



NPPF: Flood Risk Assessment

Dig Gate Lane, Rochdale

Rochdale Power Limited

SHF.3050.001.HY.R.001.A



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Project:	NPPF: Flood Risk Assessment
For:	Rochdale Power Ltd
Status:	Issued
Date:	October 2022
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Executive Summary

This report presents an FRA in accordance with the NPPF and NPPG ID: 7 guidance, for a proposed gas-powered reserve energy facility, located on land to the south of Dig Gate Lane, Rochdale.

The report includes an assessment of the surface water drainage requirements of the Site and details the flood risk and how this could be managed and mitigated to allow the Site to be developed in support of the full planning application.

The FRA has demonstrated the following:

- The 0.11-hectare (ha) Site is comprised of agricultural (grassed) land.
- The Site slopes in a north-west direction and is underlain by Clayey soils and geology with low infiltration potential.
- There are no onsite or bounding watercourses. The nearest watercourse is in third-party land to the north-west of the Site.
- The risk of flooding from all sources is assessed as negligible. Residual flood risk would be mitigated by setting finished floor levels of buildings and vulnerable electrical above external levels, and through the adoption of a surface water drainage strategy.
- The proposed use is classified as essential infrastructure. Essential infrastructure uses are considered acceptable in terms of flood risk in Flood Zone 1 (low risk). The Sequential Test would be passed, and the Exception Test would not be required.

The FRA has considered the potential impact of the development on surface water runoff rates, given the increase in impermeable areas post-development. These rates have been calculated, and it has been demonstrated that surface water can be managed, such that flood risk to and from the Site following development will not increase. This will be achieved through a restricted (1.0 l/s minimum rate) discharge rate, and an appropriately sized geocellular storage with an outfall to a nearby public surface water sewer. A maintenance and management plan will ensure the effectiveness of the drainage strategy for the lifetime of the development.

The FRA demonstrates that the proposed development would be operated with minimal risk from flooding and would not increase flood risk elsewhere. The development should therefore not be precluded on the grounds of flood risk and surface water drainage.

1.0 Introduction

1.1 Background

- 1.1.1 Enzygo Ltd was commissioned by Rochdale Power Ltd to carry out a site-specific flood risk assessment (FRA), including a surface water drainage strategy, in support of a full planning application for a proposed gas-powered reserve energy facility. The Site is located on land to the south of Dig Gate Lane, Rochdale (the 'Site').
- 1.1.2 The proposal is for a gas-powered reserve energy facility, with associated infrastructure on the 0.11-hectare (ha) Site. A copy of the proposed layout is included in Appendix 1.
- 1.1.3 A site-specific FRA assesses the current and future flood risk to and from a development site. It demonstrates how flood risk will be managed now and over the development's lifetime, taking climate change, drainage, and the vulnerability of its intended users into account.
- 1.1.4 The objectives of a site-specific FRA are to:
- Assess whether a proposed development is likely to be affected by current or future flooding from a range of sources.
 - Assess whether the development will increase flood risk elsewhere.
 - Decide on measures to deal with these effects and risks and assess their appropriateness.
 - Provide enough evidence for the local planning authority to apply (if necessary) the Sequential Test.
 - Decide whether the development will be safe and will pass the Exception Test if applicable.
- 1.1.5 In England, planning applications for development need an FRA¹ for most developments including:
- In Flood Zones 2 and 3 including minor development and change of use.
 - Sites of 1ha or larger in Flood Zone 1.
 - Sites of less than 1ha in Flood Zone 1, including change of use to a more vulnerable class (for example from commercial to residential), and where they could be affected by sources of flooding other than rivers and the sea.
 - Land in Flood Zone 1 in a Critical Drainage Area (CDA) as notified by the Environment Agency.
 - Land in Flood Zone 1 identified in a strategic flood risk assessment as being at increased flood risk in future.
- 1.1.6 The purpose of this FRA is to assess the risk of flooding to the proposed development and where possible provide sufficient mitigation to demonstrate that future users of the development would remain safe throughout its lifetime, that the development would not increase flood risk on Site and elsewhere and, where practicable, would reduce flood risk overall.

¹ Department for Communities and Local Government (2017). Flood Risk Assessments if You're Applying for Planning Permission [<https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>].

1.2 Scope

- 1.2.1 Government policy development on and flood risk is set out in the National Planning Policy Framework (NPPF) 2 and is supported by National Planning Practice Guidance: Flood Risk and Coastal Change [NPPG ID7]³.
- 1.2.2 NPPF paragraphs 148-169 set out the need for an appropriate assessment of flood risk at all levels of the planning process and require the application of a sequential risk-based approach to assess the suitability of land for development in flood risk areas.
- 1.2.3 The FRA should also make allowances for climate change⁴ to minimise vulnerability and provide resilience to flooding and coastal change in the future. The allowances are predictions of anticipated change in:
- Peak river flow by river basin district.
 - Peak rainfall intensity.
 - Sea level rise.
 - Offshore wind speed and extreme wave height.
- 1.2.4 The allowances are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere. There are different allowances for different periods of time over the next century.
- 1.2.5 Site-specific FRAs are categorised according to level. Simple Level 1 Screening studies give a general indication of the potential flood risk to a site and identify whether more detailed Level 2 assessment is required or not. A Level 2 assessment is a qualitative appraisal to develop understanding of flood risk to a site and the effects of the site on flooding elsewhere including recommended mitigation measures. Level 3 assessments are more detailed quantitative studies, for example modelling to establish flood levels at a site in the absence of Environment Agency or other data or providing detailed drainage designs.
- 1.2.6 This report is a Level 2 qualitative FRA but includes a Level 3 assessment of the surface water drainage requirements for the proposed development.

1.3 Aims

- 1.3.1 This FRA aims to provide enough flood risk information to satisfy the requirements of the NPPF, PPG ID7 and regional/local government plans and policies. It describes the potential for the Site to be impacted by flooding, the impacts of the proposed development on flooding elsewhere near the Site, and the proposed measures that could be incorporated into the development to mitigate the identified risks.

² Department for Communities and Local Government (2018). Revised National Planning Policy Framework (published July 2018 and updated February 2019) [<https://www.gov.uk/government/collections/revised-national-planning-policy-framework>].

³ Department for Communities and Local Government (published March 2014 and update August 2022). Planning Practice Guidance ID7-030-20140306; Flood Risk & Coastal Change [<https://www.gov.uk/guidance/flood-risk-and-coastal-change>].

⁴ Department for Communities and Local Government (published February 2016 and updated May 2022). Flood Risk Assessments: Climate Change Allowances [<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>].

1.4 Planning Context

National Policy

1.4.1 The FRA was prepared in accordance with the NPPF and NPPG ID7.

Regional/Local Policy

1.4.2 The FRA considers the following policies within the Rochdale Core Strategy (adopted 2016):

- Policy G8: Protected Areas - Managing Water Resources and Flood Risk.

1.4.3 The FRA also considers the following flood risk and drainage guidance documents:

- Rochdale Borough Council (2013) Rochdale Borough's Strategy for Flood Risk Management 2013-2023 (Consultation Draft)⁵.
- Rochdale Borough Council Flood and Drainage Guidance (Appendix 5).

1.5 Report Structure

1.5.1 This report is structured as follows:

- Section 2 identifies the sources of information that were consulted.
- Section 3 describes the existing Site.
- Section 4 outlines the flood risk to the existing site and proposed development.
- Section 5 details the proposed mitigation measures against identified flooding sources.
- Section 6 assesses the potential impacts of the proposed development on surface water drainage and proposes mitigation for those effects.
- Section 7 includes the maintenance and management plan.
- Section 8 presents a summary and conclusions.

⁵ https://consultations.rochdale.gov.uk/strategic-planning/strategy_flood_risk_october_2013/supporting_documents/Rochdale%20Boroughs%20Strategy%20for%20Flood%20Risk%20Management%20Consultation%20Draft%20October%202013.pdf

2.0 Sources of Information

2.1 Sources of Information

2.1.1 The following information was consulted:

- Ordnance Survey 1:25,000 mapping (Explorer 277: Oldham, Rochdale & Stockport).
- Detailed Topographic Survey (Appendix 2).
- Environment Agency online mapping (Flood Map for Planning⁶, Long Term Flood Risk Assessment for Locations in England⁷, Catchment Data Explorer⁸ and Main River Map⁹).
- Climate Change Allowances for Peak River Flow¹⁰ and Rainfall¹¹ in England mapping.
- National River Flow Archive¹².
- Bury, Rochdale and Oldham Strategic Flood Risk Assessment (SFRA) and associated mapping¹³.
- British Hydrological Society Chronology of British Hydrological Events¹⁴.
- National Soils Resources Institute (NSRI): Soilscape online mapping¹⁵.
- British Geological Survey [BGS] online mapping: Geology of Britain Viewer¹⁶.
- Landmark's Promap: Flood Data package: Additional flood mapping.
- Geosmart 1 in 100-year groundwater flood risk map.
- United Utilities sewer asset plans (Appendix 3).
- DEFRA's Magic Map for identifying Designated Sites¹⁷.
- River Levels UK for identifying Flood Alert and Flood Warning areas¹⁸.

2.2 Consultation and Discussion with Regulators

2.2.1 Consultation and discussions were undertaken with the Environment Agency, the Local Planning Authority (LPA)/Lead Local Flood Authority (LLFA), and Water Utility.

Environment Agency

2.2.2 The Environment Agency is a statutory consultee on flood risk and planning and is directly responsible for the prevention, mitigation, and remediation of flood damage for main rivers and coastal areas; and it has a strategic overview for all forms of flooding.

⁶ <https://flood-map-for-planning.service.gov.uk/>

⁷ <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

⁸ <http://environment.data.gov.uk/catchment-planning/>

⁹ <https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386>

¹⁰ <https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow>

¹¹ <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall>

¹² <http://nrfa.ceh.ac.uk>

¹³ <https://www.bury.gov.uk/CHttpHandler.ashx?id=5498&p=0>

¹⁴ <http://www.cbhe.hydrology.org.uk/search.php>

¹⁵ <http://mapapps.bgs.ac.uk/geologyofbritain3d/index.html>

¹⁶ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

¹⁷ <http://www.natureonthemap.naturalengland.org.uk/>

¹⁸ <https://riverlevels.uk/flood-map#.XclKwPn7RPZ>

2.2.3 Environment Agency Standing Advice¹⁹ and the NPPF/PPG ID: 7 was consulted and reviewed.

2.2.4 Correspondence with the Environment Agency is included in Appendix 4.

Lead Local Food Authority (LLFA)

2.2.5 Rochdale Council, as the Lead Local Flood Authority (LLFA) is responsible for local flood risk management in their areas and for maintaining a register of flood risk assets. They also have lead responsibility for managing the risk of flooding from surface water, groundwater, and ordinary watercourses.

2.2.6 Rochdale Council as the LLFA was consulted on flood risk issues at this Site.

2.2.7 Correspondence with the LLFA is included in Appendix 5.

Water Utility

2.2.8 Drainage and sewerage services in the UK are provided by a number of water and sewerage companies. United Utilities is responsible for sewerage within the area of the Site.

2.2.9 All sewerage undertakers maintain the 'DG5 register' of properties and external areas (such as gardens, highways, open spaces) which have suffered flooding from public foul/combined sewers. It does not include flooding caused by blockages.

2.2.10 Correspondence with United Utilities is included in Appendix 5.

2.3 Site Walkover

2.3.1 Enzygo staff carried out a walkover of the Site during July 2022. Observations made were used to inform the Site description.

¹⁹ Department for Communities and Local Government (published April 2012 and updated March 2019). Preparing a Flood Risk Assessment: Standing Advice [<https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>].

3.0 Site Location and Description

3.1 Location

- 3.1.1 The Site is located on land to the south of Dig Gate Lane, Rochdale, OL16 4NR.
- 3.1.2 The Site is centred on National Grid Reference (NGR) 391848, 411165.
- 3.1.3 The 0.11ha Site location is shown in Drawing 001 and in more detail in Drawing 002. The Site is set within a 0.43ha wider land ownership ('Wider Site').

3.2 Land Use

- 3.2.1 The Site is comprised of agricultural (grassed) land (Figures 3.1 and 3.2).
- 3.2.2 The Wider Site comprised of agricultural (grassed) land, bounded by Dig Gate Lane, with a car park beyond to the north; a residential dwelling to the west; and a grassed field to the south/east, with the M62 beyond.
- 3.2.3 The Site is currently accessed via an access track from Dig Gate Lane to the north.

Figure 3.1: Photographs of the Site (continues over page)

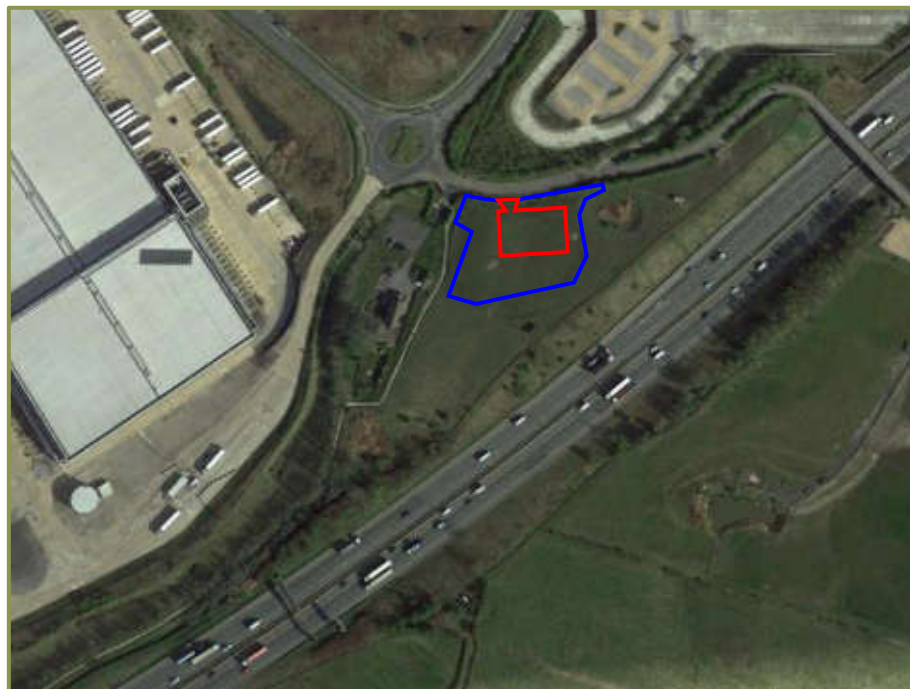


View north across the Wider Site.



View west across the Wider Site.

Figure 3.2: Aerial Photograph of the Site



Red boundary: The Site. Blue line boundary: Wider Site. Image © 2022 Digital Globe.

3.3 Topographic Information

- 3.3.1 A detailed topographical survey was carried out in November 2006 and a copy is included in Appendix 2. The main area of the Site falls in a north-east direction from 174.45m Above Ordnance Datum (m AOD) along the south-east boundary, to 172.46m AOD at the top of the

embankment located east to west through the northern extent of the Site. The fall of 1.99m over approximately 22m gives an average gradient of 1:11.

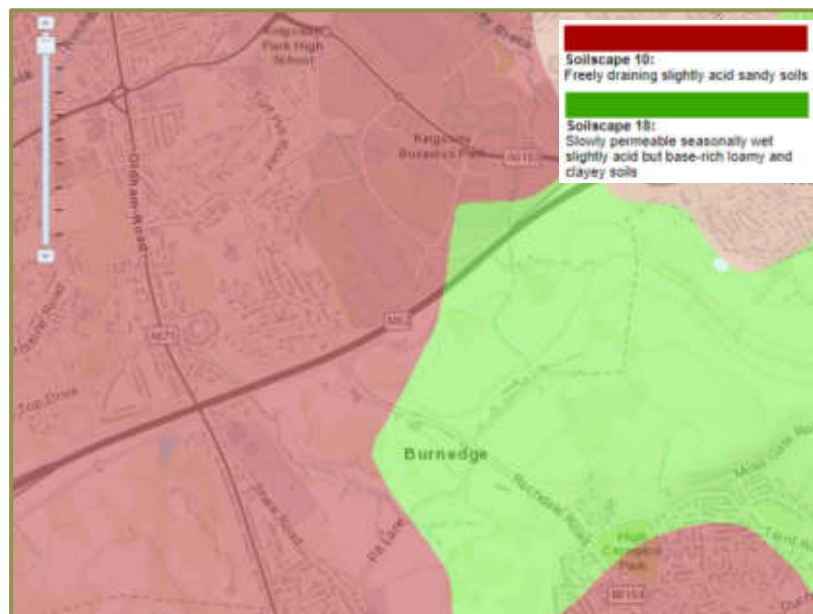
- 3.3.2 The embankment in the northern extent of the Site falls north towards Dig Gate Lane, from 172.46m AOD at the top of the embankment, to ~167m AOD (based on contour lines) along the toe of the embankment. The fall of ~5.46m over approximately 15m gives a gradient of ~1:3.

3.4 Soils and Geology

Soils Mapping

- 3.4.1 The Soilscape online soils map viewer shows the wester extent of the Site is underlain by freely draining, sandy soils. The eastern extent is underlain by slowly permeable, seasonally, loamy, and clayey soils. (Figure 3.3). The soils mapping is indicative and there may be localised variation in soil type.

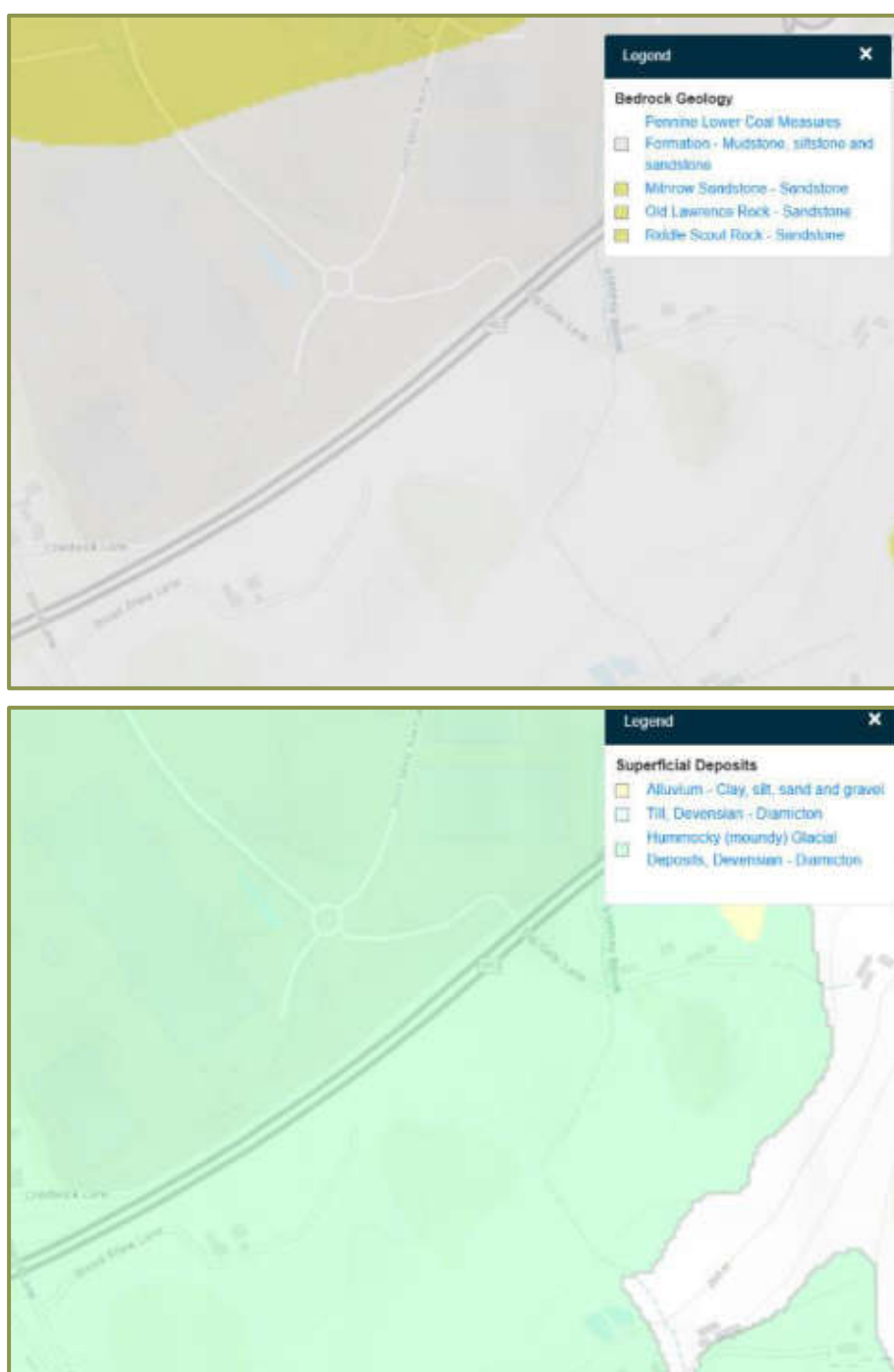
Figure 3.3: Soils Mapping



Soils Data © Cranfield University (NSRI) and for the Controller of HMSO [2022].

Geology Mapping

- 3.4.2 The Geology of Britain online map viewer (Figure 3.4) shows superficial deposits beneath the Site is Hummocky (moundy) Glacial Deposits. The bedrock beneath Site is Pennine Lower Coal Measures Formation.

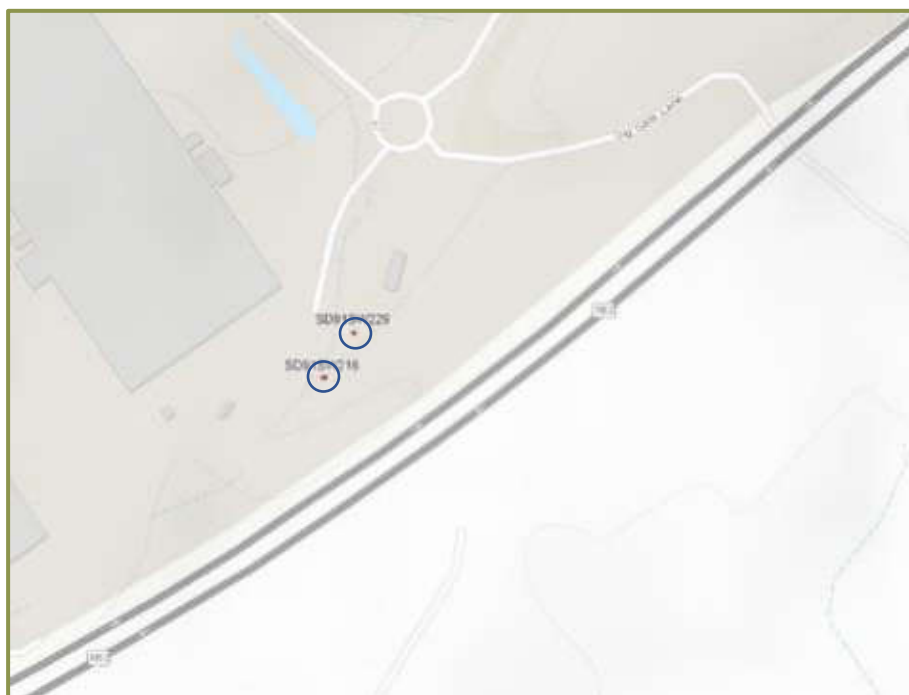
Figure 3.4: Geology Mapping

Top: Superficial Deposits Bottom: Bedrock Geology. Contains British Geological Survey materials © NERC [2022].

BGS Historical Borehole Records

- 3.4.3 The Geology of Britain online map viewer (Figure 3.5) shows there are two publicly available boreholes (SD91SW216, SD91SW229) within the same geology to the south of the Site; however, these boreholes do not contain details of the geology. There are no other borehole records in the vicinity of the Site.

Figure 3.5: Borehole Mapping



Contains British Geological Survey materials © NERC [2022].

Soakaway Testing

- 3.4.4 Soakaway testing was carried out for the Wider Site during August 2022. Four trial pits were excavated to depths up to 2.3m bgl. Trial pit locations are included in Figure 3.6 and a summary of the trial pit logs in Table 3.1. A copy of the soakaway test results is included in Appendix 6.

Figure 3.6: Trial Pit Locations

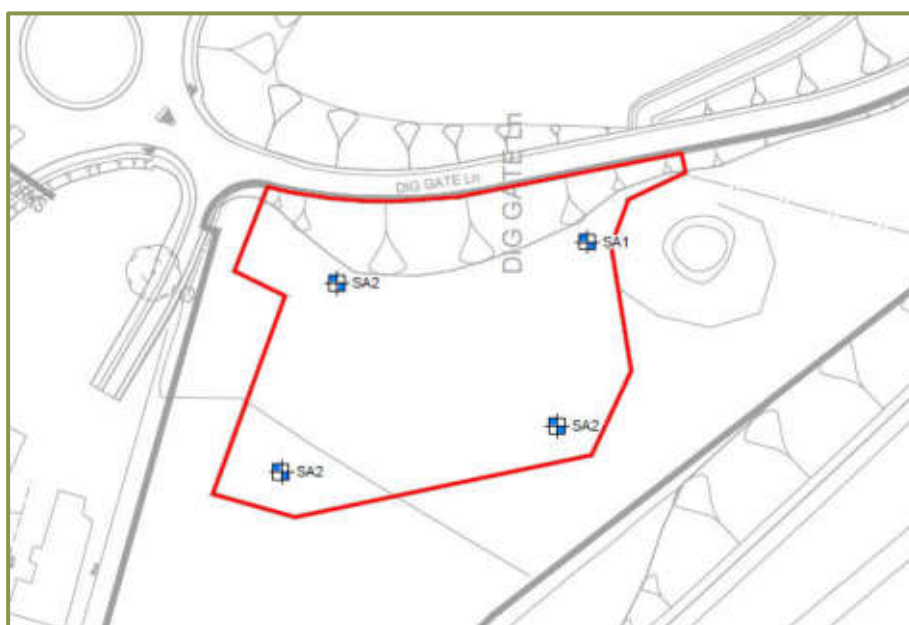


Table 3.1: Summary of Trail Pit Logs

Reference	Summary of Strata	Depth (m bgl)	Groundwater Depth (m bgl)
SA1	0-0.25m = Topsoil 0.25-2.00m = Sandy Clay [Hummocky Glacial Deposits]	2.00	Not Encountered
SA2	0-0.4m = Topsoil 0.4-2.3m = Clay [Hummocky Glacial Deposits]	2.30	Not encountered
SA3	0-0.3m = Topsoil 0.3 – 2.00m = Clay [Hummocky Glacial Deposits]	2.00	Not Encountered
SA4	0-0.40m = Topsoil 0.40 – 2.00m = Clay [Hummocky Glacial Deposits]	2.00	Not Encountered

3.5 Hydrogeology

Infiltration potential

- 3.5.1 The SuDS Infiltration Potential mapping (Drawing 007) shows that the Site is in the mapped extent of high infiltration potential.
- 3.5.2 Soakaway testing (Appendix 6) encountered Clayey soils/geology with low infiltration potential.

Defra Magic Map

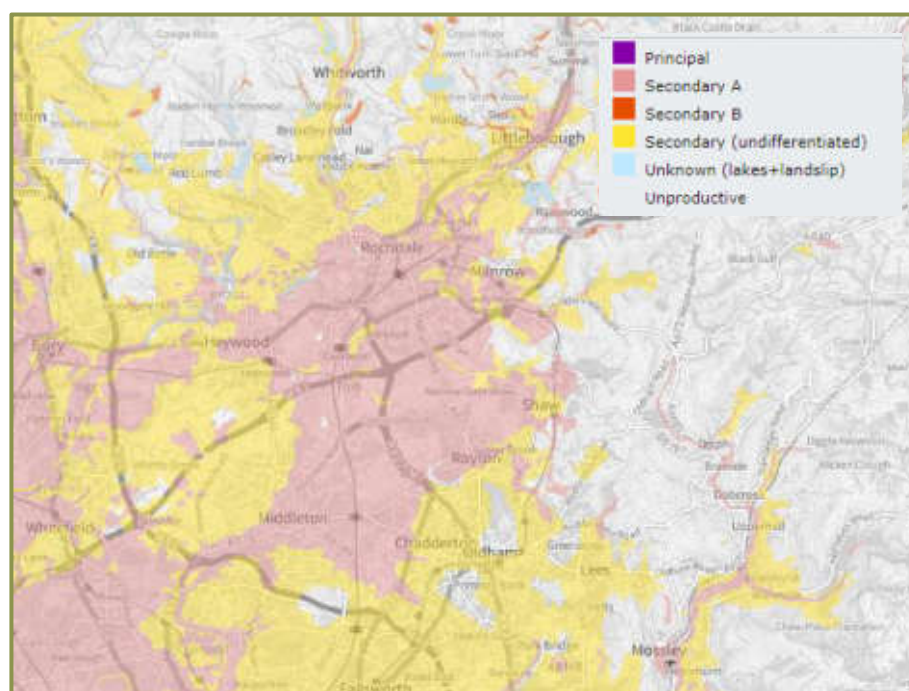
- 3.5.3 Defra Magic Map online mapping (Figure 3.7) shows the Site is not located in a groundwater Source Protection Zone (SPZ). These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. Where infiltration-based SuDS are proposed to manage surface water from a development, then direct discharge into groundwater would not be permissible. Therefore, the elevation of the groundwater table with respect to the base of the soakaway is critical, and there must be an unsaturated zone in the aquifer unit.
- 3.5.4 The Site is not located above a Principal Aquifer (bedrock designation). The Site however located above a Secondary A Aquifer within the superficial deposits (Figure 3.8).

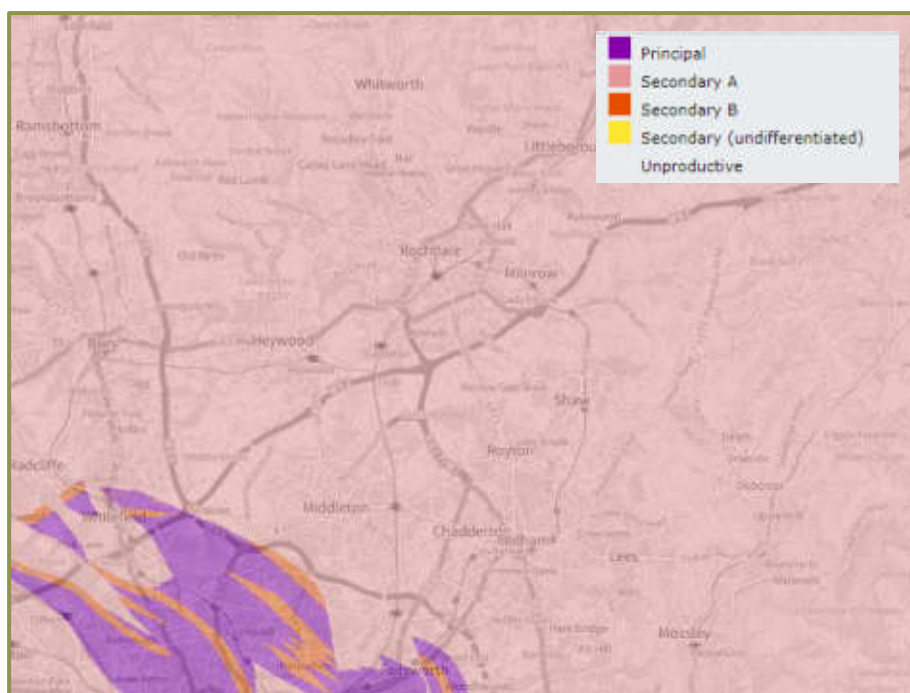
Figure 3.7: Source Protection Zone Map



From Magic Map. Contains Environment Agency information © Environment Agency and database right [2022].

Figure 3.8: Aquifer Designation Map (continues over page)





Top: Aquifer Designation (superficial deposits). Bottom: Aquifer Designation (bedrock). From Magic Map. Contains Environment Agency information © Environment Agency and database right [2022].

3.6 Catchment Hydrology

OS Mapping and Topographic Survey

- 3.6.1 OS mapping (Figure 3.9) shows there are no onsite or bounding watercourses. The nearest watercourse is an unnamed ordinary watercourse ('Watercourse 1') within third-party land, approximately 75m to the west of the Site.
- 3.6.2 The above identified watercourses are classified as 'ordinary watercourses', where flood risk work is carried out by the local drainage authority/riparian landowner.

Site Walkover Observations

i. Watercourse 1

- 3.6.3 The Site walkover observed Watercourse 1 to have an approximate 2.0m bed width, 1m depth, and 1:1 side slope. There is a Ø450mm highway culvert crossing to the north-west of the Site. The channel was observed to be dry at the time of the walkover and was moderately vegetated, which is considered normal for the time of year (Figure 3.10).

ii. Pond 1

- 3.6.4 A small pond (Pond 1) is in land to the to the east of the Site/Wider Site boundary (Figure 3.11).

Figure 3.9: Map of Watercourses

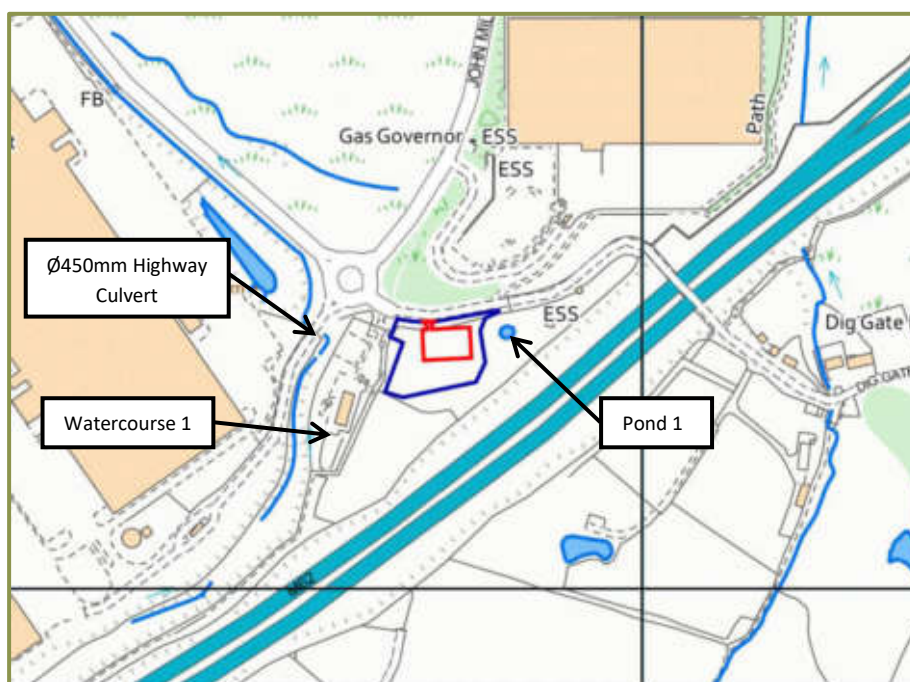


Figure 3.10: Watercourse 1

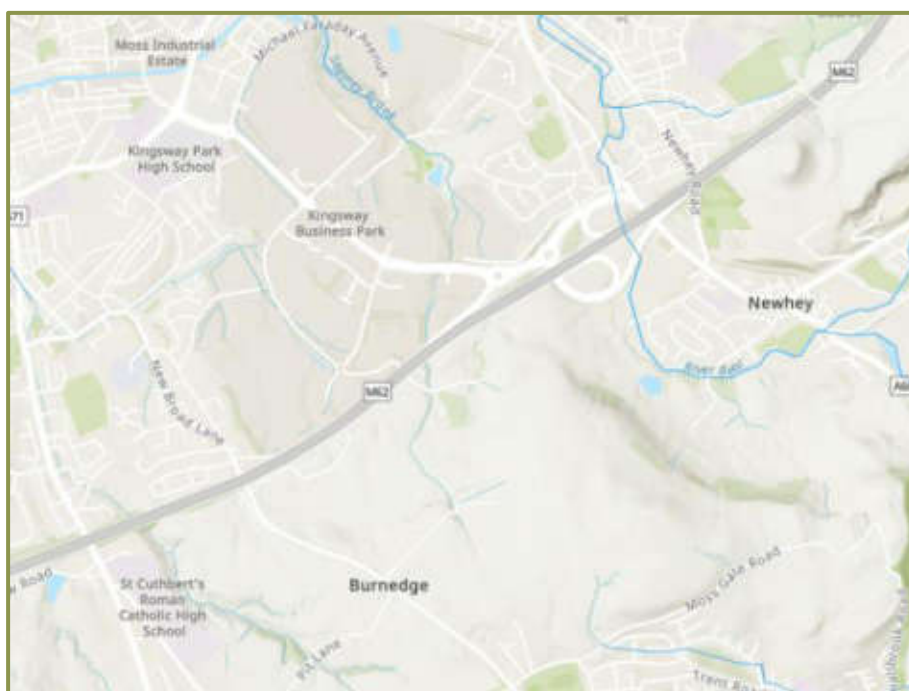


Watercourse 1 channel and highway culvert crossing to the west of the Site.

Figure 3.11: Pond 1

Main River Map

- 3.6.5 The Environment Agency online main river map (Figure 3.12) Stanney Brook (a main river) approximately 1km to the north of the Site. Main rivers are watercourses where flood risk work is carried out by the Environment Agency.

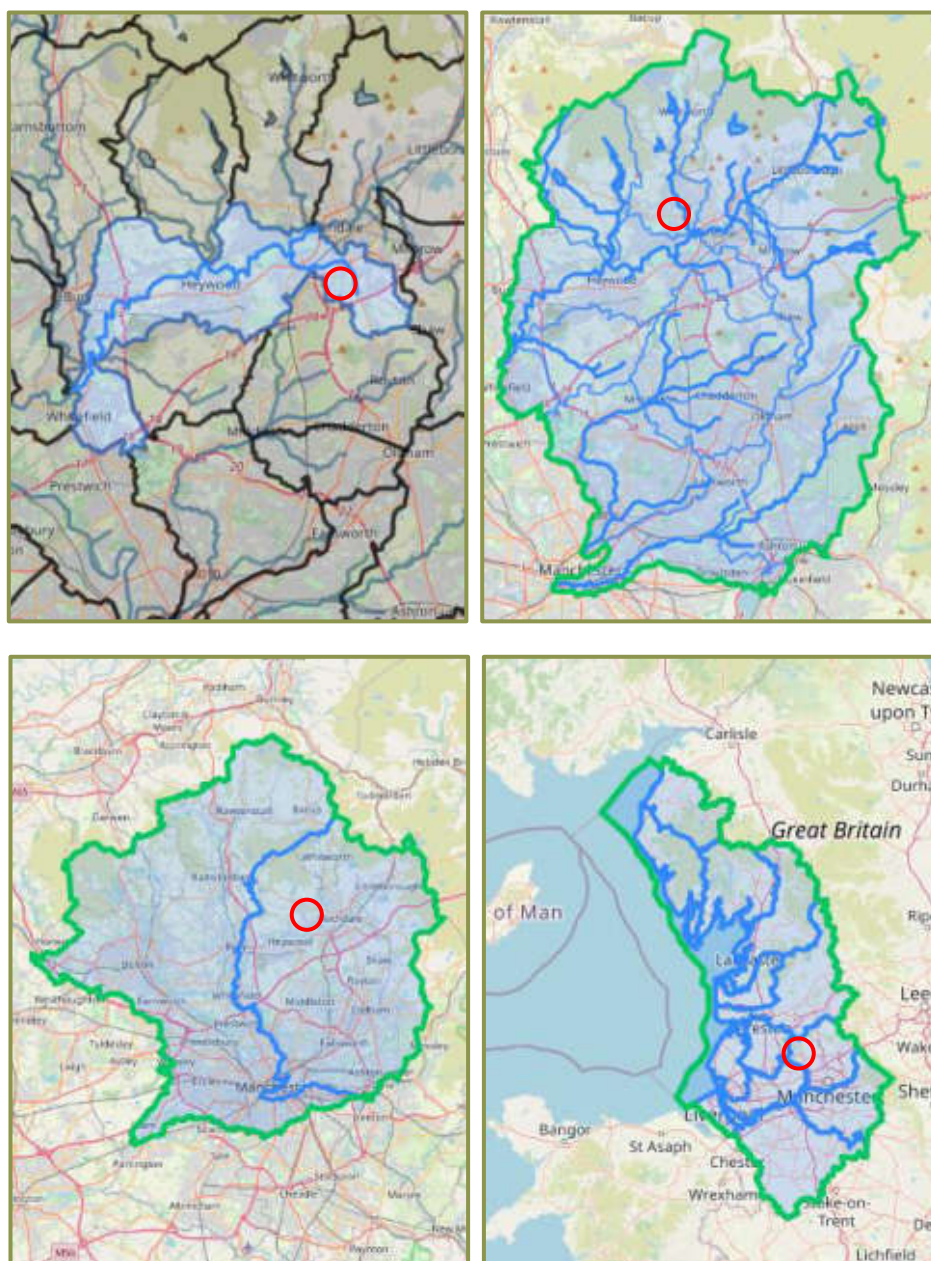
Figure 3.12: Main River Map

Contains Environment Agency information © Environment Agency and database right [2022].

Environment Agency Catchment Data Explorer Mapping

- 3.6.6 The Site resides within the Roch (Spodden to Irwell), Water Body (Figure 3.13), which is within the Roch Irk Medlock Operational Catchment, Irwell Management Catchment and North West River Basin District.

Figure 3.13: Catchment Data Explorer



Top Left: Roch (Spodden to Irwell) Water Body. Top Right: Roch Irk Medlock Operational Catchment. Bottom Left: Irwell Management Catchment. Bottom Right: North West River Basin District. Contains Environment Agency information © Environment Agency and database right [2022].

3.7 Sewerage Assets

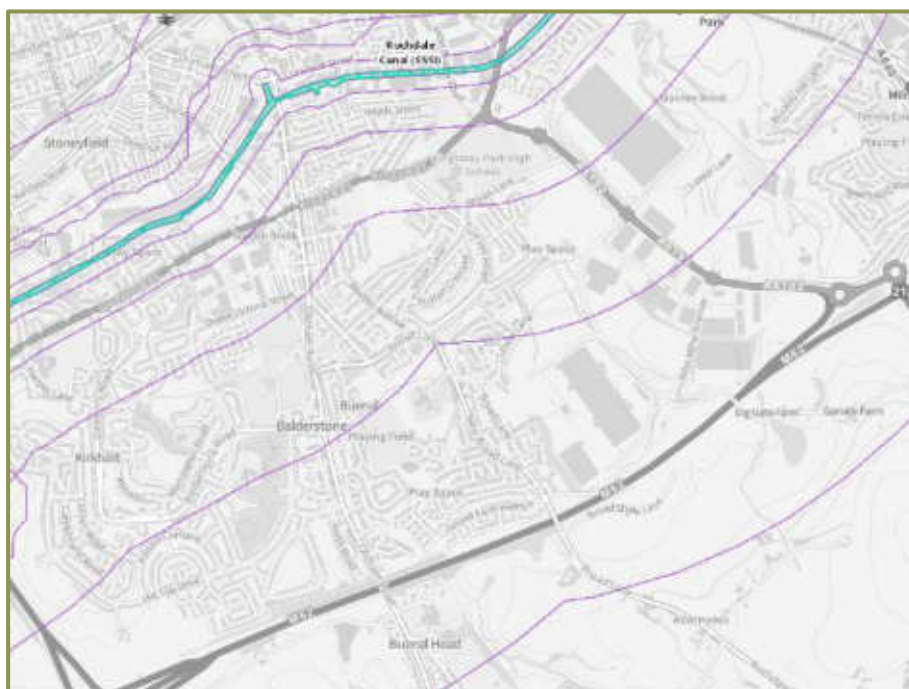
3.7.1 United Utilities asset plans (Appendix 3) show a Ø900mm public surface water sewer orientated north-east beneath John Milne Avenue to the north-west of the Site. There is also a Ø150mm public foul sewer orientated north-west beneath an unnamed highway to the north-west of the Site.

3.8 Designated Sites

3.8.1 The DEFRA Magic Map (England and Wales) (Figure 3.14) shows that there are no designated sites within the vicinity of the Site.

3.8.2 The nearest designated Site is Rochdale Canal (Site of Special Scientific Interest [SSSI]), which is located approximately 2km to the north-west of the Site.

Figure 3.14: Designated Sites



From Magic Map. Contains Environment Agency information © Environment Agency and database right [2022].

4.0 Flood Risk Assessment

4.1 Potential Sources of Flooding

- 4.1.1 A summary of the potential sources of flooding and the potential risk posed by each source at the Site is presented in Table 4.1. Each source of flooding and level of risk is then assessed in further detail.

Table 4.1: Potential Risk Posed by Flooding Sources

Flooding Source	Potential Flood Risk at Application Site (Yes/No)	Potential Source	Data Sources
Fluvial	No	Watercourse 1	Environment Agency consultation response (Appendix 4) and Environment Agency flood mapping (Drawing 005).
Tidal	No	None identified	Environment Agency consultation response (Appendix 4) and Environment Agency flood mapping (Drawing 005).
Groundwater	Yes	Secondary A Aquifer (superficial deposits)	BGS mapping (Drawing 003) and Geosmart Groundwater (Drawing 006).
Surface Water	Yes	Poor permeability and Site topography	JBA Surface Water Flooding (Drawing 004) and Environment Agency Complex mapping (Drawings 009.1-009.4).
Sewer	Yes	Public surface water and foul sewer	United Utilities asset plans
Infrastructure Failure	Yes	Reservoir and pond failure	OS mapping (Drawings 001 and 002) and Environment Agency online flood mapping.

4.2 Fluvial Flooding

Environment Agency Flood Zone Mapping

- 4.2.1 The Environment Agency Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, since these can be breached, overtopped and may not be in existence for the lifetime of a development.
- 4.2.2 The Environment Agency flood map (Drawing 005) shows the Site is in Flood Zone 1, which is land outside the 1 in 1000-year (0.1% Annual Exceedance Probability [AEP]) extent of fluvial (river) flooding, at 'low' risk.

Flood Defences

- 4.2.3 Environment Agency online flood mapping show that the Site does not benefit from flood defences.

Flood Warning Service

- 4.2.4 The River Levels UK website shows the Site is not within a flood warning area.

Summary Flood Risk

4.2.5 The risk of fluvial flooding is assessed as negligible.

4.3 Tidal Flooding

4.3.1 The Site is not located close to tidally affected flooding sources.

4.3.2 The risk of tidal flooding is assessed as negligible.

4.4 Groundwater Flooding

Introduction

4.4.1 Groundwater flooding occurs when subsurface water emerges either at surface or in made ground or in subsurface structures such as basements and services ducts. It occurs as diffuse seepage, emergence from new point source springs or an increase in flow from existing springs. It results from aquifer recharge from infiltrating rainfall, from sinking streams entering aquifers from adjacent non-aquifers, or from high river levels or tides driving water through near surface deposits. It tends to occur with a delay following rainfall and can last for several weeks or months. Groundwater flooding or shallow water tables also prevent or reduce infiltration and so can worsen surface water flooding.

BGS Groundwater Flooding Susceptibility Map

4.4.1 The BGS Groundwater Flooding Susceptibility Map (Drawing 003) shows the Site is located in the mapped extent where there is potential for groundwater flooding of property situated below ground level.

4.4.2 The BGS mapping is coarse and should be superseded by the Geosmart groundwater flood risk map.

Geosmart Groundwater Flood Risk Map

4.4.3 The Geosmart 1 in 100-year groundwater flood risk map (Drawing 006) shows that the Site is at negligible risk of groundwater flooding and falls within Risk Class 4 (Table 4.2).

4.4.4 Mapped classes combine understanding of likelihood, model and data uncertainty, and possible severity. Likelihood is ranked according to whether we expect groundwater flooding at a site due to extreme elevated groundwater levels with an annual probability of occurrence greater than 1%, considering model and data uncertainty. Severity relates to expectations of the amount of property damage or other harm that groundwater flooding at that location might cause (Table 4.2).

Table 4.2: Groundwater Flood Risk Classification

Risk Class	Probability of Groundwater Flooding	Effect
4: Negligible	Annual probability less than 1%.	Negligible unless unusually sensitive use.
3: Low	Annual probability greater than 1%.	Remote possibility of damage to property or harm to sensitive receptors Flooding likely to be limited

Risk Class	Probability of Groundwater Flooding	Effect
		to seepages and waterlogged ground, damage to basements and subsurface infrastructure, and should pose no significant risk to life. Surface water flooding may be worsened.
2: Moderate	Annual probability greater than 1%.	Significant possibility of damage to property or harm to other sensitive receptors at or near this location. flooding is likely to be in the form of shallow pools or streams. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.
1: High	Annual probability greater than 1%.	Groundwater flooding will occur which could lead to damage to property or harm to other sensitive receptors at or near this location. Flooding may result in damage to property, road or rail closures and, in exceptional cases, may pose a risk to life. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.

Soakaway Test Results

- 4.4.5 Groundwater ingress was not encountered in any of the soakaway trial pits, up to 2.30m bgl (Table 3.1).

Flood Risk

- 4.4.6 The risk of groundwater flooding is assessed as negligible.

4.5 Surface Water Flooding

Introduction

- 4.5.1 Surface water flooding occurs following rainfall on ground where infiltration rates are less than the rainfall precipitation rate. This can occur when either:
- Soils or ground materials are naturally of low permeability or have been compacted (infiltration excess runoff);
 - Soils or ground materials are saturated from previous rainfall either directly or from upslope (saturation excess runoff and return flow) or from high groundwater levels.

JBA Surface Water Flood Map

- 4.5.2 The JBA Surface Water Flood Map (Drawing 004) shows the Site is located outside the mapped extent of surface water flooding.
- 4.5.3 The JBA Surface Water Flood mapping is superseded by the more detailed Environment Agency Complex Surface Water Flood mapping.

Environment Agency Complex Surface Water Flood Mapping

- 4.5.4 The Environment Agency Complex Surface Water Flood Mapping (Drawings 009.1 to 009.4) shows the Site is located outside the mapped extent of surface water flooding.

Flood Risk

- 4.5.5 The risk of surface water flooding is assessed as negligible.

4.6 Sewer Flooding

Introduction

- 4.6.1 Sewer flooding occurs when urban drainage networks become overwhelmed after heavy or prolonged rainfall due to restrictions or blockage in the sewer network or if the volume of water draining into the system exceeds the sewer design capacity.
- 4.6.2 New sewers are built to the guidelines within Sewers for Adoption²⁰ and have a design standard to the 1 in 30-year flood event. Older sewers were not designed to any standard. Modern sewer systems will only surcharge during rainstorm events with a return period greater than 1 in 30-years (e.g. 1 in 100-years).

Sewer Asset Plans

- 3.8.3 United Utilities asset plans show a public surface water sewer orientated north-east beneath John Milne Avenue to the north-west of the Site, and a public foul sewer orientated north-west beneath an unnamed highway to the north-west of the Site.
- 3.8.4 Any surcharge flows would shed overland as shallow (<150mm) overland flows, following the local topography, north-west away from the Site (Drawing 010). The Site is also topographically higher than adjacent highways.

Flood Risk

- 4.6.3 The risk of flooding from sewers is assessed as negligible.

4.7 Flooding from Infrastructure Failure

Reservoir

- 4.7.1 The Environment Agency online flood mapping shows the Site is located outside the extent of flooding sourced from reservoirs. The risk of flooding from reservoirs is assessed as negligible.

Pond

- 4.7.2 Pond 1 is in land to the to the east of the Site/Wider Site boundary. Pond 1 is small and not impounded. The risk of flooding from pond failure is assessed as negligible.

²⁰ WRC (2012) Sewers for Adoption 7th Edition.

5.0 Flood Risk Mitigation Measures

5.1 Introduction

5.1.1 No sources of flooding were identified.

5.2 Mitigation Measures

5.2.1 The risk of flooding from all sources is assessed as negligible. Residual flood risk would be mitigated by setting finished floor levels of buildings and vulnerable electrical above external levels, and through the adoption of a surface water drainage strategy.

5.3 Summary of Flood Risk

5.3.1 Table 5.1 summarises the probability and level of risk, both with and without mitigation measures.

Table 5.1: Probability and Consequences of All Sources of Flooding

Flooding Source	Potential Source	Probability	Consequence & Impact Without Mitigation	Consequence & Impact with Mitigation
Fluvial	Watercourse 1	Negligible	Negligible	Negligible
Tidal	None identified	Negligible	Negligible	Negligible
Groundwater	Secondary A Aquifer (superficial deposits)	Negligible	Negligible	Negligible
Surface Water	Poor permeability and Site topography	Negligible	Negligible	Negligible
Sewer	Public surface water and foul sewer	Negligible	Negligible	Negligible
Infrastructure Failure	Reservoir and pond failure	Negligible	Negligible	Negligible

Key: Green - Negligible, Yellow - Low, Orange - Medium and Red - High; based on consequence and impact with mitigation from each flooding source.

5.4 Flood Guidance and Sequential Test

5.4.1 The proposal is for a gas-powered reserve energy facility. Table 2 of PPG ID: 7 (not included in this report) classifies the proposed use as 'Essential Infrastructure'.

5.4.2 The Environment Agency Flood Zones and acceptable development types are listed in Table 5.2. All development types (including essential infrastructure) are acceptable in Flood Zone 1 (low risk). The Sequential Test would be passed and the Exception Test would not be required as indicated in Table 5.3.

Table 5.2: Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	All development types generally acceptable.
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.	Most development type are generally acceptable.
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	Some development types not acceptable.
Zone 3b	'Functional Floodplain'	Land where water must flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).	Some development types not acceptable.

Note: The Flood Zones are the current best information on the extent of the extreme flood from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. The identified risk of fluvial flooding is highlighted green.

Table 5.3: Vulnerability and Flood Zone 'Compatibility' as Identified in Table 3 of PPG ID: 7

Flood Risk Vulnerability classification (see Table 1 of PPG ID: 7)	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Yes	Exception test required	Yes	Yes
Zone 3a	Exception test required	Yes	No	Exception test required	Yes
Zone 3b 'Functional Floodplain'	Exception test required	Yes	No	No	No

Key: Yes: Development is appropriate, No: Development should not be permitted.
The identified risk of fluvial flooding is highlighted green.

6.0 Site Drainage

6.1 Surface Water Drainage

- 6.1.1 Consideration of flood issues is not confined to the floodplain. This is recognised in the NPPF and associated guidance where all proposed development of 1ha or more in flood zone 1 and so outside the floodplain nevertheless requires an FRA. The alteration of natural surface water flow patterns through development can lead to problems elsewhere in a catchment, particularly flooding downstream, and the replacement of permeable vegetated areas by low-permeability roofs, roads and other paved surfaces will increase the speed, volume, and peak flow of surface water runoff. So, the NPPF and associated guidance require an FRA for all proposed development of 1ha or more outside the floodplain in flood zone 1.
- 6.1.2 A surface water management strategy for the development is proposed to manage and reduce the flood risk posed by surface water runoff from the Site. The developer will be required to ensure that any scheme for surface water management should build in enough capacity for the entire Site.
- 6.1.3 The surface water drainage arrangements for any development Site should be such that the volume and peak flow rates of surface water leaving a developed Site are no greater than the rates prior to the proposed development unless specific off-Site arrangements are made and result in the same net effect.
- 6.1.4 An assessment of the surface water runoff rates was undertaken to determine the surface water options and attenuation requirements for the Site.

6.2 Existing Drainage System

- 6.2.1 The 0.11ha Site land use comprised of agricultural (grassed) land.
- 6.2.2 The Site is underlain by low permeable (Clayey) soils and bedrock. It is likely that drainage is predominantly via overland flow, following the topography of the Site to the topographic low points (north-west towards Watercourse 1), with a small amount of infiltration to bedrock, and throughflow to watercourse.

6.3 Developable and Impermeable Areas

- 6.3.1 The proposal is for a gas-powered reserve energy facility, with associated infrastructure. The proposed development type will be a 30-year lifetime.
- 6.3.2 The impermeable area has been measured from the site layout drawing. The existing and proposed impermeable areas are shown in Table 6.1. The proposed development will increase the impermeable surfaces and so increase the amount of runoff.

Table 6.1: Impermeable Area

Area	Existing Buildings and Hardstanding	Proposed Buildings and Hardstanding	Difference
Area (ha)	0	0.11	+0.11
Percentage of Total Site Area (%)	0	100	+100

6.4 Greenfield Runoff Rates

- 6.4.1 An assessment of greenfield runoff rates was undertaken to determine the attenuation requirements for the proposed development.
- 6.4.2 The runoff rates were calculated using the HRWallingford UKSuDS online tool, with FEH method inputs (descriptors obtained from the FEH webservice²¹). This is a recommended methodology for Sites up to 50ha in area and the approach is in line with the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS²², and Environment Agency Report SC030219 – Rainfall runoff management for developments.
- 6.4.3 The following parameters were used in the runoff calculations:
- Developable Area: 0.11ha
 - Average Annual Rainfall (SAAR): 1160mm/year
 - Region No.: 10
 - BFIHOST19: 0.585
- 6.4.4 BFIHOST was updated to BFIHOST19 (November 2019) since a number of issues were identified with BFIHOST, which including a tendency to underestimate BFI in clay-dominated catchments.
- 6.4.5 BFIHOST19 is the baseflow index developed using the Hydrology of Soil Types (HOST) classification and is the baseflow proportion of the flow on average. It is estimated based on the daily mean flow data. Baseflow comprises water entering the watercourse through shallow subsurface flow and groundwater flow (mechanisms other than direct surface runoff); hence permeable soils and geology tend to yield a higher baseflow.
- 6.4.6 BFIHOST19 value assigned by the FEH webservice is considered to replicate on-site conditions.
- 6.4.7 Table 6.2 shows the calculated greenfield runoff rates. Runoff calculations are included in Appendix 7.

Table 6.2: Greenfield Runoff Rates

Annual Probability (Return Period, years)	Greenfield Runoff (l/s)
QBAR	0.82
100% (1)	0.71
3.33% (30)	1.40
1% (100)	1.71
1% Plus Climate Change	2.14

Note: 25% added to the data to account for long-term climate change as stated in 'Flood Risk Assessment: Climate Change Allowance'. The 1 in 1-year, 30-year and 100-year annual probability events are of importance to the Water Companies and the Environment Agency when looking at sewage discharge and flood risk.

- 6.4.8 It is noted that 1.0 l/s is the minimum rate that flow control devices can operate to, without blockage and cavitation issues.

²¹ Centre for Ecology and Hydrology, Flood Estimation Handbook Web Service [<https://fehweb.ceh.ac.uk/>].

²² Office of the Deputy Prime Minister, National SuDS Working Group (July 2004) Interim Code of Practice for Sustainable Drainage Systems [https://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf].

6.5 Sustainable Drainage Options (SuDS)

Feasibility of SuDS

- 6.5.1 Soakaway testing was undertaken during August 2022 and a copy of the infiltration test results are included in Appendix 6. Results demonstrate infiltration-based SuDS will not be feasible due to low infiltration rates into the Clayey geology.

Choice of SuDS Options

- 6.5.2 Sustainable water management measures should be used to control the surface water runoff from the proposed development Site, thereby managing the flood risk to the Site and surrounding areas from surface water runoff. These measures will also improve the quality of water discharged from the Site.
- 6.5.3 Current guidance promotes sustainable water management using SuDS. Options applicable to this Site are identified in Table 6.3.

Table 6.3: SuDS Options

Green roofs	Infiltration basins
Water butts	Detention basins
Permeable paving	Oversized pipes
Rainwater harvesting	Brown roofs
Filter strips	Swales
Wetland Areas	Cellular Storage

Note: SuDS appropriate to the development are highlighted green.

- 6.5.4 A hierarchy of SuDS techniques is identified²³:
- 1. Prevention** – the use of good Site design and housekeeping measures on individual Sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
 - 2. Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting).
 - 3. Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole Site).
 - 4. Regional Control** – management of runoff from several Sites, typically in a detention pond or wetland.
- 6.5.5 Using SuDS as opposed to conventional drainage systems provides several benefits by:
- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;

²³ CIRIA (2004) Report C609, Sustainable Drainage Systems – Hydraulic, Structural and Water Quality advice.

- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed Sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open spaces and wildlife habitat; and
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

SuDS Maintenance

- 6.5.6 A maintenance and management plan is included in Section 7, which will ensure the effectiveness of the drainage strategy for the lifetime of development.

6.6 Surface Water Management Strategy

Hierarchy of Discharge

- 6.6.1 In accordance with requirement H3 of the Building Regulations 2000²⁴ rainwater runoff must discharge to one of the following, listed in order of priority:

- 1. An adequate soakaway or some other adequate infiltration system:** The use of infiltration-based SuDS is not feasible due to low infiltration potential.
- 2. A watercourse:** There are no watercourse within or bounding the Site. The nearest watercourse is located in third-party land to the north-west of the Site.
- 3. A sewer:** A public surface water sewer is oriented north-east beneath John Milne Avenue to the north-west of the Site.

- 6.6.2 The potential route to discharge from the existing Site will be by outfall to the public surface water sewer. As per Appendix 3, United Utilities would accept a maximum 5.0l/s discharge rate to the 900mm public surface water sewer under John Milne Avenue.

Drainage Design

- 6.6.3 Surface water runoff would be directed to the drainage system through drainage gullies located around the perimeter of the buildings and through contouring of the hardstanding areas.
- 6.6.4 Landscaped areas should be incorporated into the layout where possible, and the associated gardens of each unit will allow a proportion of the rainfall to infiltrate into the soil substrate.
- 6.6.5 Surface water will be directed to onsite geocellular storage, positioned to achieve a gravity fed connection to the public surface water sewer (subject to levels checks).
- 6.6.6 A drainage layout is in drawing SHF33050.001-ENZ-XX-DR-D-0001.

²⁴ Office of the Deputy Prime Minister, The Building Regulations 2000.

Attenuation Requirements

- 6.6.7 Attenuation storage is required to reduce the post-application surface water runoff from the Site to calculated greenfield runoff rates, up to and including the 1 in 100-year (+25%CC) rainfall event, assuming no infiltration losses.
- 6.6.8 The following input parameters were assumed in the calculations:
- Impermeable Area: 0.11ha
 - Cv (proportion of rainfall forming surface water runoff): 100% summer, 100% winter
 - Infiltration losses: 0.00m/hour
 - Discharge Rate: 1.0 l/s minimum rate (to be agreed with United Utilities).
- 6.6.9 The attenuation volume for the 1 in 100-year event (plus 25 % climate change) is 87m³.
- 6.6.10 Attenuation calculations are included in Appendix 7. The calculated runoff rates and attenuation volumes will be reviewed at detailed design stage.

6.7 Exceedance Routes

- 6.7.1 The attenuation will be designed with a capacity up to a 1 in 100-year (plus 25% climate change) event, based on the 1.0 l/s minimum rate.
- 6.7.2 A storm event in excess of this design standard would be extreme and would cause the drainage network to overtop (with no sudden deluge) and would then shed overland following the topography (north) towards Dig Gate Lane, as per existing conditions.

7.0 Maintenance and Management Plan

7.1 Drainage Layout

7.1.1 The drainage strategy drawing includes information on:

- Surface water drainage runs.
- The position of the onsite cellular storage, including total volume, and tank dimensions.
- Flow control structures.

7.2 Operation Phase

Principles of the Maintenance and Management Plan

- 7.2.1 Key areas of maintenance have been identified from the drainage layout. The following identifies how the drainage layout has considered access, the anticipated maintenance activities and who might be responsible for the maintenance.
- 7.2.2 Maintenance of the SuDS features would be in line with the SuDS Manual (CIRIA C753, 2015). The maintenance shall be undertaken by the Site operator. In the event that the maintenance company goes into administration, the Site will be contracted to a new maintenance company. This will ensure maintenance throughout the lifetime of the development.
- 7.2.3 The schedule should be a living document as it may change, where inspections advise changes to the scheme maintenance requirements.

Proprietary Systems

- i. Flow Control Structures
- 7.2.4 Flow control structures (Hydrobrake) will be positioned downstream from the tank in a chamber which would allow access for inspection and maintenance. The Hydro-brake vortex flow control provides water quantity management for surface, across a wide range of flows and for a variety of applications. It has no moving parts and no power requirements and provides reliable, low- maintenance, engineered flood management as part of green infrastructure developments. Regular inspections should take place to ensure that no blockages have occurred.
- ii. Below Ground Drainage Pipes
- 7.2.5 Typical maintenance activities and frequency are summarised in Table 7.1.

Table 7.1: Below Ground Drainage Pipes

Maintenance Frequency	Required Action	Maintenance Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface where it can cause risks to performance.	Monthly for 3 months, then Quarterly

Maintenance Frequency	Required Action	Maintenance Frequency
	Remove sediment from pre-treatment inlet structures and inspection chambers.	Quarterly/as required.
	Maintain vegetation to design limits within the vicinity of the below ground drainage pipes/soakaways to avoid damage to the system.	Monthly/as required.
Remedial Work	Repair physical damage if necessary.	As required.
Monitoring	Inspect all inlets, outlets, and wets to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years/as required.

iii. Cellular Storage

7.2.6 Typical maintenance activities and frequency are summarised in Table 7.2.

Table 7.2: Cellular Storage (Attenuation Tank) Maintenance Activities

Maintenance Frequency	Required Action	Maintenance Frequency
Regular Maintenance	Inspect and remove debris from inlet structure	Monthly
	Remove sediment from pre-treatment structure where present	Monthly (or as required based on inspection)
	Check inlets, outlets, control structure and overflows	Annually (or as required)
Occasional Maintenance	Jetting and suction where silt has settled in the structure	As required
Remedial Work	Full replacement of the structure if permanently silted or structural failure	As required

7.3 Construction Phase

7.3.1 Mitigation measures are designed in to reduce the potential for impacts on hydrology, flood risk and water quality:

7.3.2 A summary of the mitigation measures during the construction phase, timetable for implementation and validation of the final drainage design is provided below.

- Good environmental practice based on legal responsibilities and guidance in accordance with the general overarching guidance on good environmental management in PPG1 (Environment Agency, 2013) and more specific guidance including:
 - CIRIA C650 (2005) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors.
 - CIRIA C648 (2006) Control of Water Pollution from Linear Construction Projects.
 - PPG21: Pollution Prevention Guidelines. Incident Response Planning.

- Minimise where practicable the production of silt and contaminated water by minimising:
 - Dewatering and pumping of excavations and subsequent disposal of water.
 - Runoff from exposed ground and stockpiles.
 - Plant and wheel washing.
 - Site roads.
 - Fuel and other spillages.
 - Waste storage and disposal.
 - Surface Water Management (SuDS) Scheme. The development will result in the construction of low permeability surfacing, increasing the rate of surface water run-off. The surface water drainage scheme ensures the runoff rates to the surrounding water environment are maintained at pre-development greenfield rates incorporating the effects of climate change.
- 7.3.3 The maintenance and management of the SuDS during the construction phase is essential in managing runoff on and from the Site. It is also key in ensuring the prevention of sediment and pollutants entering the bounding watercourse.
- 7.3.4 A separate Construction Environmental Management Plan (CEMP) will be required to control environmental issues during the construction process. The CEMP forms part of the Project Management Plan, which integrates the core arrangements for health and safety, quality, and environmental management for the construction phase. This integrated approach ensures that environmental aspects are considered at all stages of the design and construction process.
- 7.3.5 The construction phase will be undertaken in accordance with good practice guidelines on hydrology, flood risk and water quality for consultants and contractors, including:
 - CIRIA Environmental Good Practice on Site (C502) (1999).
 - CIRIA Control of Water Pollution from Construction Sites (C532) (2001).
 - Environment Agency Pollution Prevention Guidelines.

Timetable for Implementation

- 7.3.6 The SuDS attenuation and conveyance features will be constructed before development begins, so that they are ready to accept runoff from impermeable areas (i.e. roofs and car park) as these are constructed.

Validation

- 7.3.7 Proprietary systems will be jetted, and SuDS features de-silted, before being surveyed and inspected prior to final sign-off. This will ensure the drainage system is constructed in line with the detailed drainage design or subsequent (agreed) amendments.

8.0 Summary and Conclusions

7.1 Introduction

- 7.1.1 A site-specific Flood Risk Assessment (FRA) has been undertaken for a proposed gas-powered reserve energy facility, located on a 0.11ha Site on land to the south of Dig Gate Lane, Rochdale.

7.2 Flood Risk and Mitigation Measures

- 7.2.1 The risk of flooding from all sources is assessed as negligible. Residual flood risk would be mitigated by setting finished floor levels of buildings and vulnerable electrical above external levels, and through the adoption of a surface water drainage strategy.

7.3 Flood Guidance

- 7.3.1 The proposed gas-powered reserve energy facility is classified as essential infrastructure. Essential infrastructure uses are considered acceptable in terms of flood risk in Flood Zone 1 (low risk). The Sequential Test would be passed, and the Exception Test would not be required.

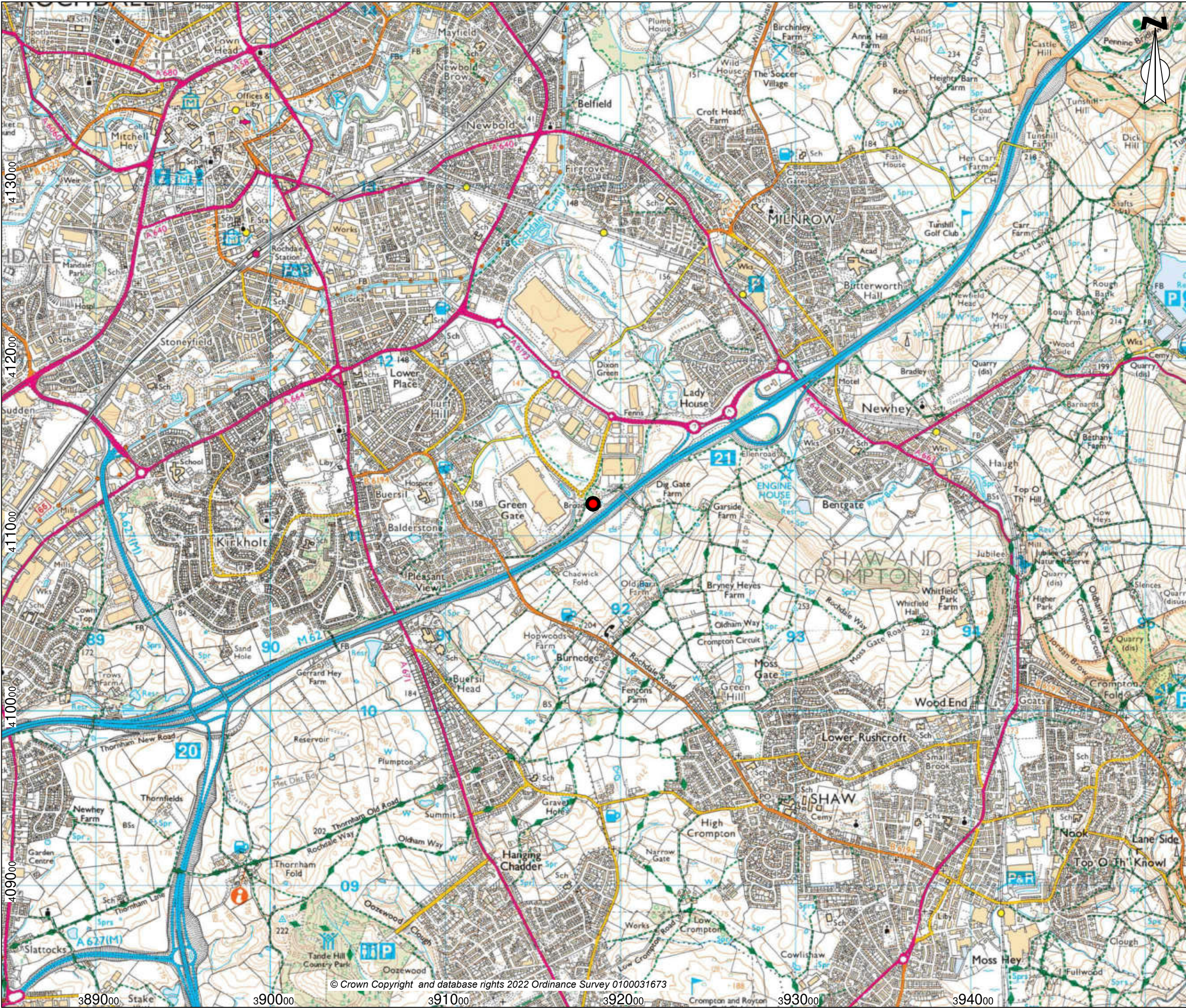
7.4 Site Drainage

Surface Water

- 7.4.1 The proposed development will increase the area of impermeable surfaces and therefore increase the amount of runoff without mitigation.
- 7.4.2 Surface water runoff from the Site will be restricted to 1.0 l/s minimum rate.
- 7.4.3 Surface water runoff from the proposed development would be attenuated on-site up to and including the 1 in 100-year event, plus 25% climate change.
- 7.4.4 A SuDS drainage scheme is proposed to manage excess runoff from the development, comprising of cellular storage designed to maintain runoff at pre-development rates, with an outfall to the nearby public surface water sewer.
- 7.4.5 A maintenance and management plan will ensure the effectiveness of the drainage strategy for the lifetime of the development.

7.5 Conclusion

- 7.5.1 This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of national policy and guidance.
- 7.5.2 The development should not therefore be precluded on the grounds of flood risk and surface water drainage.



Key

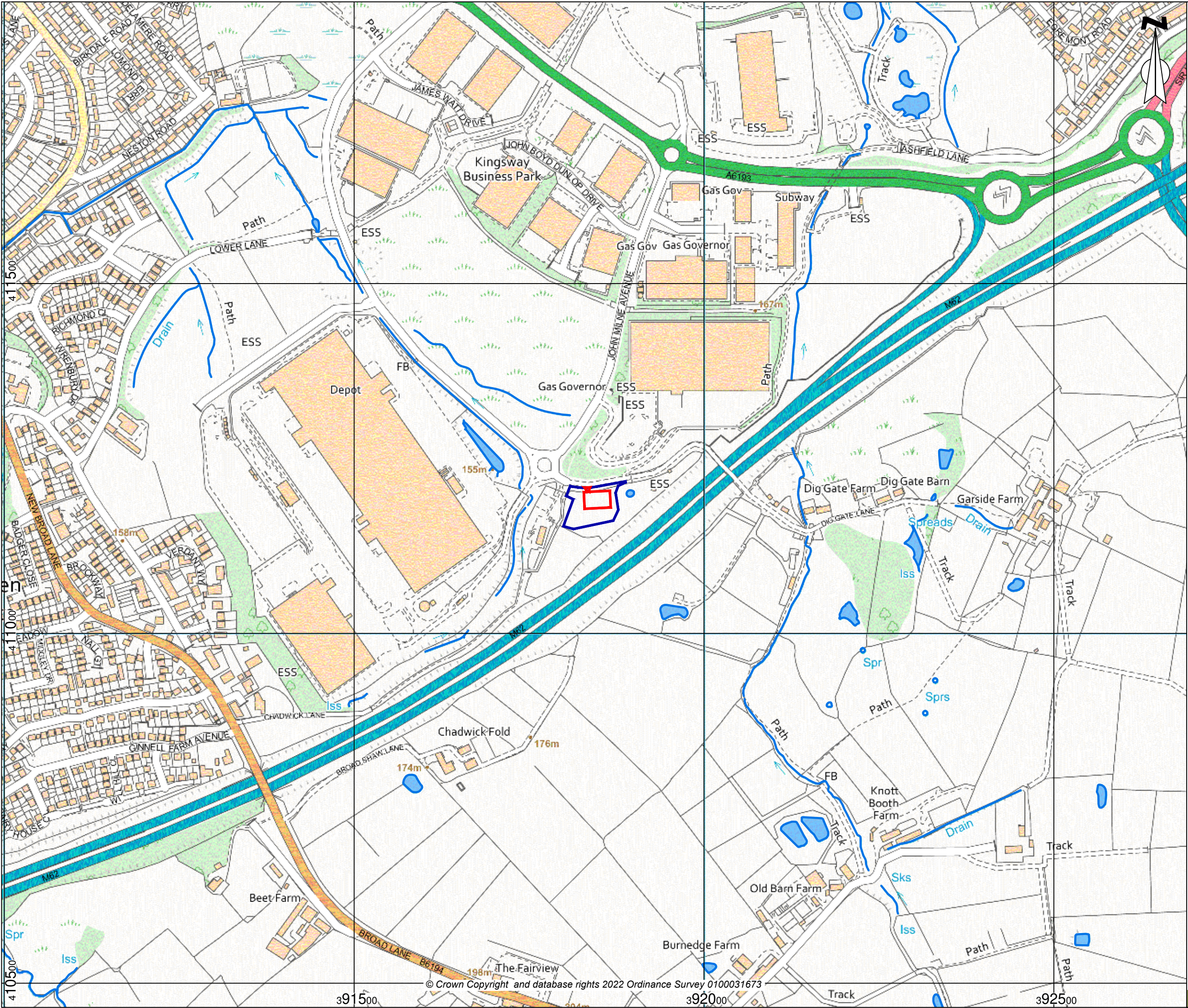


Site Location
(SD 91848 11165)



Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:		Rochdale Power Ltd	
SCALE:		PROJECT REF:	
1:20,000@A3		SHF.3050.001	
DRAWN:		DATE:	
MG		Oct 2022	
CHECKED:		PROJECT:	
DA		Dig Gate Lane, Rochdale	
TITLE:		Site Location Plan	
DRAWING NO:		SHF.3050.001.HY.D.001	



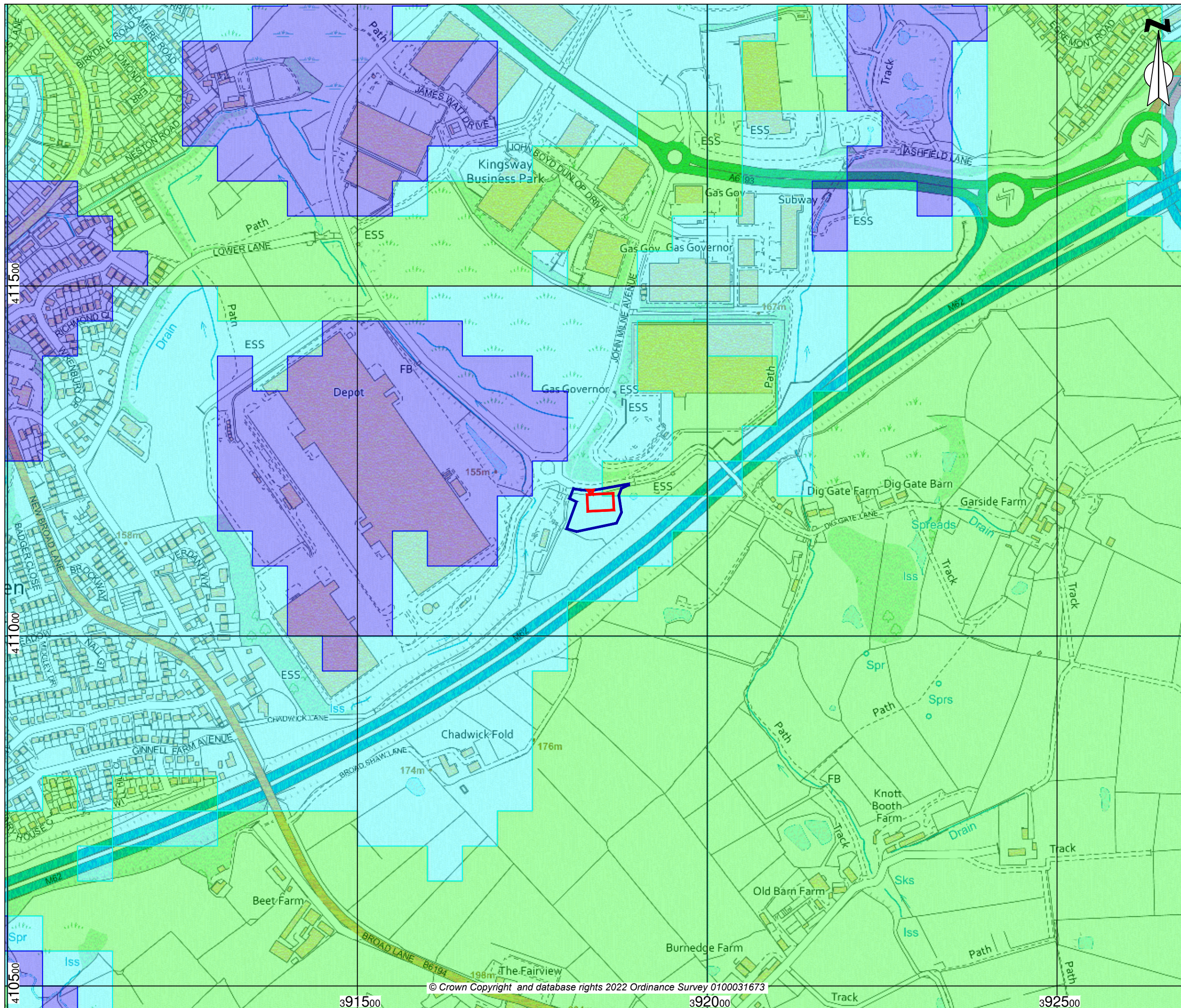
Key

- Site Boundary
- Wider Land Ownership
- Surface Water Features

enzygo
environmental consultants

Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:		PROJECT REF:
Rochdale Power Ltd		SHF.3050.001
SCALE:	DATE:	
1:5,000@A3	Oct 2022	
DRAWN:	CHECKED:	
MG	DA	
PROJECT:		
Dig Gate Lane, Rochdale		
TITLE:		
Surface Water Features		
DRAWING NO:		
SHF.3050.001.HY.D.002		



Key

- | | |
|---|--|
|  | Site Boundary |
|  | Wider Land Ownership |
|  | Potential for Groundwater Flooding to Occur at Surface |
|  | Potential for Groundwater Flooding of Property Situated Below Ground Level |
|  | Limited Potential for Groundwater Flooding to Occur |



Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:
Rochdale Power Ltd

SCALE:
1:5,000@A3

PROJECT REF:
SHF.3050.001

DRAWN:
MG

CHECKED:
DA

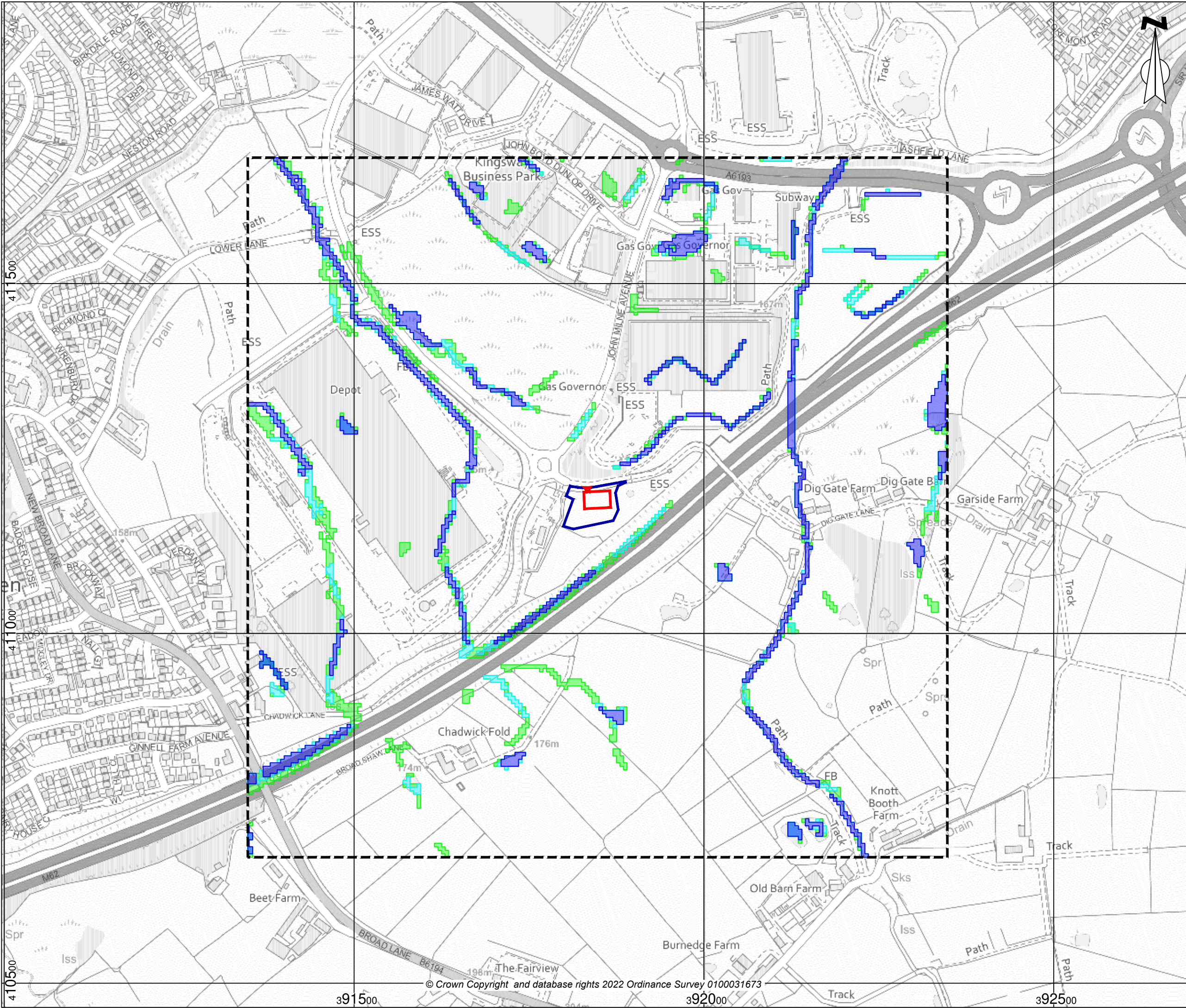
DATE:
Oct 2022

PROJECT:
Dig Gate Lane, Rochdale

TITLE:
BGS Groundwater
Flooding Susceptibility

DRAWING NO:
SHF.3050.001.HY.D.003

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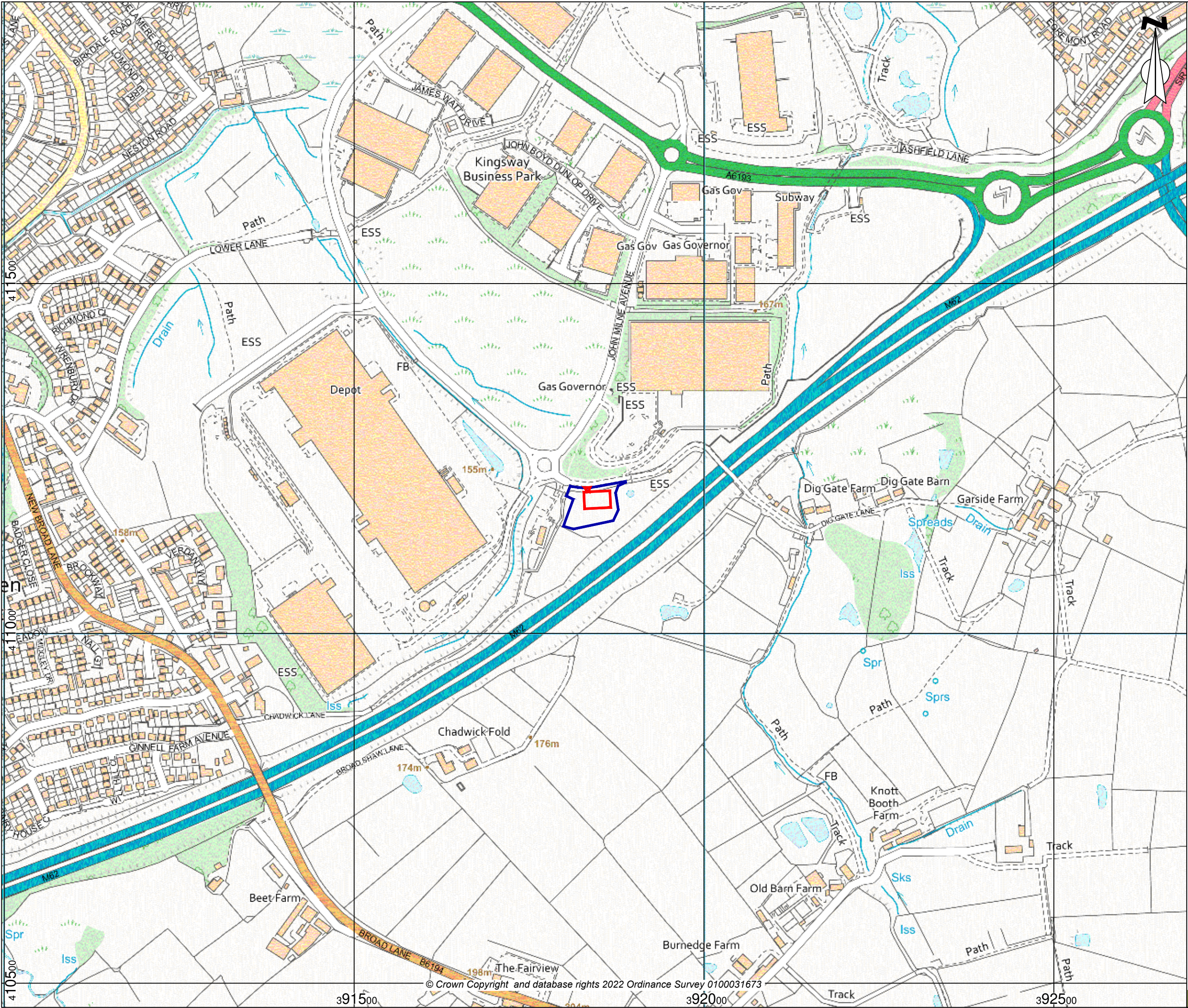
Key

- Site Boundary
- Wider Land Ownership
- Search Extent
- 1 in 75 Year Surface Water Flooding
- 1 in 200 Year Surface Water Flooding
- 1 in 1000 Year Surface Water Flooding

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environmental consultants

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CLIENT:		Rochdale Power Ltd	
SCALE:	1:5,000@A3	PROJECT REF:	SHF.3050.001
DRAWN:		MG	
CHECKED:	DA	DATE:	Oct 2022
PROJECT:		Dig Gate Lane, Rochdale	
TITLE:		JBA Surface Water Flooding	
DRAWING NO:		SHF.3050.001.HY.D.004	



Key

Site Boundary

Wider Land Ownership**Notes:**

No flooding present within the shown map extents.

Flooding from Zones 2 and 3 can be found over 1100m north of the site boundary and 1100m east of the site boundary.

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CLIENT:

Rochdale Power Ltd

SCALE:

1:5,000@A3

PROJECT REF:

SHF.3050.001

DRAWN:

MG

CHECKED:

DA

DATE:

Oct 2022

PROJECT:

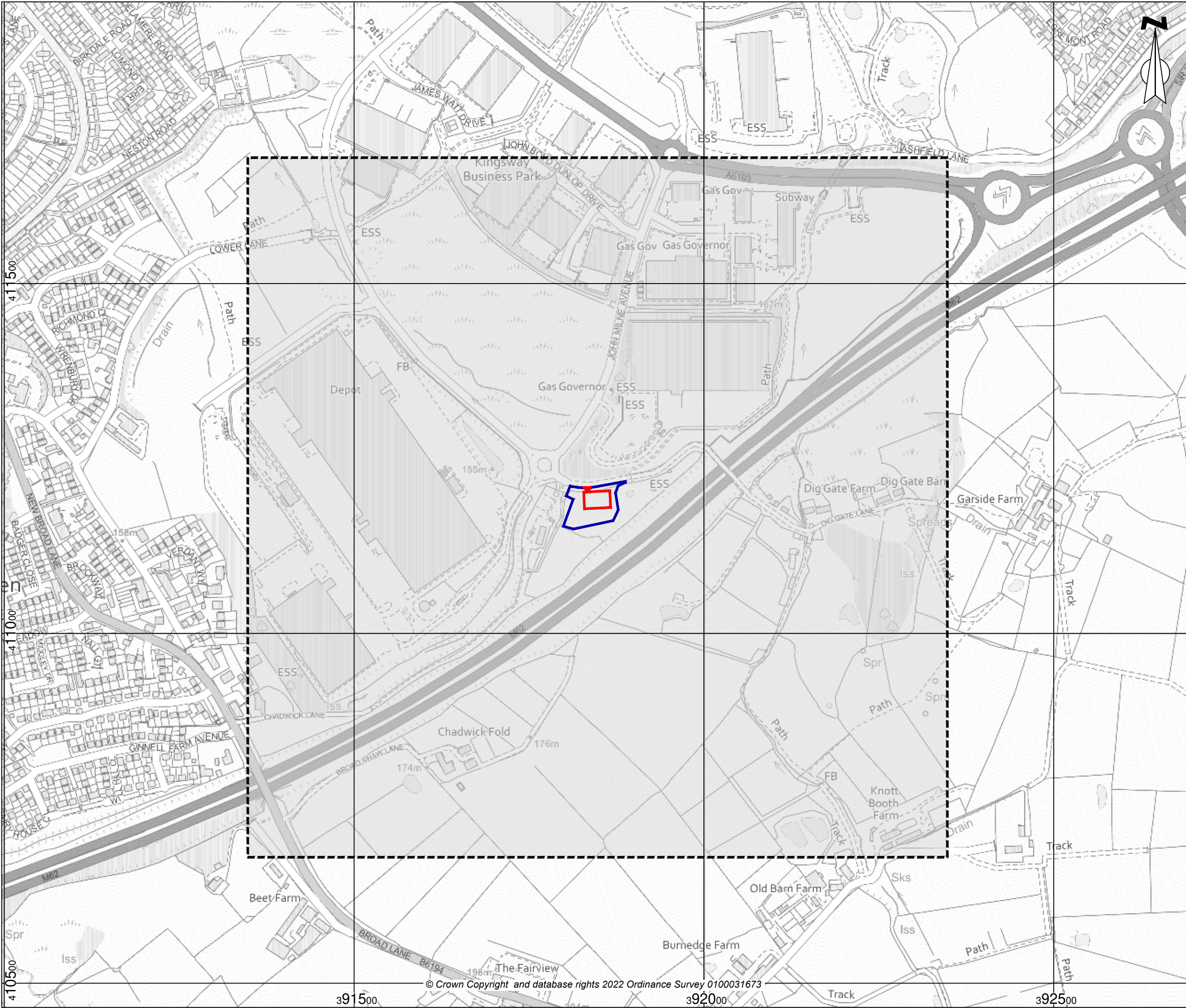
Dig Gate Lane, Rochdale

TITLE:

Environment Agency Flood Zones

DRAWING NO:

SHF.3050.001.HY.D.005



Key

Site Boundary

Wider Land Ownership

Notes:

GEOSMART GROUNDWATER FLOOD RISK MAP GW5
Version 2.4© - www.geosmartinfo.co.uk

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CLIENT:

Rochdale Power Ltd

SCALE:

1:5,000@A3

PROJECT REF:

SHF.3050.001

DRAWN:

MG

CHECKED:

DA

DATE:

Oct 2022

PROJECT:

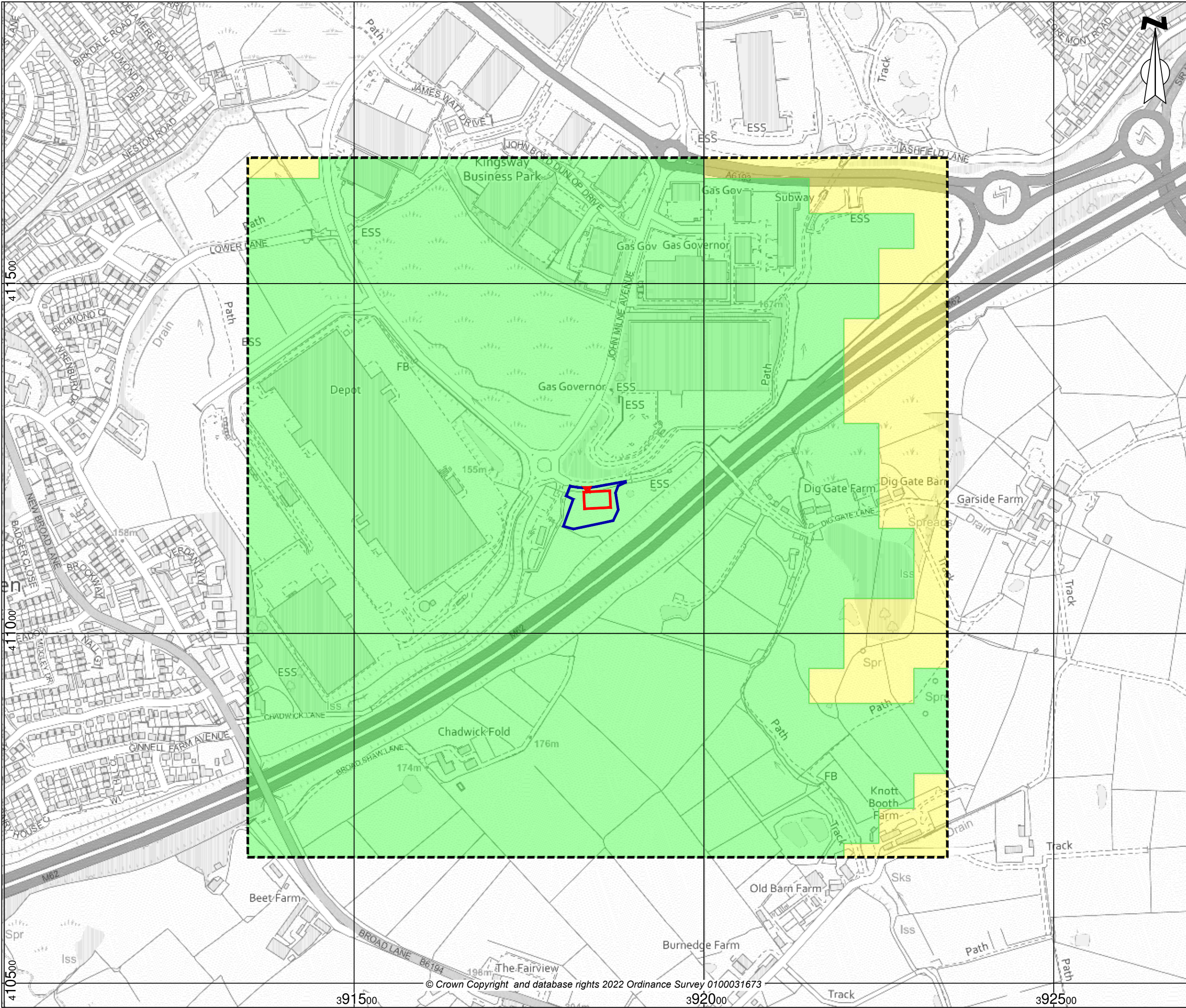
Dig Gate Lane, Rochdale

TITLE:

Groundwater Flood Risk Map

DRAWING NO:

SHF.3050.001.HY.D.006



Key

- Site Boundary
- Wider Land Ownership
- High Potential
- Moderate Potential
- Low Potential

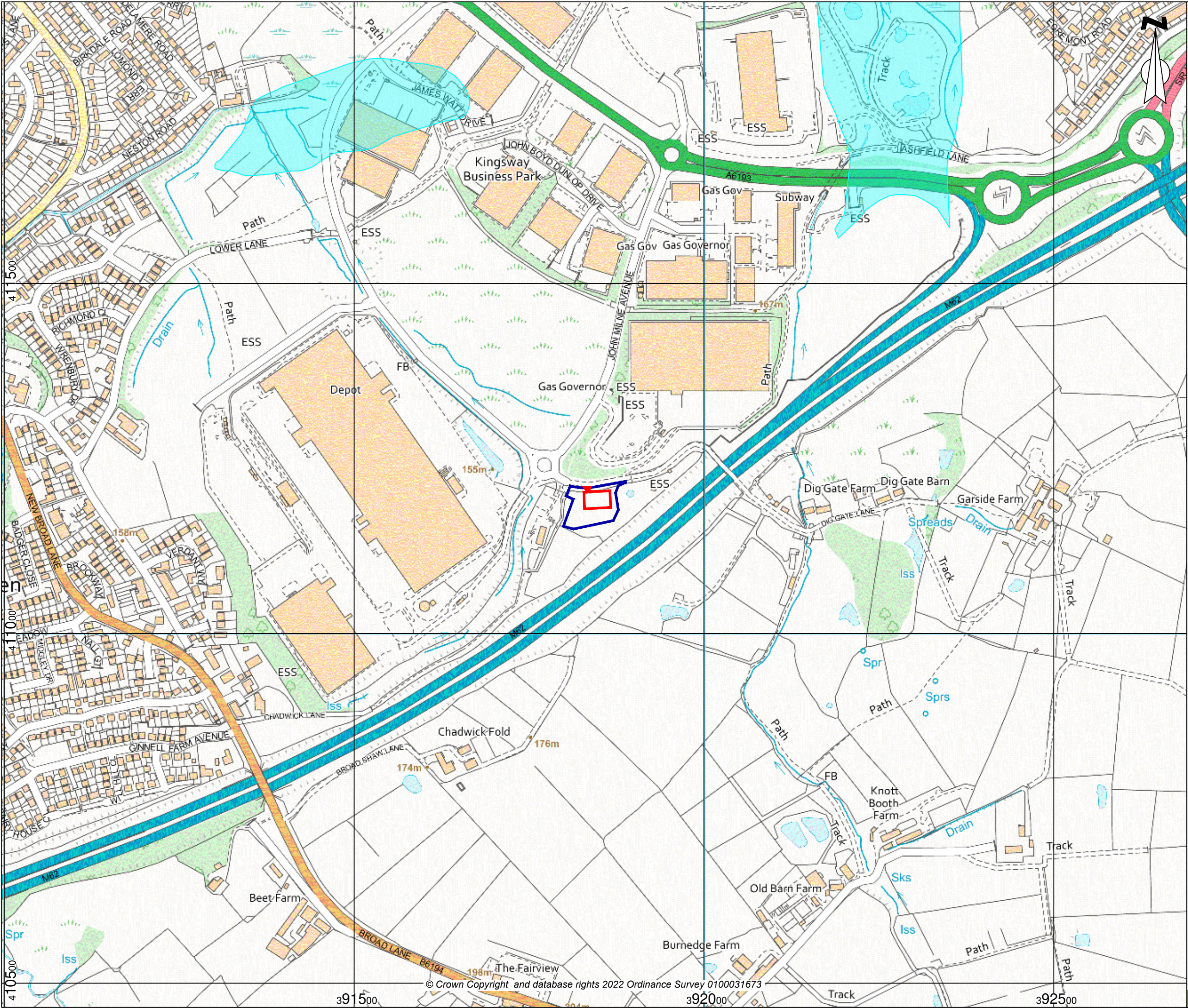
Notes:

GEOSMART SUDS INFILTRATION POTENTIAL MAP SD50
Version 1.00 - www.geosmartinfo.co.uk

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environmental consultants

Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:	Rochdale Power Ltd	
SCALE:	PROJECT REF:	
1:5,000@A3	SHF.3050.001	
DRAWN:	CHECKED:	DATE:
MG	DA	Oct 2022
PROJECT:		
Dig Gate Lane, Rochdale		
TITLE:		
SuDS Infiltration Potential Map		
DRAWING NO:		
SHF.3050.001.HY.D.007		



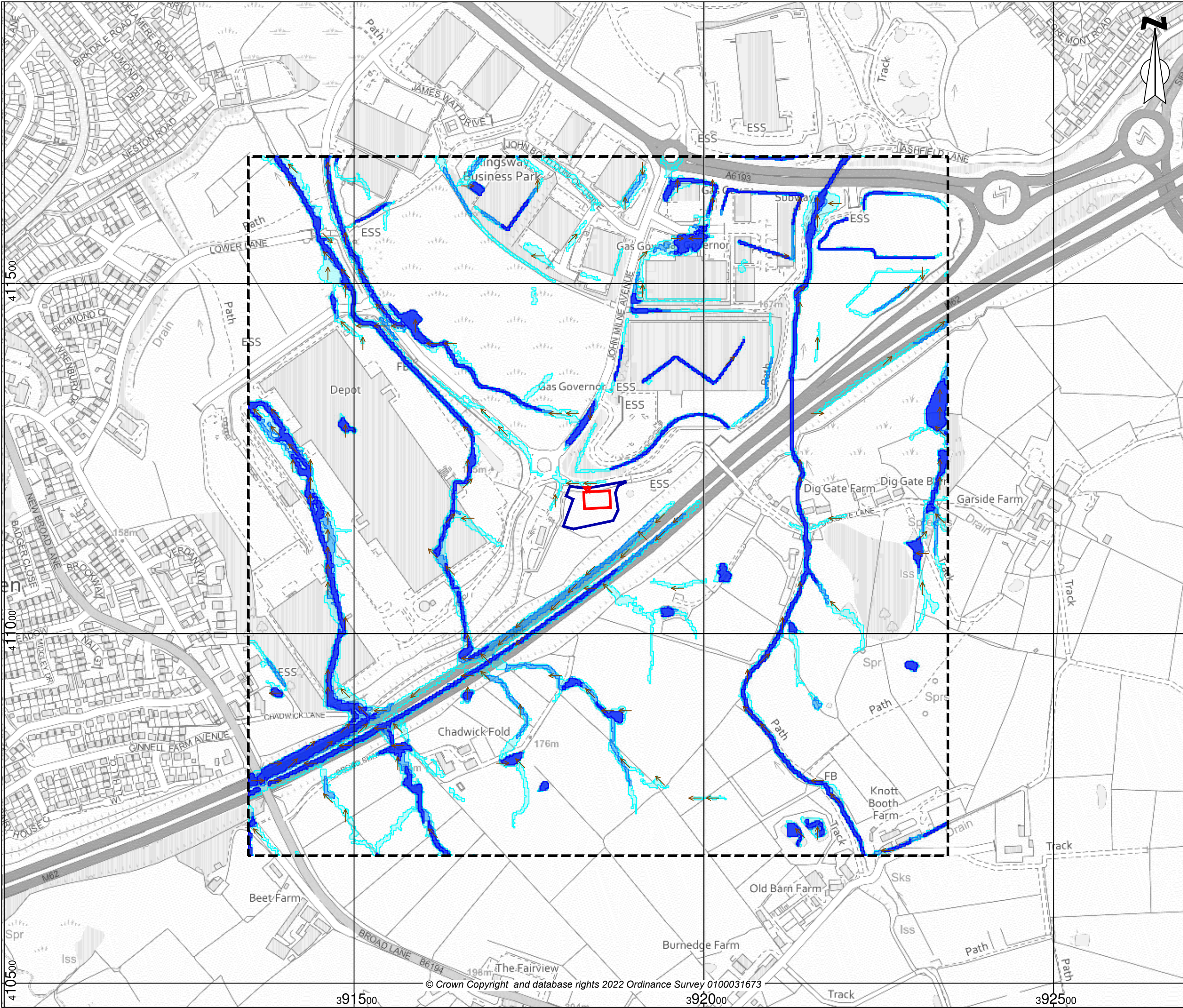
Key

- Site Boundary
- Wider Land Ownership
- Geological Indicators of Flooding (Inland Flooding)

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Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT: Rochdale Power Ltd		
SCALE: 1:5,000@A3	PROJECT REF: SHF.3050.001	
DRAWN: MG	CHECKED: DA	DATE: Oct 2022
PROJECT: Dig Gate Lane, Rochdale		
TITLE: Geological Indicators of Flooding (based on geological deposits)		
DRAWING NO: SHF.3050.001.HY.D.008		



Key

Site Boundary

Wider Land Ownership

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CLIENT:

Rochdale Power Ltd

SCALE:

1:5,000@A3

PROJECT REF:

SHF.3050.001

DRAWN:

MG

CHECKED:

DA

DATE:

Oct 2022

PROJECT:

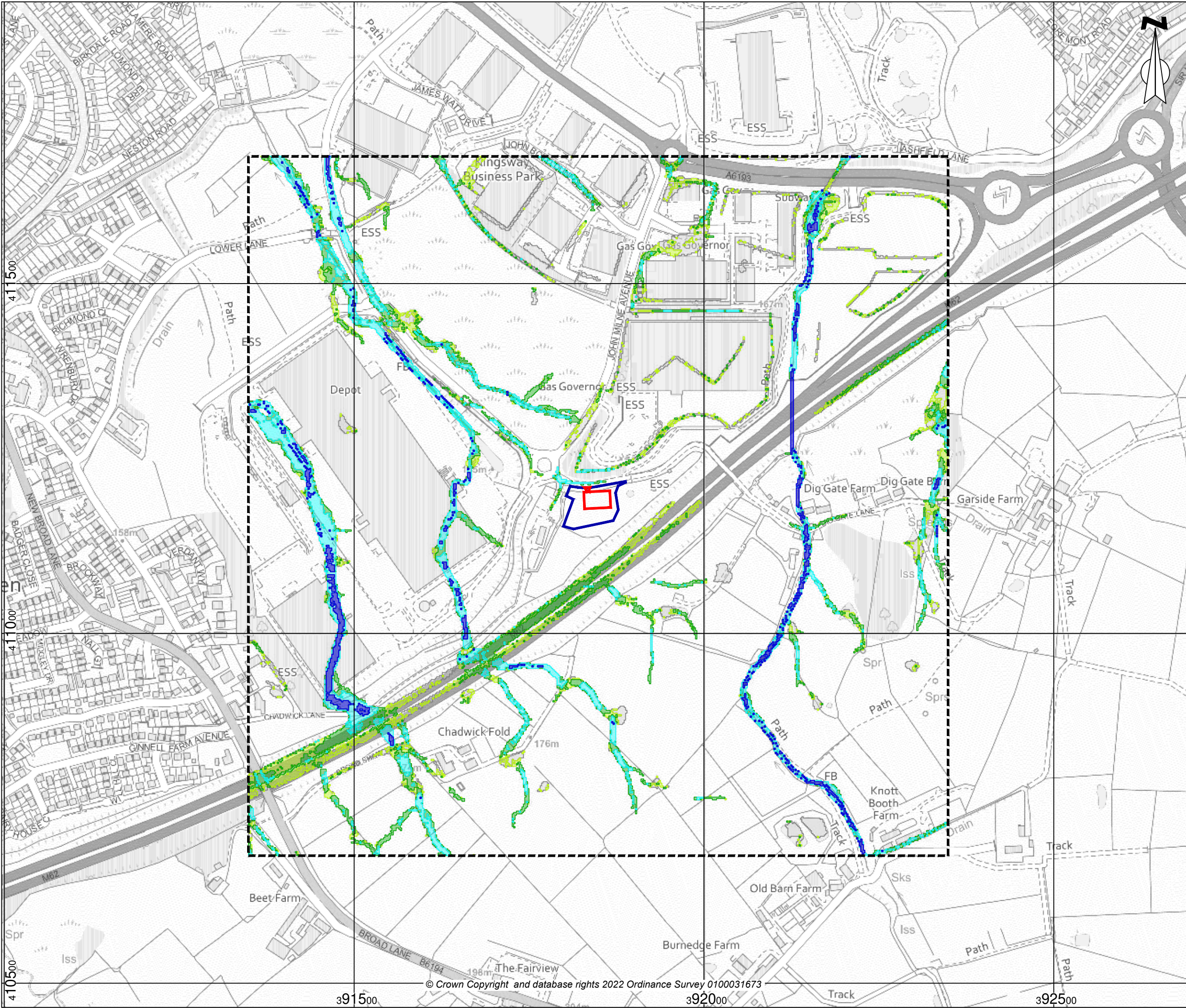
Dig Gate Lane, Rochdale

TITLE:

Environment Agency Surface Water Flow Paths

DRAWING NO:

SHF.3050.001.HY.D.009.1



Key

Site Boundary

Wider Land Ownership

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CLIENT:

Rochdale Power Ltd

SCALE:

1:5,000@A3

PROJECT REF:

SHF.3050.001

DRAWN:

MG

CHECKED:

DA

DATE:

Oct 2022

PROJECT:

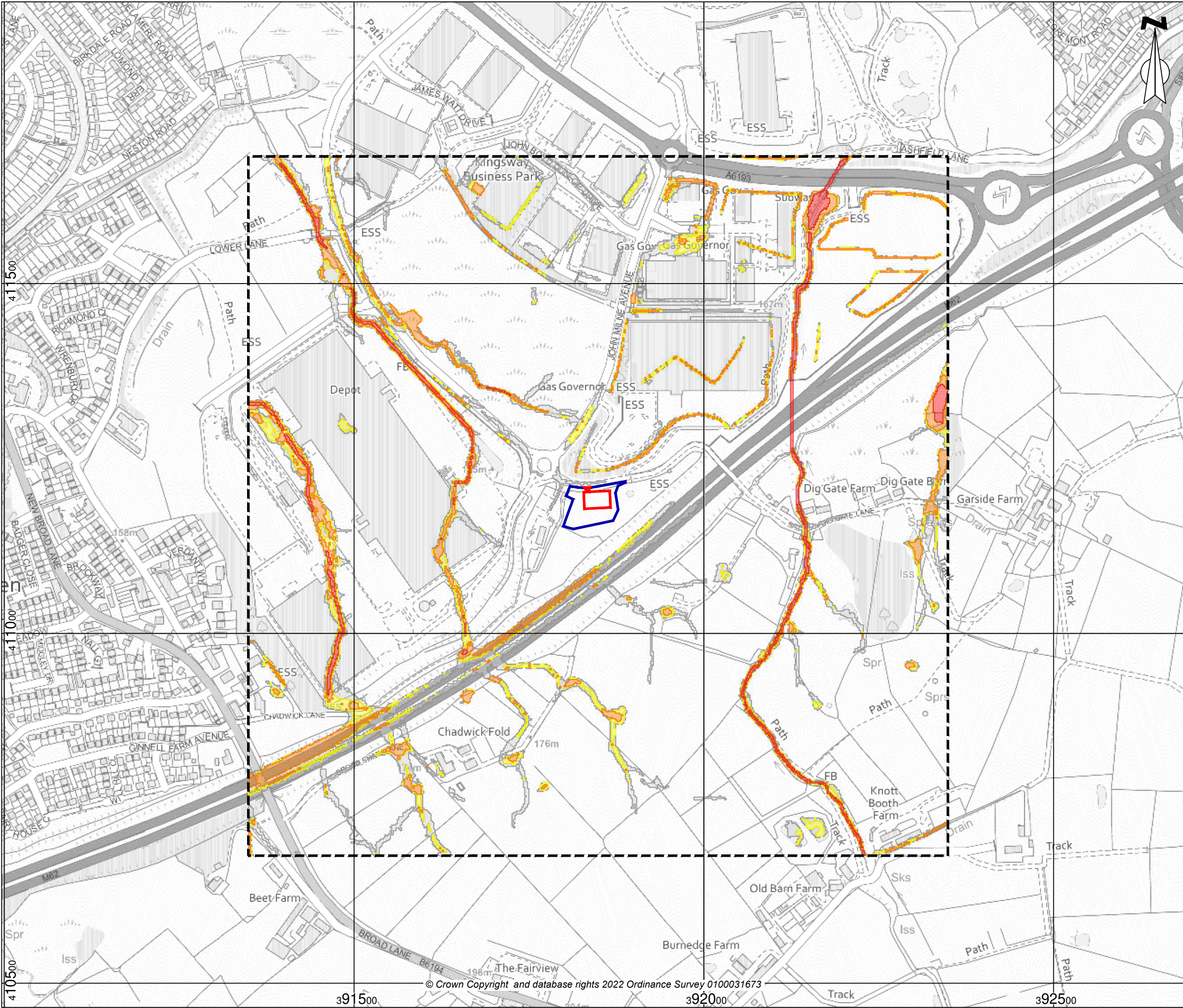
Dig Gate Lane, Rochdale

TITLE:

Environment Agency 1 in 1000
Year Surface Water Velocity

DRAWING NO:

SHF.3050.001.HY.D.009.3



Key

- Site Boundary
- Wider Land Ownership
- Search Extent
- Extreme Hazard (> 2.0)
- Significant Hazard (1.25 - 2.00)
- Moderate Hazard (0.75 - 1.25)
- Low Hazard (0.50 - 0.75)

Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:
Rochdale Power Ltd

SCALE:
1:5,000@A3

PROJECT REF:
SHF.3050.001

DRAWN:
MG

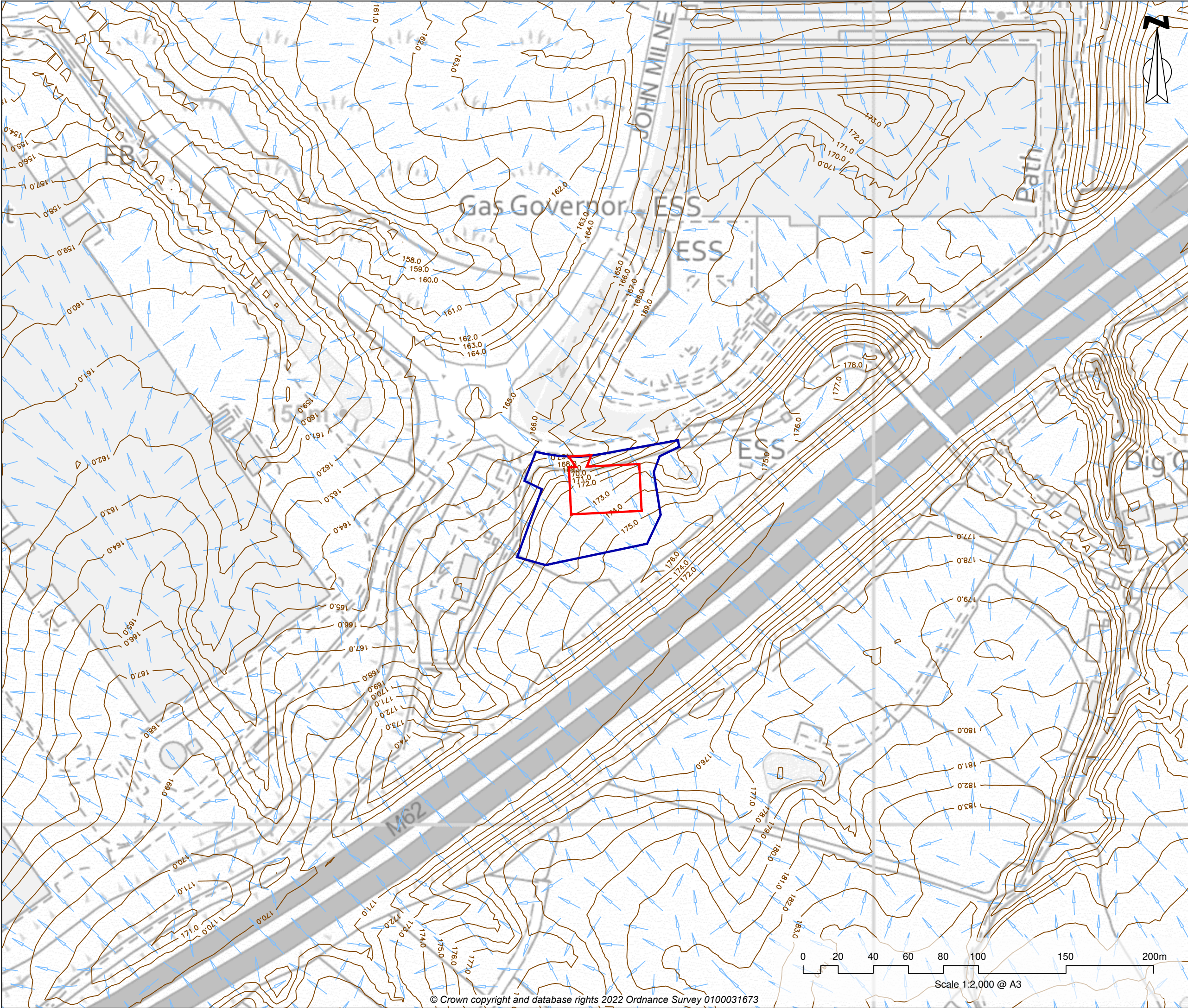
CHECKED:
DA

DATE:
Oct 2022

PROJECT:
Dig Gate Lane, Rochdale

TITLE:
Environment Agency Surface Water 1000 Year Hazard Rating

DRAWING NO:
SHF.3050.001.HY.D.009.4



Key

- Site Boundary
- Wider Land Ownership
- Contours
1.00m Intervals (mAOD)
- Surface Water Flow Path

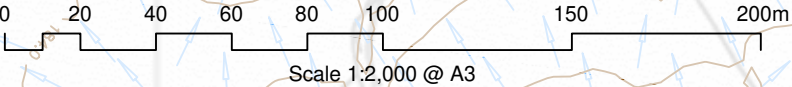
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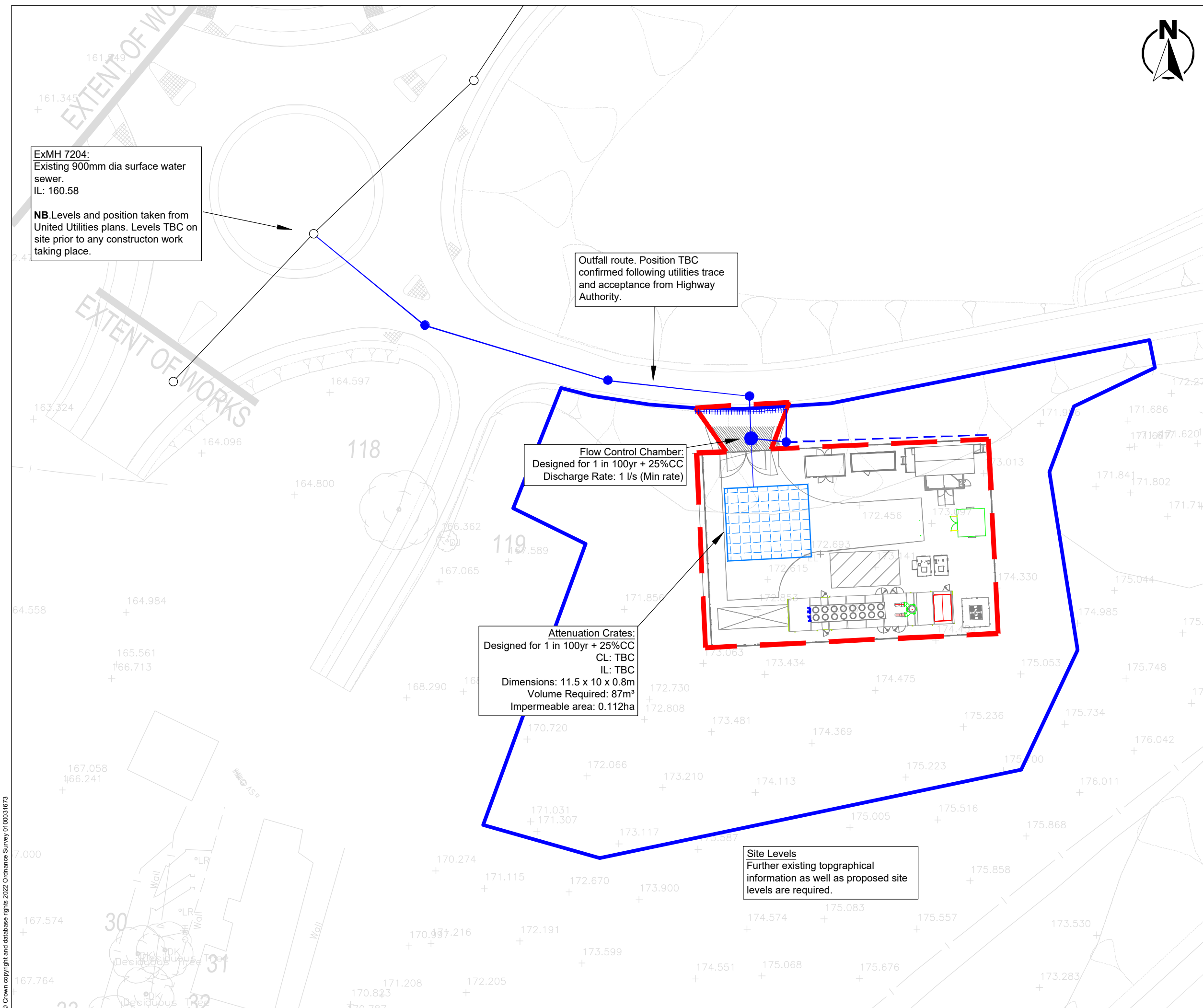
Ground Model Specification: 2m DTM LIDAR



Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:		Rochdale Power Ltd	
SCALE:		PROJECT REF:	
1:2,000@A3		SHF.3050.001	
DRAWN:		DATE:	
MG		Oct 2022	
CHECKED:		PROJECT:	
DA		Dig Gate Lane, Rochdale	
TITLE:		Flow Pathway Analysis	
DRAWING NO:		SHF.3050.001.HY.D.010	





NOTES

- Do not scale from this drawing
- All dimensions are in meters unless stated otherwise
- This drawing is to be read in conjunction with all relevant drawings and documents associated with this project.
- All surveyed information including levels and layout is provided by others
- All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

KEY

	Site Boundary
	Wider Land Ownership
	Filter Drain - 150mm Ø pipe beneath gravel trench
	Surface Water Sewer
	Channel Drain
	Existing Public Surface Water Sewer

P02	18/10/22	Strategy updated to suit latest site layout	RB	EA	EA
P01	12/09/22	First Issue	RB	EA	EA
Rev	Date	Description	DRA	CHK	AP

Project

Dig Gate Lane, Rochdale

Client

Rochdale Power Ltd

Drawing Title

Preliminary Drainage Layout

Status	Date	Scale
Preliminary	12/09/22	1:500 @ A3

Drawn	Designed	Checked	Approved
RB	RB	EA	EA

DWG No.	Revisio
SHE33050 001-ENZ-XX-DR-D-0001	Pr

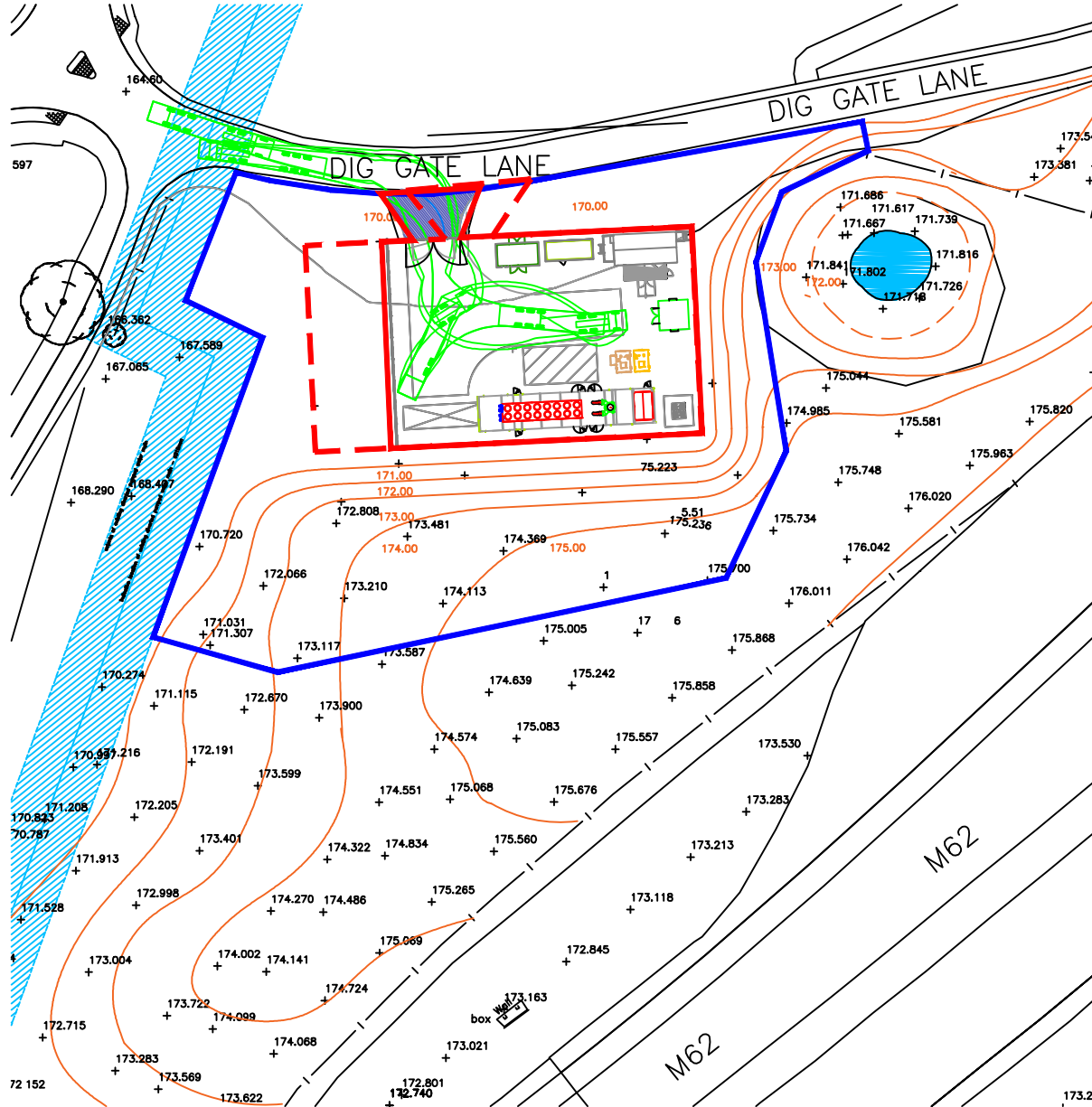


BRISTOL
01454 269 237
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MANCHESTER
0161 442 6444

SHEFFIELD
0114 321 5151
hello@enzvgo.com

Appendix 1- Proposed Layout



KEY:

 APPLICATION SITE BOUNDARY
(APPROX. 1200m²)

 ORIGINAL APPLICATION SITE BOUNDARY
(APPROX. 1400m²)

 OWNERSHIP BOUNDARY

ISSUED FOR TENDER
ALL EQUIPMENT & DIMENSIONS
SHOWN ARE INDICATIVE ONLY

UNDER NO CIRCUMSTANCE IS THIS
DRAWING TO BE USED FOR CONSTRUCTION
OR FABRICATION AT THIS ISSUE

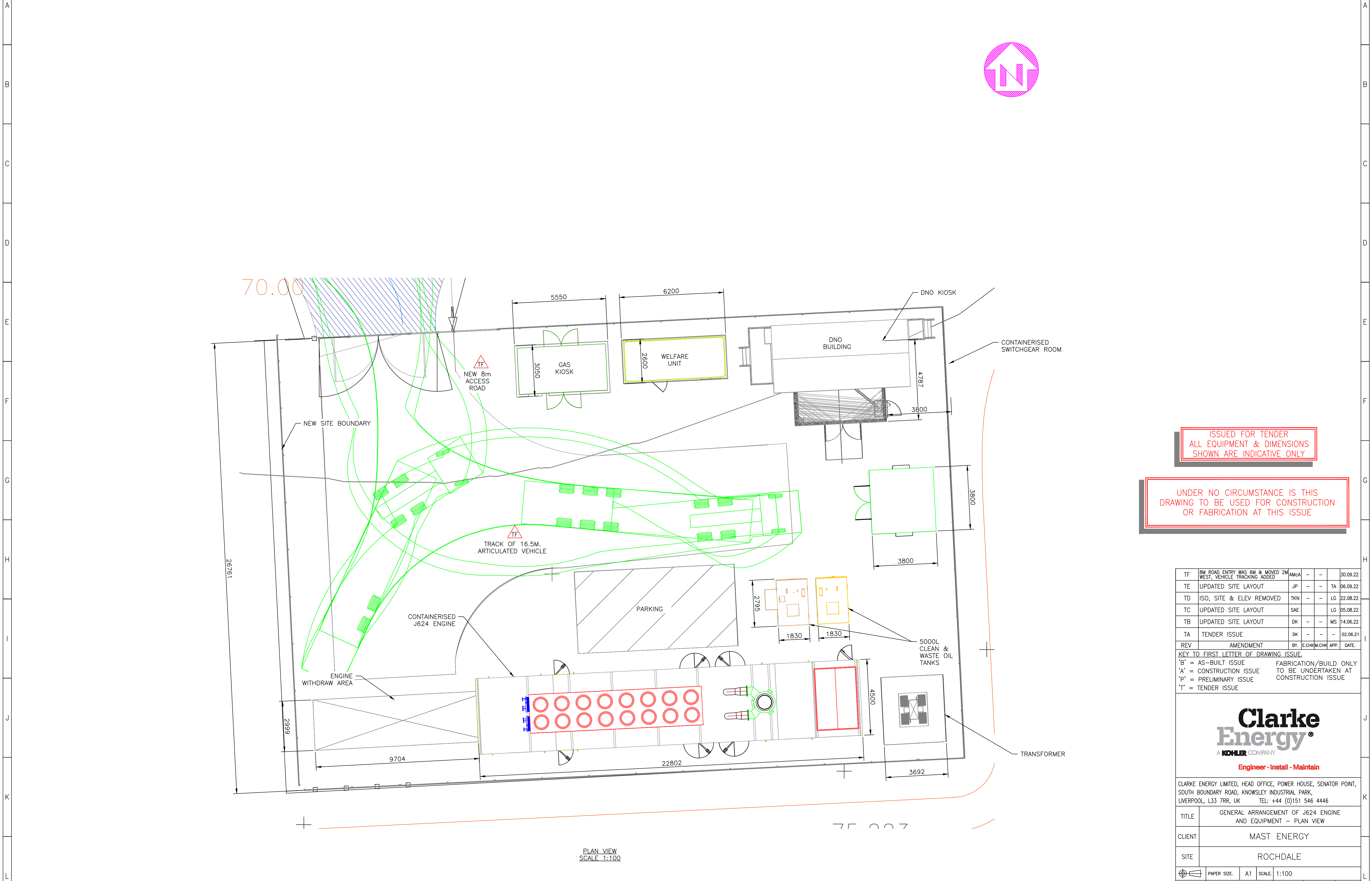
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CLARKE ENERGY LIMITED,
HEAD OFFICE, POWER
HOUSE, SENATOR POINT,
SOUTH BOUNDARY ROAD,
KNOWSLEY INDUSTRIAL
PARK, LIVERPOOL, L33
7RR, UK
TEL: +44 (0)151546446

TC	UPDATED LAYOUT	AMCA			30.09.2
TB	UPDATED SITE LAYOUT	JP	–	TA	06.09.2
TA	TENDER ISSUE	DK	–	LG	23.08.2
REV	AMENDMENT	BY.	CHK.	APP.	DATE.

 PAPER SIZE. A4 SCALE. 1:1250	GENERAL ARRANGEMENT OF J624 ENGINE AND EQUIPMENT – LOCATION PLAN (ZOOM OUT)						
	KEY TO FIRST LETTER OF DRAWING ISSUE. 'B' = ASBUILT ISSUE 'A' = CONSTRUCTION ISSUE 'P' = PRELIMINARY ISSUE 'T' = TENDER ISSUE FABRICATION/BUILD ONLY TO BE UNDER TAKEN AT CONSTRUCTION ISSUE		CLIENT	MAST ENERGY			
			SITE	ROCHDALE			
			DRAWN BY.	DANIEL K	DATE DRAWN.	23.08.22	ISSUE.
			DRAWING NO.	C5059-GA-008			TC



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ALL EQUIPMENT & DIMENSIONS
SHOWN ARE INDICATIVE ONLY

UNDER NO CIRCUMSTANCE IS THIS
DRAWING TO BE USED FOR CONSTRUCTION
OR FABRICATION AT THIS ISSUE

TF	8M ROAD ENTRY WAS 6M & MOVED 2M WEST. VEHICLE TRACKING ADDED	AMcA	-	-	30.09.22
TE	UPDATED SITE LAYOUT	JP	-	-	06.09.22
TD	ISO, SITE & ELEV REMOVED	TKN	-	-	22.08.22
TC	UPDATED SITE LAYOUT	SAE	-	-	05.08.22
TB	UPDATED SITE LAYOUT	DK	-	-	14.06.22
TA	TENDER ISSUE	DK	-	-	02.06.21
REV	AMENDMENT	BY: E.CHKM	CHK: CHK	APP: APP	DATE
KEY TO FIRST LETTER OF DRAWING ISSUE.					
'B' = AS-BUILT ISSUE			FABRICATION/BUILD ONLY		
'A' = CONSTRUCTION ISSUE			TO BE UNDERTAKEN AT		
'P' = PRELIMINARY ISSUE			CONSTRUCTION ISSUE		
'T' = TENDER ISSUE					

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LIVERPOOL, L33 7RR, UK TEL: +44 (0)151 546 4446

TITLE	GENERAL ARRANGEMENT OF J624 ENGINE AND EQUIPMENT - PLAN VIEW				
CLIENT	MAST ENERGY				
SITE	ROCHDALE				
	PAPER SIZE.	A1	SCALE.	1:100	
DRAWN BY.	DANIEL K		DATE DRAWN.	02.06.21	ISSUE.
DRAWING NO.	C5059-GA-001				TF

THIS ASSEMBLY OR PART MUST COMPLY WITH KOHLER SPECIFICATION "PEP-RML-001 RESTRICTED MATERIAL LIST"

Appendix 2 – Topographic Survey



KEY PLAN
N.T.S.

NOTES

1. THE SURVEY INFORMATION USED IN PREPARATION OF THIS & ALL OTHER WYG DRAWINGS IS NOT WARRANTED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE SURVEY INFORMATION PROVIDED.

KEY

PHASE ONE CONTRACT COMPLETED CONSTRUCTION WORKS. AS BUILT LINE AND LEVEL OF PHASE ONE WORKS TO BE CONFIRMED PRIOR TO COMMENCEMENT. IT WILL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY THE AS BUILT INFORMATION PROVIDED.

C1	ISSUED FOR CONSTRUCTION	OKR	PH	SB	03.09.07
Rev	Description	By	Chk	App	Date



Engineering
Management
Environmental
Planning

Armdale Court
Headingley
Leeds
LS6 2JJ
Tel: 0113 278 7111
Fax: 0113 278 3487

www.wyg.com

e-mail: leads@wyg.com

**White
Young
Green**
Consulting

Project:

**KINGSWAY PHASE 2
ROCHDALE**

Drawing Title:

**TOPOGRAPHICAL SURVEY
SOUTHERN LOOP ROAD AND PLOTS
SHEET 1 OF 2**

Scale at A1	Drawn By	Date	Checked By	Date	Approved By	Date
1:1000	CR	08.06	PH	14.11.06	SB	14.11.06
Project No.	Office	Type	Drawing No.	Revision		
A030095	21	H	01-002	C1		

APPROVAL ☐ INFORMATION ☐ TENDER ☐ CONTRACT ☐ CONSTRUCTION ☒

Appendix 3 – United Utilities Correspondence
