



Application to vary an installation permit to include waste operation as a DAA

Five Fords AAD facility

24 October 2018

Mott MacDonald
Victory House
Trafalgar Place
Brighton BN1 4FY
United Kingdom

T +44 (0)1273 365000
F +44 (0)1273 365100
mottmac.com

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Abbreviations and Acronyms

AAD: Advanced Anaerobic Digestion

AD: Anaerobic Digestion

ASP: Activated Sludge Plant

BAS: Biosolids Assurance Scheme

BAT: Best Available Techniques

BIP: Biomethane Injection Plant

BUP: Biogas Upgrading Plant

CABWI: Certification and Assessment Board for the Water Industry

CC: Complaint Commission

CHP: Combined Heat and Power

CHPQA: Combined Heat and Power Quality Assurance

COSHH: Control of Substances Hazardous to Health

CPNI: Centre for the Protection of National Infrastructure

DAA: Directly Associated Activity

DAWA: Directly Associated Waste Activity

dB(A): Decibels (A-weighted)

DCWW: Dŵr Cymru Welsh Water

DG7: Minimum standard for companies responding to written complaints

DS: Dry Solids

EA: Environment Agency

ELV: Emission Limit Values

EMP: Environmental Management Plan

EMS: Environmental Management System

EP OPRA: Environmental Protection Operator and Pollution Risk Appraisal

EPR: Environmental Permitting Regulations

ERA: Environmental Risk Assessment

HACCP: Hazards Analysis and Critical Control Points

HTH: High Temperature Heated

HYBAS: Hybrid Activated Sludge (proprietary Veolia wastewater treatment technology)

IBC: Intermediate Bulk Container

IEC: International Electrotechnical Commission

ISO: International Organisation for Standardisation

LTH: Low Temperature Heated

LTHW: Low Temperature Hot Water

LTP: Liquor Treatment Plant

LWS: Local Wildlife Site

MCERTS: Monitoring Certification Scheme (of the EA)

MWth: Megawatts thermal

NOx: Nitrogen Oxides

NRW: Natural Resources Wales

OCU: Odour Control Unit

OFGEM: Office of Gas and Electricity Markets

OFWAT: Water Services Regulation Authority (previously Office of Water Services)

OPRA: Operator and Pollution Risk Appraisal

PEA: Preliminary Ecological Appraisal

PIA: Pollution Incident Advisor

PS: Pumping Station

PVC: Polyvinylchloride

QM: Quality Manual

QMS: Quality Management System

RHI: Renewable Heat Incentive

RO: Reverse Osmosis? Responsible Officer

SAP: Systeme, Anwendungen und Produkte in der Datenverarbeitung (German multinational software supplier)

SCR: Site Condition Report

STP: Sludge Treatment Plant

T21: Treatment Exemption no 21 type of permit allowing waste recovery at a WwTW

tDS: tonnes Dry Solids

TGN: Technical Guidance Note

THP: Thermal Hydrolysis Process

TRIAD: A system through which the National Grid charges businesses for the costs associated with the electrical transmission network.

UV: Ultraviolet

VOC: Volatile Organic Compounds

WwTW: Wastewater Treatment Works

Main supporting document Non-Technical Summary

Introduction

The Non-technical summary has been written to support the application to vary the existing bespoke Environmental Permit (EPR/AP3139FT) for the Facility on behalf of Dŵr Cymru Welsh Water (DCWW) ('the Operator'). In order to satisfy the requirements of the Environmental Permitting Regulations (EPR) 2016, the Operator must apply to the Natural Resource Wales (NRW) for a change (variation) to an existing Environmental Permit.

The permit variation is required to take account of the proposed changes at the wider Five Fords site, which include the addition of an Advanced Anaerobic Digestion (AAD) facility to the current Anaerobic Digestion (AD) process which takes place at the site. As part of this change, the AAD and sludge treatment processes will require the importation of an increased amount of sludge and cake from other Wastewater Treatment Works (WwTW) satellite sites around North Wales. This will cause Five Fords to subsequently exceed the current T21 exemption (recover wastes at a wastewater treatment works), which covers the site and allows the treatment of up to 100,000 cubic metres of waste over any 12-month period.

Overview

Five Fords Wastewater Treatment Works (WwTW) is located to the south-east of Wrexham. Currently the site undertakes anaerobic digestion of sewage sludge from the on-site Five Fords WwTW, and liquid imports from other satellite WwTW sites in North Wales.

The biogas produced from the process is currently either burnt in the CHP engines or exported to the grid via the Five Fords WwTW Gas to Grid Facility (hereafter referred to as 'the Facility'). Currently the Facility is operated under Permit number EPR/AP3139FT. The sludge treatment works and AD plant (hereafter referred to as 'the Plant') are currently outside the environmental permit area and are subject to a T21 exemption.

Since the existing sludge treatment digestion and sustainable energy plant became operational, new advanced anaerobic digestion (AAD) technologies have become well established. These technologies increase the yield of gas obtained from the digestion of sludge and result in a higher quality end product for use as fertiliser and are well suited for large scale centralised treatment of sludge.

It is now planned to install a Cambi thermal hydrolysis process (THP) plant, a form of AAD technology, at Five Fords WwTW, and for Five Fords to become a treatment centre for all sludge produced in North Wales, taking on additional satellite sites to those already importing liquid sludge into Five Fords. This will also allow the other digesters around north Wales, many in a deteriorating condition, to be decommissioned.

The changes which will take place on site will mean that in future the AAD and sludge treatment facility will no longer meet the T21 exemption, and would, therefore, become a waste operation.

The AAD plant will be located immediately adjacent to the existing sludge treatment digestion plant, with modifications to the current AD process, and some minor modifications to equipment within the gas-to-grid permit area (removal of a boiler, modifications to the current combined heat and power (CHP) engines, and addition of another gas holder).

The proposed AAD plant will continue to process indigenous sludge from the Five Fords WWTW and will also receive a similar quantity of imported sludge. Additionally, Five Fords will start receiving cake (dewatered sludge) from several satellite sites for treatment, which will eventually make up 65% of the dried solids treated at the site. All sludge and cake will go through the new THP before being piped to the two current digester tanks, where biogas will be transported to the two gas holders. The produced gas will then be piped to the gas-to-grid installation (majority of the gas) or burnt in the two existing CHP engines to produce electricity. The current waste biogas burner will be retained and available to burn excess gas.

The proposed AAD plant will involve the following main changes:

- Cake import facility to receive dewatered sludge from the satellite sites;
- Cake silos for storage of cake prior to treatment in THPs;
- Pre-THP dewatering facility for on-site sludge and liquid imports to allow for combined storage with imported cake in silos;
- THP including two new boilers (1.567MWth each, with dual burners which can run on either biogas or natural gas) to provide steam to heat the THP streams. This is prior to the existing digestion facility;
- One new additional gas holder;
- Demolition of existing sludge buffer tanks prior to post digestion dewatering;
- Re-use of existing pre-digestion sludge storage tanks for sludge storage upstream of the Pre-THP dewatering facility;
- New post-digestion tank to the north of the cake export building;
- Extensions and modification of the current cake export building to cater for increased production of cake;
- Liquor Treatment Plant (LTP) to reduce pollutants in the post digestion dewatering centrate to acceptable levels before being pumped back to the WWTW;
- Automated de-gritting system for existing digesters;
- Removal of the current standby boiler (1.5MWth) located with the current CHP engines;
- Modification of the current CHP's (2.82MWth total), so that they no longer recover heat for the digesters.

The following are outputs from the process:

- Cake (dewatered post digestion sludge) - stored in cake building before being shipped for use as a fertiliser;
- Pre-THP centrate - pumped back to head of works for treatment;
- Post-THP centrate - passed through the LTP to remove the majority of ammonia and is then pumped to the head of the works for treatment;
- Bio gas - stored in gas holders, then passed through siloxane filters, then either:
 - Passed through the gas-to-grid plant before injection into grid;
 - Burnt in CHPs;

- Used to run the THP boilers; and
- Flared in the waste biogas burner.
- Grit (small amount) – deposited in tip before taken off site.

Additional information

The supporting document contains a description of the proposed changes, an assessment of the possible effects of this change and responses to all questions in the relevant forms - Parts A, C2, C3 and F1 - for the application documentation (plus supporting information where required). Completed forms A, C2, C3 and F1 are included within Appendix A.

The Environmental Permit variation application document ('the Main Supporting Document') consists of two main parts:

- Chapter 2 provides the general information required to inform Form C2 relating to the variation of a bespoke permit; and
- Chapter 3 provides the more detailed information required to inform Form C3 relating to the variation of a bespoke installation permit.

Form F1 covers Environmental Protection Operator and Pollution Risk Appraisal (EP OPRA) scores and the corresponding OPRA Spreadsheet is included electronically as Appendix B.

Additional information included as part of this submission, are found in the following appendices:

- Appendix A - Permit application forms
- Appendix B - EP OPRA
- Appendix C - Environmental Risk Assessment
- Appendix D - Plans
- Appendix E - Site Condition Report
- Appendix F - Relevant Correspondence
- Appendix G - Environmental Assessments
- Appendix H - Schematics

1 Introduction

1.1 Overview

This document has been prepared to support the application to vary the existing bespoke Environmental Permit (hereafter referred to as 'the Permit') EPR/AP3139FT for the Facility on behalf of Dŵr Cymru Welsh Water (DCWW) ('the Operator'). In order to satisfy the requirements of the Environmental Permitting Regulations (EPR) 2016, the Operator must apply to the Natural Resource Wales (NRW) for a change (variation) to an Existing Permit.

This document has been prepared to support an application to vary the Permit.

This is to account for the proposed changes at the wider Five Fords site, which include the addition of Advanced Anaerobic Digestion (AAD) to the current Anaerobic Digestion (AD) process which takes place at the site. As part of this change, the AAD and sludge treatment processes will require the importation of an increased amount of sludge and cake from other Wastewater Treatment Works (WwTW) satellite sites around North Wales, and will subsequently exceed its current T21 exemption (recover wastes at a wastewater treatment works), which allows the treatment of up to 100,000 cubic metres of waste over any 12-month period, and covers the site.

This document contains a description of the proposed changes, an assessment of the possible effects of this change and responses to all questions in Parts A, C2, C3 and F1 of the application documentation (plus supporting information where required). Completed forms A, C2, C3 and F1 are included within Appendix A.

1.2 Document content and structure

This environmental permit variation application document ('the Main Supporting Document') consists of two main parts:

- Chapter 2 provides the general information required to inform Form C2 relating to the variation of a bespoke permit; and
- Chapter 3 provides the more detailed information required to inform Form C3 relating to the variation of a bespoke installation permit.

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Additional information included as part of this submission, are found in the following appendices:

- Appendix A - Permit application forms
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- Appendix G - Environmental Assessments
- Appendix H - Schematics

2 General – Varying a bespoke permit (part C2)

2.1 About the permit (Question 1)

The environmental permit that this application relates to is EPR/AP3139FT.

The address for the Plant is:

Five Fords WwTW Gas to Grid Facility
Cefn Road
Abenbury
Wrexham
Clwyd
LL13 0PA

2.2 Existing Activities

DCWW is applying for a variation to account for changes to the current AD and sludge treatment centre which will exceed the T21 exemption (sometime in early 2019) and will, therefore, be classed as a waste operation. The variation will fall under the current gas-to-grid installation permit as a Directly Associated Waste Activity (DAWA).

A summary of the current permitted activities as part of the Facility is shown below:

Table 1: Permitted activities

Table S1.1 Activities

Activity reference	Activities listed in Schedule 1 of the EP Regulations	Description of the specified activity	Limits of specified activity
A1	Section 1.2 A (1) (a) – Refining gas where this is likely to involve the use of 1000 or more tonnes of gas in any 12-month period.	Refining of bio-gas produced from AD of Sewage Sludge prior to direct injection into National Gas Grid.	From receipt of raw bio-gas to entry to the National Grid including gas odourisation.
Directly Associated Activity			
A2	Propane Storage and Transfer Plant	Addition of propane to bio-methane to enhance calorific value of gas.	Storage and transfer of propane.
	Description of activities for waste operations	Limits of activities	
A3	R1: Use principally as a fuel or other means to generate energy.	Treatment operations shall be limited to: 1. Burning of waste as a fuel for CHP production of hot water and electricity, from the receipt of raw materials to the despatch of products and waste.	

Table S1.1 Activities

	2. Operation of a Waste Gas Burner (flare stack) from the receipt of biogas to the release of combustion products. 3. Storage of biogas arising from the AD process at Five Fords WwTW prior to combustion in the CHP engines and supplementary firing in the boilers or flaring. 4. Siloxane removal using a granular activated carbon filter, which will remove siloxane from the biogas deriving from the anaerobic digester prior to its combustion in the CHPs and the boiler. 5. Discharge of condensate from the gas pipelines and gas storage bag and from the siloxane removal media regeneration process, from collection to the point of discharge to the adjacent WwTW.
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Source: Environmental Permit

2.2.1 Existing Permitted Plant

The Facility, as currently permitted, allows for the upgrading and injection of biogas into the national gas grid. CHPs are also based on site which can combust biogas when needed. A dual fuel standby boiler is also retained on site, which can run on both natural gas and biogas, when needed.

The biogas produced from the existing sludge treatment and AD processes is currently outside of the environmental permit area.

The upgraded Plant will require the installation of new equipment, although a number of the existing assets will be reused as part of the enhanced digestion scheme. Some of these will require refurbishment. Table 2 lists the existing plant items within the current environmental permit.

Table 2: Existing plant items within the environmental permit EPR/AP3139FT (including any changes)

Existing items in permitted boundary	Current Status	Capacity (where applicable) (m ³ unless specified elsewhere)	To stay in place/reused/ replaced/removed as part of proposed changes
1.5MW thermal output hot water boilers	Operational		Removed
Digester Heat Exchangers	Operational		Removed

2.2.2 Existing sludge treatment and anaerobic digestion

Sludge import and treatment and AD at Five Fords is currently regulated under a T21 exemption (Ref: NRW-WME009750) allowing the treatment of 100,000 cubic metres of waste brought to the works per annum.

The site imports sludge from other sewage treatment works in the area for treatment, in addition to treating the sludge produced by the on-site sewage treatment works. Imported sludge is brought in by tankers.

Indigenous and imported sludge and liquor from WwTWs in the region is accepted at the site and treated using AD. The waste is stored and blended before being pumped to the digesters. The digestion process breaks down the organic material in the feedstock, creating gases and digestate which forms a sludge cake on dewatering. The sludge cake is acceptable for use in agriculture. The resulting liquid returns to the digestion process or goes to the head of the WwTW.

The gas produced is passed to the Facility where it is refined and either injected into the national gas grid or burned in the two CHP engines (combined thermal input of 2.82MW).

2.3 Changes to existing activities

2.3.1 Changes to existing gas to grid facility (within current permit boundary)

No changes to the current Facility are anticipated.

The digesters, which are currently outside the gas-to-grid permit boundary, will be brought within the permitted site. The updated permitted boundary is presented in drawing ref 4791-S-201-MMB-06-XX-DR-NX-06202-C03 in Appendix D.

2.3.2 Changes to sludge treatment and anaerobic digestion (currently outside the permit boundary)

It is now planned to install a Cambi thermal hydrolysis process (THP) plant, a form of AAD technology, at Five Fords WwTW, and for Five Fords to become a treatment centre for all sludge produced in North Wales, taking on additional satellite sites to those already importing liquid sludge into Five Fords. This will also allow the other digesters around north Wales, many in a deteriorating condition, to be decommissioned.

The main changes to the sludge treatment activities to be included in the varied permit are summarised as follows:

- Increased sludge treatment: the quantity of sludge treated at the site will increase to 104,465m³/annum.
- Thermal Hydrolysis Plant (THP): a Cambi THP plant will be installed prior to the current digesters. This will increase the yield of gas obtained from the digestion of sludge and result in a higher quality end product for use as fertilizer. This will include two new boilers (1.567MWth each, with dual burners which can run on either biogas or natural gas) to provide steam to heat the THP streams.
- Liquor Treatment Plant (LTP): a new LTP will be included within the new permit. This will reduce pollutants in the post digestion dewatering centrate to acceptable levels before being pumped back to the WwTW.

Details pertaining to the sludge and cake that will be imported into the Plant are displayed in Table 3. These figures are based on a worst-case scenario and were derived from Tables 3.10 and 4.2 of the Basis of Design Report (document ref DCWW-4791-S-201-MMB-06-XX-RP-CX-11001). The treatment capacity is 47tDS/day.

Table 3: Quantity of sludge and cake imported to the Plant

Stream	Concentration (%DS)	tDS/year	Volume (m ³ /year)	Comment
Imported – Existing LIQUID sludge imports	3.8	1,500	39,420	The concentration and delivery volumes are

Stream	Concentration (%DS)	tDS/year	Volume (m ³ /year)	Comment
				variable – especially the concentration. The concentration of 3.8%DS is based on measured values
Imported – proposed imported cake	20 (minimum)	13,009 (worst case including Queensferry – Phase 2 average)	$13009 \times 100 / 20 = 65,045$	The % DS should be higher than this (i.e. volume lower) this value is used to be conservative. Also, density assume 1t/m ³ which is also conservative.
Total	N/A	14,509	104,465	marginally over the 100,000 m ³ “limit”

The proposed AAD plant will include the following changes:

- Cake import facility to receive dewatered sludge from the satellite sites;
- Cake silos for storage of cake prior to treatment in THPs;
- Pre-THP dewatering facility for on-site sludge and liquid imports to allow for combined storage with imported cake in silos;
- One new additional gas holder;
- Demolition of existing sludge buffer tanks prior to post digestion dewatering;
- Re-use of existing pre-digestion sludge storage tanks for sludge storage upstream of the Pre-THP dewatering facility;
- New post-digestion tank to the north of the cake export building;
- Extensions and modification of the current cake export building to cater for increased production of cake;
- Automated de-gritting system for existing digesters;
- Removal of the current standby boiler (1.5MWth) located with the current CHP engines; and
- Modification of the current CHPs (2.82MWth total), so that they no longer recover heat for the digesters.

The stages to the process in the LTP are as follows:

- Only post-THP dewatering liquors are pumped to the LTP balance tank for buffering before being pumped forward for treatment.
- The LTP feed pumps then pump the liquors to the LTP moving bed biofilm reactor (MBBR).
- Before entering the reactor, the flow (warmed via the sludge coolers) passes through a static mixer where the low temperature final effluent is added to dilute and warm the liquors. Caustic soda is then dosed to add alkalinity to promote the conversion of ammonia into nitrogen gas.
- Flow passes into the reactor, where it is mixed and treated utilising Anammox (anaerobic ammonia oxidation) technology. Air is added to the reactor using a blower and air distribution grid, and the flow is mixed using a paddle mixer, which keeps the media and ammonia oxidising bacteria in suspension.

- Flow then passes forward to the LTP clarifier complete with half-bridge scraper. In this tank, effluent is wired over and discharged to the THP return pumping station where flow is discharged back to the main WwTW for further treatment. The sludge settled in the LTP clarifier is returned to the reactor as part of a returned activated sludge system.
- When this sludge volume increases beyond a set volume, surplus activated sludge is diverted to the THP return pumping station and pumped to the main WwTW for settlement.

Removal of:

- Standby boiler

2.3.3 Equipment to be installed

As already mentioned, the upgraded Facility will require the installation of new equipment. Table 4 shows the equipment to be installed as part of the new environmental permit boundary.

Table 4: Operational plant/ Equipment to be located within the new Environmental Permit Boundary

Equipment	New item / Existing?	Storage capacity (where applicable) (m ³ unless specified elsewhere)	Vents and values on storage tanks	Comment (where applicable)
SAS buffer tank	Existing	XX	Odour controlled	
Primary, SAS and Imports Gravity Belt Thickeners	Existing, Primary and Imports to be decommissioned, SAS to be retained	-	-	Located outside
Cake reception conveyors 1 & 2	New	2 x 30	Odour controlled	Import area enclosed but not in building
Cake storage silos 1 & 2	New	2 x 300	Odour controlled	
Screened Sludge Holding Tank	Existing tank	XX	Odour controlled	
Pre-THP Dewatering Feed Tank	Existing tank (Currently Digester Feed Tank)	XX	Odour controlled	
Digesters (A & B)	Existing	3,814 (each)	Pressure relief valves installed	
Gas Holder complete with pressure relief valve	New	1,350		
Post digestion tank coupled with air mixing/gas stripping system	New	333	Covered and odour controlled	
Pre-THP Centrifuges 1 & 2	2 New	-		Within building
Pre-THP Polymer Dosing Plant	New	12		Within building
Strainpresses	4 Existing and 1 New			Located outside
Liquid Import Rotamats	Existing			Located outside

Equipment	New item / Existing?	Storage capacity (where applicable) (m ³ unless specified elsewhere)	Vents and values on storage tanks	Comment (where applicable)
Import area OCU	New	-		
Post THP OCU	New	-		
Liquid polymer dosing plant and storage tank	Existing			Located within a building for GBTs
Centrate PS	New	XX	Covered below ground manhole	
Cake building	Upgraded Existing and New Extension	XX		
THP Stream 1 & 2 coupled with compressors	New			2No B4-3 Units
THP Sludge Coolers 1 & 2	New			3 stage cooler
Post THP Centrifuges 1, 2 & 3	3 New			Located within upgraded and repurposed north cake storage building
Post THP Polymer Dosing Plant	New			Located within upgraded and repurposed north cake storage building
Pre-THP Powder polymer storage silo	New	15 tonnes	Covered with vent valve	
Post-THP Powder polymer storage silo	Existing with screw conveyor upgraded	15 tonnes	Covered with vent valve	
LTP Balance tank	New	XX	Covered	Anita™ Mox-HYBAS LTP
LTP Reactor tank	New	XX	Covered	
LTP Clarifier	New	XX	Open topped with half bridge scrapper	
LTP Blowers	New			
Caustic Dosing Plant	New	XX	Covered and within bunded kiosk	
Liquor PS	Existing	XX	Covered below ground manhole	Discharge location changed to be new THP Site Return PS
THP Site Return PS	New	XX	Covered below ground manhole	Discharge location upstream of ASP
Low Temperature Heated (LTH) FE Storage Tank	New	XX	Covered	
High Temperature Heated (HTH) FE Storage Tank	New	XX	Covered	
Softened Water Storage Tank	New	XX	Covered	
Grit Dilution Tank	New	XX		Coupled with mixer

Equipment	New item / Existing?	Storage capacity (where applicable) (m ³ unless specified elsewhere)	Vents and values on storage tanks	Comment (where applicable)
Auto-degrit system	New			Grit removal from digesters
Steam Boilers 1& 2	New			Within a building
Steam Boiler Flue Stack	New	15m		
Potable water buffer tank	New	20	-	Located within upgraded and repurposed north cake storage building
Lime Dosing Plant	Existing			To be decommissioned
Lime Consolidation Tanks	Existing	XX		To be decommissioned
Limed Sludge Storage Tanks 1-4	Existing	XX		To be removed

Table 5 identifies the items of equipment that will be decommissioned as part of the upgrade works at Five Fords, and will, therefore, not be included in the permit.

Table 5: Items to be decommissioned and removed from the permit

Equipment	New item / Existing?	Storage capacity (where applicable) (m ³ unless specified elsewhere)	Vents and values on storage tanks	Comment (where applicable)
Post digestion tank	Existing			Decommissioned
Lime Dosing Plant	Existing			To be decommissioned
Lime Consolidation Tanks	Existing	XX		To be decommissioned
Limed Sludge Storage Tanks 1-4	Existing	XX		To be removed

2.4 Ability as an operator (Question 3)

2.4.1 Relevant offences (3a)

Relevant offences since those listed in the application document for the initial environmental permit for the installation, are listed in Table 6.

Table 6: Relevant offences

Conviction date	Court	Offence
11/12/2015	Mold Magistrates	Environmental Permitting (England and Wales) Regulations 2010

04/11/2014	Llandudno Magistrates	S.12 and S.38 Environmental Permitting (England and Wales) Regulations 2010
28/02/2014	Wrexham Magistrates	S.12(1), and S.38(2) Environmental Permitting (England and Wales) Regulations 2010
12/12/2013	Holyhead Magistrates	S.12(1)(b) and S38(1)(a) Environmental Permitting (England and Wales) Regulations 2010
20/11/2013	Llandrindod Magistrates	12(1), 38(1)(a) and 39(1) Environmental Permitting (England and Wales) Regulations 2010
19/11/2013	Llandudno Magistrates	S.38(2) Environmental Permitting (England and Wales) Regulations 2010
18/11/2013	Dolgellau Magistrates	S.12(1)(b), S38(2) and S.39(1)(a) Environmental Permitting (England and Wales) Regulations 2010
20/05/2013	Haverfordwest Magistrates	38(2) and 39(1) Environmental Permitting (England and Wales) Regulations 2010
05/04/2013	Cardiff Magistrates	S.12(1), 38(1) and 29(1) Environmental Permitting (England and Wales) Regulations 2010
06/09/2011	Hereford Magistrates	S.85(1) Water Resources Act 1991
21/04/2011	Cardiff Crown	S.85(1) Water Resources Act 1991
11/04/2011	Bridgend Magistrates	S.85(1) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
24/06/2010	Wrexham Magistrates	S.85(1) and S.85(6) Water Resources Act 1991
19/06/2009	Llwynpia Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
29/01/2009	Wrexham Magistrates	S.85(6) Water Resources Act 1991
21/10/2008	Abertillery Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
18/09/2008	Llwynpia Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
24/07/2008	Holyhead Magistrates	S.85(1) and S.85(6) Water Resources Act 1991
21/07/2008	Mold Magistrates	S.85(6) Water Resources Act 1991
25/06/2008	Stroud Magistrates	S.85(3) Water Resources Act 1991
11/01/2008	Llwynpia Magistrates	S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
17/09/2007	Aberdare Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
17/09/2007	Bridgend Magistrates	S.85(1) and S.85(6) Water Resources Act 1991
10/09/2007	Aberdare Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
26/07/2007	Wrexham Magistrates	S.85(1) and S.85(6) Water Resources Act 1991 and S.4(1) Salmon & Freshwater Fisheries Act 1975
11/05/2007	Ammanford Magistrates	S.85(1) and S.85(6) Water Resources Act 1991
14/03/2007	Neath Magistrates	S.85(1) and S.85(6) Water Resources Act 1991
12/02/2007	Bridgend Magistrates	S.85(1) Water Resources Act 1991

2.4.2 Technical ability (3b)

All DCWW Wastewater Treatment Works Operators are put through rigorous training to ensure competence for the role. Initially all operatives will complete a Level 2 Wastewater Treatment Processes Programme which is 9-days' duration and is delivered by Merit Skills. This consists of units from the Certification and Assessment Board for the Water Industry (CABWI) Diploma in Water Engineering with written assessments and covers all basic aspects of the wastewater process.

Six to twelve months later, the Operators will complete the Level 3 Competent Operator Programme. This is a 5-day training course followed by a 2-day one-to-one practical onsite assessment. The course is delivered by Water Training Solutions (a soletrader) and accredited by City & Guilds.

For operators with a role in the AAD process, DCWW has recently piloted training as part of the AAD harmonisation for Cardiff/Afan operators. This training course is called “Competent Operator for AAD” and additional units have been developed and added to the standard Level 3 programme described above. DCWW is seeking accreditation from City & Guilds for this course. The additional AAD specific units include:

City & Guilds Boiler Operator Routines and Maintenance	Fulton	1 day
Knowledge of your Steam and Condensate System (manufacturer's training)	Fulton	1 day
Anaerobic Digestion Energy Management HACCP/BAS	Water Training Solutions	2 days
Cambi THP	Cambi	1 day
Radiation Protection Awareness	Public Health England	½ day
Onsite practical assessment (one-to-one with assessor)	Water Training Solutions	2 days

An “Advanced Digestion – Technical Operator” Knowledge and Skills Framework has been developed to identify all the relevant training required for the role. Through monthly one to ones with line managers and the annual Performance Management Review Process, it is ensured that operations staff can demonstrate the knowledge and skills identified or are put forward for further training to develop the competency, if needed.

2.4.3 Finances (3c)

No relevant persons, within Welsh Water, have current or past bankruptcy or insolvency proceedings against them.

2.4.4 Management systems (3d)

2.4.4.1 Overview

DCWW has an Environmental Management System (EMS) Policy accredited to ISO14001 (see Appendix G).

In line with the EMS Policy, the Five Fords AAD and sludge treatment plant (STP) will be operated in accordance with the DCWW Quality Management System (QMS) EMS. The QMS was last audited in February 2017 and passed with no non-conformities.

DCWW has established and maintained documentation that defines and describes how the QMS is established, implemented and maintained in accordance with ISO 9001:2008 and ISO/IEC 17025:2005 and monitoring emissions to air, land and water (MCERTS) Standards. The system is structured on the organisation’s strategic business areas, business processes and customer requirements.

DCWW has also established and maintained documentation that defines and describes how the EMS is established, implemented and maintained in accordance with ISO 14001:2004 for waste water operational sites. The EMS applies to all DCWW operations.

The EMS is not integrated with the QMS at present. However, certain system procedures and operating procedures are shared by both systems. This is currently being updated by DCWW to include the THP facility.

Demonstrable procedures are outlined in the DCWW Environmental Policy Statement 2015 (see Appendix G) and the Site Operating Manual and QMS. DCWW have set out their long-term vision and direction in delivering its services in Welsh Water 2050¹.

An overall review of the QMS takes place every 12 months, and on other occasions, as required by Senior Management. There is a regular programme of audits covering all aspects of the QMS and EMS; they are included on the Internal Audit Programme operated by the Business Assurance team and audited by the Environment Agency (EA) on a frequent basis. In addition, the EMS and QMS are subject to audit by the inspection and certification company SGS (for accreditation purposes) every 6 months.

DCWW produces an annual report on environmental performance and, where required, attend local action group meetings.

The Biomethane Injection Plant (BIP) and THP will form part of the existing Facility and, as such, will be subject to the same management system arrangements.

One of the key tasks for DCWW during the permit determination process is the development of the management system arrangements for the AAD facility to cover the operations as well as the quality and environmental aspects.

2.4.4.2 Accident and Environmental Management Plan

Introduction

An Accident Management Plan, in the form of Environmental Emergency Procedures (Issue 05, 15th March 2015) and Site Emergency Plan (Version 2, October 2015), and Environmental Management Plan (Five Fords Waste Water Treatment Works – G2G Facility Environmental Management Plan, Issue 05, 22 November 2017) forms part of DCWW's QMS.

An Accident Risk Assessment has been carried out for the installation, as has a Fire Risk Assessment (dated 19/06/2015) in accordance with the Regulatory Reform (Fire Safety) Order, 2005, these are implemented in accordance with the EMS requirements and is regularly reviewed.

In addition, an Environmental Risk Assessment (ERA) (see Section 2.6) has also been produced, in accordance with the EPR H1 guidance, and all risks identified by these assessments will be incorporated into the QMS.

¹ Dŵr Cymru Welsh Water, March 2018 – Welsh Water 2050. Available online at <https://www.welshwater.com/en/Company-Information/Business-Planning/Welsh-Water-2050.aspx>

One of the key tasks for DCWW during the permit determination process will be the incorporation of the arrangements for the new AAD and STP plant into the existing Management Plans for the permitted activities.

Assessment of risks

EPR Environmental Risk Assessment (ERA) for Permits guidance outlines that a risk assessment process should be undertaken following the identification of environmental hazards. The ERA has been updated to include the proposed changes to the Facility, and is provided in Appendix C.

Techniques to reduce risk

EPR guidance states that techniques should be implemented for the management and control of specific risks.

2.4.4.3 Complaints

All written complaints are covered by the Quality Manual QM(1) 01 and handled according to procedures (DG7 Process Reports). The implementation of the complaints procedure is detailed in CC(3) series procedures. Compliance with these procedures is part of the overall assessment of DCWW's performance by OFWAT and there are penalties for poor performance. Telephone complaints are logged onto the DCWW SAP system and actions recorded by the DCWW operation and control centre (Linea). All complaints are analysed for root cause in order to prevent recurrence of the problem and assist with continuous improvement processes.

Complaints about pollution are dealt within the NO(03) 3 series procedures, and there are different procedures according to who reports the pollution. Pollutions may be reported via a number of routes including: general public, local authority, internally, contractor or formally via the Environment Agency. All pollution incident calls or emails are input into DCWWs online control system (SAP) by a Pollution Incident Advisor (PIA). This is then sent to the Waste Water Scheduling Team who allocates a Network Crew or contractor to respond to the incident; they have 4 hours to respond. After attending the incident, the operational crew provides feedback via SAP; the pollution incident details along with remedial actions taken or required are also verbally communicated to the Responsible Officer (RO). The SAP incident remains open until all follow-up work has been completed.

Following each incident, the relevant Pollution technician/Environmental Performance Officer reviews the findings and investigates details of the incident. If the root cause of the incident is identified the appropriate remedial action is undertaken and the job is closed on SAP. If the root cause is not obvious, an enhanced investigation is instigated, and the findings reviewed for appropriate remedial action. Every category 1 and 2 pollution incidents are formally reviewed by the Head of Wastewater (Network).

2.5 Supporting information (Question 5)

Plans provided, to satisfy question 5a, can be found in Appendix D.

The site condition report (SCR), produced for the Gas-to-Grid facility in 2014, is considered adequate for the permit variation as this sets the baseline against which future decommissioning will be compared. A copy of the SCR can be found in Appendix E.

2.6 Environmental Risk Assessment (Question 6)

2.6.1 Introduction

As part of the application for an environmental permit, operators must assess the risk to the environment and human health from the activities that they propose to undertake. Using the methodology outlined in the EPR Guidance (H1), this section updates the original assessment of the risks to the environment and human health from the Five Fords Site that was submitted in relation to their original permit application for a gas-to-grid facility. This variation application includes the addition of a THP plant and infrastructure included as a directly associated activity on the installation permit. A copy of the updated ERA (ref: DCWW-4791-S-201-MMB-06-XX-RP-NX-10310) can be found in Appendix C.

The ERA sets the requirements for the management of the permitted area, emission control measures etc. It assesses the additional risks, from the proposed THP processes, to the environment, amenity and human health. All control measures within the rules must be adhered to in order to obtain the permit.

Where emissions result in insignificant effects these have been screened out and where further detailed assessments of potential environmental impacts are required this is noted. A full description of the nature of the releases and measures to control them is provided in Section 3.2.

There is planning permission in place for these activities to be undertaken and the need for an environmental permit has come about through the changes made to the permitting legislation. The ERA assesses the impacts from the following environmental concerns:

- Point source and fugitive emissions to air;
- Point source and fugitive emissions to water and land;
- Noise and vibration;
- Odour;
- Litter;
- Human and environment safety; and
- Natural habitats and ecology.

2.6.2 Impact Assessment

2.6.2.1 Overview

Five Fords WwTW is located at Ordnance Survey Grid Reference SJ 36054 48054. The WwTW is situated in a predominantly rural area with the surrounding areas consisting of agricultural land, within the village and parish of Marchwiell, approximately two kilometres to the south west of Wrexham.

The WwTW is immediately bordered by areas of woodland, arable and pastoral fields and their associated hedgerows. The River Clywedog is on the northern boundary of the WwTW and the town of Marchwiell is located just south of the WwTW.

Information in this section is derived from desktop studies that have been undertaken for the Plant, and online resources such as:

- Magic Interactive Map²

2.6.2.2 Emissions to air

An air quality assessment (ref doc: DCWW-4791-S-201-MMB-06-XX-RP-NX-10311 – Five Fords AAD Air Quality Assessment, Aug 2018) has been undertaken to determine the effect on air quality associated with emissions from the site, relating to the installation of a THP facility. The assessment was undertaken using advanced dispersion modelling.

For potential human health effects, the pollutant of key concern is NO₂, although emissions of SO₂ and CO have also been considered. Effects of atmospheric concentrations of NO_x and SO₂ have also been assessed with respect to sensitive ecological sites. The method of the assessment has taken a conservative approach by assuming worst case conditions for a number of aspects including emissions characteristics, operating scenarios and meteorological conditions.

The results indicate compliance with all relevant environmental quality standards for both the protection of human health and designated sites. Overall impacts of all pollutants are considered to be insignificant and the proposed Plant is predicted to lead to an improvement in air quality compared to the existing configuration.

Abatement of other fugitive emissions to air

Based on the conclusions in the Air Quality Assessment no further abatement is required. However, best practice methods will be followed, during operation of the facility, to prevent the release of fugitive emissions.

2.6.2.3 Emissions to water and land

Water quality and resources

The water used at the Plant will be contained in a closed circuit; all wastewater streams will either be recycled within the process or captured and rerouted to the adjacent WwTW.

The AAD site will be covered in impermeable surfacing in order to contain any spillages and prevent mobilisation into the underlying groundwater. Site access roads will be built with kerbing to channel any surface spillages into the drainage network and prevent adjacent areas from being inundated. Any sewage spillages that occur will be limited in extent due to the site being secure with impermeable paving. There is sufficient capacity at the WwTW to handle the additional water input from the increased site area of the site.

Water use

There is one-point source release of wastewater from the BIP, which is discharged to the head of the on-site Five Fords WwTW (to sewer). This is limited to the small amounts of condensate present in the biogas feed to the BIP. The wastewater stream is directed to the WwTW drainage system and returned to the head of the works.

The majority of the process water, through the final effluent, will be diverted and further treated, through filtration and disinfection, for reuse within the THP. Potable water, from the water network operated by Dee Valley Water, will be required for the boiler operation and polymer make up.

² <http://magic.gov.uk/MagicMap.aspx>

Point source emissions to surface waters, sewer and groundwater

The water used at the Plant will be contained in a closed circuit; all wastewater streams will either be recycled within the process or captured and rerouted to the adjacent WwTW.

Discharges will be minimal, typically arising from periodic maintenance/cleaning operations. As such, there are no direct potentially contaminated discharges to controlled surface waters and no significant impacts. All drainage (surface water or foul water) will be captured by the onsite drainage system and returned to the head of the WwTW.

The stormwater drainage of potentially contaminated areas from within the Plant boundary will be routed into the sewage treatment process with no discharge outside of the site. There will therefore be no risk of polluted runoff affecting off-site features due to the creation of a new hardstanding and plant area.

Flood risk

The site is located within the catchment of the Afon Clywedog and is within Flood Risk Zone A (as classified by the Environment Agency and NRW), considered to be at little or no risk of fluvial or tidal flooding from the Afon Clywedog.

The nearest ordinary watercourse is approximately 280m to the west of the WwTW and flows to the Afon Clywedog upstream of the site. It is considered that this watercourse does not present any risk to the site from flooding.

The drainage system within the AAD site directs all surface water back to the head (intake) of the works and on through the treatment process. Any increase in run-off will only affect flow through the WwTW and will not impact on neighbouring sites.

2.6.2.4 Odour

An odour assessment (document ref: MOMB16B_16_Final dated 16 July 2016) was undertaken to account for the upgrades to Five Fords WwTW, in order to assess the effect upon nearby receptors.

The key findings of the study were that the predicted change in odour emissions from sludge sources would be an increase of approximately 1%, however, despite this slight increase in odour emissions, the predicted offsite odour exposure levels for the proposed upgrade are predicted to reduce. This predicted reduction in offsite odour exposure is due to the change in the way odour emissions will be released, particularly in relation to the post-digestion centrifuges and cake handling and storage area, where emissions will be released at a height allowing for greater dilution and dispersion in the atmosphere.

The proposed upgrade is, therefore, not anticipated to increase the offsite impact or result in adverse impact upon nearby sensitive receptors or the amenity of the area surrounding the site.

Odour Control Units (OCUs) will be utilised in the cake import area and the cake export area to minimise odour emissions.

To date, the site has not received any odour complaints. This is confirmed in an email from DCWW, dated 7 November 2017, which is provided in Appendix F. The results of the odour assessment are shown in Appendix G.

2.6.2.5 Noise and vibration

The proposed changes to the Plant will use a combination of existing and new structures. No new equipment will be within 300m of any properties. A noise assessment (document ref: DCWW-4791-S-201-MMB-06-XX-RP-NX-19034, dated June 2016) was carried out as part of the planning application which demonstrated that noise from the proposed Plant will be below background noise levels at the nearest sensitive receptors. Therefore, potential impacts concerning noise are found to be insignificant. The noise assessment is provided in Appendix G.

A map identifying the nearest sensitive noise receptors can be found in Figure 1 and 2 of the noise assessment in Appendix G.

A maximum dB(A) figure, in accordance with DCWW specifications, is stated for all plant equipment being procured. Where this cannot be achieved, mitigation measures have been put in place to minimise noise to the local area and operators.

Since being operational, the current permitted activity has not received noise complaints to date. This is confirmed in the email from DCWW, dated 7 November 2017, which is provided in Appendix F.

The results of the noise assessment will need to be updated once the facility is operational to determine whether further mitigation needs to be incorporated.

2.6.2.6 Litter

Solid waste

Waste generated on the WwTW site includes the following:

Waste Material	Recycled by:
Screenings/Grit	Wessex/Geneco
Scrap Metal	Alan's Skip Hire
General/Paper	Alan's Skip Hire
Waste Oils	Safety Kleen
Batteries	Alan's Skip Hire
WEEE	Alan's Skip Hire
Oil contaminated items	Safety Kleen
Aerosols	Alan's Skip Hire
Gas cylinders	BOC

To reduce volumes of waste:

- All materials and consumables delivered to site are inspected to ensure that they are fit-for-purpose. Damaged items are refused and returned to the supplier.
- Sewage sludge is de-watered from the works to be treated at the AAD Plant at Five Fords WwTW. Treated sludge is then recycled to agricultural land as a soil fertiliser. The treated sludge meets the Biosolids Assurance Scheme Quality Standards. The volume of sludge recycled to agricultural land is monitored by the waste services team.
- The Biomethane Gas from the sludge is processed in the gas-to-grid facility and injected back into the national Grid. Information on this can be found in the Gas to Grid Environmental Management Plan.
- Polymer intermediate bulk containers (IBCs) are sent back to the supplier for re-use.

- Grit is collected via an aggregates company and used as a soil conditioner. This process is licensed and controlled via the EA/NRW.
- WEEE, batteries, waste oils and oil contaminated items such as oily rags are treated as hazardous waste in accordance with legislation, these are removed from site by an approved supplier procured through SRM Ltd, using the approved waste carriers in the DCWW Contract and Framework Directory.
- Gas Cylinders for Nitrogen/Odorant/Calibration Gas etc. are collected by BOC Ltd from the Facility as they deliver a batch of new cylinders.

Five Fords WwTW has a designated waste management area that is located behind the offices next to the workshop. All skips and containers are located on a hardstand to prevent leaching into the ground. Skips and containers are clearly labelled. All waste from the Facility is sorted into this waste area at the main site other than the gas cylinders.

Waste Carrier	Waste Carriers Registration Number	Waste Carriers License Expiry Date	Waste Removed
Safety-Kleen	CBDU89939	04/04/2019	See Section 7.
Alan Skip Hire	CBDU3174	30/07/2018	See Section 7.
BOC Ltd.	CBDU105757	01/05/2019	See Section 7.

2.6.2.7 Human health and environment safety

Visual impacts

The AAD Plant is screened from public views from the north, west and south by existing vegetation. The development will, however, be visible from a footpath to the east of the site. In order to limit the visual impact of the development from this viewpoint, the larger structures have, where possible, been located close to the existing digesters. In addition, tanks have been sited on an east to west alignment and in close proximity to existing structures so that the tank to the rear is partially screened. As part of the planning proposal, a screening bund will be provided along the eastern boundary of the proposed development. Visual impacts from the Plant are therefore considered to be low.

Site security

Activities are managed and operated in accordance with the management system. The site is categorised as a critical national infrastructure site by the Centre for the Protection of National Infrastructure (CPNI) and therefore, site security is paramount. Access to site and waste is restricted by a 2.5m high chain link security fence and an automated pallisade gate (topped with barbed wire). The site is manned 24 hours a day, 7 days a week. Authorised personnel can gain access to the site using a fob system. For visitors and unauthorised personnel an intercom system at the site entrance, is used. The site also benefits from a CCTV systems. Regular inspections of the boundary fencing and buildings are undertaken to ensure that these have not been compromised and continue to prevent easy access to site. Repairs are undertaken in accordance with the EMS requirements.

Other risks relating to human health and the environment is presented in the ERA in Appendix C.

2.6.2.8 Natural habitats and ecology

Sontley Marsh, a Site of Special Scientific Interest lies 2km to the west of the site and is the only statutory designated site within a 2km radius of the development.

Three non-statutory designated sites, Local Wildlife Sites (LWS), are located within 2km of the WwTW. These are:

- Marchwiell Marsh, located south, immediately adjacent to the WwTW
- Cefn Park, located 1.5km North of the WwTW
- Erddig Estate, located 1.7km to the west of the site

There are 26 Ancient Semi Natural Woodlands and Restored Ancient Woodlands within 2km of the WwTW, the closest of which are Marchwiell Covert, located within the WwTW boundaries and Black Wood, located within 100m north of the WwTW.

A Preliminary Ecological Appraisal (PEA) survey, undertaken as part of the Planning Application, found that the active site has low ecological value.

The proposed changes to the Plant will not affect sensitive receptors in proximity to the Plant. Impacts to sensitive receptors as a result of the Plant are as the findings of the original Environmental Permit Application and are considered to be minimal and adequately controlled.

Overall impacts are considered to be negligible.

3 Part C3 – Variation to a bespoke installation permit

3.1 Activities applying to vary (Question 1)

3.1.1 Types of activity applied for

The proposed changes involve the modification of the existing STP, and upgrading of the current AD process to include a THP and LTP adjacent to the current AD site. The upgraded works will become an AAD plant. The THP will be provided by steam produced from two new boilers.

The current standby boiler located next to the CHPs will be removed, as this will no longer be needed. The CHP engines will no longer provide heat to the digesters.

The types of activities that apply are listed in Table 7.

Table 7: Types of activities

Activity reference	Installation name	Schedule 1 references	Description of the activity	Activity capacity	Annex 2 (recovery) codes
A1	Five Fords AAD Plant		Receipt of dewatered sludge at the cake import facility from the satellite sites.		R13
A2	Five Fords AAD Plant		Blending and storage of cake delivered from import facilities at cake silos prior to treatment in THP.		R13
A3	Five Fords AAD Plant		Dewatering of on-site sludge and liquid imports from pre-THP dewatering facility to allow for combined storage with imported cake in silos		R1
A4	Five Fords AAD Plant		Treatment of sludge using high pressure steam at the THP		R1
A5	Five Fords AAD Plant	Section 1.1 Part A(1)	Production of steam to heat the THP streams from two new boilers (1.567MWth each, with dual burners which can run on either biogas or natural gas).		R1
A6	Five Fords AAD Plant		Cooling of sludge and recycling of heat for use in the process.		R1
A7	Five Fords AAD Plant	Section 1.2 Part A(1)	Storage of biogas from digesters in two gas holders before further processing and a seal on the digesters is achieved.		R1
A8	Five Fords AAD Plant	Section 1.2 Part A(1)	Removal of impurities in the biogas at the siloxane removal plant.		R1
A9	Five Fords AAD Plant	Section 1.2 Part A(1)	Cleaning, upgrading and injection of biogas into the national grid after processing at the BIP.		R1
A10	Five Fords AAD Plant	Section 1.1 Part A(1)	Burning of gas at CHPs to turn it into electricity only when the biomethane plant is not online.		R1
A11	Five Fords AAD Plant	Section 1.2 Part A(1)	Stripping of the methane gas from the sludge in the post-digestion tank prior to further processing.		R1
A12	Five Fords AAD Plant		Processing and storage of treated sludge at the post-THP dewatering and cake storage building prior to being taken to land		R1
A13	Five Fords AAD Plant		Removal, separation, washing and storage of grit from the digesters at the de-gritting plant, prior to being exported as aggregated.		R1
A14	Five Fords AAD Plant		Further treatment of post digestion dewatering centrate from the post-THP dewatering process at the LTP to reduce pollutants in the liquid to acceptable levels prior to discharge to the main WwTW for further treatment		R1

3.1.2 Types of waste accepted

The current T21 exemptions allows for the waste types, identified in Table 8, to be accepted.

Table 8: Types of waste accepted

Waste Code	Description of Waste
190801	Screenings
190802	Sewage grit (waste from de-sanding) only
190805	Sludge from treating urban waste water
190899	Centrate liquor only
190902	Sludge from water clarification
190903	Sludge from decarbonation
190906	Solutions and sludge from regeneration of ion exchangers
200304	Septic tank sludge
200306	Waste from sewage cleaning
200399	Cesspool waste and other sewage sludge only

Source: UK Government – T21 Waste exemption. Accessed at <https://www.gov.uk/guidance/waste-exemption-t21-recover-waste-at-a-waste-water-treatment-works#type-of-waste-you-can-treat>

The only waste the Plant will be accepting is sludge from treating urban waste water (EWC 19 08 05). However, the list of waste types in Table 8 will be included as part of the permit as a contingency to the site operations.

Grit and screenings will be sent off-site to Geneco (Wessex Water) via Alans Skip Hire; cess pit and septic tank wastes will be delivered into the head of a works under Regulatory Position Statement 007³ or Low Risk Position 378⁴; while the other types of waste that can be treated as part of the T21 Exemption are not pertinent for the Plant.

3.2 Emissions to air, land and water (Question 2)

3.2.1 Introduction

This section identifies any point source emissions that are additional to those already identified in the current gas to grid installation permit. It provides additional details relating to the emissions that result from the operating techniques described in Section 3.3.

3.2.2 Point source emissions to air

An air quality assessment (ref doc: DCWW-4791-S-201-MMB-06-XX-RP-NX-10311 – Five Fords AAD Air Quality Assessment, Aug 2018) was undertaken to determine the effect on air quality associated with emissions from the site, relating to the installation of a THP facility.

The currently permitted point source emissions to air and the emission limit values (ELVs) for these are summarised in Table 9.

³ Regulatory Position Statement 007 – The disposal of septic tank and cesspool sludge from domestic dwellings and arisings from blocked sewers.

⁴ Low Risk Position 378 – The treatment of a maximum of 100,000m³ in any 12-month period of septic tank liquor at sewage treatment works other than at the site where the septic tank sludge is dewatered.

Table 9: Emission limit values (ELVs) for Point source emissions to Air (as given in existing permit)

Emission point and location	Parameter	Source	Limit	Unit	Reference period and Standard	Monitoring Frequency
A1 CHP stack (1)	Oxides of Nitrogen (as NO ₂)	1.41MW CHP engine exhaust stack	500	mg/m ³	Hourly average BS EN 14792	Annual
	Carbon Monoxide		1400	mg/m ³	Hourly Average BS EN 15058	Annual
	Total VOCs		1000	mg/m ³	Hourly Average BS EN 12619(4) BS EN 13526(5)	Annual
A2 CHP stack (2)	Oxides of Nitrogen (as NO ₂)	1.41MW CHP engine exhaust stack	500	mg/m ³	Hourly average BS EN 14792	Annual
	Carbon Monoxide		1400	mg/m ³	Hourly Average BS EN 15058	Annual
	Total VOCs		1000	mg/m ³	Hourly Average BS EN 12619(4) BS EN 13526(5)	Annual
A3 Dual fuel standby boiler	Oxides of Nitrogen (NO and NO ₂ expressed as NO ₂)	1.5 Dual fuel stand by boiler exhaust stack – operating on Biogas	500	mg/m ³	Hourly average BS EN 14792	Annual
	Carbon Monoxide		1400	mg/m ³	Hourly Average BS EN 15058	Annual
	Total VOCs		1000	mg/m ³	Hourly Average BS EN 12619(4) BS EN 13526(5)	Annual
	Oxides of Nitrogen, and Carbon monoxide	1.5 Dual fuel stand by boiler exhaust stack – operating on Natural gas	No limits set	-	-	Annual
A4	Siloxanes	Siloxane removal unit	No limits set	-	-	-
A5	Combustion gases	Waste gas burner (flare stack)	No limits set	-	-	-
A6 biomethane plant	Nitrogen Oxygen Carbon Dioxide Methane H ₂ S Odour	Biomethane Plant Stack	No limits set	-	-	-
A9	Biogas	Existing Gas Holder Pressure Relief Valve	No limits set	-	-	-
A10	Biogas	New Gas Holder Pressure Relief Valve	No limits set	-	-	-

Source: Environmental permit EPR/AP3139FT

There are no point source emissions from the STP as part of normal operations. The only point source emission point to air as part of normal operations of the AAD process will be the emissions from the two new dual fuel boilers which supply heat and steam to the THP.

The proposed emission points for the variation application to permit are shown in (drawing 4791-S-201-MMB-06-XX-DR-NX-06202 C03 in Appendix D.

Table 10: Proposed emission points for variation to permit

Emission point reference, and location	Source	Parameter	Amount	Unit
A1 (current)	CHP stack 1	NOx	500	mg/Nm ³
		SO ₂	-	
		CO	1,400	
A2 (current)	CHP stack 2	NOx	500	mg/Nm ³
		SO ₂	-	
		CO	1,400	
A3 (will be removed)	Boiler stack - To be removed	To be removed	To be removed	To be removed
A4 (current)	Siloxane removal unit	Siloxane	No limits set	-
A5 (current)	Waste gas burner	Combustion gases	No limits set	-
A6 (current)	Biomethane Plant Stack	Nitrogen	No limits set	-
		Oxygen		
		Carbon Dioxide		
		Methane		
		H ₂ S		
Gas Boiler 1 (to be added)	Biogas	NOx	100	mg/Nm ³ ⁵
		SO ₂	131 ⁶	
		CO	12.5	
Gas Boiler 1 (to be added)	Natural gas	NOx	100	mg/Nm ³
		SO ₂	-	
		CO	12.5	
Gas Boiler 2 (to be added)	Biogas	NOx	100	mg/Nm ³
		SO ₂	131 ⁶	
		CO	12.5	
Gas Boiler 2 (to be added)	Natural gas	NOx	100	mg/Nm ³
		SO ₂	-	
		CO	12.5	

Source: Table 4: Stack emission parameters from the air quality assessment report - DCWW-4791-S-201-MMB-06-XX-RP-NX-10311 – Five Fords AAD Air Quality Assessment, Aug 2018

As part of the changes, the standby boiler currently in operation (emission point A3) will be removed, as it will be redundant.

⁵ Normalised conditions = 3% O₂, 273.15 K, dry, 1 atm

⁶ Equivalent to 46ppm. The plant falls outside of MPCD as it is not for biological treatment, it is for raising steam, therefore the threshold is irrelevant

The proposed new boilers will have one 14m high common stack, with one core per boiler. They will comprise 2 x 350mm diameter cores, with an actual stack diameter of 940mm. The thermal input will be 1.843MW, the boiler efficiency 85% and the steam output 2,500kg/hr.

A natural gas pilot will be operated on start up for both natural gas and biogas firing. Normal operation will depend on whether there is a signal for using biogas or natural gas. The exhaust gas exit temperature will be 150°C, while the emission limits are quoted as being 100mg/Nm³. The maximum hydrogen sulphide content of the biogas will be confirmed by the site.

The CHPs will remain but will only be used when the Facility is offline or for peak load lopping or TRIAD avoidance. The fuel of the CHPs will not change, but heat will be removed via the existing heat dump fan. Electricity produced will be utilised onsite. This change was implemented following the installation of the biomethane plant and should be minimal. Prior to the installation of the biomethane plant, the CHPs would have been in operation for most of the day; whereas going forwards, they are likely to be in operation for one day per month.

The calculations are based upon the air quality assessment (ref doc: DCWW-4791-S-201-MMB-06-XX-RP-NX-10311 – Five Fords AAD Air Quality Assessment, Aug 2018).

3.2.3 Point source emissions to water

3.2.3.1 Point source emissions to water (other than sewers)

There will be no point source emissions from the THP. There are no direct potentially contaminated discharges to controlled surface waters, or direct discharge of wastewater to controlled waters from the THP.

There are also no direct potentially contaminated discharges to groundwaters.

Accidental releases of materials to the environment are controlled through adequate containment measures and working procedures.

3.2.3.2 Point source emissions to sewer, effluent treatment plant or other transfers off-site

There will be no point source emissions or direct discharges to controlled waters or public sewers, as part of the permit operation. Any liquid waste will either be reused or discharged to the drainage system of the adjacent Five Fords WwTW and will undergo treatment through the works before discharge to the River Dee. On-site WwTW effluent will meet the requirements of the existing discharge consent.

A list of the point source emissions to sewers, effluent treatment plants and other transfers off site is included as Table 11.

Table 11: Point source emission to sewers, effluent treatment plants or other transfers off site

Emission point reference, and location	Source	Location	Grid reference	Characteristics	Monitoring / mitigation measures prior to final discharge and emission point discharge.
W1 (existing and within the current permit) (discharged to Five Fords WwTW)	Condensate from the gas pipelines and gas storage bag	Adjacent to biogas storage	340900, 347320	-	-
W2 (existing and within the current permit)	Condensate from the siloxane removal media regeneration process	Adjacent to siloxane removal plant	340900, 347320	-	-
Boiler Water Treatment Plant	Water rejected by the Plant.			Will contain the same minerals found in potable water.	2litres/day Rerouted to adjacent WwTW
Boiler Maintenance	Boiler blow down to minimise damage from high mineral content water.			High purity water with traces of chemicals (used for boiler dosing).	Infrequent and negligible Rerouted to adjacent WwTW.
Drain down of plant	Occurs during maintenance when it is necessary to drain down the feed water, hot well or boiler shell.			High purity water with traces of chemicals (used for boiler dosing).	Infrequent Rerouted to adjacent WwTW.
Rainwater	Uncontaminated roof water from new buildings.			Clean rainwater from building roofs only.	Routed to water course via sealed system.
Rainwater	Run off from impervious surfaces			Clean rainwater from runoff	Rerouted to adjacent WwTW
Sanitary water	Domestic facilities.			Foul waste.	Negligible Rerouted to adjacent WwTW.
Washwater	From the washing down of mechanical equipment during maintenance activities			Variable.	Negligible Rerouted to adjacent WwTW.
Drain from foul gas skid	Cooling water from foul gas skid			Clean washwater	Negligible Rerouted to adjacent WwTW.

Emission point reference, and location	Source	Location	Grid reference	Characteristics	Monitoring / mitigation measures prior to final discharge and emission point discharge.
Condensate	Gas pipelines and new gas storage bag			Condensate with slightly elevated levels of H ₂ S dissolved from the biogas, resulting in a low level of acidity	Negligible Rerouted to adjacent WwTW.

Due to the anticipated very low levels of contamination of the water and the volumes involved, no monitoring of its composition is proposed prior to discharge to the WwTW, from the THP.

Any areas of the facility, where there is a risk of contamination of surface water, groundwater or discharge of process waters, are located on impermeable concrete surface. All surface water from these areas drain to the WwTW internal drainage system and are returned to the head of the works for treatment prior to discharge as final effluent.

3.2.4 Point source emissions to land

There will be no point source emissions to land as part of the activities carried out on site.

3.3 Operating techniques (Question 3)

3.3.1 Introduction

This section provides a technical overview of the components, the proposed techniques and measures to prevent and reduce waste arising and emissions of substances and heat, including during periods of start-up or shut-down, momentary stoppage and malfunction, and leaks.

Specifically, consideration is made of:

- The technology to be used;
- The process, in terms of how it will be operated and controlled;
- In-process controls and Best Available Techniques (BAT) Assessment; and
- Measures implemented to control emissions to air, water, sewer and land.

3.3.2 Technical standards (Question 3a)

Table 12 lists the technical guidance notes (TGNs) used to inform the techniques and measures proposed to prevent and reduce waste arising and emissions of substances, including during periods of start up and shut down, momentary stoppage and malfunction, and leaks.

Table 12: Technical Standards

Waste Activity, Schedule 1 activity or directly associated activity	Relevant Technical Guidance Note	Document reference (if appropriate)
Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.	• How to comply with your environmental permit Additional guidance for: Gasification,	• https://www.gov.uk/government/publications/gasification-liquefaction-and-refining-installations-additional-guidance

Waste Activity, Schedule 1 activity or directly associated activity	Relevant Technical Guidance Note	Document reference (if appropriate)
	- Liquefaction and Refining Installations (EPR 1.02) - Best available techniques (BAT) conclusions, for common waste water and waste gas treatment/management systems in the chemical sector	http://eippcb.jrc.ec.europa.eu/reference/BREF/BATC_CWW.pdf
Refining gas where this is likely to involve the use of 1,000 or more tonnes of gas in any 12-month period.	- How to comply with your environmental permit Additional guidance for: Gasification, Liquefaction and Refining Installations (EPR 1.02) - Best available techniques (BAT) conclusions, for common waste water and waste gas treatment/management systems in the chemical sector	https://www.gov.uk/government/publications/gasification-liquefaction-and-refining-installations-additional-guidance http://eippcb.jrc.ec.europa.eu/reference/BREF/BATC_CWW.pdf
General	- How to comply with your environmental permit - EA/NRW's horizontal environmental permitting guidance, including: - H1 Software tool and guidance - H2 Energy efficiency - H3 Noise assessment and control - H4 Odour management - H5 Site condition report	https://naturalresources.wales/permits-and-permissions/environmental-permits/guidance-to-help-you-comply-with-your-environmental-permit/?lang=en https://naturalresources.wales/permits-and-permissions/environmental-permits/horizontal-guidance/?lang=en

A copy of the schematics describing the operation and process can be found in Appendix H.

3.3.3 General requirements (Question 3b)

3.3.3.1 Overview

This section provides an overview of the measures in place at the Plant for controlling fugitive emissions, noise and odour. An ERA has been completed, in accordance with the H1 ERA Guidance, and is provided in Appendix C.

3.3.3.2 Control of fugitive emissions to air

There are no significant fugitive emissions to air of gases, vapours, or particulates as part of normal operation or in respect to the proposed changes.

3.3.3.3 Control of fugitive emissions to surface water, sewer and groundwater

There is appropriate containment for the control of liquid wastes put in place to minimise any potential releases, as identified in the EMS

3.3.3.4 Odour

As discussed in Section 2.6.2.6, odour is controlled via one current OCU and two proposed additional OCUs to account for the changes on site.

The current site has, to date, not received any odour complaints during its operation.

The predicted change in odour emissions from sludge sources is expected to lead to an increase of approximately 1%, however, despite this slight increase in odour emissions, the predicted offsite odour exposure levels for the proposed upgrade are predicted to reduce. This predicted reduction in offsite odour exposure is due to the change in the way odour emissions will be released, particularly in relation to the post-digestion centrifuges and cake handling and storage area, where emissions will be released at a height allowing for greater dilution and dispersion in the atmosphere.

The proposed upgrade is therefore not anticipated to increase the offsite impact or result in adverse impact upon nearby sensitive receptors or the amenity of the area surrounding the site.

3.3.3.5 Noise

The current permitted activity has not received any noise complaints to date as identified in Section 2.6.2.5.

The additional Plant will continue to operate in accordance with the noise conditions stated in the current Environmental Permit. Following the EPR H1 methodology, it has been determined that appropriate noise control measures are in place.

3.3.4 Type and amounts of raw materials (Question 3c)

All raw materials that will be used at the AAD plant are identified in Table 13. This list will be maintained and updated throughout the lifetime of the permit and updated within the Site Operating Manual.

Table 13: Types and amount of raw materials

Description of raw materials and composition	Maximum amount (tonnes)	Annual throughput (m ³ unless specified)	Description of how the raw material is used including any main hazardous (inc. MSDS)
Biogas (~63% Methane, 35% Carbon Dioxide, 2% Oxygen/ Nitrogen)	Direct feed	7254	Feed gas for biomethane enhancement. Fire/explosion asphyxiation
Propane (C ₃ H ₈)	15	349	Propane enrichment of biogas. Fire/explosion.
Gas odorant (Mercaptans)	0.025	0.12tpa	Legal requirement to add odour to gas stream. Flammable, irritant
Carbon Filters	8 (4No. 2 tonnes filters)	9-17No. (1-2 replacement cycles per year)	Off gas cleaning/ carbon filtration. Carbon dust – respirable hazard/irritant
Polymer	30	201tpa	Improves dewatering of sludges. Can create a slip hazard if spilled. Stored in banded units.
Lube oils	0.2	0.4tpa	Lubricant

3.3.5 Information for specific sectors (if needed) (Question 3d)

The activity does not fall under the Medium Combustion Plant Directive (EU2015/2193) because the heat generated by the plant is used to produce steam and is not used directly for any biological treatment such as anaerobic digestion; therefore, Appendix 1 of Form C3 is not required.

Additionally, as the BAT Conclusions⁷, have been completed, the requirement to complete Appendix 5 of Form C3 is not considered necessary.

3.3.6 Monitoring (Question 4)

This section provides a summary of the proposed monitoring of the Plant.

3.3.6.1 Monitoring of emissions to air

Welsh Water has monitored Volatile Organic Carbon (VOC) emissions arising from the Combined Heat and Power engines at Five Fords WwTW since commissioning in 2012. As part of this permit variation, DCWW propose that the requirement for annual monitoring of VOC emissions along with the 1,000mg/m³ threshold currently stipulated, is removed from the permit.

An H1 Environmental Assessment submitted to NRW, in 2016 using worst-case data, showed that even though the site does not meet the VOC Emission Limit Value (ELV) required in the Environmental Permit, there is no environmental degradation or impact caused, by this exceedance. This has been agreed with NRW's Regulatory Officer and Appendix F provides supporting evidence of this.

Subsequent discussions with NRW's Combined Heat and Power expert, agreed Welsh Water had robust maintenance and condition analysis in place through their maintenance provider, Edina. It is, therefore, proposed that the permit variation removes the requirement for VOC emissions testing and any threshold stipulated. To facilitate this, Welsh Water will continue to maintain the assets to their current standard and continue with weekly oil analysis, trending and condition monitoring processes to ensure the plant operates as efficiently as possible, in line with environmental requirements.

In addition to this, Welsh Water submits Combined Heat and Power engine efficiency data to Ricardo AEA as part of the 'Good Quality CHP' scheme, in March, for the previous Calendar Year. Welsh Water also submits Calendar Year efficiency data to NRW the following March. It would be an administrative improvement to amend the Calendar Year environmental performance submission for Five Fords WwTW to March to align with other reporting deadlines. Welsh Water, therefore, ask this amendment is also made as part of the variation.

No abatement technology is required and continuous monitoring is not considered necessary.

3.3.6.2 Monitoring and reporting of emissions to water and sewer

There are no direct releases to controlled waters or public sewers of emissions arising from the Plant. As such, no monitoring or reporting for the additional Plant is required.

3.3.6.3 Monitoring of waste emissions

As required by the DCWW EMS, various housekeeping and waste management practices are in place. These include segregation of wastes according to their classification and nature, labelling waste and using designated storage containers.

In accordance with the DCWW EMS Policy WO(3) 01, solid waste is disposed of in accordance with 'Duty of Care' Regulations. The composition of the waste, its hazard characteristics and any relevant precautions is clearly stated on the transfer notes provided to licensed waste

⁷ (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070)).

contractors removing waste from site for recycling and/or disposal. Records are maintained on site and reported to the regulator as required by the EPR permit.

3.3.7 Resource efficiency and climate change (Question 6)

3.3.7.1 Basic measures for improving energy efficiency (Question 6a)

Biomethane is a renewable gas, produced from organic waste and injected into the gas grid. Biomethane can make a contribution to the UK's low carbon economy, will help to manage organic waste products and has the added benefit of being a secure energy supply.

The benefit of biomethane as a renewable gas is recognised through the UK Government's Renewable Heat Incentive (RHI) scheme which provides financial incentives to promote the generation of renewable heat and biomethane. The gas to grid plant has been accredited with the ISCC⁸ to attribute a carbon footprint to the renewable gas, in conjunction with the schemes registration into the new 'Green Gas Certification Scheme' administered by Renewable Energy Assurance Ltd. This gives additional assurances of the sustainability of the renewable gas produced.

Basic Energy Requirements

The design will maximise the efficiency of the energy flows from the process ensuring that, where possible, excess process heat from one stage is recovered to feed other stages which require a heat input. This will be carried out using heat exchangers to transfer process heat.

There are a number of pieces of equipment that will need an electrical energy supply including:

- Fans / coolers;
- Pumps / boosters/conveyors;
- Thermal Hydrolysis Plant;
- Sludge dewatering and polymer dosing equipment;
- Compressors, and;
- Gas driers.

Current design information suggests that at 300Nm³/hr biogas throughput, the process will require an annual energy input of 750 MWh/yr. There is no use of fuel oils or natural gas on the biogas upgrade plant (BUP) but natural gas will be used for the steam raising boiler(s).

Energy Efficiency measures

A key objective of the DCWW EMS is to reduce energy consumption from the grid. Procedure EMP 003 specifically contains objectives for the Reduction of Energy Consumption Programme; this includes the commitment to produce monthly usage energy reports that are to be sent to Senior and Operational management and obtaining detailed electricity usage information via metering of specific areas of plant.

Energy efficiency measures implemented at the current plant include the following:

- When in operation, the combustion temperature is maintained relatively constant for reduced NOx emissions and increased efficiency.

⁸ International Sustainability & Carbon Certification - <https://www.iscc-system.org/>

- Heat from the sludge cooling, following the thermal hydrolysis plant, is recovered and then used in the process of the AAD plant by pre-warming the boiler water and sludge, reducing gas consumption.
- When in operation, the engines are equipped with turbochargers, further increasing energy efficiency.
- Ongoing monitoring of plant operating parameters is carried out to ensure process is operating optimally and to enable constant optimisation to increase the plant's efficiency.
- The maintenance scheme in place ensures fuel is combusted as completely as possible and heat is transferred efficiently.
- Good housekeeping measures are employed, and regular preventative maintenance will ensure the operations, and therefore energy efficiency, is optimised.
- Low cost measures in place to avoid inefficiencies of excessive heating or cooling, include:
 - Insulation of main hot water pipes; and
 - Insulation of heating equipment such as steam raising boiler feed, sludge coolers and boiler feed water pumps and pipework.

These measures will also be implemented once the AAD plant is in operation.

The CHP area is not located in a building but housed in acoustic containers. The only building associated with the original planning application was the heating plant room housing the Low Temperature Hot Water (LTHW) circulation pumps and boiler feed water treatment. There are limited opportunities for energy efficiency requirements as the buildings are not heated. Energy efficient lighting will be used throughout the building.

The steam raising boilers are located within a building which protects the plant for excessive heat loss. The planning application covered the entire AAD development.

As part of the OFGEM and Combined Heat and Power Quality Assurance (CHPQA) Programme requirements, usable heat will be measured and reported on a monthly basis. The monitoring scheme monitors gas use against energy production to determine performance. To achieve government incentives DCWW also monitors heat recovered, electricity production, gas use and overall efficiency of the installation. This information can be used to generate a database for further determination of energy efficiency plans.

An energy efficiency plan will be developed once the site is operational; this will determine areas of improvement and will be developed under DCWW's Environmental Policy and EMS.

3.3.7.2 Breakdown of any changes to the energy the activities use and create (Question 6b)

Following the completion of the AAD plant, biogas will continue to be upgraded and injected into the national gas grid. However, the total biogas flow will increase due to an increase in the percentage conversion of organic matter into gas due to thermal hydrolysis. This process makes the existing assets more efficient.

The thermal hydrolysis process requires high pressure steam, which is created using a new steam raising boiler and utilises natural gas in normal operation. This boiler does also have the facility to use biogas should it be available, for example, during BUP maintenance periods.

The CHPs will continue to operate, but only periodically to help the WwTW optimise its onsite power usage, specifically electricity. In normal operation, biogas will be upgraded and injected into the grid.

3.3.7.3 Climate change (Question 6c)

DCWW is not a participant to the Climate Change Levy Agreement.

3.3.7.4 Specific measures for improving energy efficiency (Question 6c)

The thermal hydrolysis process requires steam at a high pressure. To generate this steam, natural gas is used. To improve the energy efficiency of the plant, a three-stage heat recovery system is put in place. The first stage is a potable water circuit which recovers high grade heat to heat the boiler hot well. The second stage is medium grade and uses a final effluent loop to pre-warm the sludge pre-thermal hydrolysis to reduce steam demand. The final stage is low grade heat, which uses the final effluent to pre-warm the polymer used in sludge dewatering, again warming the sludge.

The heat recovery system ensures the energy used is utilised as efficiently as possible in the plant.

3.3.7.5 Efficient use of raw materials and water (Question 6d)

All materials will be handled and stored in such a way as to ensure containment. Fugitive emissions to the environment are therefore negligible.

Biogas is the primary raw material. Its consumption will be continuously monitored. The use of biogas as the fuel source offers the best environmental option and there is therefore no environmental incentive to reduce biogas consumption and consider an alternative source of fuel.

Biogas is stored within 2No. double membrane inflatable bag type holders, constructed of PVC coated polyester fabric, which is resistant to UV and microbial degradation. The base of the holders are constructed from reinforced concrete treated to withstand the potentially acidic conditions within the holder. The gas bag is completely enclosed so the gas is not in contact with the concrete.

Secondary raw materials include chemicals used in processes such as water treatment, polymer and natural gas for the steam raising boiler. Their consumption will be monitored, based on purchase records. No water is used in the BIP.

Natural gas is required to run the burners in the steam raising boiler house. This steam is required for the thermal hydrolysis process. Natural gas is not stored on site, but taken direct from the mains supply.

Water treatment chemicals are stored within the boiler building in tablet form on hard standing and within a contained drainage area. Polymer is stored in sealed silos located on bunded areas.

The DCWW purchasing procedures are included in DCWW QMS PP(3) series. The procedures ensure purchased items conform to specified requirements, including quality parameters, and review suitability for use, including efficiency and minimisation of use of raw materials.

All substances are assessed for COSHH (Control of Substances Hazardous to Health) compliance, where relevant. Material safety data sheets for all materials used and kept on site will be maintained on the site.

All raw materials are handled and stored within the confines of the buildings on site, or silos following the unloading from vehicles, with the exception of biogas which is contained within the gas handling system.

Releases of raw materials to land are considered to be negligible due to adequate containment of the materials within suitable storage vessels and presence of a contained drainage system.

3.3.7.6 Avoidance, recovery and disposal of wastes (Question 6e)

The proposed AAD plant at Five Fords will manage its waste streams in accordance with the Council Directive 2008/98/EC on waste (the Waste Framework Directive), ISO 14001, legal requirements and DCWW EMSs. There will be a Waste Management Plan that includes details of the types of waste produced at site, how wastes are segregated, stored and removed from site. Only minimal volumes of waste shall be generated at the AAD plant, with waste streams segregated and recovered for recycling where possible. All waste streams shall be managed in accordance with existing EMSs, with any final off-site disposal to be carried out by licensed waste contractors in accordance with Duty of Care requirements.

Implementation of EMS procedures and the current Environmental Policy ensures optimum disposal of the wastes produced. Submission of a detailed assessment is not considered necessary due to the minimal quantity of waste produced.

Further consultation with waste contractors will ensure that all waste streams have been considered. The sampling and characterisation of wastes will be covered under the requirements of Duty of Care.

The wastes will be stored in suitable designed containers prior to being removed from site.

Disposal routes for the waste streams have still to be determined, but the application of the waste hierarchy will be central to the decision making process.

4 Part F1 – OPRA, charges and declarations

4.1 Working out charges (Question 1)

Table 1 of the F1 form has been completed. An up-to-date EP OPRA profile is provided in Appendix B.

4.2 Payment (Questions 3)

Payment will be by BACS

4.3 Confidentiality and National Security (Question 5)

DCWW wish to claim confidentiality of some of the information provided in the application. This is on the basis of national security and public safety. Justification for this claim, along with a list of confidential documents, has been provided separately in the letter dated 5 July 2018 from DCWW's Security Manager, as part of the covering letter for the application.

4.4 Application Checklist (Question 6)

Table 14 provides a list of documents included in the application

Table 14: Application Checklist

Question reference	Document title/reference	Document section
Part C2 – Q2b	Non-Technical Summary	Main Supporting Document
Part C2 – Q3a	List of Relevant Offences	Section 2.4.1 of Main Supporting Document
Part C2 – Q3d3	Environmental Management System summary	Section 2.4.4 of Main Supporting Document
Part C2 – Q5a	Site Plans	Appendix D of Main Supporting Document
Part C2 – Q5b	Site Condition Report	Appendix E of Main Supporting Document
Part C2 – Q6	Environmental Risk Assessment	Appendix C of Main Supporting Document
Part C3 - Q1a	Listed Activities	Section 3.1, Table 7 of Main Supporting Document
Part C3 – Q1b	Waste Codes	Section 3.1, The current T21 exemptions allows for the waste types, identified in Table 8, to be accepted. Table 8 Main Supporting Document
Part C3 - Q2	Emissions to air, land and water	Section 3.2, Table 9, Table 10 and Table 11 of Main Supporting Document
Part C3 – Q3a	Technical Standards	Section 3.3, Table 12 of Main Supporting Document
Part C3 – Q3a	Schematics	Appendix H of Main Supporting Information
Part C3 – Q3b	General requirements	Section 3.3.3 of Main Supporting Document
Part C3 – Q3c	Types and amounts of raw materials	Section 3.3.4, Table 13 of Main Supporting Document

Question reference	Document title/reference	Document section
Part C3 - Q3d	Information for specific sectors	See Section 3.3.5 of main supporting document
Part C3 – Q4a	Monitoring	Section 3.3.6 of Main Supporting Document
Part C3 – Q4b	Point Source emissions to air	Section 3.3.6.1 of Main Supporting Document
Part C3 – Q6a	Basic measures for improving energy efficiency	Section 3.3.7.1 of Main Supporting Document
Part C3 – Q6b	Breakdown of any changes to the energy the activities use and create	Section 3.3.7.2 of Main Supporting Document
Part C3 – Q6c	Climate Change Levy Agreement	Sections 3.3.7.3 and 3.3.7.4 of Main Supporting Document
Part C3 – Q6d	Raw and other materials, substances and water use	Section 3.3.7.5 of Main Supporting Document
Part C3 – Q6e	Waste Avoidance	Section 3.3.7.6 of Main Supporting Document
Part F1 – Q5	Five Fords signed disclosure letter	Section 4.3 of Main Supporting Document
Part F1 – Q6	Application Checklist	Section 4.4 of Main Supporting Document

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A. Permit Application forms

B. EP OPRA

C. Environmental Risk Assessment



Environmental Risk Assessment

Five Fords WwTW permit variation

25 July 2018

Mott MacDonald
Stoneham Place
Stoneham Lane
Southampton SO50 9NW
United Kingdom

T +44 (0)23 8062 8800
F +44 (0)23 8064 7251
mottmac.com

Environmental Risk Assessment

Five Fords WwTW permit variation

25 July 2018

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1 Introduction

As part of the application for an Environmental Permit, operators must assess the risk to the environment and potential harm to human health from the activities they propose to undertake. This document provides the environmental risk assessment considered relevant to the plant in accordance with the Environmental Risk Assessment Guidance (H1).

This report updates, as part of the environmental permit variation, the assessment of the risks to the environment and human health from the Five Fords Site, submitted in relation to their original permit application for a gas-to-grid (G2G) facility (EPR/AP3139FT). The variation includes the addition of a thermal hydrolysis plant and associated infrastructure to be included as a waste operation as a directly associated activity on the installation permit.

The permit variation is required to take account of the proposed changes at the wider Five Fords site, which includes the addition of an Advanced Anaerobic Digestion (AAD) facility to the current Anaerobic Digestion (AD) process which takes place at the site. As part of this change, the AAD and sludge treatment processes will require the importation of an increased amount of sludge and cake from other Wastewater Treatment Works' (WwTW) satellite sites around North Wales. This will cause Five Fords to subsequently exceed the current T21 exemption (recover wastes at a wastewater treatment works), which covers the site and allows the treatment of up to 100,000 cubic metres of waste over any 12-month period.

The proposed AAD plant will involve the following main changes:

- Cake import facility to receive dewatered sludge from the satellite sites;
- Cake silos for storage of cake prior to treatment in Thermal Hydrolysis Plant (THP);
- Pre-THP dewatering facility for on-site sludge and liquid imports to allow for combined storage with imported cake in silos;
- THP including two new boilers (1.567MWth each, with dual burners which can run on either biogas or natural gas) to provide steam to heat the THP streams. This is prior to the existing digestion facility;
- One new additional gas holder;
- Demolition of existing sludge buffer tanks prior to post digestion dewatering;
- Re-use of existing pre-digestion sludge storage tanks for sludge storage upstream of the Pre-THP dewatering facility;
- New post-digestion tank to the north of the cake export building;
- Extensions and modification of the current cake export building to cater for increased production of cake;
- Liquor Treatment Plant (LTP) to reduce pollutants in the post digestion dewatering centrate to acceptable levels before being pumped back to the WwTW;
- Automated de-gritting system for existing digesters;
- Removal of the current standby boiler (1.5MWth) located with the current CHP engines;
- Modification of the current CHP's (2.82MWth total), so that they no longer recover heat for the digesters.

The following are outputs from the process:

- Cake (dewatered post digestion sludge) - stored in cake building before being shipped for use as a fertiliser;
- Pre-THP centrate - pumped back to head of works for treatment;
- Post-THP centrate - passed through the LTP to remove the majority of ammonia and is then pumped to the head of the works for treatment;
- Bio gas - stored in gas holders, then passed through siloxane filters, then either:
 - Passed through the gas-to-grid plant before injection into grid;
 - Burnt in CHPs;
 - Used to run the THP boilers; and
 - Flared in the waste biogas burner.
- Grit (small amount) – deposited in tip before taken off site.

The risk assessment sets the requirements for the management of the permitted area, emission control measures etc. All control measures, within the rules, must be adhered to in order to obtain the permit.

There is planning permission in place for these activities to be undertaken and the need for an environmental permit has come about through the changes made to the permitting legislation.

This document assesses risks to the environment, amenity and human health in accordance with the Environment Agency's guidance published on their website. This report deals with:

- Noise and vibration;
- Odour;
- Particulate matter;
- Litter;
- Abatement of other fugitive emissions to air;
- Vermin and insects (pests);
- Emissions to water and land; and,
- Human and Environment Safety.

It identifies the impacts on the different receptors in close proximity to the site and provides an assessment of the risks to these areas from the site. It does not include accidents. An Accident Management Plan, in the form of Environmental Emergency Procedures (Issue 05, 15th March 2015) and Site Emergency Plan (Version 2, October 2015), and Environmental Management Plan (Five Fords Waste Water Treatment Works – G2G Facility Environmental Management Plan, Issue 05, 22 November 2017) forms part of DCWW's Quality Management System (QMS).

An Accident Risk Assessment has been carried out for the installation, as has a Fire Risk Assessment (dated 19/06/2015) in accordance with the Regulatory Reform (Fire Safety) Order, 2005. The Fire Risk Assessment can be found in Appendix G of the Main Supporting Document (ref: DCWW-4791-S-201-MMB-06-XX-RP-NX-10312).

There will be no direct discharges to either surface or groundwater from the proposed changes to the site.

2 Environmental Risk Assessment

2.1 Identifying the hazards

The following list identifies some of the foreseeable environmental incidents or risks, or actions that have the potential to cause environmental harm at the site for which Environmental Risk Assessments have been carried out to identify the necessary controls to prevent and mitigate incidents, including:

- Fire and firewater containment;
- spillages;
- Transfer of substances; and,
- Waste materials handling and movement.

For each of the environmental aspects above, the approach to the assessment has following a five-stage process:

- 1) Identify the risks and sources of the risks for your site;
- 2) Identify receptors and possible pathways
- 3) Assess the risks (assuming control measures are in place);
- 4) Choose appropriate further measures to control risks further (if required); and
- 5) Present the assessment.

Section 2.1.2 presents the assessment of environmental risks

2.1.1 Assessing the risks

The Risk Assessment procedure uses subjective risk ratings as follows;

Table 2.1: Subjective risk ratings used in the risk assessment

Risk rating	Hazard degree	Estimated frequency
High	Significant environmental damage or non-compliance resulting in enforcement action	Very likely/almost certain (Monthly/More often)
Medium	Spillage, emission or non-compliance likely to result in complaint or regulator correspondence	Quite Possible/likely (Annually)
Low	Spillage, emission or minor non-compliance contained within site	Unlikely/rare (1 in 10 Years)
Negligible	Minor Spillage or emission contained on site and easily cleaned up	Very unlikely to impossible (1 in >10 years)

2.1.2 Assessment of the Environmental Risks

The following tables provides the assessment of the environmental risks, the subjective risk ratings and the mitigation in place to prevent risk occurring or manage it should it occur.

Noise and Vibration									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population	Noise and vibration	Nuisance, loss of amenity (e.g. disruption during outdoor activities), potential loss of sleep	Noise through the air and vibration through the ground.	Low	Low	Low	Local residents often sensitive to noise and vibration but there is low potential for exposure.	Noise and vibration shall be minimised and not cause nuisance. Implementation of a noise and vibration management plan, noise kept to a minimum during operating hours. Exceptional noisy operations e.g. construction – inform residents. Robust complaints procedure will be implemented. Daily site inspections by site manager will be undertaken. All findings and actions to be recorded in site diary or daily log sheet.	Low
Local human population, domestic properties, site offices	Vehicles delivering/ removing wastes and materials	Nuisance, loss of amenity.	Noise through the air and vibration through the ground.	Low	Low	Low	Local residents, site staff and other workers in close proximity to the site often sensitive to noise and vibration	Limitation of operating hrs. Limit vehicle speed to 15mph on site.	Low
Local human population, domestic properties, site offices	Vehicles arriving/ leaving the site.	Nuisance, loss of amenity.	Noise through the air and vibration through the ground.	Low	Low	Low	Local residents often sensitive to noise and vibration.	Limitation of operating hrs. Limit vehicle speed.	Low
Local population, domestic properties, site offices.	Waste treatment, processing. Noise arising from plant boilers and engines. Noise arising from THP process equipment	Nuisance, loss of amenity.	Noise through the air and vibration through the ground.	Low	Low	Low	Local residents often sensitive to noise and vibration.	Choose quiet plant and the provision of silencing equipment. Proper maintenance of plant and equipment. Limitation of operating hrs under the planning permission. Turn equipment off when not in use.	Low
Odour									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population	Odour from site activities e.g. sludge hoppers, pre-THP centrifuges, pre-THP centrifuge buffer tanks and THP feed silos, cake building and cake storage	Nuisance, loss of amenity (e.g. disruption during outdoor activities)	Air transport then inhalation.	Medium	Medium	Medium	Local residents often sensitive to odour. Wide range of waste may cause odour issues at reception from wastes, release of biogas and from digestate hence control measures adopted.	Implementation of an odour management plan, odorous waste likely to be released, due to the nature of the wastes. Emissions shall be free from odorous compounds. Non- point source emissions of biogas shall be minimised using appropriate measures. All storage tanks and lagoons are required to be covered. Also AD is an enclosed process. All doors of buildings, when not required, to remain closed.	Low

								Cake preparation and cake building Odour Control Unit (OCU) will be installed. Odour management plan will be updated and implemented. Robust complaints procedure will be implemented. Daily site inspections by site manager will be undertaken. All findings and actions to be recorded in site diary or daily log sheet.	
Local human population, domestic properties, site offices.	Spillage of odorous materials including oils, fuels, chemicals. Spillages. Failure to clean up spillages. Contaminated spill equipment not disposed of appropriately.	Nuisance, loss of amenity.	Air transport then inhalation.	Low	Low	Low	Local residents and staff often sensitive to odour.	The site operator shall adopt a procedure for dealing with spillages. The Site Manager shall ensure all spillages are cleaned up immediately. The Site Manager shall ensure all relevant staff are appropriately trained to use the spill kits. All areas of site to be cleaned regularly; Site Manager to oversee regular cleaning schedule, all staff trained on importance of good housekeeping and site cleanliness.	Low
Local human population, domestic properties, site offices	Fugitive release of H ₂ S	Nuisance, loss of amenity	Air transport then inhalation.	Low	High	Low	Fugitive release, not expected to occur under normal operating conditions.	Site management procedures. Activities shall be managed and operated in accordance with an environmental management system (will include inspection and maintenance of equipment, including engine management systems), point source emissions to air with emission limits for CO, H₂S, biogas and other GHG. Consider use of odour atomisers during unloading of waste into the system.	
Particulate Matter									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Haul roads, public highways. Domestic properties, local human population, local amenity, and site offices.	Vehicle movements on internal and external roads.	Nuisance, loss of amenity.	Air/ windblown.	Low	Low	Low	Local residents and surrounding environment often sensitive to dust. Nature of waste unlikely to cause dust.	Internal roads will be swept, as required, to reduce the likelihood of dust becoming airborne. Implementation of a particulate matter management plan, cake waste likely to be deposited during transport and storage, due to the nature of the wastes.	Low
Domestic properties, local human population, local amenity, site staff and offices.	Releases of particulate matter (dusts) and micro-organisms (bioaerosols).	Harm to human health, respiratory irritation and illness.	Air transport then inhalation.	Low	Medium	Low	Local residents, site staff often sensitive to dust and bio-aerosols. Nature of waste unlikely to cause dust. Nature of waste likely to cause a release of bio-aerosols. Emissions restricted by permit.	Wastes types have a high potential to produce bio-aerosols, but the treatment activities will not produce particulate matter in the form of dust. Ensure there is the equipment to enable the vehicles, equipment and impermeable surfaces, where applicable, to be washed down.	Low

Domestic properties, local human population, local amenity, site staff, visitors and offices.	Releases of particulate matter (dust) from cake storage bays and transport of cake off-site	Nuisance – dust on cars, clothing etc.	Air transport then deposition	Low	Low	Low	Local residents and surrounding environment often sensitive to dust. Site office and staff more directly affected	No wastes containing solely of dusts is accepted. Dust may be produced from dirt deposits from vehicles or other users of the haul road and treatment and storage of cake. Ensure vehicles, equipment and impermeable surfaces are able to be swept and washed down when necessary. Ensure cake is either stored inside a building or is able to be kept covered to reduce dusty wastes.	Low
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Litter									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population, livestock and wildlife, domestic properties and local amenity.	Waste and litter on local and internal roads. Vehicles entering and leaving site.	Nuisance, loss of amenity and road traffic accidents.	Air transport then deposition.	Low	Low	Low	Local residents, surrounding environment and animals sensitive to litter. Limited potential for litter arising from the site. Nature of waste delivered to site is sludge transported in tankers. Some potential for litter from general site activities.	All vehicles leaving the site, transporting waste will be covered to prevent waste/materials being blown from them. Wastes will be kept covered or contained when not being processed. Regular inspections for litter and debris are undertaken. All waste produced from general site activities are kept in enclosed containers, or inside a building, prior to removing from site. Implementation of a litter management plan, waste likely to be deposited during transport and storage.	Low

Mud and Debris									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population.	Vehicles depositing mud and debris arriving/ leaving the site.	Nuisance, loss of amenity, road traffic accidents.	Vehicles entering/ leaving the site.	Low	Low	Low	Road safety issues - local residents often sensitive to mud on the road. Limited potential for mud and debris.	Ensure any 'mud or sludge' arising from activities on site is cleared up. Ensure vehicles, equipment and impermeable surfaces are able to be swept and washed down when necessary. Inspect vehicle routes regularly. Sweep area when required. All vehicles leaving the site, transporting waste/ cake are to be covered to prevent waste/materials being blown from them.	Low

Abatement of other Fugitive Emissions to Air									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk

What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population.	Releases of NOx and SOx.	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Medium	Medium	There is potential for exposure to anyone living close to the site or at locations where members of the public might be regularly exposed.	Activities shall be managed and operated in accordance with a management system (will include inspection and maintenance of equipment, including engine management systems), point source emissions to air with emission limits for NOx and SOx. Gas engine stacks between 3 metres and 7 metres in height have to be located 200 metres from the nearest sensitive receiver. Stacks shall be a minimum of 3 metres in height. The activities shall not be carried out within an AQMA designated for NOx. NOx and GHG emissions controlled by emission limits. Any emissions of substances, not controlled by emission limits (such as dust, flies, vermin excluding odour and noise), shall not cause pollution.	Low
Local human population.	Releases of biogas, CO, H ₂ S and other GHG gases.	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Low	Medium	Low	Monitoring of CO and H ₂ S levels in biogas driven CHP plants has shown CO to be typically present at below benchmark levels as indicated in Agency Guidance LFTGN08.	Activities shall be managed and operated in accordance with a management system. These will include inspection and maintenance of equipment, including engine management systems, point source emissions to air with emission limits for CO, H₂S, biogas and other GHG. NOx, SOx and GHG emissions controlled by emission limits. Any emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution.	Low
Local human population	Release of microorganisms (bioaerosols)	Harm to human health - respiratory irritation and illness, depending on type	Air transport then inhalation	Medium	High	Medium	Local residents, site staff often sensitive to bio-aerosols. Potential for release at waste reception, treatment and storage. Nature of waste likely to cause a release of bio-aerosols. Emissions restricted by permit.	Wastes types have a high potential to produce bio-aerosols. Operations have to take place within a closed system with appropriate filters or scrubbing systems. Emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution.	Low
Local human population and local environment.	Arson and / or vandalism causing the release of polluting materials to air (smoke or fumes).	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters, arsonists/ vandals or local residents.	Air transport of smoke.	Low	High	Low	Local residents and site staff sensitive to smoke and fumes. Although biogas is flammable, risk of direct physical contact is reduced by activity being carried out within enclosed systems. Permitted waste types limited to sludges and liquids.	An accident management plan is required as part of management system including security, fire, explosion and spillages. Ensure adequate firefighting measures are implemented on site. Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of fire through faulty plant and equipment. Access to site and waste restricted by tight security controls. Regular maintenance of	Low

								boundary fencing and buildings to prevent access to site.	
								Safety zoning of areas under DSEAR/PEXA.	
Local human population and local environment.	Accidental explosion of biogas.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or local residents.	Air transport.	Low	High	Low	Local residents and site staff sensitive to smoke and fumes. Unlikely to happen - reduced by effective management systems. Local residents and site staff injured from flying debris during explosion	An accident management plan is required as part of management system including security, fire, explosion and spillages. Ensure adequate firefighting measures are implemented on site. Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of fire through faulty plant and equipment. Access to site and waste restricted by tight security controls. Regular maintenance of boundary fencing and buildings to prevent access to site. Safety zoning of areas under DSEAR/PEXA.	Low
Local human population and local environment	Accidental fire causing the release of polluting materials to air (smoke or fumes).	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or local residents.	Air transport of smoke.	Low	High	Low	Risk of accidental combustion of waste is minimal. Permitted waste types are predominantly human waste (sludge). Local residents and site staff often sensitive to smoke and fumes.	As above and safety zoning of areas under DSEAR/PEXA. Management system includes security, fires and spillages management plans. Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of fire through faulty plant and equipment. Ensure adequate firefighting measures are implemented on site. Access to site and waste restricted by tight security controls. Regular maintenance of boundary fencing and buildings to prevent access to site. Smoking only permitted in designated areas.	Low
Birds, Vermin and Insects									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?

Local human population.	Scavenging animals/ birds, pests.	Harm to human health from wastes carried off-site and faeces. Nuisance and loss of amenity.	Air transport and over land.	Low	Low	Low	Permitted wastes unlikely to attract scavenging animals and birds but may become nesting / breeding sites. Generally, not an issue based on current site information	Pest control management plan implemented. Use rat boxes around the site, where appropriate. Management plan includes management of pests, vermin etc. Ensure waste cannot be accessed by scavengers. All waste produced from general site activities are kept in enclosed containers, or inside a building, prior to removing from site. Doors of buildings to remain closed at all times. Regular inspection and maintenance of boundary fencing and buildings to prevent access to site. Well established and proven operational controls and procedures in place, including regular inspection and monitoring.	Very Low
Emissions to Water and Land									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Local human population and local environment.	Flooding of site.	If waste is washed off site it may contaminate buildings / gardens / natural habitats downstream.	Flood waters	Low	Low	Low	Permitted waste types are sludges/bio-solids, which may contain pathogens, so any waste washed off site will add to the volume of the local post-flood clean up and may be hazardous to human health.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. The site is located within the catchment of the Afon Clywedog and is within Flood Risk Zone A (as classified by the Environment Agency), considered to be at little or no risk of fluvial or tidal flooding from the Afon Clywedog. Area not known to flood.	Very Low
All surface waters close to and downstream of site.	Spillage of liquids, contaminated rainwater run-off from waste e.g. containing suspended solids. Damage to drainage system. Sludge/liquor spillage during delivery/storage Run off from cake storage Spillage of raw materials used for different treatment processes during delivery/storage	Acute or chronic effects to aquatic life, contamination and deterioration of water quality.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer Transport through soil/ groundwater then abstraction.	Low	Medium	Low	Potential for spillage from digestions tanks and storage vessels.	Digestion tanks built to appropriate standard and require appropriate bunding. Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. An accident management plan is required as part of management system including spillages. COSHH assessment undertaken for all raw materials. No point source emissions to water. All liquids shall be provided with secondary containment. All biogas condensate shall be discharged into a sealed drainage system or diverted to head of works through the drainage system. Impermeable surface required for storage of all wastes and materials. All water run-off on site can be directed to storm overflow tanks and fed into the head of the works through the drainage system.	Low

Local human population/amenity and local environment. All surface waters close to and downstream of site.	Arson and / or vandalism causing the release of polluting materials to land and water (Firewater and other liquids).	Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality. Pollution of water or land.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer Transport through soil/ groundwater then abstraction.	Low	High	Low	Surrounding environment sensitive to contaminated fire water and other pollutants. Although biogas is flammable, risk of direct physical contact is reduced by activity being carried out within enclosed systems. Permitted waste types limited to sludges and liquids.	An accident management plan is required as part of management system including fire and spillages. A Fire Risk Assessment has been carried out and is regularly reviewed and updated. The site is categorised as a critical national infrastructure site by the Centre for the Protection of National Infrastructure (CPNI) and therefore, site security is paramount. Access to site and waste is restricted by a 2.5m high chain link security fence and an automated pallisade gate (topped with barbed wire). The site is manned 24 hours a day, 7 days a week. Authorised personnel can gain access to the site using a fob system. For visitors and unauthorised personnel an intercom system at the site entrance, is used. The site also benefits from a CCTV systems. Regular inspections of the boundary fencing and buildings are undertaken to ensure that these have not been compromised and continue to prevent easy access to site. Repairs are undertaken in accordance with the EMS requirements. Activity undertaken within enclosed systems. Safety zoning of areas under DSEAR/PEXA. All water run-off on site can be directed to storm overflow tanks and fed into the head of the works through the drainage system.	Low
Local human population/amenity and local environment. All surface waters close to and downstream of site.	Accidental explosion of biogas, release of polluting materials to land and water (firewater and other liquids).	Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality. Pollution of water or land.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer Transport through soil/ groundwater then abstraction.	Low	High	Low	Surrounding environment sensitive to contaminated fire water and other pollutants. Unlikely to happen, particularly where effective management systems are used. Local residents and site staff injured from flying debris during explosion	An accident management plan is required as part of management system including fire, explosion and spillages. A Fire Risk Assessment has been carried out and is regularly reviewed and updated. Ensure adequate firefighting measures are implemented on site. Access to site and waste restricted by security fencing. Regular inspection and maintenance of boundary fencing and buildings to prevent access to site. Safety zoning of areas under DSEAR/PEXA. All water run-off on site can be directed to storm overflow tanks and fed into the head of the works through the drainage system.	Low
Local human population/amenity and local environment All surface waters close to and downstream of site.	Accidental fire causing the release of polluting materials to land and water (firewater and other liquids).	Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality. Pollution of water or land.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer	Low	Medium	Low	Risk of accidental combustion of waste is minimal. Permitted waste types are predominantly human waste (sludge). Local residents and site staff often sensitive to smoke and fumes.	An accident management plan is required as part of management system including fire, explosion and spillages. A Fire Risk Assessment has been carried out and is regularly reviewed and updated. Safety zoning of areas under DSEAR/PEXA.	Low

			Transport through soil/ groundwater then abstraction.					Management system includes security, fires and spillages management plans. Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of fire through faulty plant and equipment. Smoking only permitted in designated areas. All water run-off on site can be directed to storm overflow tanks and fed into the head of the works via the sites drainage system.	
Abstraction from watercourse downstream of facility (for agricultural or potable use).	Spillage of liquids, contaminated rainwater/firewater run-off from waste e.g. containing suspended solids.	Acute or chronic effects, closure of abstraction intakes.	Direct run-off from site across ground surface, via surface water drains, ditches etc. then abstraction.	Low	Medium	Low	Watercourse must have medium / high flow for abstraction to be permitted, which will dilute contaminated run-off.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. An accident management plan is required as part of management system including fire, explosion and spillages. Digestion tanks built to appropriate standard and require appropriate bunding. No point source emissions to water. All liquids shall be provided with secondary containment. All biogas condensate shall be discharged into a sealed drainage system. Impermeable surface required for storage of all wastes. All surface water run-off on site is directed to the head of the works through the drainage system.	Low

Groundwater	Spillage of liquids, contaminated rainwater run-off from waste e.g. containing suspended solids.	Acute or chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole. Spillages and contaminated firewater by direct run-off from site and via surface water drains and ditches	Low	Medium	Low	Potential for spillage from digestion tanks and storage vessels. Quantities of liquids stored are generally low.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. An accident management plan is required as part of management system including fire, explosion and spillages. Digestion tanks built to appropriate standard and require appropriate bunding. No point source emissions to water. All liquids shall be provided with secondary containment with capacity to hold 110% of the capacity of the container (single). Secondary containment that contains multiple fixed tanks, IBCs etc, must have a capacity that is equal to whichever is the greater of these 2 measurements: one quarter of the combined capacity of all the containers or 110% of the capacity of the largest container. All biogas condensate shall be discharged into a sealed drainage system. Impermeable surface required for storage of all waste and AD plant. All surface water run-off on site is directed to the head of the works through the drainage system.	Low
Groundwater, land and surface water	Reception of imported and indigenous/unknown sludge and liquids	Acute or chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole or closure of abstraction intakes. Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality. Pollution of water or land.	Transport through soil/groundwater then extraction/ abstraction at borehole or intake.	Low	Low	Low	Potential for spillage during transfer of liquid/sludge from tankers.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented to reduce spills when transferring liquids/sludges from tankers. An accident management plan is required as part of management system including sludge importation and spillages. Reception areas built to appropriate standard and require appropriate bunding. Compliance with the waste duty of care requirements to ensure waste accepted meets the permit conditions and relevant legislation. All liquid run-off on site is directed to the head of the works through the drainage system.	Very low
Groundwater, land and surface water	Sludge/liquid spillages as a result of loss of tank/pipe integrity/ carelessness during transfer or overfilling	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole or closure of abstraction intakes. Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality.	Transport through soil/groundwater then extraction/ abstraction at borehole or intake.	Low	Medium	Low	Potential for spillage during transfer of liquid/sludge from tankers.	Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of loss of tank/pipe integrity. Activities to be managed and operated in accordance with a management system and management plans and procedures implemented to reduce carelessness when emptying or overfilling. An accident management plan is required as part of management system including spillages. Reception areas built to appropriate standard and require appropriate bunding.	Low

		Pollution of water or land.						All liquids shall be provided with secondary containment with capacity to hold 110% of the capacity of the container (single). Secondary containment that contains multiple fixed tanks, IBCs etc, must have a capacity that is equal to whichever is the greater of these 2 measurements: one quarter of the combined capacity of all the containers or 110% of the capacity of the largest container. All liquid run-off on site is directed to the head of the works through the drainage system.	
Groundwater, land and surface water	Damage to drainage system	Acute or chronic effects to aquatic life, contamination and deterioration of land and water quality. Pollution of water or land.	Transport through soil/groundwater then extraction/ abstraction at borehole or intake.	Low	Low	Low	Land drain under site for groundwater channel to river.	Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of damage to drainage system. Inspections will be undertaken regularly (at least annually) and recorded in the site diary.	Low
Human and Environment Safety									
Data and Information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of risk after management?
Protected sites e.g. European sites, SACs, SPAs and SSSIs.	Any	Harm to protected site through toxic contamination, nutrient enrichment, smothering, disturbance, predation etc.	Any	Low	Medium	Low	Emissions to air, land or water may cause harm to and deterioration of nature conservation sites. However, such sites are over 500m from the site, and risk of impact is low. Operations may cause harm to and deterioration of nature conservation sites.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. Emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution. Emission limits for stack gases are specified. The potential hazards from the permitted activities pose a low risk to the broad sensitivity of species and habitats groups.	Low

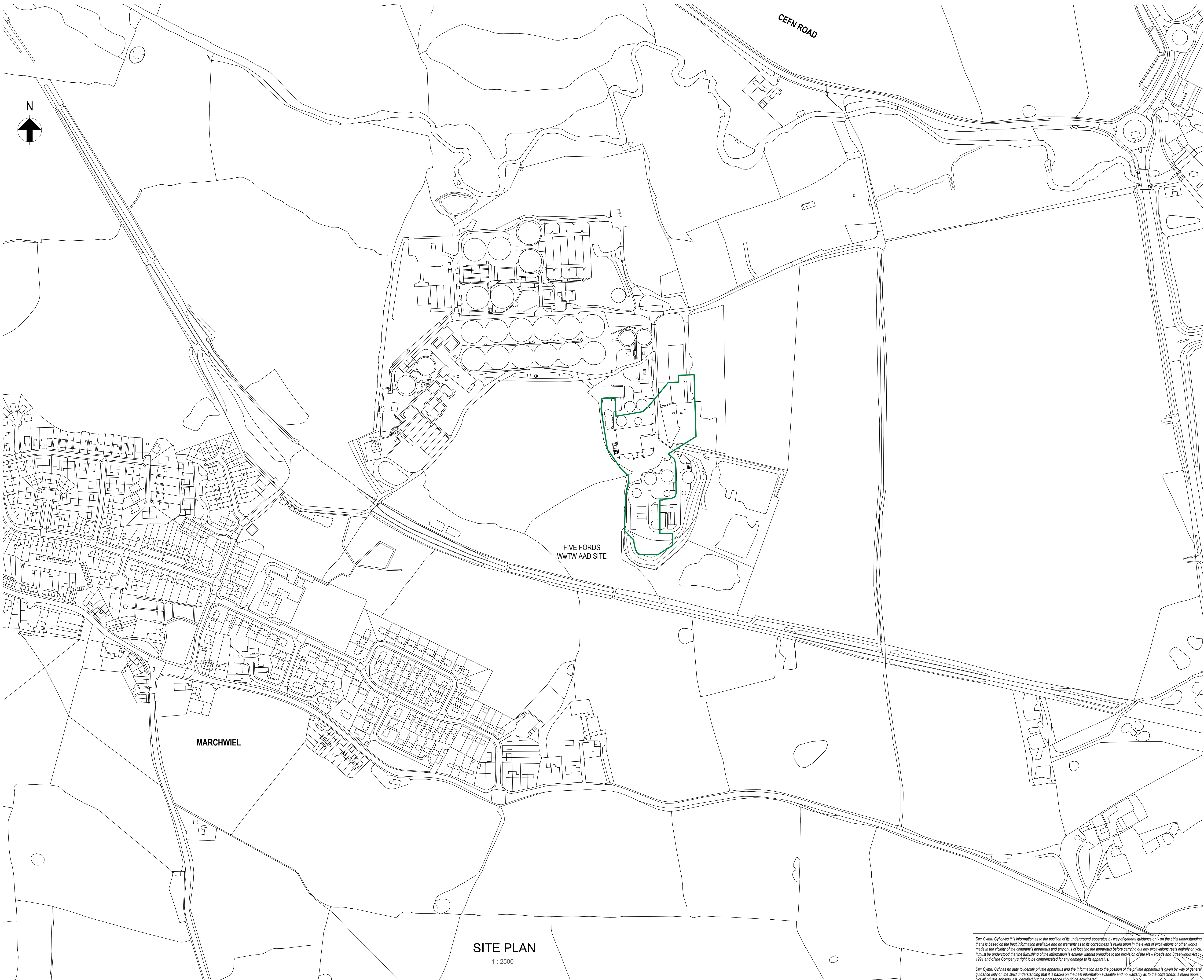
Various	Vandalism/loss of containment	Potential for uncontrolled release of fugitive emissions of gaseous, liquid or solid materials to the environment.	Various	Low	Medium	Low	Emissions to air, land or water may cause harm to and deterioration of air, land or water.	The site is categorised as a critical national infrastructure site by the Centre for the Protection of National Infrastructure (CPNI) and therefore, site security is paramount. Access to site and waste is restricted by a 2.5m high chain link security fence and an automated pallisade gate (topped with barbed wire). The site is manned 24 hours a day, 7 days a week. Authorised personnel can gain access to the site using a fob system. For visitors and unauthorised personnel an intercom system at the site entrance, is used. The site also benefits from a CCTV systems. Regular inspections of the boundary fencing and buildings are undertaken to ensure that these have not been compromised and continue to prevent easy access to site. Repairs are undertaken in accordance with the EMS requirements.	Low
Surface water / groundwater.	Loss of containment during transfer/use of chemicals, sludge	Acute or chronic effects to aquatic life, contamination and deterioration of water quality. Contamination of groundwater, requiring treatment of water or closure of boreholes	Surface water via drainage system. Underground via land drain	Low	Medium	Low	Emissions to air, land or water may cause harm to and deterioration of air, land or water.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. An accident management plan is required as part of management system including sludge importation and spillages. Waste areas built to the required standard, depending on the waste type being contained, and where require, has adequate bunding. Site Manager shall ensure the programme of Planned Preventative Maintenance (PPM) is implemented effectively to minimise the probability of loss of tank/pipe integrity. All liquids shall be provided with secondary containment with capacity to hold 110% of the capacity of the container (single). Secondary containment that contains multiple fixed tanks, IBCs etc, must have a capacity that is equal to whichever is the greater of these 2 measurements: one quarter of the combined capacity of all the containers or 110% of the capacity of the largest container. Impermeable surface required for storage of all wastes and materials. All water run-off on site is directed to the head of the works.	Low
All	Accidental release of biogas from primary digestion tank	Air and human health. Harm to human health, respiratory irritation and illness.	Air transport then inhalation.	Low	Medium	Low	Given the level of operator controls which are in place and management plans, it is considered the probability will be low.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented.	Low

All	Operator Error	Air, land, surface water and groundwater and human health	Various, dependent on nature of error.	Low	Medium	Low	Given the level of operator controls which are in place and management plans, it is considered the probability will be low. Possible contamination to air, land, groundwater and surface water.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. Procedures are in place to deal with these occurrences. All equipment is checked under preventative maintenance plans and is checked and calibrated as per the manufacturer's instructions. All operational staff are fully trained in the site operating procedures and kept up to date on changes. Training includes awareness raising of the potential implications of failure to control operations and the potential impact on the environment. Preventative measures will be under continuous review as part of the EMS procedures. Emergency operating procedures are in place. Senior site-based management have direct responsibility for implementing risk management measures.	Low
Local human population and environment	Equipment failure	Air, land, surface water and groundwater and human health	Various, dependent on nature of error.	Medium	High	Low	Emissions to air, land or water may cause harm to and deterioration of air, land or water.	Activities to be managed and operated in accordance with a management system and management plans and procedures implemented. All equipment is checked under planned, preventative maintenance plans and is checked and calibrated as per the manufacturer's instructions. Emergency operating procedures are in place. Activities shall be managed and operated in accordance with a management system including PPM	Low
Local human population after gaining unauthorised access to the installation	All on-site hazards: machinery, wastes and vehicles.	Bodily injury	Direct physical contact	Low	Medium	Low	Direct physical contact is minimised by activity being carried out within enclosed areas. Contact with waste is minimal with exception of leaks or spills from unloading of tanker and transfer of filter cake	Activities shall be managed and operated in accordance with a management system including site security measures to prevent unauthorised access. Access to site and waste restricted by security fencing. Regular inspection and maintenance of boundary fencing and buildings to prevent access to site. Activity undertaken within enclosed systems. Operator has other associated risk assessments relating to this type of potential incident.	Low



D. Site Plans

D.1 Site Location with Permitted Boundary



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN mAOD, UNLESS NOTED OTHERWISE.

2. DO NOT SCALE FROM THIS DRAWING.

3. ONLY SIGNIFICANT PIPES, METALWORK AND SERVICES ARE SHOWN. THE REMAINDER HAVE BEEN OMITTED FOR CLARITY.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION:

N/A

MAINTENANCE / CLEANING / OPERATION:

N/A

DECOMMISSIONING / DEMOLITION:

N/A

REFER TO THE DHEMR & IMS SUMMARY FOR FURTHER DETAILS. IT IS ASSUMED THAT ALL THE WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WHO HAS CARRIED OUT A COMPREHENSIVE RISK ASSESSMENT.

C02

13.07.18

AB

SCALE AMENDED

CB

CB

17.07.18

C01

11.07.18

AB

CONSTRUCTION ISSUE

CB

CB

11.07.18

Rev.

Date.

Drawn

Description.

Chkd.

Appd.

Date.

Capital Delivery Alliance

Cynghair Cyflawni Cyfalaf

Ty Awen, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name:

FIVE FORDS AAD

Drawing Title:

PERMIT APPLICATION LOCATION PLAN

Suitability:

CONSTRUCTION

Suitability Code:

A

Originator:

AB

Designer:

DB

Date:

11.07.18

Internal Project Number:

363735NN26

Scale:

1 : 2500@ A1

Rev.

C02

Drawing Number:

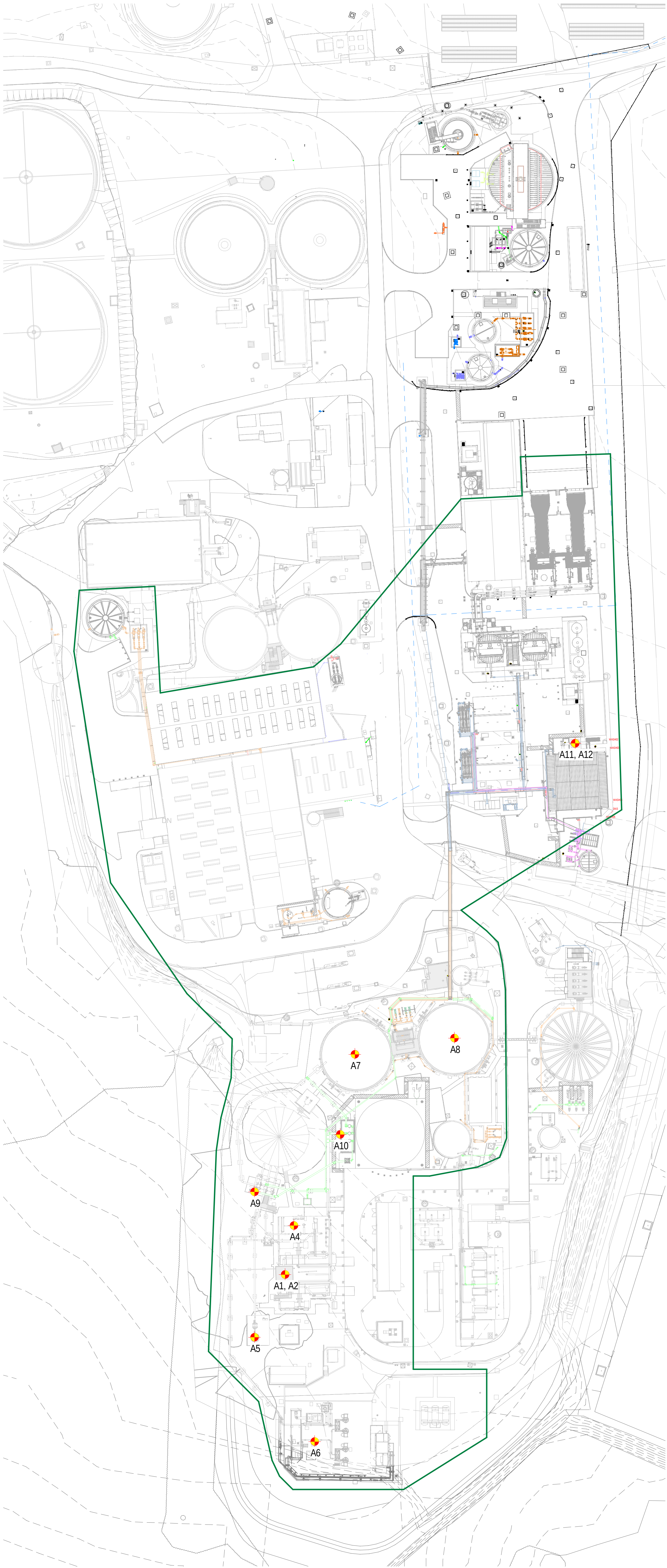
4791-S-201-MMB-06-XX-DR-NX-06203

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Dwr Cymru Cyf has no duty to identify private apparatus and the information as to the position of the private apparatus is given by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon. Not all private apparatus is identified but their presence should be anticipated.

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A1h



AAD SITE PLAN
1 : 250

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Dwr Cymru Cyf has no duty to identify private apparatus and the information as to the position of the private apparatus is given by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to the correctness is relied upon. No all private apparatus is identified but their presence should be anticipated.

NOTES:

1. NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.

2. EXISTING DRAINAGE INFORMATION TAKEN FROM 1ST HORIZON SURVEY. (JUNE 2016) AND AS-BUILT DRAWINGS PROVIDED BY DCWW (OCTOBER 2012).

- INDICATES EMISSION POINT.

EMISSIONS TO AIR:

A1 - EXISTING CHP STACK 1.

A2 - EXISTING CHP STACK 2.

A3 - EXISTING DUAL FUEL BOILER STACK (TO BE REMOVED)

A4 - EXISTING SILOXANE VENT.

A5 - EXISTING WASTE GAS BURNER.

A6 - EXISTING BIOMETHANE PLANT STACK.

A7 - EXISTING DIGESTER 1 GAS RELIEF VALVE.

A8 - EXISTING DIGESTER 2 GAS RELIEF VALVE.

A9 - EXISTING GAS HOLDER PRESSURE RELIEF VALVE.

A10 - GAS HOLDER PRESSURE RELIEF VALVE.

A11 -12 COMPOSITE STEAM BOILER STACK.

BOUNDARY KEY:

PROPOSED PERMIT BOUNDARY.

SAFETY , HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION:
NO RISK IDENTIFIED
MAINTENANCE / CLEANING / OPERATION:
NO RISK IDENTIFIED
DECOMMISSIONING / DEMOLITION:
NO RISK IDENTIFIED

REFER TO THE DHEMR & IMS SUMMARY FOR FURTHER DETAILS. IT IS ASSUMED THAT ALL THE WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WHO HAS CARRIED OUT A COMPREHENSIVE RISK ASSESSMENT.

C03	24.10.18	IN	LABELS UPDATED	DB	DB	24.10.18
C02	01.06.18	AB	BOUNDARY UPDATED	CB	CB	01.06.18
C01	27.10.17	SJR	FIRST ISSUE	CB	NB	19.04.8

Rev.	Date.	Drawn.	Description.	Chkd.	Appd.	Date.
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Ty Awen, Spooner Close, Coed Kernew, Newport, NP108FZ

Project Name: FIVE FORDS AAD

Drawing Title: ENVIRONMENTAL PERMIT - FIVE FORDS AAD EMISSION POINTS

Suitability:	Suitability Code:
CONSTRUCTION	A

Originator:	Designor:	Date:
SJR	CB	27.10.17

Internal Project Number:	Scale:	Rev.
363735NN26	As indicated@ A1	C03

Drawing Number: 4791-S-201-MMB-06-XX-DR-NX-06202

E. Site Condition Report

Dŵr Cymru Welsh Water

**Five Fords Combined Heat and
Power Project**

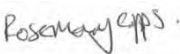
**Environmental Regulations Permit
Application - Site Condition Report**

REP/140/11

Issue | August 2011

Document Verification

ARUP

Job title		Five Fords Combined Heat and Power Project		Job number 124348-10	
Document title		Environmental Regulations Permit Application - Site Condition Report		File reference	
Document ref		REP/140/11			
Revision	Date	Filename			
Draft 1	21/02/11	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Rosie Cripps	Max Rooksby	Max Rooksby
		Signature			
Issue	19/08/11	Filename	Site Condition Report - Final.docx		
		Description	Revised for Issue		
			Prepared by	Checked by	Approved by
		Name	Rosie Cripps	Max Rooksby	Simon Power
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
Issue Document Verification with Document					☒

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Appendices

Appendix A

Site Location Plan

Appendix B

Environmental Setting

Appendix C

Pollution History

Appendix D

Raw Materials

1 Site Details

1.1 Name of the Applicant

Dŵr Cymru (Welsh Water) is the applicant for an Environmental Permit for the operation of the Five Fords Wastewater Treatment Works (WwTW) Combined Heat and Power (CHP) Facility described in the main Supporting Information document.

1.2 Activity Address

The installation is located at the following address:

Dwr Cymru Welsh Water
Five Fords Waste Water Treatment Works
Cefn Road
Adenbury
Wrexham
LL13 0PA

1.3 National Grid Reference

The centre of the site is located at National Grid Reference SJ3643247916. The site covers an area of 0.32 Ha. The location of the site is shown in Appendix A1.

1.4 Document Reference and Dates for SCR at Permit Application

The Site Condition Report (SCR) is accompanied by Application Forms A, B2, B3 and F, the Five Fords CHP Facility Supporting Information Document, EP OPRA and H1 for the application for an Environmental Permit.

This document is Version 1 of the Five Fords CHP SCR. It has been produced to support the application for an EPR Permit for the operation of the installation.

1.5 Document references for site plans

Site details are covered under Appendix A, including the following maps:

A1 Site Location Plan;

A2 Area covered by site condition report;

A3 Installation boundary;

A4 Location of receptors;

A5 Site drainage;

A6 Site surfacing; and

A7 Site Reconnaissance.

2 Condition of the Land at Permit Issue

2.1 Environmental Setting

2.1.1 Geology

The geological maps for the site and surrounding area were obtained from Landmark Information group and are included in Appendix B1.

From the reviewed geological plans, the geological sequence beneath the site can be summarised as follows:

Made ground

Glacial Till

Salop Formation - Upper Carboniferous Coal Measures

Superficial Deposits

The geological plan indicates the north eastern area of the site to be underlain by made ground, however it cannot be ruled out that such made ground exists across the wider site area, particularly due to the previous site use as sludge beds.

Natural superficial deposits underlying the site are shown to comprise glacial till, bordered by River Terrace deposits to the north. It is anticipated that the till deposits beneath the site consist of clays, and potentially more granular deposits (sands and gravels).

Bedrock

Bedrock at the site is shown to be the Salop Formation, which comprises red and red-brown mudstone, and red-brown (mostly sublitharenite) sandstone containing beds of pebbly sandstone and conglomerate.

2.1.2 Site Investigation Confirmed Ground Conditions

An intrusive investigation comprising nine hand dug trial pits was undertaken in September 2008 by Costain in the locale of the former sludge beds, which was supplemented by an additional investigation in October 2008 which comprised the excavation of eight percussive boreholes.

In addition to the above, a further intrusive investigation was undertaken in the locale of the site in 2010, and comprised the excavation of a further five cable percussive boreholes, four rotary core holes, and six trial pits.

The ground conditions encountered during all of the above investigations (which confirm the above anticipated geology), are summarised below:

Strata	Description	Thickness (m)
TOPSOIL	Turf over brown slightly gravelly clay with frequent rootlets.	0.1-0.4
MADE GROUND	Sandy gravelly clay or clayey gravel of	0.35-4.0

Strata	Description	Thickness (m)
	clinker and mixed natural lithologies. Firm to stiff gravelly sandy clay, gravelly sand with frequent cobbles, clayey sandy gravel and cobbles. Gravel and cobbles logged to comprise limestone, coal, brick, mudstone, sandstone, flint, plastic pipe, clinker, concrete, ceramics, plastic piping, timber, kerb stones, gloves and metal.	
SUPERFICIAL DEPOSITS (Alluvium and glacial till)	Soft slightly gravelly clayey SILT and Silty CLAY. Medium Dense silty fine to medium SAND, loose sandy GRAVEL. Firm and stiff slightly sandy CLAY.	1.1-12.35
Weathered Bedrock	Very weak, red MUDSTONE. Recovered as a very gravelly clay with mudstone lithorelicts.	0.2-2.7 (unproved)

Shallow groundwater was encountered within both the alluvium and made ground strata, while a deeper groundwater body was encountered within the glacial till and bedrock strata.

2.1.3 Hydrogeology

Both the bedrock strata and superficial deposits underlying the site have been classified by the Environment Agency as Secondary A Aquifers, which are described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor. The depth and direction of groundwater beneath the site is currently unknown, however it is anticipated to flow northwards, towards the river Clywedog.

There is one Source Protection Zones identified approximately 750m to the south east of the site, see Appendix B2.2. The inner source protection zone for these catchments lies approximately 2km north east of the site.

2.1.4 Surface Water Features

Hydrological data was obtained from Landmark Information Group for the water courses within 1000m of the installation.

The surface water features in the vicinity of the site are shown on Appendix B3.1. The WwTW sits approximately 500m south of the River Clywedog Afon Clywedog. The general direction of flow of the Afon Clewdog is toward the east where it discharges to the River Dee. On the south east corner of the site are two sludge lagoons and a pond, the sludge lagoons are directly adjacent to the site (within 3m).

No areas of the existing WwTW or proposed site for the anaerobic digestion facility lie within any Flood Zones. A flood map is included as Appendix B3.2.

Site drainage for the site is shown on Appendix A5.

2.2 Pollution History

2.2.1 Historic Pollution Incidents

The Landmark Information Group was commissioned to provide records of any land pollution incidents associated with the site and within 1000 m of the site boundary. All pollution incidents within and within close proximity to the site have been tabulated in Appendix C1. Details of typical pollutants that may be found within an existing WwTW are found in Appendix C2.2.

2.2.2 Historical Land-Uses and Associated Contaminants

Historical maps dating from 1873 to 2010 at both 1:10560 and 1:2500 have been reviewed to assess the historical development of the site and its surroundings. In addition, the maps have been used to identify past (or current) potentially contaminative land uses on or in the locale of the site area. Copies of historic maps reviewed are included in Appendix C2.1.

1873-1879(1:10,560 & 1:2,500)

The site is undeveloped open grassland, comprising two fields, separated in the western site area by a line of tree's and possibly a small watercourse running north to south towards a small pond south of the site boundary. Marchwiell Covert wood lies to the north west of the site and slightly encroaches on the north western boundary.

The land surrounding the site is also relatively undeveloped, comprising open farm and pasture land interspersed by trees, small farm holdings and surface water ponds. Five Fords farmhouse is located approximately 320m north east of the site boundary while High Gate Collage is annotated 200m to the south. A pond lies approximately 90m north of the site.

Marchwiell village extends to the south west of the site.

1899, 1:2,500 & 1:10,560

The tree's bordering the field in the western site area are no longer present and the field boundary now appears to be a watercourse only, which runs into the site from the north along Marchwiell Covert. A further watercourse appears to run into the site from the north east and a sluice is annotated in the central northern site area, in locale of both watercourses meeting and running southwards.

The Wrexham and Ellesmere railway line has been constructed and runs from east to west, approximately 40m south of the site boundary, with Marchwiell railway station located approximately 400m west of the site. The small pond, into which the small watercourse running from the site discharges, remains, approximately 55m south of the site.

A larger surface water pond is evident immediately south of the railway line, approximately 600m to the south east of the site.

The surrounding landscape remains to comprise of open undeveloped farmland, although slight expansion of Marchwiell village appears to have occurred. High Gate Collage is now named Holly Hedge and Five Fords Farmhouse remains.

1912 – 1914, 1:2,500 & 1:10,560

The site remains open undeveloped grassland crossed by two main water channels controlled by the sluice in the northern central site area. Marchwiell covert remains to encroach into the north west of the site, while the railway remains to run south of the site boundary.

Some minor works appear to have been undertaken along the line of the railway, and a tank is now annotated 80m south of the site, just north of the track.

The Wrexham corporation sewage farm is annotated immediately east of the site area, with associated tanks apparent on the western side of Marchwiell Covert, approximately 240m west of the site boundary.

Sludge lagoons are annotated approximately 350m north of the site boundary, immediately south of the River Clywedog which flows from west to east.

1938, 1:10,560

Little change appears to have occurred to the site itself, which remains open undeveloped grassland crossed by small watercourses. The Wrexham Corporation Sewage Farm and associated tanks and sludge lagoon remain to the north east and west (beyond Marchwiell Covert).

The Railway Line is now annotated the Great Western Railway, north of which the previously observed small tank remains annotated.

To the south west, further expansion of Marchwiell is apparent, with buildings extending eastwards towards Hollyhedge. The Five Fords Farm House remains north east of the sewage farm.

1954, 1:10,560 The site remains unchanged, however the sewage works appear under expansion, with a number of cylindrical tanks having been constructed immediately north of Marchwiell Covert, which appears to have been partly cleared. The previously observed sludge lagoon is no longer annotated, although its footprint remains evident south of the river. Little other significant change to the surrounding landscape is apparent.

1964, 1:10,000

A drain is shown to traverse the site from the sluice in the northern central area to the south eastern site corner, extending towards the east outside the site boundary.

The watercourse in the west of the site remains to flow southwards towards the pond within the railway land (south of the site). A number of sluices, drains and further ponds are annotated immediately north and south of the railtrack. The previously annotated tank is no longer present.

To the north of the site, further expansion of the sewage works is evident, along the northern edge of Marchwiell Covert, where a number of additional tanks and buildings have been constructed.

Five Fords Farmhouse also appears to have been expanded north of the site, and the housing development adjacent to Hollyhedge farm appears complete.

Maelor abattoir has been constructed approximately 800m east of the site boundary.

1974 – 1979, 1:2,500 & 1:10,000

The site is now shown to comprise of at least three depressed sludge beds associated with the Sewage works, which are now annotated as Pollution Control Works. The sludge beds extend to the east and south of the site boundary, towards the railway line, which now appears to have been dismantled, although the ponds and sluices in its locale remain.

To the immediate north of the site and to the north west, further tanks and buildings of the sewage works have been constructed, the most northerly almost reaching the River Clywedog, just south of the historic sludge lagoon. Marchwiell has been expanded considerably to the north west and south of the dismantled railway.

1992, 1:10,000 & 1:2,500

The site remains occupied by the sludge beds of the Sewage Works, while further expansion of the works has been undertaken to the east of the most northerly tanks. Marchwiell Covert remains amongst the works buildings.

The line of the dismantled railway remains south of the site, along which the surface water ponds remain.

2000, 1:10,000

The sludge beds within the site are no longer annotated; their footprints are still evident, although their layout and shapes appear to have been amended, and now comprise three within the site boundary, two rectangular on the eastern site boundary, and a circular pond like lagoon to the south east.

Slight extension to The Five Fords Farm has occurred.

2006, 1:10,000

Little change is apparent within the site boundary and in the land surrounding it.

2010 1:10,000

Little change to the site and its surroundings is evident.

Potential Sources of Contamination Summary

From review of the historical development of the site, it is considered that the sewage treatment works; first observed on the 1912 historic plan, and the associated sludge beds constructed on the site itself by 1974 are the main potential sources of contamination on the site.

In addition to the predominant historic and current site use, the historic railway line previously running south of the site, and the former tank located on the north side of the track are also identified as a potential sources of contamination.

From the reviewed geological plans and previous site investigation data, it is anticipated that made ground will be present within the shallow subsurface of the site. Such made ground may also be considered a potential source of contamination.

2.2.3 Visual and Olfactory Evidence of Existing Contamination

A site reconnaissance was undertaken on 04/03/11 by Arup on the area shown in Appendix C3.1. The purpose of the reconnaissance was to inspect the site and surrounding area for indicators of potential land pollution.

At the time of the site reconnaissance the facility was undergoing construction.

The vegetation and top soil had been stripped back in the location of the site development works. There was a significant quantity of general soil from the construction activities around the site. In this area visual or olfactory evidence of contamination was not found at the site and the soil appearance was as would be expected.

All vegetation around the boundary of the site was healthy and showed no signs of die back. The site was bounded by temporary security fencing and the sludge lagoons and pond were separated further from the construction site with fencing and a new fence.

The area of the site inspected is shown on Appendix C3.1 and associated photographs of the Five Fords site have been included in Appendix C3.2.

2.2.4 Evidence of Damage to Pollution Prevention Measures

The installation is not yet constructed. Commissioning of all new elements of the installation, including the CHP plant, following construction will ensure that the plant and all pollution prevention and containment measures are fully operational and not damaged.

2.2.5 Wastewater Treatment Works Contamination

Sewage Treatment Works.

Sewage sludge can potentially contain elevated levels of nitrogen (predominantly in the form of ammonium and organic-N), metals and metalloids (including Hg, Cu, Ni, Pb, Zn, As, Cd, Se, Mo, Co, Cr and Ag), phosphate, pathogens, and organic compounds (including PCBs, PAHs, organochlorine pesticides, phthalate esters, surfactants, furans, chlorobenzenes, solvents, phenols and dioxins)

Additionally, a wide variety of materials may be screened from raw sewage. These materials may include textiles, plastics, metals, wood or other plant fragments.

Leaking or Overflowing Lagoons.

It is possible that some of the sludge lagoons previously present on the site and currently occupying land adjacent to the site, have leaked in the past or were not effectively lined. It is also possible that, especially at times of heavy rainfall, the lagoons may have overflowed onto the surrounding land.

Burial

Waste material, such as sludge or screenings, may have been historically buried on or near the site. Burial of material is likely to have taken place in discrete

‘hotspots’. It is unlikely that any burial areas were lined or capped. The nature of the material buried would determine whether it would biodegrade readily, the volumes and concentrations of leachate generated, and the potential for gas generation and accumulation.

Chemical Storage & Use

Historically, any chemicals or fuels stored or used may potentially have leaked or been spilled. Such chemicals might include aluminium sulphate, ferric chloride or sulphate, lime, polymeric substances (generally biodegradable), fuel oils or lubricating oils, insecticides and herbicides.

Herbicides and pesticides may have been used widely to control vermin and weed growth across the site.

2.3 Evidence of Historical Contamination

During the site reconnaissance survey no evidence of historical contamination of the site was evident. Data obtained from pollution incident investigations undertaken at or near the site are summarised in Appendix C1.

2.4 Baseline Soil and Groundwater Reference Data

The previous ground investigations undertaken at the site comprised excavation of a number of trial pits and boreholes, from which soil and groundwater samples were obtained and sent for laboratory chemical analyses.

The Geo-environmental Interpretative report produced by AECOM in June 2010 (not included due to its size but available on request), concluded the following with regards to contamination within the shallow ground surface of the site:

- **Human Health:** The potential chronic risks to human health were assessed by comparing the recorded contaminant concentrations against AECOM GAC derived for a commercial/industrial land use. No contaminants were recorded at levels above the applied guidelines.
- **Groundwater:** Slightly elevated concentrations of contaminants were recorded above the applied controlled waters assessment criteria in leachate samples obtained from the made ground and alluvium on the site. In addition, elevated levels of several contaminants were recorded in groundwater samples taken from boreholes installed in natural strata.
- AECOM considered that the concentrations were elevated against very stringent drinking water standards and that natural dilution and attenuation would likely reduce the concentrations of the contaminants reaching controlled waters. Some of the recorded concentrations were also considered to be representative of background concentrations.

2.5 Additional Supporting Information

2.5.1 Environmental Consents, Licenses, Authorisations, Permits and Designations for the Site and Surrounding Area

Landmark Information Group was requested to provide records of any Discharge Consents, Waste Management Licenses, Abstraction Licenses, IPC Authorisations, PPC Permits and Land Drainage Consents for the site and within 1000 metres of the site boundary. The data is provided in Appendix 0.

3 Permitted Activities

3.1 Permitted Activities

Permitted activities within the proposed regulated facility include:

- Combustion of biogas in the CHP facility, including two CHP units and in one dual fuel hot water boiler;
- Generation of approximately 1,200kW of electrical power by the CHP units; and
- Transfer of heat from the installation to the sewage sludge digesters.

3.2 Non-permitted Activities Undertaken

Non-permitted activities undertaken at the sludge treatment works are as follows:

- The indigenous primary sludge and imported sludge is pumped through sludge screens and held in a screened sludge holding tank.
- The screened sludge is then pumped to gravity belt thickeners and thickened to 6%. Indigenous SAS (surplus activated sludge) is also thickened to 6% using a separate stream of thickeners.
- Polyelectrolyte is used as a thickening agent for the sludge. There are separate polymer make up and dosing plants for both the raw sludge and the SAS.
- Both the thickened raw sludge and SAS is then pumped to a thickened sludge holding tank prior to being pumped to the digesters via a sludge / water heat exchanger.
- Both digesters displace sludge into a common weir box where it gravitates to the post digestion storage tank.
- Lime slurry is then added to the sludge to achieve an enhanced product in line with HACCP (Hazard Analysis and Critical Control Points) requirements.
- Limed sludge is then pumped to the dewatering plant which consists of 3No. centrifugal centrifuges which will operate in a duty/assist/standby configuration.
- Polymer for sludge dewatering is dosed from a second batch make up system
- The cake is dewatered in centrifuges to 23-30% dry solids and then conveyed by a series of screw conveyors to a number of cake bays. The cake is then removed by a specialist contractor and spread on the local land bank.

3.3 Dangerous Substances

Appendix D1 identifies the raw materials used as part of the Five Fords CHP Facility, none of the raw materials used on site have been deemed to be dangerous.

The Five Fords CHP is not subject to Control of Major Accidents Hazards Regulations (1999) (COMAH).

3.4 Document References

All site location plans are included in Appendix A.

The environmental risk assessment for the above mentioned permitted activities is included as part of the H1 assessment for the Five Fords Permit.

Appendix A

Site Location Plan

A1 Site Location



Legend

Five Fords Waste Water Treatment Works

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I1	2011-05-27	LC	RC	RC
Issue	Date	By	Chkd	Appd



ARUP

4 Pierhead Street
Cardiff CF10 4QP
Tel +44 29 2047 3727 Fax +44 29 2047 2277
www.arup.com

Client

Dŵr Cymru
Welsh Water

Imtech
ImtechProcess

Job Title

Five Fords Environmental Permitting

Drawing Title

Site Location

Scale at A3

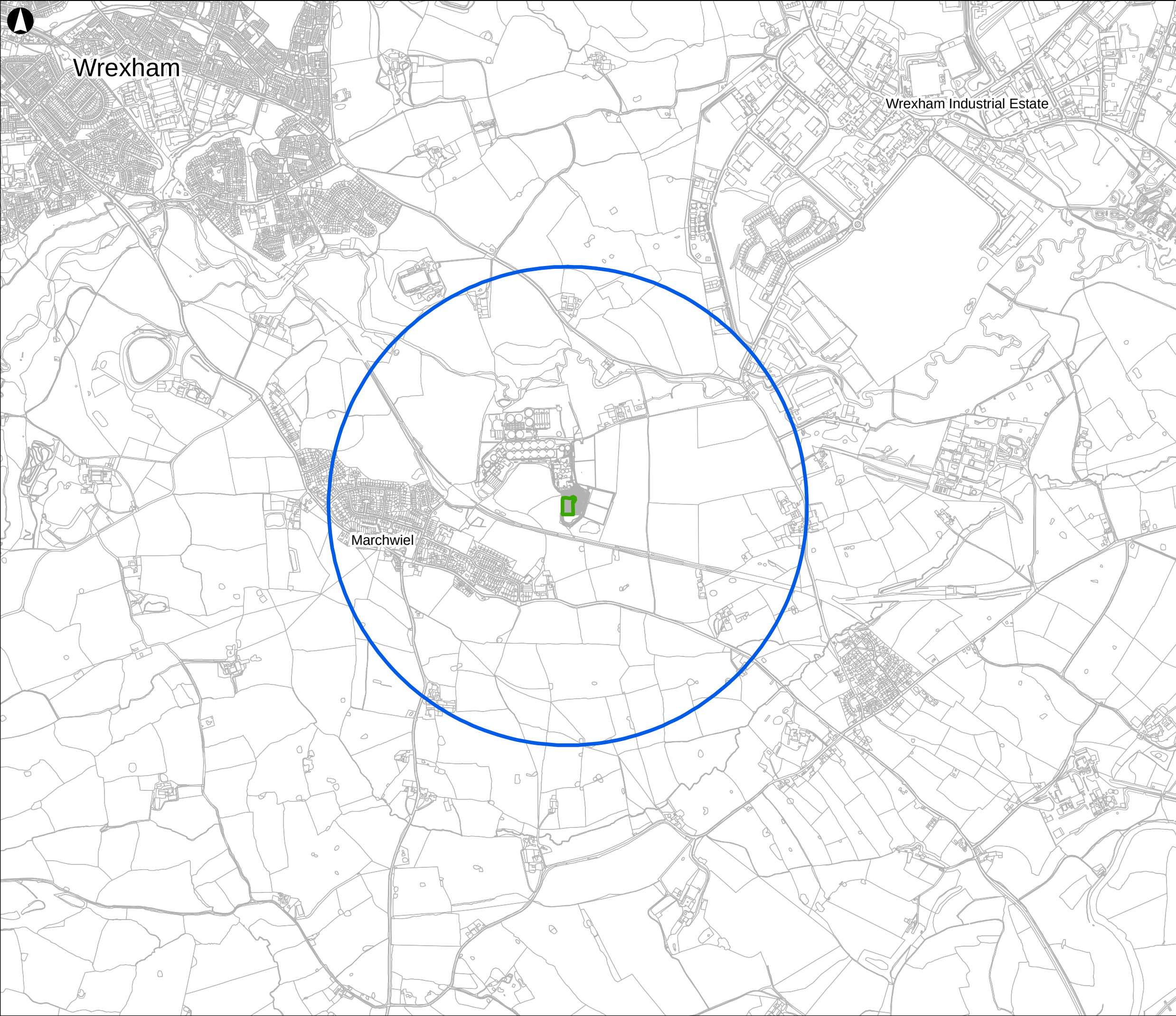
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Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	A1	I1

A2 The Area Covered by the Site Condition Report



Wrexham

Wrexham Industrial Estate

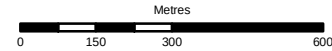
Marchwiell

Legend

-  Area covered by Site Condition Report
-  Installation Boundary

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I1	2011-08-04	LC	RC	RC
Issue	Date	By	Chkd	Appd



ARUP

4 Pierhead Street
Cardiff CF10 4QP
Tel +44 29 2047 3727 Fax +44 29 2047 2277
www.arup.com

Client



Job Title

Five Fords Environmental Permitting

Drawing Title

Area covered by site condition report

Scale at A3

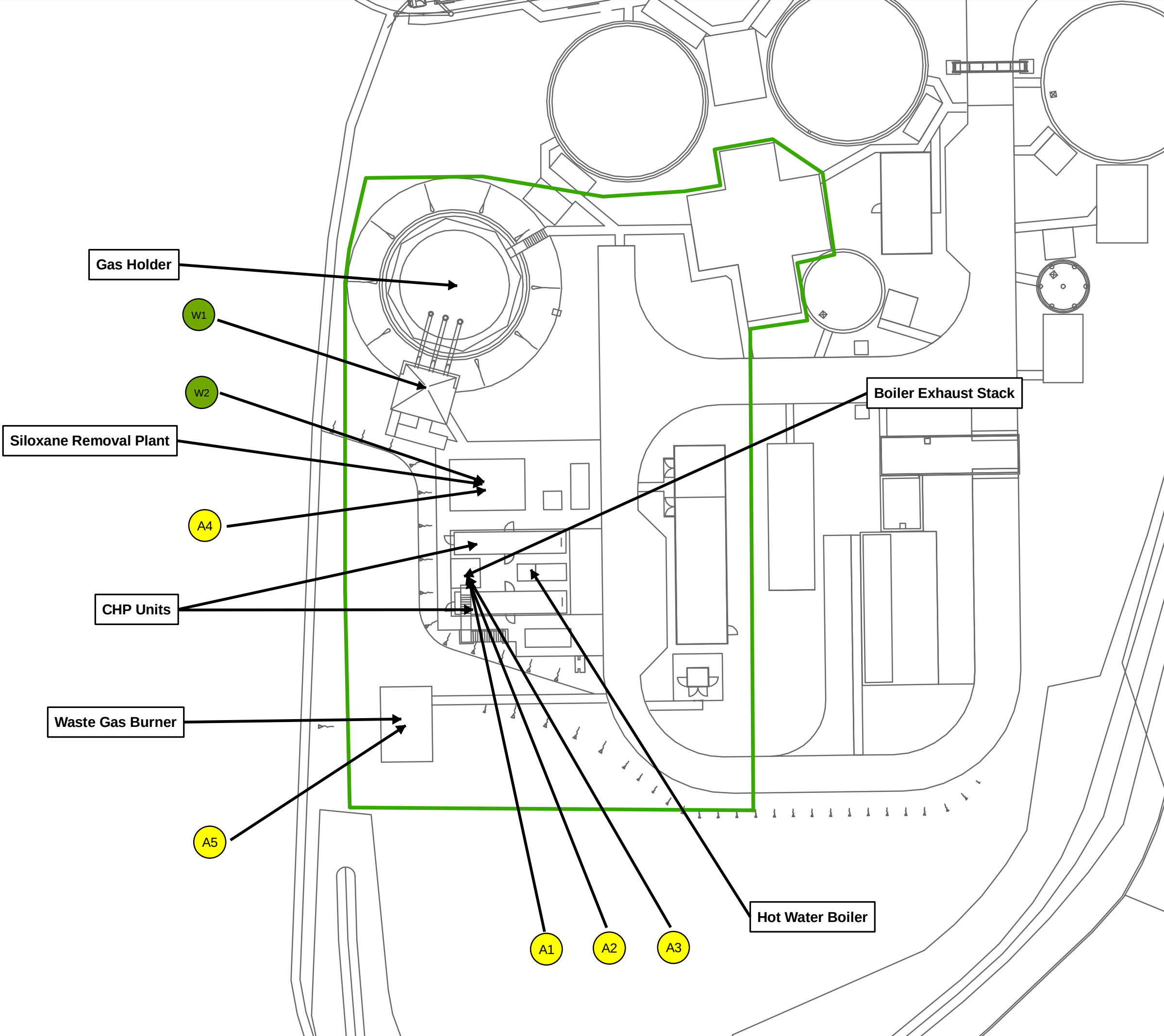
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Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	A2	I1

A3 Installation Boundary

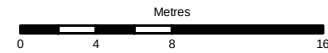


Legend

- Air Emissions
- Water Emissions
- Installation Boundary

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I1	2011-08-04	LC	RC	RC
Issue	Date	By	Chkd	Appd



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Cardiff CF10 4QP
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Client



Job Title

Five Fords Environmental Permitting

Drawing Title

Installation Boundary

Scale at A3

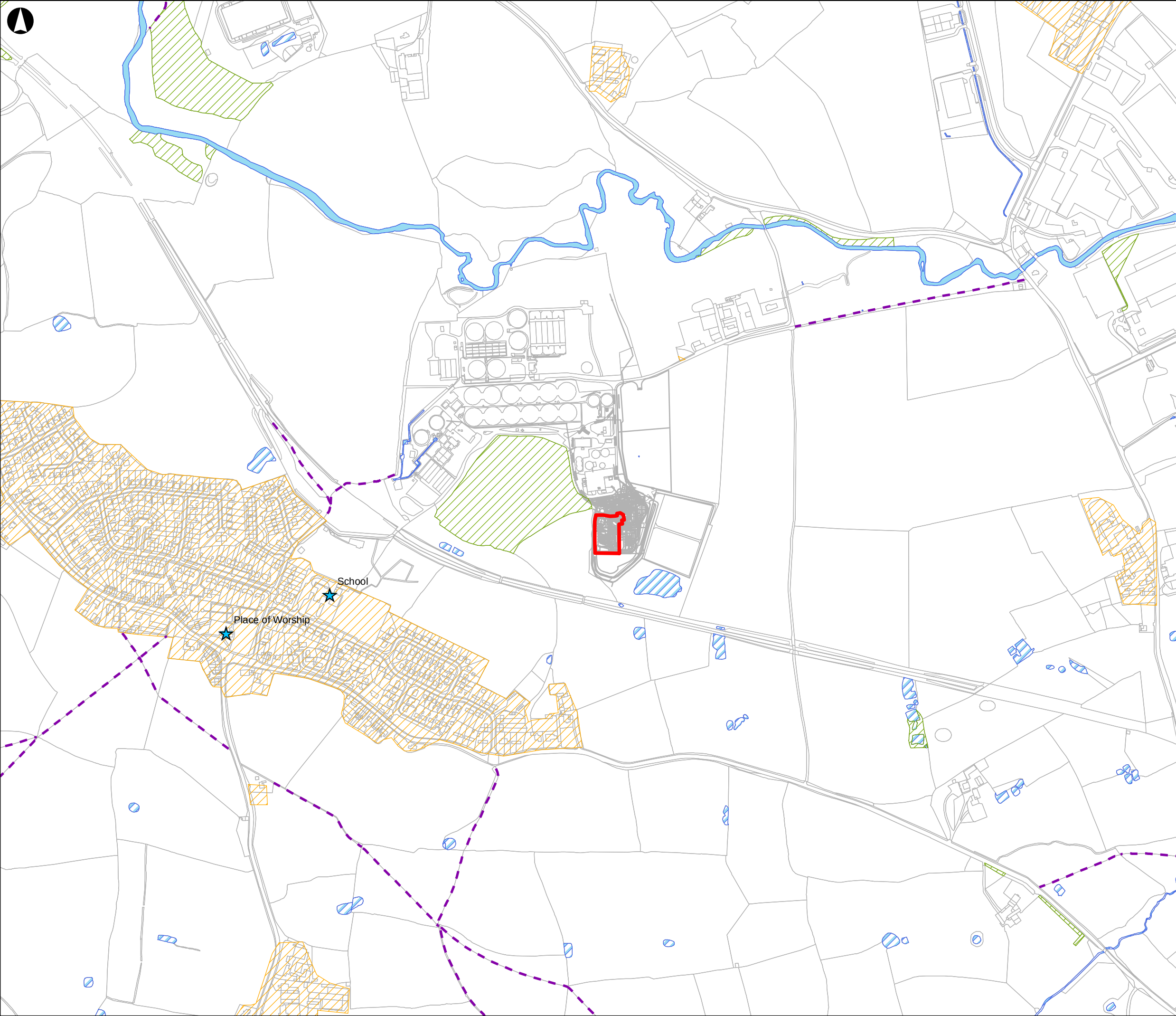
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Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	A3	I1

A4 Location of Receptors

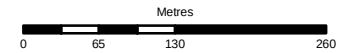


Legend

- ★ Features
- - - Public Footpath
- River Clywedog
- Tree Cover
- Inland Water
- Residential
- Installation Boundary

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Cardiff CF10 4QP
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Job Title

Five Fords Environmental Permitting

Drawing Title

Location of Receptors

Scale at A3

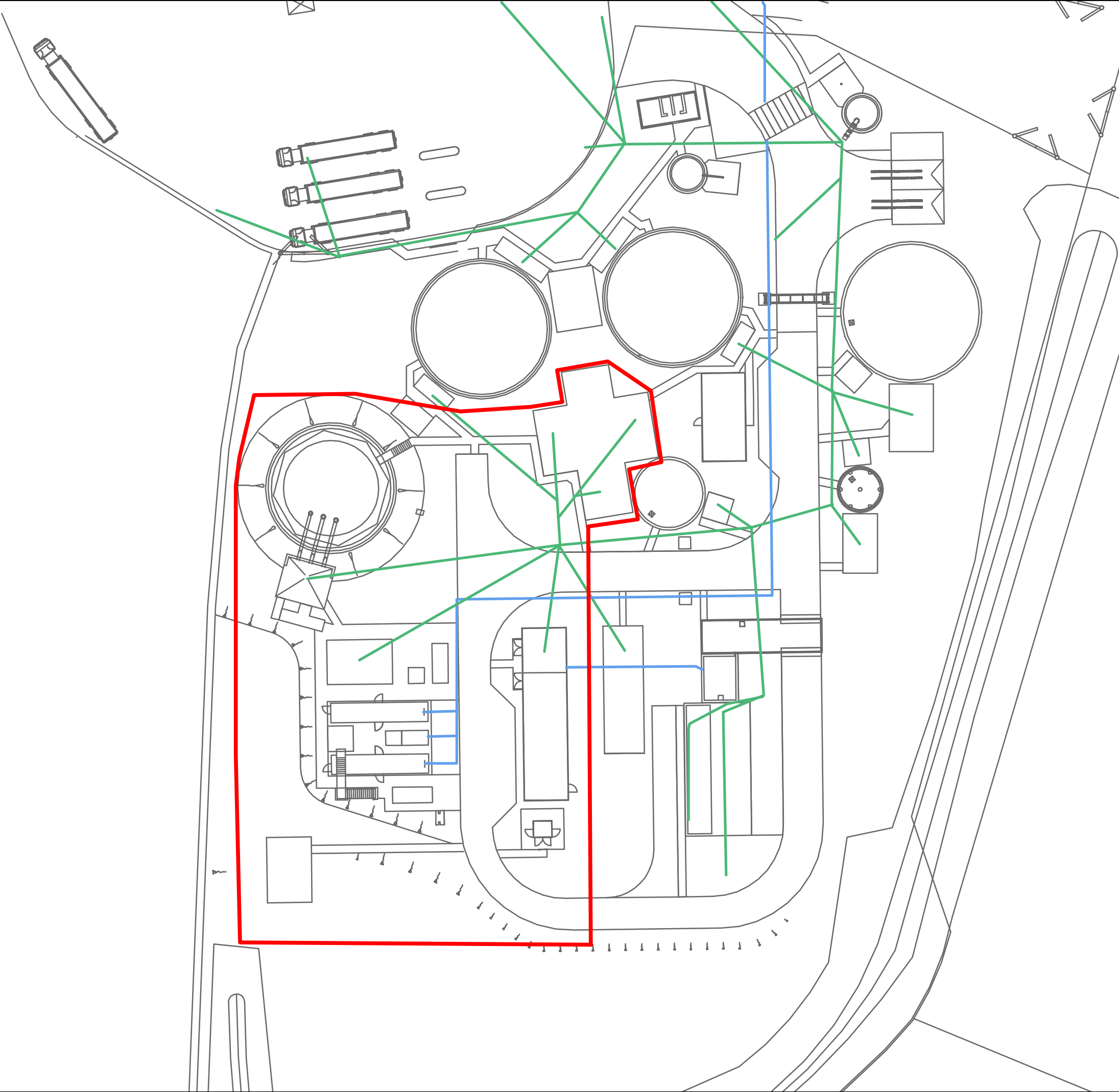
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Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	A4	I1

A5 Site Drainage



Legend

- Installation Boundary
- Drainage
- Potable Water

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I1	2011-05-27	LC	RC	RC
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Tel +44 29 2047 3727 Fax +44 29 2047 2277
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Client

Job Title
Five Fords Environmental Permitting

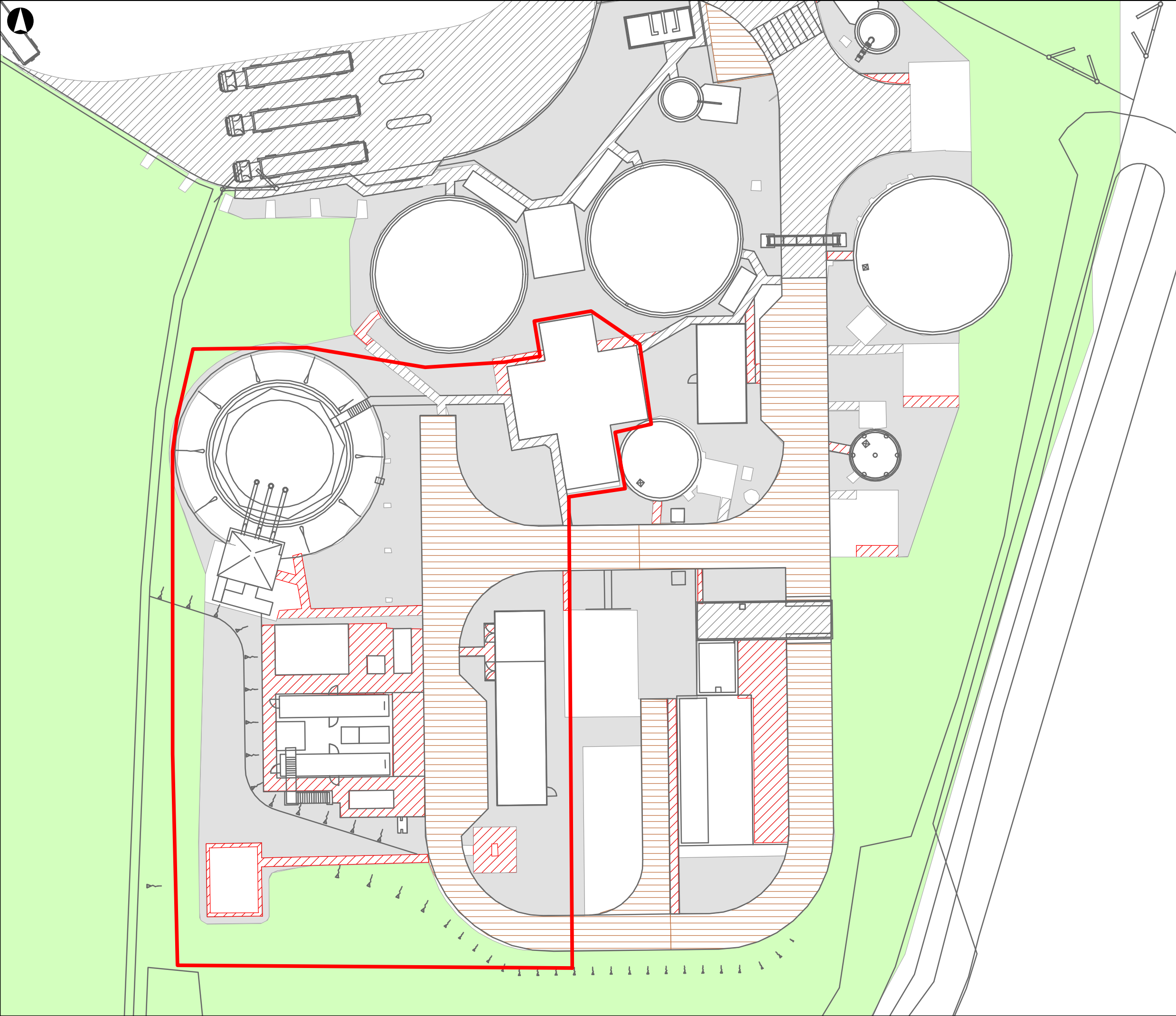
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Site Drainage

Scale at A3
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Drawing Status
For Issue

Job No 216723-00	Drawing No A5	Issue I1
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A6 Site Surfacing

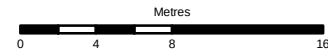


Legend

- Installation Boundary
- Concrete Access Road or Footpath
- Grass
- Stone
- Stone Access Road
- Stone Footpath

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Issue	Date	By	Chkd	Appd



ARUP

4 Pierhead Street
Cardiff CF10 4QP
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Job Title

Five Fords Environmental Permitting

Drawing Title

Site Surfacing

Scale at A3

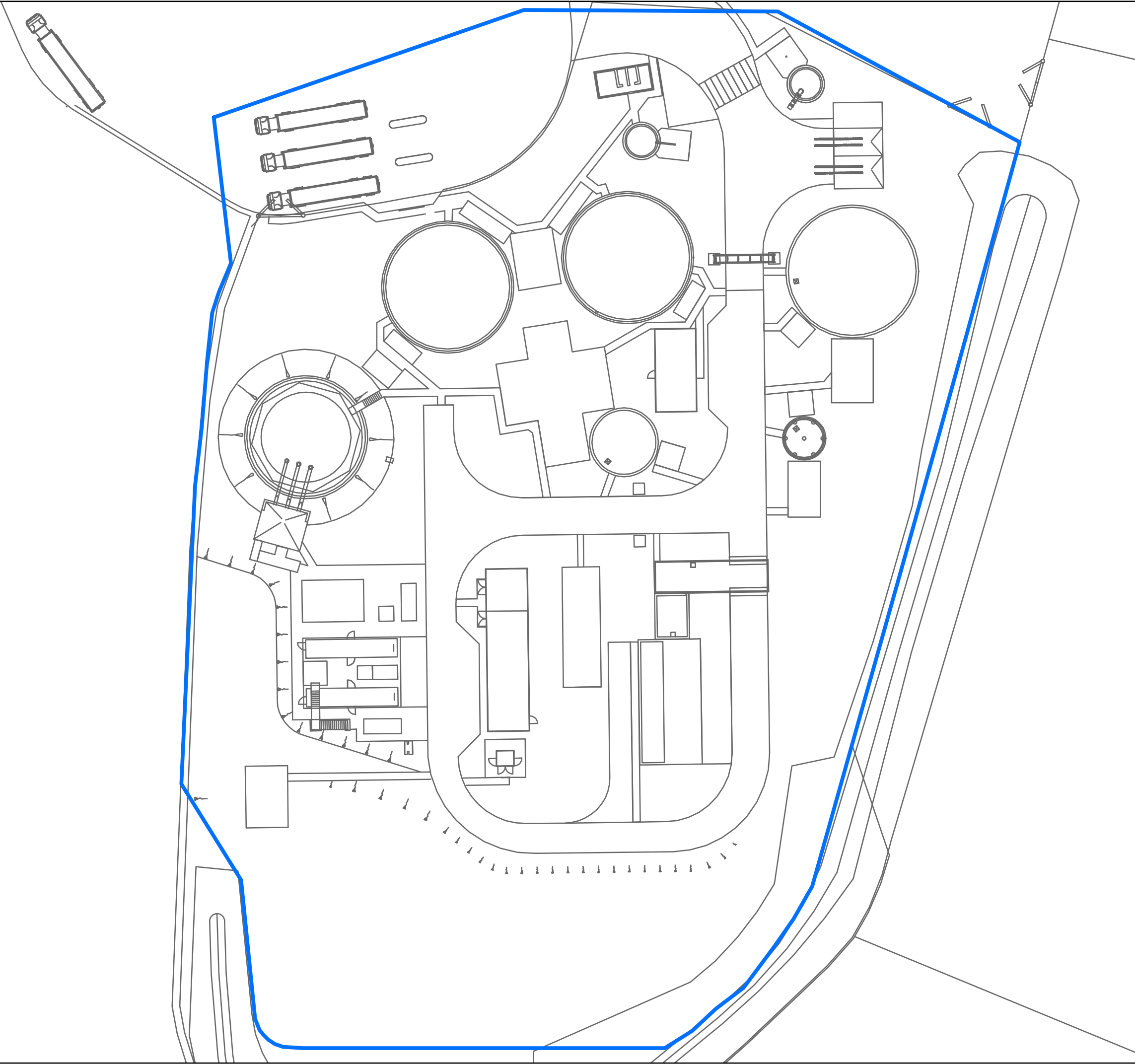
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Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	A6	I1

A7 Site Reconnaissance

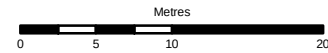


Legend

Site Reconnaissance

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I1	2011-05-27	LC	RC	RC
Issue	Date	By	Chkd	Appd



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Cardiff CF10 4QP
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Client



Job Title

Five Fords Environmental Permitting

Drawing Title

Site Reconnaissance

Scale at A3

1:500

Drawing Status

For Issue

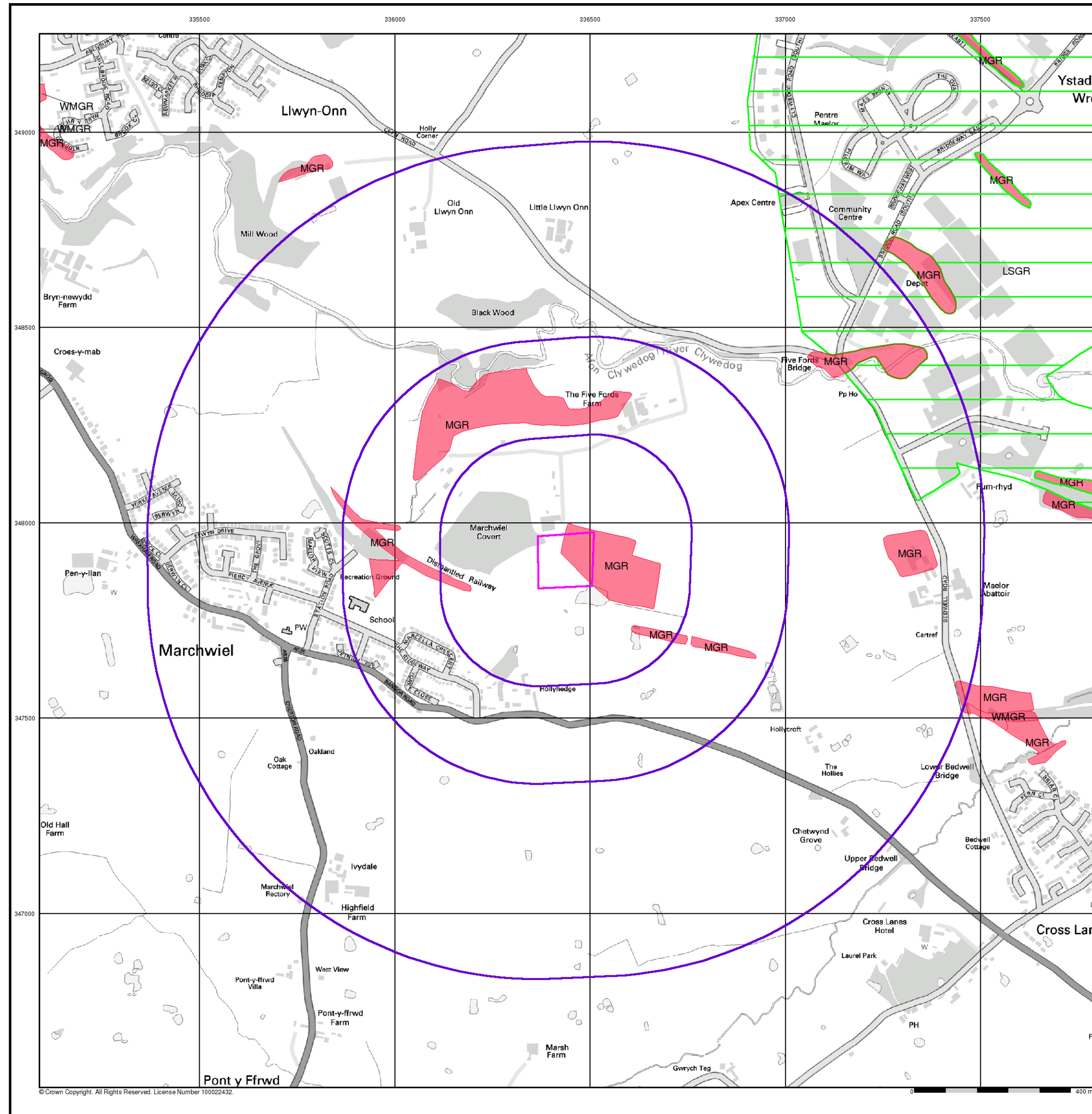
Job No	Drawing No	Issue
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Appendix B

Environmental Setting

B1 Geological

B1.1 Artificial Ground and Landslips



Artificial Ground and Landslip

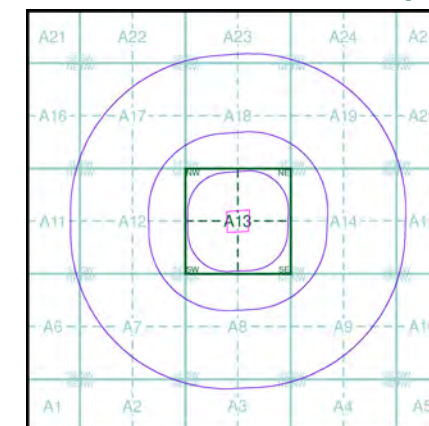
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes founded strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



Order Details

Order Number: 34641744_1_1
Customer Ref: 600108-Five Fords
National Grid Reference: 336440, 347900
Slice: A
Site Area (Ha): 1.91
Search Buffer (m): 1000

Site Details

Site at, Marchwiel, Wrexham

Geology 1:10,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Present Day - Present Day
	LSGR	Landscaped Ground (Undivided)	Unknown/Unclassified Entry	Present Day - Present Day
	WMGR	Infilled Ground	Artificial Deposit	Present Day - Present Day

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay	Flandrian - Flandrian
	GLLD	Glaciolacustrine Deposits	Clay	Pleistocene - Pleistocene
	TILL	Till	Diamicton	Quaternary - Quaternary
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Quaternary - Quaternary
	GFDU	Glaciofluvial Deposits	Sand and Gravel	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	KNSF	Kinnerton Sandstone Formation	Sandstone	Scythian - Scythian
	SAL	Salop Formation	Sedimentary Rock Cycles, Coal Measure Type	Early Permian - Westphalian D



Geology 1:10,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:10,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around a site. This mapping may be more up to date than previously published paper maps.

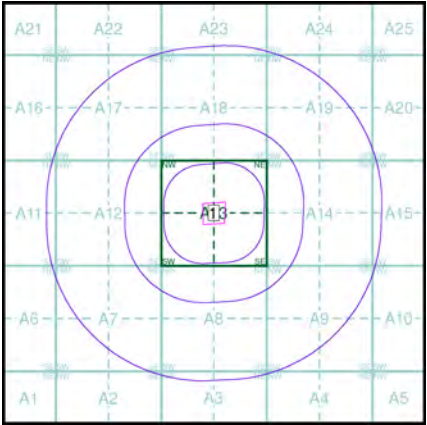
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page.

Please Note: Not all of the layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:10,000 Maps Coverage

Map ID:	1
Map Name:	SJ34NE
Map Date:	1995
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Available
Landslip:	Not Available
Rock Segments:	Not Available

Geology 1:10,000 Maps - Slice A



Order Details

Order Number:	34641744_1_1
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National Grid Reference:	336440, 347900
Slice:	A
Site Area (Ha):	1.91
Search Buffer (m):	1000

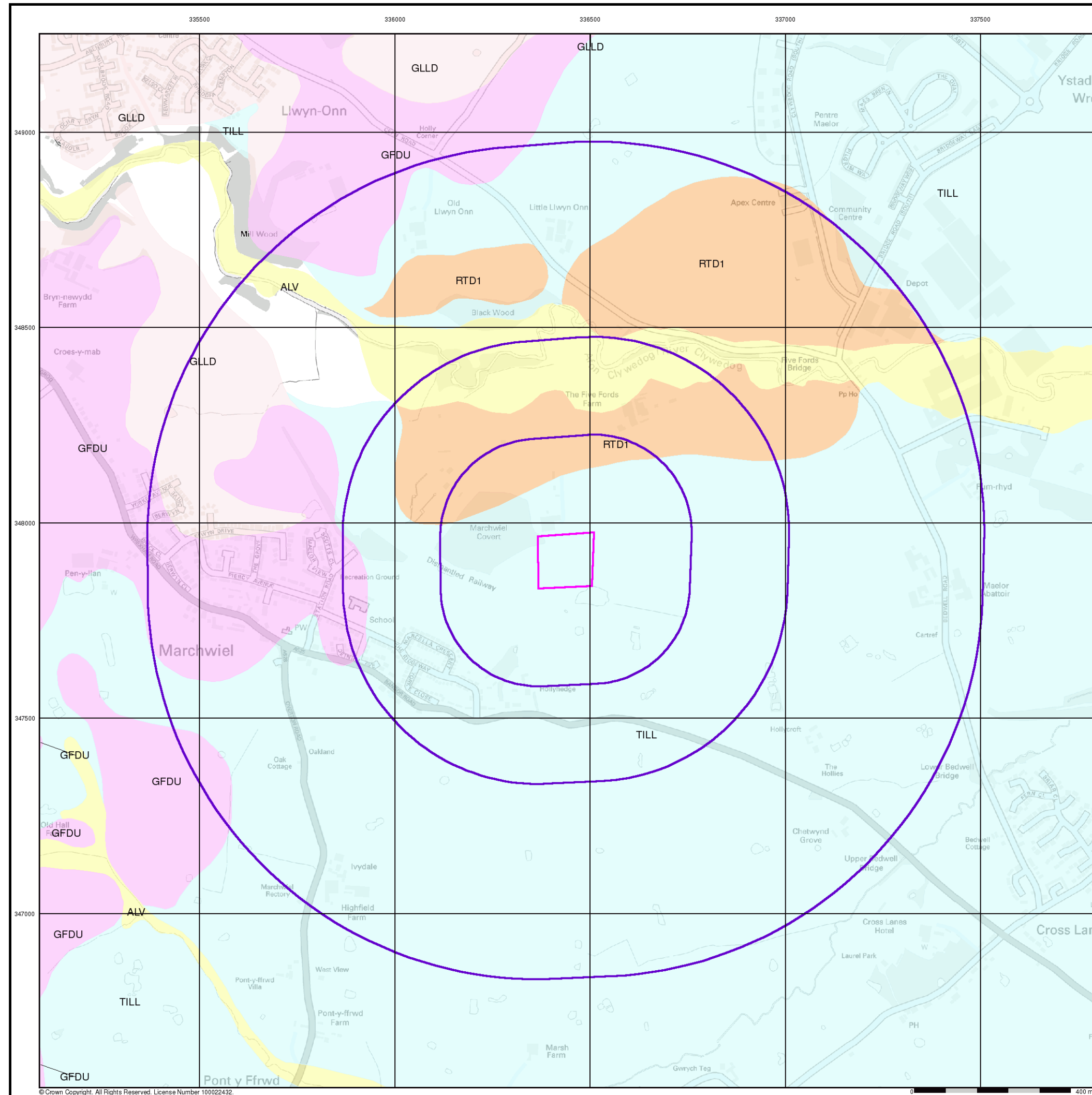
Site Details

Site at, Marchwiell, Wrexham



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

B1.2 Superficial Geology



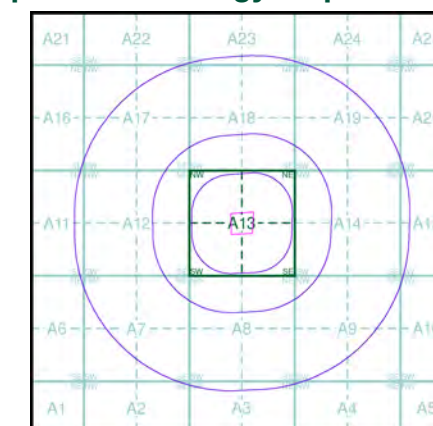
Superficial Geology

BGS 1:10,000 Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details

Order Number:	34641744_1_1
Customer Ref:	600108-Five Fords
National Grid Reference:	336440, 347900
Slice:	A
Site Area (Ha):	1.91
Search Buffer (m):	1000

Site Details

Site at, Marchwiel, Wrexham



Tel: 0844 844 9952
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Geology 1:10,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Present Day - Present Day
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Superficial Geology

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	GLLD	Glaciolacustrine Deposits	Clay	Pleistocene - Pleistocene
	TILL	Till	Diamicton	Quaternary - Quaternary
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Quaternary - Quaternary
	GFDU	Glaciofluvial Deposits	Sand and Gravel	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	KNSF	Kinnerton Sandstone Formation	Sandstone	Scythian - Scythian
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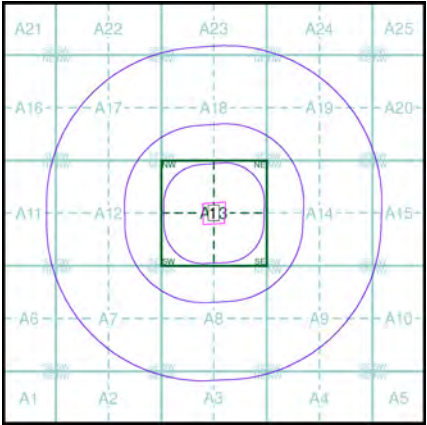
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Geology 1:10,000 Maps Coverage

Map ID:	1
Map Name:	SJ34NE
Map Date:	1995
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Available
Landslip:	Not Available
Rock Segments:	Not Available

Geology 1:10,000 Maps - Slice A



Order Details

Order Number:	34641744_1_1
Customer Ref:	600108-Five Fords
National Grid Reference:	336440, 347900
Slice:	A
Site Area (Ha):	1.91
Search Buffer (m):	1000

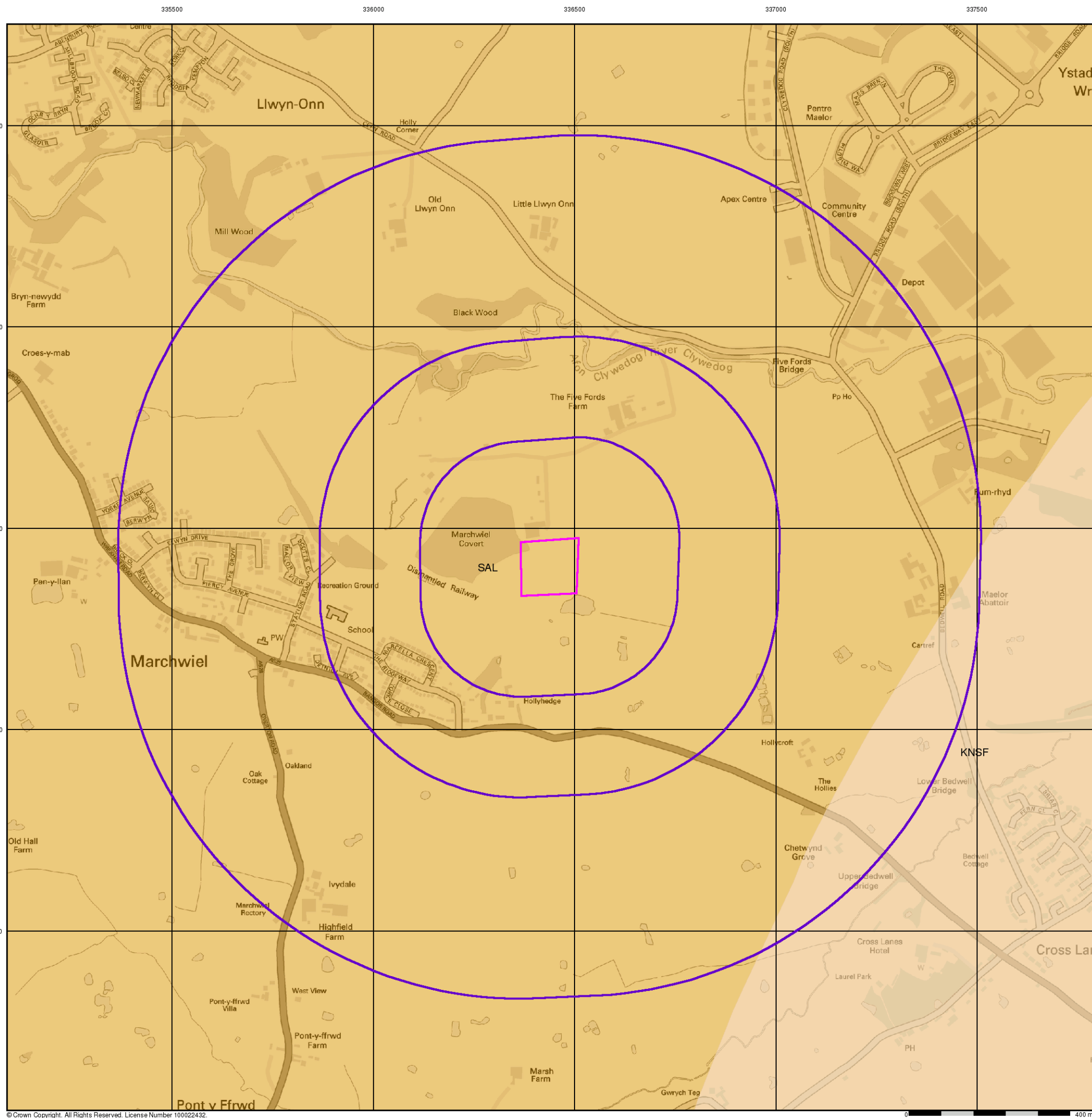
Site Details

Site at, Marchwiel, Wrexham



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

B1.3 Bedrock and Faults



Bedrock and Faults

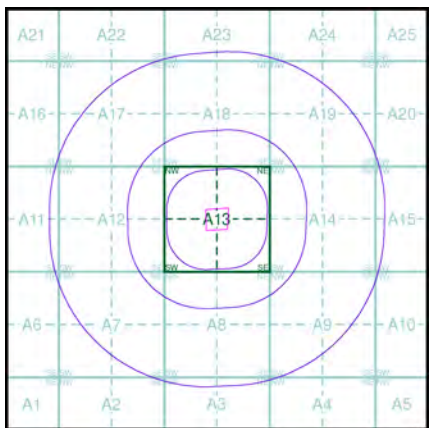
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults and thin beds mapped as lines such as coal seams and mineral veins. These are not restricted by age and could relate to features of any of the 1:10,000 geology datasets.

Bedrock and Faults Map - Slice A



Order Details

Order Number: 34641744_1_1
Customer Ref: 600108-Five Fords
National Grid Reference: 336440, 347900
Slice: A
Site Area (Ha): 1.91
Search Buffer (m): 1000

Site Details

Site at, Marchwiel, Wrexham

Geology 1:10,000 Maps Legends

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Bedrock and Faults

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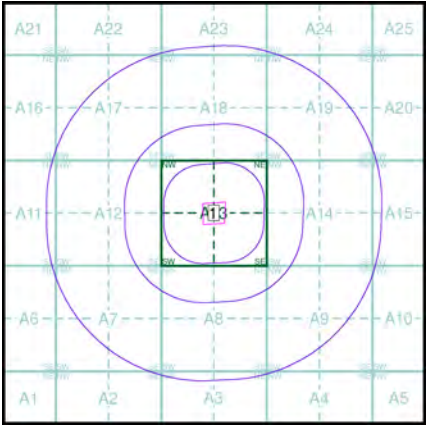
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Geology 1:10,000 Maps - Slice A



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Site Area (Ha):	1.91
Search Buffer (m):	1000

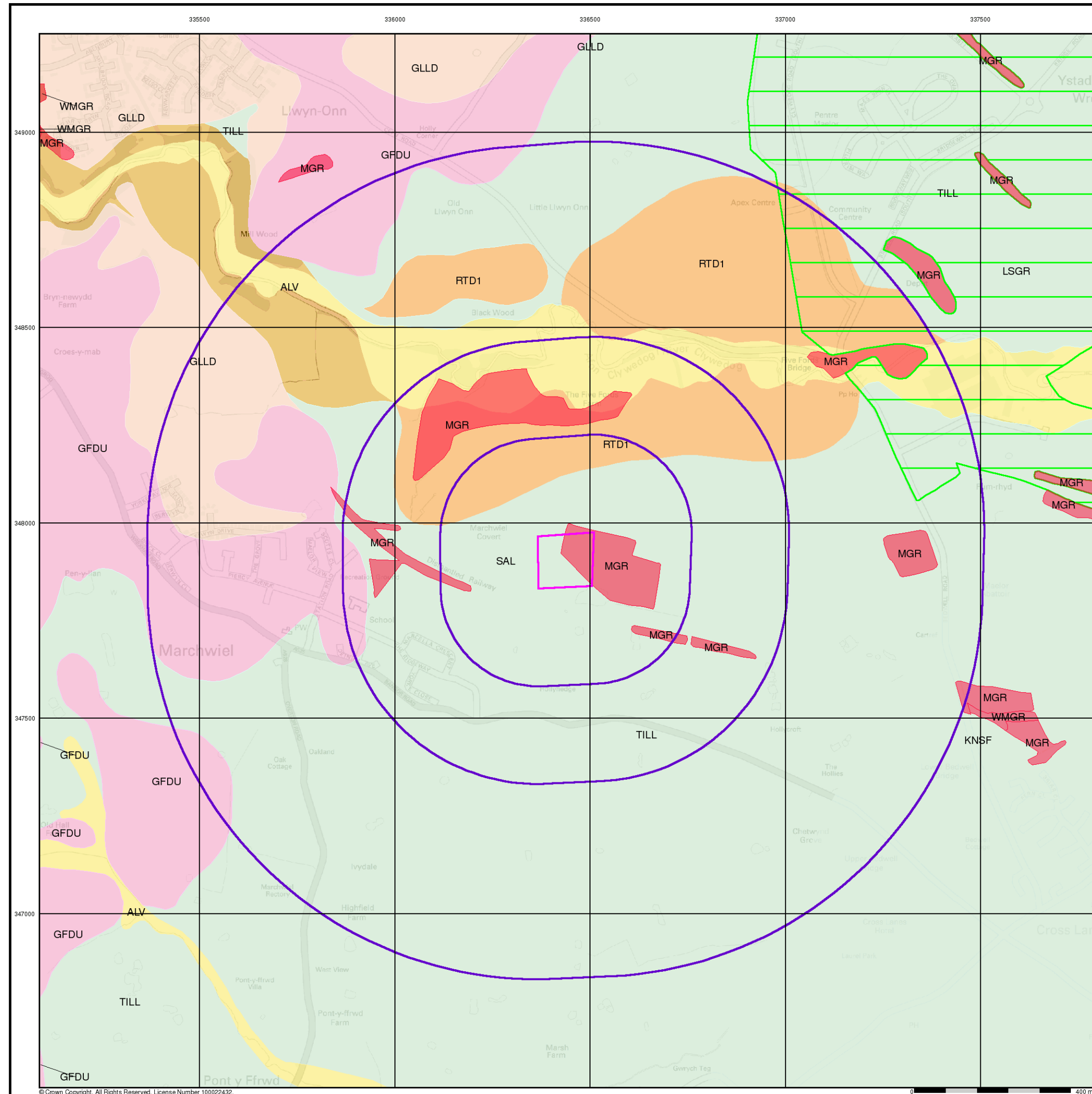
Site Details

Site at, Marchwiel, Wrexham



Tel: 0844 844 9952
Fax: 0844 844 9951
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B1.4 Combined Surface Geology



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

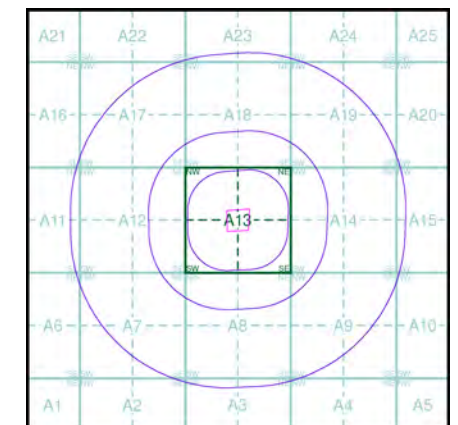
Additional Information

More information on 1:10,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details

Order Number: 34641744_1_1
Customer Ref: 600108-Five Fords
National Grid Reference: 336440, 347900
Slice: A
Site Area (Ha): 1.91
Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Geology 1:10,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Present Day - Present Day
	LSGR	Landscaped Ground (Undivided)	Unknown/Unclassified Entry	Present Day - Present Day
	WMGR	Infilled Ground	Artificial Deposit	Present Day - Present Day

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay	Flandrian - Flandrian
	GLLD	Glaciolacustrine Deposits	Clay	Pleistocene - Pleistocene
	TILL	Till	Diamicton	Quaternary - Quaternary
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Quaternary - Quaternary
	GFDU	Glaciofluvial Deposits	Sand and Gravel	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	KNSF	Kinnerton Sandstone Formation	Sandstone	Scythian - Scythian
	SAL	Salop Formation	Sedimentary Rock Cycles, Coal Measure Type	Early Permian - Westphalian D



Geology 1:10,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:10,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around a site. This mapping may be more up to date than previously published paper maps.

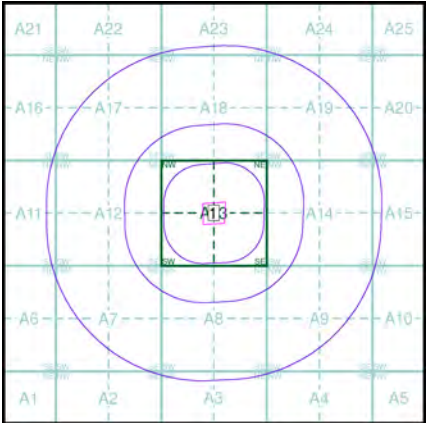
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page.

Please Note: Not all of the layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:10,000 Maps Coverage

Map ID:	1
Map Name:	SJ34NE
Map Date:	1995
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Available
Landslip:	Not Available
Rock Segments:	Not Available

Geology 1:10,000 Maps - Slice A



Order Details

Order Number:	34641744_1_1
Customer Ref:	600108-Five Fords
National Grid Reference:	336440, 347900
Slice:	A
Site Area (Ha):	1.91
Search Buffer (m):	1000

Site Details

Site at, Marchwiell, Wrexham

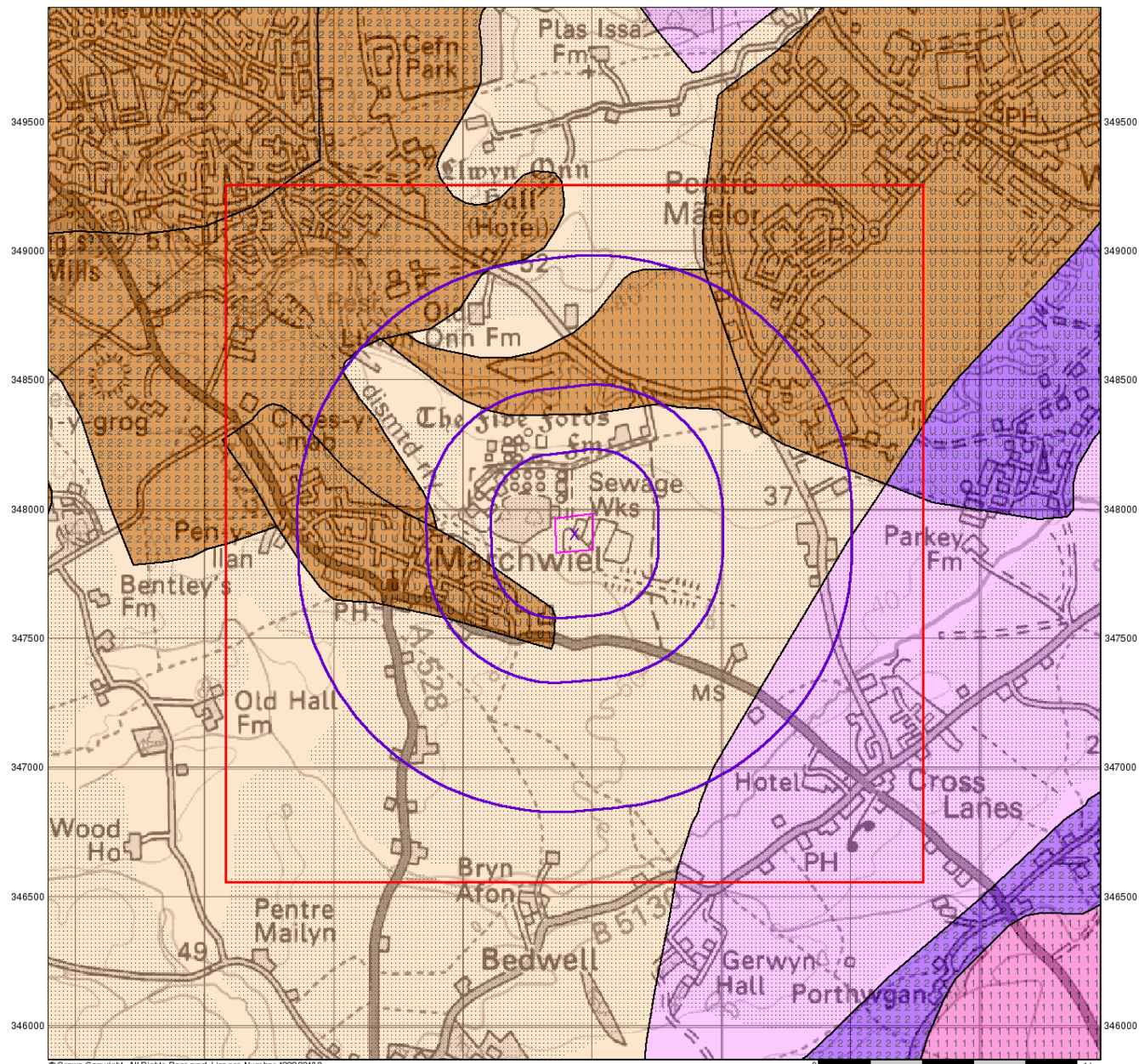


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B2 Hydrogeology

B2.1 Groundwater Vulnerability Map

334500 335000 335500 336000 336500 337000 337500 338000



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0 1 km



Groundwater Vulnerability

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

Major Aquifer (Highly Permeable)

Minor Aquifer (Variably Permeable)

Non Aquifer (Negligibly Permeable)

Water or Sea

Drift Deposit

Soil Classes

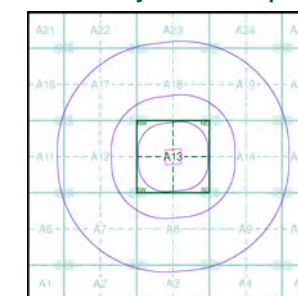
High (H) 1, 2, 3, U
Intermediate (I) 1, 2
Low

High (H) 1, 2, 3, U
Intermediate (I) 1, 2
Low

High (H) 1, 2, 3, U
Intermediate (I) 1, 2
Low

High (H) 1, 2, 3, U
Intermediate (I) 1, 2
Low

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 1000

Site Details

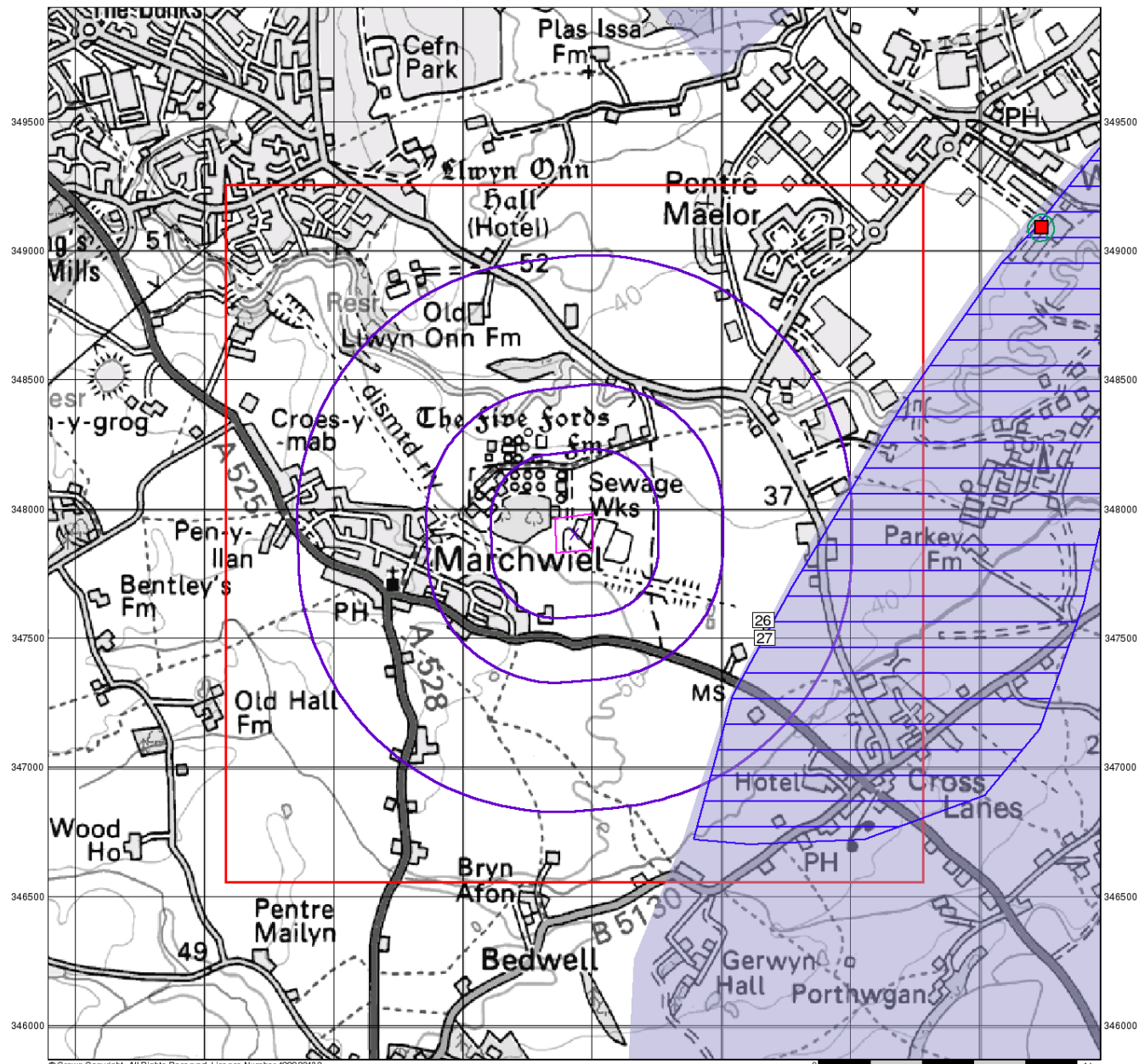
Site at, Marchwiel, Wrexham



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B2.2 Source protection zones

334500 335000 335500 336000 336500 337000 337500 338000



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Source Protection Zones

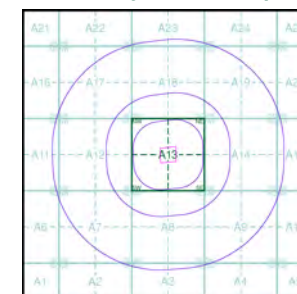
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Source Protection Zone I
- Source Protection Zone II
- Source Protection Zone III
- Zone of Special Interest
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiel, Wrexham



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B3 Surface Waters

B3.1 Surface waters features

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Prosecution Relating to Authorised Processes
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

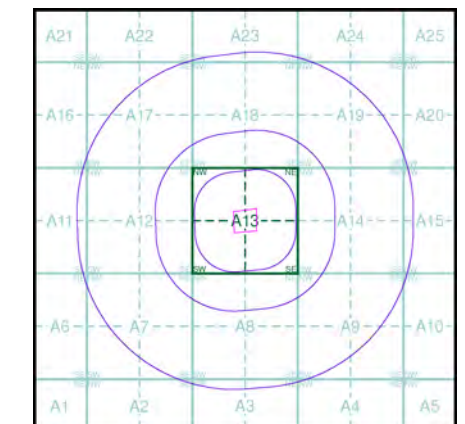
Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

Site Sensitivity Map - Slice A

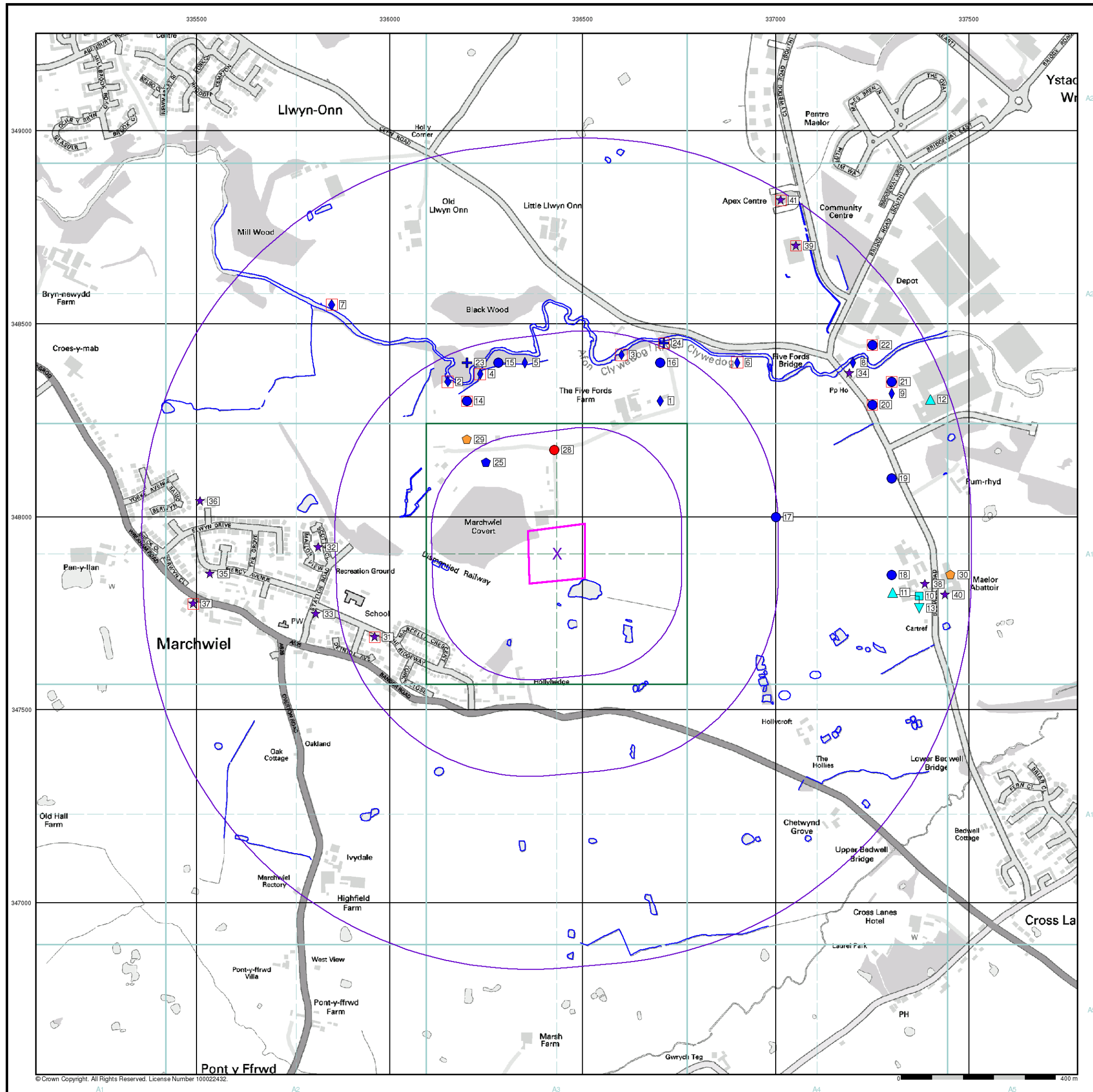


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



B3.2 Flood Map

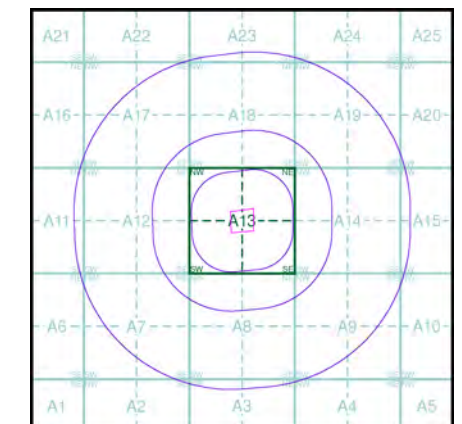
General

-  Specified Site
-  Specified Buffer(s)
-  Bearing Reference Point

Agency and Hydrological (Flood)

-  Extreme Flooding from Rivers or Sea without Defences (Zone 2)
-  Flooding from Rivers or Sea without Defences (Zone 3)
-  Area Benefiting from Flood Defence
-  Flood Water Storage Areas
-  Flood Defence

Flood Map - Slice A

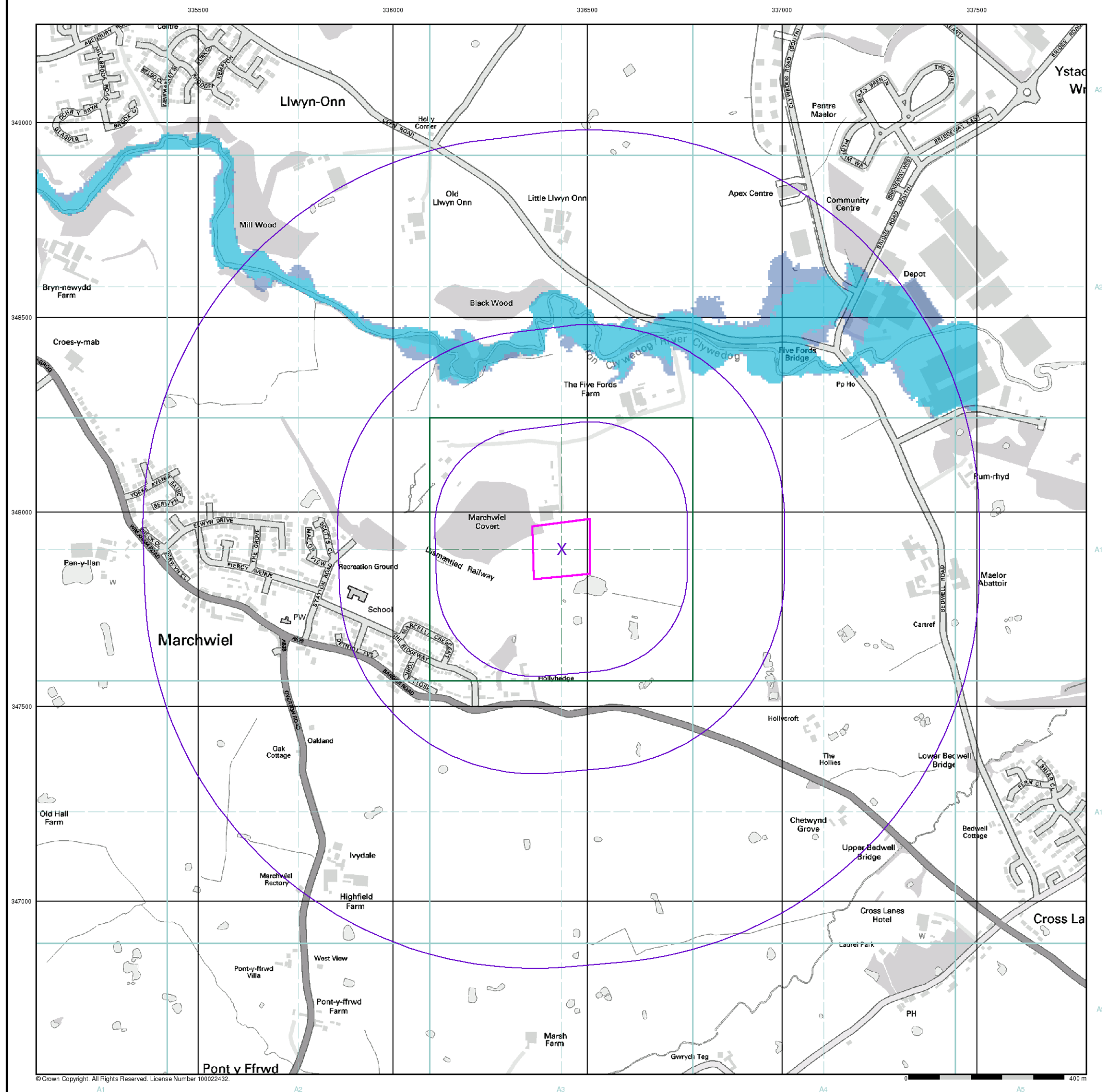


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



B4 Envirocheck Sensitive Land uses Map

Appendix C

Pollution History

C1 Pollution Incidents that may have Affected Land

C1.1 Pollution Incidents within the Installation Boundary

There were no pollution incidents to water and air reported within the installation boundary from Envirocheck Report 34305752_1_1, 25-Mar-2011.

C1.2 Pollution Incidents outside the Installation Boundary

The following information details the pollution incidents to water and air within 250m of the installation boundary from Envirocheck Report 34305752_1_1, 25-Mar-2011.

Table 2: Pollution incidents within 250m

Envirocheck Map Ref	Description	NGR	Distance from Site	Details
25	Substantiated Pollution Incident Register	336250 348141	209m to the NW	Pollutant - sewage materials, final effluent on 7th September 2010. Water impact category 2 - significant incident

The following information details the pollution incidents to water and air within 500m of the installation boundary from Envirocheck Report 34305752_1_1, 25-Mar-2011.

Table 3: Pollution incidents within 500m

Envirocheck Map Ref	Description	NGR	Distance from Site	Details
14	Pollution incidents to controlled waters	336200 348295	368m to the NW	Blocked sewer, pollutant unknown on 1st April 1996 .Category 3 – minor incident
14	Pollution incidents to controlled waters	336200 348300	373m to the NW	Blocked sewer, pollutant unknown on 1st April 1996 .Category 3 – minor incident
15	Pollution incidents to controlled waters	336300 348400	442 to the N	Chemicals – other organic. 31st July 1996. Category 3 – minor incident
16	Pollution incidents to controlled waters	336700 348400	462 to the NE	Mud/Clay/Soil. 19 th March 1998. Category 3 – minor incident
17	Pollution	337000	494 to the E	Miscellaneous – fire

Envirocheck Map Ref	Description	NGR	Distance from Site	Details
	incidents to controlled waters	348000		water/foam. 20 th September 1996. Category 3 – minor incident

C2 Historical Land Uses and Associated Contaminants

C2.1 Historical Land Use Maps

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

	Gravel Pit		Sand Pit		Other Pits
	Quarry		Shingle		Orchard
	Osiers		Reeds		Marsh
	Mixed Wood		Deciduous		Brushwood
	Fir		Furze		Rough Pasture
	Arrow denotes flow of water		Trigonometrical Station		
	Site of Antiquities		Bench Mark		
	Pump, Guide Post, Signal Post		Well, Spring, Boundary Post		
	•285 Surface Level				
	Sketched Contour		Instrumental Contour		
	Main Roads		Minor Roads		
	Sunken Road		Raised Road		
	Road over Railway		Railway over River		
	Railway over Road		Level Crossing		
	Road over River or Canal		Road over Stream		
	Road over Stream				
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Burgh Boundary (Scotland)				
	Rural District Boundary				
	Civil Parish Boundary				

Ordnance Survey Plan 1:10,000

	Chalk Pit, Clay Pit or Quarry		Gravel Pit
	Sand Pit		Disused Pit or Quarry
	Refuse or Slag Heap		Lake, Loch or Pond
	Dunes		Boulders
	Coniferous Trees		Non-Coniferous Trees
	Orchard		Scrub
	Bracken		Heath
	Marsh		Reeds
	Building		Glasshouse
	Sloping Masonry		Pylon
	Cutting		Embankment
	Road Under		Road Over
	Level Crossing		Foot Bridge
	Standard Gauge Multiple Track		Standard Gauge Single Track
	Siding, Tramway or Mineral Line		Narrow Gauge
	Geographical County		Administrative County, County Borough or County of City
	Municipal Borough, Urban or Rural District, Burgh or District Council		Borough, Burgh or County Constituency
	Civil Parish		
	BP, BS Boundary Post or Stone		Police Station
	Church		Post Office
	Club House		Public Convenience
	Fire Engine Station		Public House
	Foot Bridge		Signal Box
	Fountain		Spring
	Guide Post		Telephone Call Box
	Mile Post		Telephone Call Post
	Mile Stone		Well

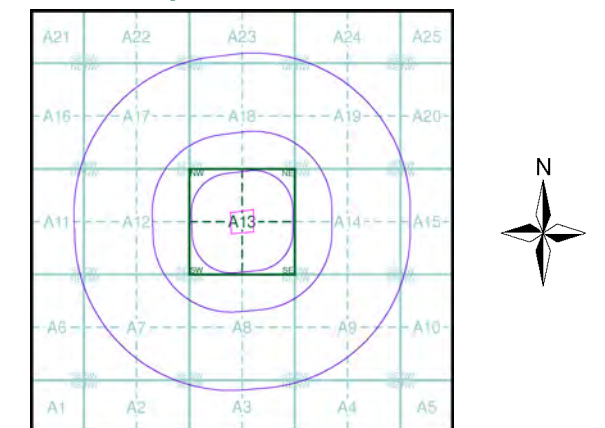
1:10,000 Raster Mapping

	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil, parish or community boundary
	District, Unitary, Metropolitan, London Borough boundary		Constituency boundary
	Area of wooded vegetation		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Positioned tree
	Orchard		Coppice or Osiers
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Reeds
	Water feature		Flow arrows
	Mean high water (springs)		Mean low water (springs)
	Telephone line (where shown)		Electricity transmission line (with poles)
	Bench mark (where shown)		Triangulation station
	Point feature (e.g. Guide Post or Mile Stone)		Pylon, flare stack or lighting tower
	Site of (antiquity)		Glasshouse
	General Building		Important Building

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Denbighshire	1:10,560	1879	2
Flintshire	1:10,560	1879	3
Cheshire	1:10,560	1881	4
Denbighshire	1:10,560	1899 - 1900	5
Flintshire	1:10,560	1900	6
Denbighshire	1:10,560	1914 - 1915	7
Denbighshire	1:10,560	1938 - 1954	8
Denbighshire	1:10,560	1938 - 1954	9
Denbighshire	1:10,560	1954	10
Ordnance Survey Plan	1:10,000	1964	11
Ordnance Survey Plan	1:10,000	1979	12
Ordnance Survey Plan	1:10,000	1992	13
10K Raster Mapping	1:10,000	2000	14
10K Raster Mapping	1:10,000	2006	15
10K Raster Mapping	1:10,000	2010	16

Historical Map - Slice A

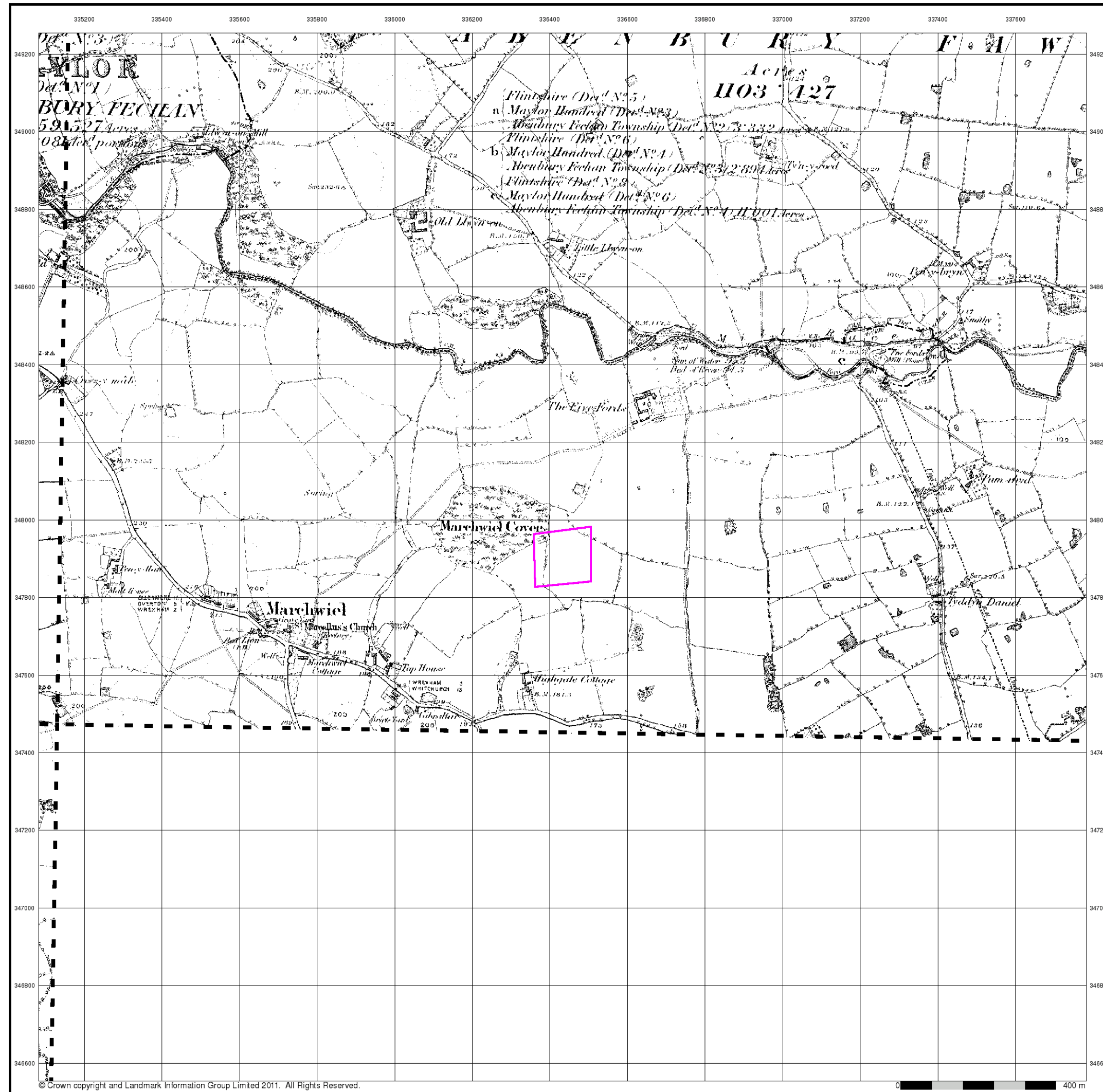


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



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0 400 m



Denbighshire

Published 1879

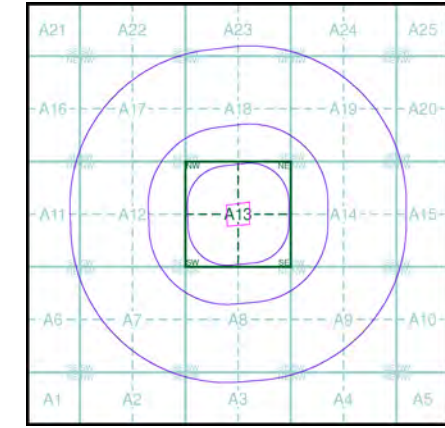
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

02800 1879 1:10,560	02900 1879 1:10,560
03500 1879 1:10,560	

Historical Map - Slice A



Order Details

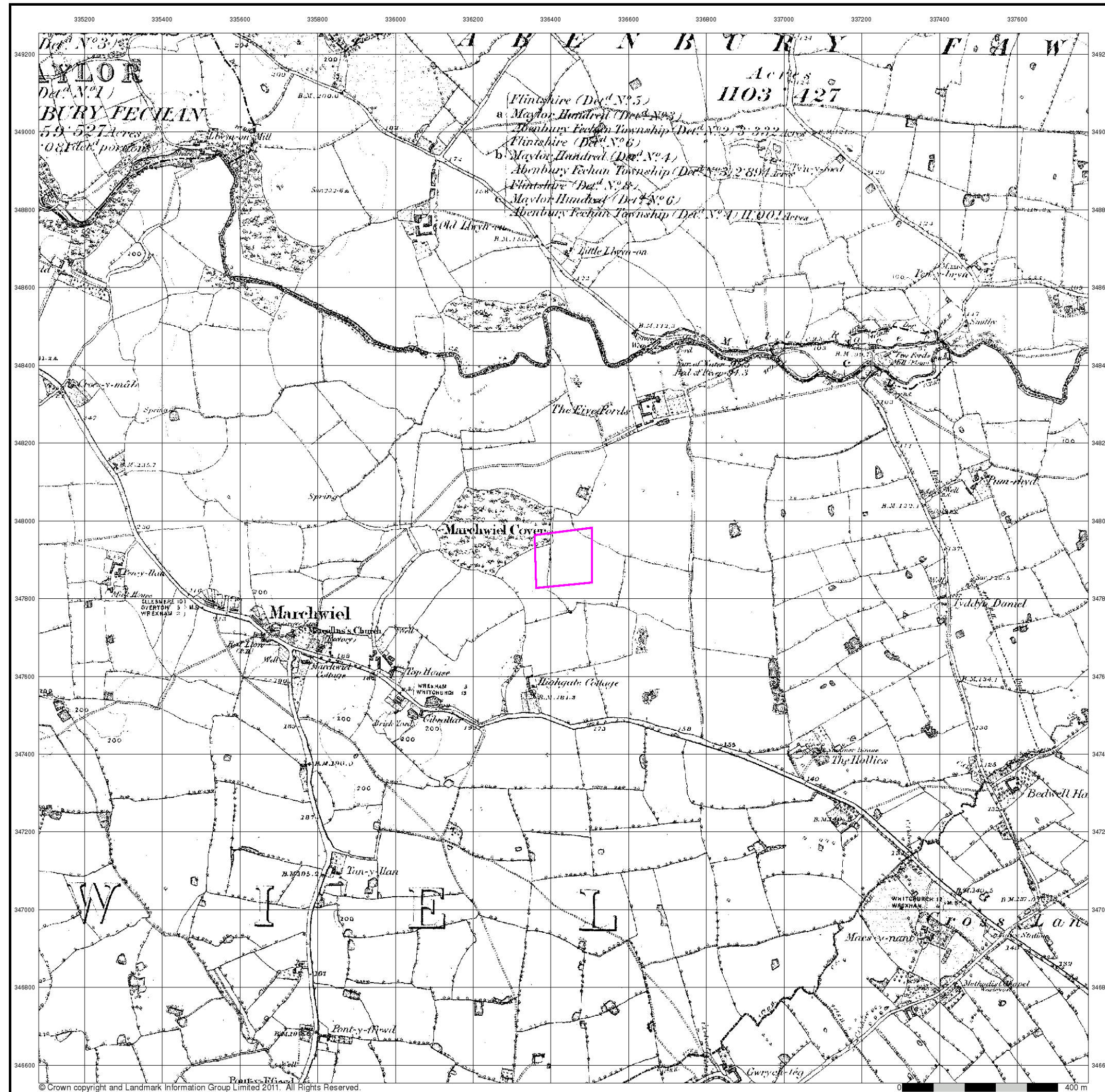
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Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



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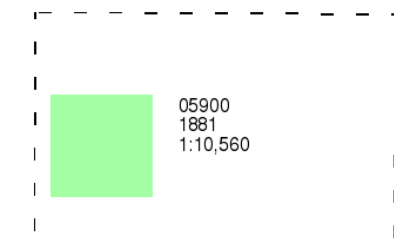
Cheshire

Published 1881

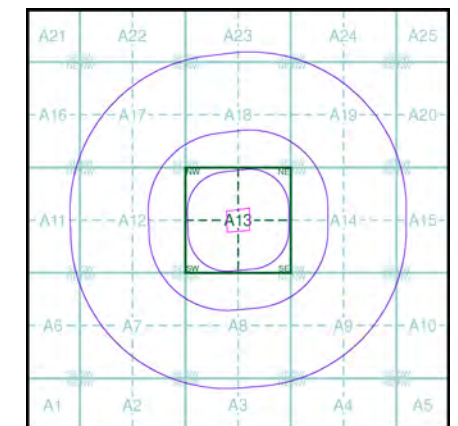
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 1000

Site Details

Site at, Marchwiel, Wrexham



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Denbighshire

Published 1899 - 1900

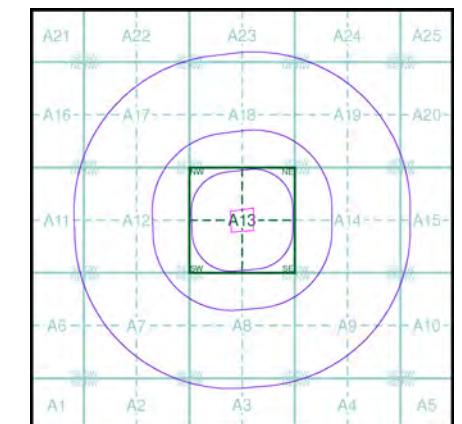
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

028SE 1900 1:10,560	029SW 1899 1:10,560
035NE 1900 1:10,560	

Historical Map - Slice A

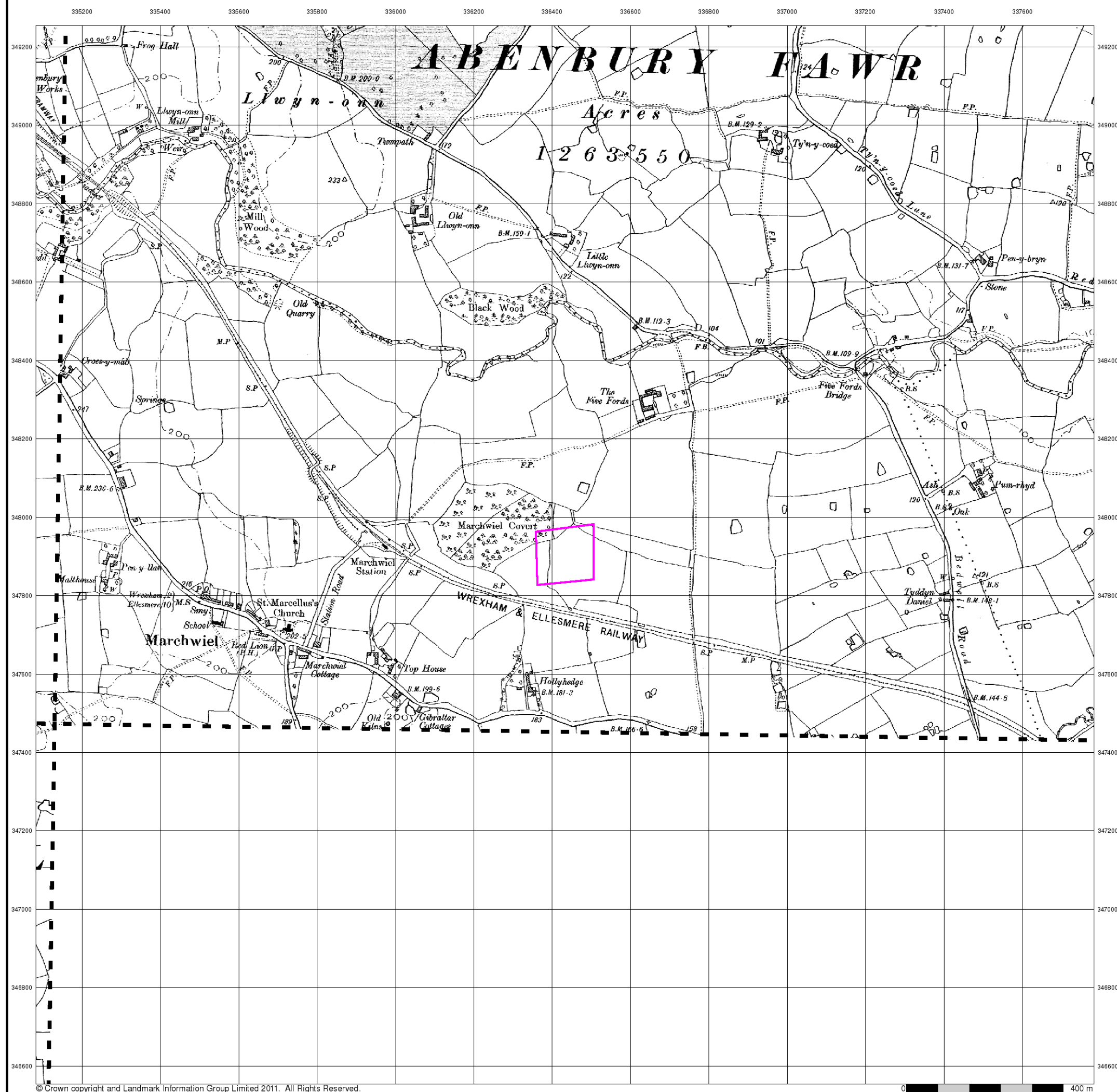


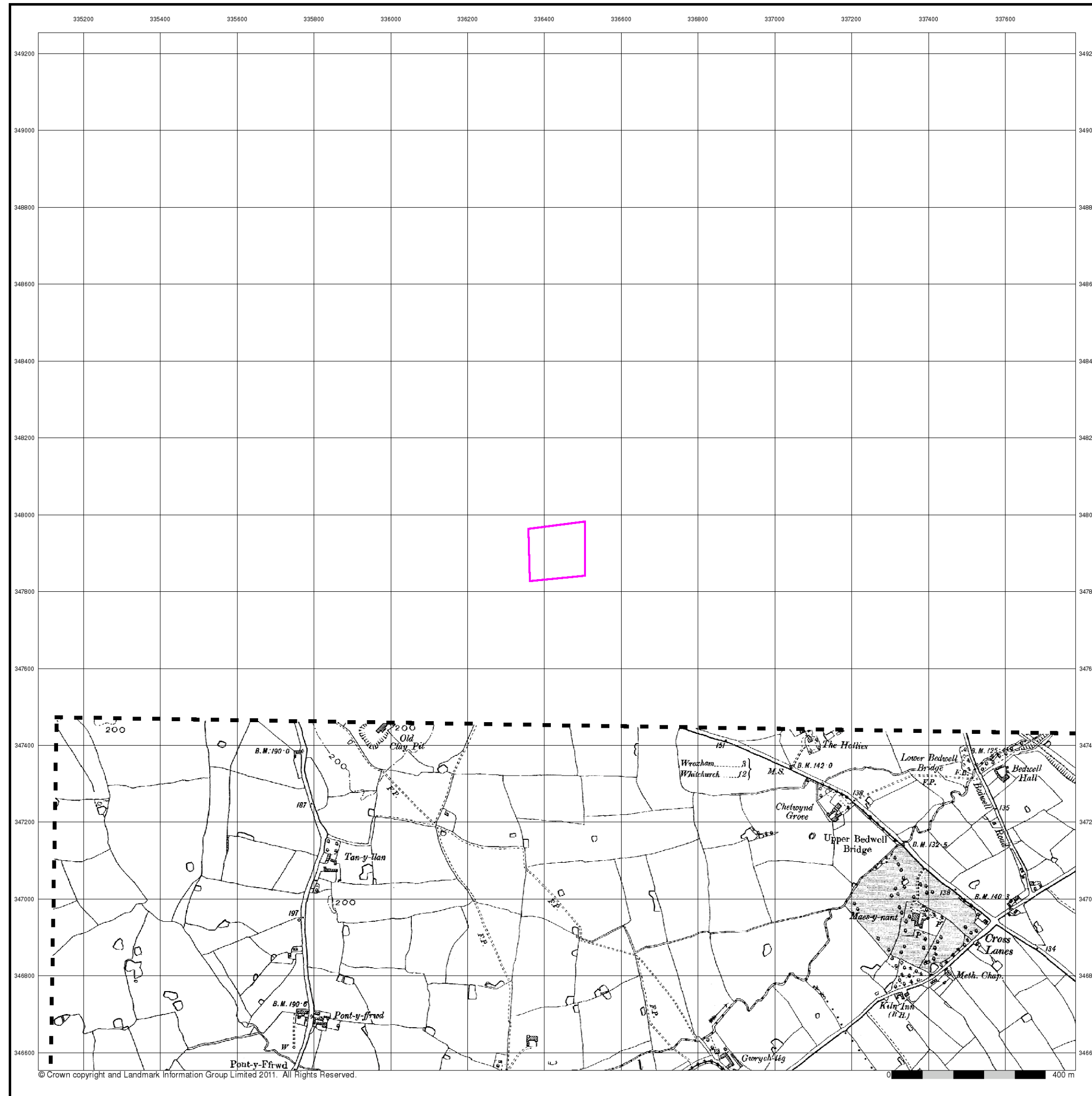
Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham





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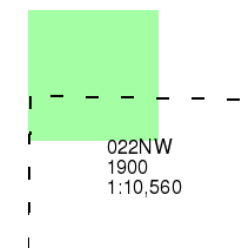
Flintshire

Published 1900

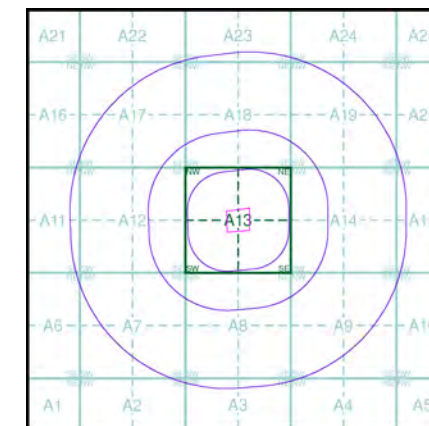
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



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Web: www.envirocheck.co.uk

Denbighshire

Published 1914 - 1915

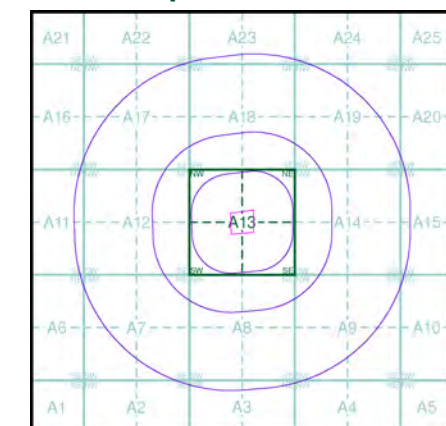
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

028SE 1915 1:10,560	029SW 1914 1:10,560
035NE 1914 1:10,560	036NW 1914 1:10,560

Historical Map - Slice A

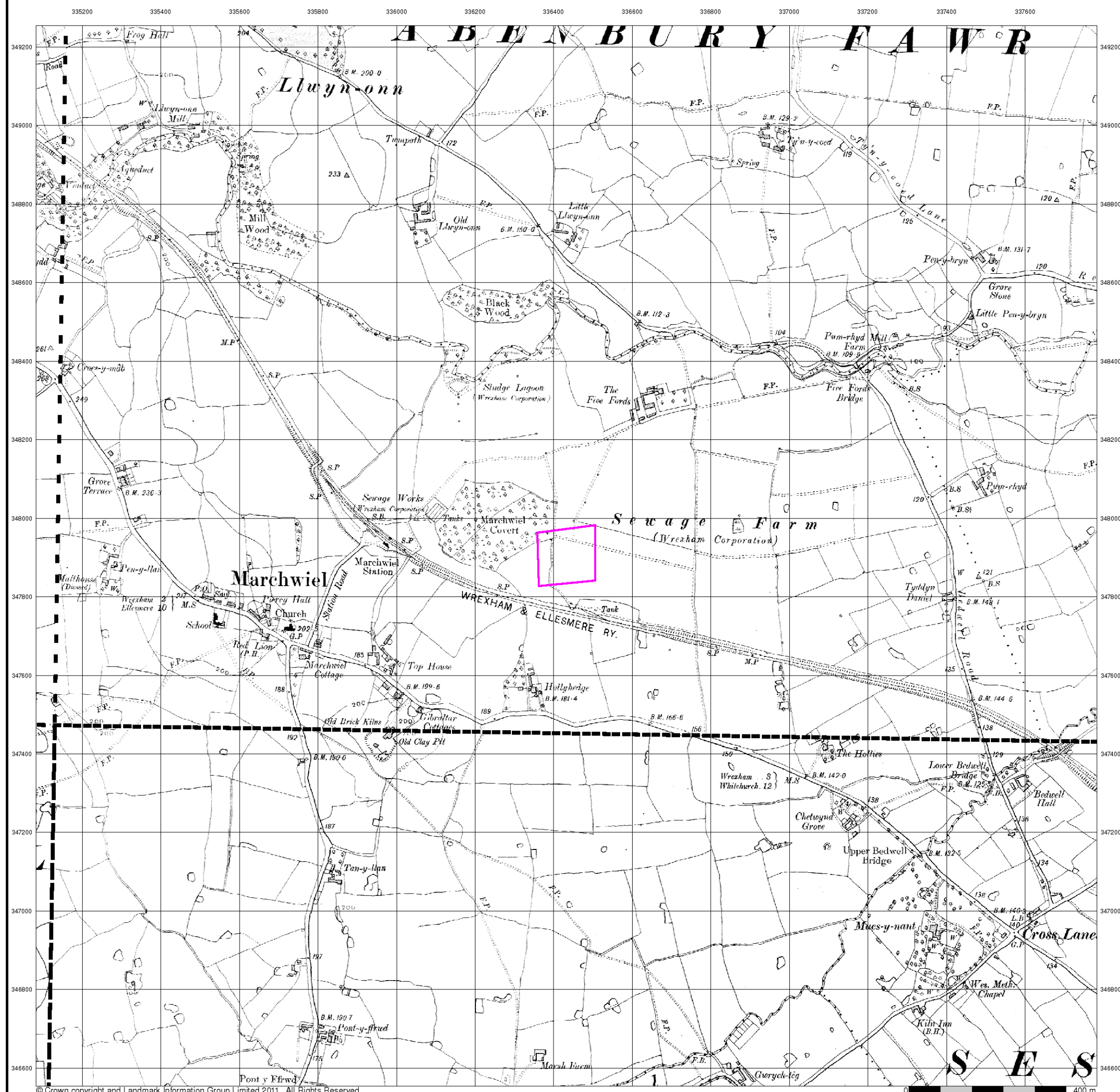


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



Denbighshire

Published 1938 - 1954

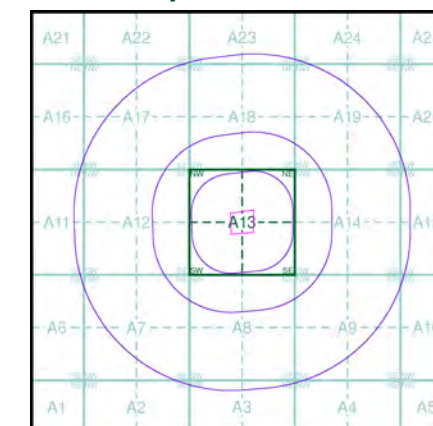
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

028SE 1938 1:10,560	029SW 1938 1:10,560
035NE 1938 1:10,560	036NW 1954 1:10,560

Historical Map - Slice A

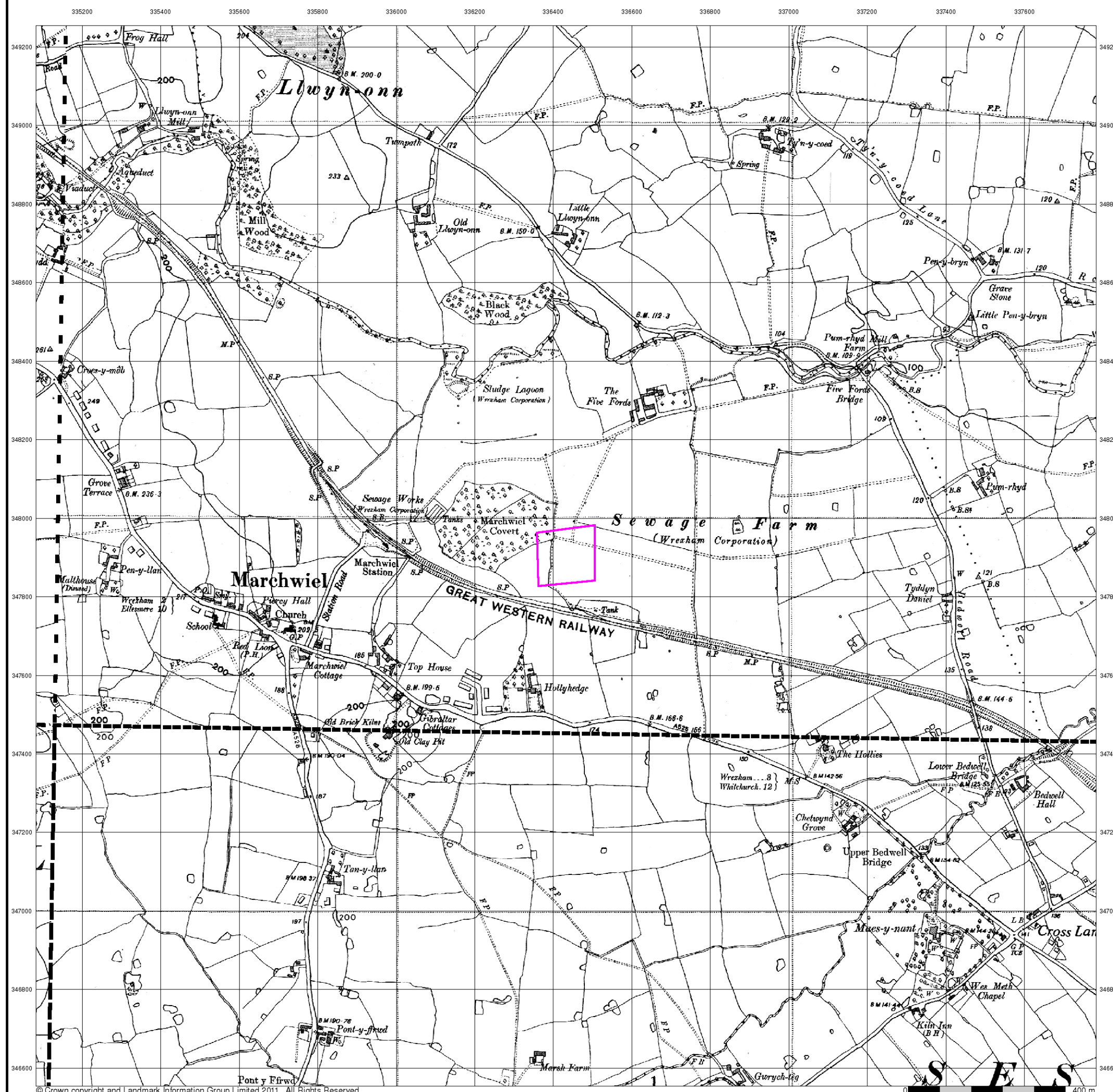


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



Denbighshire

Published 1938 - 1954

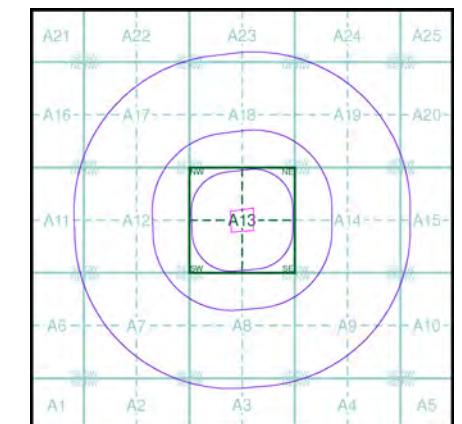
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

028SE 1938 1:10,560	029SW 1954 1:10,560
035NE 1954 1:10,560	

Historical Map - Slice A

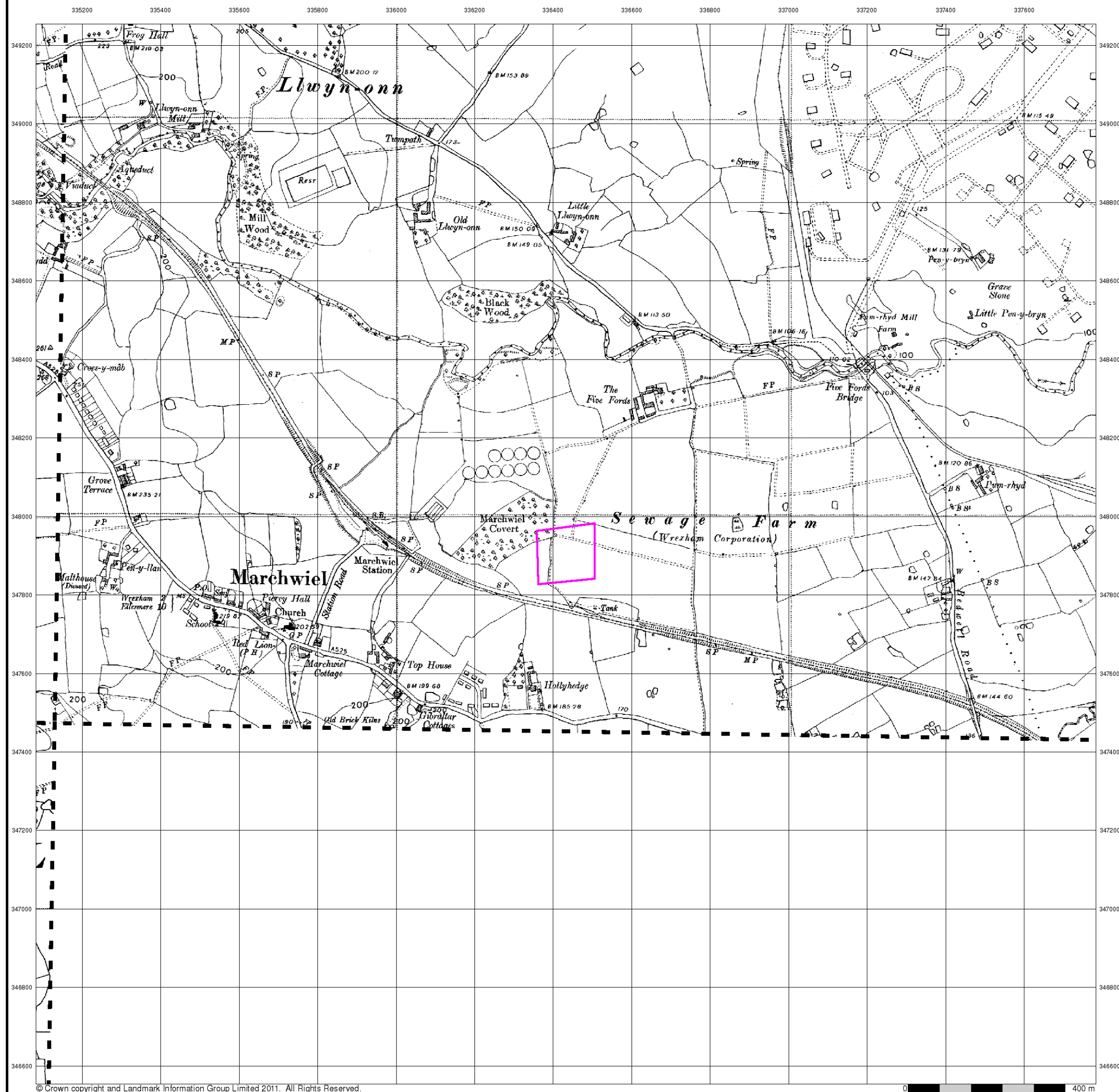


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham





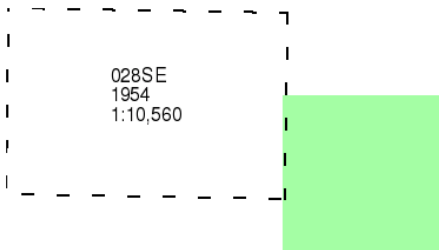
Denbighshire

Published 1954

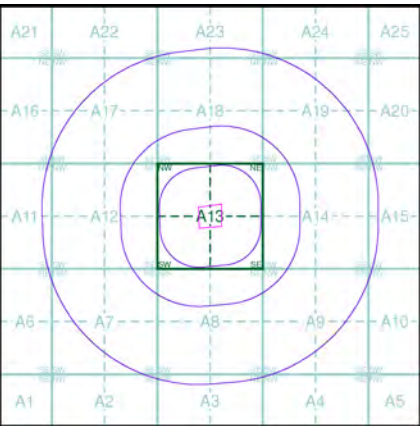
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

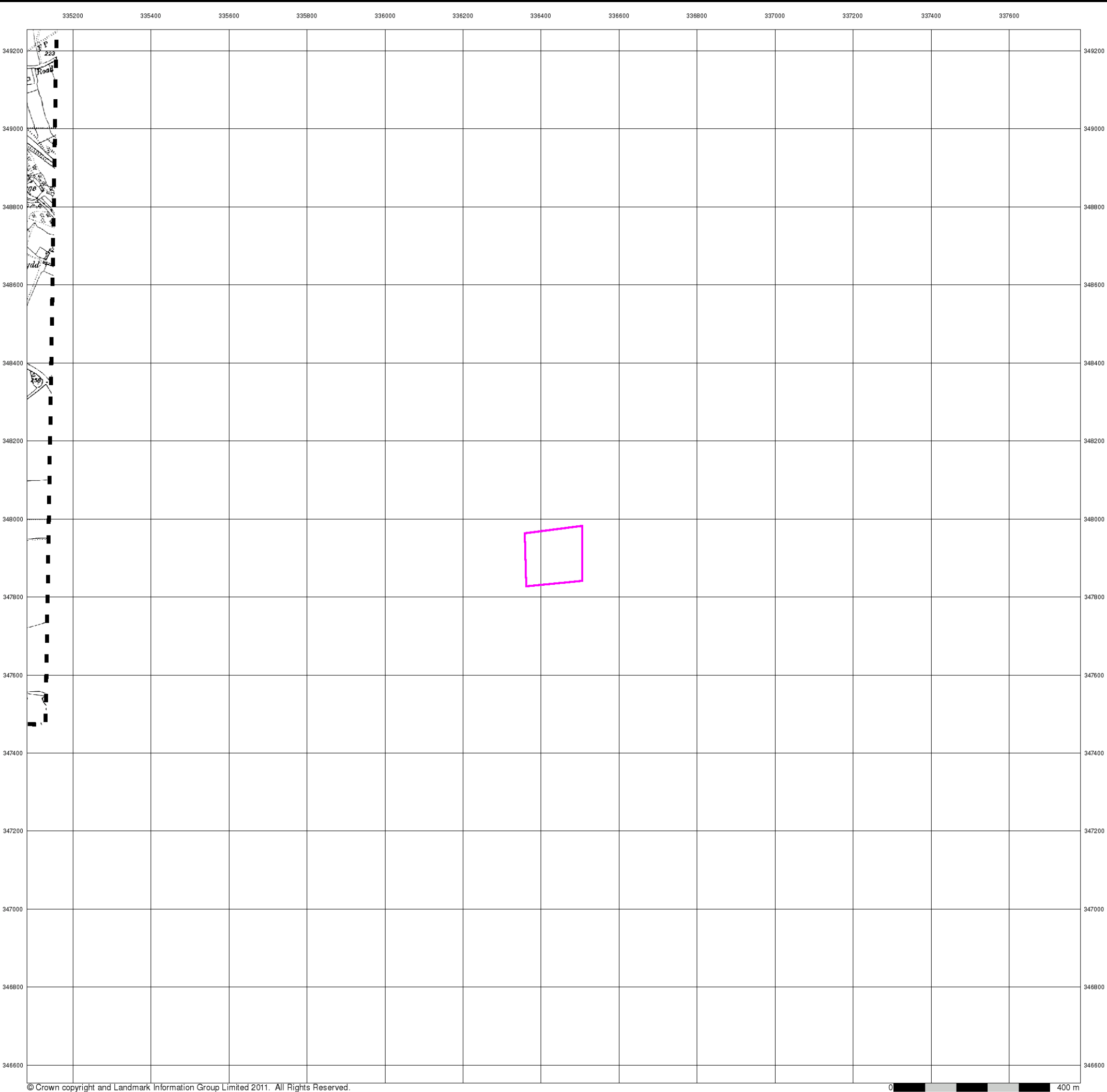
Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



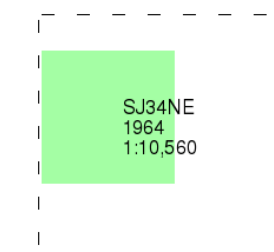
Ordnance Survey Plan

Published 1964

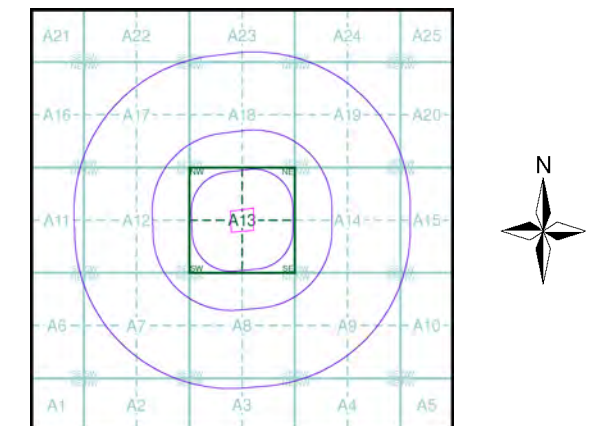
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

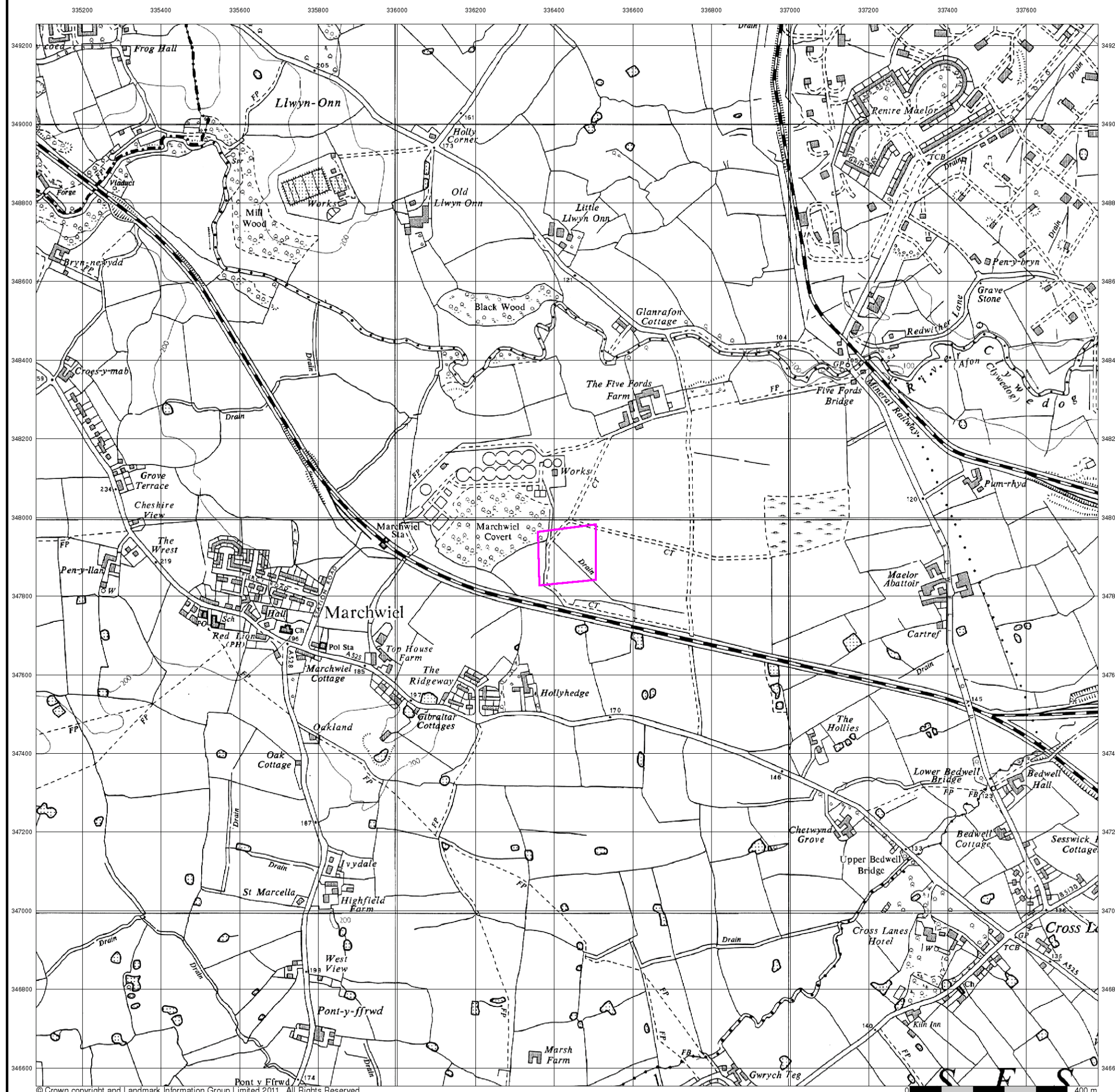


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



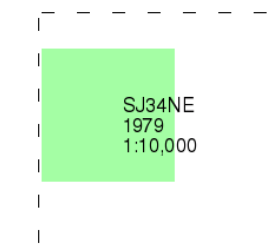
Ordnance Survey Plan

Published 1979

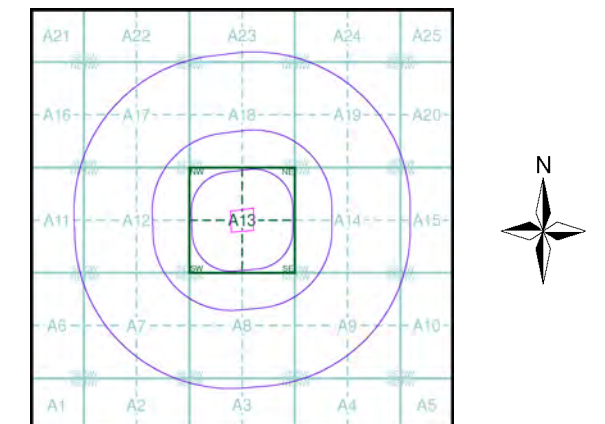
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

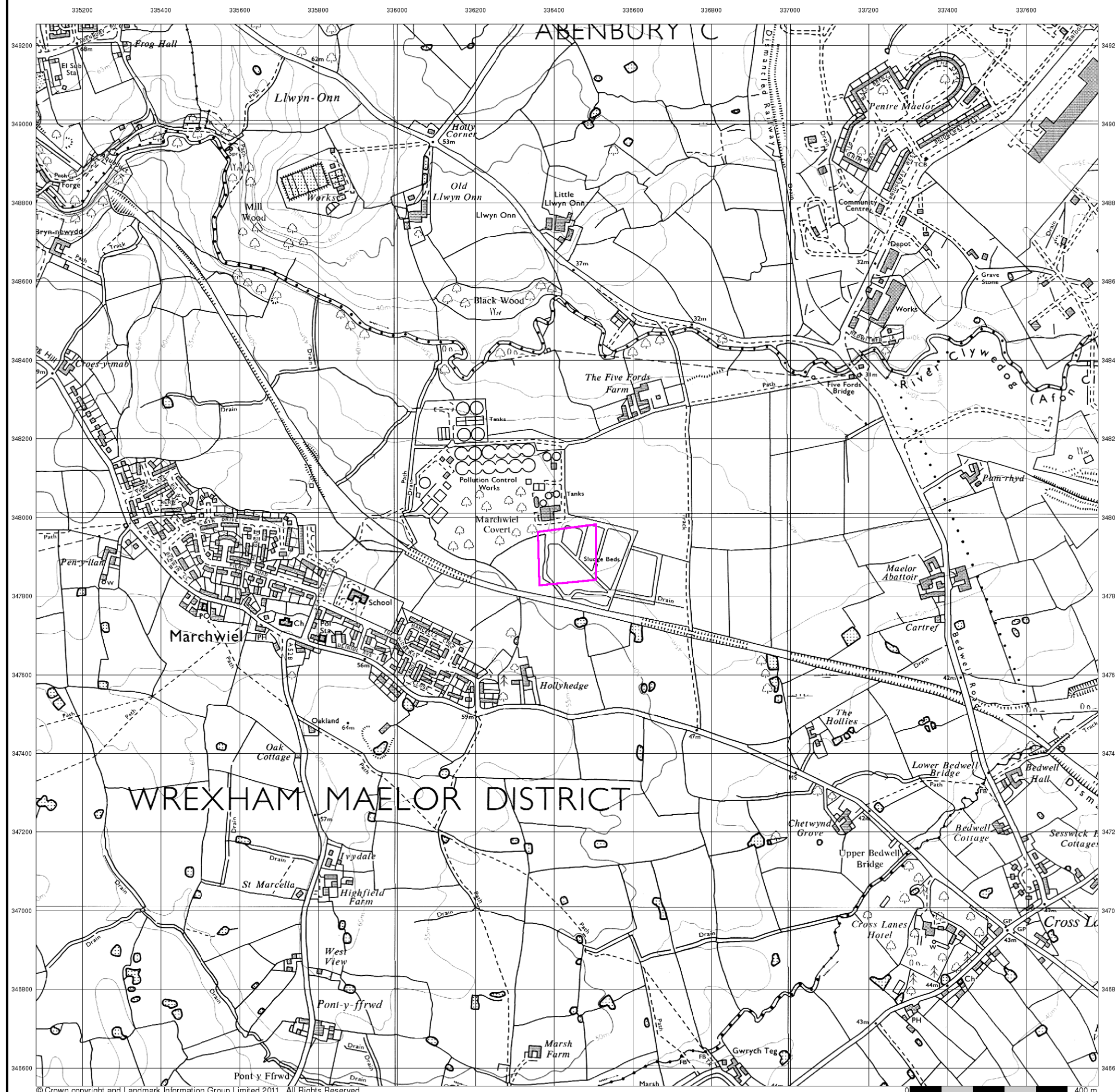


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



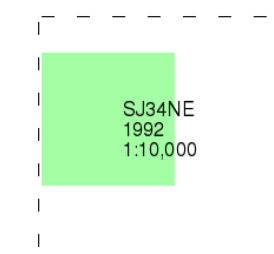
Ordnance Survey Plan

Published 1992

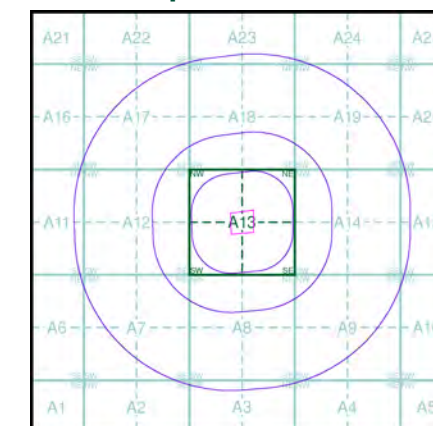
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

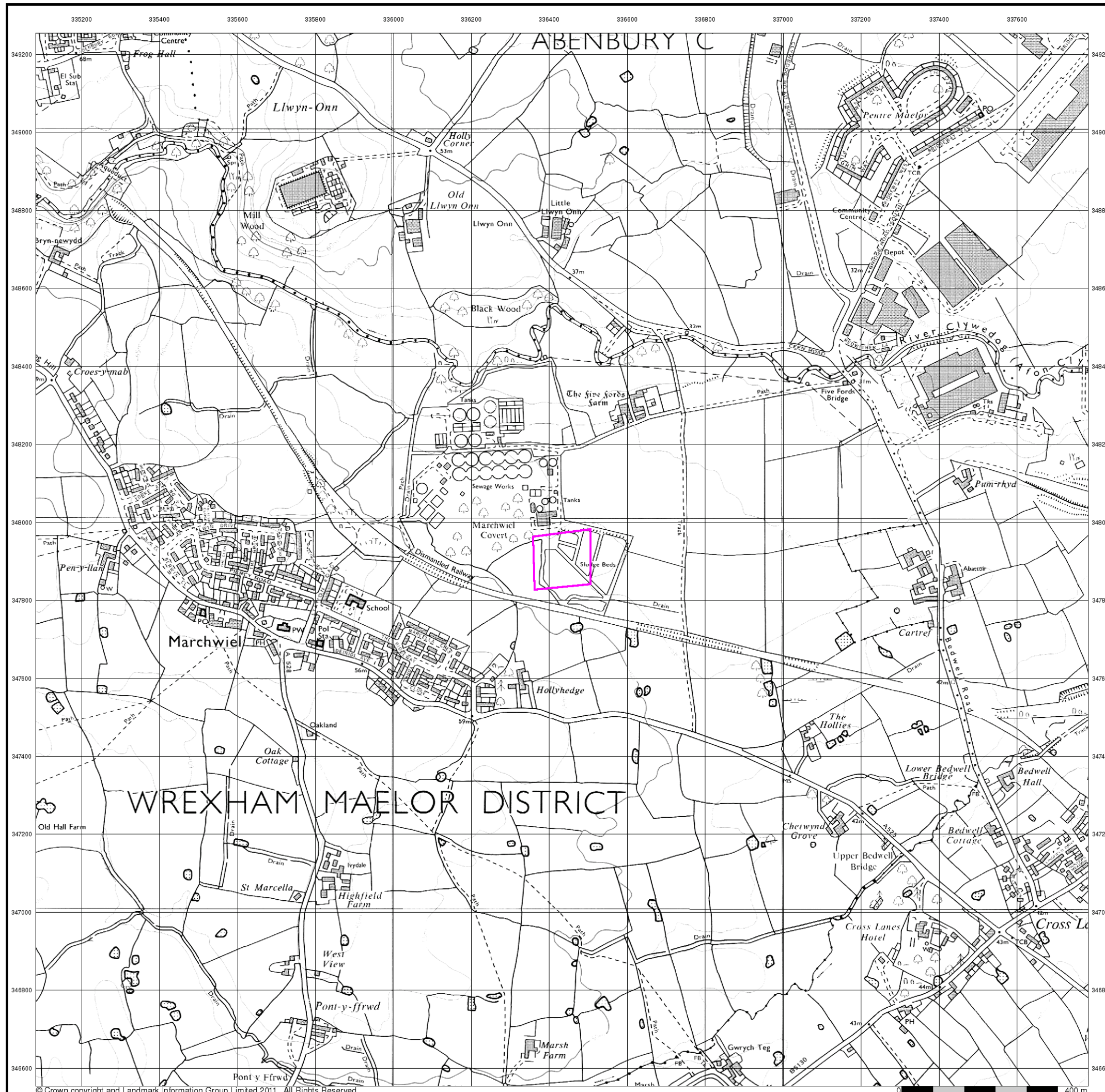


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



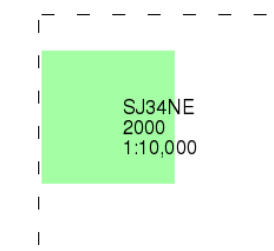
10k Raster Mapping

Published 2000

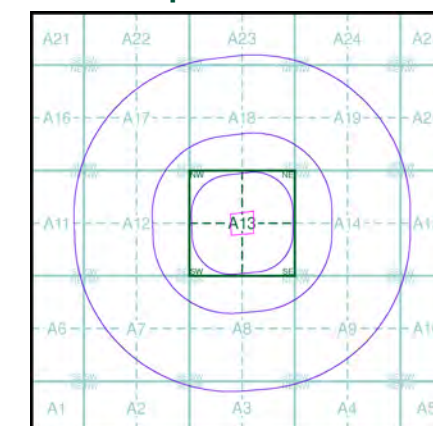
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A

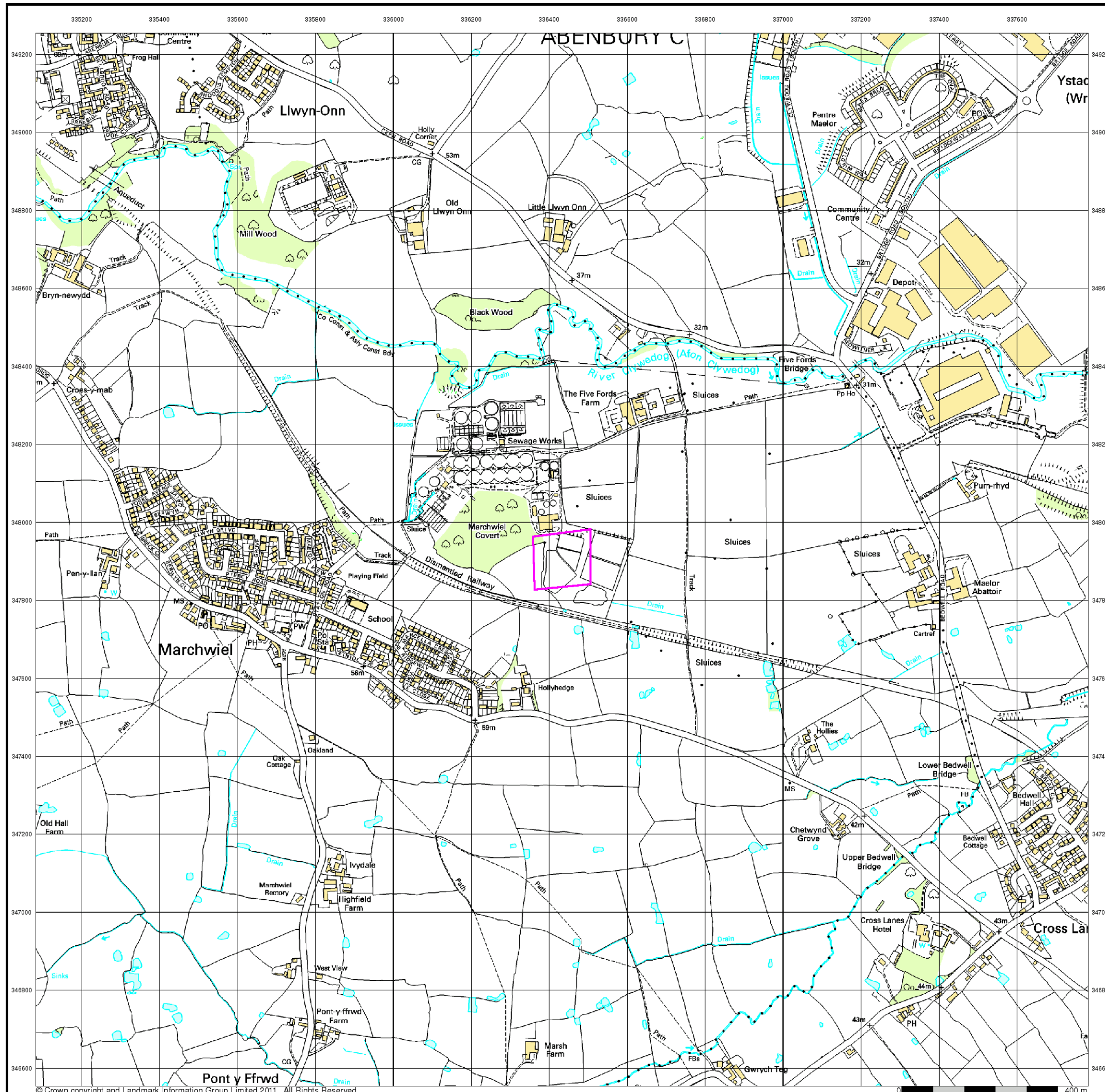


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



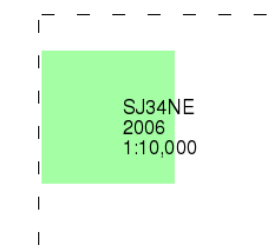
10k Raster Mapping

Published 2006

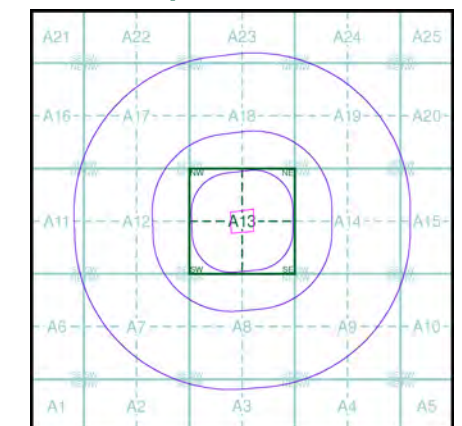
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A

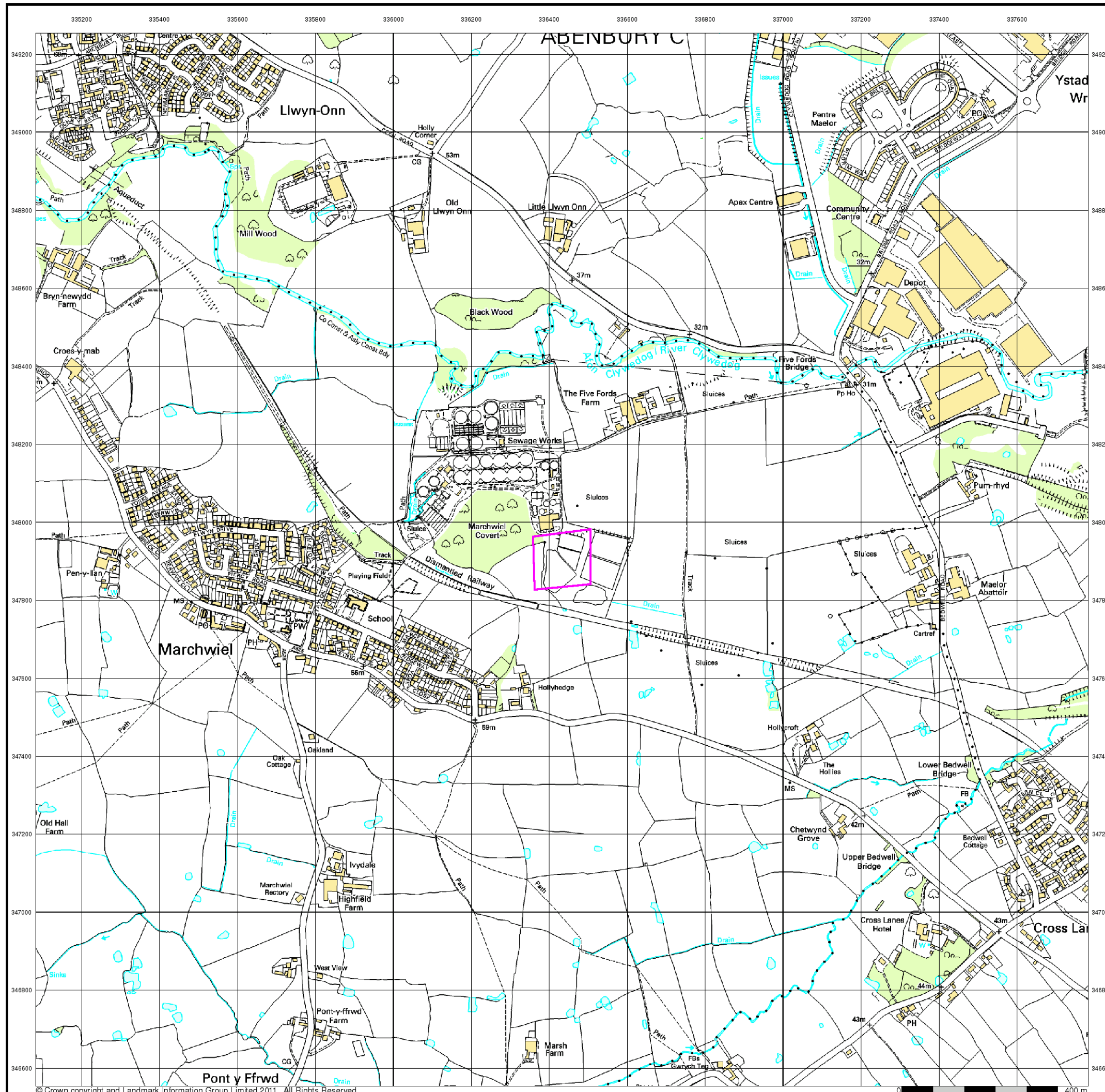


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

Site Details

Site at, Marchwiell, Wrexham



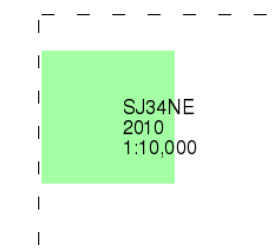
10k Raster Mapping

Published 2010

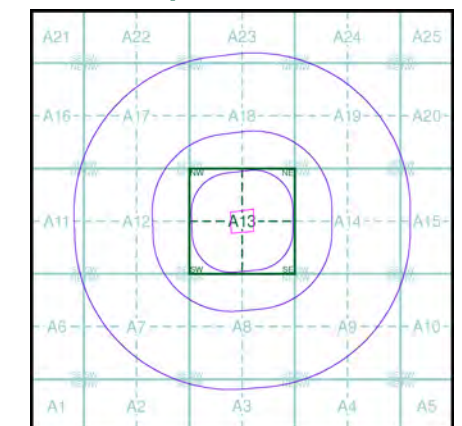
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A

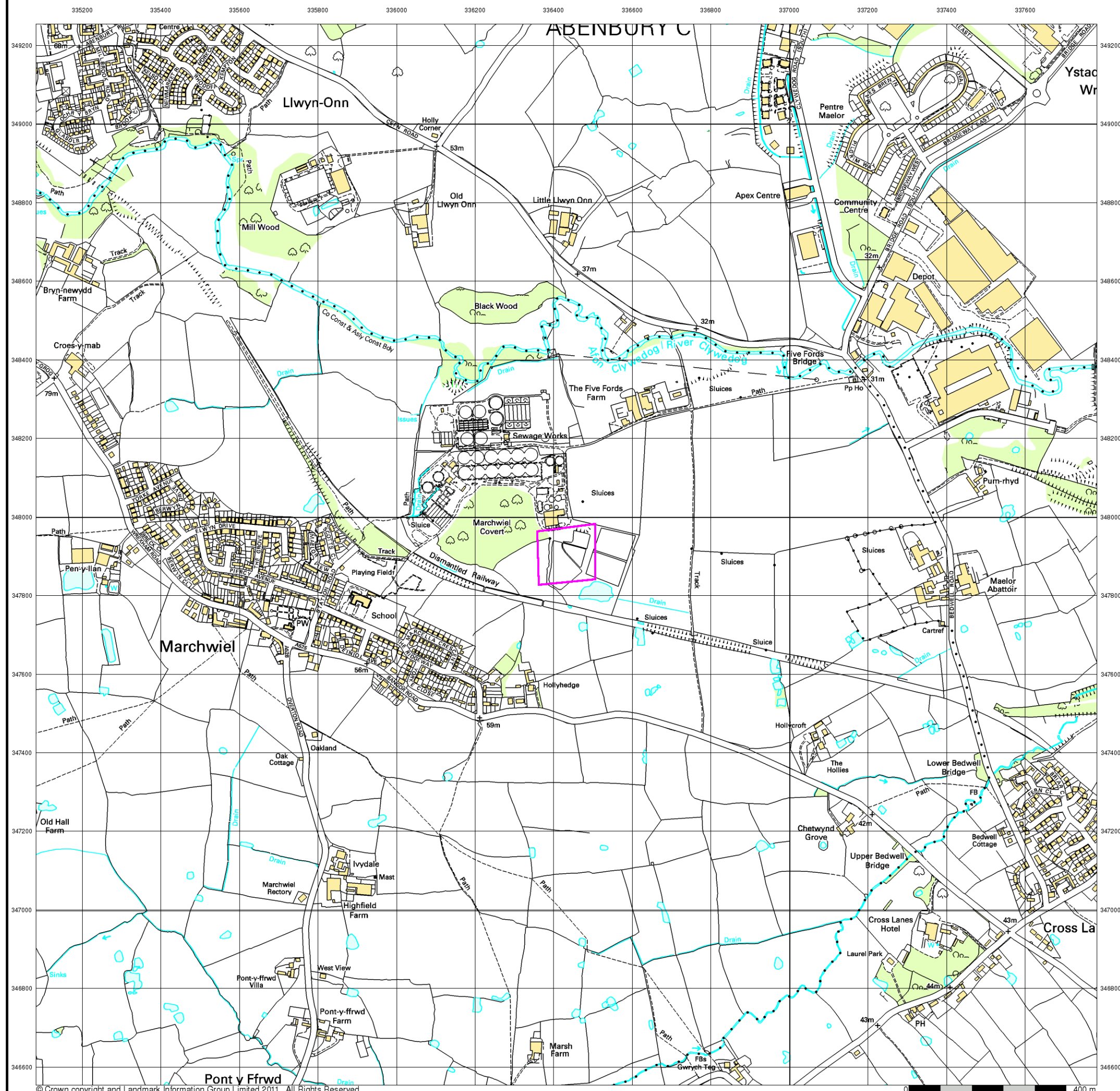


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 1000

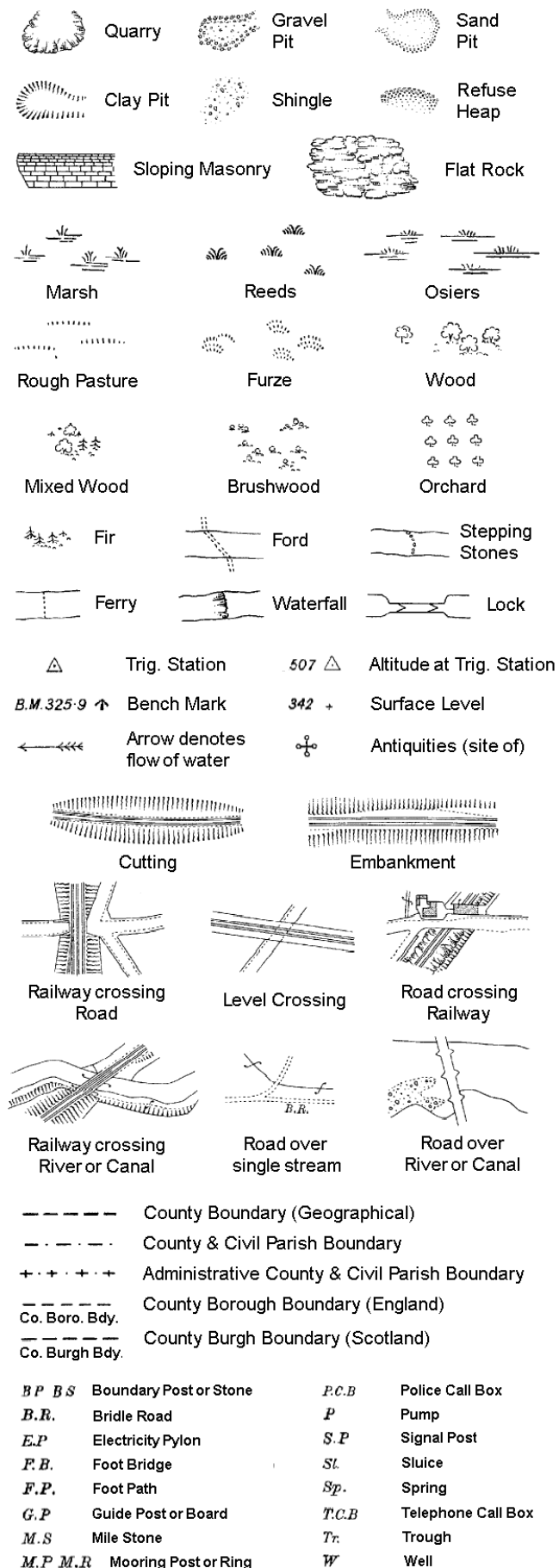
Site Details

Site at, Marchwiell, Wrexham

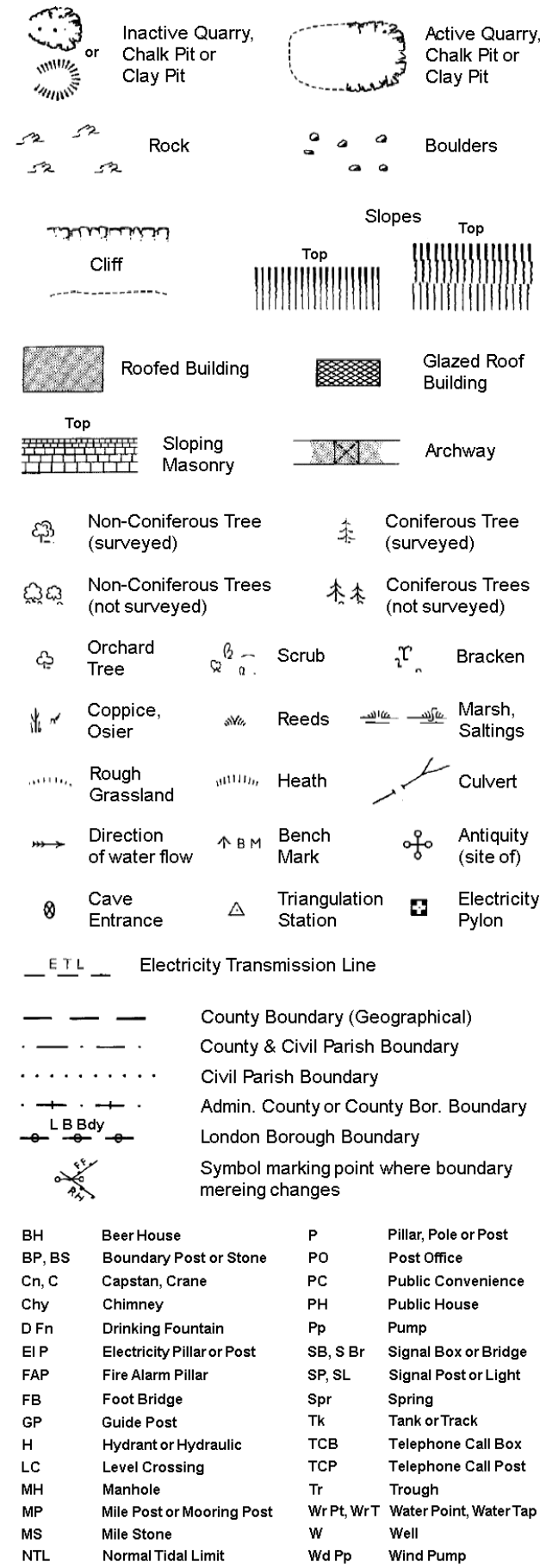


Historical Mapping Legends

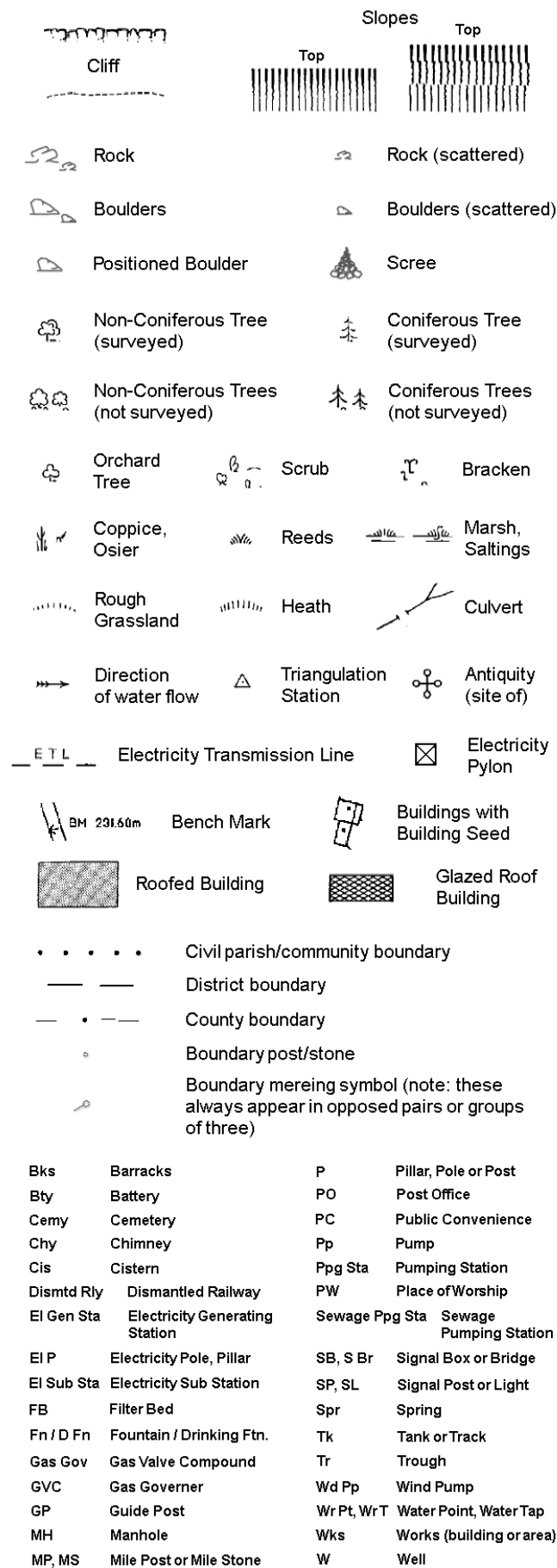
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



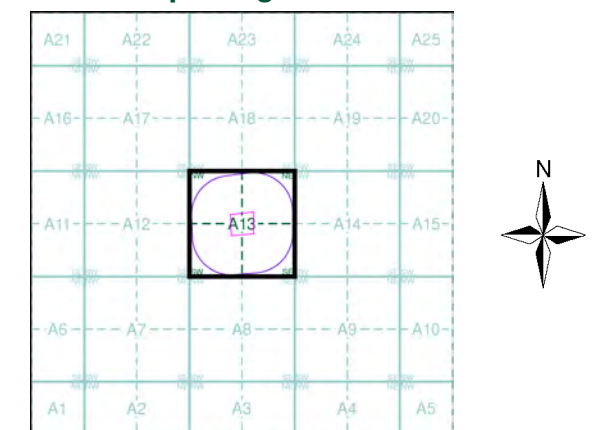
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Denbighshire	1:2,500	1873	2
Denbighshire	1:2,500	1899	3
Denbighshire	1:2,500	1912	4
Ordnance Survey Plan	1:2,500	1961	5
Additional SIMs	1:2,500	1961 - 1977	6
Supply of Unpublished Survey Information	1:2,500	1974	7
Additional SIMs	1:2,500	1988	8
Large-Scale National Grid Data	1:2,500	1992	9

Historical Map - Segment A13



Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

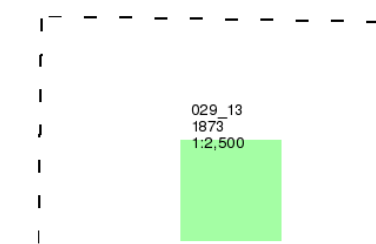
Denbighshire

Published 1873

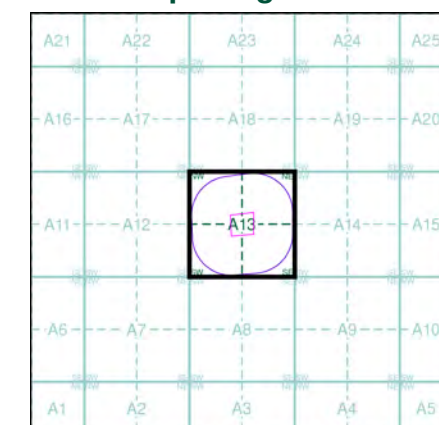
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

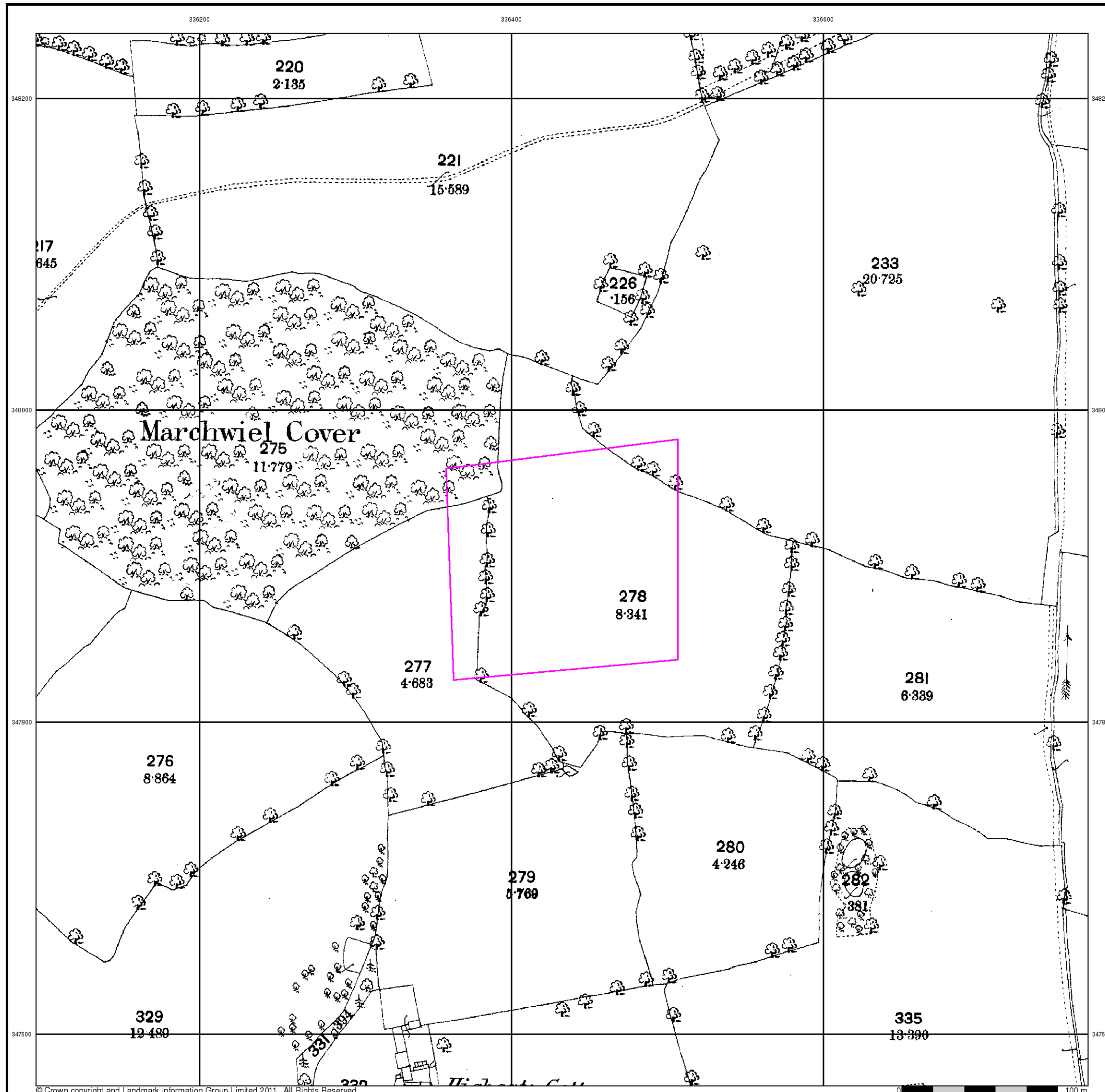


Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



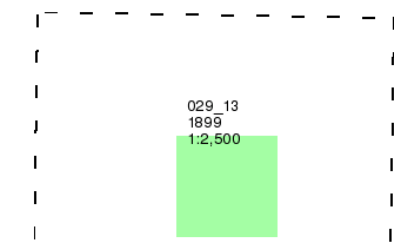
Denbighshire

Published 1899

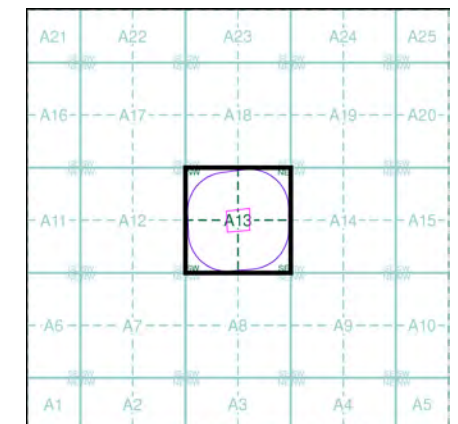
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

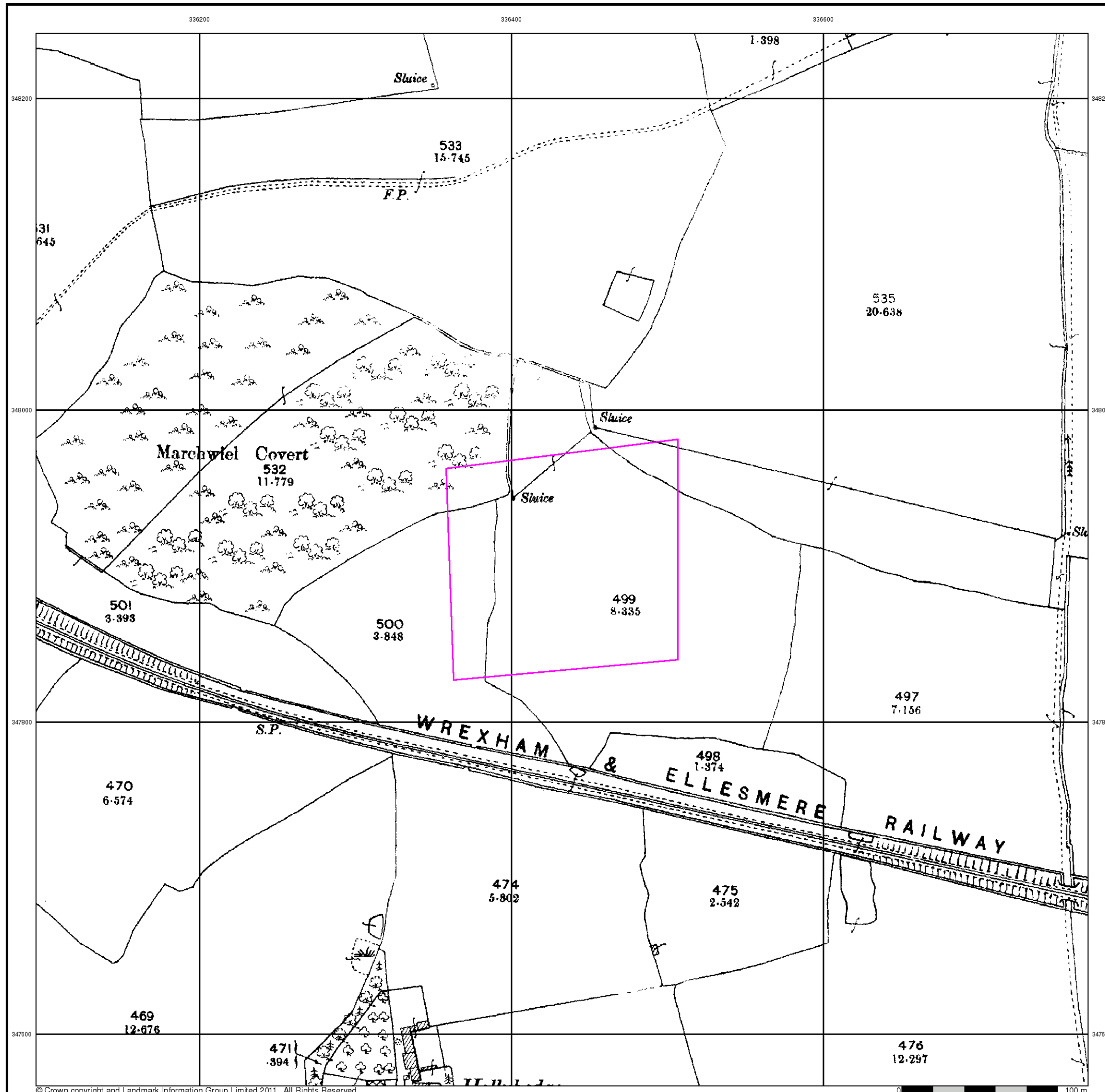


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



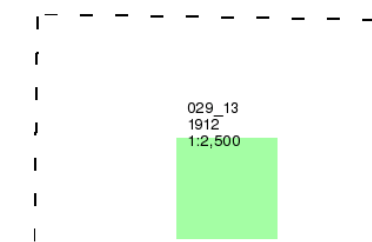
Denbighshire

Published 1912

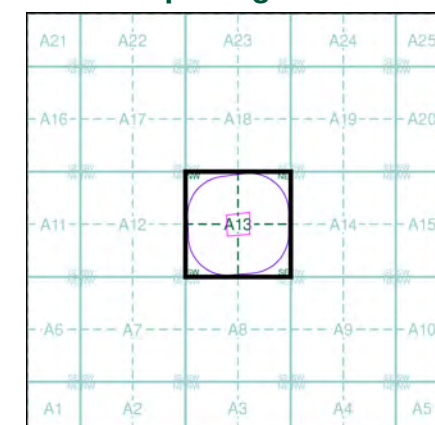
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

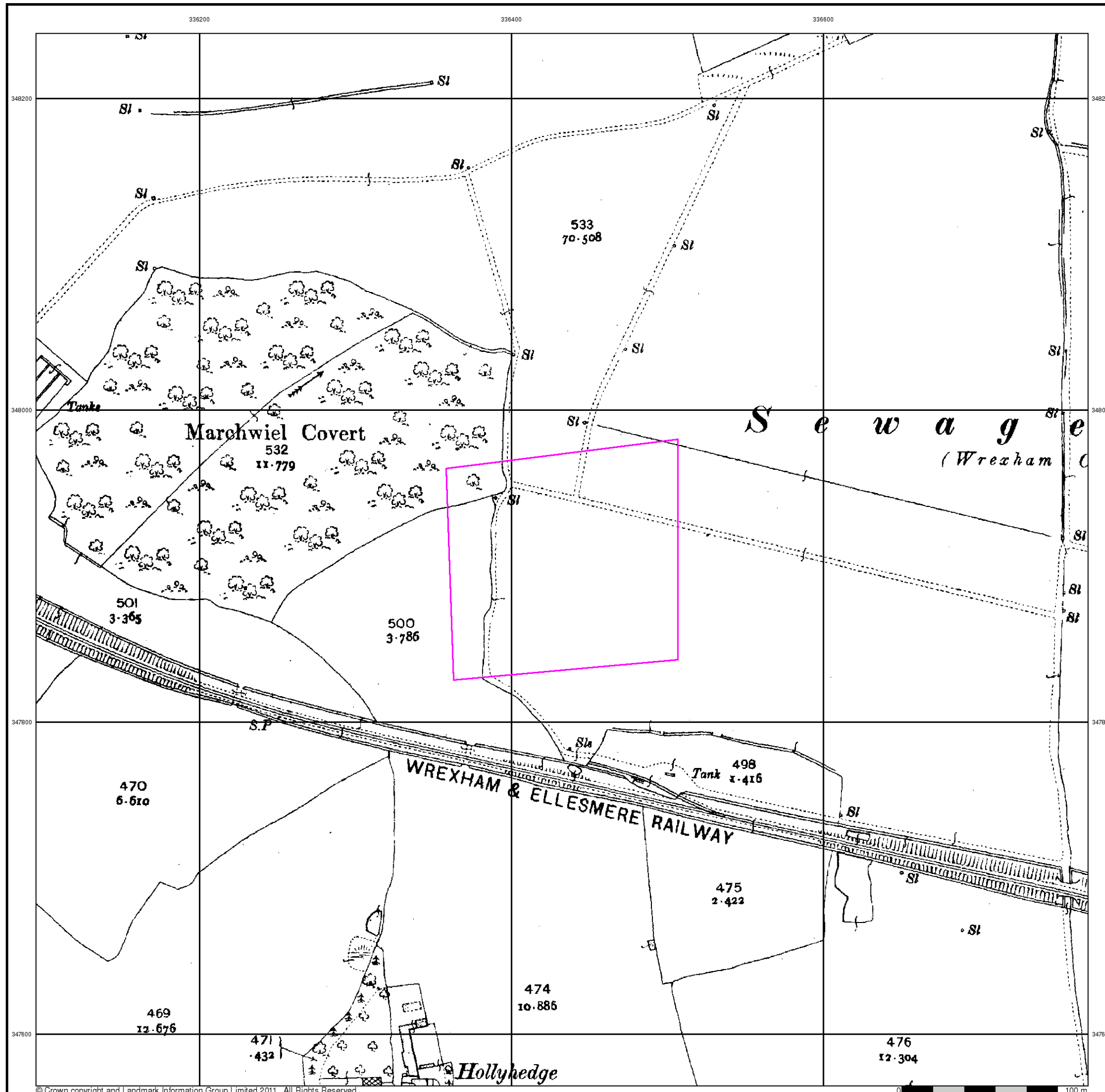


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



Ordnance Survey Plan

Published 1961

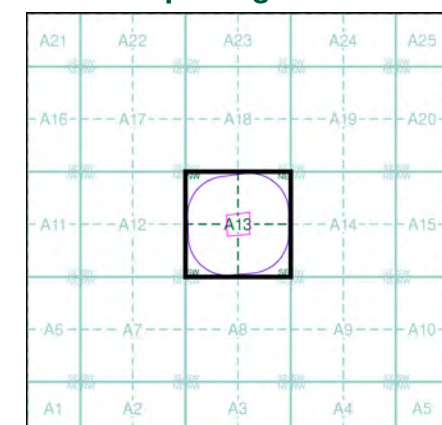
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ3648
1961
1:2,500
SJ3647
1961
1:2,500

Historical Map - Segment A13

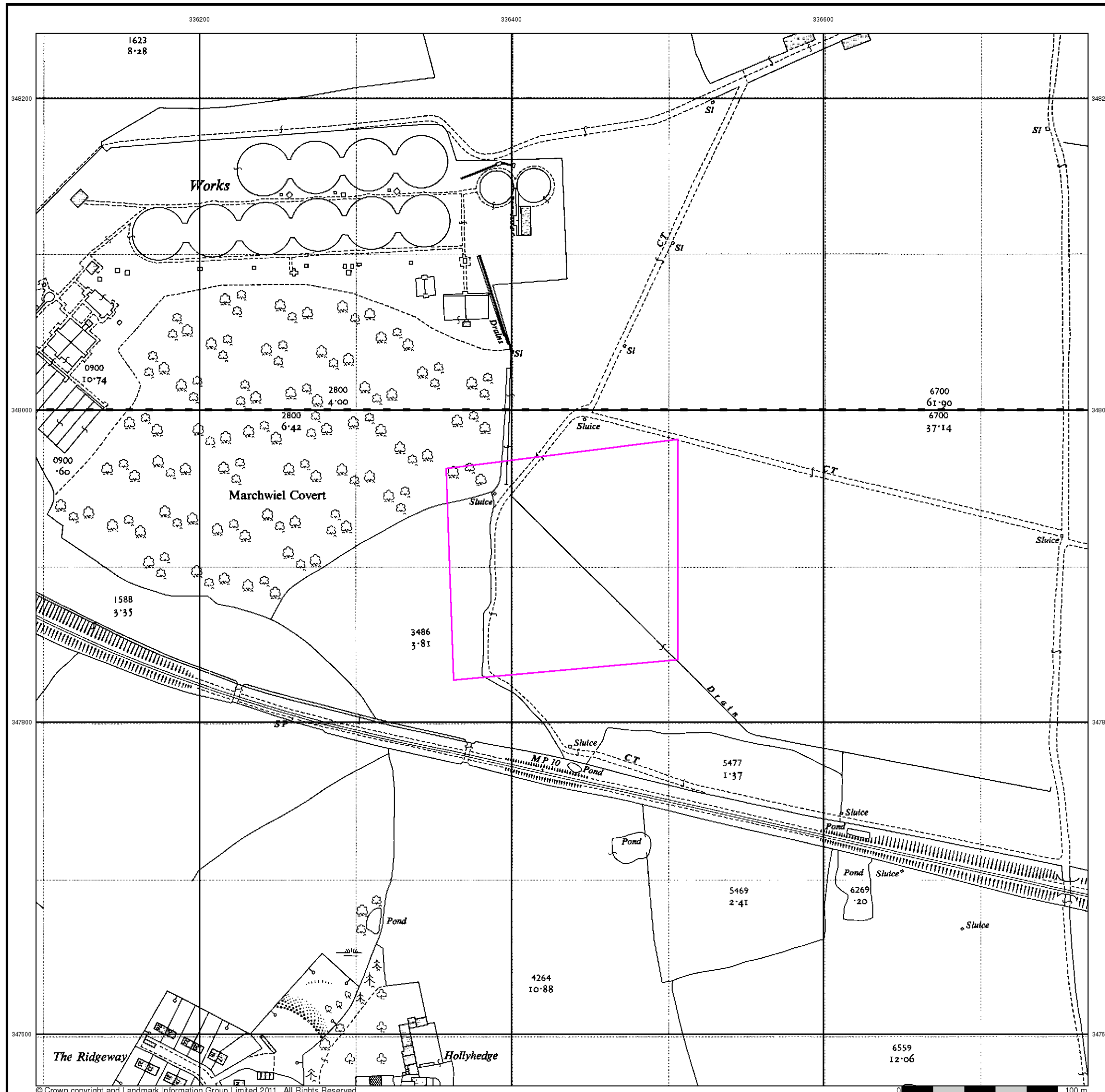


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



Additional SIMs

Published 1961 - 1977

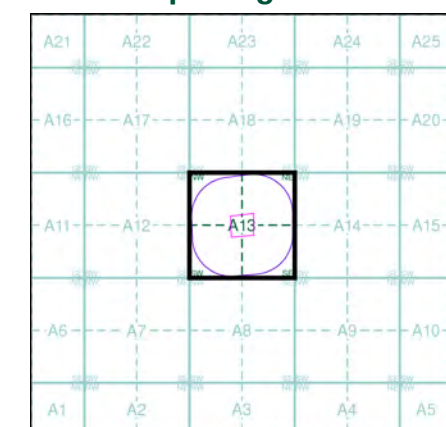
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ3648	1961	1:2,500
SJ3647	1977	1:2,500

Historical Map - Segment A13

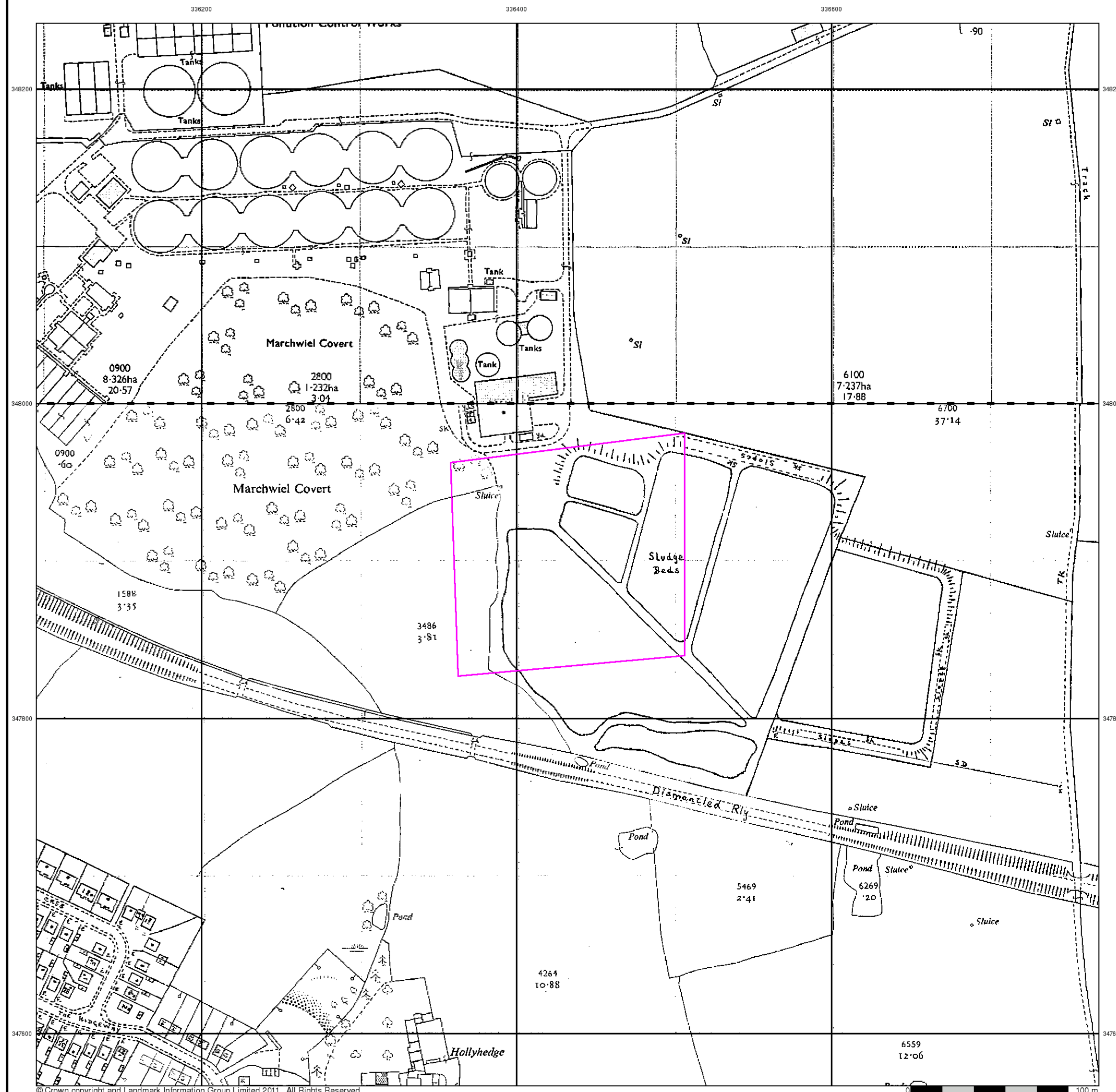


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



Supply of Unpublished Survey Information

Published 1974

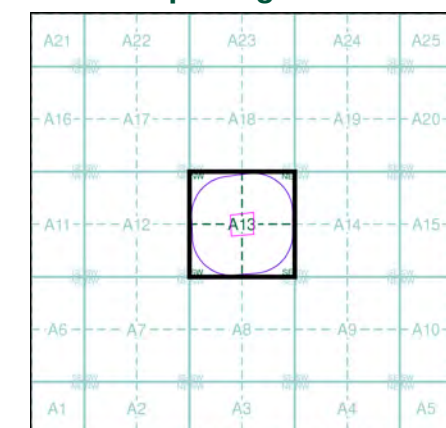
Source map scale - 1:2,500

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ3648	1974	1:2,500
SJ3647	1974	1:2,500

Historical Map - Segment A13

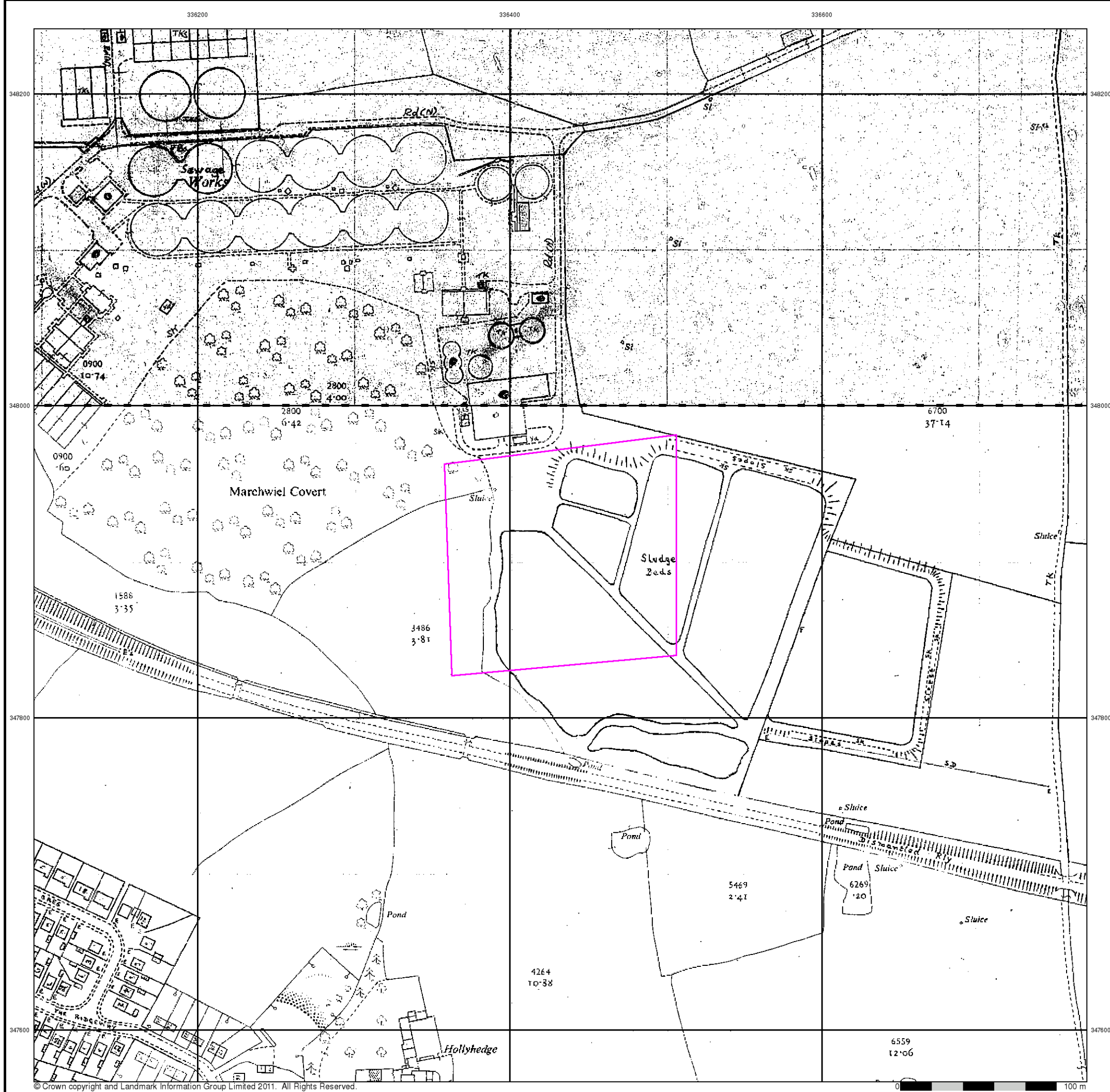


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



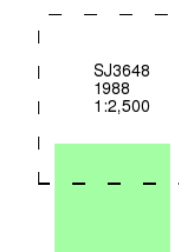
Additional SIMs

Published 1988

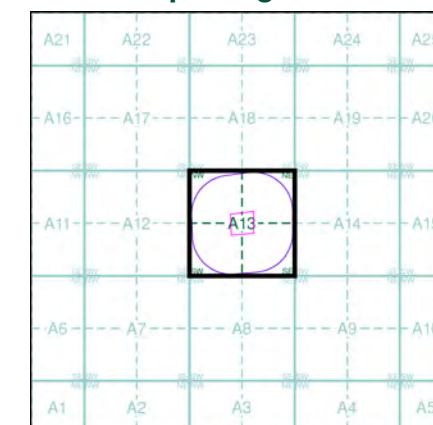
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13

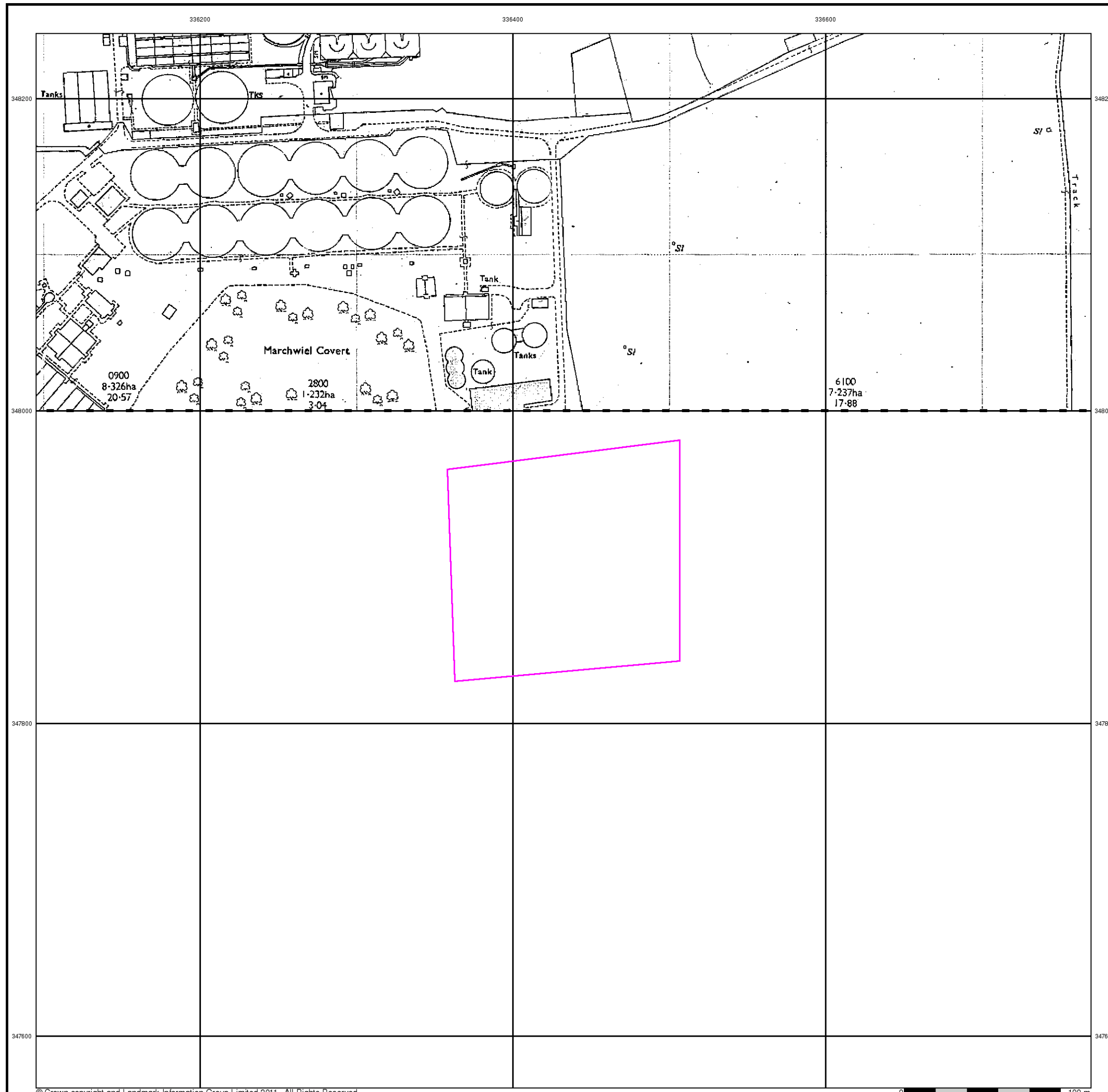


Order Details

Order Number: 34305752_1_1
 Customer Ref: 600108-78 Five Fords
 National Grid Reference: 336430, 347900
 Slice: A
 Site Area (Ha): 2.03
 Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



Large-Scale National Grid Data

Published 1992

Source map scale - 1:2,500

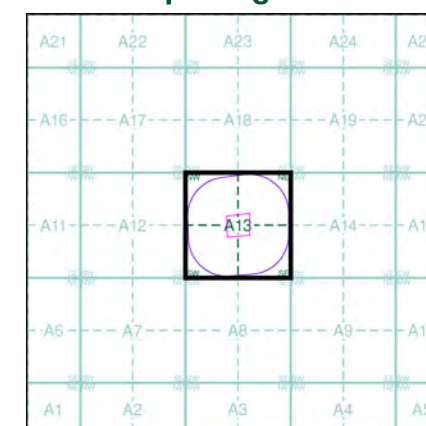
'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ3648
1992
1:2,500

SJ3647
1992
1:2,500

Historical Map - Segment A13

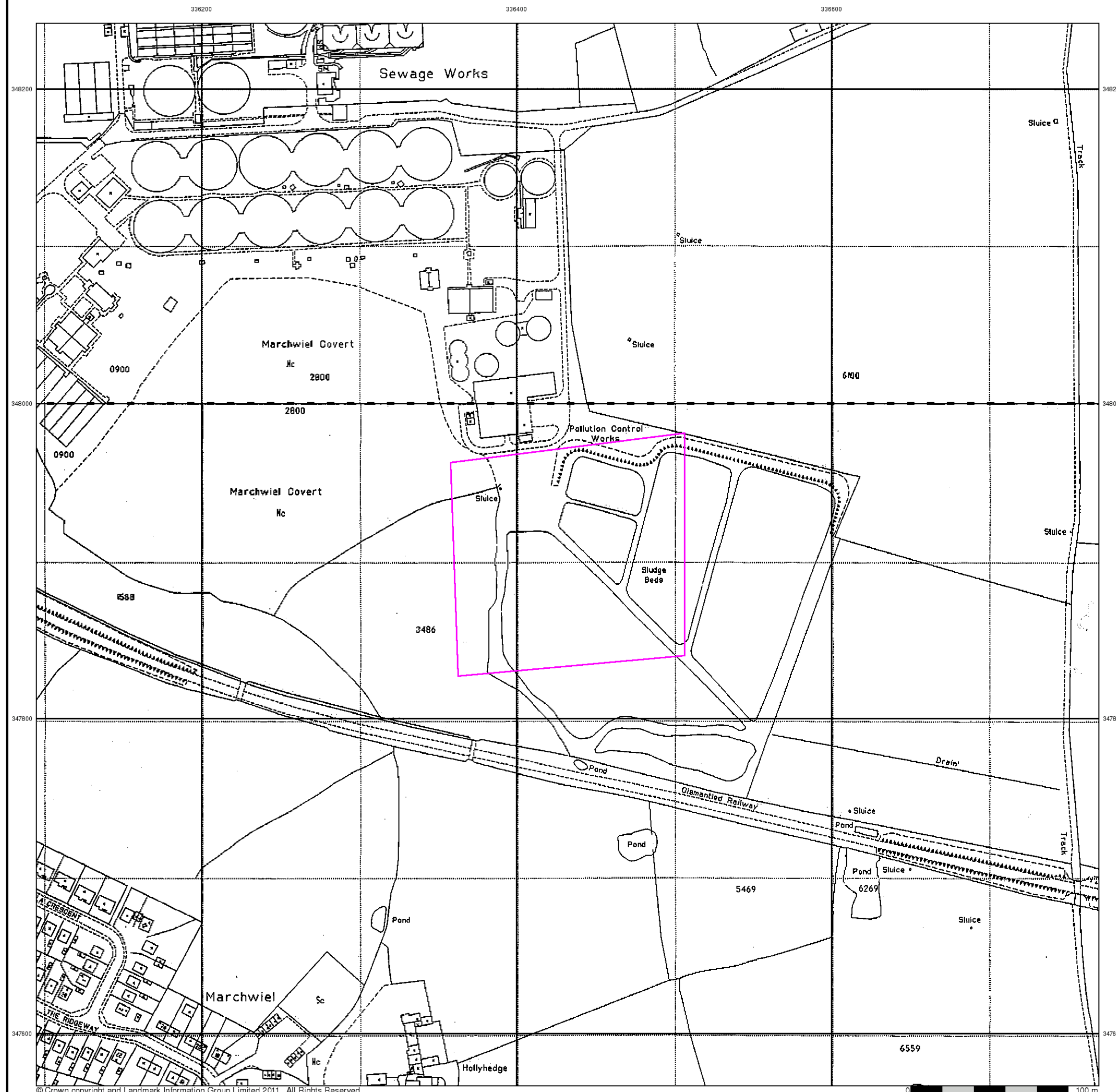


Order Details

Order Number: 34305752_1_1
Customer Ref: 600108-78 Five Fords
National Grid Reference: 336430, 347900
Slice: A
Site Area (Ha): 2.03
Search Buffer (m): 250

Site Details

Site at, Marchwiell, Wrexham



C2.2 Associated Contaminants

Early 20th c sludge was spread on land and allowed to dry out before being ploughed into the soil. The liquid was distributed by field irrigation.

The chemical composition of incoming industrial effluents varies widely in terms of heavy metal and organic chemical compounds and could include solvents and pesticides.

Some chemicals including aluminium, iron and chlorine compounds are used in treatment. Polyelectrolytes may be used in the flocculation stage. Sodium hydroxide or hydrochloric acid may be added to adjust the pH of effluent to assist biological breakdown.

When higher flows occur during rainfall, part of the sewage may be diverted and held in storm-water tanks. This is treated once the high flow has subsided, or if the flow is very high, the sewage may be discharged, untreated, into the surface water course.

The 5 main waste streams are:

- Final sludge (which is an enhanced product suitable for disposal on farmland used for crops);
- Final effluent discharged to receiving waters;
- Spent filter media comprising coke, clinker, slag, sand and gravel to landfill;
- Grit which is washed and disposed to landfill;
- Screenings comprising large suspended solid materials are disposed to landfill or incinerated.

There is also the potential for the following contamination to be present at Sewage Treatment Works:-

- Metals, organic pollutants and pathogens in sludge drying beds and storage areas;
- Leakages from pipe works and tanks leading to localised higher concentrations of contaminants and from use of land storage;
- Potential generation of methane, carbon dioxide and hydrogen sulphide and dried sludge can be combustible;
- Some pipe work and building materials such as cladding and roofing may contain asbestos;
- Inorganic compounds such as nitrates and sulphates.

A large proportion of residual contaminants in sludge may have a low solubility and be absorbed into fine particles. The movement of soil particles through soil is retarded by the presence of clay minerals and organic matter. Leaching might be concentrated in the shallow soil.

The presence of organic compounds such as solvents and pesticides will be influenced by the industries serviced by the works.

On account of the above, potential contaminants associated with sewage treatment works can be summarised as follows:

- Metals, metalloids and their compounds (arsenic, aluminium, cadmium, copper, iron, nickel, mercury, lead, zinc)
- Inorganic ions (cyanides, sulphates, sulphides, chlorides, fluorides ammonium, nitrates, phosphates)
- Organics (fuel oils, polychlorinated biphenyls, halogenated compounds – dependent on source of industrial influent).
- Treatment chemicals (aluminium chlorohydrate, aluminium sulphate, ferrous sulphate, sodium hydroxide, ferric chloride, calcium oxide)
- Gas generation in buried sludges (methane, carbon dioxide, hydrogen sulphide)

Former Railway Land

A review of the historical plans pertaining to the site area indicated a former railway (The Great Western) to run east to west south of the site boundary. Railway land is considered to be a potential source of a number of contaminants; primarily arising from ashy ballasts used on and along trackside margins, fuel leaks and spills from trains, cargo spillages, treated sleepers (with preservatives) and herbicides to control weed growth along tracks. A number of rail lines are also constructed over made ground, which is also considered a potential source of contamination.

It is considered that the above former land use may have given rise to contaminants which may have encroached/migrated to within the site boundary.

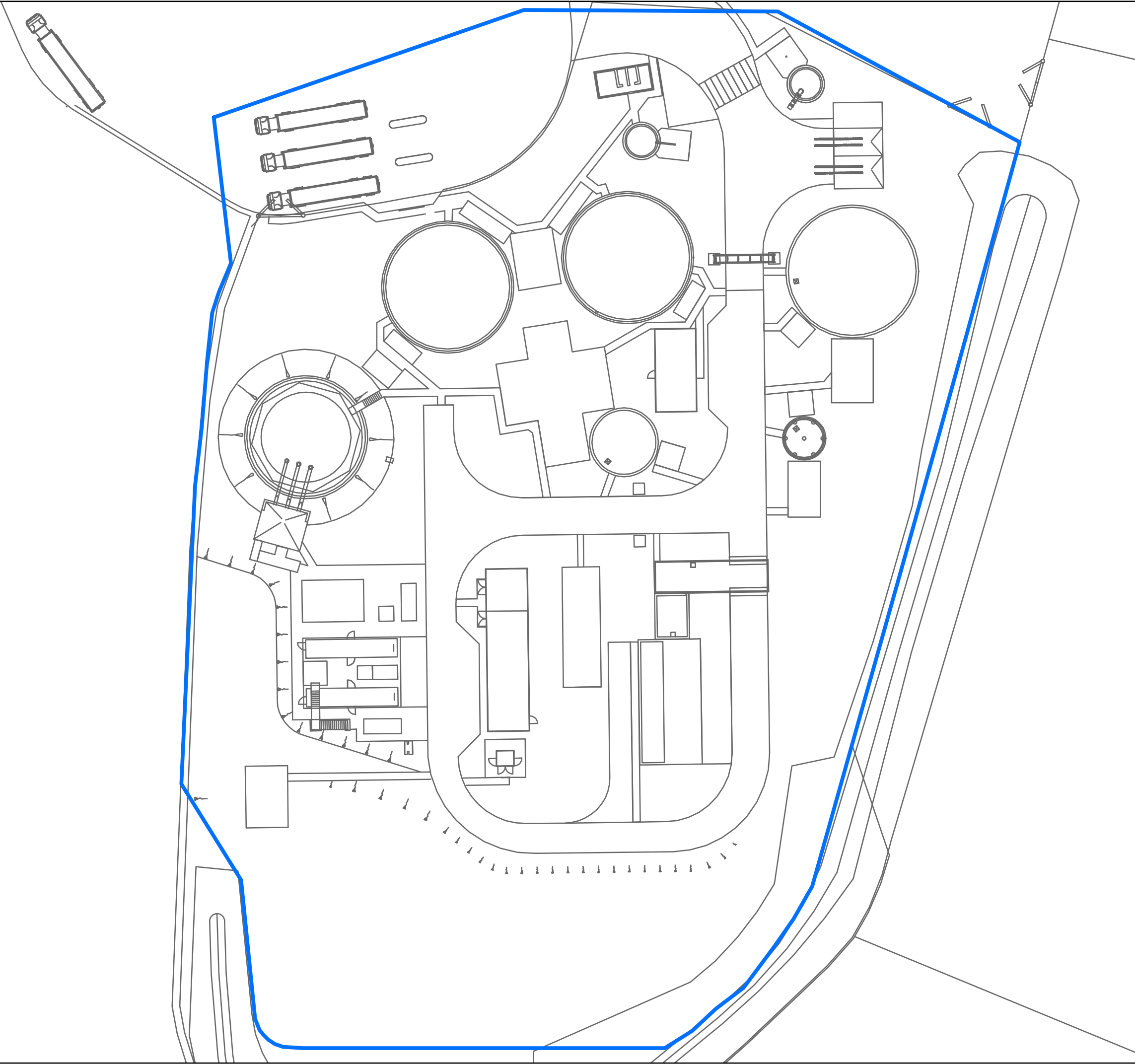
Contaminants associated with the above include heavy metals, sulphates, phenols, petroleum hydrocarbons, and creosotes.

Made Ground

It is considered that made ground may have been used in the historic development of the site as a sewage treatment works and during construction of the sludge beds. This has been confirmed, from the previous site investigation data which indicates up to 4m of made ground to exist in the locale of the site area. The contaminative nature of the made ground depends on its source, which is, at present, unknown. Generally, potential contaminants associated with made ground include heavy metals, organic contaminants and asbestos.

C3 Site Reconnaissance Plan

C3.1 Site Reconnaissance Map

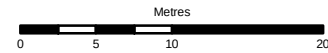


Legend

Site Reconnaissance

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I1	2011-08-17	LC	RC	RC
Issue	Date	By	Chkd	Appd



ARUP

4 Pierhead Street
Cardiff CF10 4QP
Tel +44 29 2047 3727 Fax +44 29 2047 2277
www.arup.com

Client



Job Title

Five Fords Environmental Permitting

Drawing Title

Site Reconnaissance

Scale at A3

1:500

Drawing Status

For Issue

Job No	Drawing No	Issue
216723-00	C3.1	I1

C3.2 Site Reconnaissance Photographs



Photograph 1: Proposed location of thickened sludge buffer tank, digester feed pumps and mixer



Photograph 2: Location of digester looking towards west boundary of site



Photograph 3: Location of SAS buffer tank, thickener feed pumps and mixer



Photograph 4: Eastern boundary of site with new fence looking towards proposed location of thickeners / poly kiosk, odour control and HV and LV distribution kiosk



Photograph 5: Location of digesters and thickened sludge buffer tank, digester feed pumps and mixer. Looking towards proposed location of heat exchangers and gas holder



Photograph 6: View from East boundary of site towards digesters and proposed location of gas holder at western boundary



Photograph 7: Proposed location of CHP units, hot water boiler, exhaust flue, siloxane removal plant and waste gas burner

C4 Environmental Consents, Licenses, Authorisations and Permits for the Site and Surrounding Area

The following consents, licences, authorisations and permits are identified within 1000m of the site from Envirocheck Report 34305752_1_1, 25-Mar-2011.

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	Discharge Consents Operator: Jones G.E. & Co. Property Type: Undefined Or Other Location: Five Fords Farm Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0162701 Permit Version: 1 Effective Date: 27th October 1988 Issued Date: 27th October 1988 Revocation Date: 23rd December 1992 Discharge Type: Unspecified Discharge: Onto Land Environment: Receiving Water: To Land Status: Consent expired Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	373	1	336700 348300
2	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Five Fords Stw - Settled Storm, Cefn Road, Abenbury, Wrexham, LI13 0rx Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0005702 Permit Version: 2 Effective Date: 18th November 2003 Issued Date: 17th November 2003 Revocation Date: Not Supplied Discharge Type: Public Sewage: Storm Sewage Overflow Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: Varied by Application - (Water Resources Act 1991, Schedule 10 as amended by Environment Act 1995) Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	418	1	336180 348340
2	Discharge Consents Operator: Wrexham Borough Council Property Type: Undefined Or Other Location: Five Fords Stw Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0057501 Permit Version: 1 Effective Date: 17th June 1969 Issued Date: 17th June 1969 Revocation Date: 21st March 1986 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: Revoked (Water Resources Act 1991, Section 88 & Schedule 10 as amended by Environment Act 1995) Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	440	1	336150 348350
3	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Abenbury Wwtw, Cefn Road, Abenbury, Wrexham, LI13 0pa Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0110201 Permit Version: 3 Effective Date: 20th April 2005 Issued Date: 20th April 2005 Revocation Date: Not Supplied Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Freshwater Stream/River Environment: Receiving Water: River Clywedog Status: Varied by Application - (Water Resources Act 1991, Schedule 10 as amended by Environment Act 1995) Positional Accuracy: Located by supplier to within 10m	A18SE (N)	425	1	336554 348403

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
3	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Abenbury Stw Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: CM0110201 Permit Version: 2 Effective Date: 30th January 1985 Issued Date: 30th January 1985 Revocation Date: 19th April 2005 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Freshwater Stream/River Environment: Receiving Water: River Cylwedog Status: New Consent, by Application (Water Resources Act 1991, Section 88) Positional Accuracy: Located by supplier to within 100m	A18SE (N)	449	1	336600 348420
3	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Abenbury Stw Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0110201 Permit Version: 1 Effective Date: 19th August 1982 Issued Date: 19th August 1982 Revocation Date: 29th January 1985 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Not Specified Environment: Receiving Water: Cylwedog Status: Authorisation revokedRevoked Positional Accuracy: Located by supplier to within 10m	A18SE (N)	449	1	336600 348420
4	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Five Fords Stw, Wrexham, Wales, Uk Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0077801 Permit Version: 2 Effective Date: 14th November 1989 Issued Date: 14th November 1989 Revocation Date: 29th September 1990 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Freshwater Stream/River Environment: Receiving Water: River Dee Status: Authorisation revokedRevoked Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	426	1	336234 348370
4	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Five Fords Stw, Wrexham, Wales, Uk Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0077801 Permit Version: 3 Effective Date: 30th September 1990 Issued Date: 14th November 1989 Revocation Date: 28th November 1991 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Freshwater Stream/River Environment: Receiving Water: River Dee Status: Authorisation revokedRevoked Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	426	1	336234 348370

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
4	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewage Disposal Works - Water Company Location: Five Fords Stw, Wrexham, Wales, Uk Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0077801 Permit Version: 1 Effective Date: 1st July 1983 Issued Date: 1st January 1981 Revocation Date: 13th November 1989 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge: Freshwater Stream/River Environment: Receiving Water: River Dee Status: Authorisation revoked Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	427	1	336230 348370
5	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Undefined Or Other Location: Five Fords Stw Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0061201 Permit Version: 1 Effective Date: 20th February 1970 Issued Date: 20th February 1970 Revocation Date: 22nd December 1992 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: Consent expired Positional Accuracy: Located by supplier to within 10m	A18SW (N)	435	1	336350 348400
6	Discharge Consents Operator: Wrexham Borough Council Property Type: Sewerage Network - Sewers - Water Company Location: Five Fords Sso Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0005701 Permit Version: 1 Effective Date: 25th November 1968 Issued Date: 25th November 1968 Revocation Date: 5th March 1986 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: New Consent (Water Resources Act 1991, Section 88 & Schedule 10 as amended by Environment Act 1995) Positional Accuracy: Located by supplier to within 100m	A19SW (NE)	575	1	336900 348400
6	Discharge Consents Operator: Dwr Cymru Cyfyngedig Property Type: Sewerage Network - Sewers - Water Company Location: Five Fords Sso Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: CM0005702 Permit Version: 1 Effective Date: 25th November 1968 Issued Date: 25th November 1968 Revocation Date: 17th November 2003 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: New Consent, by Application (Water Resources Act 1991, Section 88) Positional Accuracy: Located by supplier to within 100m	A19SW (NE)	575	1	336900 348400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	Discharge Consents Operator: Company Secretary Property Type: Water Treatment Works Location: Llwyn Onn Wtw Cefn Road Abenbury, Cefn Road, Wrexham, LI13 9tt Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0066701 Permit Version: 3 Effective Date: 12th July 2003 Issued Date: 11th July 2003 Revocation Date: Not Supplied Discharge Type: Trade Effluent Discharge: Freshwater Stream/River Environment: Receiving Water: River Clywedog Status: Modified (Water Resources Act 1991, Schedule 10 as amended by Environment Act 1995) Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	777	1	335850 348550
7	Discharge Consents Operator: Company Secretary Property Type: Water Treatment Works Location: Llwyn Onn Wtw Cefn Road Abenbury, Cefn Road, Wrexham, LI13 9tt Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0066701 Permit Version: 2 Effective Date: 14th July 2000 Issued Date: 24th September 1971 Revocation Date: 11th July 2003 Discharge Type: Trade Effluent Discharge: Freshwater Stream/River Environment: Receiving Water: River Clywedog Status: Consent revoked or revised: New Consent issued (Section 37(1)) Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	777	1	335850 348550
8	Discharge Consents Operator: Welsh Development Agency Property Type: Undefined Or Other Location: Wrexham Ind. Estate Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0093101 Permit Version: 1 Effective Date: 19th May 1982 Issued Date: 19th May 1982 Revocation Date: 21st June 1996 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: Consent expired Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	810	1	337200 348400
9	Discharge Consents Operator: Tetra Pak Wrexham Ltd, Fao D G Jones Property Type: Undefined Or Other Location: Wrexham Tetra Pak Wrexham Ltd. Bedw, Tetra Pak Wrexham Ltd. Bedwell R, Bedwell Road Authority: Environment Agency, Welsh Region Catchment Area: River Dee Reference: Cm0146401 Permit Version: 1 Effective Date: 23rd December 1985 Issued Date: 23rd December 1985 Revocation Date: 21st August 1995 Discharge Type: Unspecified Discharge: Freshwater Stream/River Environment: Receiving Water: Clywedog Status: Consent expired Positional Accuracy: Located by supplier to within 10m	A19SE (NE)	863	1	337300 348320
10	Local Authority Integrated Pollution Prevention And Control Name: Animal Waste Services Ltd Location: Tyddyn Daniel, Bedwell Road, Marchwiell, Wrexham, LI13 0ts Authority: Wrexham County Borough Council, Environmental Health Department Permit Reference: WCBC/IPPC/07/AWS Dated: Not Supplied Process Type: Waste Management Description: Incinerator Status: Permit Issued Positional Accuracy: Manually positioned to the address or location	A14SE (E)	866	2	337371 347795

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
11	Local Authority Pollution Prevention and Controls Name: Animal Waste Services Ltd Location: Tyddyn Daniel, Marchwiell, WREXHAM, Clwyd, LL13 0TS Authority: Wrexham County Borough Council, Environmental Health Department Permit Reference: WCBC/IPPC/07/AWS Dated: 3rd October 1996 Process Type: Local Authority Air Pollution Control Description: PG5/3 Animal carcase incineration processes under 1 tonne an hour Status: Application exempt from APC Positional Accuracy: Automatically positioned to the address	A14SE (E)	867	2	337372 347796
12	Local Authority Pollution Prevention and Controls Name: Tetra Pak (Wrexham) Limited Location: Bedwell Road, Cross Lanes, WREXHAM, Clwyd, LL13 0UT Authority: Wrexham County Borough Council, Environmental Health Department Permit Reference: WCBC-PG6-17-TP(V3) Dated: 13th January 1994 Process Type: Local Authority Air Pollution Control Description: PG6/17 Printing of flexible packaging Status: Authorised Positional Accuracy: Manually positioned to the address or location	A19SE (E)	949	2	337400 348300
13	Local Authority Pollution Prevention and Control Enforcements Location: Tyddyn Daniel, Bedwell Road, Marchwiell, Wrexham, LL13 0ts Type: Air Pollution Control Enforcement Notice Reference: WCBC/IPPC/07/AWS Date Issued: 26th March 2007 Enforcement Date: Not Supplied Details: Not Supplied Positional Accuracy: Manually positioned to the address or location	A14SE (E)	866	2	337371 347795
	Nearest Surface Water Feature	A13SE (SE)	3	-	336477 347822
14	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Five Fords Sdw Authority: Environment Agency, Welsh Region Pollutant: Unknown Note: Blocked Sewer Incident Date: 1st April 1996 Incident Reference: 27776 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SW (NW)	368	1	336200 348295
14	Pollution Incidents to Controlled Waters Property Type: Water Company Sewage: Sewage Treatment Works Location: Five Fords Sdw Authority: Environment Agency, Welsh Region Pollutant: Unknown Note: Blocked Sewer Incident Date: 1st April 1996 Incident Reference: 27776 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SW (NW)	373	1	336200 348300
15	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Five Fords Stw Authority: Environment Agency, Welsh Region Pollutant: Chemicals - Other Organic Note: Not Supplied Incident Date: 31st July 1996 Incident Reference: 29258 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SW (N)	442	1	336300 348400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
16	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Rear Of, Glan Yr Afon Cottage Authority: Environment Agency, Welsh Region Pollutant: Mud/Clay/Soil Note: Afon Clywedog Incident Date: 19th March 1998 Incident Reference: 35143 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	462	1	336700 348400
17	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Marchwiel At, Side Of Layby, WREXHAM Authority: Environment Agency, Welsh Region Pollutant: Miscellaneous - Fire water / Foam Note: Accidental Spillage/Leakage Incident Date: 20th September 1996 Incident Reference: 29996 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Leakage Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14NW (E)	494	1	337000 348000
18	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Bedwell Road Authority: Environment Agency, Welsh Region Pollutant: Light Oil Note: Poor Management Incident Date: 21st April 1997 Incident Reference: 31934 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Overflow Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14SE (E)	794	1	337300 347850
19	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Bedwell Road Authority: Environment Agency, Welsh Region Pollutant: Oils - Diesel (Including Agricultural) Note: Not Supplied Incident Date: 26th February 1996 Incident Reference: 27898 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14NE (E)	803	1	337300 348100
20	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Grounds Of Tetra Pak, WREXHAM Authority: Environment Agency, Welsh Region Pollutant: Crude Sewage Note: Blockage; Afon Clywedog Incident Date: 25th June 1998 Incident Reference: 36160 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Leakage Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	809	1	337250 348300
20	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Tetra, Pac Factory Authority: Environment Agency, Welsh Region Pollutant: Unknown Note: Not Supplied Incident Date: 6th June 1996 Incident Reference: 28661 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	855	1	337300 348300

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
21	Pollution Incidents to Controlled Waters Property Type: Water Company Sewage: Sewerage Location: Tetrapak Authority: Environment Agency, Welsh Region Pollutant: Crude Sewage Note: Mechanical Failure Incident Date: 28th August 1995 Incident Reference: 25516 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Leakage Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	873	1	337300 348345
21	Pollution Incidents to Controlled Waters Property Type: Water Company Sewage: Sewerage Location: Tetrapak Authority: Environment Agency, Welsh Region Pollutant: Mud/Clay/Soil Note: Mechanical Failure Incident Date: 27th August 1995 Incident Reference: 25515 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Leakage Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	875	1	337300 348350
22	Pollution Incidents to Controlled Waters Property Type: Not Given Location: Upstream Of, Teif Terrace Authority: Environment Agency, Welsh Region Pollutant: Sewage - Septic Tank Effluent Note: Blocked Sewer Incident Date: 17th June 1996 Incident Reference: 28685 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Overflow Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	877	1	337250 348445
22	Pollution Incidents to Controlled Waters Property Type: Water Company Sewage: Other Location: Up Stream Of, Tetrapack Authority: Environment Agency, Welsh Region Pollutant: Sewage - Septic Tank Effluent Note: Blocked Sewer Incident Date: 17th June 1996 Incident Reference: 28685 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Overflow Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A19SE (NE)	879	1	337250 348450
	River Quality Name: Clywedog GQA Grade: River Quality B Reach: Conf.Redwithther Bk. - O/F Five Fords Stw Estimated Distance (km): 4.8 Flow Rate: Flow less than 1.25 cumecs Flow Type: River Year: 2000	A18SE (N)	383	1	336551 348361
	River Quality Name: Clywedog GQA Grade: River Quality B Reach: O/F 5 Fords Stw-Conf.Gwenfro Kings Mill Estimated Distance (km): 2.2 Flow Rate: Flow less than 1.25 cumecs Flow Type: River Year: 2000	A18SW (NW)	430	1	336135 348330

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
23	River Quality Biology Sampling Points Name: Clywedog (Dee) Reach: Confluence Redwither Brook To Outfall Five Fords Sewage Treatment Works Estimated Distance: 4.80 Positional Accuracy: Located by supplier to within 100m Year: 1990 GQA Grade: River Quality Biology GQA Grade C - Fairly Good Year: 1995 GQA Grade: River Quality Biology GQA Grade A - Very Good Year: 2000 GQA Grade: River Quality Biology GQA Grade C - Fairly Good Year: 2002 GQA Grade: River Quality Biology GQA Grade Not Supplied Year: 2003 GQA Grade: River Quality Biology GQA Grade Not Supplied Year: 2004 GQA Grade: River Quality Biology GQA Grade B - Good Year: 2005 GQA Grade: River Quality Biology GQA Grade B - Good Year: 2006 GQA Grade: River Quality Biology GQA Grade B - Good Year: 2007 GQA Grade: River Quality Biology GQA Grade B - Good Year: 2008 GQA Grade: River Quality Biology GQA Grade B - Good Year: 2009 GQA Grade: River Quality Biology GQA Grade B - Good	A18SW (NW)	465	1	336200 348400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
24	River Quality Chemistry Sampling Points Name: Clywedog Reach: Confluence Redwither Brook To Overflow Five Fords Sewage Treatment Works Estimated Distance: 4.80 Objective: Not Supplied Positional Accuracy: Located by supplier to within 10m Year: 1990 GQA Grade: River Quality Chemistry GQA Grade E - Poor Compliance: Not Supplied Year: 1993 GQA Grade: River Quality Chemistry GQA Grade D - Fair Compliance: Not Supplied Year: 1994 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1995 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 1996 GQA Grade: River Quality Chemistry GQA Grade A - Very Good Compliance: Not Supplied Year: 1997 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1998 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1999 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2000 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2001 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2002 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2003 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2004 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2005 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2006 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2007 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2008 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2009 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied	A18SE (NE)	511	1	336710 348450

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
24	River Quality Chemistry Sampling Points Name: Clywedog Reach: Outfall 5 Fords Sewage Treatment Works To Confluence Gwenfro Kings Mill Estimated Distance: 2.20 Objective: Not Supplied Positional Accuracy: Located by supplier to within 10m Year: 1990 GQA Grade: River Quality Chemistry GQA Grade D - Fair Compliance: Not Supplied Year: 1993 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1994 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1995 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 1996 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 1997 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1998 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 1999 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2000 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2001 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2002 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2003 GQA Grade: River Quality Chemistry GQA Grade C - Fairly Good Compliance: Not Supplied Year: 2004 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2005 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2006 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2007 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2008 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied Year: 2009 GQA Grade: River Quality Chemistry GQA Grade B - Good Compliance: Not Supplied	A18SE (NE)	511	1	336710 348450
25	Substantiated Pollution Incident Register Authority: Environment Agency Wales, North Area Incident Date: 7th September 2010 Incident Reference: 820449 Water Impact: Category 2 - Significant Incident Air Impact: Category 4 - No Impact Land Impact: Category 4 - No Impact Positional Accuracy: Located by supplier to within 10m Pollutant: Sewage Materials: Final Effluent	A13NW (NW)	209	1	336250 348141

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Mr P Williams Licence Number: 24/67/7/0018 Permit Version: 100 Location: Well Authority: Environment Agency, Welsh Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 29th March 1966 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A1NW (SW)	1917	1	334820 346690
	Water Abstractions Operator: Calypso Soft Drinks Ltd Licence Number: 24/67/7/0222 Permit Version: 1 Location: 144m Deep, 150mm Dia. Borehole Aw1 Authority: Environment Agency, Welsh Region Abstraction: Food And Drink: Process Water Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Spectrum Business Park Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 10th September 2001 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	(NE)	1938	1	338190 348940
	Water Abstractions Operator: Calypso Soft Drinks Ltd Licence Number: 24/67/7/0213 Permit Version: 100 Location: 144m Deep, 150mm Dia. Borehole Aw1 Authority: Environment Agency, Welsh Region Abstraction: Food And Drink: Process Water Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: 144M Deep 150mm Diameter Borehole Aw1 Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 10th September 1998 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(NE)	1938	1	338190 348940
	Groundwater Vulnerability Soil Classification: Soils of Low Leaching Potential - Soils in which pollutants are unlikely to penetrate the soil layer because water movement is largely horizontal or they have large ability to attenuate diffuse pollutants. Lateral flow from these soils contribute to groundwater recharge elsewhere in the catchment Map Sheet: Sheet 16 West Cheshire Scale: 1:100,000	A13SE (SE)	0	1	336434 347904
	Drift Deposits Drift Deposit: Low permeability drift deposits occurring at the surface and overlying Major and Minor Aquifers are head, clay-with-flints, brickearth, peat, river terrace deposits and marine and estuarine alluvium Map Sheet: Sheet 16 West Cheshire Scale: 1:100,000	A13SE (SE)	0	1	336434 347904
	Bedrock Aquifer Designations Aquifer Desination: Secondary Aquifer - A	A13SE (SE)	0	3	336434 347904
	Superficial Aquifer Designations Aquifer Designation: Unproductive Strata	A13SE (SE)	0	3	336434 347904
26	Source Protection Zones Name: Calpso Drinks (Wrexham) Source: Environment Agency, Head Office Reference: We097 Type: Zone III (Total Catchment): The total area needed to support the discharge from the protected groundwater source.	A9NE (SE)	729	1	337164 347525

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
27	Source Protection Zones Name: Calpso Drinks (Wrexham) Source: Environment Agency, Head Office Reference: We097 Type: Zone II (Outer Protection Zone): Either 25% of the source area or a 400 day travel time whichever is greater.	A9NE (SE)	745	1	337169 347500
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
28	Licensed Waste Management Facilities (Locations) Licence Number: 37130 Location: Abenbury, Wrexham, Clwyd, LL13 0PA Operator Name: United Utilities Green Energy Limited Operator Location: Not Supplied Authority: Environment Agency Wales, North Area Site Category: Treatment - Biological Licence Status: Surrendered Issued: 26th April 1995 Last Modified: Not Supplied Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: 16th September 2003 IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A13NW (N)	202	1	336426 348174
	Local Authority Landfill Coverage Name: Wrexham County Borough Council - Has supplied landfill data		0	5	336434 347904
29	Registered Waste Treatment or Disposal Sites Licence Holder: Hyder Industrial Ltd Licence Reference: NOW-523-L (L85) Site Location: Five Fords S.T.Works, Cefn Road, Marchwiell, Wrexham, Clwyd Operator Location: Alexandra Gate, Rover Road, CARDIFF, South Glamorgan, CF2 2UE Authority: Environment Agency Wales, North Area Site Category: Treatment - Biological Max Input Rate: Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year) Waste Source: Some restriction on source of waste Restrictions: Licence Status: Operational as far as is knownOperational Dated: 1st April 1995 Preceded By: Not Given Licence: Superseded By: Not Given Licence: Positional Accuracy: Approximate location provided by supplier Boundary Quality: Not Supplied Authorised Waste: Max.Waste Permitted By Licence Specified Waste From Local Company Prohibited Waste: Medical, Surgical, Veterinary Wastes Percussive/Explosive/Similar Waste Red List Substances (76/464/Eec) Spec.Waste (Epa'90:S62/1996 Regs) Sub'S Control. Radioactive Subs Act'60 Waste In Drums Waste N.O.S. Waste With Flash Pt < 32 C	A13NW (NW)	286	1	336200 348200
30	Registered Waste Treatment or Disposal Sites Licence Holder: E Clutton & Sons Licence Reference: L54A Site Location: Maelor Abattoir Tyddyn Daniel, Bedwell Road, Marchwiell, Wrexham, Clwyd Operator Location: As Site Address Authority: Environment Agency Wales, North Area Site Category: Incineration Max Input Rate: Very Small (Less than 10,000 tonnes per year) Waste Source: No known restriction on source of waste Restrictions: Licence Status: Site now IPC authorisedAuthorised Dated: 1st July 1990 Preceded By: Not Given Licence: Superseded By: Not Given Licence: Positional Accuracy: Manually positioned to the address or location Boundary Quality: Not Supplied Authorised Waste: Small Pets, Farm Animals & Offal	A15SW (E)	944	1	337450 347850

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Westphalian and Stephanian, undivided, of Barren Red lithology	A13SE (SE)	0	3	336434 347904
	Coal Mining Affected Areas Description: In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report.	A13SE (SE)	0	4	336434 347904
	Non Coal Mining Areas of Great Britain Risk: Rare Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Potential for Collapsible Ground Stability Hazards No Hazard				
	Potential for Compressible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (W)	0	3	336425 347904
	Potential for Ground Dissolution Stability Hazards No Hazard				
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	94	3	336400 348075
	Radon Potential - Radon Affected Areas Affected Area: The property is in an intermediate probability radon area, as between 1 and 3% of homes are above the action level Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	0	3	336434 347904

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
31	Contemporary Trade Directory Entries Name: Merry Maids Of Wrexham Location: 55, The Ridgeway, Marchwiell, Wrexham, Clwyd, LL13 0RU Classification: Cleaning Services - Domestic Status: Inactive Positional Accuracy: Automatically positioned to the address	A12SE (SW)	426	-	335961 347689
31	Contemporary Trade Directory Entries Name: Merry Maids Location: 55, The Ridgeway, Marchwiell, Wrexham, Clwyd, LL13 0RU Classification: Cleaning Services - Domestic Status: Active Positional Accuracy: Automatically positioned to the address	A12SE (SW)	426	-	335961 347689
32	Contemporary Trade Directory Entries Name: Fibre Fresh Carpet & Upholstery Care Location: 5, Scotts Close, Marchwiell, WREXHAM, Clwyd, LL13 0RQ Classification: Carpet, Curtain & Upholstery Cleaners Status: Active Positional Accuracy: Automatically positioned to the address	A12NE (W)	544	-	335816 347921
33	Contemporary Trade Directory Entries Name: Acdc Domestic Location: Paladinus, Station Road, Marchwiell, Wrexham, Clwyd, LL13 0RT Classification: Washing Machines - Servicing & Repairs Status: Inactive Positional Accuracy: Automatically positioned to the address	A12SE (W)	560	-	335809 347748
34	Contemporary Trade Directory Entries Name: F Lloyd (Penley) Ltd Location: Five Fords Cottage, Cefn Road, Abenbury, Wrexham, Clwyd, LL13 0PA Classification: Road Haulage Services Status: Active Positional Accuracy: Automatically positioned to the address	A19SE (NE)	789	-	337191 348374
35	Contemporary Trade Directory Entries Name: Magical Maids Location: 55, Piercy Avenue, Marchwiell, Wrexham, Clwyd, LL13 0RL Classification: Cleaning Services - Domestic Status: Active Positional Accuracy: Automatically positioned to the address	A12SW (W)	827	-	335535 347852
36	Contemporary Trade Directory Entries Name: Marchwiell Craft Products Location: 2, Taliesin, Marchwiell, Wrexham, Clwyd, LL13 0RF Classification: Manufacturers Status: Inactive Positional Accuracy: Automatically positioned to the address	A12NW (W)	853	-	335509 348040
37	Contemporary Trade Directory Entries Name: Price Motor Co Location: The Bungalow Workshops, Wrexham Road, Marchwiell, Wrexham, Clwyd, LL13 0PH Classification: Car Dealers Status: Active Positional Accuracy: Automatically positioned to the address	A12SW (W)	873	-	335491 347774
37	Contemporary Trade Directory Entries Name: Steve Scott Location: The Bungalow Workshops, Wrexham Road, Marchwiell, Wrexham, Clwyd, LL13 0PH Classification: Garage Services Status: Inactive Positional Accuracy: Automatically positioned to the address	A12SW (W)	882	-	335485 347751
38	Contemporary Trade Directory Entries Name: Cluttons Animal By-Products Ltd Location: Bedwell Road, Cross Lanes, Wrexham, Clwyd, LL13 0TS Classification: Animal By-Products Status: Active Positional Accuracy: Automatically positioned to the address	A14SE (E)	880	-	337386 347826
39	Contemporary Trade Directory Entries Name: Bonaprene Products Ltd Location: Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Precision Engineers Status: Inactive Positional Accuracy: Automatically positioned to the address	A19NW (NE)	905	-	337052 348702

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
39	Contemporary Trade Directory Entries Name: Bonaprene Products Ltd Location: Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Hydraulic Equipment & Accessories - Sales & Service Status: Inactive Positional Accuracy: Automatically positioned to the address	A19NW (NE)	905	-	337052 348702
39	Contemporary Trade Directory Entries Name: Bonaprene Products Ltd Location: Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Rubber & Plastic Products - Manufacturers Status: Active Positional Accuracy: Automatically positioned to the address	A19NW (NE)	905	-	337052 348702
40	Contemporary Trade Directory Entries Name: Fairfield Meat Co Ltd Location: Bedwell Road, Cross Lanes, Wrexham, Clwyd, LL13 0TS Classification: Abattoirs Status: Active Positional Accuracy: Automatically positioned to the address	A14SE (E)	933	-	337439 347808
41	Contemporary Trade Directory Entries Name: R F Bellis Haulage Ltd Location: Unit 4, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Road Haulage Services Status: Active Positional Accuracy: Automatically positioned to the address	A19NW (NE)	972	-	337002 348816
41	Contemporary Trade Directory Entries Name: R G Engineering Services Location: Unit 4, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Engineers - General Status: Inactive Positional Accuracy: Automatically positioned to the address	A19NW (NE)	972	-	337002 348816
41	Contemporary Trade Directory Entries Name: W R Refrigeration Ltd Location: Unit 3, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Refrigeration Equipment - Commercial Status: Inactive Positional Accuracy: Automatically positioned to the address	A19NW (NE)	980	-	337013 348820
41	Contemporary Trade Directory Entries Name: Signature Kitchen Location: Unit 3, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Kitchen Furniture Manufacturers Status: Active Positional Accuracy: Manually positioned to the address or location	A19NW (NE)	980	-	337013 348820
41	Contemporary Trade Directory Entries Name: Wilsons Ltd Location: Unit 7, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Car Body Repairs Status: Active Positional Accuracy: Automatically positioned to the address	A19NW (NE)	982	-	337003 348828
41	Contemporary Trade Directory Entries Name: Apex Auto Centre Location: Unit 2, Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Mot Testing Centres Status: Active Positional Accuracy: Automatically positioned to the address	A19NW (NE)	991	-	337026 348825
41	Contemporary Trade Directory Entries Name: Britewater Ltd Location: Apex Centre, Clywedog Road South, Wrexham Industrial Estate, Wrexham, Clwyd, LL13 9XS Classification: Ventilators & Ventilation Systems Status: Active Positional Accuracy: Automatically positioned to the address	A19NW (NE)	999	-	337025 348835

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices Cheshire West and Chester Council - Environmental Health Department Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department Wrexham County Borough Council - Public Protection Department	April 2009 August 2008 May 2010	Annually Not Applicable Annual Rolling Update
Discharge Consents Environment Agency - Welsh Region	January 2011	Quarterly
Enforcement and Prohibition Notices Environment Agency - North West Region Environment Agency - Welsh Region	March 2011 March 2011	Quarterly Quarterly
Integrated Pollution Controls Environment Agency - North West Region Environment Agency - Welsh Region	October 2008 October 2008	Not Applicable Not Applicable
Integrated Pollution Prevention And Control Environment Agency - North West Region Environment Agency - Welsh Region	January 2011 January 2011	Quarterly Quarterly
Local Authority Integrated Pollution Prevention And Control Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department Cheshire West and Chester Council - Environmental Health Department Wrexham County Borough Council - Environmental Health Department	December 2008 March 2010 November 2010	Not Applicable Annually Annual Rolling Update
Local Authority Pollution Prevention and Controls Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department Cheshire West and Chester Council - Environmental Health Department Wrexham County Borough Council - Environmental Health Department	December 2008 March 2010 November 2010	Not Applicable Annually Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department Cheshire West and Chester Council - Environmental Health Department Wrexham County Borough Council - Environmental Health Department	December 2008 February 2011 November 2010	Not Applicable Annually Annual Rolling Update
Nearest Surface Water Feature Ordnance Survey	July 2010	Quarterly
Pollution Incidents to Controlled Waters Environment Agency - Welsh Region	December 1998	Not Applicable
Prosecutions Relating to Authorised Processes Environment Agency - North West Region Environment Agency - Welsh Region	December 2011 January 2011	Monthly Monthly
Prosecutions Relating to Controlled Waters Environment Agency - North West Region Environment Agency - Welsh Region	December 2011 January 2011	Monthly Monthly
Registered Radioactive Substances Environment Agency - North West Region Environment Agency - Welsh Region	January 2011 January 2011	Quarterly Quarterly
River Quality Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points Environment Agency - Head Office	January 2011	Annually
River Quality Chemistry Sampling Points Environment Agency - Head Office	January 2011	Annually
Substantiated Pollution Incident Register Environment Agency - North West Region - South Area Environment Agency Wales - North Area	January 2011 January 2011	Quarterly Quarterly

Agency & Hydrological	Version	Update Cycle
Water Abstractions Environment Agency - Welsh Region	January 2011	Quarterly
Water Industry Act Referrals Environment Agency - North West Region Environment Agency - Welsh Region	October 2010 October 2010	Quarterly Quarterly
Groundwater Vulnerability Environment Agency - Head Office	January 2011	Not Applicable
Drift Deposits Environment Agency - Head Office	January 1999	Not Applicable
Bedrock Aquifer Designations British Geological Survey - National Geoscience Information Service	October 2010	Annually
Superficial Aquifer Designations British Geological Survey - National Geoscience Information Service	October 2010	Annually
Source Protection Zones Environment Agency - Head Office	January 2011	Quarterly
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	November 2010	Quarterly
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	November 2010	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	November 2010	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	November 2010	Quarterly
Flood Defences Environment Agency - Head Office	November 2010	Quarterly

Waste	Version	Update Cycle
BGS Recorded Landfill Sites British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Historical Landfill Sites Environment Agency - North West Region - South Area Environment Agency Wales - North Area	January 2011 January 2011	Quarterly Quarterly
Integrated Pollution Control Registered Waste Sites Environment Agency - North West Region Environment Agency - Welsh Region	October 2008 October 2008	Not Applicable Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries) Environment Agency - North West Region - South Area Environment Agency Wales - North Area	January 2011 January 2011	Quarterly Quarterly
Licensed Waste Management Facilities (Locations) Environment Agency - North West Region - South Area Environment Agency Wales - North Area	October 2010 October 2010	Quarterly Quarterly
Local Authority Landfill Coverage Cheshire County Council (now part of Cheshire East Council) - Environmental Planning Department Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department Wrexham County Borough Council	May 2000 May 2000 May 2000	Not Applicable Not Applicable Not Applicable
Local Authority Recorded Landfill Sites Cheshire County Council (now part of Cheshire East Council) - Environmental Planning Department Wrexham County Borough Council Chester City Council (now part of Cheshire West and Chester Council) - Environmental Health Department	February 2005 June 2003 May 2000	Not Applicable Not Applicable Not Applicable
Registered Landfill Sites Environment Agency - North West Region - South Area Environment Agency Wales - North Area	March 2003 March 2003	Not Applicable Not Applicable
Registered Waste Transfer Sites Environment Agency - North West Region - South Area Environment Agency Wales - North Area	March 2003 March 2003	Not Applicable Not Applicable
Registered Waste Treatment or Disposal Sites Environment Agency - North West Region - South Area Environment Agency Wales - North Area	March 2003 March 2003	Not Applicable Not Applicable
Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH) Health and Safety Executive	May 2010	Bi-Annually
Explosive Sites Health and Safety Executive	July 2010	Bi-Annually
Notification of Installations Handling Hazardous Substances (NIHHS) Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements Wrexham County Borough Council - Planning Department Cheshire West and Chester Council - Planning Department Cheshire County Council (now part of Cheshire East Council) - Planning Department Chester City Council (now part of Cheshire West and Chester Council)	December 2010 February 2011 July 2008 October 2008	Annual Rolling Update Annually Annual Rolling Update Not Applicable
Planning Hazardous Substance Consents Wrexham County Borough Council - Planning Department Cheshire County Council (now part of Cheshire East Council) - Planning Department Cheshire West and Chester Council - Planning Department Chester City Council (now part of Cheshire West and Chester Council)	December 2010 July 2008 March 2010 October 2008	Annual Rolling Update Annual Rolling Update Annually Not Applicable

Geological	Version	Update Cycle
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	October 2010	Bi-Annually
BGS 1:625,000 Solid Geology British Geological Survey - National Geoscience Information Service	August 1996	Not Applicable
Coal Mining Affected Areas The Coal Authority - Mining Report Service	January 2006	As notified
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	February 2009	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2010	Annually
Radon Potential - Radon Affected Areas British Geological Survey - National Geoscience Information Service	May 2007	As notified
Radon Potential - Radon Protection Measures British Geological Survey - National Geoscience Information Service	May 2007	As notified
Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries Thomson Directories	February 2011	Quarterly
Fuel Station Entries Catalist Ltd - Experian	February 2011	Quarterly

Sensitive Land Use	Version	Update Cycle
Areas of Adopted Green Belt Chester City Council (now part of Cheshire West and Chester Council)	December 2010	As notified
Areas of Unadopted Green Belt Chester City Council (now part of Cheshire West and Chester Council)	December 2010	As notified
Areas of Outstanding Natural Beauty Natural England Countryside Council for Wales	July 2010 November 2010	Bi-Annually Bi-Annually
Environmentally Sensitive Areas The National Assembly for Wales - GI Services (Department of Planning & Countryside) Natural England	August 2008 October 2010	Annually Annually
Forest Parks Forestry Commission	April 1997	Not Applicable
Local Nature Reserves Natural England Wrexham County Borough Council	December 2010 December 2010	Bi-Annually Bi-Annually
Marine Nature Reserves Countryside Council for Wales	November 2010	Bi-Annually
National Nature Reserves Countryside Council for Wales	November 2010	Bi-Annually
National Parks The National Assembly for Wales - GI Services (Department of Planning & Countryside) Natural England	August 2008 January 2011	Annually Bi-Annually
Nitrate Sensitive Areas Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	December 2009	Not Applicable
Nitrate Vulnerable Zones The National Assembly for Wales - GI Services (Department of Planning & Countryside)	October 2005	Annually
Ramsar Sites Countryside Council for Wales	November 2010	Bi-Annually
Sites of Special Scientific Interest Countryside Council for Wales	November 2010	Bi-Annually
Special Areas of Conservation Countryside Council for Wales	November 2010	Bi-Annually
Special Protection Areas Countryside Council for Wales	November 2010	Bi-Annually

Appendix D

Raw Materials

D1 Raw Materials

Schedule 1 Activity	Use	Raw Material and chemical composition	Storage Location and capacity	Quantities used	Fate of the material in the installation (i.e. approximate percentages to each environmental medium and to the products	Environmental impact (e.g. degradability, bioaccumulation potential, toxicity to relevant species)	Reasonably practicable alternative raw materials	Justification for the continued use of any substance for which there is a less hazardous alternative
Combustion	Combustion fuel 1	Bio Gas CH ₄ /CO ₂ /N ₂ /trace substances	Gas holders 1350m ³ at standard operating pressure	2.65x10 ⁶ m ³ /annum	100% combustion products to air	Combustion product CO ₂ is a greenhouse gas.	None. The biogas is from a waste	Renewable energy under the OFGEM ROCs system.
	Combustion fuel 2	Natural Gas	National grid	1.4x10 ⁵ m ³ /annum	100% combustion products to air	Combustion product CO ₂ is a greenhouse gas.	Fuel Oil	There is no less hazardous alternative. Fuel Oil was rejected due to the H&S issues associated with storage and discharge of particulates. NG is only to be used as a back up to the Biogas

Schedule 1 Activity	Use	Raw Material and chemical composition	Storage Location and capacity	Quantities used	Fate of the material in the installation (i.e. approximate percentages to each environmental medium and to the products	Environmental impact (e.g. degradability, bioaccumulation potential, toxicity to relevant species)	Reasonably practicable alternative raw materials	Justification for the continued use of any substance for which there is a less hazardous alternative
	Low Temperature Hot Water System	Potable Water	Various pipework and locations around the site	Variable but once system is full it is a closed system and should only be topped up at loss of pressure due to leakage etc. m3/d	100% contained within the system.	Negligible	N/A	N/A
	Hot water pipework	Corrosion inhibitor	N/A due to small quantities only added periodically. If used the corrosion inhibitor will be brought to site as and when required and will therefore not required storage.	50 litres / first fill of hot water pipework with 5 litres/m ³ of water.	100% to boiler feed water	Negligible, no residual expected. If the pipework is drained down it will be routed through the treatment works.	N/A	The initial design is that oxygen scavenger will not be required in the boiler water. If it is required it will likely be sodium bisulphate and will be in the quantities shown.
	Engine lubrication	Lubricating Oil	100l inside the CHP container which acts as a bund.	1.5m ³ /annum	Recovered, re-used or disposed	Negligible	N/A	N/A

F. Correspondence

Manns, Anita L

From: Manns, Anita L
Sent: 24 October 2018 12:05
To: Manns, Anita L
Subject: RE: NN26 - Permit Application - Questions

From: Dean Jonathan
Sent: 07 November 2017 14:58
To: [REDACTED]
Cc: [REDACTED]
Subject: FW: NN26 - Permit Application - Questions

Jayne,

Could you have a look at question 2 of the below and comment please.

Sean,

Attached environmental plans for the site and G2G plant. The new AAD area will need to have its own environmental plan produced (3b)

Question 4 yes QMS 14001 audited Feb 2017 and passed with no non conformities.

Question 5 (a) yes (b) yes it will be added to the new plan.

Question 6 we have recently had an noise survey, report pending but no actual plan in place for noise and odour, any complaints would be handled through the OCC.

Question 7 I would imagine the codes being the same to currently being operated, I have not heard we will be trying to accept any different types of wastes.

Question 8 attached.

Question 9 complaints procedure- all calls and emails handled through the DCWW OCC.

Question 10 no odour complaints received.

Question 11 no noise complaints received.

Thanks
Jonathan



**Cyfoeth
Naturiol
Cymru
Natural
Resources
Wales**

Ein cyf/Our ref: VOC monit
Eich cyf/Your ref:

Natural Resources Wales
Chester Road
Buckley
Flintshire CH7 3AJ

Ebost/Email:
julia.frost@naturalresourceswales.gov.uk
Ffôn/Phone: 03000 653859

Dwr Cymru Cyfyngedig
Five Fords WwTW
Cefn Road
Abenbury
Wrexham
LL13 0PA

23 July 2015

Dear Mr Dixon

At our meeting on 15 June 2015 we discussed the issues that Welsh Water have been experiencing with achieving the VOC limit in your permit at Five Fords.

I highlighted that I was not comfortable to continue with the "temporary relaxation" of the VOC limit given to yourselves previously, without agreeing a revised emission limit value and timescale on it.

You asked why emission limit values have been set at Five Fords and not at other similar sites Welsh Water have. As promised I looked into these issues and reviewed the historical discussions regarding it.

The original permit issued to you in 2012 included four improvement conditions. Whilst I can find emails relating to this issue and confirmation that these improvement conditions have been signed off, I have been unable to locate the actual submissions. The improvement condition sign off in June 2013 refers to the submission of results of a sampling exercise in January and February 2013 but not the further assessment required. To date you have been unable to provide these also.

In the original application the biogas was reported to contain very low levels of VOCs and the combustion control systems should ensure effective combustion and VOC destruction. A limit was set in the permit for VOCs of 1000 mg/m³ based on the benchmark stated in Environment Agency Guidance. However, an improvement condition was set requiring you to propose an appropriate monitoring programme to establish the levels of total VOCs and Non-methane VOCs from the CHP stacks. As a follow on to this a second improvement condition required you to carry out an assessment of the environmental impact of these emissions on the environment.

The results of the monitoring and the results of the assessment were to be reported to ourselves so that we could assess whether the VOC limit set was appropriate and whether a limit for nmVOCs was necessary.

At our meeting in June 2015 you said that you proposed to carry out the annual air monitoring over the summer. I suggest that, once the 2015 results are available, you carry out the assessment required by the improvement condition in the original permit using the results obtained to date. As well as the VOC and nmVOCs required by improvement conditions 1 and 2, SO₂ emissions should also be considered as required by improvement conditions 3 and 4. This information should then be submitted to Natural Resources Wales for review.

Continued over

Until this review is complete, and any revised limits incorporated into a permit variation, the emission limit values set in the original permit will stand and an exceedance of these must be reported and investigated in line with the relevant permit conditions.

To allow time for the completion of the monitoring, review of the results and pulling together of a report, the end of December 2015 would seem like an appropriate deadline.

The VOC result for 2014 was considerably higher than previous results. In order to try and understand why this was I asked to be provided with the monitoring reports from the sampling exercises to date. These reports have been reviewed internally by our monitoring expert who has come back with the following comments:

- It would be useful to gather as much information as to what the load through the CHPs is when the monitoring is being carried out. This may help indicate a difference in VOC emissions
- Are there any CEMS on the CHPs monitoring VOCs?
- Have you assessed whether there has been a change in inlet biogas causing the increase in VOCs in the last round of monitoring?
- Is the maintenance schedule adequate to ensure that the CHP are re-tuned appropriately or whether there has been extensive wear and tear?

Please can you confirm that you are happy with this proposal and that a deadline of end December 2015 for the assessment is achievable.

Yours sincerely



Julia Frost
Swyddog Rheliad a Cyswllt Cymdeithas / Regulatory and Community Liaison Officer

Facility Reference Information

Please complete the following information:

Company Name: Dwr Cymru - Welsh Water
 Location: Five Fords, Wrexham
 Permit Number: EPR/AP3139FT

If you have data already stored in a previous version of the H1 software you may import it by pressing the button to the right.

Please note that before the import can take place any data that already exists in this copy of the tool will be removed. Please also note that any 'Operating Mode' information you had entered in your Air and Water inventories will defer to the default of 100% on data import

Import Utility

NOTE ON MICROSOFT ACCESS SECURITY WARNING

Depending on your security settings, you may get a security notice appearing each time the import routine connects to a table in your source database. You need to click 'Open' on this message for the import routine to be successful. There are 18 tables to connect to in total but if you place your cursor over the 'Open' button you will be able to repeatedly click your mouse to make this process execute quickly and without too much frustration. We apologise for this inconvenience but it is an aspect of Microsoft Security provisions that are beyond our control.

Describe the Objectives

Depending on the reason for the assessment you will need to complete different parts of the tool.

Select the type of assessment:

- | | | |
|-------------------------------------|--|---|
| ☒ a) | to carry out an ENVIRONMENTAL ASSESSMENT of the releases resulting from the facility as a whole | Do Steps 1, 2 and 3 only |
| ☐ b) | to conduct a costs/benefits OPTIONS APPRAISAL to determine BAT or support the case for derogation under the Industrial Emission Directive. | Do Steps 1, 2, 3 and 4 and continue with 5 and 6 if necessary |

1.1 Briefly summarise the objectives and reason for the assessment in terms of the main environmental impacts or emissions to be controlled:

To assess the significance of the site's VOC emissions (which are present as methane).

Scope of Environmental Assessment

List the activities included in the assessment

Number	Activity	Comments
1	Waste Treatment CHP Facility	Assessment of VOC releases from the site's two CHP stacks, references A1 and A2.

Use the 'Add' button at the bottom left to create a new activity

Describe the Candidate Options

Identify all reasonably applicable options of techniques

You should include:

- a brief description of individual control measures or configurations of control measures selected for each option, and the activities with which they are associated (the existing base-case may conveniently be the first option).
- justification why any techniques generally applicable to the regulated facility have not been selected for assessment. (see relevant H1 annex) (This should be based on regulated facility-specific technical, not economic reasons).
- for new projects, whether any initial environmental assessment that was done at the project evaluation stage, or any screening of technology or process routes prior to this assessment, particularly where this has a bearing on environmental performance. (see H1)

In the case of b) or c)
please enter your Comments here:

N/A

Option Number	Title	Description
1	Base-Case	N/A

Once a series of options have been generated for the proposed project, it is recommended that the Operator discuss these with the local Regulator to check both parties agree that the options are satisfactory. This may save the Operator from spending resources on assessment of options which are unlikely to meet the required environmental performance.

List the main activity or activities to which the release control options are applicable and any other activities that will be affected by the candidate control option on the main activity:

Air Release Points

Please define your Release Points for Releases to Air

Are there any Air emissions?

Yes

Number	Description	Location or Grid Reference	Activity or Activities	Effective Height metres	Efflux Velocity m/s	Total Flow m3/hr
1	A1	CHP Discharge Stack 1	Combustion of anaerobic digestion plant biogas, CHP 1.	0		1840
2	A2	CHP Discharge Stack 2	Combustion of anaerobic digestion plant biogas, CHP 2.	0		1806

Comments

Efflux velocity and total flow expressed at reference conditions of 273K, 101.3kPa, 5% oxygen, dry.

Building height within a distance of 5L is 23m high, whereas discharge stacks heights are only 18m high. Accordingly, effective stack heights are zero.

Air Emissions Inventory

Please list all Substances released to Air for each Release Point identified in the previous page.

Number	Substance	Measurement Method	Operating Mode (% of	Data relating to Long Term effects			Data relating to Short Term effect			Annual Rate	ELV Conc.
				Conc.	Release Rate	Measurement Basis	Conc.	Release Rate	Measurement Basis		
1	Total VOCs as Methane	Periodic*	100.0%	1689.8	0.863676	hourly average	1689.8	0.863676	hourly average	27.2369	

Measurement method: * provide detail in comments box

Comments: Permit ELVs are 1000mg/m3 expressed as total VOCs. There are no EALs for methane. It was agreed with the NRW that the US PAC value of 1885mg/m3 should be used as the EAL.

Measurement method: * provide detail in comments box

Comments:

Permit ELVs are 1000mg/m3 expressed as total VOCs. There are no EALs for methane, it was agreed with the NRW that the US PAC value of 1885mg/m3 should be used as the EAL.

Air Emissions Inventory

Please list all Substances released to Air for each Release Point identified in the previous page.

Number	Substance	Measurement Method	Operating Mode (% of)	Data relating to Long Term effects		Data relating to Short Term effect		Annual Rate	ELV Conc.
				Conc.	Release Rate	Conc.	Release Rate		
1	Total VOCs as Methane	Periodic*	100.0%	1688.0	0.846813 hourly average	1688.0	0.846813 hourly average	26.7051	

Measurement method: * provide detail in comments box

Comments: Permit ELVs are 1000mg/m3 expressed as total VOCs. There are no EALs for methane, it was agreed with the NRW that the US PAC value of 1885mg/m3 should be used as the EAL.

Identify Relevant Impacts

Identify any environmental impacts that are not relevant to this assessment by deselecting from the list below:

Releases in Part 2?		Justification for omission
Yes	☒ Air	
Yes	☐ Deposition from Air to Land	Not relevant to this assessment
No	☐ Water	Not relevant to this assessment
No	☐ Waste	Not relevant to this assessment
Yes	☐ Visual	Not relevant to this assessment
Yes	☐ Ozone Creation	Not relevant to this assessment
Yes	☐ Global Warming	Not relevant to this assessment

If you have deselected an environmental impact as not relevant to this assessment, no further assessment of this impact will be carried out

Local Environmental Quality

Describe the Quality of the Environment:

Provide a brief description of the main local factors that may influence the importance of the impact of emissions in the surrounding environment

Air Quality

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity ?
(Environmental Quality Standards for air and water are described in EPR Technical Guidance Notes)

No

Are there any Local Air Quality Management Plans applicable to releases from the activity?

No

Water Quality & Resources

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity?

Are proposals to abstract water satisfactory in order to obtain an abstraction licence?

Is the activity located in a groundwater vulnerable zone (for activities with direct releases to land only)?

Proximity to Sensitive Receptors

Is public annoyance likely to be an issue for noise, odour or plume visibility ?

Are there any wildlife habitats, eg Special Areas of Conservation, or Special Protection Areas, likely to be affected by releases from the activity? (Description of requirements of Habitats Directive is provided in EPR Technical Guidance Notes)

Air Impacts

Calculate Process Contributions of Emissions to Air

This table estimates the Process Contribution (PC), calculated as the maximum ground level concentration for each emission listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dispersion modelling, this may be entered as indicated and will be used instead of the estimated PC.

Number	Substance	Long Term			Short Term		
		EAL µg/m ³	PC µg/m ³	* Modelled PC µg/m ³	EAL µg/m ³	PC µg/m ³	Modelled PC µg/m ³
1	Total VOCs as Methane	1885000	253		1885000	6.671	

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

State the location of any detailed air dispersion modelling and also the main assumptions:

Comments

Air Impact Screening Stage One

Screen out Insignificant Emissions to Air

This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.

Number	Substance	Long Term		Short Term		Long Term		Short Term	
		EAL	µg/m ³	EAL	µg/m ³	PC	% PC of EAL	> 1% of EAL?	> 10% of EAL?
1	Total VOCs as Methane	1,885,000	µg/m ³	1,885,000	µg/m ³	253	0.0135	No	No
						6,671	0.354		

Air Impact Modelling Assessment

See guidelines in H1 Annex F section entitled "Decide if you need detailed air modelling."

Describe here the justification for whether detailed modelling is, or is not required for any of the releases. Refer to the guidelines in H1 Annex F

Impact of methane releases is insignificant, therefore, no further assessment is required.

Describe source of background information:

Document Reference of detailed modelling work:

Rhys Ellis
Regulatory officer
Natural Resources Wales
Industrial Regulation Team

23/03/2018

Re: Monitoring reports Five Fords 2017

Dear Rhys,

Thank you for the correspondence on 2nd March. I have compiled further information which I ask be considered as part of our assessment for Calendar year 2017.

With respect to reporting deadlines Welsh Water (DCWW) has previously illustrated to NRW at site meetings that all our other permits for CHP operations stipulate a 31st March deadline for performance data. This 31st March deadline also coincides with our Combined Heat and Power Quality Assurance reporting to Ricardo AEA. I subsequently understood DCWW to have permission to submit these returns by 31st March. Please can you advise how we clarify this to avoid DCWW working to different deadlines to those that NRW are expecting?

With respect to the emissions data itself, Five Fords operated with a "temporary relaxation" from its commissioning in 2012 until 2015. Following commissioning of a Gas to Grid plant, NRW's Julia Frost determined that the temporary relaxation was no longer appropriate in a letter dated 23rd July 2015. DCWW has since worked with its maintenance provider Edina and has consistently achieved VOC emissions well below the peak levels of around 3,000 mg/m³ recorded on 4th November 2015. DCWW undertook testing on 9th and 10th June 2016 to evidence that combustion set point changes can yield changes to NO_x emissions whilst the VOC emissions remained consistently around 1,600 mg/m³. In parallel with this, DCWW engaged Environmental Compliance Ltd to produce a H1 assessment using worst-case (3,000 mg/m³) recorded emissions. This H1 assessment determined there was no significant impact to the environment and this was acknowledged by NRW on 22/11/2016.

I now seek a mutual conclusion on how to permit the VOC emissions. During an audit on 22nd November 2016 NRW's gas engine specialist Tony Roberts advised Five Fords' engines are not a cause of environmental concern. Since 2015 DCWW has continually evidenced improved VOC emissions from the CHP engines. In addition DCWW has provided NRW evidence that other V12 CHP engines in DCWW's portfolio achieve very similar VOC emission levels, around 2,000 mg/m³. I would very much welcome further discussion to explore a more workable permit for both parties.

Best regards,



Andrew Dixon
Energy Operations Manager (Generation)

Dixon Andrew

From: Dixon Andrew
Sent: 10 May 2016 18:43
To: 'Frost, Julia'
Cc: Dean Jonathan; Bradford, Julie; Williams Aled
Subject: Five Fords WwTW - EPR/AP3139FT
Attachments: RE: Five Fords H1

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Julia,

I am writing in response to your CAR form raised on 20/04/2016. As promised I have undertaken some further discussions with our engine O&M provider Edina to see if we can shed any further light on the points you raised in your recent CAR form. I intend to give a further update before the end of May to try and further address your comments around changes in operation and root cause, however, given Edina's response in point 3 I think we may need to arrange for a follow-up meeting after the emissions are re-tested in June 2016 to consider what the most pragmatic solution is for the VOC condition within the permit.

1. The figures and concentration used on the original H1 assessment were based on the average from the four years of operation. I attach again the revised H1 Environmental Compliance Ltd completed using worst case conditions from the four years. The findings still conclude that the VOC emissions are not environmentally significant. I trust this also answers your second comment on why the initial H1 was not at worst case conditions.
2. I appreciate the permit condition still stands, however, I am unsure what we may be able to implement beyond the actions already identified:
 - a. I have sought further information from the engine O&M provider – this follows in point 3.
 - b. We are investigating the possibility that changes to sludge import composition, in particular increased industrial sludge from the Kinmel Bay area, may contribute to the rise in VOC content of the biogas, however, I cannot give anything more detailed at this stage.
 - c. We have changed engine loading, by the very introduction of the gas to grid plant which gave rise to the amended permit in 2015, we have reduced the volume of biogas being utilised by the CHP engines and have reduced the loading on the engines (80% cap at present) to reduce start-stopping of the engines. I feel if we increased the demand settings on the engines they would ramp up to higher outputs and then frequently shut down due to biogas availability – we are not producing enough raw biogas to run the engines and the gas to grid plant at high loadings.
3. From discussion with Edina's UK Service Manager there have been no major changes to the routine maintenance activities undertaken at Five Fords. The engine management systems are set up such that they are trying to give the optimum trade-off between combustion temperature and inlet air temperature. Inlet air temperature is controlled using the intercooler to set engine efficiency and performance parameters. At present NO_x levels, which I understand vary inversely with the VOC levels, are set below the permit threshold of 500 mg/m³ within the Engine Management System. It is possible for us to configure the engines to burn hotter which would achieve an increase in VOC 'burn-off', however, we would potentially increase NO_x emissions in doing so.

In the meantime I will arrange for us to undertake further emissions testing in June 2016 and look forward to hearing back from you once you have had a chance to give the points above due consideration. As mentioned above I will be in touch again before the end of May to update you on further findings.

Best regards,

Andrew Dixon

H1



Welcome to the H1 Software

Version 2.7.6 - February 2016

If you find the screen fonts in the H1Tool too small to read you can use the Windows zoom feature at any time to magnify the screen by holding down the 'Windows' key and '+' key. To cancel the feature hold down the 'Windows' key and 'Esc' key.

Introduction

This version of the tool accompanies the Horizontal Guidance Note H1 and the eleven supporting technical annexes

Important Notes:

With the exception of Annex I (Landfill) and Annex J (Groundwater) this software tool can be used to complete risk assessments within the technical annexes which support H1. However, further information may need to be provided in the following areas:

- detailed assessment of fate and effects, where required
- decision-making trails for the comparison and ranking of options

This software provides a general structure for assessing costs and environmental impacts. You may need to decide the best way to apply this structure to fit the nature and pattern of your operation, in particular:

- where load is variable, such as seasonal or demand-led operations
- where a number of processes are conducted at the same time, such as integrated operations
- where a number of products are made, with possible differences in unit operations and release points employed
- where fugitive or potential emergency releases are of particular interest

Information in this database will be used to determine your EPR permit, therefore to get the most from this software tool, you should:

- read the H1 Overview document, to understand the basic principles, module structure and methods
- use the HELP boxes and refer to the H1 guidance as you progress to ensure that the data you input is representative and accurate
- use the comments boxes to clarify assumptions and data sources

This software will also output annual emissions data to an OPRA profile(s), which you can select on the Summary Tables page.

[On line instructions on using this tool and on the H1 Methodology itself are available on Gov.UK \(click here\)](#)

Facility Reference Information

Please complete the following information:

Company Name: Dwr Cymru-Welsh Water
Location: Five Fords, Wrexham
Permit Number: EPR/AP3139FT

If you have data already stored in a previous version of the H1 software you may import it by pressing the button to the right.

Import Utility

Please note that before the import can take place any data that already exists in this copy of the tool will be removed. Please also note that any 'Operating Mode' information you had entered in your Air and Water inventories will defer to the default of 100% on data import

NOTE ON MICROSOFT ACCESS SECURITY WARNING

Depending on your security settings, you may get a security notice appearing each time the import routine connects to a table in your source database. You need to click 'Open' on this message for the import routine to be successful. There are 18 tables to connect to in total but if you place your cursor over the 'Open' button you will be able to repeatedly click your mouse to make this process execute quickly and without too much frustration. We apologise for this inconvenience but it is an aspect of Microsoft Security provisions that are beyond our control.

Introduction to Step 1

Step 1: Describe the Scope and Options

The aim of this step is to:

- state the OBJECTIVES of the assessment
- in the case of ENVIRONMENTAL ASSESSMENT of the whole facility, describe the scope of the activities to be included in the assessment;
- in the case of OPTIONS APPRAISALS, identify candidate options for BAT by considering all relevant techniques to prevent and minimise pollution and the scope of activities covered by the techniques.

Depending on the reason for the assessment, you will need to complete different modules of the guidance. The software will automatically select the required modules according to the responses you enter.

NOTE: If you are going to complete more than one assessment or appraisal, make sure that you create a copy of the H1 file for each new assessment BEFORE you begin to input data. This is because Microsoft Access automatically saves changes to the current file you are using, rather than allowing you to save your changes at the end of your work.

TO CONTINUE WITH STEP 1, PRESS "NEXT".

Describe the Objectives

Depending on the reason for the assessment you will need to complete different parts of the tool.

Select the type of assessment:

- ☒ a) to carry out an ENVIRONMENTAL ASSESSMENT of the releases resulting from the facility as a whole Do Steps 1, 2 and 3 only
- ☐ b) to conduct a costs/benefits OPTIONS APPRAISAL to determine BAT or support the case for derogation under the Industrial Emission Directive Do Steps 1, 2, 3 and 4 and continue with 5 and 6 if necessary

1.1 Briefly summarise the objectives and reason for the assessment in terms of the main environmental impacts or emissions to be controlled:

To assess the significance of the site's VOC emissions (which are present as methane).

Scope of Environmental Assessment

List the activities included in the assessment

Number	Activity	Comments
1	Waste Treatment CHP Facility	Assessment of VOC releases from the site's two CHP stacks, references A1 and A2.

Use the 'Add' button at the bottom left to create a new activity

Describe the Candidate Options

Identify all reasonably applicable options of techniques

You should include:

- a brief description of individual control measures or configurations of control measures selected for each option, and the activities with which they are associated (the existing base-case may conveniently be the first option).
- justification why any techniques generally applicable to the regulated facility have not been selected for assessment. (see relevant H1 annex) (This should be based on regulated facility-specific technical, not economic reasons).
- for new projects, whether any initial environmental assessment that was done at the project evaluation stage, or any screening of technology or process routes prior to this assessment, particularly where this has a bearing on environmental performance. (see H1)

In the case of b) or c)
please enter your Comments here:

N/A

Option Number	Title	Description
1	Base-Case	N/A

Once a series of options have been generated for the proposed project, it is recommended that the Operator discuss these with the local Regulator to check both parties agree that the options are satisfactory. This may save the Operator from spending resources on assessment of options which are unlikely to meet the required environmental performance.

List the main activity or activities to which the release control options are applicable and any other activities that will be affected by the candidate control option on the main activity:

Introduction to Step 2

Step 2: Emissions Inventory

The aim of this Step is to produce an inventory of sources and releases of polluting substances from each option. This is used as the basis for the subsequent evaluation of environmental impacts.

For this Step you will require information on:

- release points and sources of emissions to air, water (inc. sewer) or land
- concentration and mass rate of released substances
- frequency and duration of releases and how these relate to long term and short term effects

IMPORTANT NOTES

- you may need to consider a suitable method for assessment of groups of pollutants, such as VOCs, heavy metals, uncharacterised liquid effluents, etc (see "Grouping air emissions" in Annex F).

TO CONTINUE WITH STEP 2, PRESS "NEXT".

Air Release Points

Please define your Release Points for Releases to Air

Are there any Air emissions?

Yes

Number	Description	Location or Grid Reference	Activity or Activities	Effective Height metres	Efflux Velocity m/s	Total Flow m ³ /hr
1 A1		CHP Dishcharge Stack 1	Combustion of anaerobic digestion plant biogas, CHP 1		0	2158
2 A2		CHP Dishcharge Stack 2	Combustion of anaerobic digestion plant biogas, CHP 2		0	2150

Comments

Efflux velocity and total flow expressed at reference conditions of 273K, 101.3kPa, 5% Oxygen & Dry Gas and is the highest recorded from the emissions data between 2013 - 2015.

Building height within a distance of 5L is 23m high, whereas the discharge stacks heights are only 18m high. Accordingly, effective stack heights are zero.

Air Emissions Inventory

Please list all Substances released to Air for each Release Point Identified in the previous page.

Number	Substance	Meas'ment Method	Operating Mode (% of)	Data relating to Long Term effects					Data relating to Short Term effect			Annual Rate	ELV Conc.
				Conc.	Release Rate	Meas'ment Basis	Conc.	Release Rate	Meas'ment Basis	Conc.	Annual Rate		
				mg/m3	g/s		mg/m3	g/s		mg/m3	tonne/yr		mg/m3
1	Total VOCs as Methane	Periodic*	100.0%	3016.8	1.808422	hourly average	3016.8	1.808404	hourly average		57.0304		

Measurement method: * provide detail in comments box

Comments: Permit ELVs are 1000mg/m3 expressed as total VOCs.

There are no EALs for methane. It was agreed with the NRW that the US PAC value of 1885mg/m3 should be used as the EAL.

TVOC data is the worst case from the emissions data measured between 2013 - 2015.

Air Emissions Inventory

Please list all Substances released to Air for each Release Point identified in the previous page.

Number	Substance	Measurement Method	Operating Mode (% of)	Data relating to Long Term effects				Data relating to Short Term effect				Annual Rate tonne/yr	ELV Conc. mg/m3
				Conc. mg/m3	Release Rate g/s	Measurement Basis	Conc. mg/m3	Release Rate g/s	Measurement Basis	Conc. mg/m3	Annual Rate tonne/yr		
1	Total VOCs as Methane	Periodic*	100.0%	2250.8	1.344234	hourly average	2250.8	1.344234	hourly average	42.3918			

Measurement method: * provide detail in comments box

Comments: Permit ELVs are 1000mg/m3 expressed as total VOCs.

There are no EALs for methane. It was agreed with the NRW that the US PAC value of 1885mg/m3 should be used as the EAL.

TVOC data is the worst case from the emissions data measured between 2013 - 2015.

Identify Relevant Impacts

Identify any environmental impacts that are not relevant to this assessment by deselecting from the list below:

Releases in Part 2?	Justification for omission
Yes	☒ Air
Yes	☐ Deposition from Air to Land
No	☐ Water
No	☐ Waste
Yes	☐ Visual
Yes	☐ Ozone Creation
Yes	☐ Global Warming
	Not relevant to this assessment
	Not relevant to this assessment
	Not relevant to this assessment
	Not relevant to this assessment
	Not relevant to this assessment
	Not relevant to this assessment

If you have deselected an environmental impact as not relevant to this assessment, no further assessment of this impact will be carried out

Introduction to Step 3

Step 3: Quantify Impacts

The aim of this Step is to quantify the effects on the environment of the releases listed in the inventory in Step 2. The guidance provides methods for assessing the eight main environmental considerations of most relevance to the EPR regime. Your releases may not result in effects to all eight of these considerations, and this tool allows you to screen out any that are not relevant.

The emissions you entered in Step 2 are automatically brought forward for assessment into each environmental consideration that is relevant for that type of release (e.g. a release may have more than one type of effect).

This part of the tool allows you to screen out any releases that are insignificant, and to identify those releases where further, detailed assessment of the potential environmental impact may be required.

IMPORTANT NOTE

This software tool only completes part of the requirements for Step 3, as described above. Depending upon the degree of risk to the environment presented by the releases, the operator may need to do further, detailed assessment of the potential effects using methodologies that are not provided here. This information should be submitted separately, as indicated within this part of the tool.

TO CONTINUE WITH STEP 3, PRESS "NEXT".

Local Environmental Quality

Describe the Quality of the Environment:

Provide a brief description of the main local factors that may influence the importance of the impact of emissions in the surrounding environment

Air Quality

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity? (Environmental Quality Standards for air and water are described in EPR Technical Guidance Notes)

No

Are there any Local Air Quality Management Plans applicable to releases from the activity?

No

Water Quality & Resources

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity?

Are proposals to abstract water satisfactory in order to obtain an abstraction licence?

Is the activity located in a groundwater vulnerable zone (for activities with direct releases to land only)?

Proximity to Sensitive Receptors

Is public annoyance likely to be an issue for noise, odour or plume visibility?

Are there any wildlife habitats, eg Special Areas of Conservation, or Special Protection Areas, likely to be affected by releases from the activity? (Description of requirements of Habitats Directive is provided in EPR Technical Guidance Notes)

Air Impacts

Calculate Process Contributions of Emissions to Air

This table estimates the Process Contribution (PC), calculated as the maximum ground level concentration for each emission listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dispersion modelling, this may be entered as indicated and will be used instead of the estimated PC.

Number	Substance	Long Term			Short Term		
		EAL µg/m ³	PC µg/m ³	* Modelled PC µg/m ³	EAL µg/m ³	PC µg/m ³	Modelled PC µg/m ³
1	Total VOCs as Methane	1885000	467		1885000	12,295	

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

* State the location of any detailed air dispersion modelling and also the main assumptions: Comments

Air Impact Screening Stage One

Screen out Insignificant Emissions to Air

This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.

Number	Substance	Long Term		Short Term		Long Term		Short Term		> 10% of EAL?
		EAL	µg/m3	EAL	µg/m3	% PC of EAL	PC	% PC of EAL	PC	
1	Total VOCs as Methane	1,885,000	1,885,000	1,885,000	467	0.0248	12,295	0.653	12,295	No

Air Impact Modelling Assessment

See guidelines in H1 Annex F section entitled "Decide if you need detailed air modelling."

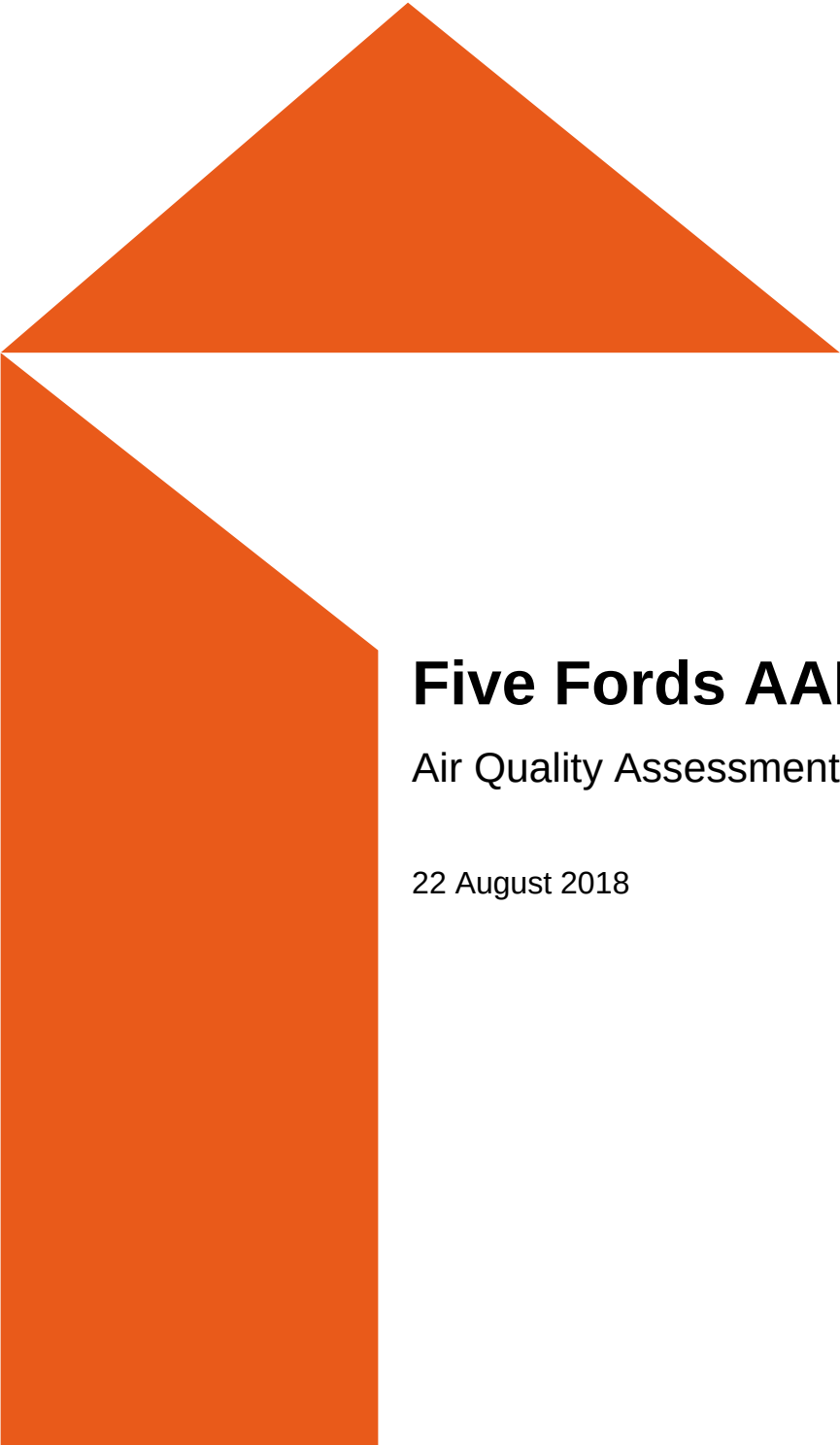
Describe here the justification for whether detailed modelling is, or is not required for any of the releases. Refer to the guidelines in H1 Annex F

Impact of methane releases is insignificant, therefore, no further assessment is required.

Describe source of background information:

Document Reference of detailed modelling work:

G. Environmental Assessments



Five Fords AAD

Air Quality Assessment

22 August 2018

Mott MacDonald Bentley
Ty Awen
Spooner Close
Celtic Springs Business
Park
Coedkernew
Newport NP10 8FZ
United Kingdom

mottmacbentley.co.uk

Five Fords AAD

Air Quality Assessment

22 August 2018

Issue and Revision Record

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1 Introduction

1.1 Overview

This document has been prepared to support the application to vary the existing bespoke Environmental Permit (hereafter referred to as 'the EP') EPR/AP3139FT for the Five Fords Advanced Anaerobic Digestion (AAD) ('the Plant') on behalf of Dŵr Cymru Welsh Water (DCWW) ('the Operator'). In order to satisfy the requirements of the Environmental Permitting Regulations (EPR) 2016, the Operator must apply to the Natural Resource Wales (NRW) for a change (variation) to an Existing Permit.

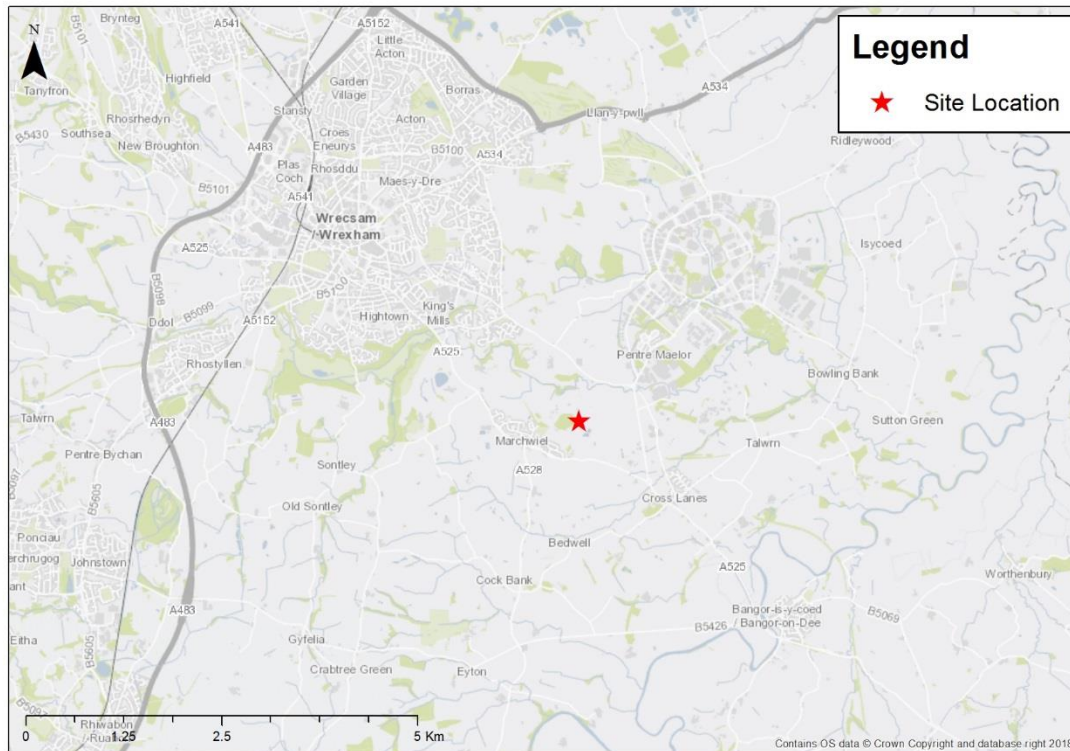
The existing EP includes the continuous operation of two Combined Heat and Power (CHP) engines which utilise biogas produced by the Anaerobic Digestion (AD) process one dual fuel (natural gas and biogas) standby boiler. This air quality assessment which supports the EP permit variation assesses two new proposed 1.6 MWth dual fuel steam boilers and changes to the operation of the existing CHP and standby boiler.

This report provides an assessment of potentially significant point source emissions to air, and subsequent air quality effects, associated with the operation of the existing and proposed plant using a detailed dispersion model.

A description of the plant process is presented in the main application document.

1.2 Site Location

The proposed plant is located within the existing Five Fords AAD, which is situated approximately 3.5km south east Wrexham Town Centre. Figure 1 shows the location of the site and the extent of the study area.



and can be oxidised within airborne water droplets. The most common sources of SO₂ include fossil fuel combustion, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of waste and production of elemental sulphur. Coal burning is the single largest man-made source of sulphur dioxide accounting for about 50% of annual global emissions, with oil burning accounting for a further 25-30%. The most common natural source of SO₂ is volcanoes.

1.3.3 Carbon monoxide

CO is a colourless, odourless gas produced by the incomplete combustion of carbon-based fuels and by biological and industrial processes. The major source of CO is traffic, particularly in urban areas. CO is produced under conditions of inefficient combustion, is rapidly dispersed away from the source and is relatively inert over the timescales relevant for its dispersion.

2 Legislative Context

2.1 European Union

Various EU Air Quality Directives and UK Air Quality Regulations are relevant to the operation of the CHP and Boiler Plant. The following section provides a summary of the relevant legal framework.

Directive 2008/50/EC¹ on ambient air quality and cleaner air for Europe was adopted in May 2008 and sets out a range of mandatory Limit Values (LV) for different pollutants including NO₂, SO₂ and CO. The directive consolidated previous air quality directives (apart from the Fourth Daughter Directive), setting Limit Values or Target Values for the concentrations of specific air pollutants and providing a new regulatory framework for particulate matter smaller than 2.5µm in diameter (PM_{2.5}). It also allows Member States to apply to postpone attainment deadlines.

The Air Quality Standards Regulations 2010² came into force in June 2010; they implement the EU's Directive 2008/50/EC on ambient air quality.

The Air Quality (England) Regulations 2000³ and Air Quality (England) (Amendment) Regulations 2002⁴ include air quality objectives that have different compliance target dates but which, in most cases, are numerically synonymous with the limit values. The air quality objectives are for specific use by local authorities in undertaking their local air quality management duties pursuant to Part IV of the Environment Act 1995. Relevant air quality objectives are also referenced for information in this assessment in absence of any limit values.

The Environment Act 1995 requires the UK Government to produce a national 'Air Quality Strategy' (AQS). The AQS establishes the UK framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. The first Air Quality Strategy was adopted in 1997 and replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in January 2000. The 2000 Strategy has subsequently been replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007⁵.

The air quality objectives in the AQS are a statement of policy intentions or policy targets. As such, there is no legal requirement to meet these objectives except in as far as they mirror any equivalent legally binding limit values in EU Directives and English Regulations.

The Environment Act 1995 requires that Natural Resource Wales has regard to the AQS in exercising their pollution control functions. Local Authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose.

¹ European Union. (April 2008), 'Directive on Ambient Air Quality and cleaner Air for Europe', Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044.

² Statutory Instrument. (2010), 'The Environmental Permitting (England and Wales) Regulations', Queen's Printer of Acts of Parliament.

³ Statutory Instrument. (2000), 'Air Quality (England) Regulations', No. 97. Queen's Printer of Acts of Parliament.

⁴ Statutory Instrument. (2002), 'Air Quality (England) (Amendment) Regulations', No. 297. Queen's Printer of Acts of Parliament.

⁵ Department for Environment Food and Rural Affairs. (July 2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland', Cm 7169, Department for Environment Food and Rural Affairs.

2.2 Permitting Requirements and Associated Guidance

2.2.1 Assessment criteria

The following section presents the relevant air quality standards that are applicable to the AAD plant and are collectively described as the environmental quality standards (EQS).

Natural Resource Wales have adopted the guidance issued by the Environment Agency. Environment Agency's Horizontal Guidance Note H1 (EA's H1) was replaced in February 2016 by the "air emissions risk assessment for your environmental permit"⁶ which provides guidelines for the air dispersion modelling report and environmental standards for air and Environmental Assessment Levels (EALs) for emissions to air and has been applied to this assessment.

2.2.2 Air quality limit values and objectives

Table 1 summarises the air quality objectives and limit values for the pollutants relevant to this assessment.

Table 1: Summary of relevant air quality objectives and limit values

Pollutant	Averaging period	Objective / limit value ($\mu\text{g}/\text{m}^3$)	Allowance
For the protection of human health			
Nitrogen dioxide (NO_2)	1 hour	200	18 times pcy
	Annual	40	–
Sulphur dioxide (SO_2)	15 minute	266	35 times pcy
	1 hour	350	24 times pcy
	24 hour	125	3 times pcy
Carbon monoxide (CO)	8 hour	10,000	Maximum daily running 8 hour mean
For the Protection of Vegetation and ecosystems			
Nitrogen oxides (NO_x)	Annual	30	–
	Daily	75	–
Sulphur dioxide (SO_2)	Annual	20	–

Notes: 'pcy' = per calendar year

Directive 2008/50/EC¹ sets out that the Limit Values apply everywhere with the exception of:

- any locations situated within areas where members of the public do not have access and there is no fixed habitation;
- in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;
- on the carriageway of roads; and
- on the central reservations of roads except where there is normally pedestrian access to the central reservation.

Table 2 presents the locations where the Air Quality Objectives apply for the protection of human health.

⁶ Environment Agency. (2016) 'Air Emissions Risk Assessment for your Environmental Permit'.

Table 2: Locations where air quality objectives apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24 Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1 Hour	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

The areas where the Air Quality Standards Regulations annual limit for the protection of vegetation applies are as follows:

- More than 20 kilometres from an agglomeration (i.e. an area with a population of more than 250,000);
- More than 5 kilometres away from industrial sources regulated under Part A of the Environment Act 1990 (and/or Part A1 sites under the Environmental Permitting regulations);
- More than 5 kilometres away from motorways or major roads with traffic counts of more than 50,000 vehicles per day; and
- More than 5 kilometres away from built up areas of more than 5,000 people.

Therefore, designated ecological sites within these areas do not have the benefit of protection from statutory air quality limit values. However, the regulatory agencies have agreed with the countryside agencies that these critical levels should be applied on a precautionary basis.

2.2.3 Environmental assessment levels

The Environment Agency Risk Assessment Guidance provides further assessment criteria in the form of Environmental Assessment Levels (EALs). The only additional applicable EAL to this assessment is a short term (1 hour) EAL for CO, at 30,000 µg/m³.

3 Methodology

3.1 Overview

The approach to the air quality assessment has involved the following key elements:

- Establishing the Ambient Concentration (AC) from consideration of the Department for Environment Food and Rural Affairs (Defra) Air Quality Information Resource (UK-AIR)⁷ background predictions in the vicinity of the site;
- Quantitative assessment of the operational effects on local air quality, utilising a new generation dispersion model– ADMS and presenting results as Process Contributions (PC) and where required the Predicted Environmental Concentrations (PEC) in the context of relevant standards.

3.2 Modelling approach

3.2.1 Modelled Scenarios

The emission sources which have been included within this assessment are:

- Two existing 2.8MWth output combined heat and power engines ('CHPs')
- One existing 1.5MWth output hot water standby boiler ('existing boiler')
- Two new 1.6 MWth output dual fuel steam raising boilers ('new boilers')

The existing operating conditions for the Plant consists of the two CHP engines operating at 100% load continuously all year (with the exception of planned shutdowns for maintenance etc). The existing boiler operates occasionally throughout the year when either one or both engines are not running, typically due to maintenance, to maintain temperature within the heated anaerobic digestion process.

The proposed operating conditions for the Plant consists of the two new boilers operating at 100% load continuously all year (with the exception of planned shutdowns for maintenance etc) and the two existing CHP engines being used for peak lopping, assumed to be 8 hours per month. The existing standby boiler would be decommissioned.

In order to undertake a comprehensive assessment, a number of scenarios have been included to capture the worst-case effects.

On the basis of the above, the following scenarios have been assessed:

- Scenario 1 – Two existing CHP engines operating on biogas at full load continuously throughout the year
- Scenario 2 – One existing CHP engine and one existing standby boiler operating on biogas at full load continuously throughout the year
- Scenario 3 – Two new boilers operating on natural gas at full load continuously throughout the year
- Scenario 4 - Two new boilers operating on biogas at full load continuously throughout the year

⁷ Defra Air Information Resource available at <https://uk-air.defra.gov.uk/> [last accessed 03/08/2018]

- Scenario 5 - Two new boilers and two existing CHPs operating on natural gas at full load continuously throughout the year.
- Scenario 6 - Two new boilers and two existing CHPs operating on biogas at full load continuously throughout the year.

Scenario 5 and 6 represents a hypothetical operating condition as it assumes that the two new boilers and the two existing engines will operate continuously, all year at full load. The scenarios are hypothetical as the plant would not be operated in this way. However, these scenarios have been undertaken for the purpose of this assessment for comparison with the short term EQS to ensure any operation of the plant coincides with worst case meteorological conditions.

3.2.2 Model selection

A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources.

Atmospheric Dispersion Modelling System (ADMS) is a practical dispersion model, developed by Cambridge Environmental Research Consultants (CERC), which models a wide range of buoyant and passive releases to atmosphere either individually or in combination. ADMS brings together the results of recent research on dispersion modelling. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings, radioactive decay and deposition. The model has been subject to extensive validation. ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. The latest version of the model, ADMS 5.2, has been used in this assessment.

3.2.3 Buildings

The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. ADMS includes a building effects module (as described above) used to calculate the dispersion of pollution from sources near large structures. The buildings likely to have a dominant effect (i.e. with the greatest dimensions likely to promote turbulence) are listed in Table 3 and illustrated in Figure 2 and have been included within the model.

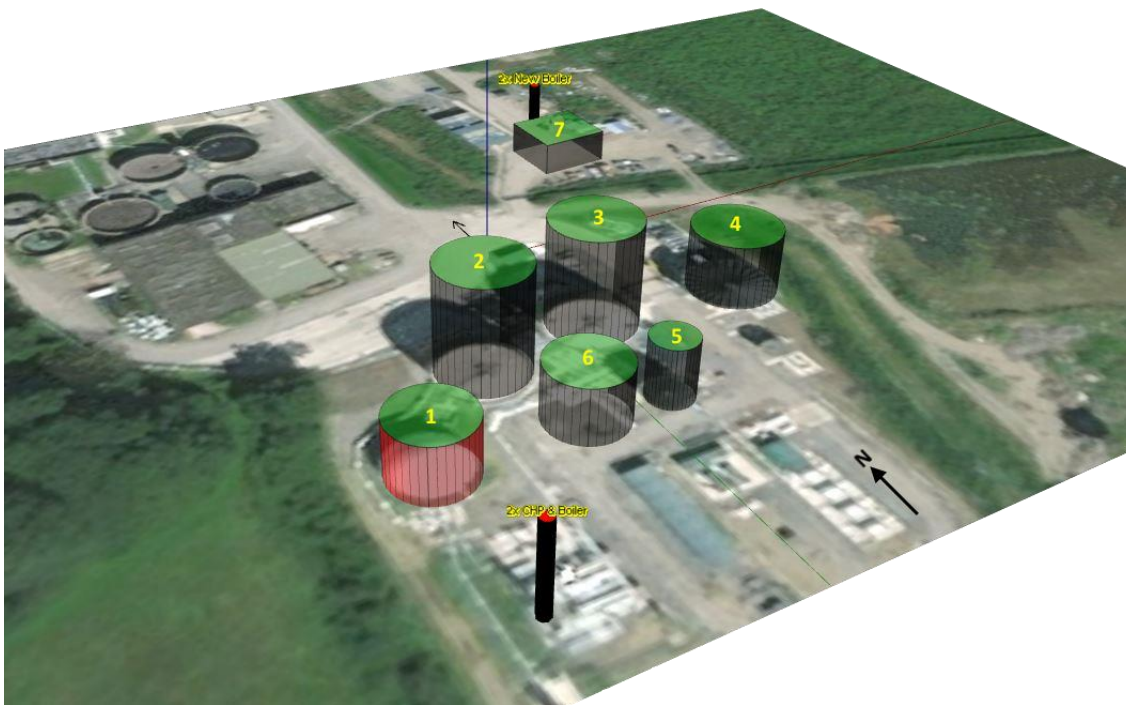
Table 3: Building dimensions used within the assessment

ID	Building	Shape	National grid reference		Height (m)	Length/diameter (m)	Width (m)	Angle (°)
			X	Y				
1	Gas Holder	Circular	336403	347923	11	15	-	-
2	Digester	Circular	336422	347943	21	17	-	-
3	Digester	Circular	336446	347947	21	17	-	-
4	Sludge Tank	Circular	336476	347945	12.8	17	-	-
5	Sludge Tank	Circular	336445	347923	11.7	8.5	-	-
6	New Gas Holder	Circular	336430	347924	11	15	-	-
7	New Boiler House	Rectangle	336476	348010	7	15	14	87

Note: OS Grid Reference for centre of buildings.

Angle relates to the orientation of the buildings within the ADMS model

Figure 2: Building layout used within the dispersion model



3.2.4 Meteorology

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed.
- Wind speed affects the distance the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise.
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. ADMS uses a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

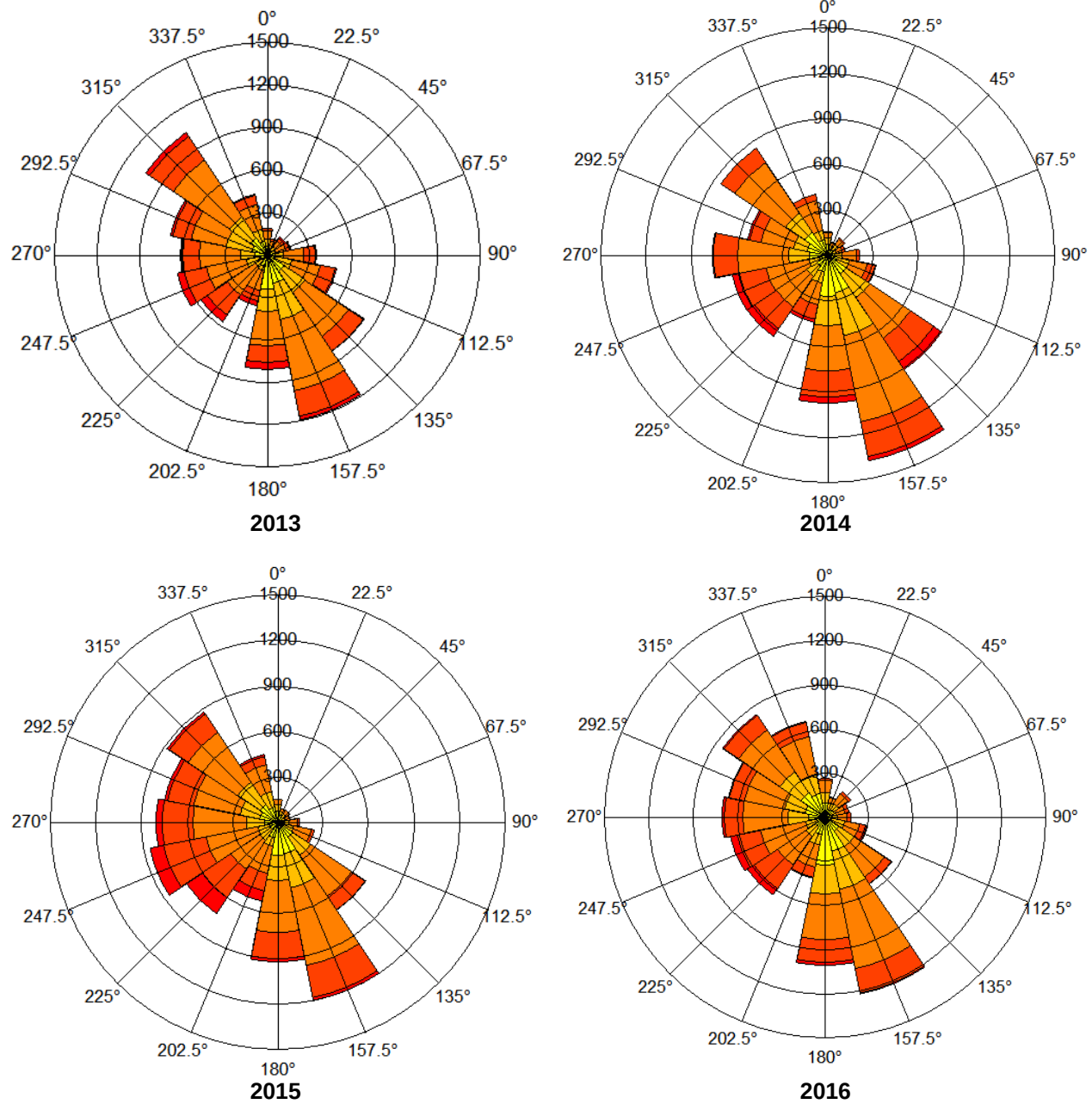
For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

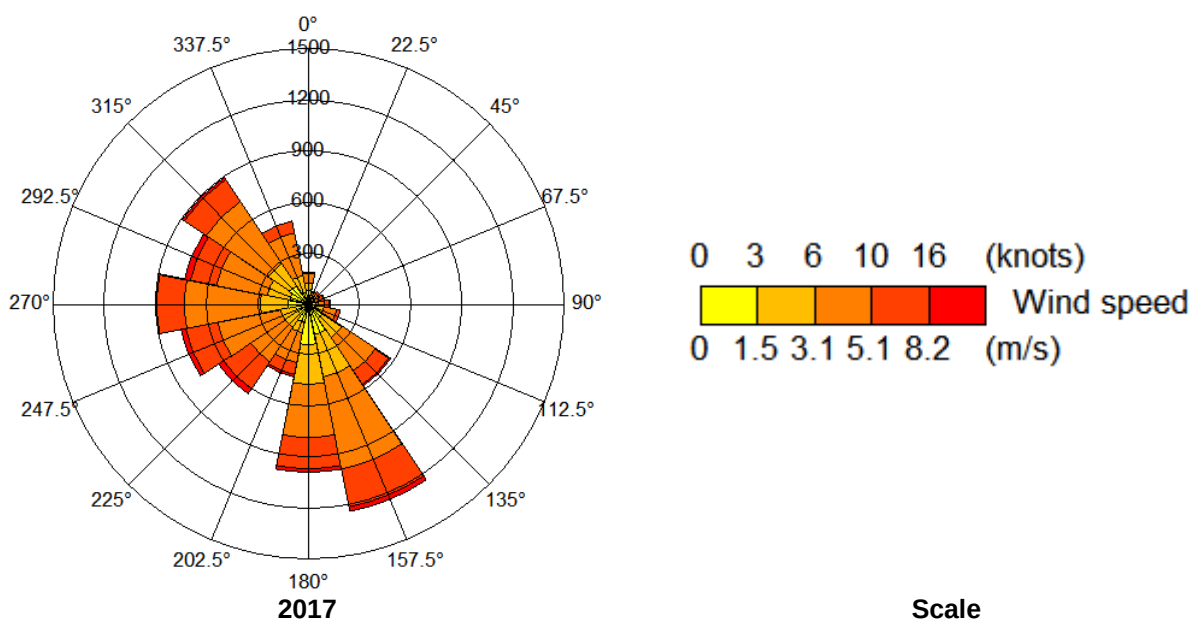
The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. As recommended by the EA, dispersion model simulations were performed for emissions from the site using five years of data. Data from Harwarden meteorological station were used as this was the most representative of the site. Data from the last five years were used, comprising the years 2013 to 2017. This meteorological station is located approximately 17 kilometres to the north of the site.

Wind roses have been constructed for each of the five years of meteorological data used in this assessment. The wind roses presented in Figure 3 illustrate that in most years there is

dominance in winds from the south-east with less frequent winds from the west, north west and south west.

Figure 3: Wind roses for Harwarden (2013 – 2017)





3.2.5 Terrain

The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks by reducing the distance between the plume centre line and ground level and increasing turbulence and, hence, plume mixing.

Terrain in the region of the site is generally flat and has slopes with gradient less than a one metre gain in height for 10 metres travelled, and therefore no terrain data has been included in the dispersion model.

3.2.6 Surface roughness

The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length. Land use surrounding the site can largely be characterised as agricultural, therefore, a surface roughness length of 0.3 metres has been assigned.

3.2.7 Emissions data

Emissions for all individual combustion sources have been based on an annual average plant load of 100%. It has been assumed that exhaust gases will contain the maximum concentrations of pollutants presented and Plant will run at 100% load all year round. This approach is considered to result in a conservative assessment as, in practice, annual average plant loads of the boilers are likely to be below 100% (due to maintenance, downtime etc.) and the CHP engines will only operate intermittently, in addition pollutant concentrations will likely be below those proposed.

The two new boiler emissions have been calculated from data provided by the supplier. Where information was not available emission parameters have been calculated. The equations used in the flue gas calculations are presented below:

- Correcting for water content:
Dry value = Measured value x 100 / (100 – H₂O measured concentrations [%]).
- Correcting for oxygen content:
Corrected value = Measured value x (21 – O₂ Reference value [%] / 21 – O₂ Measured Value [%]).
- Correcting for temperature:
Corrected value = Measured value x (Temperature of measured value [K] / 273 [K]).

Table 4 presents the emission data which was used in the dispersion modelling for all scenarios.

Table 4: Stack emission parameters

Property	Unit	2xCHP Multi-flue	1xCHP	Existing Boiler	2xNew Boiler Multi-flue	2xNew Boiler Multi-flue
Scenario (see Section 3.2.1)	-	1, 5 and 6	2	2	3 and 5	4 and 6
Fuel	-	Biogas	Biogas	Biogas	Natural Gas	Biogas
Stack location (British National Grid)	x,y	336404, 347892	336404, 347892	336404, 347892	336476, 348020	336476, 348020
Stack height	m	17	17	17	14	14
Exit diameter	m	0.424	0.3	0.4	0.495	0.495
Exit temperature	°C	180	180	200	150	150
Efflux velocity (actual)	m/s	16.55	16.55	10.23	10.04	16.52
Volumetric flow rate (actual)	Am ³ /s	2.34	1.17	1.29	0.97	1.59
Actual O ₂	%	-	-	-	2.5	2.5
Actual H ₂ O	%	-	-	-	16.53	16.07
Volumetric flow rate (normalised)	Nm ³ /s	0.984	0.492	0.564	1.041	1.722
NO _x emission	mg/Nm ³	500	500	500	100 ^(a)	100 ^(a)
	g/s	0.492	0.246	0.282	0.104	0.172
SO ₂ emission	mg/Nm ³	-	-	-	-	131 ^(b)
	g/s	0.44	0.22	0.25	0.0	0.226
CO emission	mg/Nm ³	1400	1400	1400	12.5	12.5
	g/s	0.04	0.02	0.03	0.013	0.022

Notes: Data from existing plant from previous assessment undertaken for Environmental Permit application

^(a) Normalised conditions = 3% O₂, 273.15 K, dry, 1 atm

^(b) equivalent to 46ppm

3.2.8 NO_x to NO₂ relationship

The NO_x emissions associated with combustion activities at the site will typically comprise approximately 90-95% nitrogen monoxide (NO) and 5-10% nitrogen dioxide (NO₂) at source. As described previously, the NO oxidises in the atmosphere in the presence of sunlight, ozone

and volatile organic compounds to form NO₂, which is the principal concern in terms of environmental health effects.

There are various techniques available for estimating the portion of the NO_x that is converted to NO₂, which will increase with distance from the source. The Environment Agency's air emission risk assessment guidance⁶ identifies that a 100% conversion of NO_x to NO₂ can be used for calculation of annual average concentrations and a 50% conversion of NO_x to NO₂ is applicable for calculation of short term concentrations. For the purposes of this assessment, the EA's recommended conversion rates have been used.

3.2.9 Sensitive receptors

3.2.9.1 Human health

A number of discrete receptors representing the façades of the closest residential properties have been included within the model so that a comparison against the air quality objectives can be made. These receptors have been chosen as they are expected to experience the greatest change due to their close proximity to the proposed plant. Table 5 and Figure 4 show the locations of the discrete receptors considered within this assessment. These receptors are consistent with those used in the original EP application.

Table 5: Modelled human health receptors

Receptor Number	Receptor Description	National Grid Reference		Height of Receptor (m)
		X	Y	
R1	Farm approximately 850m north of the Site	336078	348678	1.5
R2	Residential approximately 540m west of the Site	335873	347936	1.5
R3	Residential approximately 410m southwest of the Site	336020	347752	1.5
R4	Farm approximately 615m northeast of the Site	336592	348480	1.5
R5	Farm approximately 410m northeast of the Site	336573	348262	1.5

This assessment has included modelling of pollutant concentrations across a Cartesian grid with a 50 metre receptor spacing up to a five kilometre radius around the site.

3.2.9.2 Ecological receptors

A review of ecological receptors has been carried out. Specific sites designated for their ecological importance need only be considered where they fall within set distances from the assessment site as specified in the EA Guidance:

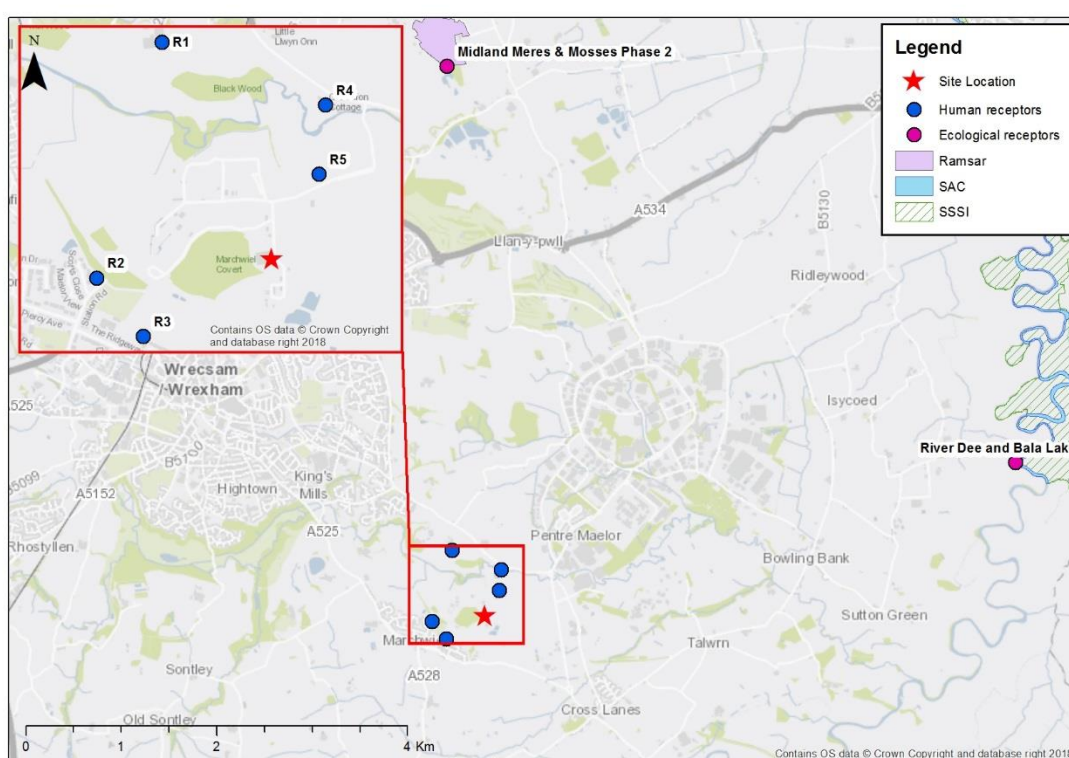
- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10 kilometres of the installation; and,
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodlands within two kilometres of the location of the installation.

Discrete receptors representing the closest point of the ecological sites meeting the above criteria have been assessed. Table 6 and Figure 4 presents the locations of ecological sites included in the assessment.

Table 6: Ecological sites considered within the assessment

Site Name	Designation	Closest Modelled Location (x y)		Distance from Site (km)
Midland Meres & Mosses Phase 2	Ramsar	336024	353750	5.9
River Dee and Bala Lake	SAC	341986	349600	5.8

Figure 4: Modelled Receptors



3.2.10 Significance Criteria

A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance'.

Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively.

In order to ensure that the descriptions of effects used within this report are clear, consistent and in accordance with recent guidance, definitions have been adopted from the EA's Air Emissions Risk Assessment for your Environmental Permit Guidance⁶. Where impacts do not meet the EA's Air Emissions Risk Assessment description of 'insignificant', guidance from the

Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK)⁸ has been used. Table 3.7 provides a summary of criteria used to screen out insignificant emissions.

Table 3.7: Summary of assessment criteria

Parameter	Long Term Standards	Short Term Standards
Criteria for screening out insignificant emissions	Emissions can be seen as insignificant where: PC long term $\leq$ 1% of standard	Emissions can be seen as insignificant where: PC short term $\leq$ 10% of standard
Screen out insignificant PECs	PC long term + AC is less than 70% of standard	PC short term is less than 20% of standard minus twice the long term background concentration
Screening for SPAs, SACs, Ramsar and SSSIs	the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas If your long-term PC is greater than 1% and your PEC is less than 70% of the long-term environmental standard, the emissions are insignificant	The short-term PC is less than 10% of the short-term environmental standard for protected conservation areas
Screening for local nature sites	If the long-term PC is less than 100% of the short-term environmental standard emissions are insignificant	If the short-term PC is less than 100% of the long-term environmental standard emissions are insignificant

Note: PC = Process Contribution; PEC = Predicted Environmental Concentration (PC + Ambient Concentration, AC);

EQS = Environmental Quality Standard; EAL = Environmental Assessment Level;

AQAP = Air Quality Action Plan:

3.2.11 Assessment of Compliance with EU Limit Values

Defra uses the Pollution Climate Mapping (PCM) model to report compliance with EU Directive 2008/50/EC. The PCM model calculates NO₂ concentrations at roadside locations where the EU limit values apply.

PCM projections are available for a modelled base year of 2015 and modelled projections for 2017 to 2030 with projected NO₂ concentrations declining year on year in response to anticipated improvements in air quality primarily as a result of future improvements in vehicle emissions.

2018 PCM data has been obtained from the Defra website. The closest PCM links included are located approximately 2.3km to the north west of the Plant. Concentrations in the PCM model within the modelled 5km radius are well below the EU limit values for NO₂.

⁸ Environmental Protection UK and Institute of Air Quality Management (May 2015), 'Land-Use Planning and Development Control: Planning for Air Quality' 2015.

4 Baseline Conditions

4.1 Introduction

Information on air quality in the UK can be obtained from a variety of sources including Local Authorities, national network monitoring sites and other published sources. For the purposes of this assessment, information has been obtained from Wrexham County Borough Council⁹ (WCBC) and the Department for Environment, Food and Rural Affairs (Defra) Air Information Resource (AIR)⁷ website.

4.2 WCBC Review and Assessment

The North Wales Combined Authority fulfils the air quality review and assessment obligations, as specified in Part IV of the Environment Act 1995, for six local authorities including WCBC. The purpose of the review and assessment procedure is to determine areas that have an exceedance of or are at risk of exceeding the relevant air quality objectives. Where an area exceeds an air quality objective an Air Quality Management Area (AQMA) must be declared and an Air Quality Action Plan (AQAP) must be prepared to specify and implement measures to improve air quality.

Whilst WCBC undertake ambient monitoring, there are no background monitoring sites representative of the study area.

There are no AQMAs within the authority of WCBC suggesting that air quality is generally good. The closest AQMA is within Cheshire West and Chester Council and is approximately 18.5km north of the Plant and is outside of this assessments study area.

4.3 Defra Air Projected Background Concentrations

Defra provides estimates of pollution concentrations across the UK for each one kilometre grid square for future years up to 2030. Data has been collected for the nearest grid square (OS Grid Co-ordinates 574500, 207500) to the Plant. Table 8 presents data obtained from Defra for 2018 to represent current year background concentrations. These background concentrations have been added to the Plant process contribution (PC) to determine the predicted environmental concentrations (PEC). Short term background concentrations have been assumed to be twice the annual mean concentrations in line with EA Guidance⁶.

Table 8: Defra projected annual mean pollutant concentrations ($\mu\text{g}/\text{m}^3$)

Pollutant	2018	
	Long Term	Short Term
NO _x	9.8	19.6
NO ₂	7.5	15
SO ₂ ^(a)	3.9	7.8
CO ^(a)	255	510

Notes: ^(a) 2001 concentration data assumed in the absence of more recent data and projection factors for future years.

⁹ https://www.wrexham.gov.uk/english/environment/air_quality/ [last accessed 03/08/2018]

5 Results

5.1 Introduction

The results of modelling atmospheric emissions from the Plant at the discrete receptor locations are presented in tabular form in this section.

Additionally, contour plots for the worst-case meteorological year for each pollutant show the geographical distribution of pollutants.

5.2 Human Health Receptors

Table 9 presents the maximum Process Contribution (PC) of all relevant pollutants from Scenarios 1 to 6 across the modelled grid.

Scenario 1 and Scenario 2 present the results of the existing operating procedure of the two CHPs and boiler.

Scenario 3 and Scenario 4 present the results of the proposed operation of the two new dual fuel steam boilers; combusting natural gas and biogas respectively. Modelled short term PC's are below 10% and long term PCs are below 1% of the relevant EQS for all pollutants and therefore are considered to be insignificant in accordance with the EAs air emissions risk assessment guidance [8].

Scenario 5 and Scenario 6 present the results of the proposed operation of the two new dual fuel steam boilers and the two existing CHPs. In Scenario 5 the two new boilers are combusting natural gas and in Scenario 6 the two new boilers are combusting biogas. All plant has been assumed to operate at full load continuously throughout the year. Long term (annual mean) concentrations have not been presented for these scenarios as it is expected that the CHPs will only operate for 8 hours per month and therefore this limited operation would have negligible effect on annual mean concentrations. Although the predicted NO₂ and SO₂ short term PCs exceed the 10% criteria for screening out PCs, it is unlikely that they would always operate at a time that coincides with the worst meteorological conditions. PCs are unlikely to be as high as those presented in Table 9 and are considered 'insignificant'. Therefore, predicted environmental concentrations (PECs) have not been presented.

A comparison of PCs from the existing plant in Scenario 1 and Scenario 2 against the proposed plant in Scenarios 3 and 4 shows that the proposed Plant will lead to an improvement in air quality compared to the existing situation.

A comparison of PCs from the existing plant in Scenario 1 and Scenario 2 against the proposed plant in Scenarios 5 and 6 show that PCs are broadly similar, even with the highly conservative prediction made by Scenario 5 and Scenario 6.

Overall, the PCs from the new operating procedures in Scenarios 3-6 are considered to be 'insignificant' with regards to human health.

Table 9: Maximum Process Contributions (PCs) ($\mu\text{g}/\text{m}^3$)

Pollutant	Averaging period	Max PC						Max PC as % of EQS						EQS
		Sc1	Sc2	Sc3	Sc4	Sc5	Sc6	Sc1	Sc2	Sc3	Sc4	Sc5	Sc6	
NO ₂	99.79 %'ile of hourly averages	19.7	27.1	4.7	5.9	20.9	21.8	9.8	13.5	2.4	3.0	10.5	10.9	200
	Annual ^(a)	0.5	0.6	0.2	0.3	-	-	1.3	1.5	0.5	0.8	-	-	40
SO ₂	99.9 %'ile of 15 minute averages	39.8	54.5	0.0	16.6	39.8	44.9	15.0	20.5	0.0	6.2	15.0	16.9	266
	99.73 %'ile of hourly averages	33.6	47.4	0.0	15.4	33.6	39.2	9.6	13.5	0.0	4.4	9.6	11.2	350
	99.18 %'ile of 24 hourly averages	10.1	13.0	0.0	9.9	10.1	14.1	8.0	10.4	0.0	8.0	8.0	11.3	125
CO	Hourly Max	3.8	6.3	1.3	1.8	4.3	4.4	0.0	0.0	0.0	0.0	0.0	0.0	30,000
	Running 8 hour maximum	3.6	6.0	1.1	1.5	4.0	4.2	0.0	0.1	0.0	0.0	0.0	0.0	10,000

Note: PC = Process Contribution; PEC = Predicted Environmental Concentration
EQS = Environmental Quality Standard
^(a) – Annual mean objective applies at long term receptors, such as residential, only. Results presented for annual means are at Receptor 5 which has the highest modelled PCs.
‘-’ means averaging period not applicable to Scenario
Bold text show PCs that exceed the screening criteria for long term (1%) and short term (10%) PCs.
Scenario 1 – Two existing engines operating on biogas at full load continuously throughout the year
Scenario 2 – One existing engine and one existing standby boiler operating on biogas at full load continuously throughout the year
Scenario 3 – Two new boilers operating on natural gas at full load continuously throughout the year
Scenario 4 - Two new boilers operating on biogas at full load continuously throughout the year
Scenario 5 - Two new boilers and two existing CHPs operating on natural gas at full load continuously throughout the year.
Scenario 6 - Two new boilers and two existing CHPs operating on biogas at full load continuously throughout the year.

5.3 Ecological Receptors

Table 10 to Table 12 present the modelled results at designated sites for comparison with the EALs (critical levels) for NO_x and SO₂. The results have been assessed using Scenario 4 as this represented the worst case of annual mean impacts and are presented alongside the results from Scenario 1.

For NO_x and SO₂ PCs are below 1% of the relevant EQS and therefore in accordance with EA guidance are considered to be insignificant.

Table 10: Critical Level Results – Annual Mean NO_x concentrations (µg/m³)

Site Name	Designation	Max PC		Max PC as % of EAL		EAL
		Sc1	Sc4	Sc1	Sc4	
Midland Meres & Mosses Phase 2	Ramsar	0.03	0.01	0.1	0.03	30
River Dee and Bala Lake	SAC	0.02	0.01	0.1	0.03	30

Note: PC = Process Contribution; EAL = Environmental Assessment Level; EP = Environmental Permit

Table 11: Critical Level Results – Daily NO_x concentrations (µg/m³)

Site Name	Designation	Max PC		Max PC as % of EAL		EAL
		Sc1	Sc4	Sc1	Sc4	
Midland Meres & Mosses Phase 2	Ramsar	0.3	0.1	0.4	0.1	75
River Dee and Bala Lake	SAC	0.2	0.1	0.3	0.1	75

Note: PC = Process Contribution; EAL = Environmental Assessment Level

Table 12: Critical Level Results – Annual Mean SO₂ concentrations (µg/m³)

Site Name	Designation	Max PC		Max PC as % of EAL		EAL
		Sc1	Sc4	Sc1	Sc4	
Midland Meres & Mosses Phase 2	Ramsar	0.02	0.01	0.1	0.1	20
River Dee and Bala Lake	SAC	0.01	0.01	0.1	0.1	20

Note: PC = Process Contribution; EAL = Environmental Assessment Level

5.4 Contour Plots

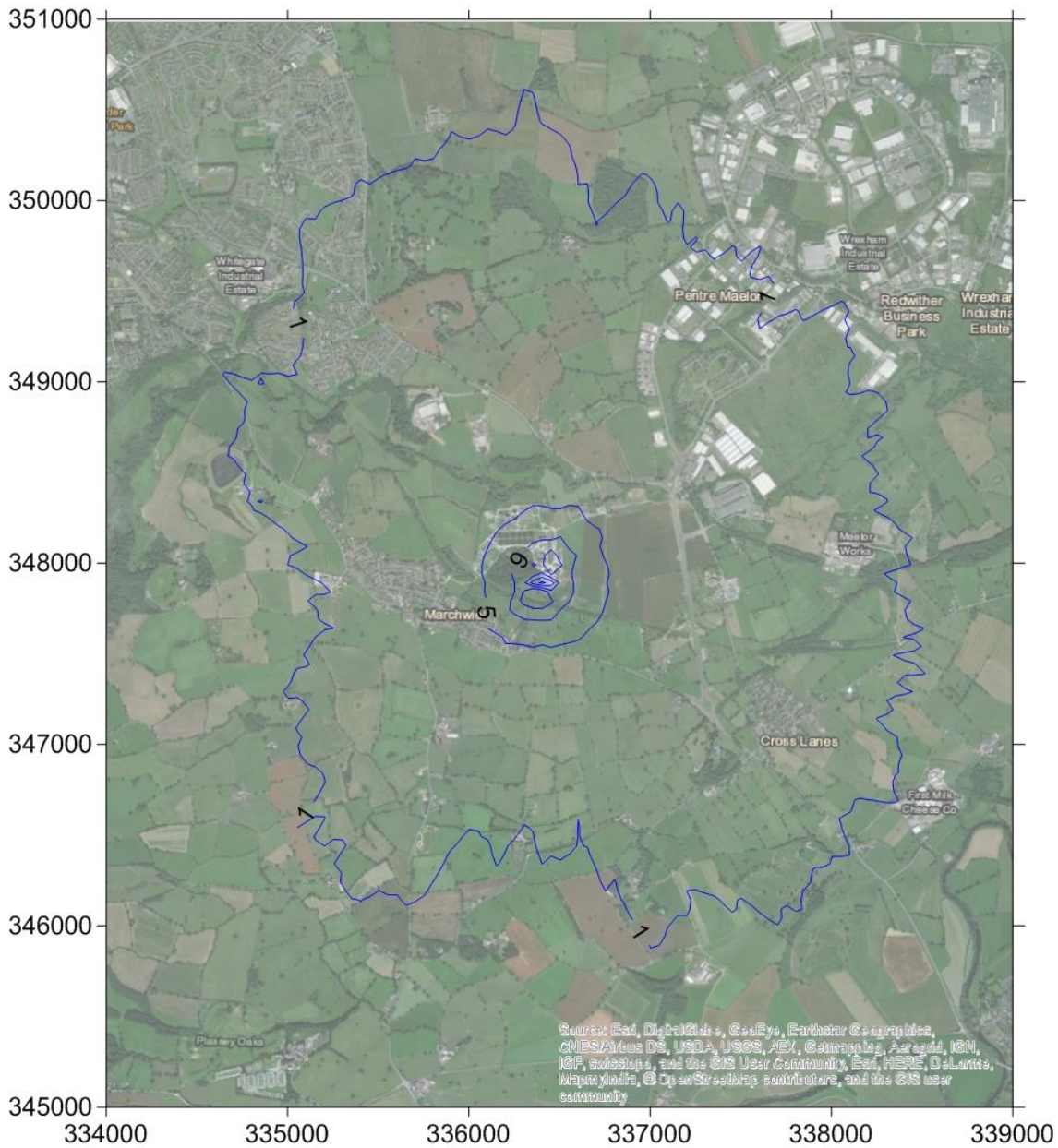
Figure 5 to Figure 8 present contour plots for long term and short term NO₂ PCs for Scenario 1 and Scenario 4. These contour plots have been presented to demonstrate the pattern of dispersion for long term and short term averaging periods for the most common operating scenarios. The contour plots show that the maximum concentrations from the normal operation of the CHPs and boilers are very close to the Plant and that the proposed normal operation of the two new boilers has lower PCs and spatial spread than the existing operation of the CHPs.

Figure 5: Scenario 1 - Annual Mean NO₂ Contour Plot



Notes: Meteorological year: 2014; Minimum contour: 0.1 $\mu\text{g}/\text{m}^3$; Contour interval; 0.5 $\mu\text{g}/\text{m}^3$

Figure 6: Scenario 1 - 1 hour 99.79% NO₂ Contour Plot

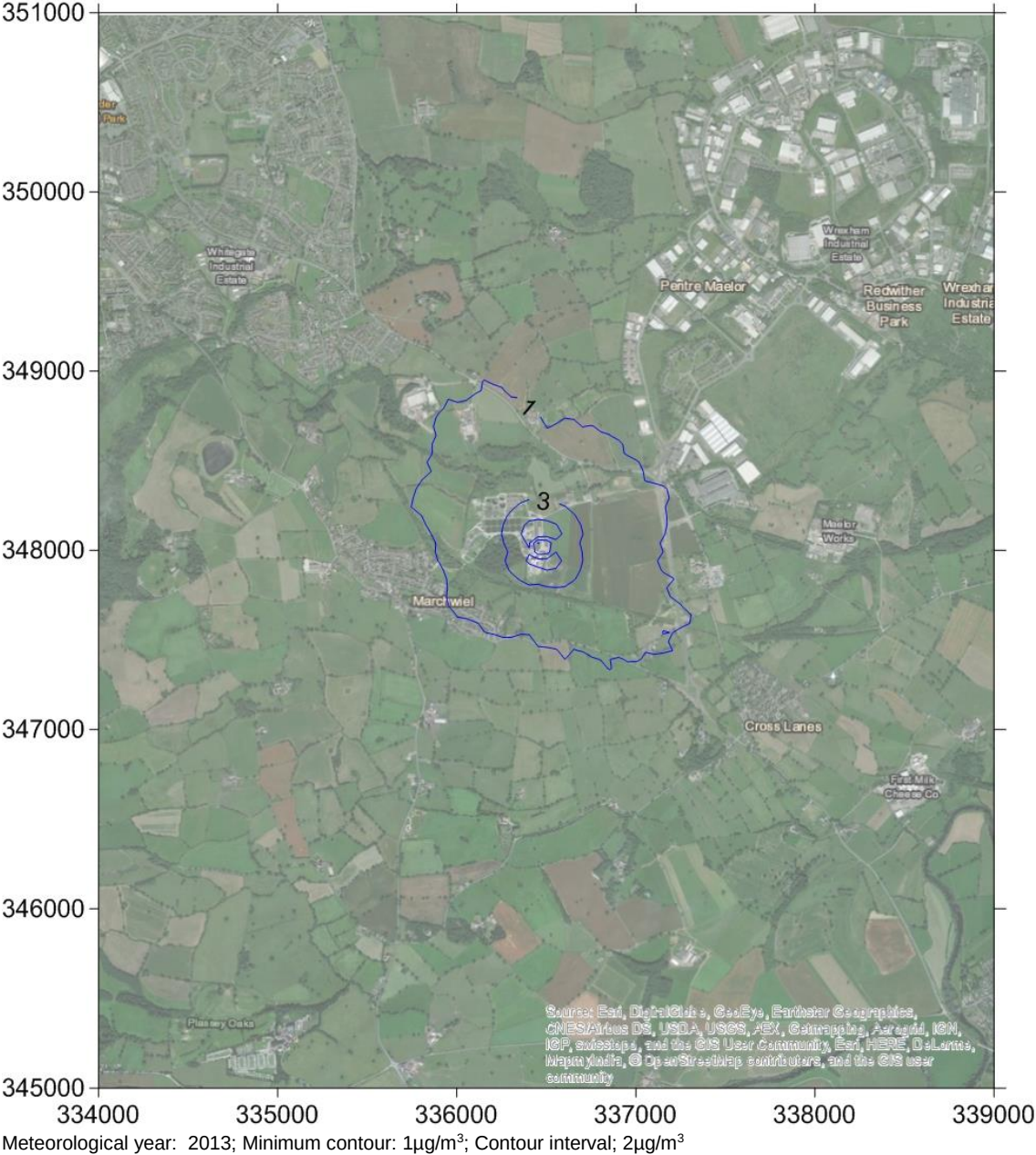


Notes: Meteorological year: 2016; Minimum contour: 1 μ g/m³; Contour interval; 4 μ g/m³

Figure 7: Scenario 4 - Annual Mean NO₂ Contour Plot



Figure 8: Scenario 4 - 1 hour 99.79% NO₂ Contour Plot

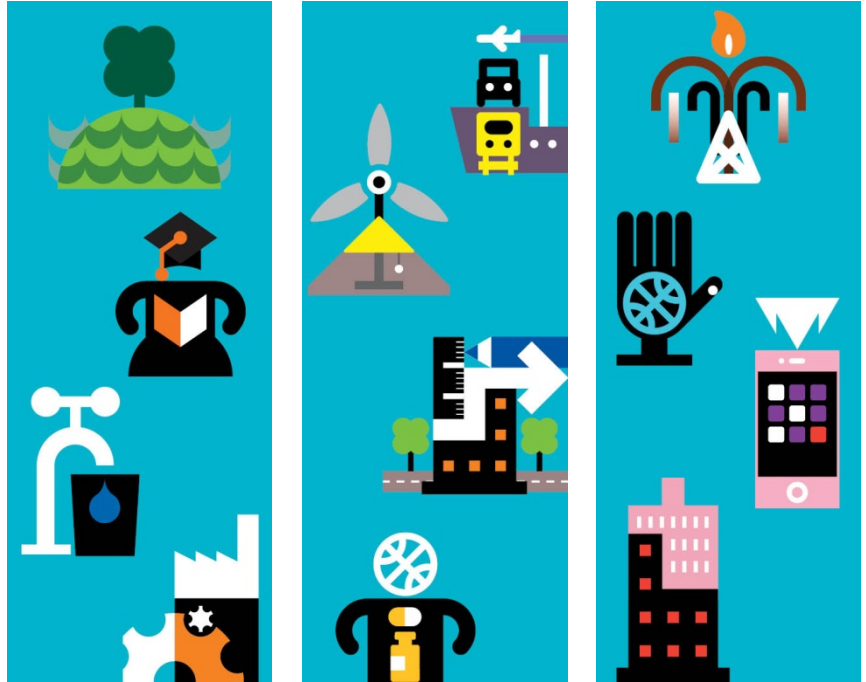


6 Conclusions

An assessment has been undertaken to determine the effect on air quality associated with emissions from the site using advanced dispersion modelling. For potential human health effects the pollutant of key concern is NO₂, although emissions of SO₂ and CO have also been considered. Effects of atmospheric concentrations of NO_x and SO₂ have also been assessed with respect to sensitive ecological sites. The method of the assessment has taken a conservative approach by assuming worst case conditions for a number of aspects including emissions characteristics, operating scenarios and metrological conditions.

The results indicate compliance with all relevant environmental quality standards for both the protection of human health and designated sites. Overall impacts of all pollutants are considered to be insignificant and the proposed Plant is predicted to lead to an improvement in air quality compared to the existing configuration.





Five Fords AAD

Noise Assessment

June 2016

Dwr Cymru Welsh Water

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Executive Summary

It is proposed to install new advanced anaerobic digestion plant at the Five Fords Sewage Treatment Facility, Wrexham, Wales LL13 0PA.

The purpose of this report is to assess the predicted construction and operational noise impact of these units by applying British Standards relating to these noise sources.

The construction noise calculations have been carried out to predict the noise impact at the closest noise sensitive receptor locations and to determine if there is any significant effect.

The Rating Level of the new plant is predicted to be 37 dB(A) at the closest noise sensitive receptors. The results of the baseline noise survey carried out at the site in March 2016 found that the lowest daytime measured background sound levels L_{A90} at the same location was 42 dB(A), for the daytime and 38 dB(A) for the night-time periods.

The predicted Rating Level is below the lowest background sound levels during the day and the night demonstrating that the predicted noise impact due to the operation of the proposed plant are likely to have a low impact due to noise.

1 Introduction

1.1 Background

Mott MacDonald was commissioned by Mott MacDonald Bentley (MMB) to conduct a noise assessment at the Five Fords sewage treatment facility, Wrexham, Wales, LL130PA, to assess the impact, if any, associated with the installation of new advanced anaerobic digestion plant comprising of a Thermal Hydrolysis Process (THP) and associated equipment immediately to the west of the Solar Phase 2 development within the site. The THP and associated equipment is hereafter referred to as THP in this report.

The site currently includes various items of plant associated with the sewage treatment works including an advanced anaerobic digestion facility.

1.2 Purpose of the Report

This report presents the results of an assessment of the potential noise impact of the proposed THP in accordance with the British Standard (BS) 4142 (2014)¹ and the noise and vibration associated with the construction of these in accordance with BS5228-1: 2014² and BS5228-2: 2014³, respectively.

1.3 Site Description

The site is located at the Five Fords sewage treatment facility in Wrexham, Wales LL130PA. The site is in proximity to the river River Clywedog, which lies to the north west. Immediately to the south lies the village of Marchwiel. The other boundaries to the site are formed by open fields and green areas.

The proposed new THP associated plant locations are shown within Figure 1.

There are existing residential properties to the south, namely properties along Scotts Close and properties along Marcella Crescent and properties further to the north of the site on Cefn Road.

For the purpose of this assessment, the closest representative noise sensitive residential receptors have been identified as:

- 1 Cefn Road
- 6 Scotts Close
- 16 Marcella Crescent

and are shown in Figure 1

¹ BS4142: 2014 Methods for rating and assessing industrial and commercial sound

² BS5228-1: 2014 Code of practice for noise and vibration control on construction and open sites (noise)

³ BS5228-2: 2014 Code of practice for noise and vibration control on construction and open sites (vibration)

2 Assessment Criteria

2.1 BS4142 2014: Methods for rating and assessing industrial and commercial sound

BS4142: 2014 provides guidance for assessing a new industrial sound source in mixed residential and industrial areas. The methods described in this British Standard assess the likely effects of the new sound source on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The relevant parameters in this instance are as follows:

- Background Sound Level – $L_{A90,T}$ – defined in the standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using 'Fast' time weighting and quoted to the nearest whole number of decibels;
- Specific Sound Level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, Tr;
- Residual Sound Level - $L_{Aeq,T}$ - the equivalent continuous 'A' weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- Rating Level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

The standard recognises that certain acoustic features of a sound source can increase the impact over that expected based purely on the sound level. The standard identifies the following features to be considered:

- Tonality – a correction of 2 dB is applied for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible;
- Impulsivity - a correction of 3 dB is applied for impulsivity which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible. An impulse is defined as the sudden onset of a sound;
- Intermittency – a correction of 3 dB can be applied if the intermittency of the specific sound is readily identifiable against the residual acoustic environment at the receptor i.e. it has identifiable on/off conditions;
- Other sound characteristics – a correction of 3 dB can be applied where the specific sound features characteristics that are neither tonal nor impulsive, but are readily distinctive against the residual acoustic environment.

Once any corrections have been made, the background level is subtracted from the rating level. The standard states that:

- "Typically, the greater the difference, the greater the magnitude of impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.
- The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does

not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context."

The standard specifies the specific sound level as an $L_{Aeq,T}$ with a one-hour assessment period during the day (07:00 – 23:00) and a fifteen-minute assessment period at night (23:00 – 07:00).

2.2 BS5228-1: 2014 Code of practice for noise and vibration control on construction and open sites (noise)

BS 5228-1: provides a methodology for predicting and assessing noise levels generated by fixed and mobile plant used for a range of typical construction activities.

It is proposed that the guidance within Section E3: Example Method 1 – The ABC Method is considered for this assessment.

The assessment is based upon the exceedance of threshold noise limits which will be determined from the current ambient noise at the identified receptor locations. The assessment methodology was agreed with Nick Minshall of Wrexham County Borough Council⁴.

The construction site noise level is predicted and then for the appropriate period (night, evening/weekends or day) the ambient noise level is determined and then rounded to the nearest 5dB.

The Category is chosen as follows:

Category A – threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Category B - threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.

Category C - threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.

If the site noise exceeds the appropriate category level (A, B or C) then a significant effect is potentially indicated, depending on factors such as the duration of the construction works and character of the impact.

⁴ Telephone conversation between Nick Minshall – Joseph Mendis 13 May 2016 1045hrs.

Table 2-1: BS5228-1 Assessment categories for the ABC method

Period	Threshold value [dB(A)]		
	Category A	Category B	Category C
Night-time (2300-0700)	45	50	55
Evenings (1900 to 2300) and weekends	55	60	65
Daytime* (0700 to 1900)	65	70	75

* weekdays and 0700 to 1300 on Saturdays.

2.3 BS5228-2: 2014 Code of practice for noise and vibration control on construction and open sites (vibration)

BS 5228 Part 2 provides guidance on the effect of ground-borne vibration and the likelihood that this will cause complaint and cosmetic damage to buildings. The standard does not indicate whether particular vibrations are significant. However, the standard does provide the following guidance on effects:

- At a vibration level of 0.14mm/s “vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction”
- At a vibration level of 0.3mm/s “vibration might be just perceptible in residential environments”
- At a vibration level of 1.0mm/s “it is likely that vibration in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents”, and
- At a vibration level of 10mm/s “vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.”

3 Measurement Survey

3.1 Methodology

Three unattended noise surveys were carried out by Mott MacDonald between Thursday 7 April and Wednesday 13 April 2016 in order to quantify the background sound levels in the area at the closest noise-sensitive receptors to the site:

The un-attended survey comprised installation of automatic noise monitors at the north eastern aspect and south western aspects of the site in order to measure the ambient noise level of the local area and ascertain the noise climate at the closest noise sensitive properties in these areas over several days.

During the automatic unattended noise survey and the attended noise survey periods the temperature varied between 10°C and 15°C and wind speeds remained less than 5 m/s. These conditions were considered to be suitable for noise measurements.

The proposed work site is shown in Figure 1.

3.2 Instrumentation

Unattended medium term noise measurements were made using three integrating sound level meters type Rion NL32. The microphones were located in free-field conditions (i.e. at least 3.5m from any significant reflecting surface other than the ground) and at an approximate height of 1.5m above ground on which they were mounted.

All personnel conducting the noise measurements were qualified in acoustics and environmental noise monitoring.

Before and after each measurement session, the sensitivity of each measurement system was checked using a CAL 200 calibrator, designed to comply with the Class 1 standard for accuracy.. Variations of no greater than 0.2 dB were noted over the measurement sessions. The sound level meter used have calibration certificates obtained no more than two years before the period of the survey. Details of the noise equipment used are provided in Table 1.



Figure 1 Site Layout Plan – Source -Mott MacDonald Bentley

Table 3-1 Details of noise measurement equipment used during the survey

Item	Make & model	Serial number
Calibrator	Larson Davis CAL 200	5132
Sound Level meter	Rion NL32	2201511
Sound Level meter	Rion NL32	2201641
Sound Level meter	Rion NL32	2202001

3.3 Measurement positions

A plan showing the location of the measurement position is shown in Figure 1 above. The measurement positions were chosen to be representative of the closest sensitive noise receptor locations.

3.3.1 Results

A continuous, unattended measurement of background sound levels was carried out between 7 April and 13 April 2016 at the closest considered noise sensitive receptors to the Five Fords sewage treatment facility. During the installation of the equipment the main sources of noise observed were:

- Existing distant plant noise
- Birdsong
- Local vehicle movements
- Distant road traffic

The results are summarised in Table 2 below. A time history of the results is presented in Appendix A for the medium term measurements.

Table 3-2 Summary of results of the background sound level monitoring

Measurement Location (see Figure 1)	L _{Aeq} (15min), 07:00-23:00 dB	L _{Aeq} (15min), 23:00-07:00 dB	L _{A90} (15min), 07:00-23:00 dB	L _{A90} (15min), 23:00-07:00 dB	Comment
1 Cefn Road	45	44	41	40	Included distant plant noise, and road traffic noise from Cefn Road
6 Scotts Close	42	40	37	33	Included distant road traffic noise from local roads, noise associated with the sewage treatment facility --
16 Marcella Crescent	44	40	42	38	Included birdsong and distant noise associated with the sewage treatment

4 Assessment

4.1 Computer Noise Model

CadnaA noise prediction software has been employed to produce noise contours for operation of the proposed advanced anaerobic plant (AADs).

The following assumptions have been made in generating the noise model.

- Calculations are based on data provided by the project team so there may be additional contribution from other plant items not accounted for in the model.
- Calculation model is based on the methodologies set out in ISO 9613⁵
- No ground heights have been used within the model, this is a worst case scenario and allows free propagation of the noise around the study area;
- Building heights have been either assumed or taken from available project documentation;
- The ground absorption within the calculation area is defined as 50% hard ground;
- The study area was defined by the extent of the available mapping data as per the supplied information by the project team.
- A sound power level of 88 dB (A) is used for the plant operating at maximum load. This was determined from sound pressure levels measured independently⁶ at a distance of 1m from a similar source.

4.2 Noise Contours

Noise contours have been produced to predict the propagation of noise from the operation of the AAD facility. An output of the predicted noise propagation is presented below in Figure 2.

⁵ ISO 9613:1996 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation

⁶ Email by Mr Ian Horn Mechanical Design Engineer at Mott Macdonald Bentley via an annotated drawing. It is that noise sources were measured at a distance of 1m from the equipment and resulted in a sound pressure level of 80dB(A) which translates into a sound power level of 88dB(A).

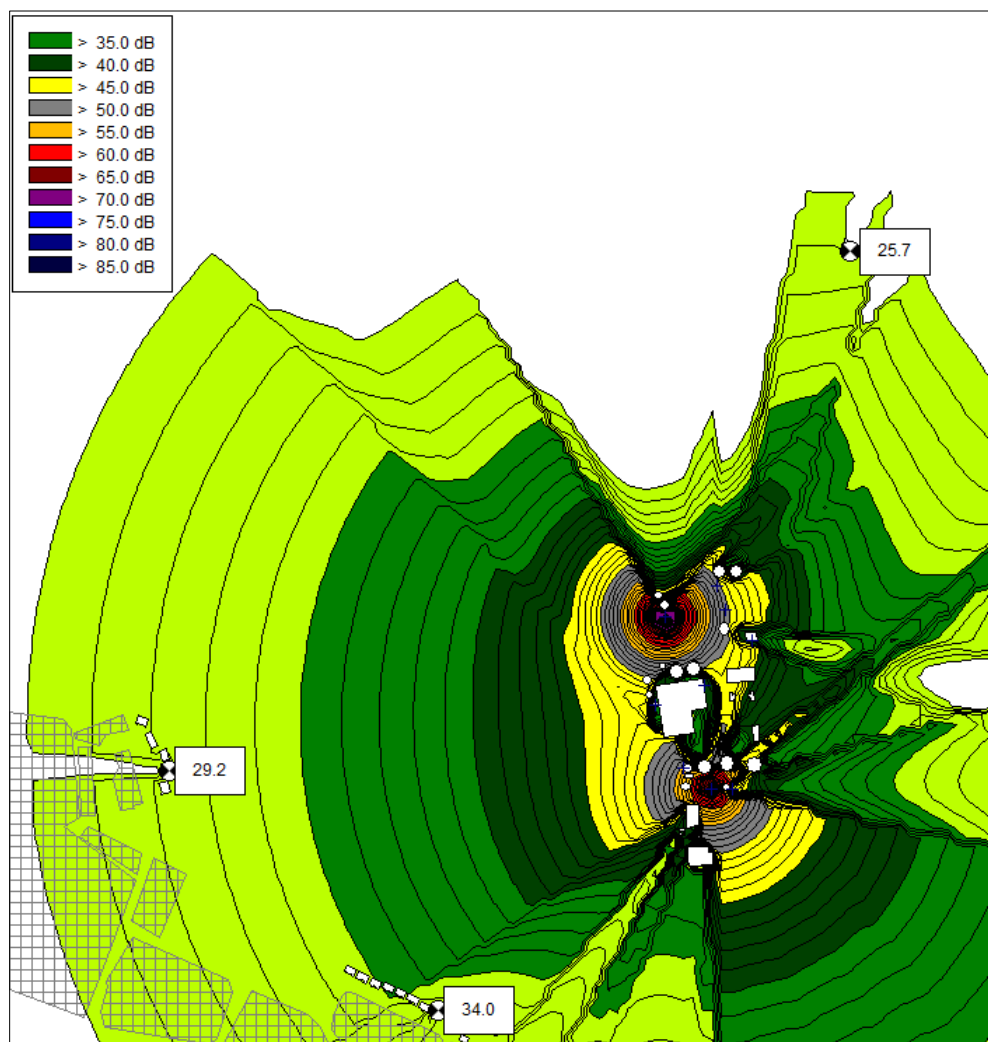


Figure 2 Operational Noise Contours

4.3 BS 4142 – Operational Noise

Table 4-1, below, details the predicted noise levels due to the proposed THP plant and associated equipment compared to the background sound levels measured during the quietest periods of the day and night during the total measurement period.

The results are presented as free-field levels, to enable comparison with the measured free-field background levels.

It is noted that the identified receptors lie more than 200m from the proposed works areas within the site.

Table 4-1 BS4142 assessment of noise levels from plant

Receptor	Rating Level dB(A) incl. penalty 3dB for intermittency	Daytime background sound level L_{A90} dB	Excess of Rating Level over Background Level dB	Night-time background sound level L_{A90} dB	Excess of Rating Level over Background sound level dB
1 Cefn Road	29	41	-12	40	-11
6 Scotts Close	32	37	-5	33	-1
16 Marcella Crescent	37	42	-5	38	-1

The predicted Rating Levels for the THP and associated plant are below the measured daytime and night-time background sound levels expressed as L_{A90} at the closest noise sensitive receptors.

The highest predicted noise contribution from the THP and associated plant at the positions of where the background noise levels were measured is 37 dB(A) at Marcella Crescent. This is below the measured background noise level.

At both other locations the Rating Level including the intermittency correction is lower than the measured respective background noise levels.

An acoustic penalty correction of 3 dB for intermittency has been applied as it is assumed that the noise emitted by the some plant items may include elements of intermittency as discussed in Section 2.1.

BS4142: 2014 states that:

“If the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context.”

Table 4-1 shows that the background noise level exceeds the rating level at all receptors for both day and night indicating that noise from the THP and associated plant will have a low impact.

4.4 BS5228 – Construction Noise

A construction noise assessment has been carried out in accordance with BS5228-1 Example Method 1 – The ABC Method. The construction hours are assumed to be 0700-1900hrs for weekdays and 0700-1300hrs for Saturday. No working on Sunday.

The construction works have been divided into the following phases with the associated likely durations and plant as informed by the project team:

- Earthworks – 1 month
- Foundations – 3 months
- Construction – 2 years

Table 4-2: Construction plant noise levels

Ref - Defra Construction Noise Level Database		Octave Band Sound Pressure Levels (Hz)								Sound Pressure Level dBA
Wrexham STW Five Fords		63	125	250	500	1k	2k	4k	8k	
Earthworks/Number of items										
x3	Tracked Excavator	80	83	76	73	72	70	69	66	78
x5	Articulated Dump Truck (Tipping Fill)	80	76	73	70	69	66	63	58	74
	Wheeled Loader	85	83	76	75	75	72	72	61	80
Foundations										
x2	Large Rotary Bored Piling Rig -	84	92	81	80	78	76	68	61	83
x5	Lorry JK -	73	78	78	78	74	73	68	66	80
x2	Concrete Pump + Cement Mixer Truck (Discharging)	69	64	64	66	63	59	53	47	67
	Tracked Excavator	80	83	76	73	72	70	69	66	78
Construction -general site activities										
x2	Articulated Dump Truck JK	90	87	77	79	75	73	67	63	81
x2	Wheeled Excavator (Idling)	61	59	57	57	58	52	42	34	61
x4	Concrete Pump + Cement Mixer Truck (Discharging)	69	64	64	66	63	59	53	47	67
1	Wheeled Mobile Telescopic Crane	80	79	73	74	73	73	64	55	78
1	Mobile Telescopic Crane	87	82	78	74	71	67	60	52	77
1	Diesel Generator	80	74	57	54	53	48	45	37	61
1	Diesel Generator	70	62	62	57	53	52	48	41	60

The values in the final column (sound pressure level dB(A)) represent the sound levels at 10m from the plant used in each construction phase.

The computer noise model (CadnaA) has been used to predict façade noise levels (1m in front of the most exposed window) at the noise sensitive receptors described above using the reference noise levels in Table 4-2.

Due to the nature of the terrain, soft ground conditions are assumed between the construction noise sources and the receivers. No barrier correction was assumed.

The baseline measurement selected for calculations is generally the lowest $L_{Aeq,T}$ recorded during standard working hours and is corrected to a façade level if the measurement was carried out in the free-field.

The results of this analysis are presented in Table 4-3

Table 4-3: BS5228 analysis

Phase	Distance to works (m)	Measured baseline noise rounded to nearest 5dB (day) $L_{Aeq,T}$	Predicted noise level from construction (day) $L_{Aeq,1h}$	Assessment
1 Cefn Road				
Earthworks	305	50 dB	54 dB	No Significance
Foundations	305	50 dB	60 dB	No Significance
Construction	305	50 dB	60 dB	No Significance
6 Scotts Close				
Earthworks	504	40 dB	53 dB	No Significance
Foundations	504	40 dB	57 dB	No Significance
Construction	504	40 dB	57 dB	No Significance
16 Marcella Crescent				
Earthworks	250	45 dB	56 dB	No Significance
Foundations	250	45 dB	60 dB	No Significance
Construction	250	45 dB	60 dB	No Significance

For all three receptors the measured baseline noise level (rounded to the nearest 5dB) is below the threshold value of 65dB for Category A corresponding to the lowest ambient noise levels. Category A is therefore selected for all three receptors for this assessment.

The results of the calculations from the assumed plant indicate that daytime noise impacts at the closest noise sensitive receptors are expected not to exceed the 65dB (A) threshold at any considered receptor.

There is no potentially significant effect at any of the considered receptors.

4.5 Construction Traffic

Noise effects that may arise due to construction traffic flows have been assessed based on assumed average HGV traffic numbers and a likely construction traffic route utilizing the Cefn Road. Worst case daily construction movements of approximately 8 vehicles movements per day (4 movements each way) have been used to assess potential construction traffic noise effects.

A qualitative analysis suggests that a worst case construction traffic activity will be negligible in comparison to the current traffic frequenting the site. Thus predicted construction traffic noise is to be of negligible impact magnitude.

4.6 Construction Vibration

BS 5228 –2: provides empirical relationships describing vibration impacts arising from various activities (in terms of peak particle velocity). Some of these values and those from Department for Transport (DfT) Report 53 have been plotted in Figure 5 as a function of distance from the source.

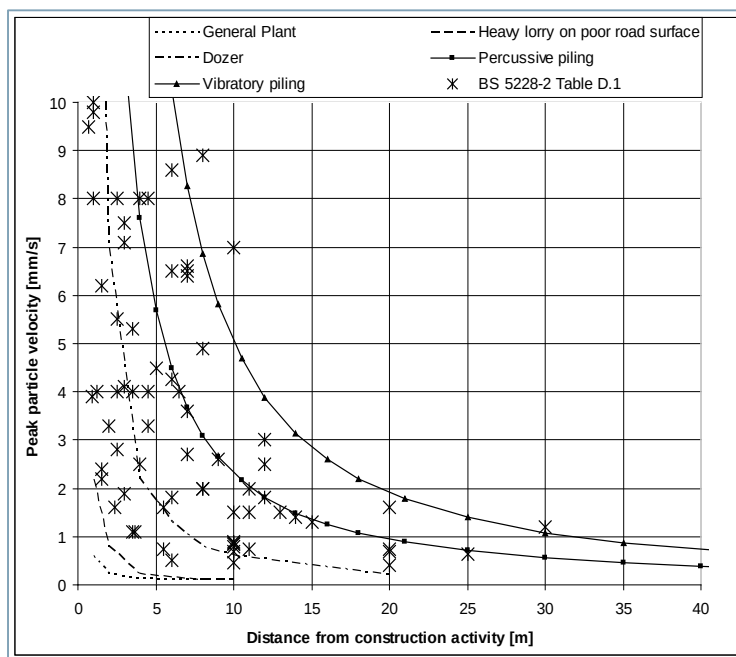


Figure 3 Vibration levels for construction plant using data in BS 5228 and DfT Report 53

Vehicle movements (within close proximity to 1 Cefn Road) such as plant deliveries, tracked crane deliveries and wheeled tippers within the site for the supply and removal of spoil could be, at their closest, approximately 50m from the sensitive receptors. Consideration of Figure 5 above indicates that transient vibration levels are likely to be below 0.14 mm/s during the passage of these vehicles and also any other operating plant such as dozers and are thus likely to be below the perceptibility threshold.

5 Conclusions

A noise impact assessment has been conducted for the proposed new THP Plant at the Five Fords sewage treatment facility.

The operational noise assessment in accordance with BS4142:2014 has indicated that the proposed THP will have a low impact at the nearest noise sensitive receptors.

The construction noise assessment has demonstrated that no potential significant effect is expected at any of the noise sensitive receptors.

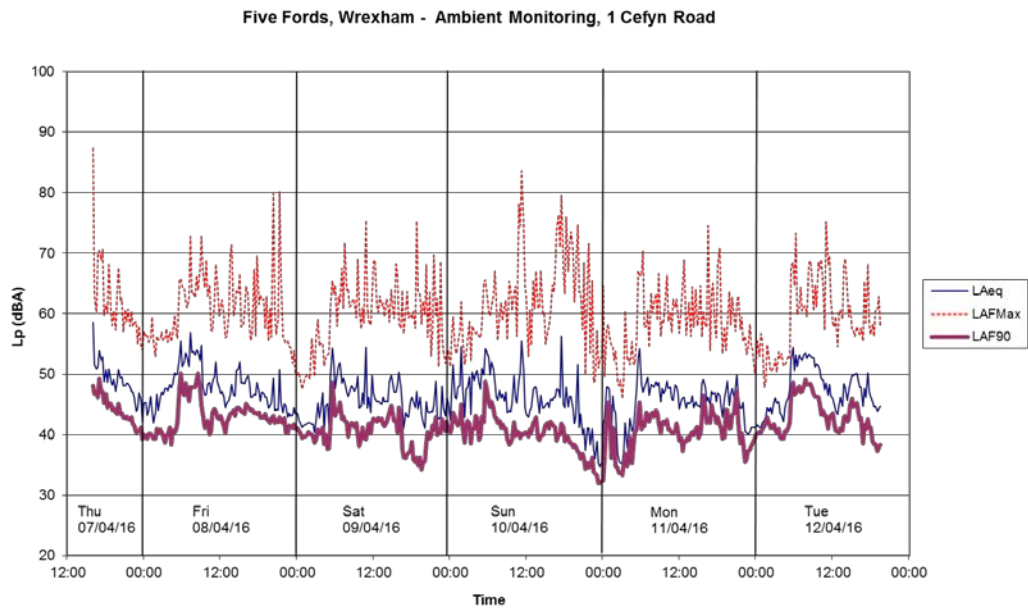
On the basis of this assessment, the proposed THP are not considered likely to give rise to a significant adverse impact on health and quality of life in relation to noise.

Appendices

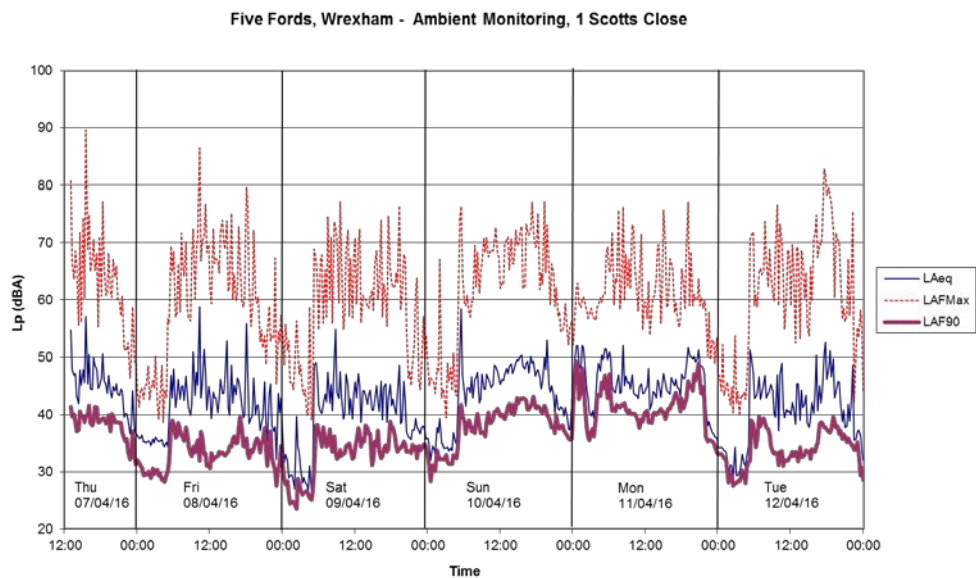
Appendix A. Medium term measurement data	16
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Appendix A. Medium term measurement data

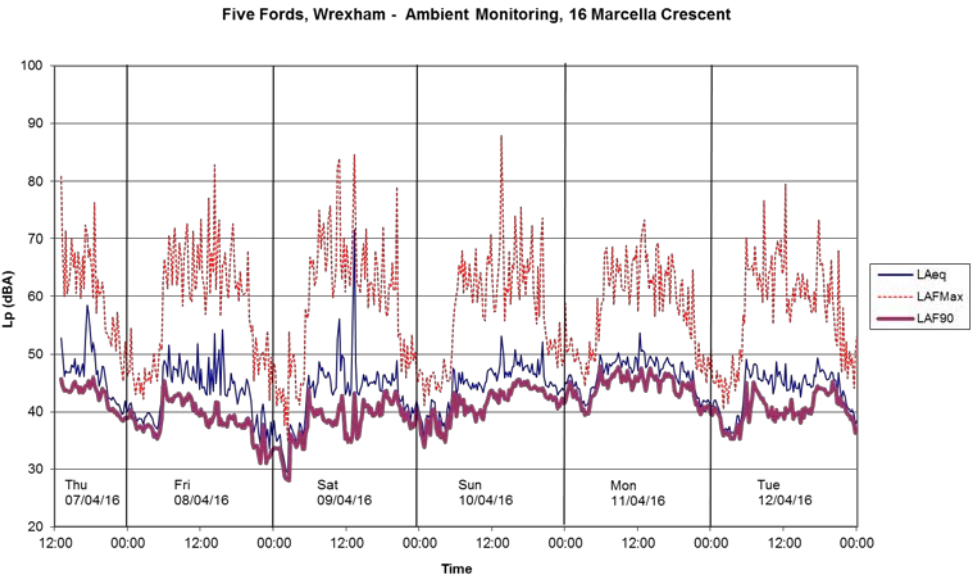
Results of the medium-term unattended noise monitoring at 1 Cefn Road



Results of the medium-term unattended noise monitoring at 6 Scotts Close



Results of the medium-term unattended noise monitoring at 16 Marcella Crescent





Report

Five Fords WwTW AAD - Odour Impact
Assessment of Upgrade Works

Client: Mott MacDonald Bentley Ltd.
DCWW Capital Delivery Alliance
Ty Awen
Celtic Springs Business Park
Newport, NP10 8FZ

Report number: MOMB16B_16_FINAL
Project code: MOMB16B
Date: 26 July 2016 (July 2016)



title: **Five Fords WwTW AAD - Odour Impact Assessment of Upgrade Works**

report number: **MOMB16B_16_FINAL**

project code: **MOMB16B**

key words:

client: **Mott MacDonald Bentley Ltd.
DCWW Capital Delivery Alliance
Ty Awen
Celtic Springs Business Park
Newport NP10 8FZ**

contact: **D Buxton**

contractor: **Odournet UK Ltd
5, St. Margaret's Street
Bradford on Avon
Wiltshire BA15 1DA
01225 868869 phone
01225 865969 fax
Companies House Cardiff 2900894
uk@odournet.com**

authors: **Charlotte Skinner**

approved: **on behalf of Odournet UK Ltd by**

Mr. Nick Jones, director

date: **26 July 2016**

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2430



Executive Summary

This report presents the findings of an odour assessment of upgrades to Five Fords Wastewater Treatment Works (WwTW). The upgrades at the site relate to the replacement of the existing sludge liming process with a new Thermal Hydrolysis Plant (THP). The study was commissioned by Mott MacDonald Bentley (MMB).

The purpose of the study is to assess how the upgrade is likely to affect odorous emissions and associated odour exposure from the sludge handling and processing areas of the site. As the upgrade only affects specific elements of the operations that relate to sludge processing, it is likely that the odorous emissions from the rest of the works operations will not change. The proposed study therefore focuses on the sludge processing elements of the site only.

The specific objectives of the study are defined as follows:

1. To review the current sludge treatment processes at Five Fords to identify odour sources and estimate the current magnitude of odour emissions from these sources under baseline conditions.
2. To review the proposed upgrade design to identify the new sources of odour that will be introduced, estimate odour emissions, and clarify how the odour emissions from the site are likely to change as a result of the proposed upgrade.
3. To assess the change in off-site odour exposure around the site for the proposed upgrade scenario and evaluate the effect of these upgrades on offsite impact risk and potential adverse impact on the amenity of the area around the site.

The study was informed by previous studies conducted by Odournet UK at a range of WwTW across the UK, including an odour survey of Treborth WwTW which operates a sludge liming process and of Afan WwTW which operates a Thermal Hydrolysis Plant of similar design to that proposed for Five Fords WwTW.

The study focuses on assessing the odour exposure levels which may occur from sludge treatment operations around the site under the following operational conditions:

- Baseline conditions - current operational conditions.
- Proposed upgrade - upgrade conditions with 2 No. odour control units (OCU).

The assessments were performed using mathematical atmospheric dispersion modelling techniques which provided a statistical analysis of the odour exposure levels that are likely to occur around the site for a five year period.

The dispersion modelling was conducted using the US EPA AERMOD dispersion model (version 7.7.1.2). The model was run in accordance with recent guidance issued by the US EPA and guidance relevant to odour assessment published by the Environment Agency.

The dispersion model outputs were compared to assess how odour exposure levels are likely to change as a result of the upgrade. This comparison was conducted using a range of odour impact criteria commonly applied in the UK.

The key findings of the study are as follows:

1. The predicted change in odour emissions from the sludge sources at Five Fords WwTW as a result of the proposed upgrade is an increase of approximately 1%.
2. Despite this slight increase in odour emissions the predicted offsite odour exposure levels for the proposed upgrade, as indicated by dispersion modelling, are predicted to reduce. The area

exposed to commonly used UK odour impact criteria under the baseline and proposed upgrade scenarios are summarised in the table below:

Table 1: Areas covered by each odour impact isopleth for 2010, the worst case year

Odour criteria	Baseline scenario (km ²)	Proposed upgrade (km ²)
C ₉₈ 1 hour ≥ 1.5 ou _E /m ³	0.80	0.64
C ₉₈ 1 hour ≥ 3.0 ou _E /m ³	0.37	0.21
C ₉₈ 1 hour ≥ 5.0 ou _E /m ³	0.20	0.08

3. This reduction in predicted offsite odour exposure is due to the change in the way in which the odour emissions are released, especially in relation to the post-digestion centrifuges and cake storage and handling, where the emissions are released at height allowing for greater dilution and dispersion in the atmosphere.
4. The implementation of the proposed upgrade to the sludge operations at the works is therefore not anticipated to increase the offsite impact risk or to result in an increase in adverse impact on the amenity of the area around the site.

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1 Introduction and scope

1.1 Scope

This report presents the findings of an odour assessment of upgrades to Five Fords Wastewater Treatment Works (WwTW). The upgrades at the site relate to the replacement of the existing sludge liming process with a new Thermal Hydrolysis Plant (THP). The study was commissioned by Mott MacDonald Bentley (MMB).

The purpose of the study is to assess how the upgrade is likely to affect odorous emissions and associated odour exposure from the sludge handling and processing areas of the site. As the upgrade only affects specific elements of the operations that relate to sludge processing, it is likely that the odorous emissions from the rest of the works operations will not change. The proposed study therefore focuses on the sludge processing elements of the site only.

The specific objectives of the study are defined as follows:

1. To review the current sludge treatment processes at Five Fords to identify odour sources and estimate the current magnitude of odour emissions from these sources under baseline conditions.
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3. To assess the change in off-site odour exposure around the site for the proposed upgrade scenario and evaluate the effect of the upgrades on offsite impact risk and potential adverse impact on the amenity of the area around the site.

MMB also requested the investigation of the effect of implementing the proposed upgrade but with an alternative odour control strategy, defined by MMB.

The study was informed by previous studies conducted by Odournet UK at a range of WwTW across the UK, including an odour survey of Treborth WwTW which operates a sludge liming process and of Afan WwTW which operates a Thermal Hydrolysis Plant of similar design to that proposed for Five Fords WwTW.

1.2 Structure of report

The report is structured as follows:

- Section 2 describes the methodology undertaken to conduct the assessment.
- Section 3 provides an overview of existing and proposed site operations.
- Section 4 identifies the changing odour sources associated with Five Fords WwTW under the existing and proposed operational conditions.
- Section 5 details the assumptions applied to estimate odour emissions and defines an odour emission hierarchy for the works for the baseline and for the 2 No. upgrade scenarios.
- Section 6 details the results of the odour dispersion modelling and assesses how offsite odour exposure and impact risk is likely to change in comparison to baseline conditions.
- Section 7 summarises the conclusions of the study.

Supporting information is provided in the Annex.

1.3 Quality Control and Assurance

Odournet's odour measurement, assessment and consultancy services are conducted to the highest possible quality criteria by highly trained and experienced specialist staff. All activities are conducted in accordance with quality management procedures that are certified to ISO9001 (Certificate No. A13725).

All sensory odour analysis and odour sampling services are undertaken using UKAS accredited procedures (UKAS Testing Laboratory No. 2430) which comply fully with the requirements of the international quality standard ISO 17025: 2005 and the European standard for olfactometry EN13725: 2003. Where required, Odournet are accredited to conduct odour sampling from stacks and ducts in accordance to ISO 17025: 2005 and EN13725: 2003 under the MCERTS scheme. Odournet is the only company in the UK to have secured UKAS accreditation for all elements of the odour measurement and analysis procedure.

The Odournet laboratory is recognised as one of the foremost laboratories in Europe, consistently outperforming the requirements of the British Standard for Olfactometry in terms of accuracy and repeatability of analysis results.

2 Description of approach

2.1 Identification of odour sources and estimation of odour emissions

The odour sources associated with the existing and proposed sludge treatment assets were defined on the basis of an audit of the existing Five Fords WwTW site, and review of information provided by MMB.

Emission estimates (expressed in terms of European odour units) for each source were defined using data collected during previous surveys of sludge liming at Treborth WwTW¹ and a THP process at Afan WwTW². Measurement data from other operational sewage treatment facilities was also used where relevant and appropriate.

In defining emissions from each odour source, consideration was also given to the influence of the following factors:

- Turbulence of aspects of the processes handling odorous liquid and solid material.
- The frequency and duration of release of intermittent activities.

2.2 Odour assessment methodology

The study assessed the odour exposure levels which might occur from sludge treatment operations around the site under the following operational conditions:

- Baseline conditions - current operational conditions.
- Proposed upgrade - Upgrade conditions with 2 No. odour control units (OCU).
- Alternative upgrade - Upgrade conditions with 1 No. OCU.

These assessments were performed using mathematical atmospheric dispersion modelling techniques which provided a statistical analysis of the odour exposure levels that are likely to occur around the site for a the worst case meteorological year of a five year period.

The dispersion modelling was conducted using the US EPA AERMOD dispersion model (version 7.7.1.2). The model was run in accordance with recent guidance issued by the US EPA and guidance relevant to odour assessment published by the Environment Agency.

The predicted odour exposure levels under each operational condition were then compared to assess how odour exposure levels are likely to change as a result of the upgrade. This comparison was conducted using a range of odour impact criteria which are described in more detail below.

2.3 Odour impact criteria

In general terms, odour annoyance is recognised as a symptom that develops as a result of intermittent but regular exposure to odours that are recognisable and have an offensive character. The key factors that contribute to the development of odour annoyance can be usefully summarised by the acronym FIDOL:

- Frequency of exposure.
- Intensity or strength of exposure.
- Duration of exposure.

¹ Odournet Report Reference DCWW13B_13_draft 'Odour impact assessment of Treborth STW'. April 2014.

² Odournet Report Reference DCWW14D_19_draft 'Odour impact assessment of Treborth STW following sludge treatment upgrades'. January 2015.

- Offensiveness.
- Location sensitivity.

In acknowledgement of these factors, a number of odour impact criteria have been developed that enable the odour impact risk of proposed facilities to be predicted using dispersion modelling techniques. These criteria are generally defined in terms of a minimum concentration of odour (reflecting the intensity/strength element of FIDOL) that occurs for a defined minimum period of time (reflecting duration and frequency element of FIDOL) over a typical meteorological year. The concentration element of these criteria can be increased or lowered to reflect variations in the offensiveness of the odours released from a specific type of facility, and the sensitivity of nearby sensitive locations.

There are currently a range of odour criteria applied in the UK to attempt to gain an insight into the probability of odour annoyance developing at a given location. However, there is no firm consensus on which odour impact criteria should be applied for sewage treatment works and the issue is currently a matter of rigorous debate.

In the UK, odour impact criteria are generally expressed in terms of a European odour unit concentration that occurs for more than 2% of the hours of a typical meteorological year, and have been designed for application to permanent residential properties which are considered to be the most sensitive from an impact risk perspective.

The most commonly applied criterion from this perspective is the 'Newbiggin criterion'. This criterion was originally introduced into a public inquiry for a new sewage works at Newbiggin-by-the-sea in 1993, and equates to an odour exposure level of 5 European odour units per cubic metre ($C_{98, 1\text{-hour}} > 5 \text{ ou}_E/\text{m}^3$). The Newbiggin criterion has been successfully applied during numerous planning and odour nuisance assessment studies since 1993 for sewage, waste, food and a range of other industrial and agricultural activities.

Since 2002, a range of indicative odour annoyance criteria have also been applied to assess odour impact risk from residential properties, which have supplemented the use of the Newbiggin criterion. These criteria were introduced in the Horizontal Guidance Note for Odour Management H4 issued by the Environment Agency³ and define three different levels of exposure at which odour impact or annoyance could potentially be expected to occur, for odours with high, moderate and low offensiveness. The indicative criteria are presented in the table below:

Table 2: Odour impact criteria

Relative offensiveness	Indicative criterion	Typical processes
Most offensive	1.5 ou_E/m^3 98 th percentile (hourly average)	Processes involving decaying animals or fish remains; septic effluent or sludge; biological landfill odours
Moderately offensive	3 ou_E/m^3 98 th percentile (hourly average)	Intensive livestock rearing; sugar beet processing; fat frying (food processing); well aerated green waste composting
Less offensive	6 ou_E/m^3 98 th percentile (hourly average)	Brewery; coffee roasting; confectionary; bakery

Odour guidance published by DEFRA in March 2010⁴ also refers to these criteria but in less specific terms. The guidance does not state which criterion should be applied for assessing impact but does suggest that typical criteria fall within the range of $C_{98, 1\text{-hour}} = 1.5 \text{ ou}_E/\text{m}^3$ to $C_{98, 1\text{-hour}} = 5 \text{ ou}_E/\text{m}^3$. Similarly, guidance

³ IPPC H4 Technical Guidance Note "H4 Odour Management", published by the Environment Agency, March 2011.

⁴ Odour Guidance for Local Authorities, published by DEFRA, March 2010.

published by the Institute of Air Quality Management (IAQM)⁵ in May 2014 also refers to these criteria. This guidance does however state that odour impact may occur between $C_{98, 1\text{-hour}} = 1 \text{ ou}_E/\text{m}^3$ and $C_{98, 1\text{-hour}} = 10 \text{ ou}_E/\text{m}^3$ and that professional judgement should be applied to determine criteria on a case by case basis by considering the underlying science, sensitivity of local receptors and developing case law.

There is currently some debate as to which odour criteria currently are the most appropriate for assessing the risk of impact of odorous industries such as sewage treatment, and to what extent the criteria are able to predict occurrence of odour annoyance for different odour types. Whilst there appears to be a substantial body of evidence to support the Newbiggin-by-the-Sea impact criterion for assessing the development of odour annoyance from the sewage sector, the availability of such evidence for the EA criteria is currently somewhat lacking. There is therefore a developing view within the UK odour community that the most stringent EA criteria (i.e. $C_{98, 1\text{-hour}} = 1.5 \text{ ou}_E/\text{m}^3$) may represent an overly precautionary standard in many cases even for highly offensive odours.

Odournet's general experience based on assessment of odours which could generally be classified as moderate to highly offensive (e.g. odours from waste water and sludge handling operations) generally supports this view, and indicates that odour annoyance is a symptom that is most likely to develop at exposure levels between $C_{98, 1\text{-hour}} = 3 \text{ ou}_E/\text{m}^3$ and $C_{98, 1\text{-hour}} = 5 \text{ ou}_E/\text{m}^3$,

This observation is supported to some extent by the findings of recent legal cases relating to odours from sewage treatment works (and a policy statement issued by the Chartered Institute of Water and Environmental Management) as indicated below, although from review of these it is clear that the use of the most stringent criteria EA cannot necessarily be discounted.

- **Appeal by Abbey Homes against St Edmundsbury Borough Council (March 2012).** The Borough Council originally refused planning permission for the erection of 101 dwellings on land between Upthorne Road and Hepworth Road, Stanton, Suffolk, for reasons including the proximity of the site to an existing small rural sewage treatment works and the potential effects on the living conditions of future residents of the dwellings. On the basis of odour dispersion modelling submitted by experts acting for both parties, the inspector considered an appropriate threshold to be more than $C_{98, 1\text{-hour}} = 1.5 \text{ ou}_E/\text{m}^3$, and that $C_{98, 1\text{-hour}} = 3 - 5 \text{ ou}_E/\text{m}^3$ was a more appropriate threshold (the inspector could see no reason to expect a significant loss of amenity to the occupiers of the proposed dwellings where Anglian Water's modelling predicted exposure levels below $C_{98, 1\text{-hour}} = 3 \text{ ou}_E/\text{m}^3$). The appeal was allowed and planning permission was granted.
- **Appeal against Corby Borough Council (2012).** This appeal concerned land at Ashley Road, Middleton, Leicestershire. The inspector concluded in this case "I believe that it is reasonable to take account of the $1.5 \text{ ou}_E/\text{m}^3$ contour map in determining odour impact. In my view areas subject to such concentrations are unlikely to provide a reasonable permanent living environment."
- **Appeal by Lakeland Leisure Ltd. against Allerdale Borough Council, 2012.** This appeal concerned the development of dwellings in Cockermouth, Cumbria in the vicinity of a sewage treatment works. The inspector concluded that development within the area predicted to experience odour exposure levels of $C_{98, 1\text{-hour}} = 3 \text{ ou}_E/\text{m}^3$ or less would be appropriate due to the anticipated medium offensive nature of the odours from the sewage works.
- **Thames Water vs. Dobson 2011.** This nuisance action was brought against Thames Water Mogden Sewage Treatment Works by a group of residents claiming odour nuisance caused by this large municipal sewage works in London. The inspector concluded that he would be reluctant to find nuisance if the modelled odour concentration was only $C_{98, 1\text{-hour}} > 1.5 \text{ ou}_E/\text{m}^3$ but as the odour concentration rises to $C_{98, 1\text{-hour}} = 5 \text{ ou}_E/\text{m}^3$ he considered that this was the area where

⁵ Guidance on the assessment of odour for planning, published by IAQM: April 2014.

nuisance from the works would start and that by the time that $C_{98, 1\text{-hour}} > 5 \text{ ou}_E/\text{m}^3$ or above is reached nuisance would certainly be established.

- **Appeal by JS Bloor (Northampton) Ltd 2010.** This appeal concerned a proposed residential development on land near an existing sewage treatment works in Leighton Linlade. The inspector noted that the water company used a standard of $C_{98, 1\text{-hour}} > 5 \text{ ou}_E/\text{m}^3$ which they indicated would be a “concentration level above which odour might be a potential nuisance”, and stated that the approach seemed reasonable and had been accepted at a previous appeal.
- **Extract from CIWEM policy statement.** CIWEM issued a position statement on odour in 2012 stating that the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:
 - $C_{98, 1\text{-hour}} > 10 \text{ ou}_E/\text{m}^3$ - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;
 - $C_{98, 1\text{-hour}} > 5 \text{ ou}_E/\text{m}^3$, - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance;
 - $C_{98, 1\text{-hour}} < 3 \text{ ou}_E/\text{m}^3$, - complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature.

For the purposes of this study, which was aimed at comparing how the off-site odour impact from the site will change following the upgrade, the results of the odour dispersion model were presented in the form of concentration isopleths which were plotted on a plan of the area surrounding the WwTW and encompassed the following specific odour exposure levels:

- $C_{98 \text{ 1 hour}} \geq 1.5 \text{ ou}_E/\text{m}^3$.
- $C_{98 \text{ 1 hour}} \geq 3 \text{ ou}_E/\text{m}^3$.
- $C_{98 \text{ 1 hour}} \geq 5 \text{ ou}_E/\text{m}^3$.

An analysis was also conducted to estimate the area of land that fell within each odour exposure band for each scenario.

3 Description of works operations

3.1 Site location

Five Fords Wastewater Treatment Works (WwTW) is located to the south-east of Wrexham in a predominantly rural location. There are however a number of urban areas located in the vicinity of the works, with the nearest receptors located to the South West and North East of the site. Figure 1 below shows the location of the works.

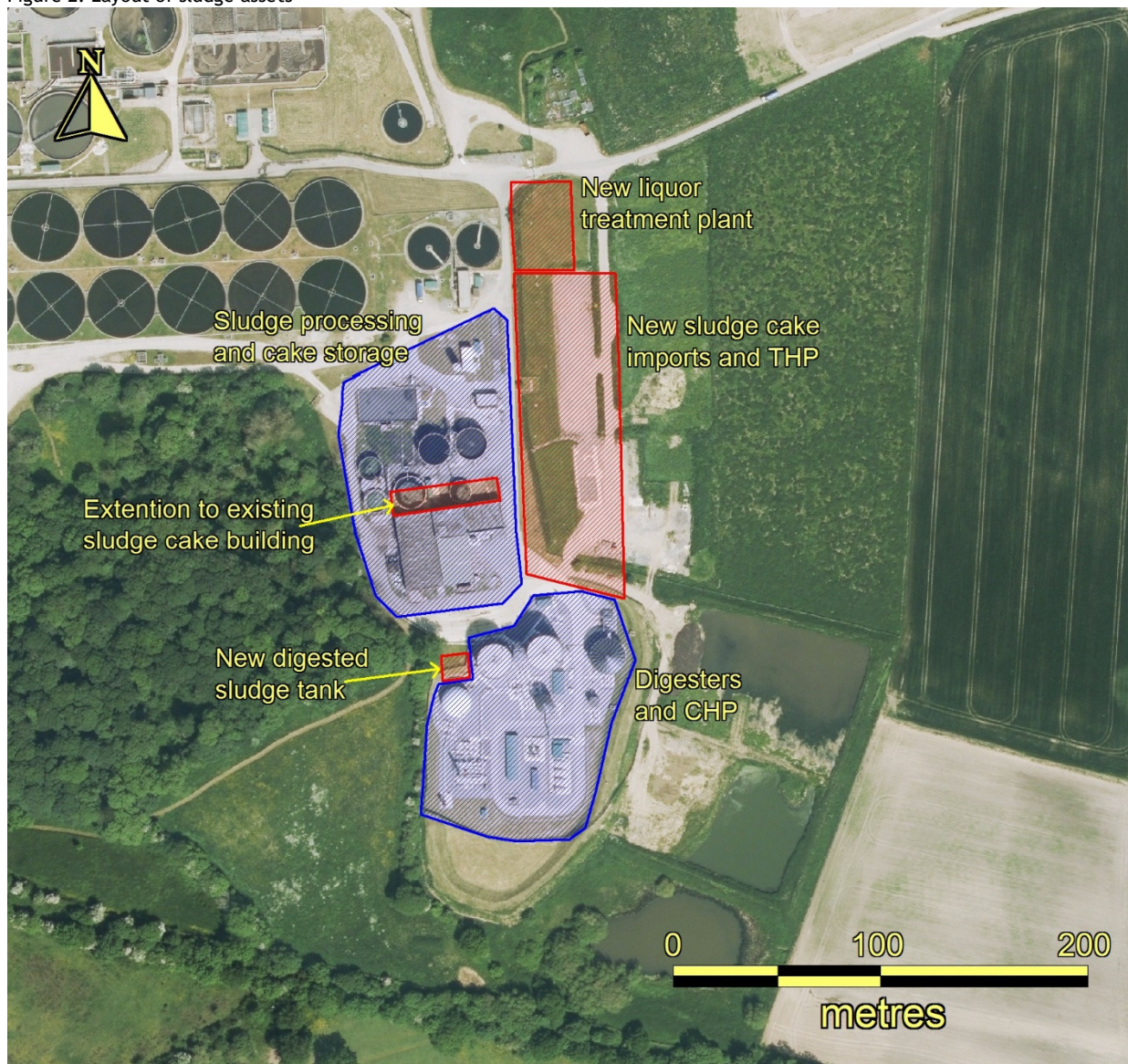
Figure 1: Location of Five Fords WwTW



3.2 Treatment process

Five Fords WwTW is a relatively large works which serves a population equivalent of approximately 132,000. The layout of the current and planned sludge treatment assets at Five Fords WwTW is shown in Figure 2. The blue areas represent existing assets and the red areas the planned upgrade assets.

Figure 2: Layout of sludge assets



3.2.1 Existing sludge treatment operations

Liquid sludge is imported into Five Fords WwTW. This flows through 1 of 2 No. screens which discharge rags into 1 of 2 No. open skips. The screened sludge is then pumped to the strain presses, where it is joined by sludge from the Five Fords primary settlement tanks (PSTs). This sludge then passes through 1 of 4 No. strain presses and into the mixed screened sludge tank. The strained material is deposited to 1 of 2 No. open skips. The raw sludge is then thickened in 1 of 2 No. gravity belt thickeners (GBT) before entering the thickened sludge tank. Surplus activated sludge (SAS) from the covered SAS buffer tank is pumped to 1 No. GBT before also entering the thickened sludge tank. There is also a standby GBT which is not used as part of normal operations.

From the thickened sludge tank the sludge is pumped via 1 of 2 No. heat exchangers, into 1 of 2 No. digesters. After digestion the sludge is pumped into 1 No. open post digestion tank.

Gas from the digesters is collected and stored in a gas storage bag before being used to fuel boilers and 2 No. combined heat and power (CHP) plant. Water heated via the boilers is used in the heat

exchangers. A waste biogas burner (flare) is also present on site that can be used to burn excess gas when required.

From the post digestion tank the digested sludge is pumped to 1 of 2 No. open lime consolidation tanks. Lime is added to the sludge within the pipe to these tanks. From the consolidation tanks the limed digested sludge is fed into 1 of 2 No. open sludge holding tanks.

From the sludge holding tanks the sludge is pumped to 1 of 3 No. centrifuges which operate on the first floor of the sludge cake building. Cake from the centrifuges is then stored in the sludge cake building prior to transport off-site.

Liquors from the centrifuges and belt presses are pumped to re-enter the wastewater treatment works prior to the PSTs.

The current site operations are served by 1 No. OCU which extracts and treats air from the following:

- Raw sludge reception pumping station
- Liquor returns pumping station
- Screened sludge tank
- Gravity belt thickeners
- Thickened sludge buffer tank

3.3 Changes - Proposed upgrade

The proposed sequence of sludge treatment will remain as is upstream of the 1 No. thickened sludge tank.

From the thickened sludge tank instead of going straight to the digesters, the sludge will be dewatered in 1 of 2 No. pre-THP centrifuges. Excess sludge for the centrifuges can also be stored in a pre-THP centrifuge buffer tank when required. From the centrifuges the sludge will be pumped into 1 of 2 No. THP feed silos.

Imported raw sludge cake will be tipped into 1 of 2 No. hoppers. Once the material has been tipped the doors of the hopper will close. The imported sludge cake will then be pumped into the THP feed silos. In the pipework to the silos the cake will be diluted with final effluent from the wastewater treatment works.

The combined sludge from the THP feed silos will then enter the THP system, which is a sealed system. In this system the sludge will first go to the pulper tank, where it will be brought up to temperature (approximately 70°C), then into 2 No. reactor tanks, where pressurised steam will be used to increase the pressure and temperature (to approximately 180°C). From here the sludge will enter a flash tank where a rapid drop in pressure and temperature will cause the breakdown of cell walls within the sludge. The steam from the flash tank will be re-used and therefore there should be no odorous escapes to atmosphere.

The sludge will then enter 1 of 2 No. digesters via a 2 stage cooling system. The gas from the digesters will be extracted and held in the existing gas bag. The waste biogas flare will also remain on site to burn any excess gas. The digester gas will then be sent to join the national grid. It is understood there are no odour releases from these processes. The existing CHPs will remain on site, but will not be used in the course of normal operations.

The sludge from the digesters will be pumped to a new post digestion tank. From here it will be pumped to the cake building, which will be extended, where it will go through 1 of 3 No. post digestion centrifuges. The cake from these will be deposited in the sludge cake building and periodically

transported off site. Liquors from the centrifuges will be pumped to a new liquor treatment plant. This will consist of 1 No. balance tank followed by 2 No. sequential batch reactor (SBR) tanks.

2 No. OCUs will serve the operations, in addition to the current sludge OCU. The cake preparation OCU will serve the:

- Imported sludge hoppers
- THP feed silos
- Pre-THP centrifuges
- Pre-THP centrifuge buffer tank

The cake building OCU will extract air from the cake handling building, releasing the air from a stack on the North-West corner of the building.

3.4 Changes - Alternative upgrade

The changes for the alternative upgrade are as those listed above for the proposed upgrade, with the exception that the emissions from the sludge cake building will not be extracted and treated through an OCU. Instead the post digestion centrifuges and cake handling and storage will be located in a building with open sides and no extraction.

4 Review of odour sources

4.1 Overview of the mechanisms for odour generation from wastewater treatment operations

The generation of odour from the processing of sewage is primarily associated with the release of odorous Volatile Organic Compounds (VOCs) that are generated as a result of the anaerobic breakdown of organic matter by micro-organisms. Anaerobic breakdown starts within the human bowel and may continue within the sewerage network and treatment works if conditions (i.e. a lack of oxygen) allow.

The key objectives of the sewage treatment process are to remove solid organic matter which is responsible for generation of the majority of sewage odours and to provide treatment to remove any residual contaminants from the wastewater so that it can be returned back into the environment.

Since the main source of odour and VOCs is the solid organic matter, the most intense and offensive odours tend to be generated from the operations involving the handling of sludge i.e. the processes applied to dewater, treat and store raw sludge. These processes are generally considered to present the greatest risk of odour impact offsite, unless adequate controls are put in place. Depending upon the quality of the sewage presented to the works, the aspects of the treatment process involved in the handling of raw sewage (e.g. preliminary and primary treatment stages) may also generate significant levels of offensive odours.

Odours generated from the sewage treatment processes downstream of the primary sludge removal stage (e.g. the activated sludge processes and final settlement) present a significantly reduced risk of odour impact. This is due to the fact that the majority of odorous biogenic material has been removed from the flow at this point, and the treatment processes applied to remove any remaining contaminants in the sewage are aerobic which inhibits the formation of the majority of the reduced sulphur compounds which are responsible for offensive sewage odours.

The rate of odour release from sewage and sludge sources is primarily dependent upon the temperature of the material, and the surface area exposed to the atmosphere. As a result, odorous emissions from sewage treatment operations tend to be highest during the summer months. Furthermore, activities that lead to increases in the surface area of odorous material exposed to the atmosphere (e.g. due to turbulence generated by sewage handling processes and agitation of sludge) will inevitably lead to an increase in the magnitude of odour released.

4.2 Identification of odour sources

The sources of odour identified for the baseline and upgrade conditions are summarised in the table below. A tick mark indicates an active odour source and a cross indicates a none active odour source (e.g. sources that will be decommissioned as a result of the upgrade).

Table 3: Operational sludge odour sources under each scenario

Odour Source	Frequency of emission	Baseline	Proposed upgrade	Alternative upgrade
Imported sludge screens, strain presses and skips	Intermittent	✓	✓	✓
Sludge OCU	Continuous	✓	✓	✓
Fugitive emissions from covered SAS buffer tank	Continuous	✓	✓	✓
1 No. open rectangular post digestion tank	Continuous	✓	✗	✗
2 No. open lime consolidation tanks	Continuous	✓	✗	✗
2 No. open sludge holding tanks	Continuous	✓	✗	✗
3 No. centrifuges for limed sludge in a building	Continuous	✓	✗	✗
Storage of limed sludge cake in a building	Continuous	✓	✗	✗
Collection of limed sludge cake in a building	3 trailers/day	✓	✗	✗
2 No. imported sludge hoppers	8 lorries/day	✗	✓	✓
Cake preparation OCU	Continuous	✗	✓	✓
1 No. circular post digestion tank	Continuous	✗	✓	✓
Cake building OCU	12 hrs/day	✗	✓	✗
3 No. centrifuges of THP sludge cake in an open sided building	12 hrs/day	✗	✗	✓
Agitation of THP sludge cake in an open sided building	7 hrs/day	✗	✗	✓
Storage of THP sludge cake in an open sided building	Continuous	✗	✗	✓
1 No. open liquor treatment balance tank	Continuous	✗	✓	✓
2 No. open liquor treatment SBR tanks	Continuous	✗	✓	✓

*Cake preparation OCU serves the imported sludge hoppers, pre-THP centrifuges, pre-THP centrifuge buffer tanks and THP feed silos.

**Cake building OCU extracts air from within the cake building which contains the post digestion centrifuges, cake storage and agitation.

5 Estimation of odour emissions

5.1 Assumptions applied to estimate odour emissions

5.1.1 General assumptions

A summary of the key assumptions applied to derive emission estimates are presented below. Full details of the emission values used in the model can be found in Annex A.

- The odour emission rates for the majority of odour sources were calculated with reference to odour emission rates measured during the 2014 Afan and 2013 and 2012 Treborth odour sampling programs and from emissions obtained from a broader range of studies conducted on sewage treatment processes by the Odournet group.
- For turbulent sources, a multiplier was applied to reflect the increase in emissions associated with the increased surface area of liquid exposed to the atmosphere at such locations. The following factors were applied to account for varying levels of turbulence:

Table 4: Turbulence factors

Level of turbulence	Factor
Quiescent	1
Low	3
Moderate	6
High	12
Extreme	20

5.1.2 Baseline emission assumptions

A summary of the key assumptions applied to derive emission estimates are presented below.

- The sludge OCU has been assumed to be operating at its design specification of 2 No. fans operating at duty assist together extracting 4000m³/hr of air and treating it to 1000 ou_E/m³. The following assumptions have been applied to estimate emissions from the sludge OCU:

Table 5: Emission estimates for OCU

Odour source	Outlet odour concentration [ou _E /m ³]	Flow rate [m ³ /s]	Emission rate [ou _E /s]	Efflux velocity [m/s]	Stack height [m]
Sludge OCU	1000	1.1	1100	12	3

- The emission rate from the SAS buffer tank has been assumed based on data measured by Odournet UK at other operational WwTWs in the UK. The area emission rate has been reduced by 50% to account for the containment provided by the covering of the tank.
- Emissions from the sludge skips have been estimated on the basis of measurements undertaken by Odournet UK at other operational WwTW in the UK. It has been assumed that 2 No. sludge press skips and 2 No. sludge screen skips will be present on site.
- The post digestion tank emission rate has been derived from the emission rate measured at Afan WwTW. An area of turbulence has been applied to the post digestion tank to account for the tank filling, which is assumed to occur for 50% of the time.
- The lime consolidation and limed sludge holding tank emission rates have been derived from the full limed sludge tank emission rate measured at Treborth WwTW. An area of turbulence has been applied to each tank to account for the tank filling, which is assumed to occur for 25% of the time for each tank.

- The digested limed sludge centrifuges are assumed to operate for 24 hours/day. Emissions from the centrifuges and associated movement of sludge have been estimated based on Odournet's experience at operational WWTWs across the UK.
- The sludge cake has been assumed to remain on site for an average of 7 No. days. It is assumed that on average approximately one third of the building area is covered with cake. A 50% reduction in odour emissions has been applied due to the containment provided by the building. This is assumed to be a precautionary estimate due to the open doors and gaps in the building fabric.
- It is assumed that 22 No. 15 tonne trailers collect sludge cake each week over a period of 30 minutes each. The emission rate for this has been derived from Odournet's experience from measurements undertaken at WwTW across the UK.

5.1.3 Proposed upgrade emission assumptions

A summary of the assumptions applied to derive emission estimates for the upgrade aspects of the works for the proposed upgrade are presented below.

- It is assumed that emissions from the pre-THP centrifuge, pre-THP centrifuge buffer tank and THP feed silos are fully captured by the cake preparation OCU and that there are no fugitive emissions. Emissions from within the sludge hoppers are assumed to be fully captured by the OCU, however a fugitive release is also applied for the tipping of the sludge cake into the hopper. The emission rate for this is based on the agitation of raw sludge measured at Afan, and it is assumed that 9 No. 29 tonne trucks deposit each day over a 20 minute period each.
- It is assumed that emissions from the post digestion centrifuges, associated movement of material, cake bays and collection of cake are fully captured by the cake handling OCU, and that there are no fugitive emissions.
- The sludge OCU has been assumed to be operating at its design specification of 2 No. fans operating at duty assist, together extracting 4000 m³/hr of air and treating it to 1000 ou_E/m³.
- The following criteria have been applied for the OCUs from discussion with MMB. The outlet odour concentration for the cake handling OCU has been reduced from the specified 2000 ou_E/m³ to 500 ou_E/m³ due to Odournet's experience of the likely odour loading to this type of OCU.

Table 6: Emission estimates for OCU

Odour source	Outlet odour concentration [ou _E /m ³]	Flow rate [m ³ /s]	Emission rate [ou _E /s]	Efflux velocity [m/s]	Stack height [m]	Temp. [°C]
Sludge OCU	1000	1.1	1100	12	3	0
Cake preparation OCU	2000	3.5	7000	12	3	0
Cake building OCU	500	12.0	6000	12	11.8 ⁶	0

- Emissions for the post digestion tank were calculated based on the measured result at Afan multiplied by the surface area of the tank. It is assumed that the tank is filling for 50% of the time and that there is an area of turbulence associated with this. This area has been based on that observed in the current sludge tanks at Five Fords.
- Emissions from the liquor balance tank and SBR tanks were estimated using data measured by Odournet UK at other operational WwTW in the UK.

⁶ Assumed to be released vertically 1m above building height.

5.1.4 Alternative upgrade emission assumptions

The emission rates and assumptions for the proposed upgrade are also assumed for the alternative upgrade, with the exceptions of those details below.

- It is assumed that the post digestion centrifuges and associated movement of material, cake bays and collection of cake is undertaken in an open sided building, with no forced extraction and therefore no cake building OCU.
- The sludge cake has been assumed to remain on site for an average of 7 No. days. It is assumed that an area of approximately one third of the building area is covered with cake. The emission rate measured at Afan WwTW has been applied for this source.
- It is assumed that 50 No. 15 tonne trailers collect sludge cake each week over a period of 30 minutes each. The emission rate measured at Afan WwTW has been applied for this source.
- The digested limed sludge centrifuges are assumed to operate for 12 hours/day. The emission rate applied per centrifuge has been estimated on the basis of measurements undertaken by Odournet at other WwTW around the UK.

5.2 Breakdown of estimated emissions

A breakdown of the odour emissions generated from the sludge assets for the baseline and the proposed upgrade scenarios is presented in the table below. The emission rates presented have been adjusted to reflect the frequency of occurrence of each odour source, and are thus time weighted.

Table 7: Breakdown of time weighted odour emissions for the baseline and upgrade scenarios

Odour Source	Baseline scenario		Proposed upgrade		Alternative upgrade	
	Emission rate [ouE/s]	% of total	Emission rate [ouE/s]	% of total	Emission rate [ouE/s]	% of total
Sludge screens and strain presses	750	3.9	750	3.8	750	3.9
Sludge OCU	1100	5.7	1100	5.6	1100	5.8
SAS buffer tank	49	0.3	49	0.3	49	0.3
Rectangular Post digestion tank	2151	11.1	-	-	-	-
2 No. open lime consolidation tanks	5938	30.7	-	-	-	-
2 No. open sludge holding tanks	4367	22.6	-	-	-	-
Centrifuge of limed sludge	3000	15.4	-	-	-	-
Storage of limed sludge cake	1925	9.9	-	-	-	-
Agitation of limed sludge cake	71	0.4	-	-	-	-
2 No. imported sludge hoppers	-	-	1483	7.6	1483	7.8
Cake preparation OCU	-	-	7000	35.7	7000	36.7
Circular post digestion tank	-	-	481	2.5	481	2.5
Cake building OCU	-	-	6000	30.6	-	-
Centrifuges of THP sludge cake	-	-	-	-	1500	7.9
Agitation of THP sludge cake	-	-	-	-	50	0.3
Storage of THP sludge cake	-	-	-	-	3941	20.7
Open liquor treatment balance tank	-	-	950	4.9	950	5.0
Open liquor treatment SBR tanks	-	-	1767	9.0	1767	9.3
Total	19351	100	19581	100	19071	100

Review of the table above indicates only small changes in the total time weighted odour emission rates occur for the upgrade scenarios in comparison to the baseline. From the baseline to the proposed upgrade there is an increase in time-weighted emissions by approximately 1.2%. From the baseline to the alternative upgrade there is a decrease in the time-weighted emissions by approximately 1.5%.

The largest contributor to the baseline emissions comes from the lime consolidation and limed sludge holding tanks which contribute approximately 53% of the total time weighted emissions. The emissions from the digested sludge tank, the centrifuges and associated agitation, and the cake storage and handling account for 11%, 15% and 10% of total time weighted emissions respectively. The remaining emissions from the sludge screens and strain press skips, sludge OCU and SAS buffer tank together contribute only 10% to the site emissions.

It should be noted that due to the time weighting the agitation of sludge cake appears as a small contributor to emissions, however at its time of occurrence it will give a larger emission rate.

The greatest contributor to time weighted emissions for the upgrade scenarios are the cake preparation OCU at 36% and 37% for the proposed and alternative upgrades respectively. The cake centrifuges, handling and treatment (cake handling OCU or cake storage and handling and centrifuges) are the next largest contributors to site emissions at approximately 31% and 29% for the proposed and alternative upgrades respectively. This is where the difference in emission rates between the 2 upgrade scenarios occurs, with the assumed outlet concentration of an OCU against the calculated emission rates of the sources.

If the initial stated outlet odour concentration of the cake building OCU was utilised, then the emissions from this source would be 4 times higher than the emissions from the open sided cake building processes. As such the 500 ou_E/m³ outlet concentration was applied as it is unlikely that the inlet to the OCU will reach 2000 ou_E/m³. Due to the similarity of the assumed cake building OCU and the open sided building cake process emission estimates it is probable that extraction without odour treatment would achieve the 500 ou_E/m³ outlet concentration.

The baseline cake storage and handling and centrifuge emissions are lower than those for the upgrade scenarios due to the covering provided by the building and the smaller surface area of sludge cake out-weighing the reduced usage time of the upgrade centrifuges and the less odorous nature of the sludge cake.

The time weighted emissions from sludge cake import are relatively low at approximately 8% in both the proposed and alternative upgrades. Like with the sludge agitation however, at the time of these occurring these emissions are much greater.

The liquor balance tanks contribute approximately 14% of time weighted emissions for the proposed and alternative upgrades, and the unchanged sources (i.e. sludge strain presses, screens and skips, sludge OCU and SAS buffer tank) account for approximately 10% of time weighted emissions.

Although the emissions released from the baseline and upgrade scenarios are broadly comparable, the way in which they are released varies considerably with the use of OCUs, the release time periods and the location of the sources. As such the effect of the upgrades in terms of changes in off-site odour exposure and hence potential impact risk, will be evaluated by the dispersion modelling.

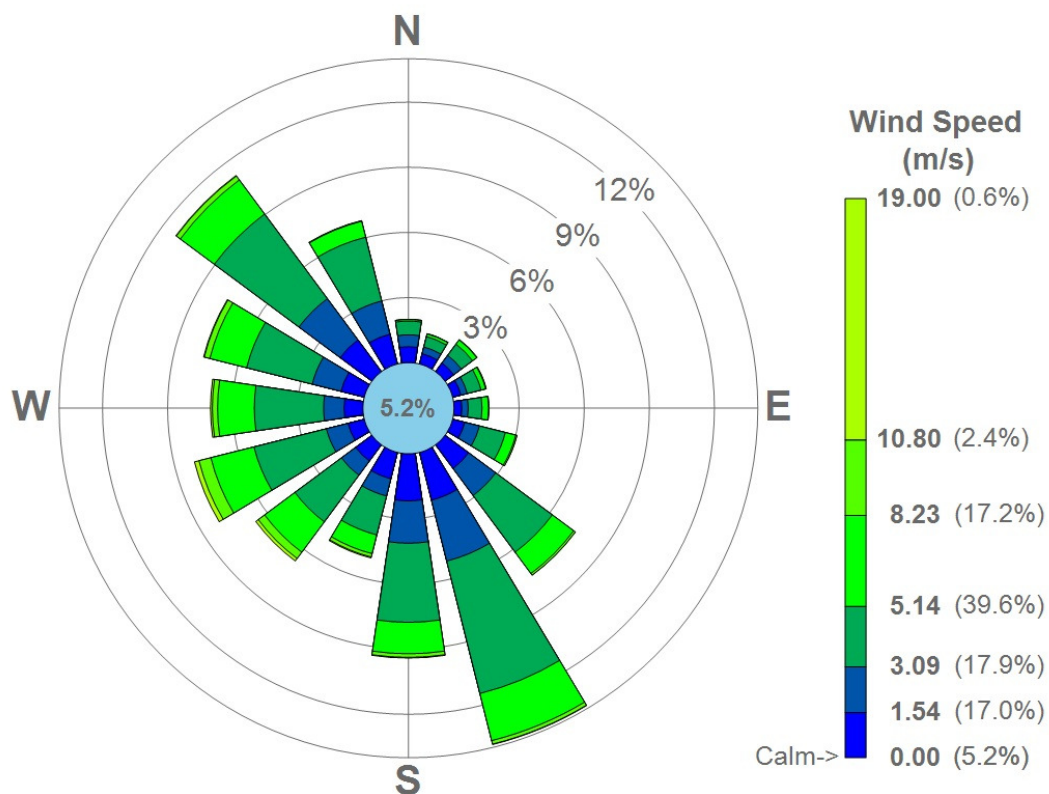
6 Review of changes to odour exposure levels

6.1 Modelling assumptions

The key assumptions which were applied within the model to represent site operations and define the dispersion characteristics for the site were as follows:

- Meteorological data utilised within the study was derived from 5 years of recent sequential hourly average data obtained from Hawarden meteorological station for the years 2009 to 2013. This meteorological recording station is located approximately 17 km to the North of the site. The meteorological data was adjusted to reflect the surface characteristics of the meteorological site in accordance with the guidelines issued in the AERMOD Implementation Guide⁷ issued by the US EPA. The wind rose for the meteorological data utilised in the study is presented below.

Figure 3: Wind rose for Hawarden meteorological station for 2009 - 2013



- The study area was defined as rural, in line with land use classification techniques described in the AERMOD User Guide issued by the US EPA.
- A 2 km by 2 km uniform Cartesian receptor grid was defined for the study area with a spacing of 50 m.
- Data describing the topography of the area surrounding the works was obtained from Ordnance Survey in Landform Panorama™ format.
- The following buildings have been assumed to be present on site for the baseline scenario:

⁷ AERMOD Implementation Guide, Published by the US EPA, Last Revised: March 19, 2009

Table 8: Assumed building dimensions for baseline Scenario

Building	Height [m]	Dimensions
Existing sludge cake building	13.4	26 m x 18.5 m and 48.5 m x 33 m
Disused tank to the North of proposed cake building OCU	8	5.5 m radius
Disused tank to the North of proposed cake building OCU	8	5.5 m radius
Lime storage building	4	11 m x 5.5 m
2 No. digesters	22.5	8.5 m radius
Mixed screened sludge tank	11.9	8.5 m radius
SAS buffer tank	5.9	2.5 m radius
Kiosk to West of Sludge OCU	3	21.5 m x 6 m
Kiosk to south of sludge OCU	3	10 m x 3 m
Kiosk to East of Sludge OCU	3	6 m x 4.5 m and 8.5 m x 2 m
Thickened sludge tank	11.8	4 m radius
Kiosk to North West of thickened sludge tank	3	11 m x 5.5 m
Gas balloon	12.8	7 m radius
GBTs	2	15 m x 4 m
2 No. lime consolidation tanks	10.5	7.5 m radius

- The following buildings have been assumed to be present on site for the proposed and alternative upgrades:

Table 9: Assumed building dimensions for upgrade Scenarios

Building	Height [m]	Dimensions
Extension of sludge cake building	10.8	51 m x 11 m
Existing sludge cake building	13.4	26 m x 18.5 m and 48.5 m x 33 m
Pre-THP centrifuge buffer tank	17	5.5 m radius
Pre-THP centrifuge building	7.7	15 m x 12 m
2 No. THP feed silos	17	6 m radius
2 No. Cake reception hoppers	10.4	12 m x 8 m
Disused tank to the North of proposed cake building OCU	8	5.5 m radius
Disused tank to the North of proposed cake building OCU	8	5.5 m radius
Liquor treatment SBR tank	9	5.5 m radius
Liquor treatment SBR tank	9	7.5 m radius
Liquor treatment balance tank	9	7.5 m radius
Lime storage building	4	11 m x 5.5 m
2 No. digesters	22.5	8.5 m radius
Mixed screened sludge tank	11.9	8.5 m radius
SAS buffer tank	5.9	2.5 m radius
Kiosk to West of Sludge OCU	3	21.5 m x 6 m
Kiosk to south of sludge OCU	3	10 m x 3 m
Kiosk to East of Sludge OCU	3	6 m x 4.5 m and 8.5 m x 2 m
Thickened sludge tank	11.8	4 m radius
Kiosk to North West of thickened sludge tank	3	11 m x 5.5 m
Gas balloon	12.8	7 m radius
GBTs	2	15 m x 4 m

- The model only considers normal operational occurrences. Short term events such as plant breakdown, maintenance and repair may impact considerably on the odorous emissions from time to time. Such short term variations have not been considered within the model.

6.2 Results of odour dispersion modelling

6.2.1 Output of dispersion model

The output of the dispersion model for the baseline and upgrade scenarios are presented in Figures 4, 5 and 6 below for 2010, the worst case meteorological year of the 5 year period. For the upgrade scenarios the baseline is also presented as a blue dashed line for comparison purposes. Isopleth maps for the remaining years are shown in Annex B. Table 10 shows the areas covered by each impact contour for each scenario.

Figure 4: Odour contours for the baseline scenario. Results presented are for 2010, the worst case year of the 5 year period.

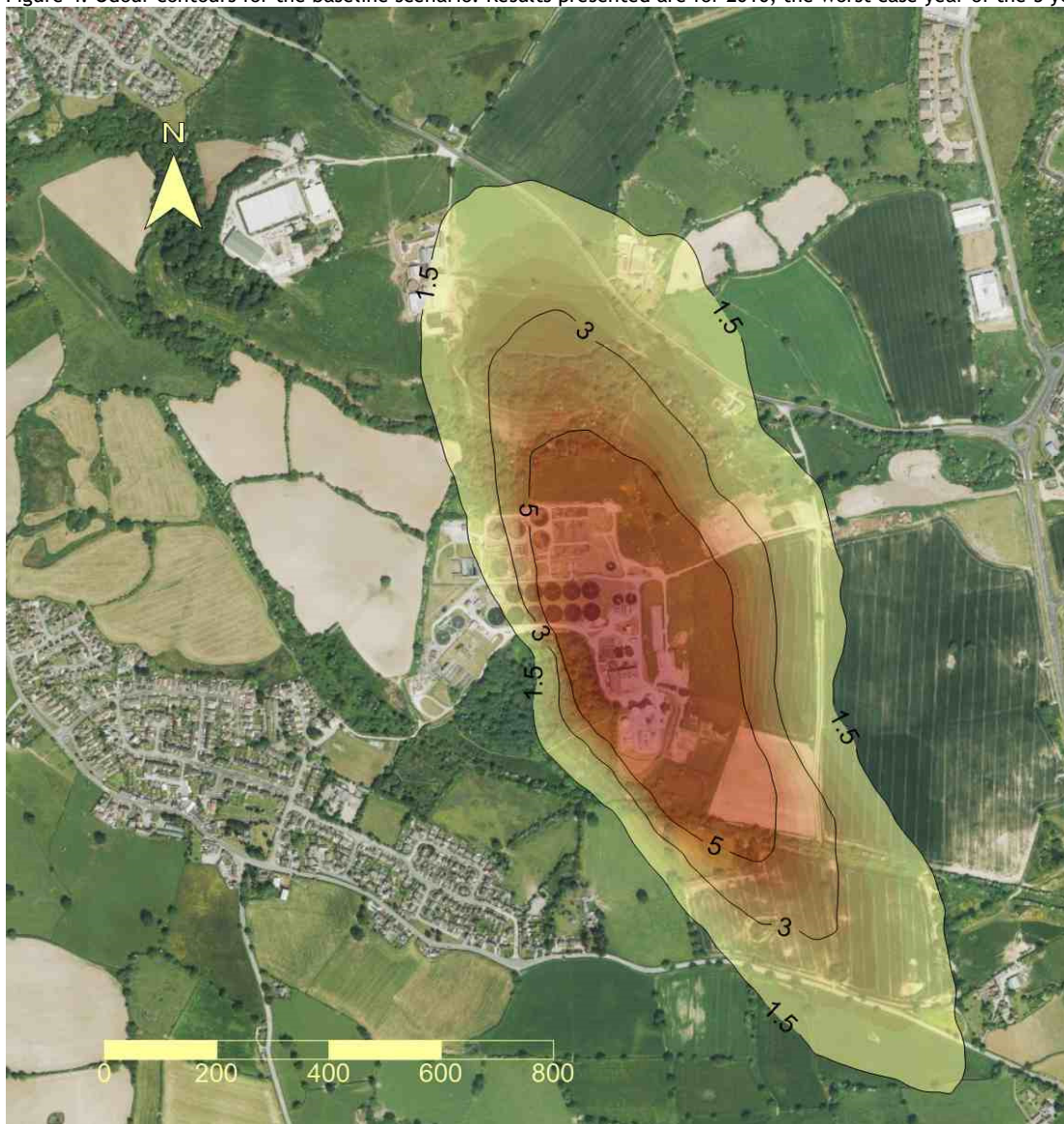


Figure 5: Odour contours for the proposed upgrade for 2010. The baseline scenario is also presented as blue dashed lines.

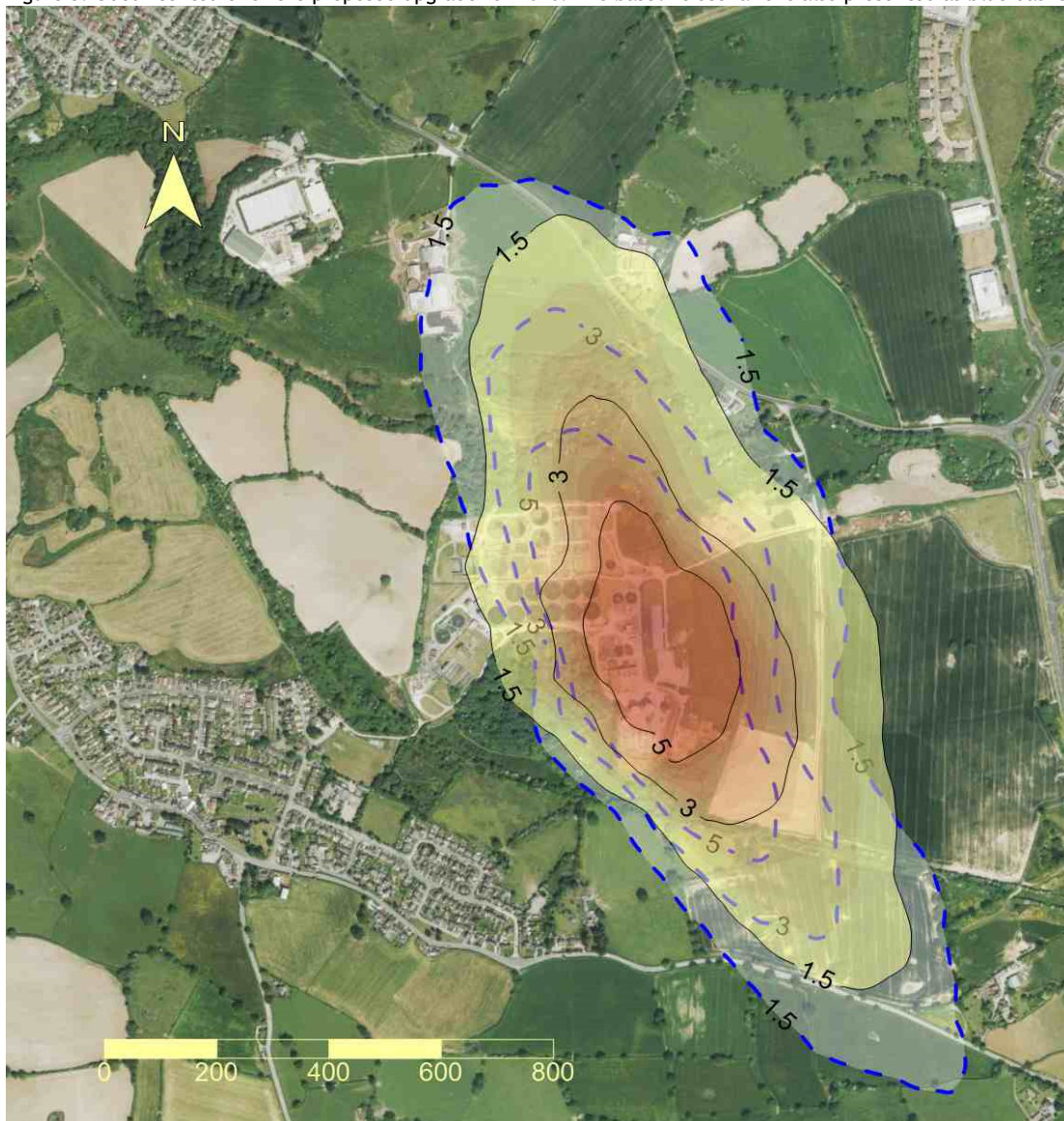


Figure 6: Odour contours for the alternative upgrade for 2010. The baseline scenario is also presented as blue dashed lines.

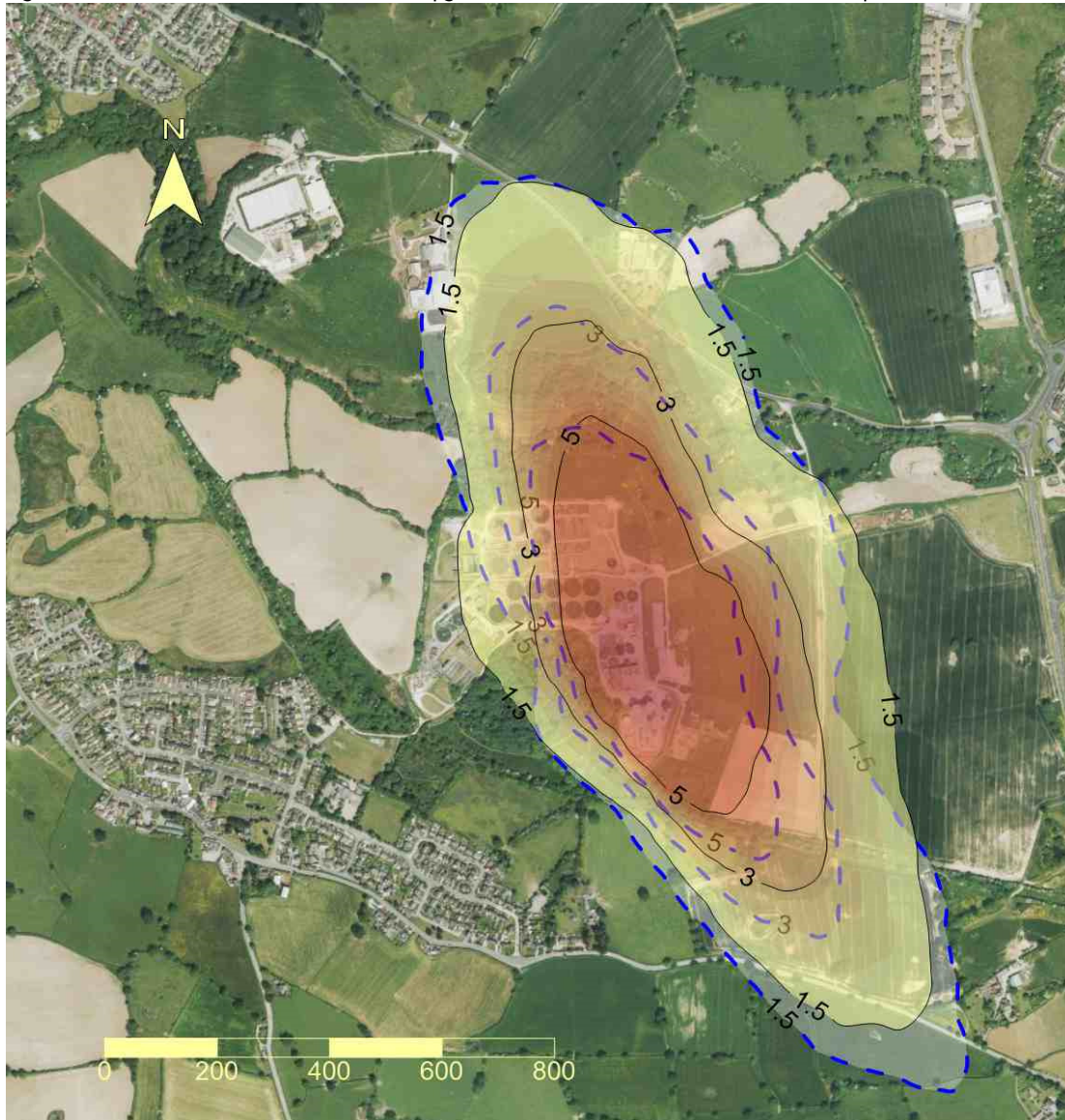


Table 10: Areas covered by each odour impact isopleth for 2010, the worst case year

Odour criteria	Baseline scenario (km ²)	Proposed upgrade (km ²)	Alternative upgrade (km ²)
C ₉₈ 1 hour ≥ 1.5 ou _E /m ³	0.80	0.64	0.76
C ₉₈ 1 hour ≥ 3.0 ou _E /m ³	0.37	0.21	0.34
C ₉₈ 1 hour ≥ 5.0 ou _E /m ³	0.20	0.08	0.17

6.2.2 Discussion of results

It is clear from Figures 4, 5 and 6 and Table 7 that the areas covered by each odour impact criteria decrease for each upgrade scenario in comparison to the baseline for 2010, the worst-case meteorological year. The reduction seen is greater for the proposed upgrade than for the alternative upgrade, which is likely due to the increased height at which the emissions from the cake building are released. This increased height allows for greater dilution and dispersion of emissions.

7 Summary of findings

The key findings of the study are as follows:

1. The predicted change in odour emissions from the sludge sources at Five Fords WwTW as a result of the proposed upgrade is an increase of approximately 1%.
2. Despite this slight increase in odour emissions the predicted offsite odour exposure levels for the proposed upgrade, as indicated by dispersion modelling, are predicted to reduce. The area exposed to commonly used UK odour impact criteria under the baseline and proposed upgrade scenarios are summarised in the table below:

Table 11: Areas covered by each odour impact isopleth for 2010, the worst case year

Odour criteria	Baseline scenario (km ²)	Proposed upgrade (km ²)
C ₉₈ 1 hour ≥ 1.5 ou _E /m ³	0.80	0.64
C ₉₈ 1 hour ≥ 3.0 ou _E /m ³	0.37	0.21
C ₉₈ 1 hour ≥ 5.0 ou _E /m ³	0.20	0.08

3. This reduction in predicted offsite odour exposure is due to the change in the way in which the odour emissions are released, especially in relation to the post-digestion centrifuges and cake storage and handling, where the emissions are released at height allowing for greater dilution and dispersion in the atmosphere.
4. The implementation of the proposed upgrade to the sludge operations at the works is therefore not anticipated to increase the offsite impact risk or to result in an increase in adverse impact on the amenity of the area around the site.

Annex A Emission rates

Specific emission rates for baseline operational conditions

The specific emission rates applied to each source under baseline operational conditions are presented below:

Table 12: Emission assumptions for open sources

Stage of treatment	Odour Source	Odour emission rate (excluding turbulence) [ou _E /m ² /s]	Turbulence multiplier
Sludge handling and treatment	Post digestion tank	5	1 - 6
	Lime consolidation tanks	16	1 - 6
	Sludge holding tanks	16	1 - 6
	Sludge cake bays	10*	1
	SAS buffer tank	5*	1
	Sludge press skips	50	1
	Sludge screens skips	50	1

*This does not include the 50% reduction in emission rate for containment provided.

Table 13: Emission assumptions for agitation sources

Stage of treatment	Source	Operation	Emission rate [ou _E /kg]
Thickened sludge handling	Collection of sludge cake by trailers	Agitation during collection of cake from bays.	260*

* This does not include the 50% reduction in emission rate for containment provided by the building.

Table 14: Emission assumptions for volume sources

Stage of treatment	Source	Emission rate [ou _E /s]
Sludge handling and treatment	Centrifuge of digested limed sludge [each]	1000

Table 15: Emission estimates for OCU

Odour source	Outlet odour concentration [ou _E /m ³]	Flow rate [m ³ /s]	Emission rate [ou _E /s]	Efflux velocity [m/s]	Stack height [m]
Sludge OCU	1000	1.1	1,100	12	3

Specific emission rates applied for the proposed upgrade

The specific emission rates applied for the proposed upgrade are presented below:

Table 16: Emission assumptions for open sources

Stage of treatment	Odour Source	Odour emission rate (excluding turbulence) [ou _E /m ² /s]	Turbulence multiplier
Sludge handling and treatment	Post digestion tank	5	1 - 6
	Liquor treatment balance tank	10	1
	2 No. liquor treatment SBR tanks	5	1
	SAS buffer tank	5*	1
	Sludge press skips	50	1
	Sludge screens skips	50	1

*This does not include the 50% reduction in emission rate for containment provided.

Table 17: Emission assumptions for agitation sources

Stage of treatment	Source	Operation	Emission rate [ouE/kg]
Sludge handling and treatment	Raw sludge deposit to hopper	Agitation during depositing of raw sludge	491

Table 18: Emission estimates for OCU

Odour source	Outlet odour concentration [ouE/m ³]	Flow rate	Emission rate [ouE/s]	Efflux velocity [m/s]	Stack height [m]
Cake preparation OCU	2000	3.5	7000	12	3
Cake building OCU	500*	12.0	6000	12	11.8
Sludge OCU	1000	1.1	1100	12	3

*The design criteria for the outlet odour concentration for this source was to achieve 2000 ouE/m³. From examination of the potential incoming load an outlet concentration of 500 ouE/m³ has been applied.

Specific emission rates applied for the alternative upgrade

The specific emission rates applied to each source for the alternative upgrade are presented below:

Table 19: Emission assumptions for open sources

Stage of treatment	Odour Source	Odour emission rate (excluding turbulence) [ouE/m ² /s]	Turbulence multiplier
Sludge handling and treatment	Post digestion tank	5	1 - 6
	Liquor treatment balance tank	10	1
	2 No. liquor treatment SBR tanks	5	1
	Sludge cake bays	7	1
	SAS buffer tank	5*	1
	Sludge press skips	50	1
	Sludge screens skips	50	1

*This does not include the 50% reduction in emission rate for containment provided.

Table 20: Emission assumptions for agitation sources

Stage of treatment	Source	Operation	Emission rate [ouE/kg]
Sludge handling and treatment	Raw sludge deposit to hopper	Agitation during depositing of raw sludge	491
	Collection of sludge cake by trailers	Agitation during collection of cake from bays.	40

Table 21: Emission estimates for OCU

Odour source	Outlet odour concentration [ouE/m ³]	Flow rate [m ³ /s]	Emission rate [ouE/s]	Efflux velocity [m/s]	Stack height [m]
Cake preparation OCU	2000	3.5	7000	12	3
Sludge OCU	1000	1.1	1100	12	3

Table 22: Emission assumptions for volume sources

Stage of treatment	Source	Emission rate [ou _E /s]
Sludge handling and treatment	Centrifuge of digested limed sludge [each]	1000

Annex B Dispersion model outputs for the remaining years

Proposed Upgrade

The dispersion model outputs for years 2009, 2011, 2012 and 2013 are presented in the figures below. In each case the proposed upgrade is presented as solid black lines and the baseline for the corresponding year is presented as blue dashed lines.

Figure 7 Predicted odour exposure levels for the proposed upgrade for 2009.

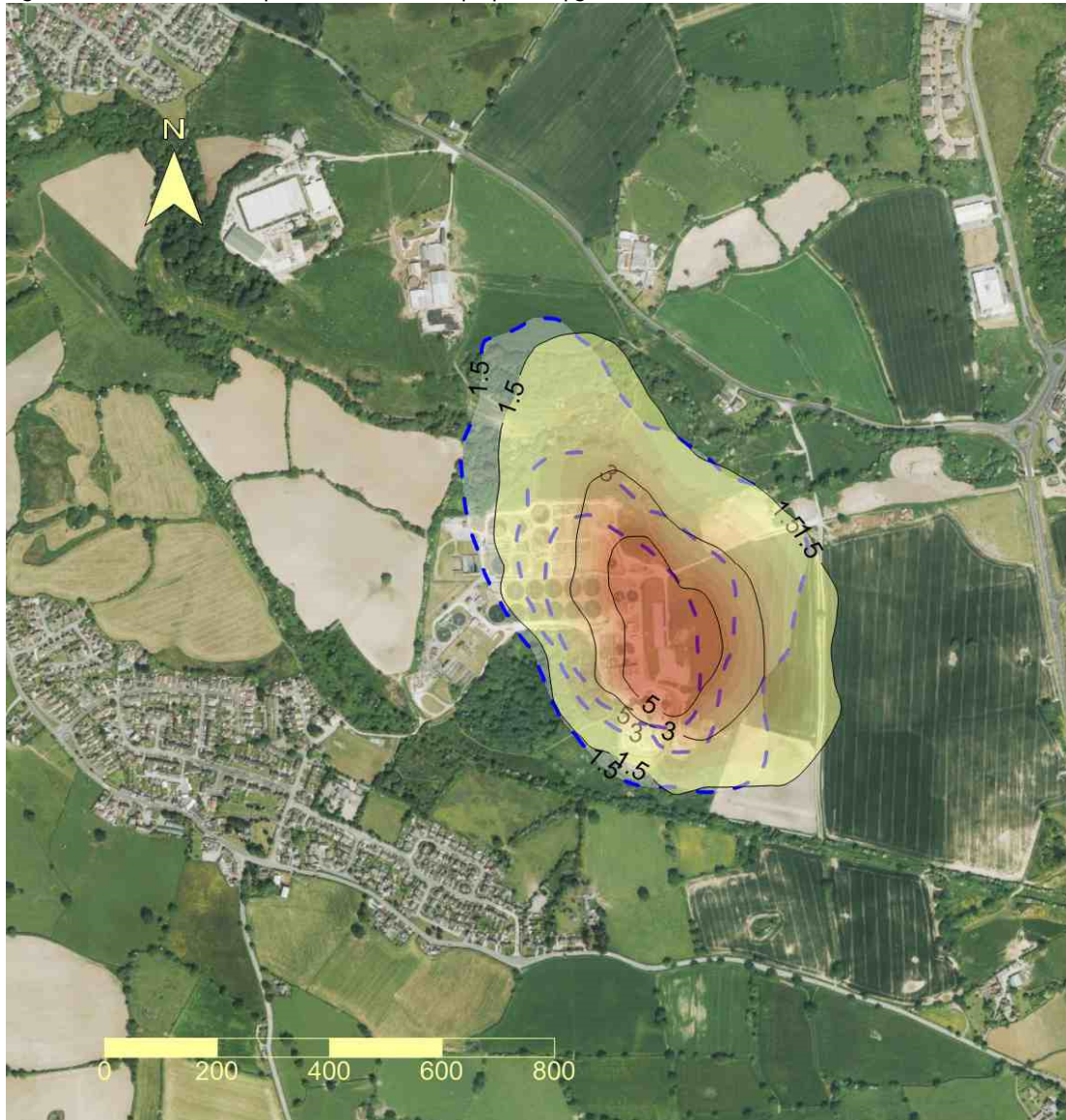


Figure 8: Predicted odour exposure levels for the proposed upgrade for 2011.

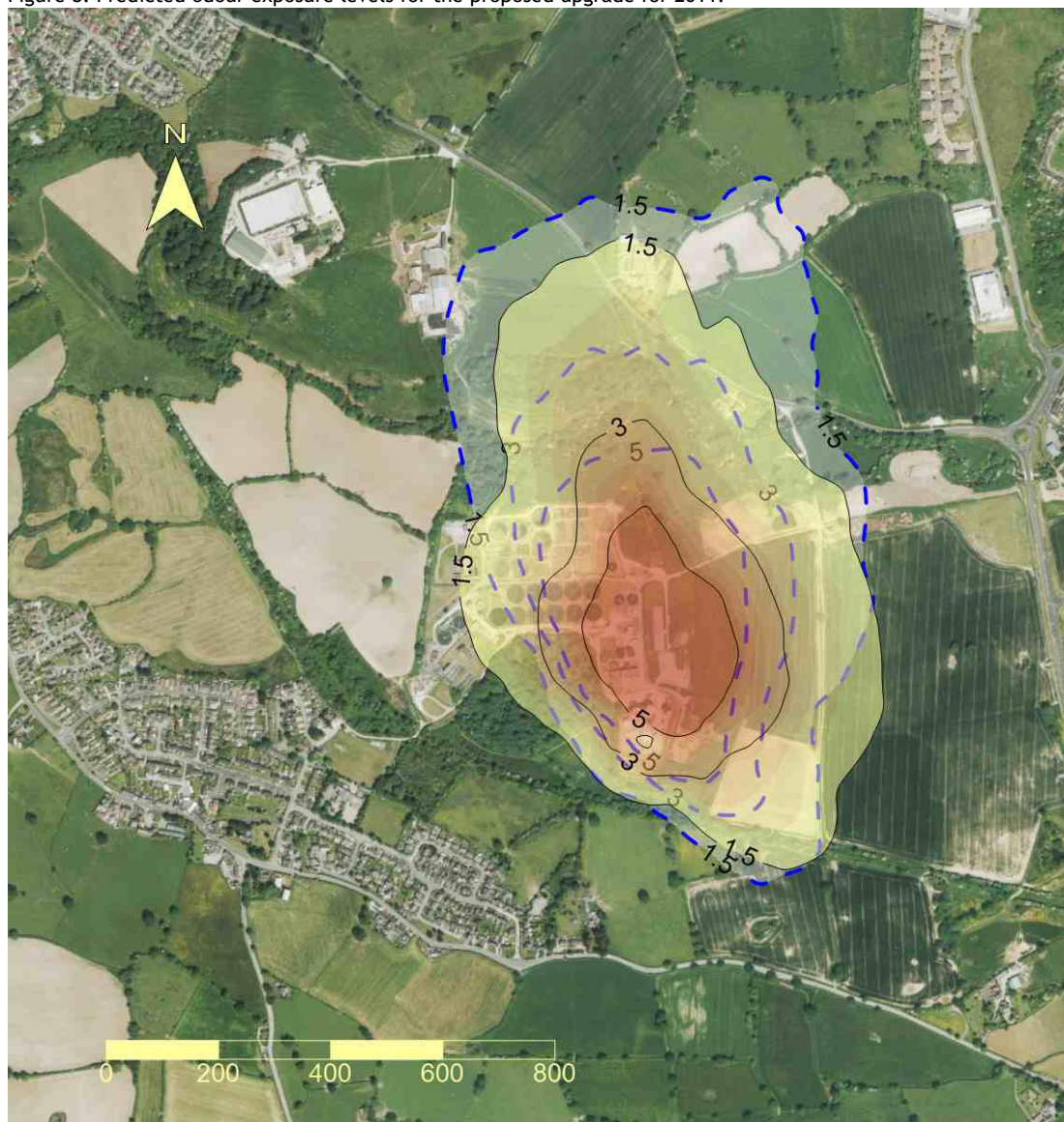


Figure 9 Predicted odour exposure levels for the proposed upgrade for 2012.

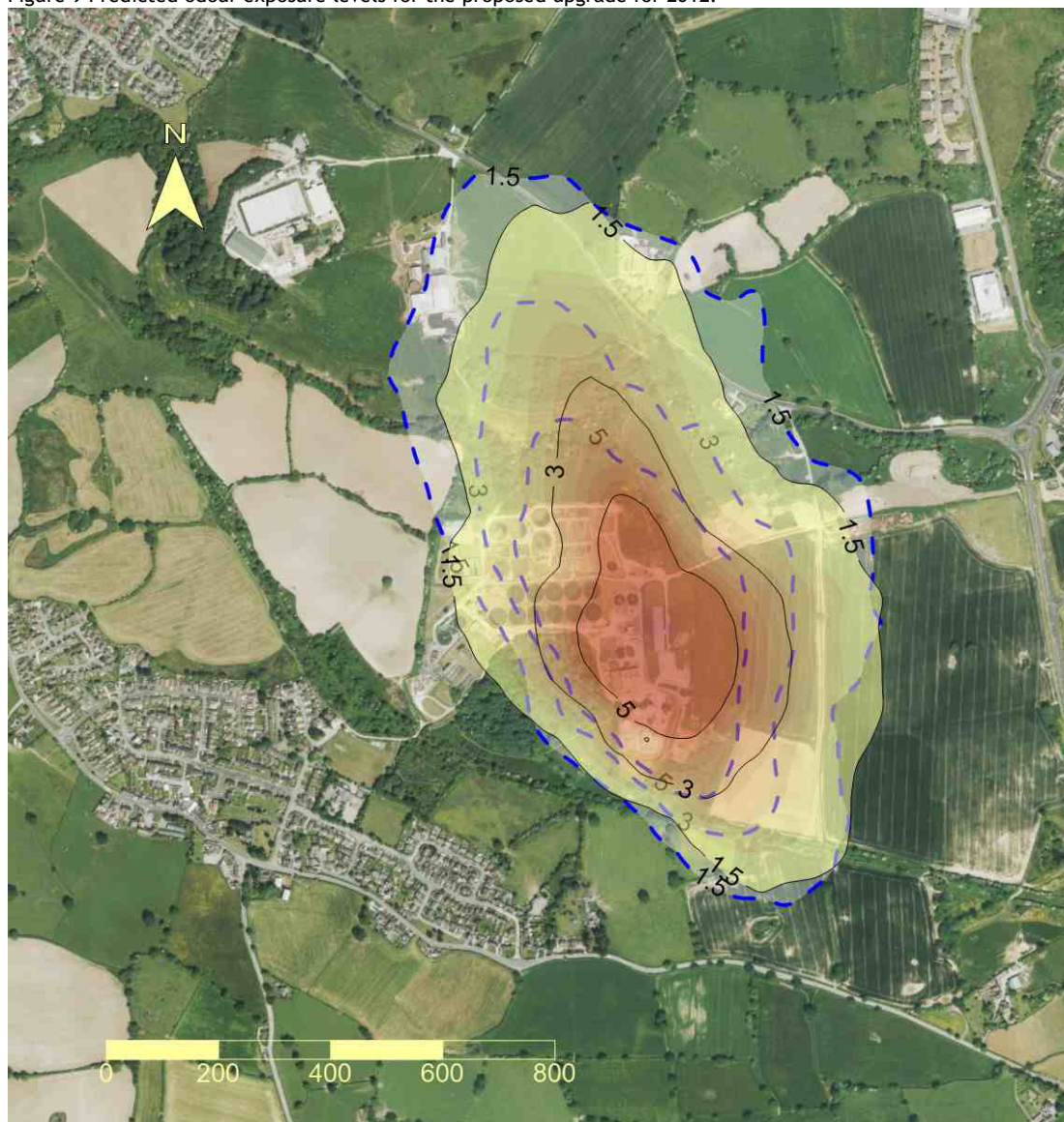
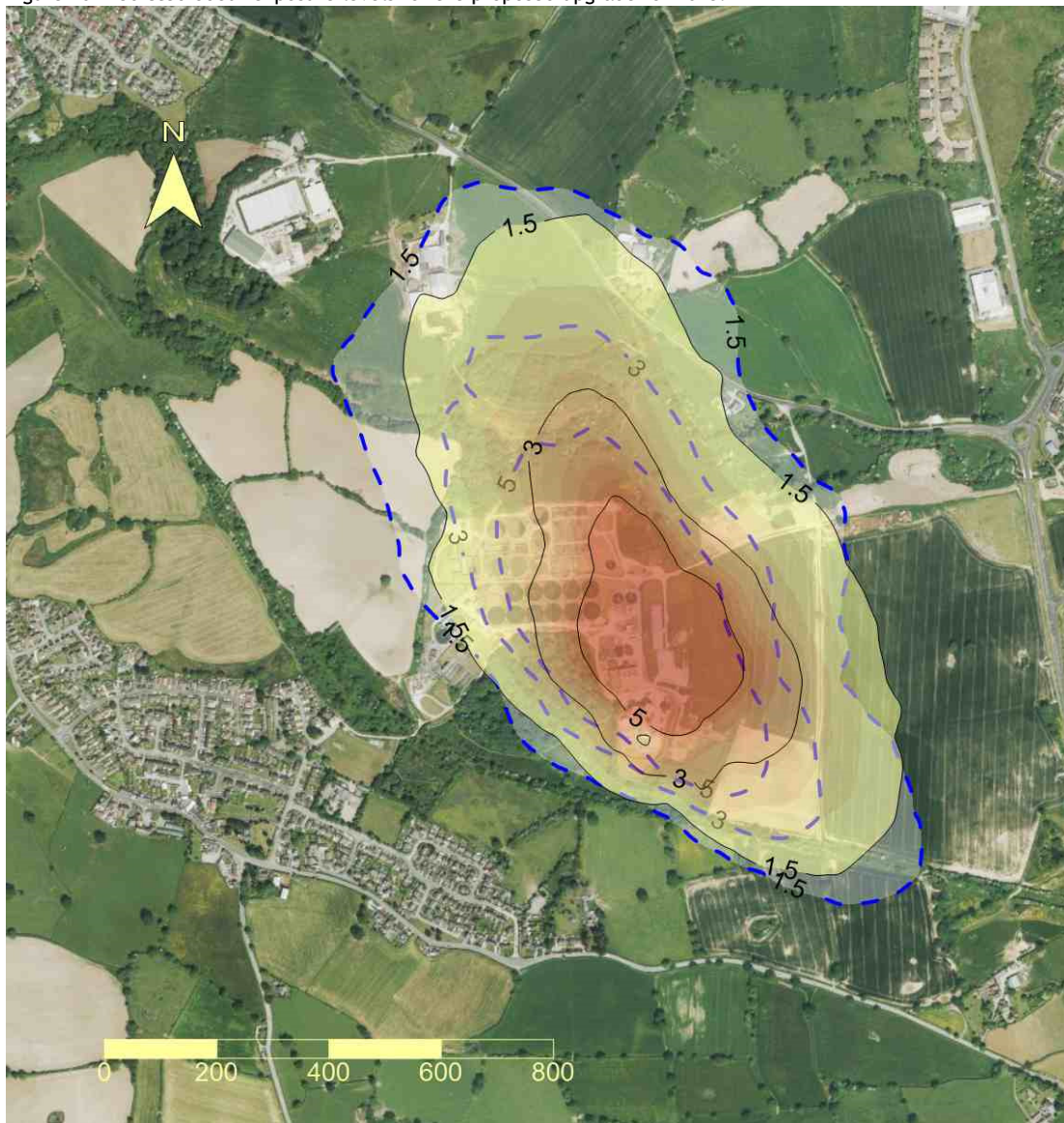


Figure 10 Predicted odour exposure levels for the proposed upgrade for 2013.



Alternative upgrade

The dispersion model outputs for years 2009, 2011, 2012 and 2013 are presented in the figures below. In each case upgrade scenario 2 is presented as solid black lines and the current baseline for the corresponding year is presented as blue dashed lines.

Figure 11 Predicted odour exposure levels for the alternative upgrade for 2009.

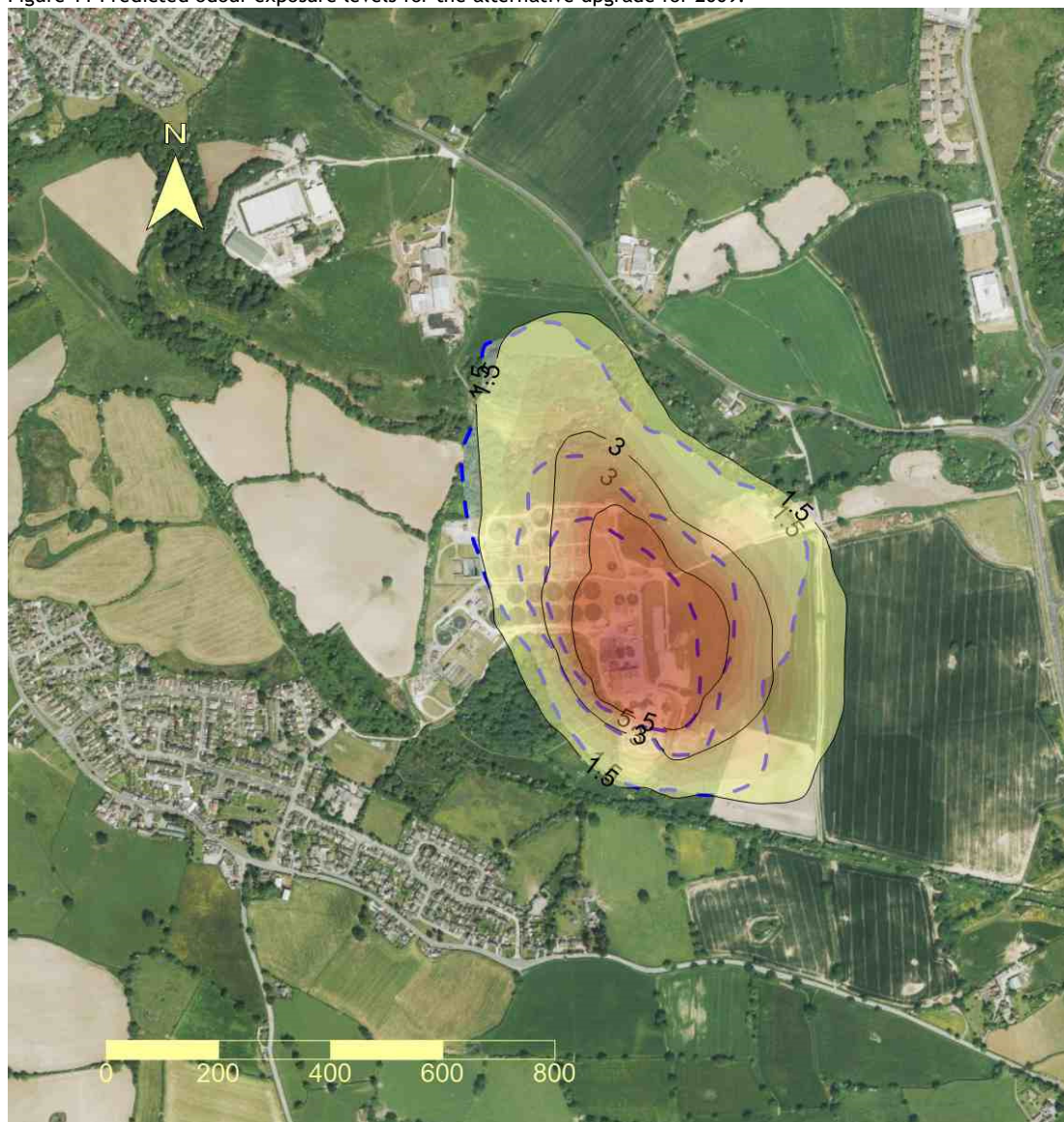


Figure 12 Predicted odour exposure levels for the alternative upgrade for 2011.

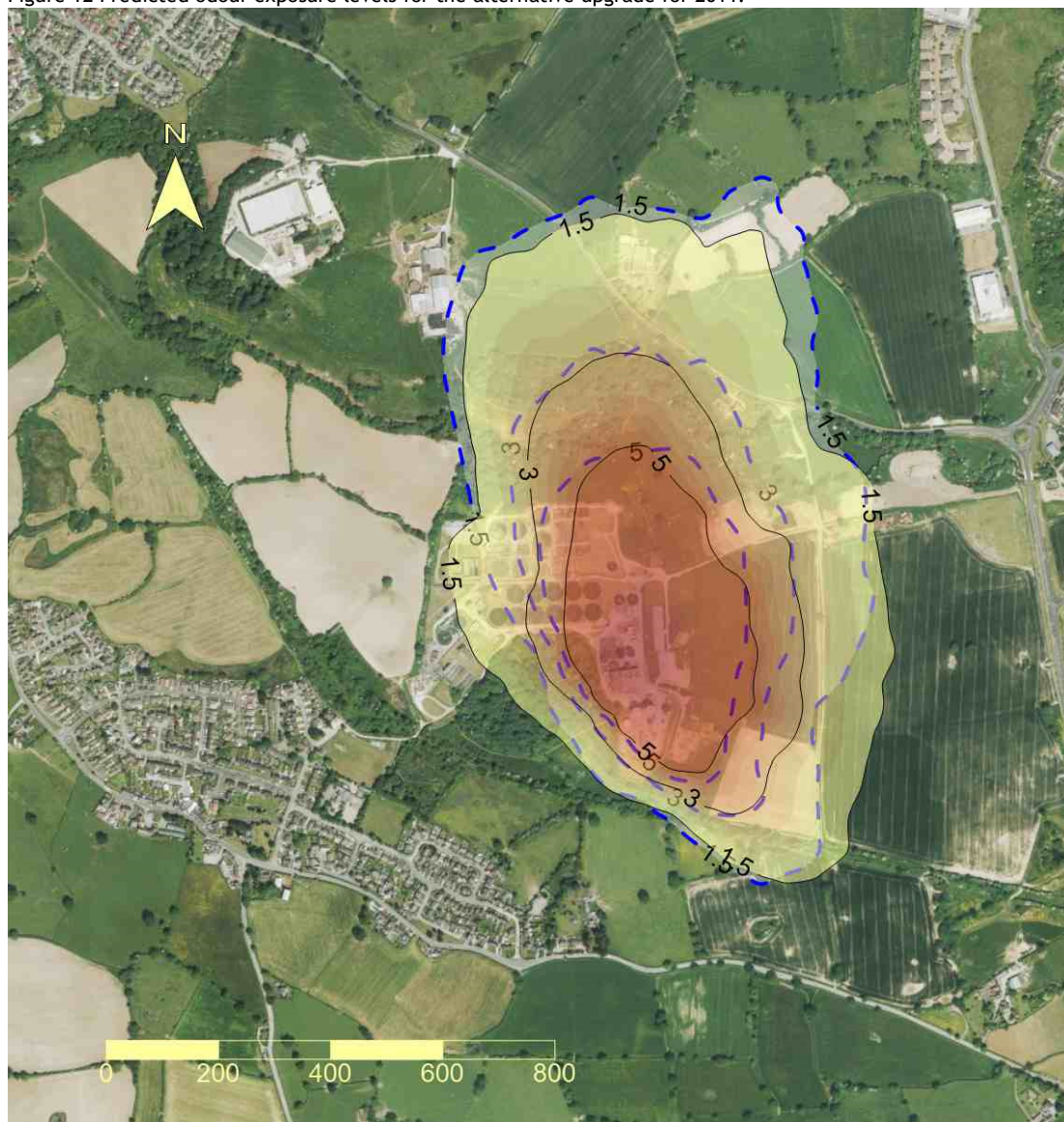


Figure 13 Predicted odour exposure levels for the alternative upgrade for 2012.

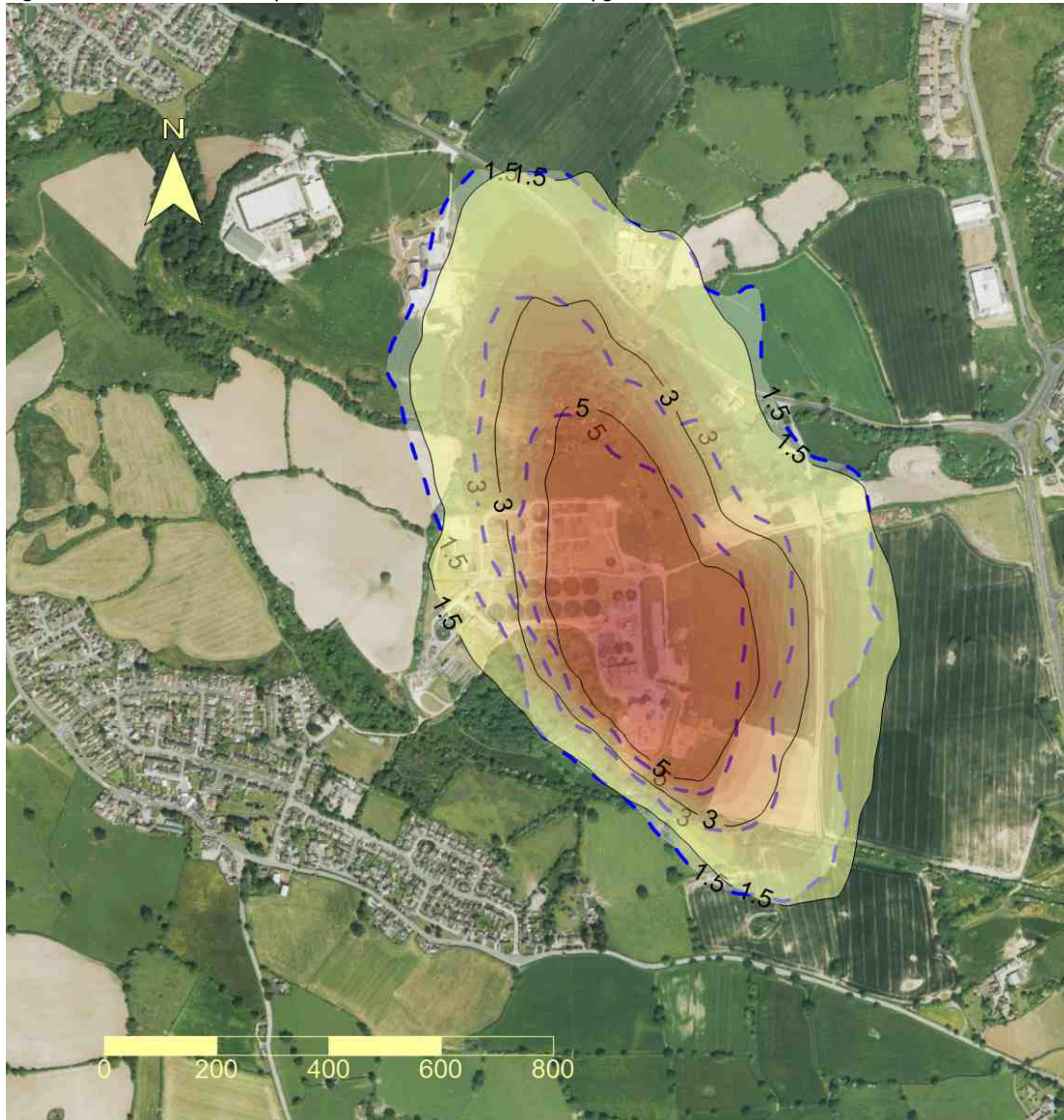
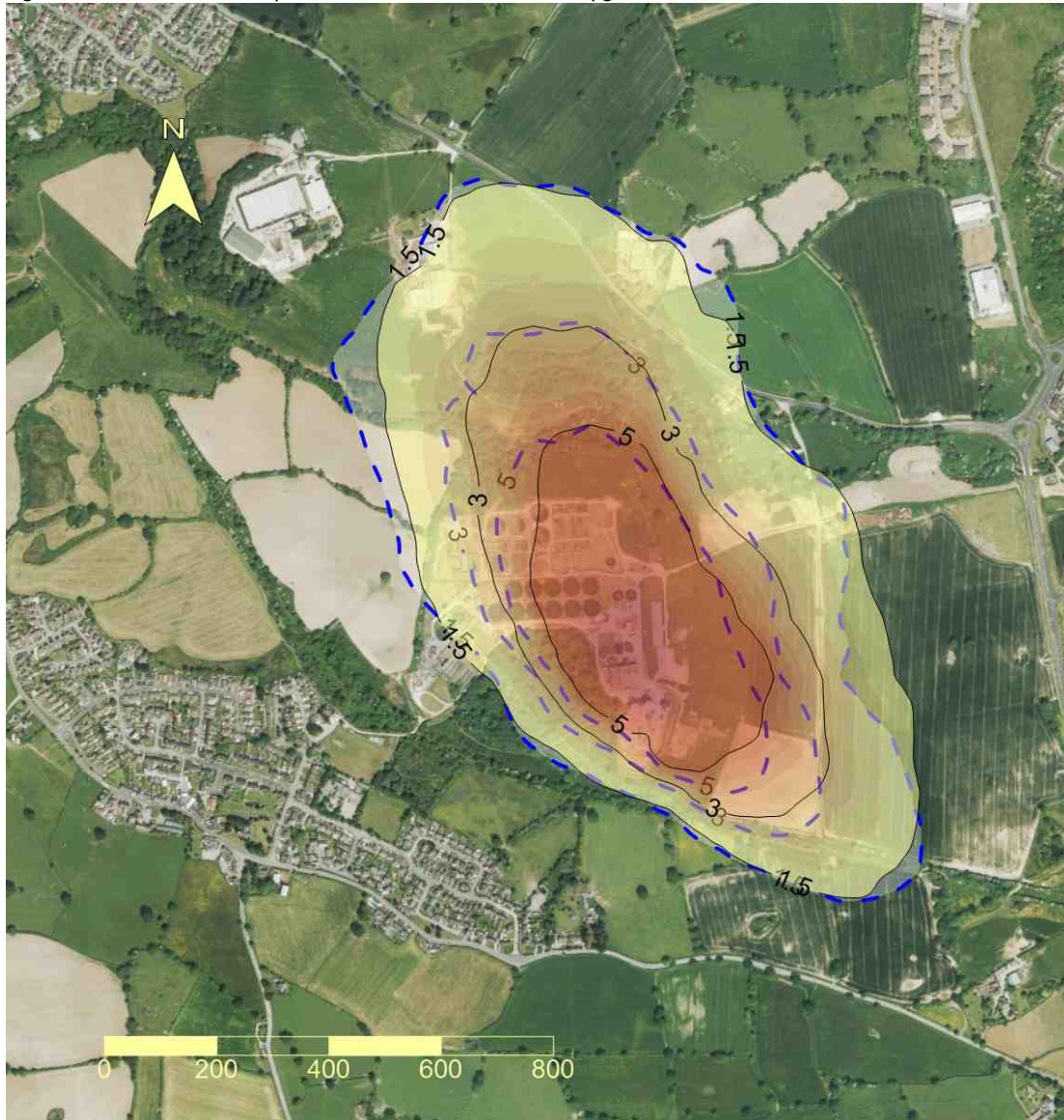


Figure 14 Predicted odour exposure levels for the alternative upgrade for 2013.



Environmental Policy Statement

Environmental Policy Statement

Dŵr Cymru Welsh Water recognises that the protection of our environment is an integral and fundamental part of our business operations. Our principal aims are to operate in a sustainable manner, to evaluate and manage our environmental impacts and to promote greater environmental awareness amongst our employees, contractors and suppliers. Welsh Water will continually improve environmental performance and incorporate, where practical, identified best practice in sustainable development.

We will achieve this by:

- Continuing to prevent, reduce and minimise the impact of any polluting emissions to the environment by utilising 'best practice' implemented through effective environmental management control systems with the objective of ensuring continual improvement.
- Complying with all relevant legal and other standards and requirements relating to our Environmental Management System.
- Seeking to use environmentally responsible suppliers and working with existing and potential new suppliers to encourage environmental improvements. Encouraging the effective use of materials and supplies, promoting the application of the waste hierarchy.
- Developing Welsh Water Environmental Management System Objectives based on our significant environmental aspects and compliance with legal requirements, these objectives will be regularly reviewed with the aim of ensuring continual improvement.
- Optimising energy efficiency and encourage and facilitate the use of appropriate environmental technology throughout the business.
- Ensuring that all employees are aware of this Policy and the Welsh Water Environmental Management System. This will be achieved through environmental awareness training enabling employees to implement and develop practices appropriate to the objectives contained in the Welsh Water Environmental Management System.
- Developing an Environmental Management System that conforms to the requirements of BS EN ISO 14001 which is documented, implemented and maintained.

In line with other company management system policies, Welsh Water will incorporate the above commitments into our business practices and ensure that we translate them into appropriate environmental objectives and targets.

This policy will be communicated to all Welsh Water employees and anyone working on behalf of Welsh Water and will be available to the public via the Internet. This policy will be reviewed annually or when business needs or relevant legislation changes.



Chris Jones

Chief Executive
Dŵr Cymru Welsh Water
September 2015

Datganiad Polisi Amgylcheddol

Mae Dŵr Cymru Welsh Water yn cydnabod bod diogelu ein hamgylchedd yn rhan annatod a hanfodol o'n gweithgareddau busnes. Ein prif nodau yw gweithredu mewn ffordd gynaliadwy er mwyn gwerthuso a rheoli ein heffeithiau amgylcheddol, ac er mwyn hyrwyddo ymwybyddiaeth amgylcheddol ymysg ein cyflogeion, ein contractwyr a'n cyflenwyr. Bydd Dŵr Cymru yn gwella ei berfformiad amgylcheddol yn barhaus, a lle bo'n ymarferol, bydd yn ymgorffori arferion gorau cydnabyddedig o ran datblygu cynaliadwy.

Byddwn yn cyflawni hyn trwy:

- Barhau i atal, lleihau a lleiafu effaith unrhyw allyriannau llygru ar yr amgylchedd trwy ddefnyddio 'arferion gorau', a'u rhoi ar waith trwy systemau rheoli amgylcheddol effeithiol, gyda'r amcan o sicrhau gwelliannau parhaus.
- Cydymffurfio â'r holl ofynion cyfreithiol a'r safonau a'r gofynion eraill sy'n ymwneud â'n System Rheoli Amgylcheddol.
- Ymdrechu i ddefnyddio cyflenwyr sy'n amgylcheddol gyfrifol, a gweithio gyda chyflenwyr presennol a darpar-gyflenwyr newydd i hyrwyddo gwelliannau amgylcheddol. Hyrwyddo defnydd effeithiol o ddeunyddiau a chyflenwadau, gan hyrwyddo defnydd o'r hierarchiaeth gwastraff.
- Datblygu Amcanion ar gyfer System Rheoli Amgylcheddol Dŵr Cymru yn seiliedig ar yr agweddau amgylcheddol o bwys sy'n gysylltiedig â'n gwaith, a chydymffurfiaeth â'r gofynion cyfreithiol. Caiff yr amcanion hyn eu hadolygu'n gyson gyda'r nod o sicrhau gwelliannau parhaus.
- Optimeiddio effeithlonrwydd ynni, a hyrwyddo a hwyluso'r defnydd o dechnoleg amgylcheddol briodol ar draws y busnes.
- Sicrhau bod yr holl gyflogeion yn ymwybodol o'r Polisi hwn ac o System Rheoli Amgylcheddol Dŵr Cymru. Cyflawnir hyn trwy ddarparu hyfforddiant ymwybyddiaeth amgylcheddol a fydd yn galluogi'r cyflogeion i weithredu a datblygu arferion sy'n briodol i amcanion System Rheoli Amgylcheddol Dŵr Cymru.
- Datblygu System Rheoli Amgylcheddol sy'n cydymffurfio â gofynion BS EN ISO 14001, sy'n cael ei dogfennu, ei gweithredu a'i chynnal.

Yn unol â pholisiau eraill systemau rheoli'r cwmni, bydd Dŵr Cymru yn ymgorffori'r ymrwymadau uchod i'r arferion busnes, ac yn sicrhau ein bod yn eu trosi yn amcanion ac yn dargedau amgylcheddol priodol.

Caiff y polisi hwn ei gyfleu i holl gyflogeion Dŵr Cymru ac i unrhyw un sy'n gweithio ar ran Dŵr Cymru, a bydd ar gael i'r cyhoedd ar y Rhyngwrdd. Adolygir y polisi hwn yn flynyddol neu pan fo anghenion y busnes neu'r ddeddfwriaeth berthnasol yn newid.



Chris Jones

Prif Weithredwr
Dŵr Cymru Welsh Water
Medi 2015



By Royal Charter

Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2015

This is to certify that:

Dwr Cymru Welsh Water
Pentwyn Road
Nelson
Treharris
CF46 6LY
United Kingdom

Holds Certificate Number:

EMS 622141

and operates an Environmental Management System which complies with the requirements of ISO 14001:2015 for the following scope:

Potable water and waste water services managing the provision, distribution and treatment processes. The provision of education and recreation facilities. Contract management and support services within Dwr Cymru Welsh Water.

This is a multi-site certification. Site details are defined on DCWW's controlled document SP(1)01 – Master Asset List Issue 21 dated 19th May 2017

For and on behalf of BSI:

Andrew Launn, EMEA Systems Certification Director

Original Registration Date: 2008-01-29

Latest Revision Date: 2018-05-10

Effective Date: 2018-05-10

Expiry Date: 2021-05-09



Page: 1 of 2

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A Member of the BSI Group of Companies.

Certificate No: EMS 622141

Location

Dwr Cymru Welsh Water
Pentwyn Road
Nelson
Treharris
CF46 6LY
United Kingdom

Registered Activities

Potable water and waste water services managing the provision, distribution and treatment processes. The provision of education and recreation facilities. Contract management and support services within Dwr Cymru Welsh Water.

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Original Registration Date: 2008-01-29

Latest Revision Date: 2018-05-10

Effective Date: 2018-05-10

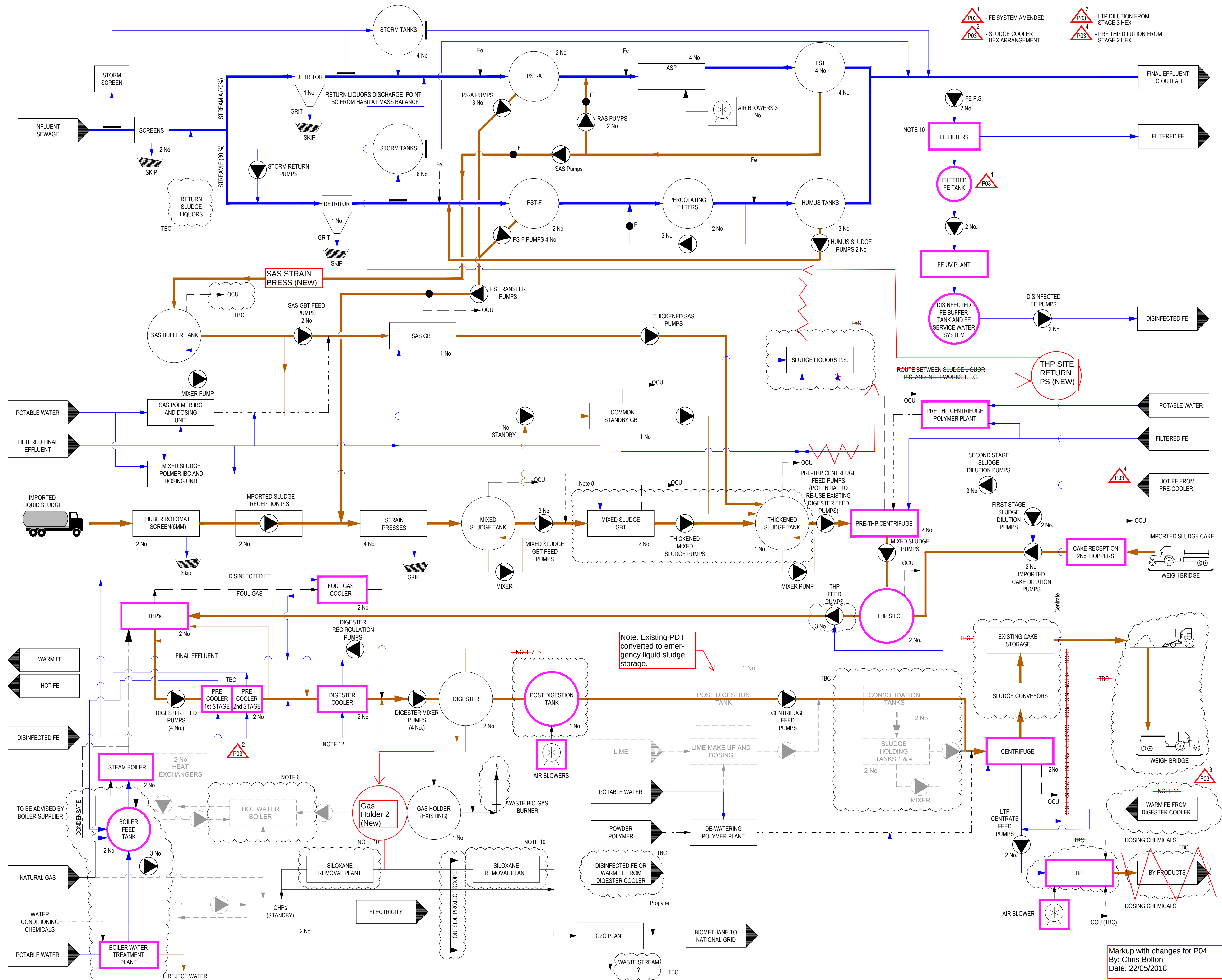
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Page: 2 of 2

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BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.
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H. Schematics



Notes

- NEED TO CONFIRM WITH SITE OPERATIONS STAFF THE CONFIGURATION AND STATUS OF ALL OCU'S.
- THE O & M MANUAL STATES THAT AN OCU IS PROVIDED ON THE SLUDGE RECEPTION DIGESTED SLUDGE STORAGE TANKS. THIS NEEDS TO BE CONFIRMED.
- SITE SHOWS AN OCU ON THE THICKENED SLUDGE WELL. SITE OPERATIONS TO CONFIRM CONFIGURATION.
- PRESENCE / TYPE OF MIXERS IN THE SLUDGE TANKS TO BE CONFIRMED.
- THE PROCESS ARRANGEMENT NEEDS TO BE CONFIRMED ON SITE DURING SITE VISIT.
- CONSIDER USING EXISTING WATER BOILER TO PRE-HEAT WATER TO STEAM BOILER.
- ~~POTENTIAL OF DISUSED SLUDGE HOLDING TANK - OR USE EXISTING POST-DIGESTION TANK~~
- POTENTIAL TO DECOMMISSION IMPORTED LIQUID SLUDGE AND PRIMARY GBT AND DIRECTLY DE-WATER.
- CAPACITY OF EXISTING SILOXANE REMOVAL PLANT TO BE CONFIRMED.
- EXISTING FE SYSTEM NOT SHOWN - ~~TO BE INTEGRATED WITH NEW SYSTEM~~
- ~~USE OF WARM FE AS LTP DILUTION TO BE REVIEWED / CONFIRMED~~
- THE NEED FOR DISINFECTED FE FOR DIGESTER COOLER TO BE REVIEWED.

Legend

Valve - normally closed
Pumps
Flowmeter
Dry solid samples
Activated Sludge Plant
Primary Settlement Tanks
Final Effluent
Final Settlement Tanks
Heat Exchanger
Return Activated Sludge
Surplus Activated Sludge
Odour Control Plant
Gravity Belt thickener
Primary Sludge
Pumping Station
Liquor Treatment Plant
Ferric Dosing

Main wastewater flows
Minor wastewater flows
Dosing flows
Air Line
Main sludge flows
Minor sludge flows
Gas
Foul Air
Steam
Connections currently not in use
Units currently not in use
New/Upgraded Units

Rev	Comment	Drawn	Check	Approv	Date
P03	REVISED FOR GATEWAY 3	JOD	SH	DB	25.08.15
P02	FOR GATEWAY 3	JOD	SH	DB	22.05.15
P01	ISSUED TO LTP SUPPLIERS	MJP	KCP	SPH	01.04.15

Rev: _____ Comment: _____ Drawn: _____ Check: _____ Approv: _____ Date: _____

Dwr Cymru Welsh Water

Dwr Cymru Welsh Water, Ty Awen, Celtic Springs Business Park, Newport NP10 8FZ
Telephone - 0800 0520145
Website - www.dwrcymru.com

MMB
Mott MacDonald Bentley Limited

Telephone - 02920 467800
Facsimile - TBC
E-mail - info@mm-b.co.uk
Website - www.mm-b.co.uk

Mott MacDonald Limited,
Fitzalan House, Fitzalan Road
Cardiff
CF24 0EL

Project Name:
FIVE FORDS (WREXHAM) WwTW & STC AAD SCHEME

Drawing Title:
PROCESS FLOW DIAGRAM CONFIGURATION WITH THP (CAMBI)

Drawn	Checked	Approved	Date
MJP	KCP/SPH	DB	01.04.15

Suitability:
FOR INFORMATION

Partner Proj N°
329011NN26

Scale:
N.T.S

Rev:
P03

Drawing No:
DCWW-4791-S-201-MMB-01-DR-P-01501

Markup with changes for P04
By: Chris Bolton
Date: 22/05/2018

