattered scrub.

4.14 Nesting birds are protected under The Wildlife and Countryside Act 1981 (and amendments), including Feral Pigeons whose nests can only be removed by an authorised person for reasons of health and safety and only when they are satisfied that non-lethal methods of resolving the problem such as proofing measures are ineffective or impractical. As a precaution to avoid delays to the demolition of the buildings, it is recommended that the building interiors are made bird proof by first ensuring that no live birds or active nests remain within, and then sealing entry points such as broken windows. It is recommended that any demolition works and scrub clearance be carried out outside of the bird-nesting season of March to August. Where this is not possible the buildings should be surveyed for nesting birds by a suitably qualified ecologist prior to works commencing. If they are found, then the nest and surrounding habitat must remain intact until the young have fledged. It should be noted that Feral Pigeons will breed all year if food supplies are plentiful.

4.15 In the wider context the site offers only limited opportunities for nesting birds, the loss of which is likely to be negligible with regard to local bird populations. Consideration could be given to the incorporation of new nesting sites for small birds into the new buildings. Special bricks or boxes are some of the methods used to create artificial nesting sites for species such as Starlings, which are already known to occur in the area and are a UK BAP Priority Species. These can be designed into the building to provide permanent nesting sites or can be installed upon completion. Colony nest boxes are suitable for House Sparrows, which are also known to occur in the area and are also a UK BAP Priority Species (JNCC, 2014a).

4.16 The landscape planting scheme should concentrate on species that are native to the area and ideally produce a range of seeds and berries at varying times of the year. Nectar rich plants could also be used encourage invertebrates on to the site, which in turn provide food for birds as well as other species such as bats.

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GROUND INVESTIGATION REPORT FOR THE FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER

PREPARED FOR MARKEY CONSTRUCTION

Report No. 3829

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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Report Production Record		
Report No	3829	
Site Name	The Former Norville Works, Tarrington Road, Tredworth, Gloucester	
Client	Markey Construction	
Report on	Ground Investigation	
Issue No. / Status	1	Final
Prepared by	[redacted]	
Approved by	[redacted]	
Date	12 February 2015	

Report Revision Record		
Issue No.	*Date*	*Revision Details*

CONTENTS

GROUND INVESTIGATION REPORT FOR FORMER NORVILLE WORKS, TARRINGTON ROAD, GLOUCESTER PREPARED FOR MARKEY CONSTRUCTION

1 INTRODUCTION

1.1 It is proposed to redevelop the above derelict factory site with new residential housing. A ground investigation was requested, the objectives of which were to confirm the ground profile, establish geotechnical conditions relevant to founding options, and undertake a quantitative contamination risk assessment. This supplements earlier preliminary works undertaken by others.

1.2 The geotechnical investigation has been carried out in general accordance with Eurocode 7 'Geotechnical Design', in particular BS EN 1997-1:2004 and 1997-2:2007 and BS EN ISO 14688-1:2002 and 14688-2:2004. The proposed development is considered to fall into the Geotechnical Category 2 classification, thus routine field and laboratory testing methods have been adopted. Reference has also been made to BS5930:1999 A2:2010 'Code of Practice for Site Investigation', and NHBC Standards Chapter 4.2 – 'Building Near Trees'.

1.3 The Geo-environmental assessment has been carried out in accordance with the Environment Agency (EA) and NHBC publication "Guidance for the Safe Development of Housing on Land Affected by Contamination" (2000), BS10175:2011 "Code of Practice for the Investigation of Potentially Contaminated Sites" and EA document CLR 11 "Model Procedures for the Management of Land Contamination".

1.4 This report has been prepared in line with verbal instruction received on 27 October 2014 from Ian Green of MG Property Consultants on behalf of Markey Construction. The agreed scope of works has been based upon a number of earlier proposals dating from May 2013.

2 DESK STUDY RESEARCHES

2.1 Centred on approximate National Grid Reference SO 84300 – 17750 the site lies in the Tredworth district of Gloucester, approximately 1km southeast of the city centre as shown on drawing 3829/1. As indicated on drawing 3829/2 it comprises a collection of derelict industrial buildings in various states of vandalism or decay, with extensive external hardstanding. The north-westerly flowing Sud Brook passes through the site, whilst existing residential development surrounds it on all sides.

2.3 The site has been subject to previous desk study research (and preliminary intrusive investigation) by others and whilst it is not intended to repeat that exercise within this report, pertinent features are summarised below:

- Geologically the site is underlain by river terrace deposits (the Cheltenham Sand & Gravel) over 'bedrock' of the Charmouth Mudstone Formation, both of which are classified as secondary aquifers; localised alluvium may also be present close to the brook; the site does not lie within a groundwater source protection zone and consistent with the urban setting there are no nearby abstractors; it is not within potential influencing distance of any open or closed landfills, and does not lie within a known radon-affected area
- The site was undeveloped fields until c.1885 when it was first developed with the Hatherley Step Works; as shown on drawing 3829/4 this gradually expanded over the years with several changes to building layout including a periodic internal tramway; the premises are known to have been converted to aircraft manufacture for the 'war effort' and may subsequently have been part of the Gloucester Railway Carriage & Wagon Works, before being taken over by Slumberland (1966) then finally by Norville (c.1988); several site buildings were the subject of a major post-closure fire
- On the above basis potential contamination risks were identified in respect of on-site tipped wastes, leaks from former above-ground fuel and chemical storage tanks, and PCB leakage from electrical sub-stations yet preliminary investigation and assessment actually revealed little in the way of ground contamination, although mildly impacted groundwater was locally recorded

3 PROPOSED DEVELOPMENT

3.1 Following demolition of existing derelict industrial buildings it is proposed to redevelop the site with some forty-five residential units, with the preliminary proposed layout presented as drawing 3829/3 indicating a variety of flats, semi-detached houses and bungalows. Private and communal gardens plus off-road parking are to be provided, with new access drives built off Tarrington Road and Paul Road, and a wide strip of communal open space is to be created along the course of the Sud Brook. Proposed finished ground/floor levels are as yet unknown.

4 PRELIMINARY RISK ASSESSMENT

4.1 The site and its immediate surroundings have been assessed in terms of historical and current land use together with the environmental, geological and hydrogeological setting. In view of the foregoing information including the results of previous work undertaken by others, the **principal contaminants of concern** include the following:

- Toxic and phytotoxic metals within made ground
- PAH compounds within ash-based made ground
- Asbestos fibres from former building roof-sheeting
- Hydrocarbons associated with former on-site workshop and fuel storage tanks
- Landfill gas emissions from deep made ground or natural alluvium
- Naturally elevated sulphates/sulphides within CMF bedrock

4.2 Based upon the proposed residential end use for the site, the **critical receptor** is identified as a female adult of age class 1-6 and our assessment has been progressed on this basis.

4.3 The resulting preliminary Conceptual Site Model is shown in Figure 1 below and illustrates how the presence of principal contaminants of concern, if proven, can be translated into **potential pollutant linkages** to future site users/residents and local environmental receptors such as groundwater. This is summarised in Table 1 and Figure 1 below, together with appropriate risk levels.

FIG 1: PRELIMINARY CONCEPTUAL SITE MODEL (NTS)

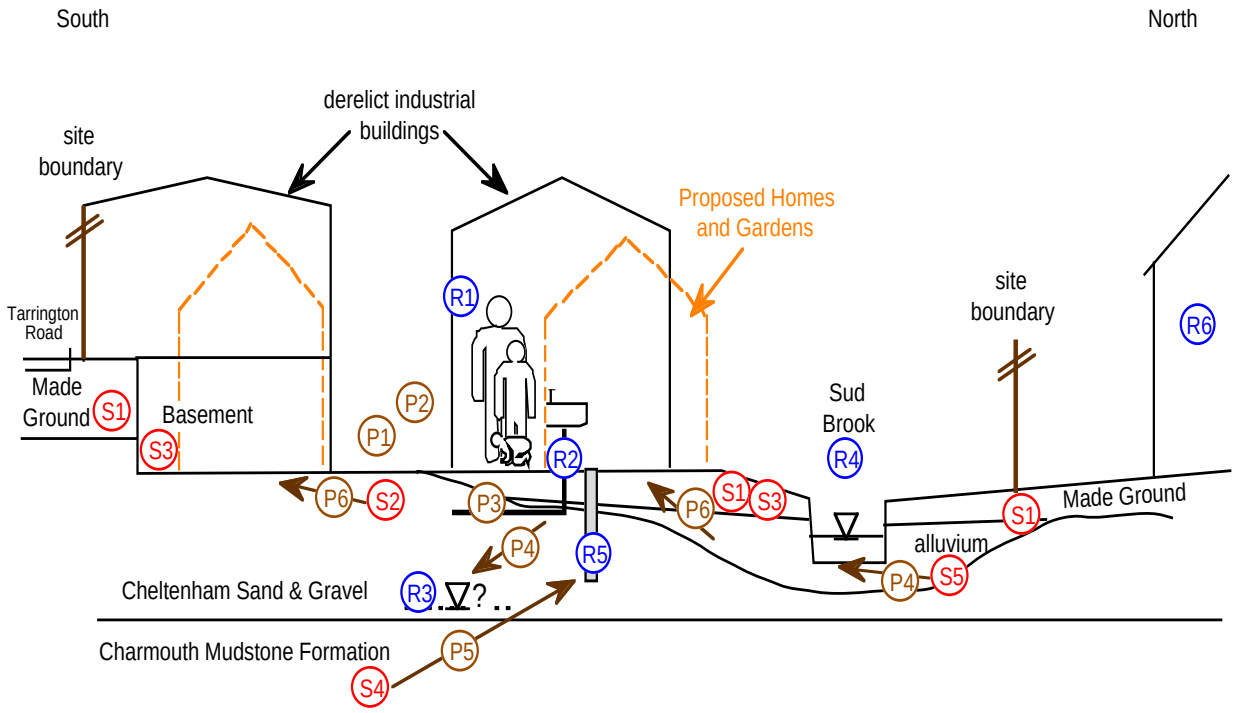


TABLE 1: SUMMARY OF PRELIMINARY POTENTIAL POLLUTANT LINKAGES

Potential Sources	Pathways	Receptors R1	R2	R3	R4	R5	R6	Comments	Preliminary Risk Assessment
ON-SITE									
S1	**P1**	X						Direct contact/ingestion/inhalation pathways viable in proposed private gardens	Moderate
	P2	X					X		
	P3		X					Ash-based made ground possible	Moderate
	P4			X	X			New supply pipework assumed	Moderate
	P5							Not in SPZ but water-course runs through site	Moderate
	P6								
	P7								
S2	**P1**	X						Direct contact/vapour inhalation pathways viable in proposed gardens	Moderate
	P2	X					X		
	P3		X					New supply pipework assumed	Moderate
	P4			X	X				
	P5								
	P6								
	P7								
S3	**P1**							Warehouses thought to have had ACM roof sheeting, but site virtually total hardcover	Low-moderate
	P2	X					X		
	P3								
	P4								
	P5								
	P6								
	P7								
S4	**P1**							CMF usually contains elevated sulphate/sulphide	Moderate
	P2								
	P3								
	P4								
	P5					X			
	P6								
	P7								
S5	**P1**							Deep made ground/organic alluvium possible	Low-moderate
	P2								
	P3								
	P4								
	P5								
	P6	X							
	P7								
OFF-SITE									
None	-	-	-	-	-	-	-	-	-

SOURCES	**S1**	Toxic metals, TPH and PAH within near surface made ground
	S2	Hydrocarbon residues from former diesel AST
	S3	Asbestos fibres from suspected ACM roof sheeting
	S4	Elevated sulphate/sulphide within CMF
	S5	Landfill gas emissions from deep made ground/alluvium
PATHWAYS	**P1**	Direct dermal contact or ingestion, including via soil attached to vegetables
	P2	Inhalation of dust and vapours
	P3	Permeation into new water supply pipework
	P4	Vertical leaching of leachable contaminants in unsaturated zone and lateral migration in saturated zone
	P5	Direct contact with high sulphate-bearing material
	P6	Gas migration through unsaturated zone and accumulation within confined spaces
	P7	Radon gas migration through unsaturated zone and accumulation within confined spaces
RECEPTORS	**R1**	Future site residents
	R2	New potable water supply
	R3	Groundwater (bedrock is a minor aquifer, not in a source protection zone)
	R4	Surface waters (Sud Brook runs through site)
	R5	Concrete foundations
	R6	Adjacent land users/residents

5 GROUND INVESTIGATION REPORT

Site Works

5.1 The Phase 2 intrusive investigation took place on 19 November 2014 by way of windowless-sampling (mini boreholes) and trial pitting. Borehole positions as indicated on drawing 3829/2 were selected by this Practice in order to obtain good site coverage relative to the proposed development layout, as well as target any specific features identified from Phase 1 researches. No buried services plans were made available prior to start of works thus the precautions of a CAT electrical service scanner and hand-dug starter pits were deployed prior to commencement of drilling. Several buried services were encountered, and although all were considered likely to be non-live/disconnected that prompted pit termination. Twin electricity cables (45mm diameter steel housing with tar-paper coating) were uncovered at 0.8m depth in TP4; a suspected gas main (60mm diameter broken steel pipe with yellow plastic coating) was encountered at 0.25m depth in TP5; a suspected drain/sewer plus adjacent electricity cable were found at 0.5m depth in TP6.

5.2 A total of seven windowless-sample boreholes (WS1 - WS7) were drilled to depths of up to 4.45m using percussive sampling techniques, whilst the trial pits were shallower at depths of up to 1m. The borehole cores and pit arisings were logged in accordance with Eurocode 7 (BS EN ISO 14688-1:2002 and 14688-2:2004), and representative disturbed samples taken for geotechnical and contamination testing as appropriate. In-situ standard penetration tests (SPT's) were carried out in accordance with BS EN ISO 22476-3:2005 at regular intervals within boreholes in order to assess the relative density of the material penetrated, and the resulting N values (uncorrected) are indicated on the borehole logs. For reference the SPT hammer energy ratio certificate (calibration report) is presented together with the BH logs in Appendix 3. No works have been undertaken within buildings apart from WS5 and TP7 and 8.

5.3 Upon completion of logging and sampling all trial pits and most boreholes were backfilled using nominally compacted arisings and broken slabs replaced at surface. Standpipes constructed as gas-wells were installed within WS1, 3 and 4 to enable a preliminary programme of gas/water monitoring, the results of which are presented in Appendix 5.

Laboratory Testing - Geotechnical

5.4 Eight samples were taken for moisture content and index determinations, the results of which together with secondary derived parameters are presented in Table 2, along with classification to EN ISO 14688-2:2004 and NHBC Standards.

TABLE 2: INDEX TEST RESULTS AND CLASSIFICATION

WS No	Depth (m)	Sample of	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Plasticity	Consistency Index	<425um (%)	Modified PI	Volume Change Potential (NHBC)
1	1.4	CMF	31	63	24	39	CH	0.82	94	37	Medium
1	2.9	CMF	27	64	23	41	CH	0.9	100	41	High
2	2.0	CMF	31	65	26	39	CH	0.87	100	39	Medium
3	0.5	MG	19	62	15	47	CH	0.91	96	45	High
4	1.2	?AL	22	64	17	47	CH	0.89	100	47	High
5	3.2	AL	38	61	27	34	CH	0.68	100	34	Medium
6	1.2	CMF	24	61	21	40	CH	0.93	96	38	Medium
7	1.8	CMF	27	68	22	38	CH	0.87	100	38	Medium

Classification to EN ISO 14688-2:2004 MG=Made Ground; AL=Alluvium; CMF= Charmouth Mudstone Formation

5.5 Twelve samples were subject to sulphate and acidity testing as per BRE Special Digest 1 (2005) in order to determine their aggressivity with respect to buried concrete. Results and classification are presented in Table 3.

TABLE 3: CHEMICAL TEST RESULTS AND CLASSIFICATION

Sample Ref	Sample Depth (m)	Sample of	Total sulphate SO_4 (%)	Total sulphur (%)	Total potential sulphate SO_4 (%)	Oxidisable sulphides SO_4 (%)	pH value in soil	Water soluble sulphate (mg/l)		Overall classification according to BRE Special Digest 1 (2005)	
								SO_3	SO_4	DS	ACEC
WS1	1.0	CS	0.10	<0.05	<0.15	<0.05	7.7	110	130	DS-1	AC-1
WS1	2.0	CMF	0.09	<0.05	<0.15	<0.06	8.0	<50	23	DS-1	AC-1
WS1	3.0	CMF	0.08	<0.05	<0.15	<0.07	7.9	<50	22	DS-1	AC-1
WS2	0.5	?AL	0.03	<0.05	<0.15	<0.12	8.5	<50	12	DS-1	AC-1
WS2	2.5	CMF	0.09	0.07	0.22	0.13	8.2	<50	37	DS-1	AC-1
WS2	3.5	CMF	0.16	0.98	2.9	2.7	8.4	59	71	DS-4	AC-4
WS4	1.5	AL	0.04	<0.05	<0.15	<0.11	8.0	<50	10	DS-1	AC-1
WS4	2.75	AL	0.02	<0.05	<0.15	<0.13	8.0	<50	<10	DS-1	AC-1

Sample Ref	Sample Depth (m)	Sample of	Total sulphate SO_4 (%)	Total sulphur (%)	Total potential sulphate SO_4 (%)	Oxidisable sulphides SO_4 (%)	pH value in soil	Water soluble sulphate (mg/l)		Overall classification according to BRE Special Digest 1 (2005)	
								SO_3	SO_4	DS	ACEC
WS4	4.0	CMF	0.39	1.4	4.2	3.8	7.9	430	510	DS-4	AC-4
WS6	1.2	CMF	0.17	0.06	0.18	0.01	7.7	93	110	DS-1	AC-1
WS6	1.6	CMF	0.14	<0.05	<0.15	<0.01	8.0	85	100	DS-1	AC-1
WS6	2.4	CMF	0.13	0.07	0.22	0.09	8.1	<50	46	DS-1	AC-1

TS = Topsoil; CS = Cheltenham Sand; AL = Alluvium; CMF = Charmouth Mudstone Formation

5.6 Two samples were subject to particle size distribution testing, and the grading curves are presented in Figure 2 below.

FIG 2: PARTICLE SIZE DISTRIBUTION GRADING CURVES

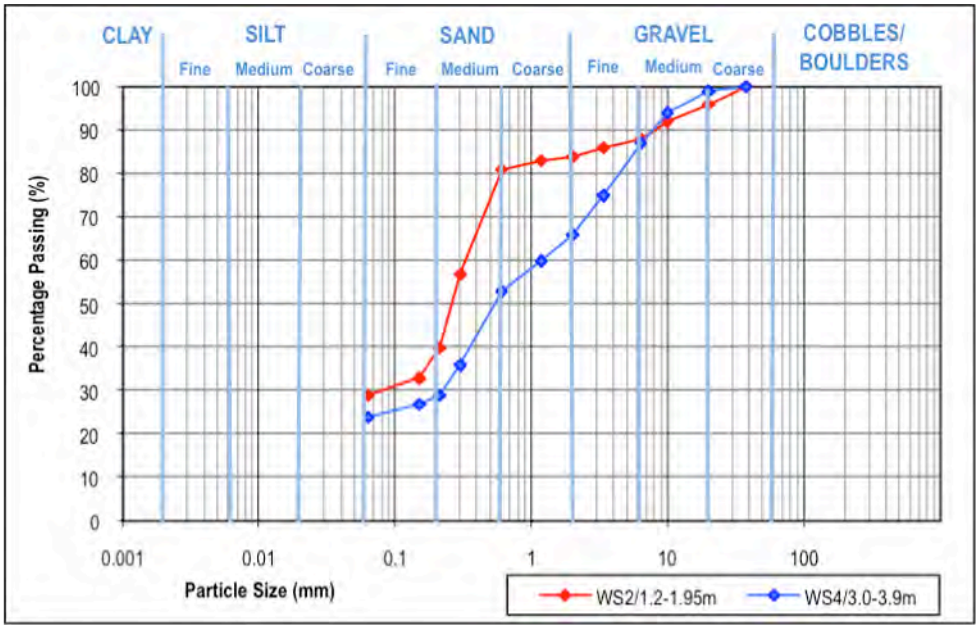


TABLE 4: PARTICLE SIZE DISTRIBUTION ANALYSIS RESULTS

BH No	Depth (m)	Sample Composition (%)			Classification (as per EN ISO 14688-2:2004)
		Gravel	Sand	Fines	
WS2	1.2-1.95	16	55	29	gravelly very silty/clayey, fine to medium SAND
WS4	3.0 - 3.9	34	42	24	very silty/clayey, very gravelly, fine to medium SAND

Laboratory Testing - Contamination

5.7 The contamination sampling scheme was conducted in accordance with BS10175:2011 to provide general spatial coverage across the site as well as targeting proposed gardens and landscaping plus any specific features or areas of potentially contaminative sources associated with the former site usage. All test results including relevant data obtained from previous investigations have been incorporated into an appropriate risk assessment to determine risk levels to the receptors, such that any necessary remedial measures can be identified and recommended to ensure that the proposed development site is 'fit for use'.

5.8 Initially thirty two samples (twenty-eight soil and four waters) were sent to UKAS-accredited Scientific Analysis Laboratories in Manchester, of which:

- twenty were tested to a suite of commonly occurring toxic and phytotoxic metals
- twelve were subject to speciated PAH content
- nine were tested for banded TPH compounds and a single sample for speciated C6-35 TPHCWG analysis
- Three were subject to asbestos fibre screening
- twelve were tested to determine acidity and three for organic matter

5.9 Given that initial screening detected asbestos fibres in two of the three tested samples, an additional twelve samples were later submitted for screening, with detailed quantification as a dependent option (and also undertaken on the original 'positive' samples).

5.10 The certified laboratory test results are presented as Appendix 3, the first page of which includes summary tables. All results and their implications upon the preliminary CSM are further discussed in Section 8.

Discussion on Ground Conditions

5.11 The boreholes have shown natural ground conditions to be more or less commensurate with geological mapping, with all boreholes proving a mantle of sandy clay or sand representing the river terrace deposits (Cheltenham Sand) over clay of the Charmouth Mudstone Formation (CMF); suspected alluvium was locally encountered close to the Sud Brook. Consistent with the brownfield industrial

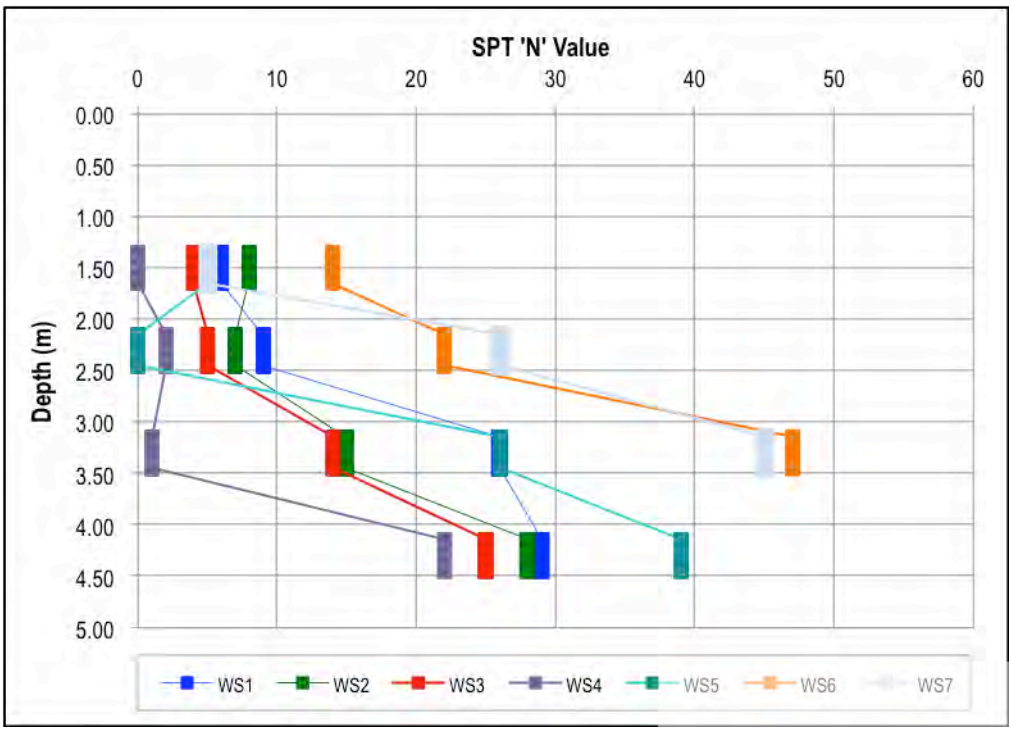
context concrete hardstand is present almost site-wide, underlain by mostly granular made ground; topsoil is restricted to a small area where a previous building/structure may have been removed. A summary of the observed strata is presented in Table 5 below, although for specific descriptions of ground conditions reference should be made to the logs presented in Appendix 2.

TABLE 5: SUMMARY OF OBSERVED STRATA

Stratum	Base Depth (m)	Notes
CONCRETE: extremely strong unreinforced hardstand	0.1 - 0.3	All except TP4 -7 and WS3 and 5
TARMAC: dense yard/roadway hardstand	0.08	TP5 only
TOPSOIL: firm brown clay with much leaf litter, occasional rootlets and rare charcoal fragments	0 - 0.05	TP7, 8 and WS3 only
MADE GROUND: mostly angular gravel and cobbles of brick and concrete with fine to medium gravel of black ash, mortar; rare rusty metal and glass	0.35 - 1.4	All except TP7, 8 and WS3
CLAY: very soft to soft, light brown clay; locally dark grey and wet with organic plant remains (suspected Alluvium)	2.95 – 3.55	WS4-5 only
CLAY/SAND: orangish-brown slightly clayey quartzitic medium sand, locally gravelly (cream limestone), locally sandy clay (*Cheltenham Sand*)	1.3 – 3.9	All boreholes except WS5 - 7
CLAY/MUDSTONE: initially firm to stiff light grey mottled brown plastic clay, becoming stiff dark bluish grey and fissured with mudstone fabric and fossil shell fragments *(Charmouth Mudstone Formation)*	>4.45	Encountered in all boreholes
Roots and Desiccation	Roots: to 1.9m in WS4 only (self-seeded buddleia) Desiccation: none seen	
Perched Water / Groundwater	Borehole water strikes at 2.8-4.45m All trial pits and WS1, 6 and 7 dry (see Appendix 5 for monitoring results)	

5.12 Laboratory index testing classifies the CMF as high plasticity and medium to high shrinkage clay in accordance with NHBC Standards, however consistent with the general lack of trees, consistency index values of 0.89-1.0 indicate no moisture deficit i.e. no evidence of existing desiccation. Uncorrected SPT N-values are plotted against depth in Figure 3 below.

FIG 3: SPT N-VALUE -v- DEPTH



5.13 The almost site-wide hardstand afforded good access/trafficking for the drilling rig and excavator whilst operating. Water strikes were encountered during the drilling of several holes, and subsequent monitoring recorded standing levels as shown in Appendix 5. Perched or groundwater levels are of course subject to seasonal fluctuation according to prevailing weather conditions, and the situation encountered and described above could potentially change in the future, especially in a period of seemingly ever-apparent but unpredictable climate change.

6 GEOTECHNICAL MODEL AND RECOMMENDATIONS FOR FOUNDATION DESIGN

6.1 Site investigation has proven natural ground conditions more or less commensurate with recorded geological mapping, comprising natural clay/sand of the Cheltenham Sand over clay of the Charmouth Mudstone Formation; the CS thickens towards the course of the Sud Brook, where it is locally replaced to some 3-3.5m depth by soft suspected alluvial clay. Despite the localised observation of rooted soils (WS4 only) but consistent with the general lack of trees, laboratory testing results showed no evidence of existing desiccation.

6.2 Foundation design at this site will be dictated primarily by distance from the brook course, and also by as yet undefined proposals for any re-levelling following removal of the derelict warehouse and basement. The site has a long history of industrial occupation thus additional unrecorded basements and/or remnant foundations may also have a significant influence. The made ground and alluvial deposits are considered unsuitable as a founding horizon on account of low and variable bearing resistance whilst the Cheltenham Sand is of insufficient extent, thus new foundations should be constructed through all such deposits to found in undisturbed natural clay of the CMF.

6.3 Given that health and safety plus economic reasons usually restrict spread (strip/trenchfill) foundations to 2.5m depth, this straight away indicates that these are only likely to be feasible for approximately the southern half of the site. Within the remaining area closer to the brook it is likely that piled foundations will offer the best alternative, indeed the entire development could be piled since the reduced volume of arisings requiring off-site disposal would offset the greater construction cost, although EC7-compliant pile design would normally require deeper investigation boreholes to some 10-12m depth in order to provide the requisite data; any consideration of rafts would dictate additional investigation targetted upon a defined layout in order to properly assess ground suitability. Note that due to current access restrictions these 'generalisations' are made without the benefit of any investigation data beneath the footprint of the main warehouse basement.

6.4 Where spread foundations into the CMF are potentially suitable, the high volume change potential would dictate a minimum founding depth of 1m or greater within influencing distance of trees (and as necessary to penetrate overlying river terrace deposits). On this basis slight foundation deepening may be necessary in the vicinity of the existing mature cherry tree at the mid-western site boundary, however this is subject to final proposals in terms of development layout, tree-felling and finished ground levels, none of which are yet confirmed.

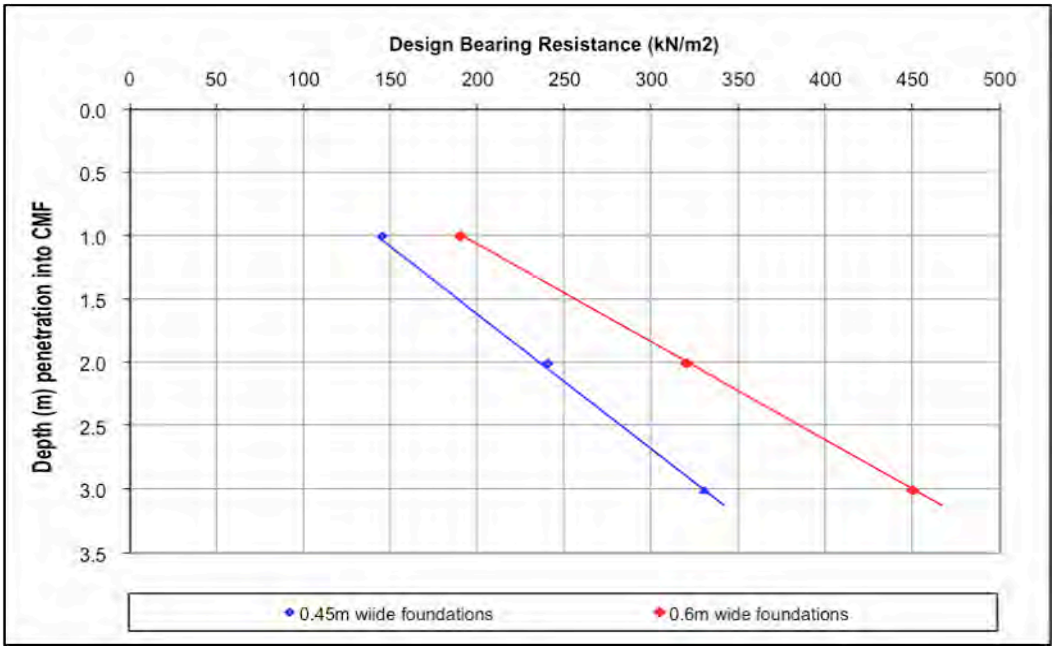
6.5 Design calculations in Eurocode 7 (BS EN 1997-1) require the establishment of design values for actions, ground properties and ground resistances, definition of the limits that must not be exceeded (usually a serviceability limit state), the setting up of calculation models for the relevant ultimate or serviceability limit state, and showing by such calculation that these limits will not be exceeded. Design values for such calculations are derived by applying partial factors to characteristic values for actions, ground properties and ground resistances, and based upon the

foregoing geotechnical model and following the requirements of Design Approach 1, both Combination 1 and Combination 2 calculations have been undertaken.

6.6 BS EN 1997-2:2007 and BS EN ISO 22475-1:2006 require quality class 1 samples for determination of soil shear strength, and such samples can only be obtained by category A sampling methods. To avoid the costly complexities of such sampling in-situ tests can alternatively be undertaken, the borehole standard penetration test (SPT) being the most commonly adopted method, as undertaken in this investigation. Field results are adjusted or ' normalised' in accordance with Eurocode requirements (BS EN ISO 22476-9:2009 for SPT's), to generate characteristic values of undrained shear strength that can then be used for determination of bearing resistance as described above.

6.7 Given the variable depth to the CMF, bearing resistance (bearing capacity) has been assessed on the basis of penetration depth into the CMF rather than simply depth below existing surface, which would not account for the variable ground profile. On this basis the bearing resistance for standard 0.45 and 0.6m wide strip/trenchfill foundations has been calculated, and is plotted against depth of CMF penetration in Figure 4 below such that values can be assigned to the appropriate founding depth. This can be reviewed once the development layout is confirmed.

FIG 4: DESIGN BEARING RESISTANCE -v- DEPTH OF PENETRATION INTO CMF



6.8 In line with NHBC Standards (2014) Clause 4.2-S4 (a), heave protection in the form of compressible material should be provided against the inside faces of all external wall foundations greater than 1.5m deep (or around piles and under ground-beams) based on the appropriate tree height. On the same basis we recommend the site-wide adoption of fully suspended ground floor slabs for all plots, incorporating a sub-slab void of 225mm for pre-cast (block and beam) concrete, or 300mm for a timber floor.

6.9 In view of the results shown in Table 4, buried concrete in spread foundations placed to 3m depth can adopt Design Sulphate Class DS-1 and Aggressive Chemical Environment Class AC-1 i.e. no enhanced specification required; although unlikely, any deeper spread foundations would require DS/AC-4 concrete mix design. Concrete design for piles is subject to a different assessment which indicates a DS/AC-2 classification, although additional strength requirements may affect mix design.

6.10 With regard to new road/pavement design, the widespread presence of made ground suggests that a CBR value of 2% should be adopted, although this should be reviewed once any proposals for post-demolition re-levelling are known. It is therefore recommended that in-situ tests be undertaken once the finished site level has been established and the relevant formation level exposed.

Recommendations for Monitoring of Ground Conditions during Construction

6.11 Since the natural soils beneath the site have the potential to be subject to softening, where exposed, in the presence of free water, inspection should ensure that no unexpected source of water has been struck, and that site drainage is so organised as to ensure that no water enters or stands in excavations. Shallow excavations should remain stable in the short term, although instability/collapse may occur, especially in deeper excavations, where perched/ground water may be encountered. Minor seepages, where encountered, would be best dealt with by sump type pumping, possibly used in conjunction with shoring equipment to maintain pit wall stability. Based upon the findings of TP7 and 8 it is advised that any deep excavations close to the brook are deferred until needed, since water could clearly rise to shallow levels, especially if a direct hydraulic connection were made.

6.12 In the event of any doubt in the above matters, this Practice would be pleased to attend site as instructed.

7 SOAKAWAY DRAINAGE

7.1 Percolation testing was not requested as part of the investigation, however based upon our previous comparable experience of the CMF and indeed the sandy clay of the overlying CS, such ground is considered to be unsuitable for the adoption of soakaway drains due to negligible permeability. Alternative drainage options will therefore need to be sought, which may involve utilisation of any existing discharge arrangement with the transmission of surplus surface water run-off via an attenuation facility into an existing drainage network (or the Sud Brook?), in which case prior approval should be sought from the relevant regulatory authority.

8 CONTAMINATION RISK ASSESSMENT

Human Health

8.1 The contamination risk assessment has been carried out in general accordance with the methodology described within Appendix 3. Where Tier 2 assessment has been necessary, in conjunction with statistical methods as per CIEH guidance we have used the ' deterministic' CLEA software model V1.06 to generate site-specific assessment criteria (SSAC). It will be seen from the summary sheets in Appendix 3 that all toxic metal and virtually all PAH results fall below Tier 1 SGV/GAC, with only a single value of the PAH compound benzo(a)pyrene (TP1/0.5m made ground) posing a potential health risk such that remedial action needs to be considered, see Section 9 below (it also classifies as an outlier to the main population of results).

8.2 Two of the three initial asbestos screen tests detected fibres however subsequent detailed quantification testing proved concentrations of <0.001% (the limit of detection). The second phase of asbestos screening recorded positive fibre detection in two of the additional twelve samples, however detailed quantification again proved concentrations of <0.001%. On this basis there is no evidence of a significant health risk from asbestos fibres within near-surface ground, thus remedial measures to protect future residents should not be necessary. This excludes any potential ACM sources that may be detected by pre-demolition building fabric surveys (to be undertaken by others), which might have implications for both construction phase personnel and future residents.

Landfill Gas and Radon Gas

8.3 The Preliminary Conceptual Site Model presented in Section 4 identified that deep made ground and/or organic material within natural alluvial deposits could pose a potential risk of gas emissions at the site. Three subsequent monitoring rounds on dedicated on-site gas-wells has however recorded maximum concentrations of 0.2% and 3.2% of methane and carbon dioxide respectively, which in conjunction with a maximum flow-rate of 0.3l/Hr (even at low atmospheric pressure) generates a gas screening value of 0.0096l/Hr. With reference to CIRIA C665 (2007) this equates to a 'Green' classification using the NHBC traffic light system for low-rise housing (with minimum 150mm ventilated underfloor void), or 'characteristic situation 1' for residential flats, in both cases indicating a negligible gas regime and no requirement for gas protection measures. That said the recommended adoption of suspended ground floor slabs in all dwellings will anyway provide passive sub-slab ventilation.

8.4 In line with desk study research, radon protection measures are not required within new construction at this site although it is as usual recommended that this be discussed local building control in case they adopt minimum required protection levels.

Controlled Waters

8.5 Water samples recovered from boreholes WS3 and WS4 plus up and downstream samples taken from the Sud Brook record no elevations of either toxic metals or PAH compounds which exceed EA EQS or UK DWS thresholds. On this basis pre-construction remedial measures in respect of controlled waters are not considered necessary.

Waste Classification for Off-site Disposal of Arisings

8.6 In accordance with current legislation all soil arisings generated for disposal as part of this development site are by definition a "commercial waste" and will be classified as both a directive and a controlled waste. On the assumption that excavated trench arisings will be removed from site, then as per the European Waste Catalogue (EWC) such material will be coded 1705, that is "soil (including excavated soil from contaminated sites), stones and dredging spoil".

8.7 In accordance with Technical Guidance Waste Management 2 (TGWM2, EA Version 3, May 2013) the contamination test results obtained for that material have been

compared with respective threshold data as set out in TGWM2 in order that this specific waste stream can be classified. As shown in Appendix 3 the recorded mineral oil hydrocarbon content of 1400mg/kg suggests that this material (alone) might classify as 'Hazardous Waste' (EWC Code 170503), however the remainder would probably be characterised as 'non-hazardous'. As such we advise that formal Waste Acceptance Criteria (WAC) testing be undertaken in order to properly classify surplus arisings prior to any off-site landfill disposal. The landfill operator will require the contamination test data undertaken as part of this investigation (and any future WAC testing).

Water Supply Pipework

8.8 Consideration has been given to the potential effects of recorded concentrations on new water utility pipework, by comparison to generic guidance as set out in the UK Water Industry Research (UK WIR) report 'Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites' (2010). At face value and dependent upon the route of such pipework through the site, such assessment indicates that recorded concentrations might necessitate "toxic preventative measures" (i.e. upgrading of water supply pipework to a barrier pipe such as ' Protectaline' or similar), although it is recommended that advice be sought from the local regulatory authority prior to ordering pipework. Some additional targetted testing might be needed once the proposed pipeline route is established.

9 REFINED CONCEPTUAL SITE MODEL AND PRELIMINARY REMEDIAL RECOMMENDATIONS

9.1 In view of the above discussions the preliminary Conceptual Site model has been refined as shown in Figure 5 and Table 6 below.

FIG 5: REFINED CONCEPTUAL SITE MODEL (NTS)

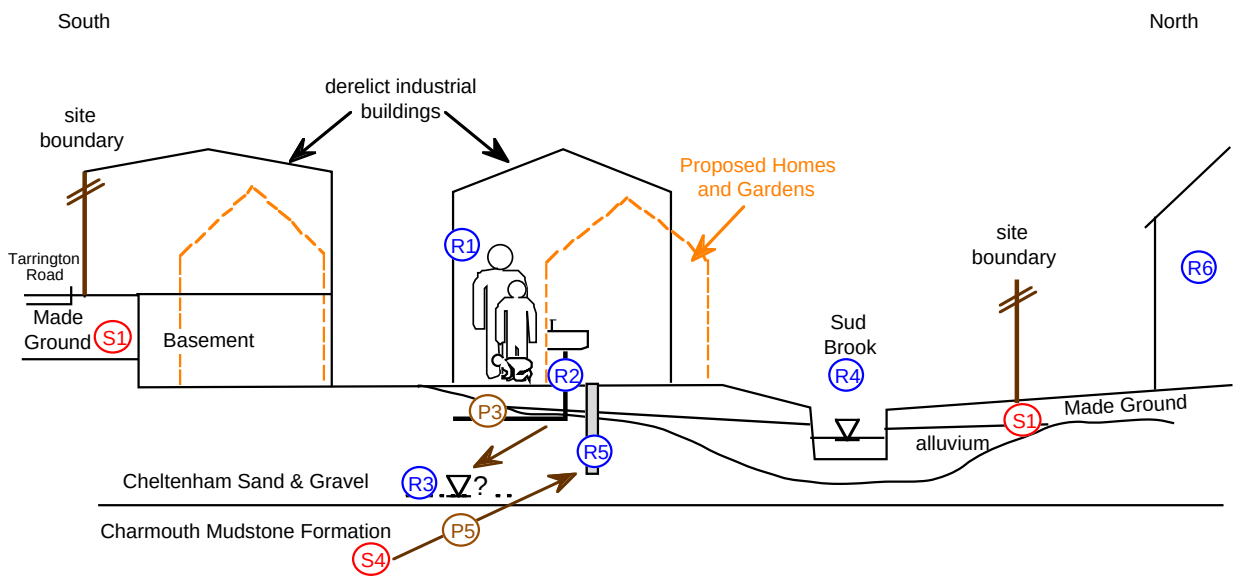


TABLE 6: SUMMARY OF POTENTIAL POLLUTANT LINKAGES

Potential Sources	Pathways	Receptors R1	R2	R3	R4	R5	R6	Comments	Refined Risk Rating	Remedial/Mitigation Requirements
ON-SITE										
S1	P1	X						SSAC locally exceeded	Low-Moderate	Apply clean cover across gardens and soft landscaping Check if provider (STW) requires barrier-type pipework
	P2	X								
	P3		X?							
	P4									
	P5									
	P6									
	P7									
S4	P1							Only applies to concrete poured into open trenches (not piles)	Low	Adopt sulphate-resistant concrete mix
	P2									
	P3									
	P4									
	P5					X				
	P6									
	P7									
OFF-SITE										
NONE	-	-	-	-	-	-	-	-	-	-

SOURCES	**S1**	Locally elevated PAH (BaP) in made ground
	S4	Naturally elevated sulphate/sulphide in CMF
PATHWAYS	**P1**	Direct dermal contact or ingestion via soil attached to vegetables
	P2	Inhalation of dust & vapours
	P3	Permeation into new water supply pipework
	P4	Vertical leaching in unsaturated zone and lateral migration in saturated zone
	P5	Direct contact with high sulphate-bearing clay
	P6	Gas migration through unsaturated zone & accumulation within confined spaces
RECEPTORS	**R1**	Future residents
	R2	Potable water supply
	R3	Groundwater
	R4	Surface Waters
	R5	Concrete foundations
	R6	Adjacent land users/residents

9.2 The localised presence within made ground of slightly elevated (benzo(a)pyrene dictates some form of remedial action in order to protect the health of future residents. The site is however essentially devoid of topsoil so the obvious solution would be the application across all future gardens and soft landscaping of imported soil to form a clean capping, thereby breaking any potential pollutant linkage. Using the guidance within BRE 465 ' Cover Systems in Land Regeneration' (2004) a required thickness of 300mm is suggested for private gardens (probably be less for communal gardens/POS), subject to approval by the Contaminated Land Officer.

9.3 In line with best industry practice the scope of contamination testing has been based upon the site history, proposed land usage and actual findings, with reference where necessary to DoE Industry Profiles and DEFRA/EA guidance. To the best of our knowledge information concerning the land quality assessment is accurate at the date of issue, however subsurface conditions including ground contamination may vary spatially and with time. There may be conditions pertaining to the site not disclosed by the above sources of information which might have a bearing upon the recommendations made, were such conditions known. We have however used our professional judgement in order to limit this during the investigation.

9.4 The conclusions and recommendations made in respect of land quality do not address any potential risks to site operatives or groundworkers during the construction stage. These issues should be addressed by the Principal Contractor in accordance with the relevant statutory procedures and regulations (CDM Regulations 2007).

9.5 It is important that these limitations be clearly recognised when the findings and recommendations of this report are being interpreted. Additional assessment may be necessary should a significant delay occur between report date and implementation of the proposed scheme to which it relates.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 The foregoing discussions and recommendations are based upon the results of a borehole and trial pit investigation preceded by a review of previous desk study and preliminary investigation reports by others. The recent trial pits and boreholes recorded a relatively consistent ground profile across the site, although ground

conditions may vary between investigation points, thus a careful watch should be maintained for any abnormalities encountered during site strip etc which might require referral back to this Practice.

10.2 The site is known to have been occupied by industrial premises (Hatherley Step Works) from c1885, which through various slight changes remained in operation as a spectacle manufacturing works until closure in 2007. The derelict buildings have since remained to the present day, becoming ever-more vandalised despite being a securely locked site.

10.3 The intrusive investigation has proven a profile of surface hardstanding over made ground, overlying river terrace deposits and localised alluvium along the course of the Sud Brook, all underlain by 'bedrock' of clay grading to weak mudstone of the Charmouth Mudstone Formation. Boreholes close to the stream recorded water strikes at some 3-4m depth during drilling, with subsequent monitoring proving standing levels of some 1.6-2.4m depth.

10.4 Foundation design is dictated by depth to the Charmouth Mudstone Formation since all overlying deposits are considered unsuited due to low and variable bearing resistance and/or inconsistent thickness. Conventional strip/trench-fill foundations should be possible for much of the proposed development however within the zone closest to the Sud Brook piled foundations are likely to offer the best solution. Site-wide adoption of suspended ground floor slabs is also recommended, and subject to final layout localised heave protection may also be necessary. This is discussed further in Section 6 along with consideration of bearing resistance and recommendations for monitoring of ground conditions during construction.

10.5 Buried concrete for spread foundations to 3m depth (if possible) can adopt DS/AC-1 mix design i.e. no special sulphate protection is necessary, however any deeper foundations will require DS/AC-4 design to account for naturally elevated sulphate/sulphide within the CMF.

10.6 The site is initially considered to be unsuitable for soakaway drainage, and unless soakaway testing reveals otherwise (not undertaken to date) alternative drainage options will need to be sought.

10.7 A detailed contamination risk assessment including toxic and phytotoxic metals, TPH and PAH analysis plus asbestos fibre screening and quantification indicates the site to be relatively uncontaminated, with only a localised perceived risk to human health;

as such relatively routine remedial/mitigation measures have been recommended. No risks have been identified in respect of landfill gas emissions (from made ground or natural alluvium), radon gas or potential pollution of controlled waters. This is fully discussed in Sections 8 and 9 of this report.

10.8 Initial classification on the basis of existing results suggests that in terms of off-site landfill disposal certain excavated site arisings might classify as "hazardous waste", whereas much of it would probably classify as 'non-hazardous'. As such WAC testing has been recommended to formally characterise such materials.

10.9 Should planning consent be subject to certain conditions, this report and attachments should be lodged with the local planning authority such that they can update their records.

10.10 The above recommendations must not be used in respect of any development differing in any way from the proposals described in this report, without reference back to this Practice or to another geotechnical/geo-environmental specialist.

11 REFERENCES

Geotechnical

BS EN 1997-1:2004 *'Geotechnical Design - General Rules'*

BS EN 1997-2:2007 *'Geotechnical Design - Ground Investigation & Testing'*

British Standards Institute, BS5930:1999 '*Code of Practice of Site Investigations*' (1999) plus Amendment 2 (2010)

National House Building Council (NHBC) Standards: Chapter 4.2 '*Building Near Trees*' (2007)

BS EN 14688: *'Geotechnical Investigation and Testing - Identification and Classification of Soil Part 1 Identification and Description*' (2002)

BS EN 14688: *'Geotechnical Investigation and Testing - Identification and Classification of Soil Part 2 Principles for a Classification'* (2004)

BS EN 14689: *'Geotechnical Investigation and Testing - Identification and Classification of Rock Part 1 Identification and Description*' (2003)

British Standards Institute, BS 1377: *'British Standard Methods of Test for Soils for Civil Engineering Purposes',* Parts 1 - 9, (1990)

Building Research Establishment (BRE) Special Digest 1 '*Concrete in Aggressive Ground*' (2005)

British Geological Survey Sheet SO81NW (1975)

Building Research Establishment (BRE) Digest 365 "*Soakaway Design*" (2007)

Geotechnical Engineering Ltd report 18722/01 – Phase 1 Geoenvironmental Desk Study (May 2006)

Environmental

British Standards Institute, BS 10175: *'Code of Practice for the Investigation of Potentially Contaminated Sites'* (2011)

Environment Agency CLR 11: '*Model Procedures for the Management of Land Contamination*'

Environment Agency/National House Building Council (NHBC) R&D 66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2000)

Chartered Institute of Environmental Health (CIEH)/Land Quality Management Limited (LQM). The LQM/CIEH *'Generic Assessment Criteria for Human Health Risk Assessment'* (2nd Edition). Land Quality Press

Department of the Environment, Transport & the Regions: *'The Environmental Protection Act 1990: Part IIA'* (2000)

Construction Industry Research & Information Association (CIRIA) 665: '*Assessing Risks Posed by Hazardous Ground Gases to Buildings*' (2007)

Building Research Establishment (BRE): Radon – '*Guidance on Protective Measures for New Buildings*' (2007)

Geotechnical Engineering Ltd report 18722/02 - Geoenvironmental Assessment (May 2006)

FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER

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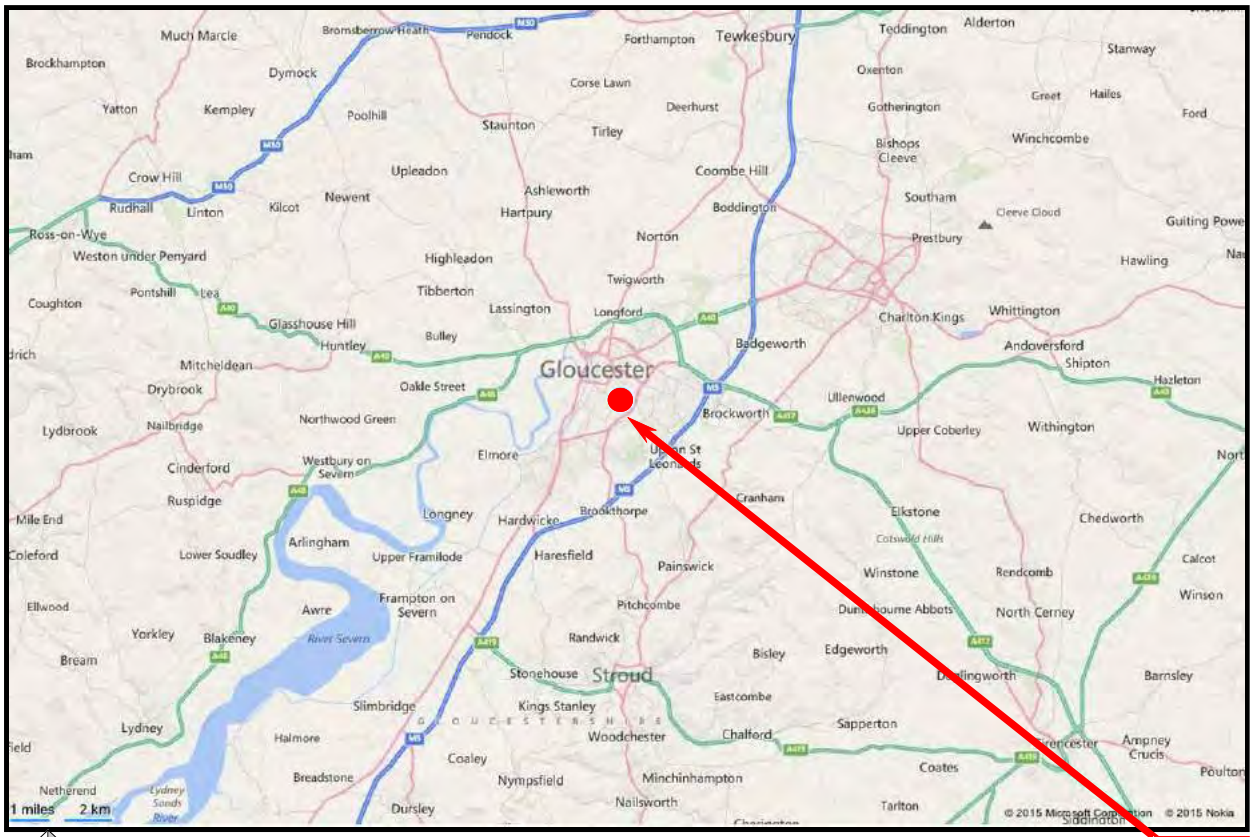
SITE LOCATION (based on Microsoft Bing Mapping)

Job No.	Drawing No.	Scale:	Date:
3829	3829/1	NTS	11.02.15



THE SITE

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SITE SURVEY (after RES TopoSurvey drg L01 A, 19.11.14) SHOWING INVESTIGATION LOCATIONS

Job No.	Drawing No.	Scale:	Date:
3829	3829/2	1:500 @ A3	11.02.15

WS1 - WS7
TP1 - TP11
November '14
Stream Sampling Points
P1 Number and direction of photograph (Appendix 1)

N

PAUL STREET
TARRINGTON ROAD
HATHERLEY ROAD
SUD BROOK CHANNEL
SUD BROOK CHANNEL

BUILDING 1
BUILDING 2
BUILDING 3
BUILDING 4
BUILDING 5
BUILDING 6
BUILDING 7

GROUND FLOOR LEVEL = 21.119
BASEMENT LEVEL = 18.713
BASEMENT EXTENT

TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11

WS1
WS2
WS3
WS4
WS5
WS6
WS7

P1
P2
P3
P4
P5
P6
P7
P8

Downstream
Upstream

TYPE	Units
1 Bed 2 Person Flat	12
2 Bed 3 Person Flat	6
3 Bed 5 Person House	7
Walk up Flat 1 Bed 2 Person	4
2 Bed 4 Person	13
Undercroft Flat Above	1
2 Bed 3 Person Bungalow	2
Total	**45 Units**
Wide frontage unit	
Dual Aspect unit	

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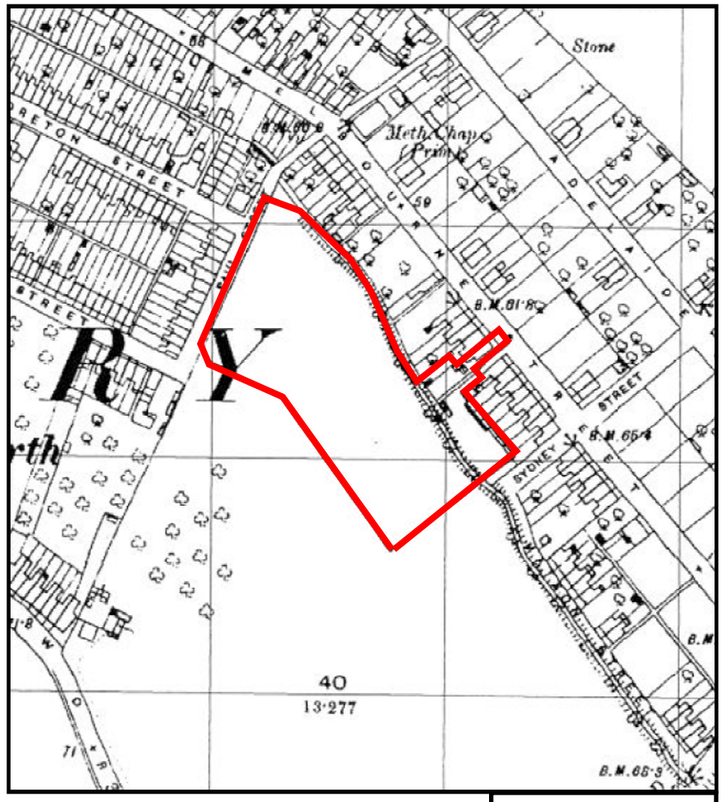
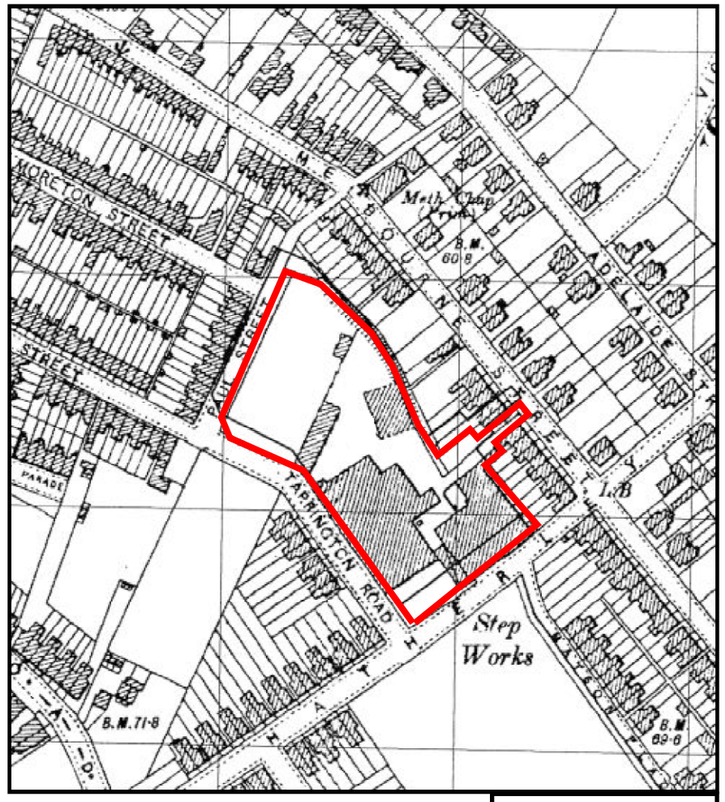
PROPOSED DEVELOPMENT LAYOUT (after BM3 provisional plan) SHOWING INVESTIGATION LOCATIONS

Job No.	Drawing No.	Scale:	Date:
3829	3829/3	1:500 @ A3	11.02.15

WS1 - WS7 November '14
TP1 - TP11



1884
(scale 1:2500)



1902
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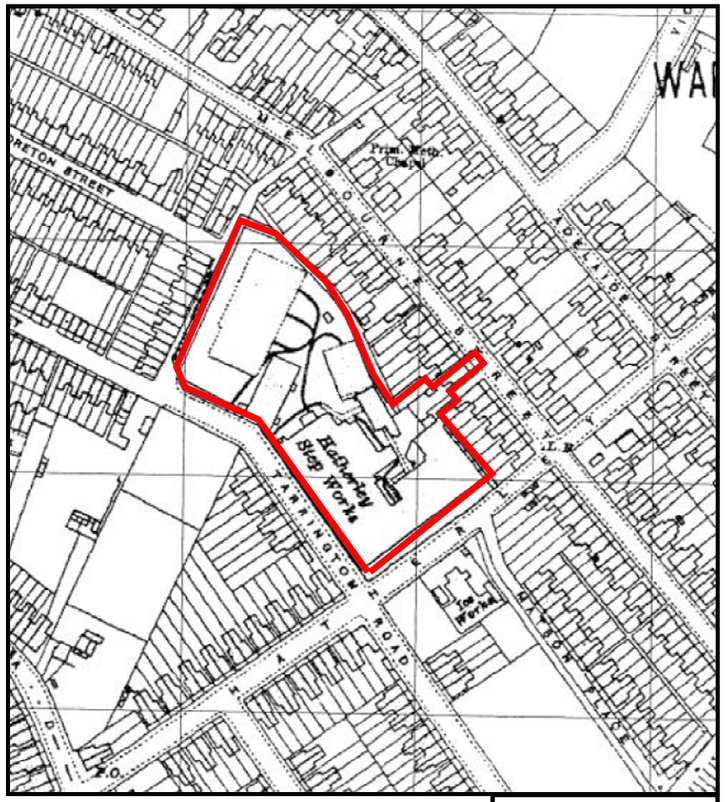
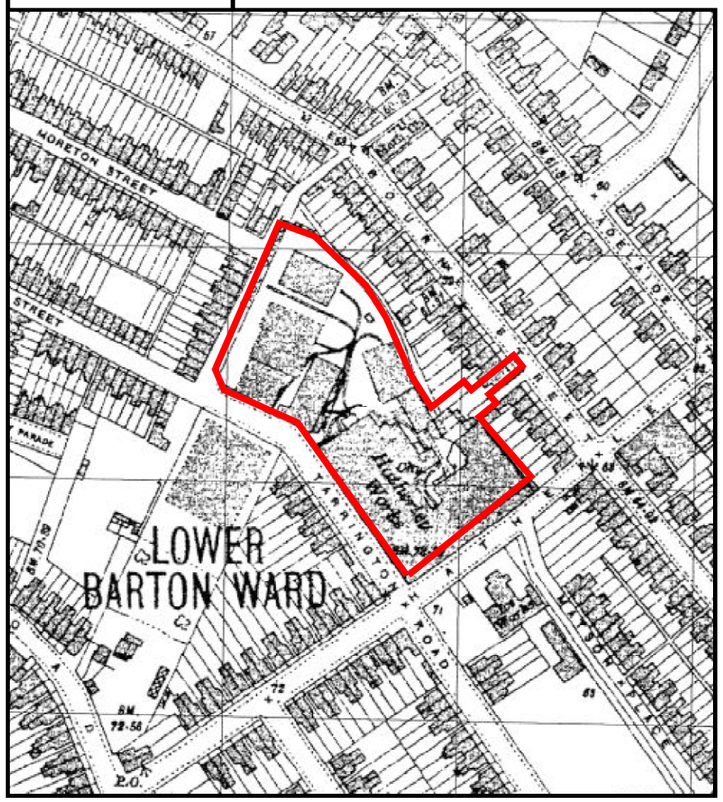
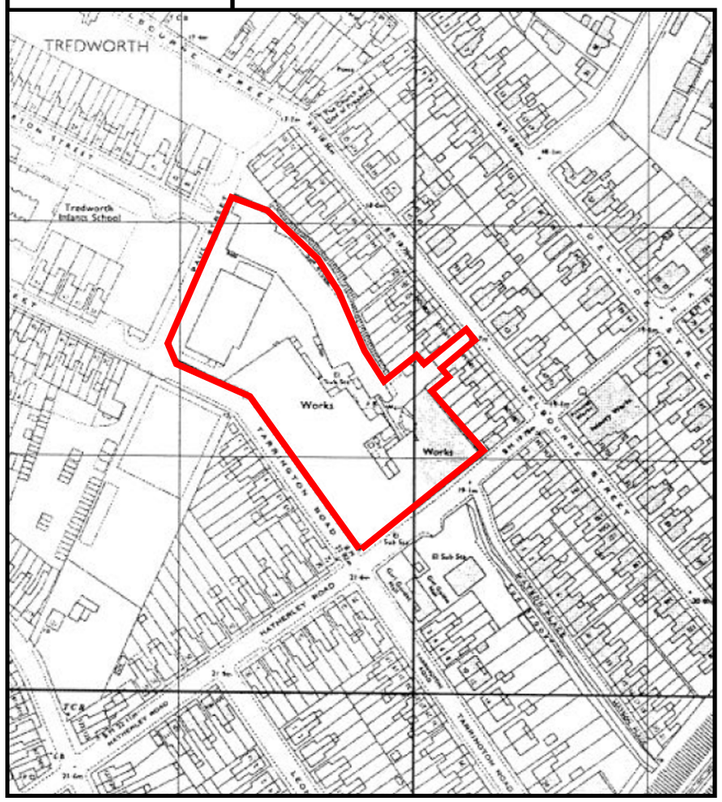


1923
(scale 1:2500)

1936
(scale 1:2500)



1972
(scale 1:2500)



1994
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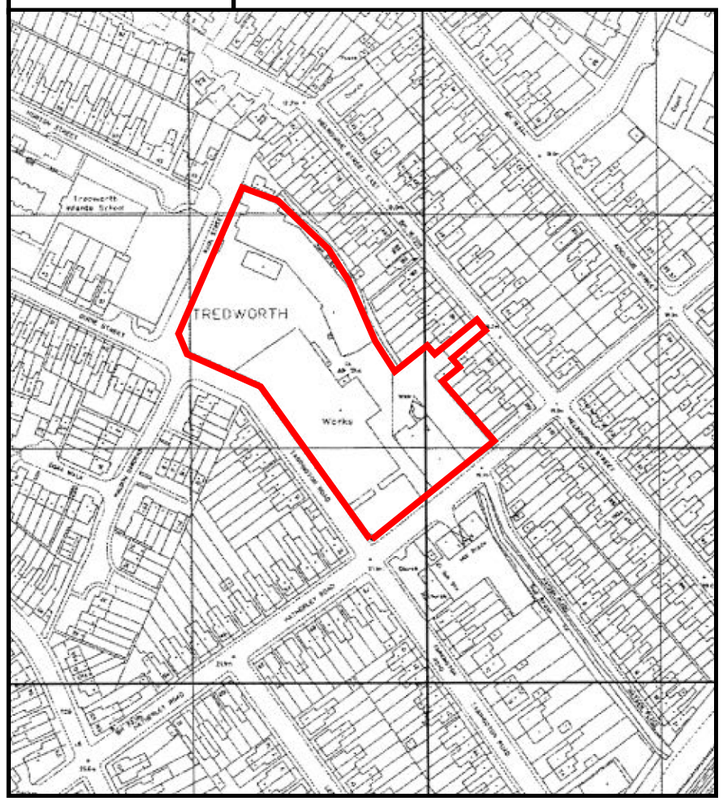

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EXTRACTS OF ORDNANCE SURVEY PLANS TO SHOW SITE HISTORY

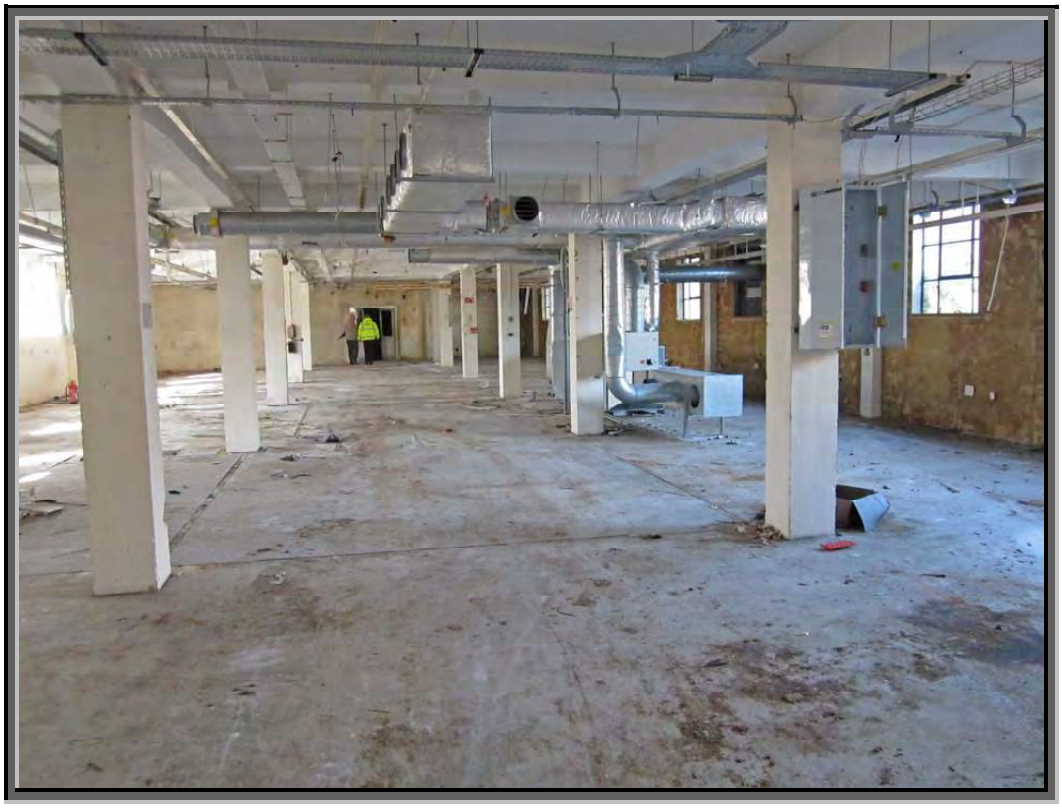
Job No.	Drawing No.	Scale:	Date:
3829	3829/4	as shown	11.02.15

N

APPENDIX 1

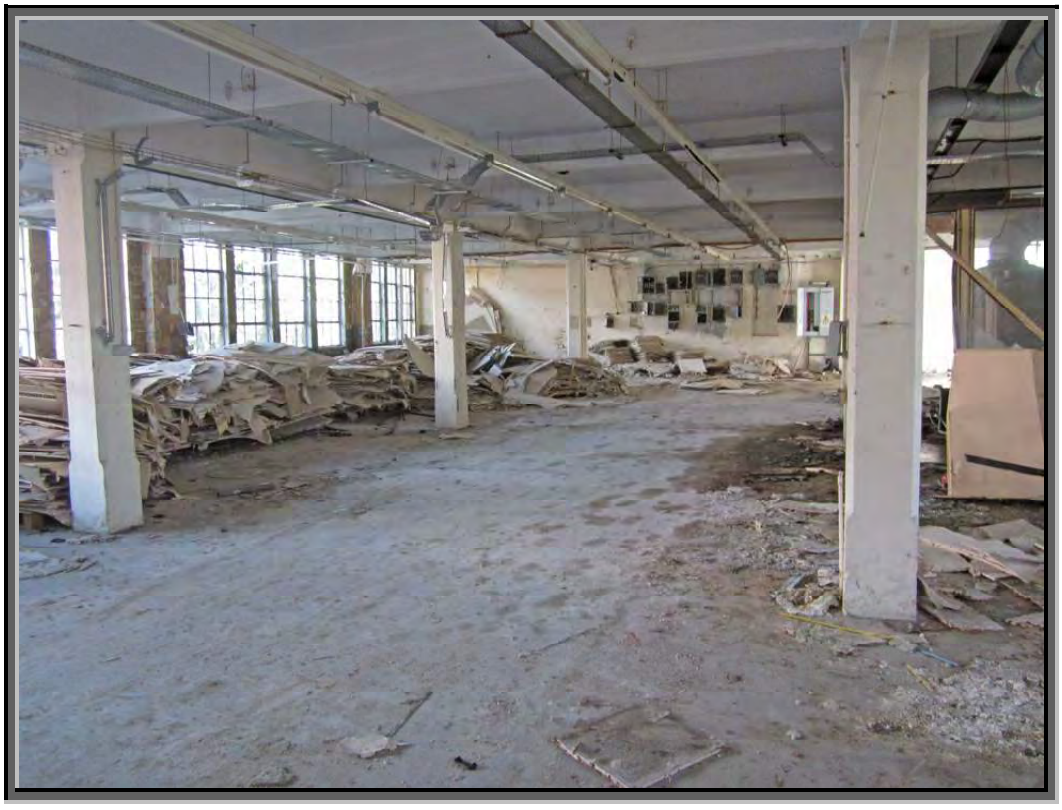
SITE PHOTOGRAPHS

Photograph P1: showing view across main yard



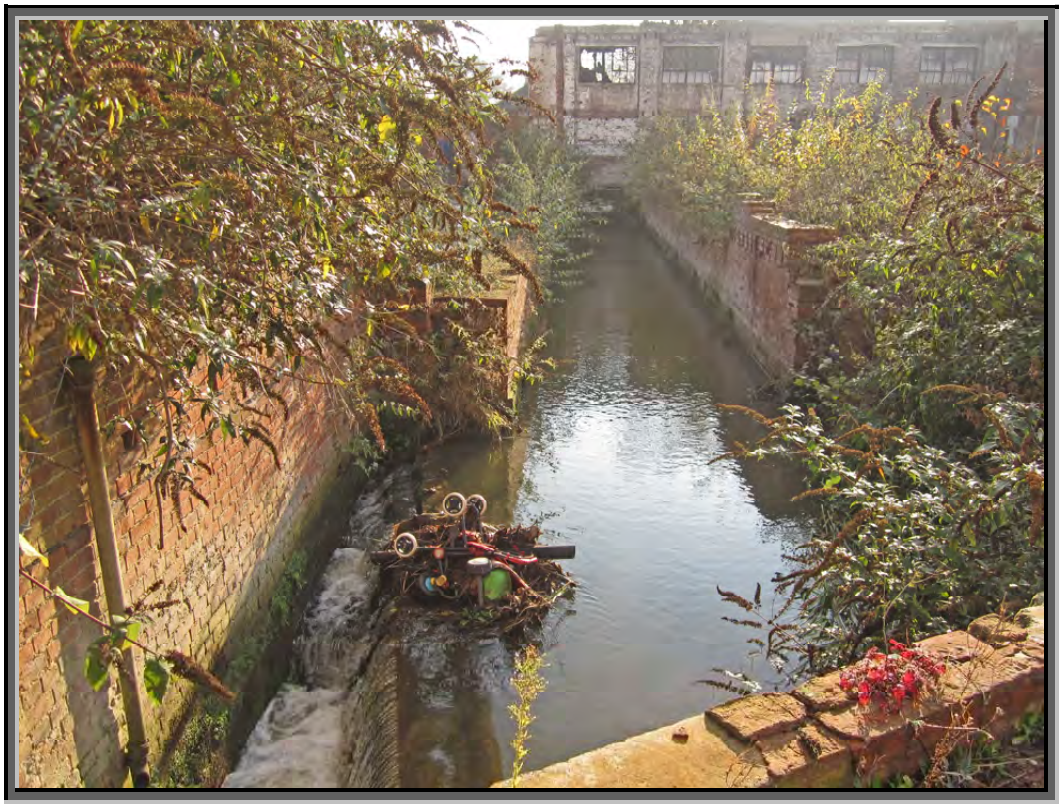
Photograph P2: showing Building 1 interior

Photograph P3: showing Building 2 interior



Photograph P4: showing Building 3 interior

Photograph P5: showing Building 5 interior



Photograph P6: showing Sud Brook (and wier) within site

Photograph P7: showing redundant electricity sub-station

Photograph P8: showing overgrown yard

APPENDIX 2

BOREHOLE AND TRIAL PIT LOGS

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KEY TO BOREHOLE LOG SYMBOLS

Symbol	Explanation
D or J	Small Disturbed Sample (tub or jar sample)
B	Large Disturbed Sample
U	Undisturbed Sample
W	Water Sample
U70	Undisturbed Sample

Undrained Shear Strength Test (HSV)

90	Hand vane - direct reading in kN/m^2

Standard Penetration Test (SPT)

15	SPT 'N' Value (BS EN ISO 22476-3:2005)
125/50	Where full test drive not completed, penetration (125mm) and blow count (50) recorded
NR	No effective penetration

Water

	Water struck
	Water standing

Test/Core Range

TCR	Total Core Recovery - as percentage of core run. Where value significantly exceeds 100%, a note is given on remarks on log
SCR	Solid Core Recovery - as percentage of core run. Note: assessment of solid core is based on full diameter
RQD	Rock Quality Designation - the amount of solid core greater than 100mm expressed as percentage of core run
	Where SPT has been carried out at beginning of core run, disturbed section of core excluded from SCR and RQD assessment

Instrumentation

	Bentonite Seal
	Solid / Perforated Standpipe
	Granular Response Zone

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				WS1
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	18-11-14	20.60	E 383,918 N 217,139	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.10	HARDSTAND: probable strong, grey CONCRETE (50% clasts, 50% matrix)		
						(0.40) 0.50	MADE GROUND: probable soft, black, sandy CLAY, with rare gravel of brick and shale		
0.50	D					(0.40) 0.90	MADE GROUND: probable soft, orangish-brown, slightly sandy CLAY, with rare fine to medium gravel		
1.00	D					(0.40) 1.30	SAND: probable loose, dull orangish-brown, slightly clayey, medium SAND	CS	
1.20		N6					CLAY: firm to stiff, mottled greyish-brown, plastic CLAY		
1.40	D			49 70 80 59					
2.00	D			70			2.00 - rare shell and gypsum crystals		
2.00		N9					2.00 - 3.80 - oily film visible on surface of core		
2.30	D			88 104 87 123		(3.15)	2.75 - relict mudstone fabric evident	CMF	
2.90	D			12					
3.00	D			60					
3.00		N26					3.30 - dark bluish-grey, friable and locally fissured		
4.00		N29				4.45			
							Core Recovery: 0.0 - 1.2m hand-dug starter pit 1.2 - 4.0m 100% Oily film has faint hydrocarbon odour Borehole terminated at 4.45m depth Gas/groundwater monitoring well installed to 4.0m depth, with gas valve and lockable cover at surface		

Boring Progress and Water Observations					
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt
18-11-14					DRY

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

AL? = possible Alluvium
AL = Alluvium
CS = Cheltenham Sand
CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

Wilson Associates Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				**WS2**
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	18-11-14	19.90	E 383,916 N 217,173	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA							
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.20	HARDSTAND: probable strong, grey CONCRETE (50% clasts, 50% matrix)		
0.25	D					0.30	MADE GROUND: probable medium dense, grey, sandy fine to medium GRAVEL of limestone (sub-base)	CS	
0.50	D					(0.45) 0.75	CLAY: probable soft, dull orangish-brown, sandy, plastic CLAY, with rare fine to medium gravel of charcoal		
1.20-1.95	D						SAND: probable loose, dull orangish-brown, slightly clayey to clayey, medium SAND	CS	
1.20		N8				(1.20)	1.60 - becoming gravelly		
						1.95			
2.00	D						CLAY: probable soft to firm, mottled light brown and grey, plastic CLAY		
2.00		N7							
2.50	D			37 38			2.40 - becoming dark bluish-grey and with relict mudstone fabric evident		
3.00	D		1						
3.00		N15				(2.50)	3.10 - water struck in SPT	CMF	
							3.50 - friable and fissured		
4.00		N28							
						4.45			
							Core Recovery: 0.0 - 1.2m hand-dug starter pit 1.2 - 4.0m 100% Borehole terminated at 4.45m depth; backfilled with arising upon completion of sampling and testing		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole position scanned using Cable Avoidance Tool (CAT); no services detected AL? = possible Alluvium AL = Alluvium CS = Cheltenham Sand CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				**WS3**
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	18-11-14	19.20	E 383,950 N 217,152	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.01	TOPSOIL: probable very loose, dark brown, organic, gravelly SAND		
						(0.49)	MADE GROUND: probable loose, reddish-brown, sandy GRAVEL, with occasional whole brick		
0.30	D					0.50			
0.50	D						CLAY: probable soft, dull reddish/orangish-brown, sandy, plastic CLAY with rare gravel of charcoal	CS	
						0.80			
							CLAY: probable soft, dull reddish/orangish-brown, sandy, plastic CLAY		
1.20		N4				(0.85)		CS	
						1.65			
				53			CLAY: probable firm, mottled light brown and grey, plastic CLAY		
				50					
2.00		N5		53					
							2.50 - 2.90 - becoming probable soft		
				35					
				24					
				40					
3.00		N14		40		(2.80)	2.90 - dark bluish-grey, friable and fissured, with rare shell fragments	CMF	
4.00		N25							
			▼1			4.45			
							Core Recovery: 0.0 - 1.2m hand-dug starter pit 1.2 - 4.0m 100% Borehole terminated at 4.45m depth Gas/groundwater monitoring well installed to 4.0m depth, with gas valve and lockable cover at surface		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
			1.00	101							Borehole position scanned using Cable Avoidance Tool (CAT); no services detected AL? = possible Alluvium AL = Alluvium CS = Cheltenham Sand CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				WS4
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	18-11-14	18.90	E 353,980 N 217,122	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA							
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
0.15	D0.35					0.12	CONCRETE: extremely strong, former hardstanding, unreinforced		
						0.35	MADE GROUND: probable medium dense, fine to coarse GRAVEL and COBBLES of brick, mortar and very dark grey/black ash		
						(1.15)	CLAY: probable soft, mid grey, silty and plastic CLAY, frequent medium gravel size fragments of black charcoal/organic	AL?	
1.20	D								
1.20		N0				1.50			
1.50	D			19			CLAY/SILT: probable soft, light brown, locally slightly sandy, CLAY/SILT		
				32					
				37					
				43					
				43			1.90 - live root from adjacent buddleia		
2.00		N2				(1.45)		AL?	
				22			2.40 - becoming mottled light brown and grey		
				31					
				26					
2.75	D			20		2.95			
3.00	D3.9			22			SAND: probable loose to medium dense, dark grey, gravelly, medium SAND, gravel is fine to medium limestone		
3.00		N1				(0.95)		CS	
						3.90			
4.00	D						CLAY: probable stiff, dark bluish-grey, friable, fissured CLAY, with shell fragments throughout		
4.00		N22				(0.55)		CMF	
						4.45			
							Core Recovery: 0.0 - 1.2m machine dug starter pit 1.2 - 3.0m 100% 3.0 - 4.0m 60% Borehole terminated at 4.45m depth Gas/groundwater monitoring well installed to 3.7m depth, with gas valve and lockable cover at surface		

Boring Progress and Water Observations					
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

AL? = possible Alluvium
AL = Alluvium
CS = Cheltenham Sand
CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				WS5
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	18-11-14	18.60	E 384,002 N 217,089	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA							
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION		Geology	Instrument/ Backfill
0.00-0.30	D					(1.00) 1.00	CLAY: probable firm, light brown, slightly silty, plastic, structureless CLAY		AL	
0.90	D									
1.20		N5		27 30 27 31 31		(1.30) 2.30	CLAY: probable soft, light brown, plastic CLAY		AL	
2.00		N0								
2.80	D		1			(1.25) 3.55	SILT: probable very soft to soft, dark grey, wet, slightly sandy SILT, with occasional organic plant matter		AL	
3.00		N26								
3.20	D									
4.00		N39				(0.90) 4.45	CLAY: probable stiff, dark bluish-grey, friable, fissured CLAY, with rare shell fragments		CMF	
							Core Recovery: 0.0 - 1.2m machine dug starter pit 1.2 - 3.0m 100% 3.0 - 4.0m 60% Borehole terminated at 4.45m depth; backfilled with arising upon completion of testing and sampling			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	Borehole position scanned using Cable Avoidance Tool (CAT); no services detected AL? = possible Alluvium AL = Alluvium CS = Cheltenham Sand CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				**WS6**
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	19-11-14	21.10	E 383,968 N 217,079	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA							
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.10	HARDSTAND: probable strong, grey CONCRETE (30% clasts, 70% matrix)		
						0.20	HARDSTAND: probable strong, grey CONCRETE (50% clasts, 50% matrix)		
						(0.60)			
0.60	D					0.80	MADE GROUND: probable soft, dark brown, sandy CLAY, with rare friable mudstone and rare charcoal, ash and brick		
0.70	D						CLAY: probable firm, light brown, plastic CLAY		
1.20	D								
1.20		N14					1.40 - becoming mottled light brown and grey		
1.60	D			81 77 110			1.75 - friable and relict mudstone fabric evident		
2.00		N22				(2.65)		CMF	
2.40	D								
							2.75 - becoming dark bluish-grey		
3.00		N47							
						3.45			
							Core Recovery: 0.0 - 1.2m hand-dug starter pit 1.2 - 3.0m 100% Borehole terminated at 3.45m depth; backfilled with arisings upon completion of testing and sampling		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
19-11-14					DRY						Borehole position scanned using Cable Avoidance Tool (CAT); no services detected AL? = possible Alluvium AL = Alluvium CS = Cheltenham Sand CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

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BOREHOLE LOG

Project				BOREHOLE No
Former Norville Works, Tarrington Road, Tredworth, Gloucester				**WS7**
Job No	Date	Ground Level (c.m, AOD)	Co-Ordinates (c.)	
3829	19-11-14	21.10	E 383,948 N 217,108	
Contractor				Sheet
CC Ground Investigations Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.16	HARDSTAND: probable strong, grey CONCRETE (60% clasts, 40% matrix)		
0.20	D					(0.84)	MADE GROUND: probable loose, yellowish-brown, very sandy, fine to medium GRAVEL of limestone		
						1.00			
1.00	D					(0.40)	MADE GROUND: probable soft, dark brown, slightly sandy, plastic CLAY, with rare charcoal, ash and brick		
1.20		N5				1.40			
							CLAY: probable stiff, mottled light brown and grey, plastic CLAY		
							1.60 - relict mudstone fabric evident		
1.80	D								
2.00		N26							
						(2.05)		CMF	
							2.60 - becoming dark, bluish-grey, with rare shell		
3.00		N45							
						3.45			
							Core Recovery: 0.0 - 1.2m hand-dug starter pit 1.2 - 3.0m 100% Borehole terminated at 3.45m depth; backfilled with arisings upon completion of testing and sampling		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
19-11-14			2.00	101	DRY						Borehole position scanned using Cable Avoidance Tool (CAT); no services detected AL? = possible Alluvium AL = Alluvium CS = Cheltenham Sand CMF = Charmouth Mudstone Formation

All dimensions in metres Scale 1:50	Client Markey Construction Limited	Method/ Plant Used Window Sampling / Terrier 2002 (Rig T02)	Logged By TC

Wilson Associates

Job No. 3829

FORMER NOVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER

WS1 HDP Arisings 0 - 1.2m

WS1 Core 1.2 - 4.45m

WS2 HDP Arisings 0 - 1.2m

WS2 Core 1.2 - 4.45m

W3 HDP Arisings 0 - 1.2m

WS3 Core 1.2 - 4.45m

Wilson Associates

Job No. 3829

FORMER NOVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER

WS4 Core 1.0 - 4.45m

WS5 Core 1.0 - 4.45m

WS5 Core 2.0 - 3.0m

W6 HDP Arisings 0 - 1.2m

WS6 Core 1.2 - 3.0m

Job No. 3829

FORMER NOVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER

W7 HDP Arisings 0 - 1.2m

WS7 Core 1.2 - 3.0m

SPT Calibration Report

www.equipegroup.com

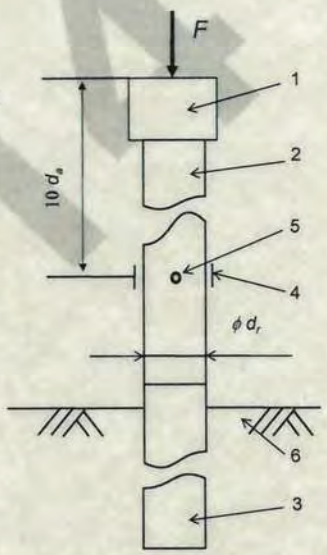
Hammer Energy Measurement Report

Type of Hammer	TERRIER
Client	CC GROUND INVESTIGATIONS
Test No	EQU1050
Test Depth (m)	11.96
Date of Test	16 May 2014
Valid until	16 May 2015
Hammer ID	T02

Mass of the hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod

Diameter	d_r =	0.052 m
Length of the instrumented rod		0.558 m
Area	A =	11.61 cm^2
Modulus	E_a =	206843 MPa

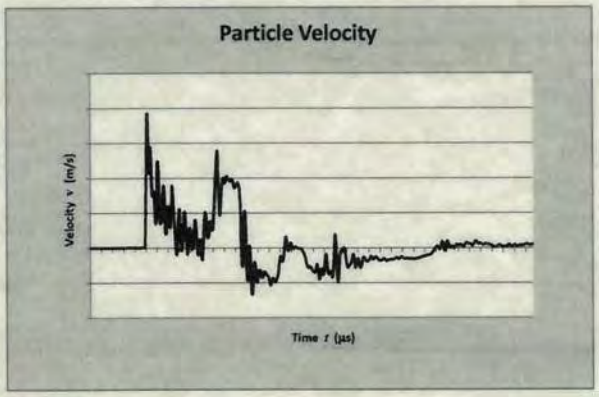


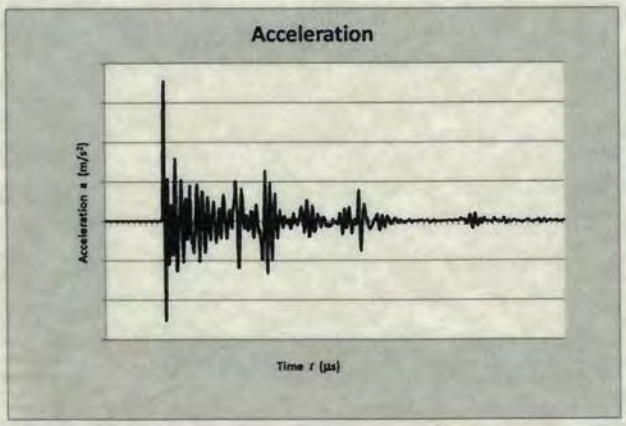
Key

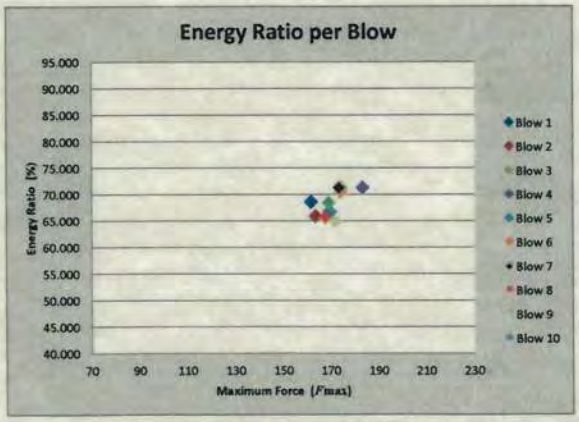
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011







Observations:
1.

E_{meas} = **0.322** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$ = **68.08%**

Equipe SPT Analyzer Operators: MH

Prepared by:	[redacted]	Checked by:	[redacted]	Date	20/05/2014

Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: 01295 670990 Fax: 01295 678232 Email: info@equipegroup.com

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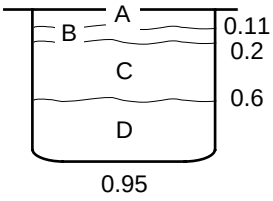
[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**TP1**
3829	18.11.14	20.2m	E 383,920 N 217,147	



DETAILS OF SUBSOIL

A CONCRETE: extremely strong/dense, former yard hardstanding; unreinforced

B MADE GROUND: probable medium dense, medium to coarse, angular GRAVEL and COBBLES of whole and broken bricks and concrete

C DISTURBED GROUND: firm/loose, mid grey, gravelly CLAY; gravel is fine to medium, subangular, black ash and brick

D CLAY: 'firm, mid orangish-brown, sandy to very sandy with rare flecks of ?charcoal *(CHELTENHAM SAND ?)*

NOTES

1 Pit logged from surface

2 Pit dry and stable

3 Soil samples taken at 0.2-0.5m, and 0.6-0.8m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

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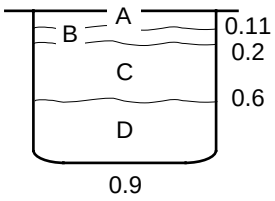
[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 19.8m	**Co-Ordinates (c.)** E 383,925 N 217,162	**TP2**



DETAILS OF SUBSOIL

A CONCRETE: extremely strong/very dense, former yard hardstanding; unreinforced

B BRICKS: single course of bricks, old floor or 'sub-base'

C DISTURBED GROUND: loose, mid grey, gravelly and soily CLAY; gravel is fine to coarse, angular black ash, brick and rare pottery

D CLAY/SAND: firm, mid orangish-brown, very sandy CLAY/loose very clayey SAND, occasional fine GRAVEL size flecks of black charcoal
(CHELTENHAM SAND ?)

NOTES

1 Pit logged from surface

2 Pit dry and stable

3 Soil samples taken at 0.2-0.5m, and 0.6-0.7m depth

Scale: 1:50	**Client** Markey Construction Limited	**Logged By:** DJW

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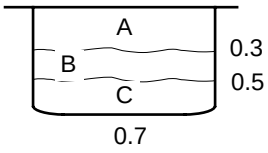
[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**TP3**
3829	18.11.14	19.4m	E 383,930 N 217,174	



DETAILS OF SUBSOIL

A CONCRETE: extremely strong/dense, former yard hardstanding; unreinforced

B MADE GROUND: probable medium dense, light grey, fine to coarse GRAVEL of concrete, mortar and brick with rare ash and rusty metal

C CLAY/SAND: probable firm, mid brown, very sandy CLAY/medium dense, very clayey, quartzitic medium SAND, rare flecks of black charcoal
(CHELTENHAM SAND ?)

NOTES

1 Pit logged from surface; depth restricted by parallel beam (? old rails ?) in stratum A

2 Pit dry and stable

3 Soil samples taken at 0.3-0.5m, and 0.5-0.7m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

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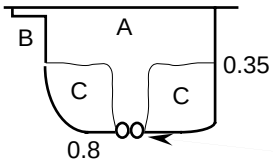
[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 18.9m	**Co-Ordinates (c.)** E 383,958 N 217,141	**TP4**



twin 45mm diameter ?redundant electricity cables in narrow trench

DETAILS OF SUBSOIL

A MADE GROUND: probable medium dense, whole and broken bricks, and angular COBBLES of cream limestone, in light brown limestone and mortar matrix

B BRICKWORK: very dense old foundations

C CLAY: probable firm, light brown, plastic and silty, flecks of black charcoal *(ALLUVIUM ?)*

NOTES

1 Pit logged from surface

2 Pit dry and stable

3 Soil samples taken at 0.0-0.35m, and 0.35-0.75m depth

Scale: 1:50	**Client** Markey Construction Limited	**Logged By:** DJW

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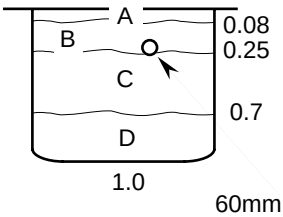
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER			TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 18.7m	**Co-Ordinates (c.)** E 383,003 N 217,132	**TP5**



60mm diameter redundant ?gas main (yellow coated steel) - already broken

DETAILS OF SUBSOIL

A TARMAC: probable very dense/strong, former hardstanding

B MADE GROUND: probable dense, COBBLES of whole and broken bricks in GRAVEL of fine to medium, dark grey/black ash, rare broken glass and rusty metal

C CLAY: probable firm, light brown, slightly silty, occasional flecks of charcoal *(ALLUVIUM ?)*

NOTES

1 Pit logged from surface

2 Pit dry and stable

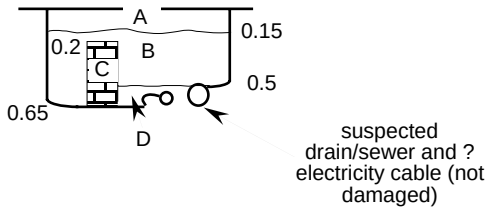
3 Soil samples taken at 0.1-0.5m, and 0.7-0.9m depth

Scale: 1:50	Client: Markey Construction Limited	Logged By: DJW

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER			TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 18.7m	**Co-Ordinates (c.)** E 383,018 N 217,112	**TP6**



DETAILS OF SUBSOIL

A CONCRETE: extremely strong former floor slab; unreinforced

B MADE GROUND: loose, angular, medium and coarse GRAVEL of light reddish-brown crystalline limestone (sub-base)

C BRICKWORK: intact former foundation – very difficult to excavate

D CLAY: probable firm, light brown, slightly sandy CLAY
(ALLUVIUM ?)

NOTES

1 Pit logged from surface; aborted due to difficulty of excavating old foundations

2 Pit dry and stable

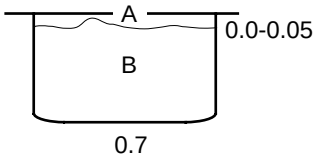
3 Soil samples taken at 0.25m, and 0.5m depth

Scale: 1:50	Client: Markey Construction Limited	Logged By: DJW

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 18.5m	**Co-Ordinates (c.)** E 383,001 N 217,107	**TP7**



DETAILS OF SUBSOIL

A TOPSOIL: probable soft, dark brown, very soily CLAY, and leaf litter (poorly developed)

B CLAY: probable firm, light brown, silty and plastic; occasional rootlets from overlying cover of buddleia bushes and weeds; occasional flecks of black charcoal
(ALLUVIUM ?)

NOTES

1 Pit logged from surface

2 Pit stable; slight seepage from base

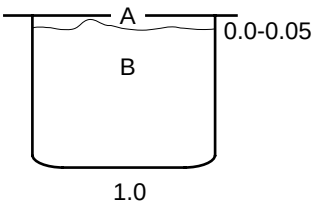
3 Soil samples taken at 0.0 - 0.3m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 18.5m	**Co-Ordinates (c.)** E 383,992 N 217,102	**TP8**



DETAILS OF SUBSOIL

A TOPSOIL: (poorly developed) probable soft, dark brown, slightly organic soily CLAY

B CLAY: probable firm, light brown, silty and plastic; slight seepage from 0.85m

NOTES

1 Pit logged from surface

2 Pit generally dry (slight seepage at/from 0.85m; stable

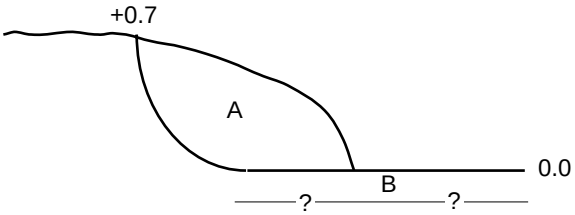
3 Soil sample taken at 0.0-0.25m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 19.0m	**Co-Ordinates (c.)** E 383,983 N 217,115	**TP9**



DETAILS OF SUBSOIL

A MADE GROUND: firm, light brown, gravelly and soily CLAY (gravel is coarse COBBLES of brick and concrete)

B CONCRETE: extremely strong, former floor slab, unreinforced

NOTES

1 Pit logged from surface

2 Pit dry and stable

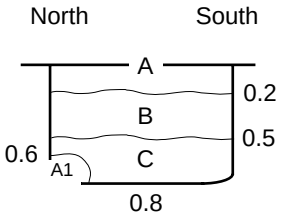
3 Soil samples taken at 0.0-0.4m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

[redacted]

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 18.11.14	**Ground Level (c.m, AOD)** 20.0m	**Co-Ordinates (c.)** E 383,938 N 217,150	**TP10**



DETAILS OF SUBSOIL

A CONCRETE: extremely strong/very dense, former yard hardstanding (unreinforced, basal polythene sheet)

A1 CONCRETE: former foundation ?

B MADE GROUND: probable loose to medium dense, fine to coarse, angular soily GRAVEL and COBBLES of cream limestone, whole and broken bricks

C CLAY: probable firm, mid to dark grey-brown, silty with flecks of back charcoal *(ALLUVIUM ?)*

NOTES

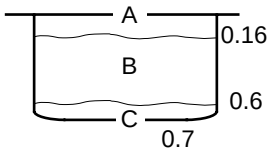
1 Pit logged from surface

2 Pit dry and stable

3 Soil samples taken at 0.2-0.5m, and 0.5-0.8m depth

Scale: 1:50	**Client**	Markey Construction Limited	**Logged By:** DJW

Site: FORMER NORVILLE WORKS, TARRINGTON ROAD, TREDWORTH, GLOUCESTER				TRIAL PIT No.
Job No. 3829	**Date** 19.11.14	**Ground Level (c.m, AOD)** 19.2m	**Co-Ordinates (c.)** E 383,918 N 217,193	**TP11**



DETAILS OF SUBSOIL

A HARDSTAND: probable strong, grey CONCRETE

B MADE GROUND: probable soft, dark brown, sandy, gravelly CLAY (gravel is brick, charcoal, ash)

C CLAY: probable soft, dull yellowish-brown, slightly sandy CLAY
(ALLUVIUM / CHELTENHAM SAND ?)

NOTES

1 Pit excavated by hand; logged from surface

2 Pit dry and stable

3 Soil samples taken at 0.4m, and 0.65m depth

Scale: 1:50	**Client** Markey Construction Limited	**Logged By:** TC

APPENDIX 3

CONTAMINATION
STATUTORY FRAMEWORK / METHODOLOGY
AND
CERTIFIED CONTAMINATION TEST RESULTS

A3 CONTAMINATION RISK ASSESSMENT

Statutory Framework

A3.1 Part 11A of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from existing land contamination. In accordance with the Act and the statutory guidance document on the Contaminated Land (England) Regulations 2000, the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only 'contaminated land' where it appears to the regulatory authority, by reason of substances within or under the land, that:

- Significant harm is being caused or there is significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

A3.2 The UK guidance on the assessment of land contamination has developed as a direct result of the introduction of these two Acts. The technical guidance supporting the new legislation has been summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs), a proposed series of twelve documents. Seven were originally published in March 1994, four more were published in April 2002, while the last remaining guidance document (CLR 11 was published in 2004. In 2008 CLR reports 7 to 10 were withdrawn by the Department of Environment Food & Rural Affairs and the Environment Agency and updated versions of CLR 9 and 10 were produced in the form of Science Reports SR2 and SR3.

A3.3 The guidance defines 'risk' as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (e.g. exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

A3.4 For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e. a substance that is capable of causing pollution or harm;

- A pathway, i.e. a route by which the contaminant can reach the receptor; and
- A receptor (or target), i.e. something which could be adversely affected by the contaminant.

A3.5 If any one of these elements is missing there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

A3.6 The presence of contamination is also a material issue in the determination of planning applications, and where a change of use is proposed, especially on brownfield (former industrial) land, investigation, assessment and remediation of contamination is often a requirement of the Planning Authority. The presence of contamination may consequently require remedial action prior to redevelopment, in circumstances which would otherwise be unlikely to result in the determination of the land as contaminated land as defined in the above legislation.

Contamination Assessment Methodology

A3.7 The guidance proposes a four-stage assessment process for identifying potential pollutant linkages on a site. These stages are set out in the table below:

No.	Process	Description
1	Hazard Identification	Establishing contaminant sources, pathways and receptors (the preliminary conceptual site model).
2	Hazard Assessment	Analysing the potential for unacceptable risks (what linkages could be present, what could be the effects).
3	Risk Estimation	Trying to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it).
4	Risk Evaluation	Deciding whether the risk is unacceptable.

A3.8 Stages 1 and 2 develop a *'preliminary conceptual model'* based upon information collated from desk studies and usually a site walkover inspection. The formation of a conceptual site model is an iterative process, and it should be updated and refined throughout each stage of the project to reflect any additional information obtained.

A3.9 The information gleaned from the desk studies and associated enquiries is presented in a desk study report with recommendations, if necessary, for further work based

upon the preliminary conceptual site model. CLR 8, together with specific DoE 'Industry Profiles' provides guidance on the nature of contaminants relating to specific industrial processes. Whilst it is acknowledged that CLR 8 has been withdrawn no replacement guidance has yet been published that lists the contaminants likely to be present on contaminated sites, thus CLR 8 guidance is still considered relevant.

A3.10 If the preliminary conceptual model identifies potential pollutant linkages, a Phase 2 site investigation is normally recommended, unless appropriate mitigation measures can be incorporated into the proposed development sufficient to negate the identified risks, subject to local planning authority approval. The number of exploratory holes and samples collected for analysis should be consistent with the size of the site and the level of risk envisaged. This will enable a contamination risk assessment to be conducted, at which point the preliminary conceptual model can be updated and relevant pollutant linkages identified.

Preliminary Risk Assessment

A3.11 By considering the various potential sources, pathways and receptors, a preliminary assessment of potential risk is made based upon the likelihood of the occurrence and the severity of the potential consequence, the latter being a function of the sensitivity of the receptor. At Phase 1 desk study stage the qualitative risk assessment is based on the categories tabulated below.

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution to controlled waters
Moderate	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species

A3.12 The likelihood of an event (probability) takes into account both the presence of the hazard and receptor and viability of the pathway, and is based on the categories tabulated below.

Category	Definition
Highly likely	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Possible	Pollution linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

A3.13 On this basis potential hazards are assigned a risk rating as shown below.

		Consequence			
		Severe	***Moderate***	***Mild***	***Minor***
Probability (Likelihood)	**Highly likely**	very high	high	moderate	low
	Likely	high	moderate	low/moderate	low
	Possible	moderate	low/moderate	low	very low
	Unlikely	low/moderate	low	very low	very low

A3.14 At Phase 2 stage, quantitative assessment of human health risk posed by ground contamination is achieved by comparison of soil concentrations with Tier 1 Generic Assessment Criteria (GAC) screening values developed by LQM (2009), and/or Soil Guideline Values as published by the Environment Agency (2009). The official Soil Guideline Values utilise a soil organic matter content of 6% which is considered to be higher than typical UK soils, however three sets of GAC's have been developed for organic matter contents of 1%, 2.5% and 6%, thus the most appropriate set is selected based upon proven site conditions.

A3.15 Contaminant concentrations below the threshold screening values are considered not to warrant further risk assessment. Concentrations of contaminants above these screening values require further consideration of potential pollutant linkages and may indicate potentially unacceptable risks to site users. Such exceedances may trigger a Tier 2 detailed quantitative risk assessment (DQRA) where site-specific parameters are used to derive site specific assessment criteria. It should be noted

that exceedance of a screening value does not necessarily indicate that the site requires remediation.

A3.16 In order to assess any risk to controlled waters posed by contaminants within the underlying soils and groundwater laboratory results have been screened against Level 1 criteria derived from the EA Environmental Quality Standards (EQS) values and the current UK Drinking Water Supply (Water Quality) Regulations (DWS), dependant upon the most vulnerable receptor. The EQS is usually an upper concentration set for the receiving watercourse and not the discharge itself. The DWS is established for compliance at the point of use or abstraction and not the source area.

SUMMARY OF CONTAMINATION TESTING RESULTS

			SOILS													WATER									
				TOXIC METALS (mg/kg)							PHYTOTOXIC METALS (mg/kg)					TOXIC METALS (µg/l)							PHYTOTOXIC METALS (µg/l)		
Sample Ref	Sample Depth	Sample of	pH	Arsenic	Cadmium	Chromium	Lead	Mercury	Selenium	Nickel	Copper	Zinc	Asbestos Screen	Asbestos Quantification (%)	Moisture Content @ 105 C (%)	Soil Organic Moisture (%)	Arsenic	Cadmium	Chromium	Lead	Mercury	Selenium	Nickel	Copper	Zinc	Hardness expressed as $CaCO_3$ (mg/l)
WS1	0.5	made ground	7.8	16	<1	31	40	<1	<3	24	27	80			16											
WS2	0.25	made ground	11.5	11	<1	14	29	<1	<3	11	13	53			10											
WS3		WATER	7.4														1.2	0.05	2	<0.3	<0.05	1.6	6	1.7	4	480
WS3	0.3	made ground	8.2	13	<1	22	83	<1	<3	20	110	140			14											
WS4		WATER	7.4														2.9	0.03	3	<0.3	<0.05	2.6	3	1.5	<2	
WS4	0.4	made ground											Am	<0.001												
WS5	0.1	made ground											ND													
WS5	0.3	made ground	8.1												16											
WS5	0.9	clay		13	<1	35	15	<1	<3	26	18	72			17											
WS6	0.6	made ground													17											
WS6	0.7	made ground	7.8	17	<1	34	140	<1	<3	36	62	220			16											
WS7	0.2	made ground	10.7												11											
WS7	1.0	made ground		16	<1	24	120	<1	<3	27	48	190			16											
TP1	0.2-0.5	made ground											Chr	<0.001												
TP1	0.8	clay		13	<1	28	35	<1	<3	24	24	110			15											
TP2	0.25	made ground											ND													
TP2	0.5	made ground													17											
TP2	0.7	clay		12	<1	28	26	<1	<3	22	22	62			14											
TP3	0.3	made ground											ND													
TP3	0.5	made ground													13											
TP3	0.7	clay		10	<1	23	34	<1	<3	16	22	61			12											
TP4	0.0-0.35	made ground											Chr	<0.001												
TP4	0.7	clay		12	<1	28	46	<1	<3	22	33	100			13											
TP5	0.3	made ground											Am	<0.001												
TP5	0.5	made ground													18											
TP5	0.9	clay	7.8	15	<1	40	44	<1	<3	29	26	99			25											
TP6	0.15-0.5	made ground											ND													
TP6	0.5	clay		11	<1	31	17	<1	<3	23	17	61			24	2.1										
TP7	0.05	made ground											ND													
TP7	0.3	clay	8.0												16											
TP7	1.0	clay														7.6										
TP8	0.0-0.25	made ground											ND													
TP8	0.1	made ground											ND													
TP8	0.25	clay		15	<1	37	60	<1	<3	29	39	94	ND		16											
TP9	0.25	made ground											ND													
TP9	0.4	made ground		16	<1	35	150	<1	<3	27	45	140			26											
TP10	0.2-0.6	made ground											ND													
TP10	0.8	made ground		16	<1	27	120	<1	<3	26	60	180			17											
TP11	0.4	made ground													19											
TP11	0.65	clay		13	<1	30	46	<1	<3	21	30	99			18	2.2										
SS1		made ground											ND													
SS2		made ground											ND													
Sudbrook	Upstream	WATER	8.0														1.1	<0.02	2	<0.3	<0.05	0.8	2	2.3	<2	350
	Downstream	WATER	8.4														1.1	<0.02	2	<0.3	<0.05	0.9	2	2.7	<2	
TIER 1: GENERIC ASSESSMENT CRITERIA																										
Soil Guideline Value (Residential with homegrown produce)				32	10	* 170	♣ 450	170	350	130	* 1310	* 2570														
Soil Guideline Value (Allotment)				43	1.8			80	120	230																
Soil Guideline Value (Commercial)				640	230	* 5370	♣ 750	3600	13000	1800	* 45000	* 572000														
CIEH GAC for residential with plant uptake **				32	10	3000					2300	3750														
CIEH GAC allotments **					0.53	35000					520	620														
CIEH GAC for commercial/industrial **					348	30000					72000	670000														
TIER 2: SITE SPECIFIC																										
Upper Confidence Limit [on true mean concentration, u] (CIEH Statistical Calculator)																										
Site-Specific Assessment Criteria (SSAC's) residential with homegrown produce				32.4	5.2	170	♣ 450	168	350	531	1310	2570														
EA EQS "River Basin Districts Typology, Standards & Groundwater Threshold Values (Water Framework Directive) (England & Wales) Directions 2010"																	50	0.25	4.7	7.2	0.07		20	28	125	
EA EQS "Environment Agency Guidance to Third Parties on Pollution of Controlled Waters for Part IIA of the 1990 Environmental Protection Act"																	50	5	150-250	20-250	1		50-200	1-28	75-500	
UK Drinking Water Standards "The Water Supply (Water Quality) Regulations 2000"																	10	5	50	25	1	10	50	2000	5000	

** Based on Soil Organic Matter of 6% (CIEH 2009)

Values in brackets indicate the solubility or vapour saturation limit (where this is exceeded by the GAC)

♣ DEFRA/EA derived SGV

* Generic SGV's calculated in-house using CLEA v1.06 based on standard parameters including sandy loam, pH =7, SOM = 6%, female and where appropriate a semi-detached house

ND = Non Detect Chr = Chrysotile Am = Amosite

SUMMARY OF POLYAROMATIC HYDROCARBON (PAH) TESTING RESULTS

Sample Ref	Sample Depth (m)	Sample of	SOIL (mg/kg)																WATER (µgl)															
			TOTAL PAH (mg/kg)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)Anthracene	Chrysene	Benzo(bk)Fluoranthene	Benzo(a)Pyrene	Indeno(1,2,3-cd)Pyrene	Dibenzo(ah)Anthracene	Benzo(ghi)Perylene	TOTAL PAH (mg/l)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)Anthracene	Chrysene	Benzo(bk)Fluoranthene	Benzo(a)Pyrene	Dibenzo(ah)Anthracene	Indeno(1,2,3)perylene	Benzo(ghi)Perylene
WS3		WATER																	0.17	0.04	<0.01	0.01	0.02	0.02	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02
WS4		WATER																	0.04	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
WS4	0.35	made ground	1.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.2	<0.01	0.1	0.5	0.2	0.2	<0.01	0.3																
WS6	0.6	made ground	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.1	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01																
TP1	0.5	made ground	14	<0.01	<0.01	<0.01	<0.01	1.1	0.3	2.0	1.9	1.2	1.2	2.6	1.7	1.0	0.3	1.1																
TP2	0.5	made ground	4.3	<0.01	<0.01	<0.01	<0.01	0.3	<0.01	0.5	0.6	0.4	0.5	1.0	0.4	0.3	<0.01	0.3																
TP3	0.5	made ground	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01																
TP4	0.35	made ground	1.5	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	0.3	0.3	0.1	0.1	0.3	0.2	<0.01	<0.01	0.1																
TP5	0.5	made ground	9.2	<0.01	<0.01	<0.01	<0.01	0.3	<0.01	1.4	1.8	0.6	0.8	2.0	1.0	0.5	0.2	0.6																
TP11	0.4	made ground	0.8	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	0.3	0.2	<0.01	<0.01	0.2	<0.01	<0.01	<0.01	<0.01																
Sudbrook	Upstream	WATER																	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Downstream	WATER																	0.11	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.04	0.03	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TIER 1: GENERIC ASSESSMENT CRITERIA																																		
Soil Guideline Value (Residential with homegrown produce)																																		
Soil Guideline Value (Allotment)																																		
Soil Guideline Value (Commercial)																																		
CIEH GAC for residential with plant uptake **				8.7	850	1000	780	380	9200	670	1600	5.90	9.3	7	1	4.2	0.90	47																
CIEH GAC allotments **				23	160	200	160	90	2200	290	620	10	12	13	2.1	7.1	2.3	160																
CIEH GAC for commercial/industrial **				1100 (432)	100000	100000	71000	23000	540000	23000	54000	97	140	100	14	62	13	660																
TIER 2: SITE SPECIFIC																																		
Upper Confidence Limit [on true mean concentration, u] (CIEH Statistical Calculator)																																		
Site-Specific Assessment Criteria (SSAC's) residential with homegrown produce				5.9			1650								0.98		0.99																	
EA EQS "River Basin Districts Typology, Standards & Groundwater Threshold Values (Water Framework Directive) (England & Wales) Directions 2010"																				2.4									0.03	0.05	Sum of = 0.002		
UK Drinking Water Standards "The Water Supply (Water Quality) Regulations 2000"																				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.01	0.1	0.1	0.1

SUMMARY OF DIESEL RANGE ORGANICS (DRO) TEST RESULTS

Sample Ref	Sample Depth	Sample of	SOIL (mg/kg)															WATER (mg/l)						
			ALIPHATIC						AROMATIC							BANDED						BANDED						
			C6 - C8	C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	C6 - C7	C7 - C8	C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	C6 - C8	C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35
WS1	2.3	clay	<0.010	<0.010	<1	<1	<1	<1	<0.010	<0.010	<0.010	<1	<1	<1	<1											
WS3		WATER																			<0.010	<0.010	<0.010	0.02	0.03	0.06
WS4		WATER																			<0.010	<0.010	<0.010	0.02	0.03	0.07
WS4	0.35	made ground														<1	<1	<1	10	160						
TP3	0.5	made ground														<1	<1	<1	1	13						
TP4	0.35	made ground														<1	<1	1	5	22						
TP6	0.25	made ground														(3) <10	12	56	470	1400						
TP10	0.5	made ground														(3) <10	(3) <10	29	220	780						
Sudbrook	Upstream	WATER																			<0.010	<0.010	<0.010	<0.01	<0.01	0.04
	Downstream	WATER																			<0.010	<0.010	<0.010	<0.01	0.01	0.05
TIER 1: GENERIC ASSESSMENT CRITERIA																										
Soil Guideline Value (Residential with homegrown produce)			73	19	93	740	45000	45000	65	120	27	69	140	250	890	46	162	880	45250	45890						
Soil Guideline Value (Allotment)																										
Soil Guideline Value (Commercial)																										
CIEH GAC for residential with plant uptake **			370	110	540 (283)	3000 (142)	76000	76000	280	611	151	346	593	770	1230	261	886 (283)	3593 (142)	76770	77230						
CIEH GAC allotments **			13000	1700	7300	13000	270000	270000	57	120	51	74	130	260	1600	1751	8260	13130	270260	363230						
CIEH GAC for commercial/industrial **			42000 (736)	12000 (451)	49000 (283)	91000 (142)	1800000	1800000	90000 (4710)	190000 (4360)	18000 (3580)	34500 (2150)	37800	28000	28000	30000 (4031)	83500 (2433)	128800 (142)	1828000	1828000						
TIER 2: SITE SPECIFIC																										
Upper Confidence Limit [on true mean concentration, u] (CIEH Statistical Calculator)																										
Site-Specific Assessment Criteria (SSAC's) residential with homegrown produce			789	39.1	195	1280	177000	177000			108	217	594	1340	2360											
EA EQS "River Basin Districts Typology, Standards & Groundwater Threshold Values (Water Framework Directive) (England & Wales) Directions 2010"																										
UK Drinking Water Standards "The Water Supply (Water Quality) Regulations 2000"																										

Scientific Analysis Laboratories Ltd

Certificate of Analysis

[redacted]

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Report Number: Supplement to 438417-1

Date of Report: 05-Dec-2014

Customer: Wilson Associates (Consulting) Limited
36 Brunswick Road
Gloucester
GL1 1JJ

Customer Contact: [redacted]

Customer Job Reference: 3829
Customer Purchase Order: 3829/TC
Date Job Received at SAL: 24-Nov-2014
Date Analysis Started: 26-Nov-2014
Date Analysis Completed: 03-Dec-2014

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

1549

[redacted]

[redacted]

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Moisture

				SAL Reference	**438417 001**	**438417 006**	**438417 010**	**438417 012**	**438417 017**	**438417 018**	**438417 019**	**438417 020**	**438417 024**	**438417 025**
				Customer Sample Reference	**BHWS1**	**BHWS2**	**BHWS3**	**BHWS4**	**BHWS5**	**BHWS5**	**BHWS6**	**BHWS6**	**BHWS7**	**BHWS7**
				Top Depth				**0.15**	**0.0**					
				Bottom Depth	**0.5**	**0.25**	**0.3**	**0.35**	**0.3**	**0.9**	**0.6**	**0.7**	**0.2**	**1.0**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**										
Moisture @ 105 C	T162	AR	0.1	%	**16**	**10**	**14**	**22**	**16**	**17**	**17**	**16**	**11**	**16**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Moisture

				SAL Reference	**438417 026**	**438417 027**	**438417 028**	**438417 029**	**438417 030**	**438417 031**	**438417 032**	**438417 033**	**438417 034**	**438417 035**
				Customer Sample Reference	**TP1**	**TP1**	**TP2**	**TP2**	**TP3**	**TP3**	**TP4**	**TP4**	**TP5**	**TP5**
				Top Depth	**0.2**	**0.6**	**0.2**	**0.6**	**0.3**	**0.5**	**0.0**	**0.35**	**0.1**	**0.7**
				Bottom Depth	**0.5**	**0.8**	**0.5**	**0.7**	**0.5**	**0.7**	**0.35**	**0.7**	**0.5**	**0.9**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**
				Type	**Sandy Soil**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**										
Moisture @ 105 C	T162	AR	0.1	%	**17**	**15**	**17**	**14**	**13**	**12**	**17**	**13**	**18**	**25**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Moisture

				SAL Reference	**438417 037**	**438417 038**	**438417 039**	**438417 040**	**438417 042**	**438417 043**	**438417 044**
				Customer Sample Reference	**TP6**	**TP7**	**TP8**	**TP9**	**TP10**	**TP11**	**TP11**
				Top Depth		**0.0**	**0.0**	**0.0**	**0.5**		
				Bottom Depth	**0.5**	**0.3**	**0.25**	**0.4**	**0.8**	**0.4**	**0.65**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**19-NOV-2014**	**19-NOV-2014**
				Type	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**							
Moisture @ 105 C	T162	AR	0.1	%	**24**	**16**	**16**	**26**	**17**	**19**	**18**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Heavy Metals(9)

				SAL Reference	**438417 001**	**438417 006**	**438417 010**	**438417 018**	**438417 020**	**438417 025**	**438417 027**	**438417 029**	**438417 031**	**438417 033**
				Customer Sample Reference	**BHWS1**	**BHWS2**	**BHWS3**	**BHWS5**	**BHWS6**	**BHWS7**	**TP1**	**TP2**	**TP3**	**TP4**
				Top Depth							**0.6**	**0.6**	**0.5**	**0.35**
				Bottom Depth	**0.5**	**0.25**	**0.3**	**0.9**	**0.7**	**1.0**	**0.8**	**0.7**	**0.7**	**0.7**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Clay**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**										
Arsenic	T6	M40	2	mg/kg	**16**	**11**	**13**	**13**	**17**	**16**	**13**	**12**	**10**	**12**
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**31**	**14**	**22**	**35**	**34**	**24**	**28**	**28**	**23**	**28**
Copper	T6	M40	1	mg/kg	**27**	**13**	**110**	**18**	**62**	**48**	**24**	**22**	**22**	**33**
Lead	T6	M40	1	mg/kg	**40**	**29**	**83**	**15**	**140**	**120**	**35**	**26**	**34**	**46**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**24**	**11**	**20**	**26**	**36**	**27**	**24**	**22**	**16**	**22**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**80**	**53**	**140**	**72**	**220**	**190**	**110**	**62**	**61**	**100**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Heavy Metals(9)

				SAL Reference	**438417 035**	**438417 037**	**438417 039**	**438417 040**	**438417 042**	**438417 044**
				Customer Sample Reference	**TP5**	**TP6**	**TP8**	**TP9**	**TP10**	**TP11**
				Top Depth	**0.7**		**0.0**	**0.0**	**0.5**	
				Bottom Depth	**0.9**	**0.5**	**0.25**	**0.4**	**0.8**	**0.65**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**19-NOV-2014**
				Type	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**						
Arsenic	T6	M40	2	mg/kg	**15**	**11**	**15**	**16**	**16**	**13**
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**40**	**31**	**37**	**35**	**27**	**30**
Copper	T6	M40	1	mg/kg	**26**	**17**	**39**	**45**	**60**	**30**
Lead	T6	M40	1	mg/kg	**44**	**17**	**60**	**150**	**120**	**46**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**29**	**23**	**29**	**27**	**26**	**21**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**99**	**61**	**94**	**140**	**180**	**99**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Asbestos

				SAL Reference	**438417 026**	**438417 032**	**438417 039**
				Customer Sample Reference	**TP1**	**TP4**	**TP8**
				Top Depth	**0.2**	**0.0**	**0.0**
				Bottom Depth	**0.5**	**0.35**	**0.25**
				Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**
				Type	**Sandy Soil**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Asbestos ID	T27	AR			Chrysotile Detected	Chrysotile Detected	N.D.

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
pH

SAL Reference	438417 001	438417 006	438417 010	438417 017	438417 020	438417 024	438417 035	438417 038
Customer Sample Reference	BHWS1	BHWS2	BHWS3	BHWS5	BHWS6	BHWS7	TP5	TP7
Top Depth				0.0			0.7	0.0
Bottom Depth	0.5	0.25	0.3	0.3	0.7	0.2	0.9	0.3
Date Sampled	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014
Type	Clay	Clay	Sandy Soil	Clay	Sandy Soil	Sandy Soil	Clay	Clay

Determinand	Method	Test Sample	LOD	Units								
pH	T7	AR			**7.8**	**11.5**	**8.2**	**8.1**	**7.8**	**10.7**	**7.8**	**8.0**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
SOM

SAL Reference	438417 025	438417 037	438417 044
Customer Sample Reference	BHWS7	TP6	TP11
Bottom Depth	1.0	0.5	0.65
Date Sampled	18-NOV-2014	18-NOV-2014	19-NOV-2014
Type	Sandy Soil	Clay	Clay

Determinand	Method	Test Sample	LOD	Units			
Soil Organic Matter	T287	M40	0.1	%	**7.6**	**2.1**	**2.2**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Wilson Sulphate Suite

SAL Reference	438417 002	438417 003	438417 004	438417 007	438417 008	438417 009	438417 013	438417 014	438417 015	438417 021
Customer Sample Reference	BHWS1	BHWS1	BHWS1	BHWS2	BHWS2	BHWS2	BHWS4	BHWS4	BHWS4	BHWS6
Bottom Depth	1.0	2.0	3.0	0.5	2.5	3.5	1.5	2.75	4.0	1.2
Date Sampled	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014

Determinand	Method	Test Sample	LOD	Units										
SO4(2:1) as SO3	T82	AR	50	mg/l	**110**	<50	<50	<50	<50	**59**	<50	<50	**430**	**93**
SO4(Total)	T102	M40	0.01	%	**0.10**	**0.09**	**0.08**	**0.03**	**0.09**	**0.16**	**0.04**	**0.02**	**0.39**	**0.17**
(Total Potential) SO4(Total) Expressed as SO4	T182	M40	0.15	%	<0.15	<0.15	<0.15	<0.15	**0.22**	**2.9**	<0.15	<0.15	**4.2**	**0.18**
(Water Soluble) SO4(2:1) expressed as SO4	T242	AR	10	mg/l	**130**	**23**	**22**	**12**	**37**	**71**	**10**	<10	**510**	**110**
(Oxidisable) Sulphide Expressed as SO4	T194	M40	0.01	%	<0.05	<0.06	<0.07	<0.12	**0.13**	**2.7**	<0.11	<0.13	**3.8**	**0.01**
pH	T7	AR			**7.7**	**8.0**	**7.9**	**8.5**	**8.2**	**8.4**	**8.0**	**8.0**	**7.9**	**7.7**
Sulphur (total)	T21	M40	0.05	%	<0.05	<0.05	<0.05	<0.05	**0.07**	**0.98**	<0.05	<0.05	**1.4**	**0.06**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Wilson Sulphate Suite

	SAL Reference	438417 022	438417 023
	Customer Sample Reference	BHWS6	BHWS6
	Bottom Depth	1.6	2.4
	Date Sampled	18-NOV-2014	18-NOV-2014

Determinand	Method	Test Sample	LOD	Units		
SO4(2:1) as SO3	T82	AR	50	mg/l	**85**	<50
SO4(Total)	T102	M40	0.01	%	**0.14**	**0.13**
(Total Potential) SO4(Total) Expressed as SO4	T182	M40	0.15	%	<0.15	**0.22**
(Water Soluble) SO4(2:1) expressed as SO4	T242	AR	10	mg/l	**100**	**46**
(Oxidisable) Sulphide Expressed as SO4	T194	M40	0.01	%	<0.01	**0.09**
pH	T7	AR			**8.0**	**8.1**
Sulphur (total)	T21	M40	0.05	%	<0.05	**0.07**

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

	SAL Reference	438417 012	438417 019	438417 026	438417 028	438417 030	438417 032	438417 034	438417 043
	Customer Sample Reference	BHWS4	BHWS6	TP1	TP2	TP3	TP4	TP5	TP11
	Top Depth	0.15		0.2	0.2	0.3	0.0	0.1	
	Bottom Depth	0.35	0.6	0.5	0.5	0.5	0.35	0.5	0.4
	Date Sampled	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	18-NOV-2014	19-NOV-2014
	Type	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Clay

Determinand	Method	Test Sample	LOD	Units							
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	<0.1	**1.1**	**0.3**	<0.1	**0.1**	**0.3**	**0.1**
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.3**	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	**0.1**	**0.1**	**2.0**	**0.5**	<0.1	**0.3**	**1.4**	**0.3**
Pyrene	T207	M105	0.1	mg/kg	**0.2**	**0.1**	**1.9**	**0.6**	<0.1	**0.3**	**1.8**	**0.2**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	**1.2**	**0.4**	<0.1	**0.1**	**0.6**	<0.1
Chrysene	T207	M105	0.1	mg/kg	**0.1**	<0.1	**1.2**	**0.5**	<0.1	**0.1**	**0.8**	<0.1
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	**0.5**	**0.1**	**2.6**	**1.0**	**0.1**	**0.3**	**2.0**	**0.2**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	**0.2**	<0.1	**1.7**	**0.4**	<0.1	**0.2**	**1.0**	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	**0.2**	<0.1	**1.0**	**0.3**	<0.1	<0.1	**0.5**	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.3**	<0.1	<0.1	<0.1	**0.2**	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	**0.3**	<0.1	**1.1**	**0.3**	<0.1	**0.1**	**0.6**	<0.1
PAH(total)	T207	M105	0.1	mg/kg	**1.6**	**0.3**	**14**	**4.3**	**0.1**	**1.5**	**9.2**	**0.8**

SAL Reference: 438417
Customer Reference: 3829

Water Analysed as Water
Miscellaneous

	SAL Reference	438417 011	438417 016	438417 045	438417 046
	Customer Sample Reference	BHWS3	BHWS4	Sud Brook-Upstream	Sud Brook-Downstream
	Date Sampled	18-NOV-2014	18-NOV-2014	19-NOV-2014	19-NOV-2014

Determinand	Method	Test Sample	LOD	Units				
Hardness expressed as CaCO3	T6	AR	10	mg/l	**480**	-	**350**	-
pH	T7	AR			**7.4**	**7.4**	**8.0**	**8.4**

SAL Reference: 438417
Customer Reference: 3829

Water Analysed as Water
Heavy Metals(9)

SAL Reference	**438417 011**	**438417 016**	**438417 045**	**438417 046**
Customer Sample Reference	**BHWS3**	**BHWS4**	**Sud Brook - Upstream**	**Sud Brook - Downstream**
Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**19-NOV-2014**	**19-NOV-2014**

Determinand	Method	Test Sample	LOD	Units				
As (Dissolved)	T281	AR	0.2	µg/l	**1.2**	**2.9**	**1.1**	**1.1**
Cd (Dissolved)	T281	AR	0.02	µg/l	**0.05**	**0.03**	<0.02	<0.02
Cr (Dissolved)	T281	AR	1	µg/l	**2**	**3**	**2**	**2**
Cu (Dissolved)	T281	AR	0.5	µg/l	**1.7**	**1.5**	**2.3**	**2.7**
Pb (Dissolved)	T281	AR	0.3	µg/l	<0.3	<0.3	<0.3	<0.3
Hg (Dissolved)	T281	AR	0.05	µg/l	<0.05	<0.05	<0.05	<0.05
Ni (Dissolved)	T281	AR	1	µg/l	**6**	**3**	**2**	**2**
Se (Dissolved)	T281	AR	0.5	µg/l	**1.6**	**2.6**	**0.8**	**0.9**
Zn (Dissolved)	T281	AR	2	µg/l	**4**	<2	<2	<2

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Total Petroleum Hydrocarbons (C6-C35 aliphatic/aromatic)

SAL Reference	**438417 005**
Customer Sample Reference	**BHWS1**
Bottom Depth	**2.3**
Date Sampled	**18-NOV-2014**

Determinand	Method	Test Sample	LOD	Units	
TPH (C6-C8 aliphatic)	T54	M105	0.010	mg/kg	<0.010
TPH (C8-C10 aliphatic)	T54	M105	0.010	mg/kg	<0.010
TPH (C10-C12 aliphatic)	T8	M105	1	mg/kg	<1
TPH (C12-C16 aliphatic)	T8	M105	1	mg/kg	<1
TPH (C16-C21 aliphatic)	T8	M105	1	mg/kg	<1
TPH (C21-C35 aliphatic)	T8	M105	1	mg/kg	<1
TPH (C6-C7 aromatic)	T54	M105	0.010	mg/kg	<0.010
TPH (C7-C8 aromatic)	T54	M105	0.010	mg/kg	<0.010
TPH (C8-C10 aromatic)	T54	M105	0.010	mg/kg	<0.010
TPH (C10-C12 aromatic)	T8	M105	1	mg/kg	<1
TPH (C12-C16 aromatic)	T8	M105	1	mg/kg	<1
TPH (C16-C21 aromatic)	T8	M105	1	mg/kg	<1
TPH (C21-C35 aromatic)	T8	M105	1	mg/kg	<1

SAL Reference: 438417
Customer Reference: 3829

Soil Analysed as Soil
Total Petroleum Hydrocarbons Banded (C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)

SAL Reference	**438417 012**	**438417 030**	**438417 032**	**438417 036**	**438417 041**
Customer Sample Reference	**BHWS4**	**TP3**	**TP4**	**TP6**	**TP10**
Top Depth	**0.15**	**0.3**	**0.0**		**0.2**
Bottom Depth	**0.35**	**0.5**	**0.35**	**0.25**	**0.5**
Date Sampled	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**	**18-NOV-2014**
Type	**Sandy Soil**	**Sandy Soil**	**Clay**		

Determinand	Method	Test Sample	LOD	Units					
TPH (C8-C10)	T8	AR	1	mg/kg	<1	<1	<1	(9) <10	(9) <10
TPH (C10-C12)	T8	AR	1	mg/kg	<1	<1	<1	**12**	(9) <10
TPH (C12-C16)	T8	AR	1	mg/kg	<1	<1	**1**	**56**	**29**
TPH (C16-C21)	T8	AR	1	mg/kg	**10**	**1**	**5**	**470**	**220**
TPH (C21-C35)	T8	AR	1	mg/kg	**160**	**13**	**22**	**1400**	**780**

SAL Reference: 438417
Customer Reference: 3829

Water Analysed as Water
Total and Speciated USEPA16 PAH

	SAL Reference	438417 011	438417 016	438417 045	438417 046
	Customer Sample Reference	BHWS3	BHWS4	Sud Brook - Upstream	Sud Brook - Downstream
	Date Sampled	18-NOV-2014	18-NOV-2014	19-NOV-2014	19-NOV-2014
Determinand	Method / Test Sample / LOD / Units				
Naphthalene	T149 AR 0.01 µg/l	**0.04**	**0.04**	<0.01	<0.01
Acenaphthylene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	<0.01
Acenaphthene	T149 AR 0.01 µg/l	**0.01**	<0.01	<0.01	<0.01
Fluorene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	<0.01
Phenanthrene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	**0.02**
Anthracene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	<0.01
Fluoranthene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	**0.04**
Pyrene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	**0.03**
Benzo(a)Anthracene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	**0.01**
Chrysene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	**0.01**
Benzo(b/k)Fluoranthene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(a)Pyrene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)Pyrene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	<0.01
Dibenzo(ah)Anthracene	T149 AR 0.01 µg/l	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)Perylene	T149 AR 0.01 µg/l	**0.02**	<0.01	<0.01	<0.01
PAH(total)	T149 AR 0.01 µg/l	**0.17**	**0.04**	<0.01	**0.11**

SAL Reference: 438417
Customer Reference: 3829

Water Analysed as Water
Total Petroleum Hydrocarbons (C6-C35) (MCR) Banded

	SAL Reference	438417 011	438417 016	438417 045	438417 046
	Customer Sample Reference	BHWS3	BHWS4	Sud Brook - Upstream	Sud Brook - Downstream
	Date Sampled	18-NOV-2014	18-NOV-2014	19-NOV-2014	19-NOV-2014
Determinand	Method / Test Sample / LOD / Units				
TPH (C6-C8)	T215 AR 0.010 mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C8-C10) DW	T215 AR 0.010 mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C10-C12) DW	T81 AR 0.01 mg/l	<0.01	<0.01	<0.01	<0.01
TPH (C12-C16) DW	T81 AR 0.01 mg/l	**0.02**	**0.02**	<0.01	<0.01
TPH (C16-C21) DW	T81 AR 0.01 mg/l	**0.03**	**0.03**	<0.01	**0.01**
TPH (C21-C35) DW	T81 AR 0.01 mg/l	**0.06**	**0.07**	**0.04**	**0.05**

Index to symbols used in Supplement to 438417-1

Value	Description
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
AR	As Received
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
N.D.	Not Detected
9	LOD raised due to dilution of sample
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Supplemental report issued in order to include top and bottom depths.
Asbestos was subcontracted to REC Asbestos

Method Index

Value	Description
T6	ICP/OES
T82	ICP/OES (Sim)
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T162	Grav (1 Dec) (105 C)
T21	OX/IR
T54	GC/MS (Headspace)
T81	GC/FID (LV)
T102	ICP/OES (HCl extract)
T8	GC/FID
T7	Probe
T149	GC/MS (SIR)
T27	PLM
T207	GC/MS (MCERTS)
T215	GC/MS (Headspace)(LV)
T194	Calc (TRL 447 T 4.11)
T287	Calc TOC/0.58
T182	Calc (TRL 447 T4.13)
T281	ICP/MS (Filtered)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Moisture @ 105 C	T162	AR	0.1	%	N	001,006,010,012,017-020,024-035,037-040,042-044
Arsenic	T6	M40	2	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Cadmium	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Chromium	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Copper	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Lead	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Mercury	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Nickel	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Selenium	T6	M40	3	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Zinc	T6	M40	1	mg/kg	M	001,006,010,018,020,025,027,029,031,033,035,037,039-040,042,044
Asbestos ID	T27	AR			SU	026,032,039
pH	T7	AR			M	001,006,010,017,020,024,035,038
Soil Organic Matter	T287	M40	0.1	%	N	025,037,044
SO4(2:1) as SO3	T82	AR	50	mg/l	N	002-004,007-009,013-015,021-023
SO4(Total)	T102	M40	0.01	%	N	002-004,007-009,013-015,021-023
(Total Potential) SO4(Total) Expressed as SO4	T182	M40	0.15	%	N	002-004,007-009,013-015,021-023
(Water Soluble) SO4(2:1) expressed as SO4	T242	AR	10	mg/l	N	002-004,007-009,013-015,021-023
(Oxidisable) Sulphide Expressed as SO4	T194	M40	0.01	%	N	002-004,007-009,013-015,021-023
Sulphur (total)	T21	M40	0.05	%	N	002-004,007-009,013-015,021-023
pH	T7	AR			U	002-004,007-009,013-015,021-023
Naphthalene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Acenaphthylene	T207	M105	0.1	mg/kg	U	012,019,026,028,030,032,034,043
Acenaphthene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Fluorene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Phenanthrene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Anthracene	T207	M105	0.1	mg/kg	U	012,019,026,028,030,032,034,043
Fluoranthene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Pyrene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Chrysene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	012,019,026,028,030,032,034,043
PAH(total)	T207	M105	0.1	mg/kg	U	012,019,026,028,030,032,034,043
Hardness expressed as CaCO3	T6	AR	10	mg/l	N	011,045
pH	T7	AR			U	011,016,045-046

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
As (Dissolved)	T281	AR	0.2	µg/l	U	011,016,045-046
Cd (Dissolved)	T281	AR	0.02	µg/l	U	011,016,045-046
Cr (Dissolved)	T281	AR	1	µg/l	U	011,016,045-046
Cu (Dissolved)	T281	AR	0.5	µg/l	U	011,016,045-046
Pb (Dissolved)	T281	AR	0.3	µg/l	U	011,016,045-046
Hg (Dissolved)	T281	AR	0.05	µg/l	U	011,016,045-046
Ni (Dissolved)	T281	AR	1	µg/l	U	011,016,045-046
Se (Dissolved)	T281	AR	0.5	µg/l	U	011,016,045-046
Zn (Dissolved)	T281	AR	2	µg/l	U	011,016,045-046
TPH (C6-C8 aliphatic)	T54	M105	0.010	mg/kg	N	005
TPH (C8-C10 aliphatic)	T54	M105	0.010	mg/kg	N	005
TPH (C10-C12 aliphatic)	T8	M105	1	mg/kg	N	005
TPH (C12-C16 aliphatic)	T8	M105	1	mg/kg	N	005
TPH (C16-C21 aliphatic)	T8	M105	1	mg/kg	N	005
TPH (C21-C35 aliphatic)	T8	M105	1	mg/kg	N	005
TPH (C6-C7 aromatic)	T54	M105	0.010	mg/kg	N	005
TPH (C7-C8 aromatic)	T54	M105	0.010	mg/kg	N	005
TPH (C8-C10 aromatic)	T54	M105	0.010	mg/kg	N	005
TPH (C10-C12 aromatic)	T8	M105	1	mg/kg	N	005
TPH (C12-C16 aromatic)	T8	M105	1	mg/kg	N	005
TPH (C16-C21 aromatic)	T8	M105	1	mg/kg	N	005
TPH (C21-C35 aromatic)	T8	M105	1	mg/kg	N	005
TPH (C8-C10)	T8	AR	1	mg/kg	N	012,030,032,036,041
TPH (C10-C12)	T8	AR	1	mg/kg	U	012,030,032,036,041
TPH (C12-C16)	T8	AR	1	mg/kg	U	012,030,032,036,041
TPH (C16-C21)	T8	AR	1	mg/kg	U	012,030,032,036,041
TPH (C21-C35)	T8	AR	1	mg/kg	U	012,030,032,036,041
Naphthalene	T149	AR	0.01	µg/l	U	011,016,045-046
Acenaphthylene	T149	AR	0.01	µg/l	U	011,016,045-046
Acenaphthene	T149	AR	0.01	µg/l	U	011,016,045-046
Fluorene	T149	AR	0.01	µg/l	U	011,016,045-046
Phenanthrene	T149	AR	0.01	µg/l	U	011,016,045-046
Anthracene	T149	AR	0.01	µg/l	U	011,016,045-046
Fluoranthene	T149	AR	0.01	µg/l	U	011,016,045-046
Pyrene	T149	AR	0.01	µg/l	U	011,016,045-046
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	011,016,045-046
Chrysene	T149	AR	0.01	µg/l	U	011,016,045-046
Benzo(b/k)Fluoranthene	T149	AR	0.01	µg/l	U	011,016,045-046
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	011,016,045-046
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	011,016,045-046
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	011,016,045-046
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	011,016,045-046
PAH(total)	T149	AR	0.01	µg/l	U	011,016,045-046
TPH (C6-C8)	T215	AR	0.010	mg/l	N	011,016,045-046
TPH (C8-C10) DW	T215	AR	0.010	mg/l	N	011,016,045-046
TPH (C10-C12) DW	T81	AR	0.01	mg/l	U	011,016,045-046
TPH (C12-C16) DW	T81	AR	0.01	mg/l	U	011,016,045-046
TPH (C16-C21) DW	T81	AR	0.01	mg/l	U	011,016,045-046
TPH (C21-C35) DW	T81	AR	0.01	mg/l	U	011,016,045-046

Scientific Analysis Laboratories Ltd

Certificate of Analysis

[redacted]

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Report Number: 449480-1

Date of Report: 28-Jan-2015

Customer: Wilson Associates (Consulting) Limited
36 Brunswick Road
Gloucester
GL1 1JJ

Customer Contact: [redacted]

Customer Job Reference: 3829/2
Customer Purchase Order: 3829/2/DW
Customer Site Reference: TREDWORTH
Date Job Received at SAL: 19-Jan-2015
Date Analysis Started: 20-Jan-2015
Date Analysis Completed: 28-Jan-2015

The results reported relate to samples received in the laboratory
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

[redacted]

[redacted]

SAL Reference: 449480
Project Site: TREDWORTH
Customer Reference: 3829/2

Soil Analysed as Soil
Asbestos

SAL Reference	449480 002	449480 003	449480 005	449480 006	449480 007	449480 008	449480 009	449480 010
Customer Sample Reference	TP2	TP3	TP5	TP6	TP7	TP8	TP9	TP10
Bottom Depth	0.25	0.3	0.3	0.5	0.05	0.1	0.25	0.6
Top Depth				0.15				0.2
Date Sampled	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015

Determinand	Method	Test Sample	LOD	Units							
Asbestos ID	T27	AR			N.D.	N.D.	Amosite Detected	N.D.	N.D.	N.D.	N.D.	N.D.

SAL Reference: 449480
Project Site: TREDWORTH
Customer Reference: 3829/2

Soil Analysed as Soil
Asbestos

SAL Reference	449480 011	449480 012	449480 013	449480 014
Customer Sample Reference	WS4	WS5	SS1	SS2
Bottom Depth	0.4	0.1		
Top Depth				
Date Sampled	15-JAN-2015	15-JAN-2015	15-JAN-2015	15-JAN-2015

Determinand	Method	Test Sample	LOD	Units				
Asbestos ID	T27	AR			Amosite Detected	N.D.	N.D.	N.D.

Index to symbols used in 449480-1

Value	Description
AR	As Received
N.D.	Not Detected
S	Analysis was subcontracted
U	Analysis is UKAS accredited

Method Index

Value	Description
T27	PLM

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos ID	T27	AR			SU	002-003,005-014

Scientific Analysis Laboratories Ltd

Certificate of Analysis

[redacted]

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Report Number: 447987-1

Date of Report: 14-Jan-2015

Customer: Wilson Associates (Consulting) Limited
36 Brunswick Road
Gloucester
GL1 1JJ

Customer Contact: [redacted]

Customer Job Reference: 3829
Customer Purchase Order: 3829/TC
Date Job Received at SAL: 24-Nov-2014
Date Analysis Started: 13-Jan-2015
Date Analysis Completed: 14-Jan-2015

The results reported relate to samples received in the laboratory
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

[redacted]

[redacted]

SAL Reference: 447987
Customer Reference: 3829

Soil Analysed as Soil
Asbestos Quantification

SAL Reference	**447987 001**	**447987 002**
Customer Sample Reference	**TP1 (438417/026)**	**TP4 (438417/032)**
Depth	**0.5**	**0.35**
Date Sampled	**18-NOV-2015**	**18-NOV-2015**

Determinand	Method	Test Sample	LOD	Units		
Asbestos Quantification	T27	AR	0.001	%	Chrysotile Detected <0.001	Chrysotile Detected <0.001

Index to symbols used in 447987-1

Value	Description
AR	As Received
S	Analysis was subcontracted
U	Analysis is UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

Method Index

Value	Description
T27	PLM

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos Quantification	T27	AR	0.001	%	SU	001-002

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

[redacted]

Report Number: 447987-1

Date of Report: 14-Jan-2015

Customer: Wilson Associates (Consulting) Limited
36 Brunswick Road
Gloucester
GL1 1JJ

Customer Contact: [redacted]

Customer Job Reference: 3829
Customer Purchase Order: 3829/TC
Date Job Received at SAL: 24-Nov-2014
Date Analysis Started: 13-Jan-2015
Date Analysis Completed: 14-Jan-2015

The results reported relate to samples received in the laboratory
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

[redacted]

[redacted]

SAL Reference: 447987
Customer Reference: 3829

Soil Analysed as Soil
Asbestos Quantification

SAL Reference	**447987 001**	**447987 002**
Customer Sample Reference	**TP1 (438417/026)**	**TP4 (438417/032)**
Depth	**0.5**	**0.35**
Date Sampled	**18-NOV-2015**	**18-NOV-2015**

Determinand	Method	Test Sample	LOD	Units		
Asbestos Quantification	T27	AR	0.001	%	Chrysotile Detected <0.001	Chrysotile Detected <0.001

Index to symbols used in 447987-1

Value	Description
AR	As Received
S	Analysis was subcontracted
U	Analysis is UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

Method Index

Value	Description
T27	PLM

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos Quantification	T27	AR	0.001	%	SU	001-002

Job No: 3829

Site Name: Former Norville Works, Tredworth, Gloucester

Soil/Stratum: COMPOSITE (all soil types)

RECORDED CONCENTRATIONS OF ELEMENT GROUPS TESTED AND RESPECTIVE RISK PHRASES (as % of selected compound)

Substance	Atomic weight	*Total Concentration mg/kg	*Total Concentration %	Selected compound	Molecular mass	Concentration %	Category of danger	Risk Phase
ARSENIC	74.92	18.00	0.0018	Arsenic trioxide	197.84	0.00475323	Carcinogenic Cat 1 T+ C N	R45 R28 R34 R50-53
CADMIUM	112.41	17.00	0.0017	Cadmium chloride	183.32	0.002772387	Carcinogenic Cat 2 Mutagenic Cat 2 Reproduction Cat 2 T+ T N	R45 R46 R60, 61 R26 R25, 48/23/25 R50,53
CHROMIUM	52	40.00	0.004	Chromium (III) chromate	452	0.034769231	O Carcinogenic Cat 2 C N	R8 R45 R35/43 R50-53
CHROMIUM	52	0.00	0	Chromium (VI) trioxide	100	0	Carcinogenic Cat 1 O Mutagenic Cat 2 Reproduction Cat 3 T+ T N C	R45 R9 R46 R62 R26 R24/25, 48, 23 R50-53 R35 R42/43
LEAD	207.2	150.00	0.015	Lead (II) sulphate	303.26	0.021954151	Reproduction Cat 1 Reproduction Cat 3 Xn N	R61 R62 R20/22/33 R50-53
MERCURY	200.59	1.00	0.0001	Mercury	200.59	0.0001	T N	R23, 33 R50,53
SELENIUM	78.96	3.00	0.0003	Selenium	78.96	0.0003	T N	R23/25 R33 R53
BORON	10.81	0.00	0	Boron trifluoride	67.82	0	Reacts with water T+ C	R14 R26/28 R35
COPPER	63.55	110.00	0.011	Copper sulphate	159.62	0.027628954	Xn Xi N	R22 R36/38 R50,53
NICKEL	58.69	36.00	0.0036	Nickel (II) sulphide	122.7	0.007526325	Carcinogenic Cat 3 Xn N	R49 R43 R50-53
ZINC	65.38	220.00	0.022	Zinc oxide	81.41	0.027394004	N	R50,53
BTEX	78.11	0.01	0.000001	Benzene	78.11	0.000001	Carcinogenic Cat 1 Mutagenic Cat 2 T N F Xi Xn	R45 R46 R48/23/24/25 R51-53 R11 R36/38 R65
BTEX	92.14	0.01	0.0000005	Toluene	92.14	0.0000005	F Reproduction Cat 3 Xn Xi	R11 R63 R48/20, 65 R38 R67
BTEX	106.17	0.35	0.000035	Ethlybenzene	106.17	0.000035	F Xn N	R11 R20 R51-53
BTEX	106.16	0.68	0.000068	Xylenes	106.16	0.000068	F N Xn Xi	R10 R51-53 R20/21 R38
GRO	103.37	10.00	0.001	C5-C10	103.37	0.001	Carcinogenic Cat 2 N Xn	R45 R51-53 R65
DRO	183.33	538.00	0.0538	C10-C25	183.33	0.0538	Carcinogenic Cat 3 N Xn	R40 R51-53 R65
MINERAL OIL	365	1400.00	0.14	C25-C44	365	0.14	Carcinogenic Cat 2 N Xn	R45 R51-53 R65
PAH	252	1.70	0.00017	benzo-a-pyrene	252	0.00017	Carcinogenic Cat 2 Mutagenic Cat 2 Xi Reproduction Cat 2 N	R45 R46 R43 R60,R61 R50-53
PAH	128	0.10	0.00001	naphthalene	128	0.00001	Carcinogenic Cat 3 Xn N	R40 R22 R50,53
PCB	337.91	0.00	0	PCB	337.91	0	N	R33-50/53

HAZARD CLASS FOR RESPECTIVE RISK PHRASE

	H1	H2	H3a (ii)	H4		H5	H6		H7		H8		H9	H10		H11		H12		H13	H14					H15
	explosive	oxidising	flammable	irritant	irritant	harmful	toxic	very toxic	carcinogenic category 1 and 2	carcinogenic category 3	corrosive burns	corrosive severe burns	infectious	toxic reproduction category 1 and 2	toxic reproduction category 3	mutagenic category 1 and 2	mutagenic category 3	contact with water, air or acid releases toxic gases	contact with water, air or acid releases very toxic gases	sensitizing	dangerous to ozone	very toxic AND may cause long term effects	toxic AND may cause long term effects	harmful and may cause long term effects	ecotoxic : non-aquatic environment	capable of yielding another substance post disposal
ARSENIC				0.004753				0.004753	0.004753		0.004753											0.004753				
CADMIUM							0.002772	0.002772	0.002772					0.002772		0.002772						0.002772				
CHROMIUM		0.034769							0.034769			0.034769										0.034769				
CHROMIUM		0.000000					0.000000	0.000000	0.000000			0.000000			0.000000	0.000000				0.000000		0.000000				
LEAD						0.021954								0.021954	0.021954							0.021954				
MERCURY							0.000100															0.000100				
SELENIUM							0.000300																	0.000300		
BORON								0.000000				0.000000														
COPPER					0.027629	0.027629																0.027629				
NICKEL						0.007526			0.007526											0.007526		0.007526				
ZINC																						0.027394				
BTEX			0.000001		0.000001	0.000001	0.000001		0.000001							0.000001							0.000001			
BTEX			0.000001		0.000001				0.000001						0.000001											
BTEX			0.004753			0.000035																	0.000035			
BTEX			0.000068		0.000068	0.000068																	0.000068			
GRO						0.001000			0.001000														0.001000			
DRO						0.053800				0.053800													0.053800			
MINERAL OIL						0.140000			0.140000															0.140000		
PAH									0.000170					0.000170		0.000170				0.000170		0.000010				
PAH						0.000010				0.000010												0.000010				
PCB																						0.000000				
Total (%)		0.03	0.00	0.00	0.03	0.25	0.00	0.01	0.14	0.05	0.00	0.03	0.00	0.02	0.02	0.00	0.00	N/A	N/A	0.01	0.00	0.03	0.05	0.14	N/A	N/A
Threshold (%)	Appendix C1	Appendix C2	Appendix C3	≥5%	≥20%	≥25%	≥3%	≥0.1%	≥0.1%	≥1%	≥5%	≥1%	Appendic C9	≥0.5%	≥5%	≥0.1%	≥1%	Appendix C12	Appendix C12	≥1%*	≥0.1%	≥0.25%	≥2.5%	≥25%	N/A	N/A

N.B. The total element concentration used in this analysis equates to the highest recorded concentration obtained from laboratory testing. The respective compound has been selected with reference to Table 3.2 of Part 3 of Annex VI of the CLP Regulation, 2009 (Directive 67/548/EEC).

* = use 1% unless specific conc limits available

LEGEND			
T+	very toxic	Xn	harmful
T	toxic	O	combustible
N	ecotoxic	C	causes burns
F	flammable	Xi	causes sensitisation

APPENDIX 4

CERTIFIED GEOTECHNICAL TEST RESULTS

Laboratory Report

GEO Site & Testing Services Ltd

Contract Number: 25183

Client's Reference: **3829/TC**

Report Date: **03-12-2014**

Client **Wilson Associates**
36 Brunswick Road
Gloucester
GL1 1JJ

Contract Title: **Tredworth, Gloucester**

For the attention of: [redacted]

Date Received: **21-11-2014**

Date Commenced: **21-11-2014**

Date Completed: **03-12-2014**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	8
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	2
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	8
Organic Matter Content-dichromate method 1377 : 1990 Part 3 : 3 - @ Non Accredited Test	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

[redacted]

Client ref: 3829/TC

Location: Tredworth, Gloucester

Contract Number: 25183-211114

Hole Number	Sample Number	Type	Depth (m)	Description of Sample*
WS1			1.40	Brown sandy gravelly (fine) silty CLAY
WS1			2.90	Brown sandy gravelly (fine) silty CLAY
WS2			2.00	Brown sandy gravelly (fine) silty CLAY
WS3			0.50	Brown sandy gravelly (fine) silty CLAY
WS4			1.20	Brown sandy gravelly (fine) silty CLAY
WS5			3.20	Brown sandy gravelly (fine) silty CLAY
WS6			1.20	Brown sandy gravelly (fine) silty CLAY
WS7			1.80	Brown sandy gravelly (fine) silty CLAY

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory

GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By: [redacted]

Date: 3.12.14

UKAS TESTING 2788

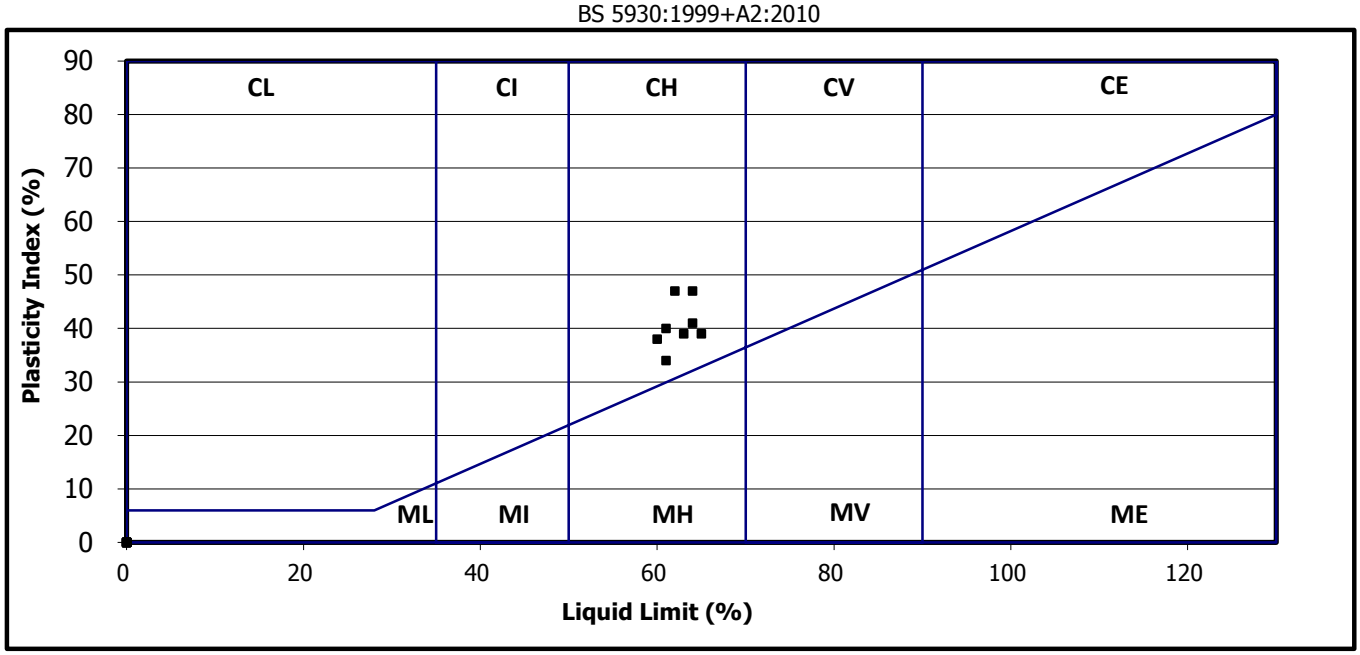
Test Report: **Method of the Determination of the plastic limit and plasticity index**
BS 1377 : Part 2 : 1990 Method 5

Client ref: **3829/TC**
Location: **Tredworth, Gloucester**
Contract Number: **25183-211114**

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS1	D	1.40	31	63	24	39	94	CH High Plasticity
WS1	D	2.90	27	64	23	41	100	CH High Plasticity
WS2	D	2.00	31	65	26	39	100	CH High Plasticity
WS3	D	0.50	19	62	15	47	96	CH High Plasticity
WS4	D	1.20	22	64	17	47	100	CH High Plasticity
WS5	D	3.20	38	61	27	34	100	CH High Plasticity
WS6	D	1.20	24	61	21	40	96	CH High Plasticity
WS7	D	1.80	27	60	22	38	100	CH High Plasticity

Symbols: **NP : Non Plastic** **# : Liquid Limit and Plastic Limit Wet Sieved**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By: [redacted]

Date: 3.12.14

[redacted]

UKAS TESTING 2788

[redacted]

Certificate of Analysis

Date:	03/12/2014
Client:	Wilson Associates
Our Reference:	25183-211114
Client Reference:	3829/TC
Contract Title:	Tredworth, Gloucester
Description: (Total Samples)	1
Date Received:	21/11/2014
Date Started:	26/11/2014
Date Completed:	27/11/2014
Test Procedures:	(B.S. 1377 : PART 3 : 1990)

Notes:

Solid samples will be disposed 1 month and liquids 2 weeks

Approved By:

Authorised Signatories:

[redacted]

Contract No: 25183-211114
Client Ref: 3829/TC
Location: Tredworth, Gloucester
Date: 27/11/2014

SUMMARY OF CHEMICAL ANALYSES

(B.S. 1377 : PART 3 : 1990)

Hole Number	Sample Number	Depth m	Sulphate Content SO3 (as SO_4)			Chloride Content		pH Value @ 25°C	Organic Matter Content %	Loss on Ignition %	Remarks
			Acid Soluble Sulphate as % SO_4	Aqueous Extract Sulphate as g/l SO_4	Ground-water g/l	Soluble Chloride as % equiv. NaCl	Ground-water g/l				
			Clause 5.5.	Clause 5.5.	Clause 5.4.	Clause 7.3	Clause 7.2	Clause 9.	Clause 3.	Clause 4.	
WS5		2.80							2.3		

NCP - No Chloride present
G.L - Ground Level

Test Report: **Particle Size Distribution Test**

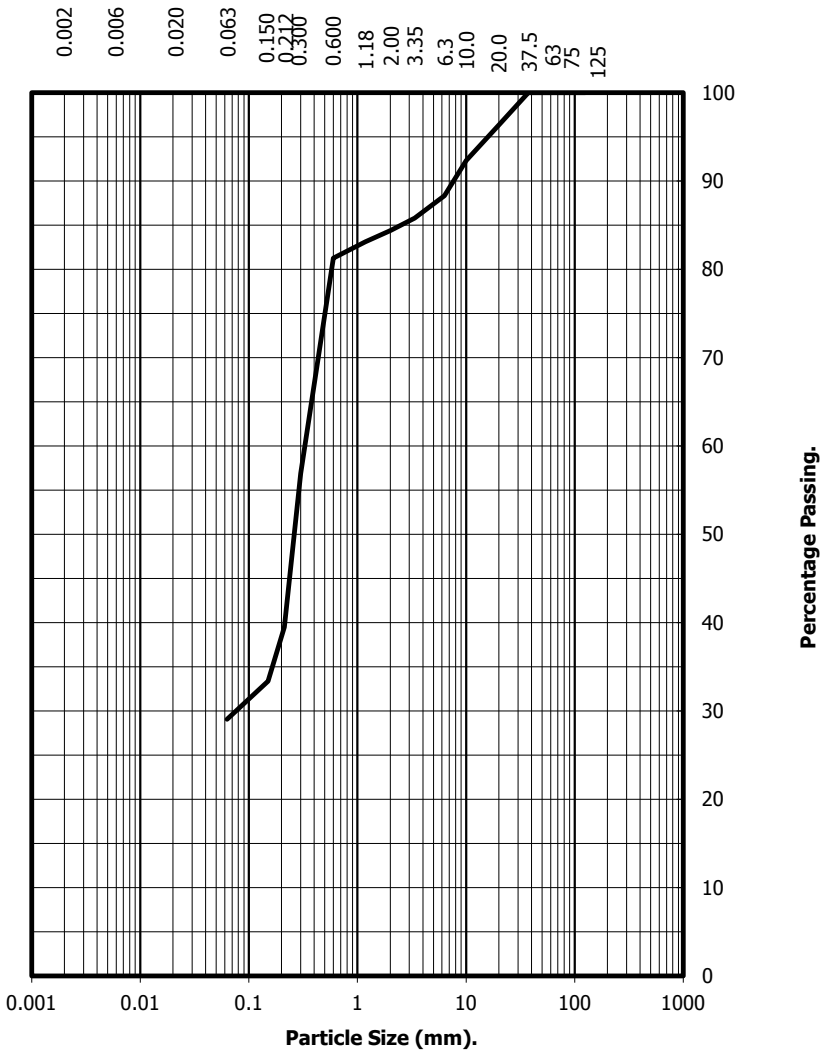
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**3829/TC**
Location:	**Tredworth, Gloucester**
Contract Number:	**25183-211114**
Hole Number:	**WS2**
Sample Number:	**N/A**
Depth from (m):	**1.20**
Depth to (m):	**1.95**
Description:	**Brown gravelly silty clayey fine to medium SAND.**
Sample Type:	**B**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	92
6.3	88
3.35	86
2.00	84
1.18	83
0.60	81
0.300	57
0.212	40
0.150	33
0.063	29

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	29	**55**	**16**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: [redacted]

[redacted]

Date: 1.12.14

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

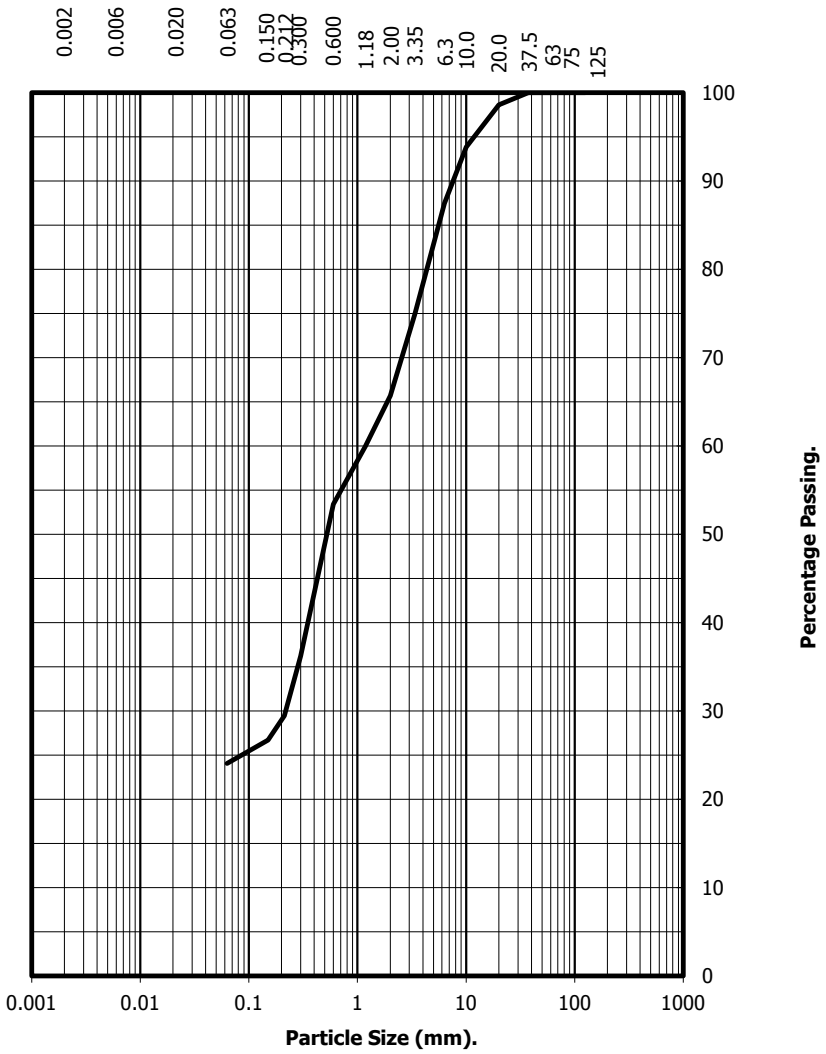
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**3829/TC**
Location:	**Tredworth, Gloucester**
Contract Number:	**25183-211114**
Hole Number:	**WS4**
Sample Number:	**N/A**
Depth from (m):	**3.00**
Depth to (m):	**3.90**
Description:	**Brown silty clayey gravelly fine to medium SAND.**
Sample Type:	**B**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	94
6.3	87
3.35	75
2.00	66
1.18	60
0.60	53
0.300	36
0.212	29
0.150	27
0.063	24

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	24	**42**	**34**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: [redacted]

[redacted]

Date: 3.12.14

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

APPENDIX 5

GAS/WATER MONITORING RESULTS

Monitoring undertaken 28 November 2014

Initial Atmospheric Pressure (mb)	Temperature (°C) and Weather	BH No	Time (mins)	Concentrations (%)			Flow rates (l/hr)	Standing water level (m, bgl)	Depth and horizon of response zone (m,bgl)
				CH_4	CO_2	O_2			
1003	8° C showers	WS1	1	0.0	3.2	15.8	0.1	2.25m	1.0 - 4.0m (sand over clay)
			2	0.0	3.1	16.0	0.1		
			3	0.0	2.9	16.2	0.0		
			4	0.0	2.6	16.9	0.1		
			5	0.0	2.4	17.1	0.0		
			6	0.0	2.2	17.2			
			7	0.0	2.0	17.3			
			8	0.0	2.0	17.3			
			9	0.0	2.0	17.4			
			10	0.0	1.9	17.4			
1003	8° C showers	WS3	1	0.0	1.4	20.8	0.1	2.81m	1.0 - 4.0m (clay)
			2	0.0	1.4	20.8	0.0		
			3	0.0	1.4	20.8	0.0		
			4	0.0	1.4	20.8	0.0		
			5	0.0	1.4	20.8	-0.1		
1003	8° C showers	WS4	1	0.0	1.5	18.9	-0.1	2.69m	1.0 - 3.7m (made ground over silt and sand)
			2	0.0	1.5	18.9	-0.1		
			3	0.0	1.3	19.0	-0.1		
			4	0.0	1.2	19.4	-0.2		
			5	0.0	0.8	20.4	-0.1		

Monitoring undertaken 8 December 2014

Initial Atmospheric Pressure (mb)	Temperature (°C) and Weather	BH No	Time (mins)	Concentrations (%)			Flow rates (l/hr)	Standing water level (m, bgl)	Depth and horizon of response zone (m,bgl)
				CH_4	CO_2	O_2			
1003	4° C cloudy	WS1	1	0.0	0.4	20.7	0.2	1.34m	1.0 - 4.0m (sand over clay)
			2	0.0	0.3	20.8	0.1		
			3	0.0	0.3	20.8	-0.1		
			4	0.0	0.3	20.8	-0.1		
			5	0.0	0.3	20.8			
1003	4° C cloudy	WS3	1	0.0	0.1	20.9	0.0	1.87m	1.0 - 4.0m (clay)
			2	0.0	0.1	20.9	0.1		
			3	0.0	0.1	20.9	0.1		
			4	0.0	0.1	20.9	0.1		
			5	0.0	0.1	20.9	0.0		
1003	4° C cloudy	WS4	1	0.0	1.2	19.5	-0.1	1.98m	1.0 - 3.7m (made ground over silt and sand)
			2	0.0	1.3	19.2	-0.1		
			3	0.0	1.3	19.3	0.0		
			4	0.0	1.2	19.3	0.0		
			5	0.0	1.1	19.4	-0.1		
			6	0.0	1.1	19.5			
			7	0.0	1.0	19.5			
			8	0.0	0.9	19.5			
			9	0.0	0.9	19.6			
			10	0.0	0.9	19.6			

Monitoring undertaken 15 January 2015

Initial Atmospheric Pressure (mb)	Temperature (°C) and Weather	BH No	Time (mins)	Concentrations (%)			Flow rates (l/hr)	Standing water level (m, bgl)	Depth and horizon of response zone (m,bgl)
				CH_4	CO_2	O_2			
983	6° C gusting wind and very heavy showers	WS1	1	0.2	2.3	17.9	0.2	2.44m	1.0 - 4.0m (sand over clay)
			2	0.2	1.6	19.2	0.3		
			3	0.2	0.7	20.5	0.3		
			4	0.1	0.5	20.6	0.2		
			5	0.1	0.3	20.7	0.1		
			6	0.1	0.2	20.7	0.1		
			7	0.1	0.2	20.8			
			8	0.1	0.2	20.8			
			9	0.1	0.2	20.8			
983	6° C gusting wind and very heavy showers	WS3	1	0.1	0.3	21.1	0.1	1.58m	1.0 - 4.0m (clay)
			2	0.1	0.3	21.0	0.1		
			3	0.1	0.3	21.0	-0.1		
			4	0.1	0.4	21.0	0.1		
			5	0.1	0.4	20.9	0.0		
			6	0.0	0.4	20.9			
			7	0.0	0.4	20.9			
			8	0.0	0.4	20.9			
			9	0.0	0.3	21.0			
			10	0.0	0.3	21.0			
983	6° C gusting wind and very heavy showers	WS4	1	0.1	0.5	21.2	-0.2	1.71m	1.0 - 3.7m (made ground over silt and sand)
			2	0.1	0.3	21.2	-0.2		
			3	0.1	0.2	21.9	0.1		
			4	0.1	0.2	21.1	0.3		
			5	0.1	0.2	21.9	0.1		
			6	0.1	0.2	21.9			

CERTIFICATION OF CALIBRATION

Geotech
A subsidiary of LANDTEC

ISSUED BY: GEOTECH LABORATORY
Date Of Calibration: 10-Sep-2014
Certificate Number: G501432_1/13307

UKAS CALIBRATION
No. 4533

[redacted]

Approved by Signatory

[redacted]

Nick Sidgwick
Laboratory Inspection

Customer: ***Wilson Associates (Consulting) Ltd***

36 Brunswick Road
GLOUCESTER
Gloucestershire
GL1 1JJ
UNITED KINGDOM

Description: GA5000 ***Model:*** GA5000
Serial Number: G501432

UKAS Accredited results:

Results after adjustment :

Methane (CH4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.41
15.1	15.1	0.64
50.0	49.5	0.94

Carbon Dioxide (CO2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.43
15.1	15.0	0.70
50.0	49.9	1.1

Oxygen (O2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.1	21.1	0.31

The inwards assessment was carried out on 08-Sep-2014.

The maximum adjustment is larger than the inwards assessment uncertainty.

All concentrations are molar.

CH4, CO2 readings recorded at : 34.5 °C ± 1.5 °C

O2 reading recorded at : 25.5 °C ± 1.5 °C

Barometric Pressure : 1014 mbar ± 3 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using reference gases.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

CERTIFICATION OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY NO. 4533

Certificate Number
G501432_1/13307

As received gas readings, as recorded on 08-Sep-2014 :

Methane (CH4)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.5	0.41
15.1	16.0	0.64
60.1	62.1	0.94

Carbon Dioxide (CO2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.1	0.43
15.1	15.2	0.70
39.9	39.9	0.70

Oxygen (O2)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
21.1	20.6	0.31

* Non-UKAS Accredited results

All concentrations are molar.

As received gas readings recorded at : 24.9 °C ± 1.5 °C

As received barometric pressure recorded at : 1012.83 mbar ± 3 mbar

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS Accredited results:

Barometer (mbar)	
Reference	Instrument Reading
1014	1017

Internal Flow	
Applied (l/hr)	Instrument Reading (l/hr)
5.0	5.1
10.0	10.1

End of Certificate