

Supplementary guidance for the selection of water pipes in land potentially affected by contamination

Introduction

In January 2011, UK Water Industry Research (UKWIR) published “Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites” (Ref 10/WM/03/21; the ‘UKWIR Guidance’). Its aim is to ensure that the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protect the quality of drinking water whilst taking into account the service life of the water distribution system. It supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 “Laying Pipes in Contaminated Land” which has been withdrawn.

The UKWIR Guidance is for use by developers, self-lay organisations, water companies and consultants when planning, designing and constructing water mains and/or services in brownfield sites. It defines brownfield sites as “land or premises that have previously been used or developed. They may also be vacant or derelict. However, they are not necessarily contaminated.” The UKWIR Guidance states that it does not apply to greenfield sites; however, we consider this supplementary guidance and the relevant sections of the UKWIR guidance as being equally suitable for application to those greenfield sites considered to be potentially affected by contamination. Where greenfield sites are not affected by contamination a preliminary risk assessment (see below) will suffice.

The UKWIR Guidance also states that there should be no departure from its provisions “*except where formally approved by the Water Company, such departure being technically justifiable or representing advances in knowledge or product development*”.

We have adopted the UKWIR Guidance in principle and produced this company specific supplementary guidance (the ‘UUW Guidance’) which includes the Risk Assessment for Water Pipes (the ‘RA’).

This guidance does not cover operative safety, health exposure modelling or accidental pipe damage.

which the pipes are to be laid may be affected by contamination. The application of the source, pathway, receptor concept will be an integral part of any pipeline risk assessment. For each potential source (the contamination) and each potential receptor (the water pipe), consideration shall be given to whether a potential pathway between source and receptor exists, or may exist in the future, linking the two. There are normally only three pathways by which contamination may come into contact with water pipes. These are direct contact with the soil or backfill, an excessive vapour phase or a contaminated groundwater regime. If none of these conditions exist on site (adopting the source, pathway, receptor concept) then it is likely that extended and/or targeted soil testing will not be required and a simple risk assessment will suffice. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. The testing requirements are as described in the following section.

The signatories of the Water Supply Application Form and the RA must ensure that all assessments of land condition have been carried out in accordance with applicable current standards and guidelines by or under the direction of a suitably qualified competent person.

We require the competent person to be a) a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or b) a Specialist in Land Condition (SiLC) with appropriate geo-environmental experience.

Risk Assessment for Water Pipes in Land Potentially Affected by Contamination

Any application for new water supplies to a development (construction of new properties, or renovation or conversion of existing buildings) in land potentially affected by contamination shall include a completed RA.

As a minimum a desk study (preliminary risk assessment) shall be provided with the RA in accordance with the framework in Environment Agency publication “Model Procedures for the Management of Land Contamination” (ref: CLR11) that sets out whether the land through

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Testing Requirements

The soil, rock and if appropriate groundwater tests that are required on all sites where the potential for organic contamination has been identified in the desk study and where water pipes are proposed to be laid must be accredited by United Kingdom Accreditation Service (UKAS) as a minimum and where commercially available the Environment Agency's Monitoring Certification Service (MCERTS). These accredited tests should be undertaken for:

Banded hydrocarbons EC5-EC10, EC10-EC16, EC16-EC40 (Total aliphatic and aromatic hydrocarbons for each banding may be summed). Aliphatic/aromatic fractionation and subsequent banding may be required should a more detailed site specific risk assessment be undertaken. The bandings have been amended to take into account readily available laboratory tests. The equivalent carbon number (EC) is used to assess petroleum hydrocarbon mixtures rather than the actual number of carbon atoms in the molecule in line with guidance issued by the Environment Agency (2005).

Volatile organic compounds (VOCs) (method by head space or purge & trap GCMS) with tentative identification of compounds greater than 20µg/kg. The method used should be capable of detecting a wide range of compounds listed in US EPA Method 8260C or similar. The method should include analysis of naphthalene.

BTEX (Benzene, toluene, ethyl benzene and xylenes) plus MTBE (Methyl-tertiary butyl ether) (by head space GCMS)

Semi-Volatile Organic Compounds (SVOCs) (method by GCMS) with tentative identification of compounds greater than 20µg/kg The method used should be capable of detecting the compounds listed in US EPA Method 8270D or similar. The total concentration of SVOCs excludes polycyclic aromatic hydrocarbons, ethers, nitrobenzene, ketones, aldehydes, phenols, cresols and chlorinated phenols. Phenols, cresols and chlorinated phenols which are detected by the SVOC analysis are given their own assessment criteria.

We do not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in the RA below replaces Table 3.1 of the UKWIR Guidance.

Where previous site uses include the use, storage, treatment, disposal or manufacture of any of the following, appropriate testing for these substances will be required:

- Ethers, nitrobenzene, ketones, aldehydes and amines. Note that the presence of amines on any site at the proposed pipe depth +/- 1.0m precludes the use of polyethylene. The methods of analysis and method of calculation of total concentrations of these compounds will need to be agreed with UUW.

To comply with the testing requirements, the suites of tests that are required on all brownfield sites where wrapped steel, wrapped ductile iron or copper pipes are to be laid as minimum must include:

- pH, Conductivity and redox potential

Sufficiency of Testing

Water pipes are normally laid at between 0.75 and 1.35m from finished ground level to crown of pipe. Samples taken and tested must represent both a) the soil in which the water pipes are to be laid and b) the soil down to at least 500mm below the underside of the proposed pipe. Where the proposed depth of the pipes is unknown at the time of application, soil samples representative of the ground condition between surface level and 1.5m below finished ground level shall be taken as a minimum. Where appropriate (see UKWIR Guidance) groundwater sampling and groundwater monitoring will also be necessary. Photo-ionisation detection (PID) monitoring along the proposed route of the pipeline may be employed, though this does not provide a definitive guide to the suitability of water pipe materials.

Where required a sufficient number of test results should be obtained from the material in which the pipes are to be laid. CLAIRE/CIEH 2008 "Guidance on comparing soil contamination data with a critical concentration" may be used, where appropriate, to justify the number of soil samples tested; however, this statistical model should not be used on heterogeneous materials or used to average test results from different types of materials.

Further guidance on representative sampling is contained within BS10175:2011 Code of Practice for the Investigation of Potentially Contaminated Sites, the Department of the Environment's Contaminated Land Research Report "Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4; 1994) and the Environment Agency's "Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination" (ref: R&D Technical Report P5-066/TR; 2000).

Where remediation has been carried out on the site, the test results obtained from validation samples will be used in the assessment. Where a horizontal capping system has been or will be employed using materials spread across a site, sufficient samples will need to be taken to characterise the capping material used and the results presented to UUW. However, the sufficiency of sampling on the horizontal capping system, in which the pipeline will be placed, may be assessed on the basis of the source, quantity and type of materials used.

Detection Limits

Only positive concentrations, ie those above the limit of detection should be used in summation of VOC and SVOC (or other test groups of compounds ie phenols, cresols and chlorinated phenols). Laboratory methods shall provide a minimum limit of detection of 10µg/kg for each individual VOC or SVOC (or other test groups of compounds) quantitatively detected in accordance with the methods described above. For tentatively identified compounds (TICs), only those compounds with a concentration of 20µg/kg or greater shall be used in the summation of VOC and SVOC (or other test groups of compounds).

Protective Measures

Where polyethylene, ductile iron, steel or copper pipes are to be laid on a brownfield site or other land potentially affected by contamination (whether or not it has been remediated) and where the concentrations exceed the generic guideline values set out in Table 1 of the RA, the developer shall provide either:

- a) a robust risk assessment to show how any contaminants will not significantly impact on proposed water supplies or buried assets over the lifetime of the assets; or
- b) more suitable pipe materials; or
- c) an engineering solution to protect the pipe work backed up by an adequate assessment of the risk.

Liquid free phase product (e.g. oil or free solvent layers) shall not remain in the ground or groundwater in the vicinity of water pipes, whether barrier pipe or any other pipe materials are used.

When designing pipe routes on land potentially affected by contamination, new preferential contamination pathways along the route of new water pipes shall not be created. Particular measures may be required to prevent the possible migration of contamination through pipe bedding and into controlled waters.

References

BS10175: 2011

"Investigation of Potentially Contaminated Sites Code of Practice"

CLAIRE/CIEH

"Guidance on comparing soil contamination data with a critical concentration" 2008

Department of the Environment Contaminated Land Research Report

"Sampling strategies for contaminated land"
prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4) 1994

Environment Agency

"Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination"
(ref: R&D Technical Report P5-066/TR) 2000

Environment Agency

"Model Procedures for the Management of Land Contamination" (ref: CLR11), 2004

Environment Agency P5-080/TR3

"The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils", 2005

UK Water Industry Research (UKWIR)

"Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21)
January 2011

Water Regulations Advisory Scheme (WRAS)

Information and Guidance Note 9-04-03

"Laying Pipes in Contaminated Land" 2002

Frequently asked questions

Why has UUW published supplementary guidance to the 'UKWIR Guidance for the Selection of Water Pipes to be used in Brownfield Sites'?

UUW agrees with the UKWIR Guidance in principle; we have published supplementary guidance to clarify some of the areas in which it will operate.

Does the UKWIR Guidance only apply to 'brownfield sites'?

Yes, the UKWIR Guidance does apply to brownfield sites; in addition United Utilities Water will apply this guidance and the UUW supplementary guidance to any greenfield sites which are potentially affected by contamination.

Who is responsible for completing/ signing the Risk Assessment for Water Pipes (RA)?

This may be the Developer, the Developers representative, or the competent person directing the land assessment. The signatory of the Risk Assessment for Water Pipes (RA) must ensure that all land assessments have been carried out in accordance with current standards and guidelines by or under the direction of a suitably qualified competent person. For water supply applications on land potentially affected by contamination, UUW requires the competent person to be either a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or a Specialist in Land Condition (SiLC). This level of competency is intended to promote good practice and high professional standards and is no greater than that required for planning purposes by Local Authorities.

Do we need to agree the number and location of soil samples with the Water Company as indicated by the UKWIR guidance following the Preliminary Risk Assessment (PRA)?

Where a preliminary risk assessment (PRA) highlights the need for a site investigation UUW considers it is a responsibility of the qualified competent person directing the land assessment to determine the location and frequency of sampling. UUW's role would be to confirm that the appropriate

choice of pipe material has been made on the basis of the information provided.

What do we do if the pipe route is not known when the Site Investigation report is commissioned?

Where the route of the pipe is not known at the site investigation stage, then any resultant pipe selection needs to take account of any contamination found on the site. Consideration should be given to identifying the route and depth of the pipeline at the site investigation stage to avoid unnecessary testing.

Is it acceptable not to undertake a site investigation and specify the use of barrier pipe which seems to be suitable for all conditions?

Not all brownfield land is contaminated, and because of that a default to barrier pipe is not an acceptable approach to UUW, due to the possibility of higher installation and future maintenance costs. The approach as to whether a site investigation is needed should be risk based. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the ground materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials.

Examples where defaulting to barrier pipe would not be acceptable:

- Where a capping layer (non-contaminated) is introduced within which the pipes will be installed.
- Sites with a potential low risk for contamination.
- Where liquid free phase product (e.g. oil or free solvent layers) is in the ground or groundwater in the vicinity of water pipes.
- Where the route of the pipe could be diverted to another suitable location free from contamination.

Are UUW employees who will assess the Design Proposals for contaminated sites suitably qualified?

It is the role of the Developer's suitably qualified competent person to deal with or direct the assessment of land. UUW's role is to assess the Risk Assessment for Water

Pipes and supporting Site Assessment Report (SAR) which is provided with any new water supply application (ie. it has been provided in the correct format, proposals for pipe selection are included, the methodology is in line with the UKWIR Guidance and UUW Supplementary Guidance, it has been directed by a suitably qualified competent person etc.). If UUW do need to provide assistance or information in deciding pipe materials then the assessment would be carried out under the direction of a suitably qualified competent person.

What happens to existing PE that is in the ground under the "old" guidelines?

The latest UKWIR guidance and UUW's supplementary guidance are intended to be used to decide what pipe materials will be used for new water mains and services. It will have no effect for developers with regard to any parts of UUW's existing network.

Will the Developer be required to submit a fully completed Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, for both the option of a mains requisition application and the option of a self-lay application?

Yes, UUW expect the 'Developer', as defined in UUW Supplementary Guidance, to submit a Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, in respect of any water pipes being installed on the development irrespective of who is to install them.

Does Table 1 in UUW's Risk Assessment for Water Pipes (RA) replace any of the tables to be completed in the Site Assessment Report (SAR) as required in the UKWIR Guidance?

UUW does not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in UUW's RA replaces Table 3.1 of the UKWIR Guidance.

Have any other Water Companies adopted the UKWIR Guidance yet?

You will need to contact the water company concerned if you are intending to install water pipes outside UUW's licensed area.

About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

Risk assessment for water pipes (RA)

The risk assessment for water pipes will help you choose appropriate materials for your development. We are happy to deal with a risk assessment for water pipes in advance of any formal application for a new water supply.

If you need any help completing the form please call us on **0345 072 6067**.

Section 1: Development details	
Development name (<i>if it has one</i>)	Trinity Islands
Development address	Plots C and D, Trinity Islands, Water Street, Manchester, M3 4JH
OS Grid reference (<i>mid point</i>)	Plot C: 382802, 397844 and Plot D: 382693, 397759
Developer's name	Renaker Build Limited
UUW reference number (<i>for UU use only</i>)	
Please provide details below of the current and historical use of the site and adjacent sites. <i>If your supporting information has details of the current and historical site use, please reference below the relevant sections of your report.</i> A historical map review is included within the WSP Phase I PRA report (WSP (2021) Trinity Islands Phase 1 PRA, Dated: October 2021, Ref: Version 3) and is summarised as follows. The historical mapping indicates the site has had multiple industrial (dye works, chemical works, corporation yard/ refuse destructor etc.) and commercial uses (pig market, garage and paper salvage shed) with multiple redevelopments prior to the present-day car parks. The surrounding land use has been a mixture of residential, commercial and industrial most notably including a meat market and abattoirs in the late 1800's to early 1900's. More recently the land use has been a mix of residential and commercial.	
Section 2: Preliminary risk assessment	
Has your desk study and site walkover identified any land potentially affected by contamination?	☒ Yes ☐ No
If the site is potentially affected by contamination but you have not completed any intrusive site investigation please provide details below of the rationale behind the intended pipe selection. <i>If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.</i> The proposals for the redevelopment of the site include the construction of four tower blocks (two on each Plot) with associated double height underground basement parking at each Plot. To allow the construction of these basements it is proposed to install a pile wall around the periphery of each Plot leaving a small strip of existing land around the edge. A plan showing the proposed development and basement footprint plans and the proposed route of the potable water pipes is attached to this document. Based off the BGS utility plan, the pipes are indicated to enter each plot via a small spur off the adjacent highways therefore the extent of the pipe route within the site is considered to be limited. As the majority of the existing shallow ground would be removed for the basement construction, which is indicated to extend up to the adjacent highway boundaries, the potable water pipe would enter the site and then almost immediately enter the building / basement. It is considered the pipes would pass through only a small amount of the existing ground material within the site boundary. The pipe would be laid in clean imported trench fill. Notwithstanding the above a preliminary risk assessment identified potential sources of contamination relating to historical site uses and a site investigation was recommended.	

Section 3: Intrusive site investigation																																	
Have you completed any intrusive site investigation?					☒ Yes ☐ No																												
Have you completed any none intrusive site investigation?					☒ Yes ☐ No																												
Date(s) when the site investigation(s) undertaken					<table border="1"> <tr> <td>2</td><td>6</td><td>0</td><td>4</td><td>2</td><td>0</td><td>2</td><td>1</td> </tr> <tr> <td>2</td><td>8</td><td>0</td><td>5</td><td>2</td><td>0</td><td>2</td><td>1</td> </tr> <tr> <td>D</td><td>D</td><td>M</td><td>M</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td> </tr> </table>					2	6	0	4	2	0	2	1	2	8	0	5	2	0	2	1	D	D	M	M	Y	Y	Y	Y
2	6	0	4	2	0	2	1																										
2	8	0	5	2	0	2	1																										
D	D	M	M	Y	Y	Y	Y																										
At what level has groundwater been encountered?					3.0 - 4.0 metres below ground level or ☐ Not encountered																												
Table 1 (Pipeline Selection Risk Assessment Summary (PSRAS)) below classifies testing required where the preliminary risk assessment has identified land potentially affected by contamination. Please provide details below of any test groups which have not been tested and the rationale for not testing. <i>If your supporting information has details of the rationale behind not testing any particular test groups, please reference below the relevant sections of your report.</i>																																	
The soil samples were analysed for a standard suite including metals, petroleum hydrocarbons including benzene, toluene, ethylbenzene and xylene, volatile/semi volatile organic compounds and polyaromatic compounds (PAH). Although the majority of existing shallow soil will be removed to facilitate the construction of the basement, for completeness a site wide assessment of the soil sample results against the UU criteria has been undertaken. The assessment indicates exceedances of petroleum hydrocarbons (EC10-EC16 and EC16-40) and pH criteria however the removal of the majority of the Made Ground, notably within the location of the proposed potable pipe route will remove the source of these exceedances i.e. ash and clinker shown on logs.																																	
If the intrusive site investigation has identified concentrations above the PE threshold (see PSRAS) and your intended pipe selection is PE. Please provide details below of the rationale behind the intended pipe selection. <i>If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.</i>																																	
Although the site investigation has identified concentrations above the PE threshold, given that the proposed development will include the removal of all except a strip of Made Ground and that the PE pipe would be installed within clean imported trench fill material, it is not deemed necessary to upgrade the pipe to barrier pipe. In addition, groundwater level is not expected to rise up to the shallow depth of the pipe installation which would prevent any deeper impact from migrating within the water table.																																	
Section 4: Site remediation																																	
Please provide details below of any site remediation (which may include a change in site levels) already completed. <i>If your supporting information has details of the site remediation already completed, please reference below the relevant sections of your report.</i>																																	
N/A																																	
Has the PSRAS (Table 1) been completed using appropriate data after remediation?								☐ Yes ☐ No ☒ N/A																									
Please provide details below of any proposed site remediation and an analysis of whether this will affect your intended pipe selection. <i>If your supporting information has details of any proposed site remediation and whether this will affect your intended pipe selection, please reference below the relevant sections of your report.</i>																																	
N/A																																	

Section 5: Final use of site

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has details of potential contamination risks which may affect your intended pipe selection, please reference below the relevant sections of your report.

The site will be redeveloped into residential apartments with below ground parking. There are no chemicals understood to be stored on the site.

What water pipe materials are intended to be used on site?

☒ PE ☐ PE Barrier Pipe Type A ☐ PE Barrier Pipe Type B
Other (please specify): x

Section 6: Additional information

Please use the section below to provide any additional details to support your intended pipe selection.

N/A

Section 7: Risk assessor

Name and relevant qualifications of person directing the risk assessment for water pipes

Emily Morgan, Principal Consultant, 11 years experience, CGeol

Name and address of risk assessor's company

WSP
No 8 First St
Manchester
M15 4RP

Date risk assessment performed

2 3 0 8 2 0 2 2

Section 8: Declaration

I confirm I have completed this form and provided supporting information in accordance with 'UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and UUW's Supplementary Guidance. I also confirm that if any further site investigation is needed and carried out, I will be required to submit an additional Risk Assessment for Water Pipes with the relevant supporting information. I understand that failure to supply any of the required information may delay my application being processed.

Name	Dave Watts	Company	WSP
Telephone	0151 331 8236	Date	0 1 0 9 2 0 2 2

Please email the completed form and supporting information to DeveloperServicesWater@uuplc.co.uk or post to us at United Utilities Water, Developer Services, Second floor Grasmere House, Lingley Mere, Warrington WA5 3LP.



About us

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Table 1 - Pipe selection risk assessment summary (PSRAS)

1. Testing must be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. Please use the appropriate testing data to complete Table 1 below.

2. If more than one pipe selection is being made, for example, for pipes in different areas of a large site, a completed PSRAS is required for each selection.

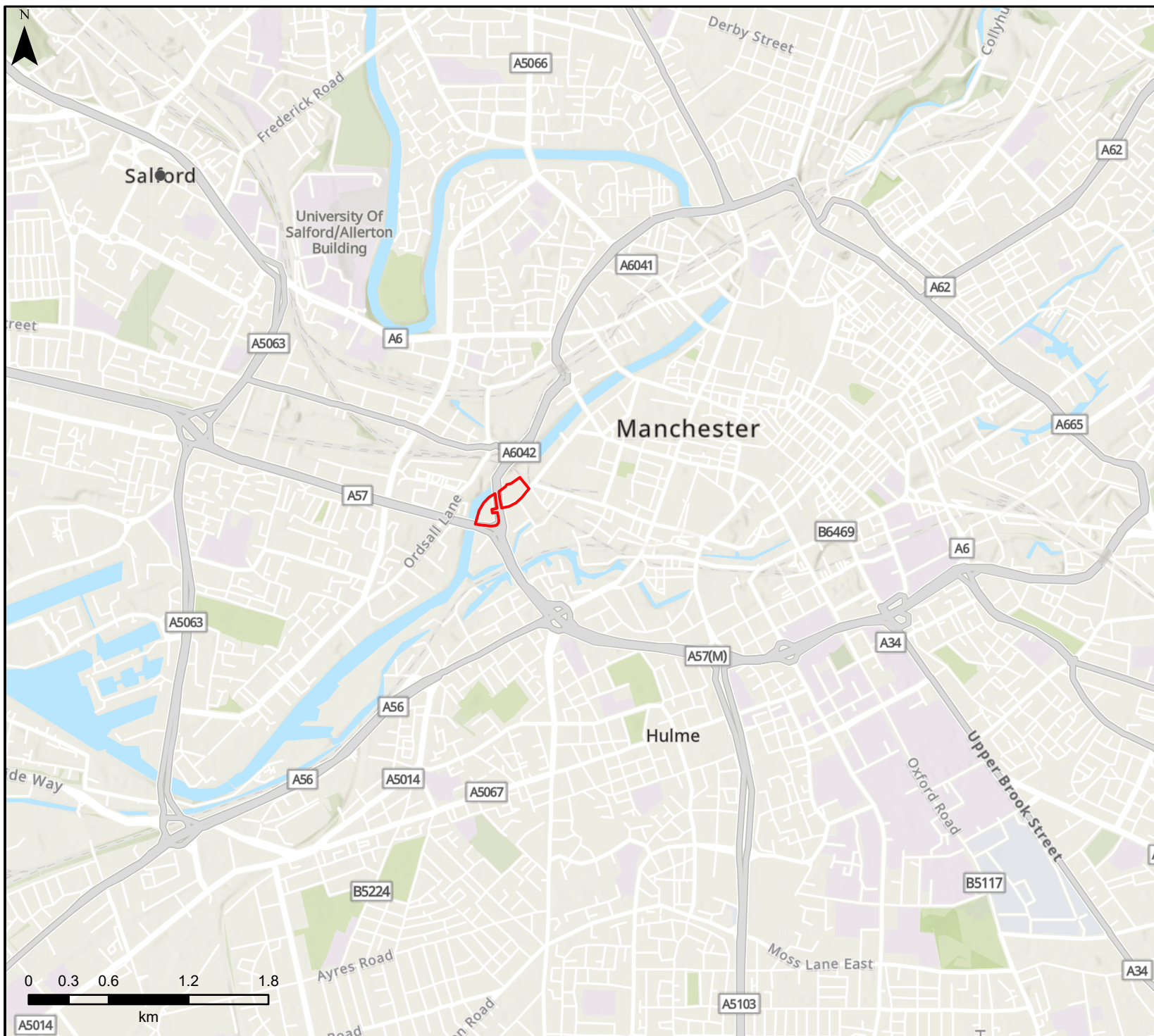
What materials have been tested to populate Table 1 below? ☒ Existing ground materials ☐ Remediated materials ☐ Imported capping materials

All concentrations in mg/kg									
Test Group	Testing Required?	PE threshold	Metal Pipes/ Barrier Pipe	Laboratory Detection Limit	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth See Note [2]	Maximum site concentration See Note [3]	Locations and depths where concentrations exceed proposed pipeline threshold	
Total VOCs	Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.5	Pass	-	-	-	-	-	-
Total BTEX & MTBE		0.1	Pass	0.01	Yes	<0.01	<0.01	N/A	
Total SVOCs (excluding PAHs and those substances marked with an *)		2	Pass	0.1	Yes	<0.1	<0.1	N/A	
EC5-EC10 aliphatic and aromatic hydrocarbons		2	Pass	0.01	Yes	<0.01	<0.01	N/A	
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	1.5	Yes	187.5	187.5	14 shallow locations recorded	
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	3.4	Yes	4400	4400	as above see comments re shallow	
Phenols* (from SVOC analysis)		2	Pass	0.5	Yes	<0.5	<0.5	N/A	
Cresols and chlorinated phenols* (from SVOC analysis)	Only where identified	2	Pass	-	-	-	-	-	
Ethers*		0.5	Pass						
Nitrobenzene*		0.5	Pass						
Ketones*		0.5	Pass						
Aldehydes*		0.5	Pass						
Amines		Fail	Pass						
Corrosive	Conductivity, Redox and pH	Pass	See Note [1]	-	Yes	11.7	11.7	see comment re: soil removal	

Note [1] Threshold: For wrapped steel, corrosive if pH<7 and conductivity > 400µS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity > 400µS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

Note [2] Water pipes are normally laid at 0.75-1.35m below finished ground level.

Note [3] Also state if liquid free product is present in soil or groundwater.



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Information Classification:

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Legend :



Site Location

Title : Figure 1: Site Location Plan

Author : WSP_Ground and Water

Scale : 1:40,000

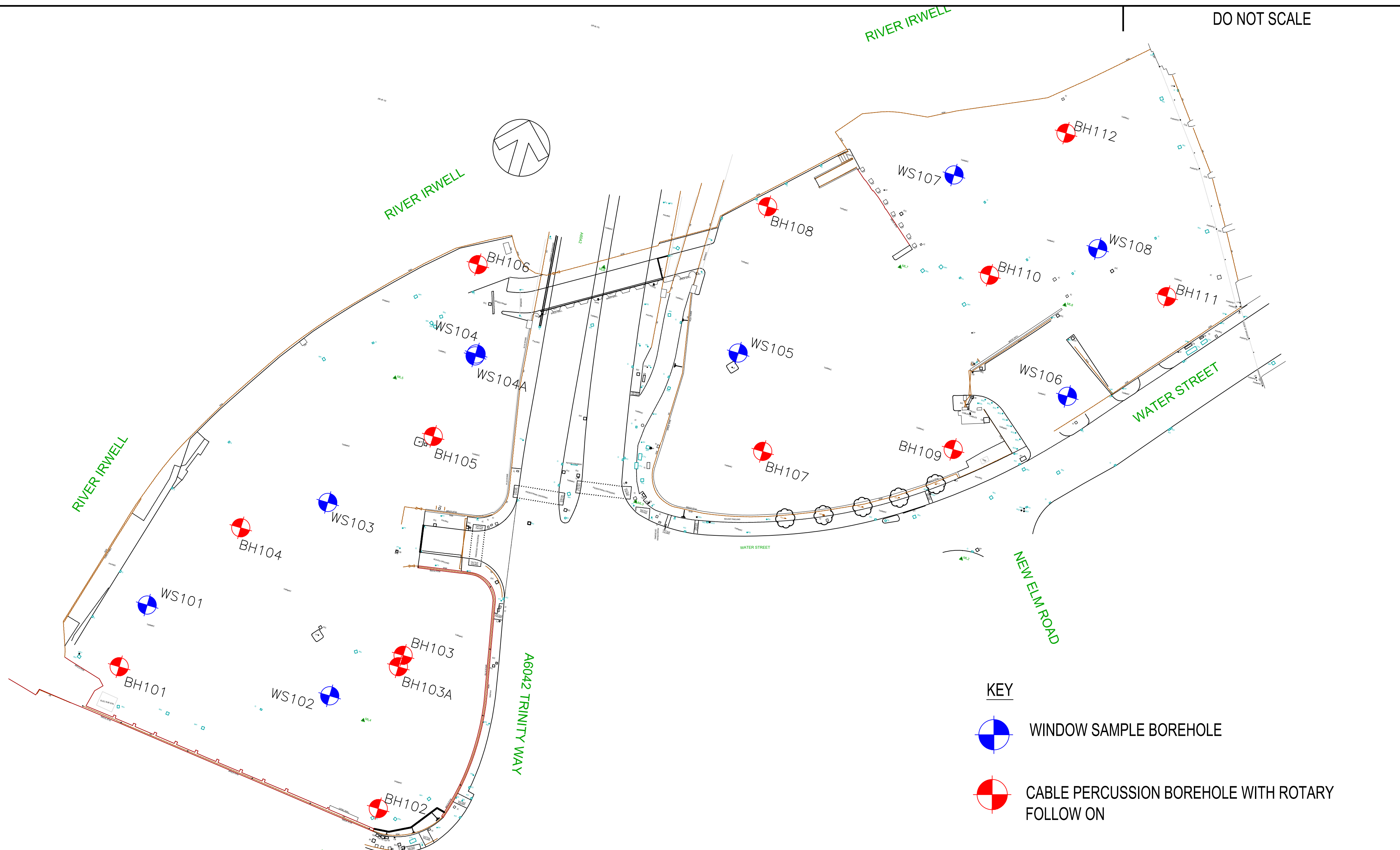
Layout : WSP A4 Landscape

Current Time : 06/04/2021 10:03



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S2 - FOR INFORMATION									

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ARCHITECT:		SIMPSON HAUGH	

PROJECT:		70082598 TRINITY ISLANDS	
TITLE:		EXPLORATORY HOLE PLAN	

SCALE @ A2: Custom		CHECKED: DW		APPROVED: SC	
PROJECT No: 70082598		DESIGNED: EM	DRAWN: EM	DATE: JULY 2021	
DRAWING No: FIGURE 2					REV: 01
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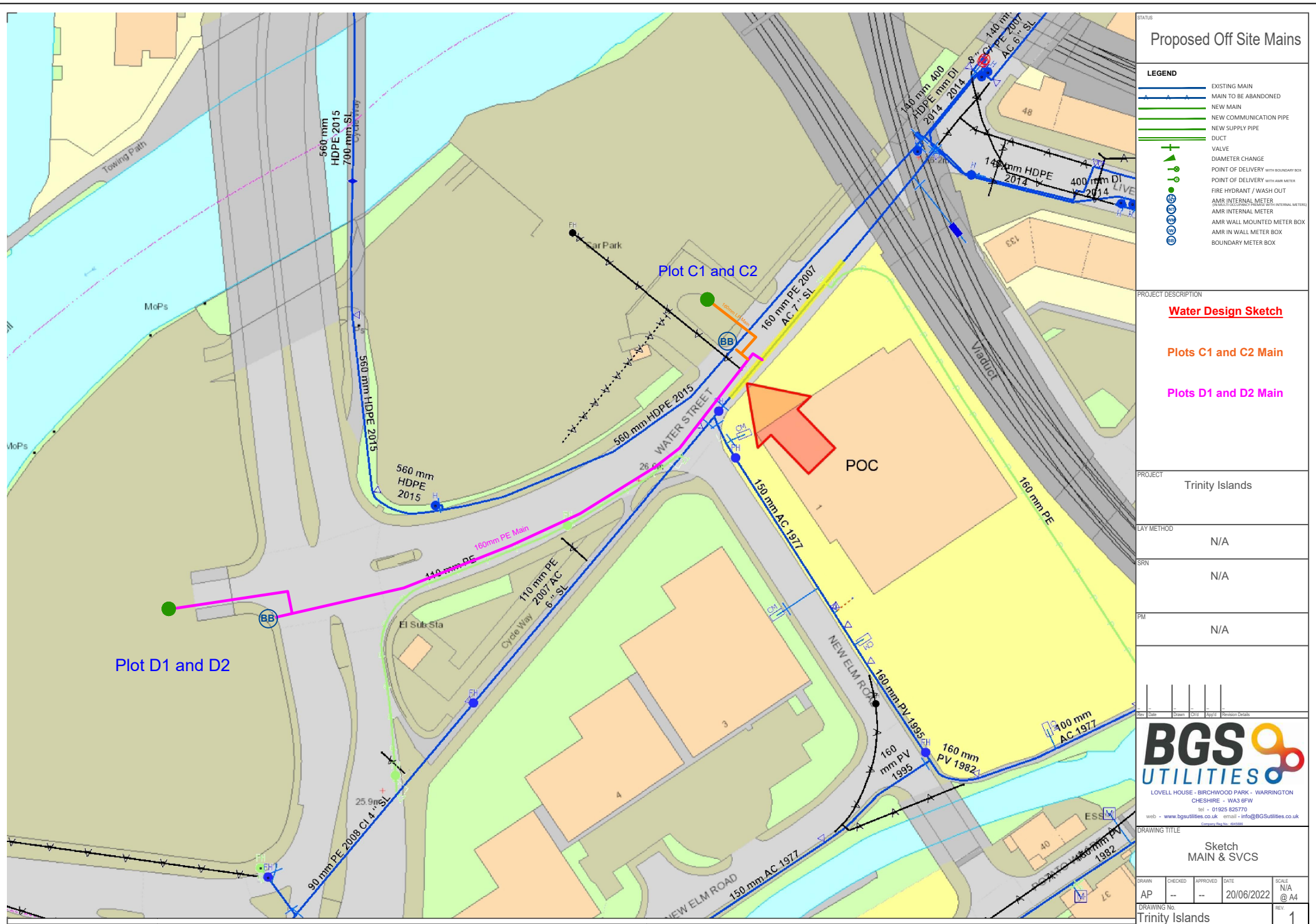
70082598 Trinity Islands

Insert 2-1 - Initial Design Layout



Insert 2-2 - Extent of Basement Excavation





United Utilities Risk Assessment Comparison				Prod D																Prod C																	
Sample ID		BH101	BH101	BH102	BH102	BH103	BH103	BH103	BH104	BH104	BH104	BH104	BH105	BH105	BH105	WS101	WS101	WS101	WS102	WS102	WS104	WS104	BH107	BH107	BH108	BH108	BH110	BH112	BH111	BH112	WS105	WS105	WS106	WS106	WS107	WS107	WS108
Depth	1.00	0.20	0.15	0.50	1.00	0.20	0.50	0.50	1.00	0.20	0.15	0.50	1.00	0.20	0.15	0.20	0.20	0.50	1.00	0.50	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50	
Sampling Date	28/04/2021	29/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	06/06/2021	
Test	Resi (POS)	LOO	Units	MG with ash	MG with ash	1-m SAND	MG with ash	MG with ash	MG with ash	MG	MG with ash	MG with ash	MG with ash	subbase	MG with ash	MG with ash	subbase	MG with ash	MG with ash	MG with ash	MG with ash	MG with ash	MG with ash	MG	MG with ash	MG with ash	subbase	MG with ash	MG with ash	SAND	MG with ash	MG with ash	SAND	MG with ash	MG with ash		
Asbestos Quantification	0.001	%																																			
Metals																																					
Arsenic	79	0.2	mg/kg	6.4	6		17		54	1.7	4.3		16		74		81	94	85	81	9.2	120	93	26		5.3	24	22	3.5	26	26	22	27	25	34	13	19
Cadmium	120	0.2	mg/kg	0.4	1		1.2		0.5	0.5	0.2		0.9		0.6		0.6	0.6	0.6	0.1	0.3	2.3	0.7		0.2	0.1	0.3	0.9	0.9	0.5	0.3	0.3	0.9	0.3	0.7		
Chromium	2140	0.15	mg/kg	14	6.1		14		21	4.1	7.9		8.4		22		9	21	18	22	17	27	100	12		8.7	16	31	3.6	13	12	16	25	20	16	9.3	8.8
Chromium, Hexavalent	5.7	1	mg/kg	1																																	
Copper	12500	0.2	mg/kg	130	13		58		190	9.9	15		32		590		35	280	250	250	26	70	430	95		11	160	100	32	150	180	180	90	130	140	22	130
Lead	375	0.3	mg/kg	470	54		1000		380	15	30		89		530		130	520	320	450	38	1000	140		20	290	370	45	290	240	190	280	320	230	22	8400	
Mercury	124	0.05	mg/kg	0.49	0.29		0.14		0.18	0.14	0.14		0.18		0.42		0.42	0.37	0.26	0.37	0.18	0.19	0.44	0.24		0.05	0.63	0.9	0.09	0.14	0.27	0.24	2.8	0.4	0.2	0.5	
Nickel	305	1	mg/kg	24	5.9		16		56	5.2	7.6		9.5		66		19	63	54	39	14	31	36	35		6.9	35	29	5.9	56	50	40	24	38	22	14	19
Zinc	1140	0.5	mg/kg	6.5	1.5		15		34	3.2	11		15		11		0.5	0.7	0.5	1.1	0.5	0.9	0.5	95		24	140	82	32	110	120	720	93	72	530	46	400
Zinc	60700	1	mg/kg	110	53		66		300	22	29		59		270		72	200	170	160	54	84	500	99		24	140	82	32	110	120	720	93	72	530	46	400
Inorganics																																					
pH			pH	9.1	9.2		7.8		6.9	9.2	11.7		9.5		8.9	7.3	7.2	7.5	7.4	8.9	10.8	7.8			8.2	7.8	8.1	8.6	7.5	7.7	10.4	7.5	7.4	8	8.1	7.8	
Total Organic Carbon			%	4.2	6		3.9		28	5	0.5		6.6		13		5.9	34	31	25	0.5	1.2	4.8	15		0.9	7.3	8.5	6.9	21	24	22	10	19	5.9	0.8	15
Surrogate Asbestos Extracted as: SOL			mg/l	68	66		66		1600				1100		26		5.9	34	31	25	0.5	1.2	4.8	15		0.9	7.3	8.5	6.9	21	24	22	10	19	5.9	0.8	15
Petroleum Hydrocarbons																																					
Aliphatic C5-C8	579000	0.01	mg/kg	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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Aliphatic C9-C11	697000	0.01	mg/kg	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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Aliphatic C9-C10	12500	0.01	mg/kg	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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Aliphatic C12-C14	12600	1.2	mg/kg	11	1.5		1.2		1.2	5.5	1.2		2.4		9.8		21	1.2	1.2	1.2	1.2	1.2	1.2	8.8		1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.7	1.2	1.2	1.2	
Aliphatic C15-C17	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C18-C20	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C21-C23	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C24-C26	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C27-C29	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C30-C32	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C33-C35	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C36-C38	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C39-C41	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C42-C44	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C45-C47	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C48-C50	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C51-C53	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C54-C56	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C57-C59	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C60-C62	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C63-C65	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C66-C68	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C69-C71	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C72-C74	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
Aliphatic C75-C77	215000	1.5	mg/kg	54	140		1.5		1.5	81	1.5		41		14		44	1.5	1.5	1.5	1.5	1.5	18	22													