Cilldara Group (Exeter) Ltd

Plots 1, 2, 3, 4, 5, 8, 9, 12 & 14 Water Lane, Exeter

Interpretative Desk Study Report

August 2023

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Report Title	Water Lane, Exeter Interpretative Desk Study Report	**Site Address**	Plots 1, 2, 3, 4, 5, 8, 9, 12 & 14 Water Lane, Exeter
Author	G&J Geoenvironmental Consultants Ltd	**Contamination / Geotechnical**	Contamination and Geotechnical
Work Stage	Desk Study	**Report Date**	August 2023
Brief Description of the Report Contents	Review of desk top information to develop a preliminary conceptual model in order to identify any geo-environmental constraints and to provide recommendations for site investigation works (as required).		

Document Control

Project:	Plots 1, 2, 3, 4, 5, 8, 9, 12 & 14 Water Lane, Exeter– Interpretative Desk Study Report
Client:	Cilldara Group (Exeter) Ltd
Job Number:	GJ176
Report Reference:	GJ176(04)-R001-DTS-V2

Document Checking:

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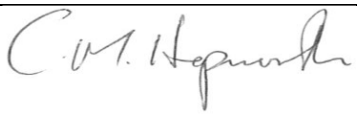
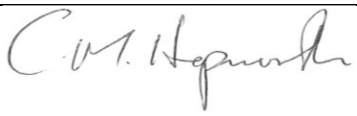
Checked and verified by:	**Chris Hepworth** Associate Director	Signed:	
Issued by	**Chris Hepworth** Associate Director	Signed:	

Issue	Date	Status	
1	December 2022	V1	
2	August 2023	V2	Amendments to Figures 2.1, 2.2 and 2.3
3			

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APPENDIX CONTENTS

1.0 Introduction

G&J Geoenvironmental Consultants Ltd (G&J) was commissioned by Cilldara Group (Exeter) Ltd to carry out an Interpretative Desk Study for a site off Water Lane, Exeter.

The purpose of this report is to collate and interpret information pertaining to the site from both a site inspection and a desk-based review of available data. The scope of the study is as follows:

- To determine the environmental setting of the site and its surroundings in terms of location, topography, ground conditions and land use;
- To discuss the geology, hydrogeology and hydrology at, and in the vicinity of, the site;
- To determine the site history and that of the surrounding area;
- To assess potential contamination issues pertaining to the site with consideration of the site's current and historic use;
- To develop an initial Conceptual Site Model (CSM) linking sources of potential contamination with pathways and receptors;
- To produce a Preliminary Risk Assessment for contamination in accordance with the *Land Contamination: Risk Management* Framework;
- To provide recommendations for further investigation work and / or mitigation measures; and
- To assist in the discharge of relevant planning conditions.

A previous desktop study was undertaken by G&J in 2019 for a similar site but which had a different site boundary. Much of the information collected for the previous desk study has been used for this report. The findings of the previous desk study are detailed in the following report:

- 'Plots 2, 3, 4, 8 & 9, Water Lane, Exeter, Interpretative Desk Study Report, April 2019', G&J Geoenvironmental Consultants Ltd, Report Reference: GJ176-DTS-V1, April 2019

1.1 Terms and Conditions

This report has been prepared in consideration of the current use of the site and a potential future mixed use development. Much of the environmental information relates to the site in its present state and should not be used in a different context without reference to G&J.

1.2 Sources of information

The following sections describe the environmental setting of the site, the site history and the anticipated ground conditions based on information taken from a variety of sources, including;

- Site Inspection conducted on the 2nd December 2022
- Current maps, plans and photographs;
- Geological maps and records;
- Environmental data (Groundsure) reports obtained for the 2019 desk study (Appendix A)
- Historical maps obtained for the 2019 desk study (Appendix B)
- Websites of relevant authorities and organisations such as The British Geological Survey, the Environment Agency, Natural England and English Heritage

Much of the information reviewed as part of this assessment is contained within the historical maps and data reports obtained from Groundsure which were obtained for the previous desk study undertaken in 2019. Only where information is considered significant and relevant in the context of the objectives of the survey has it been included in our assessment. The full Groundsure reports are referenced below:

- 10 April 2019, Groundsure Enviroinsight (GS-5937897);
- 10 April 2019, Groundsure Geoinsight (GS-5937898);
- 10 April 2019, Groundsure Mapinsight (GS-5937899_largescale);
- 10 April 2019, Groundsure Mapinsight (GS-5937899_smallscale).

Although every effort has been made to ensure the accuracy of the information contained herein, no checks have been carried out to ensure the accuracy of information obtained from third parties and no liability can be accepted for any errors or misinterpretation of the third-party information where it has been incorporated into this report.

1.3 Policy Context

The primary legal and policy mechanisms for managing contaminated land are Part IIA of the Environmental Protection Act 1990 and the National Planning Policy Framework.

Part IIA provides a statutory definition of Contaminated Land and supporting guidance which defines how to decide whether or not land meets this definition. For land to be determined as contaminated land, the onus

is on demonstrating with sufficient certainty that land is in such condition, by reasons of substances in, on or under the ground that;

a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

b) Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

Significant harm and how to determine if a significant possibility of such harm exists is defined in the statutory guidance which accompanies Part IIA. The guidance also defines **four categories** of land with respect to the risks to human health and the water environment and how the degree of risk relates to the statutory definition of contaminated land, as summarised in the following figure:

Figure 1 – Part IIA Categories

Land Category	Human Health	Water	
1	Unacceptably high probability that Significant Harm would occur if no action taken	Strong case that a Significant Possibility of Significant Pollution exists	Part IIA Contaminated Land
2	The risks are sufficient that a Significant Possibility of Significant Harm exists	Of sufficient concern to present a Significant Possibility of Significant Pollution	
3	Not low risk but does not pose a Significant Possibility of Significant Harm	The risks are not sufficient to constitute Significant Possibility of Significant Pollution	**Not** Part IIA Contaminated Land
4	Low risk to human health and no possibility of meeting the statutory definition	No/low risk to controlled waters and would not meet the statutory definition	

In terms of planning policy, a precautionary approach is adopted whereby it is necessary to demonstrate with sufficient confidence that the site cannot meet the statutory definition of contaminated land. Although the above categorisation is not explicitly applicable to planning decisions, a site classed as Category 4 should be considered suitable for development in accordance with planning policy. While a Category 3 site could be considered suitable, the reduced level of confidence associated with such a site means this is less likely.

2.0 Site Setting

2.1 Site Location

The site is located off Water Lane, to the west of the Exeter Canal and approximately 1km south of the centre of Exeter. The site is divided into a number of plots which generally reflect current land uses. The site is approximately centred on grid reference 292140 091330. The site location is shown in Figure 2.1 and the site layout, including the plot reference numbers, in Figure 2.2.

Figure 2.1 Site Location

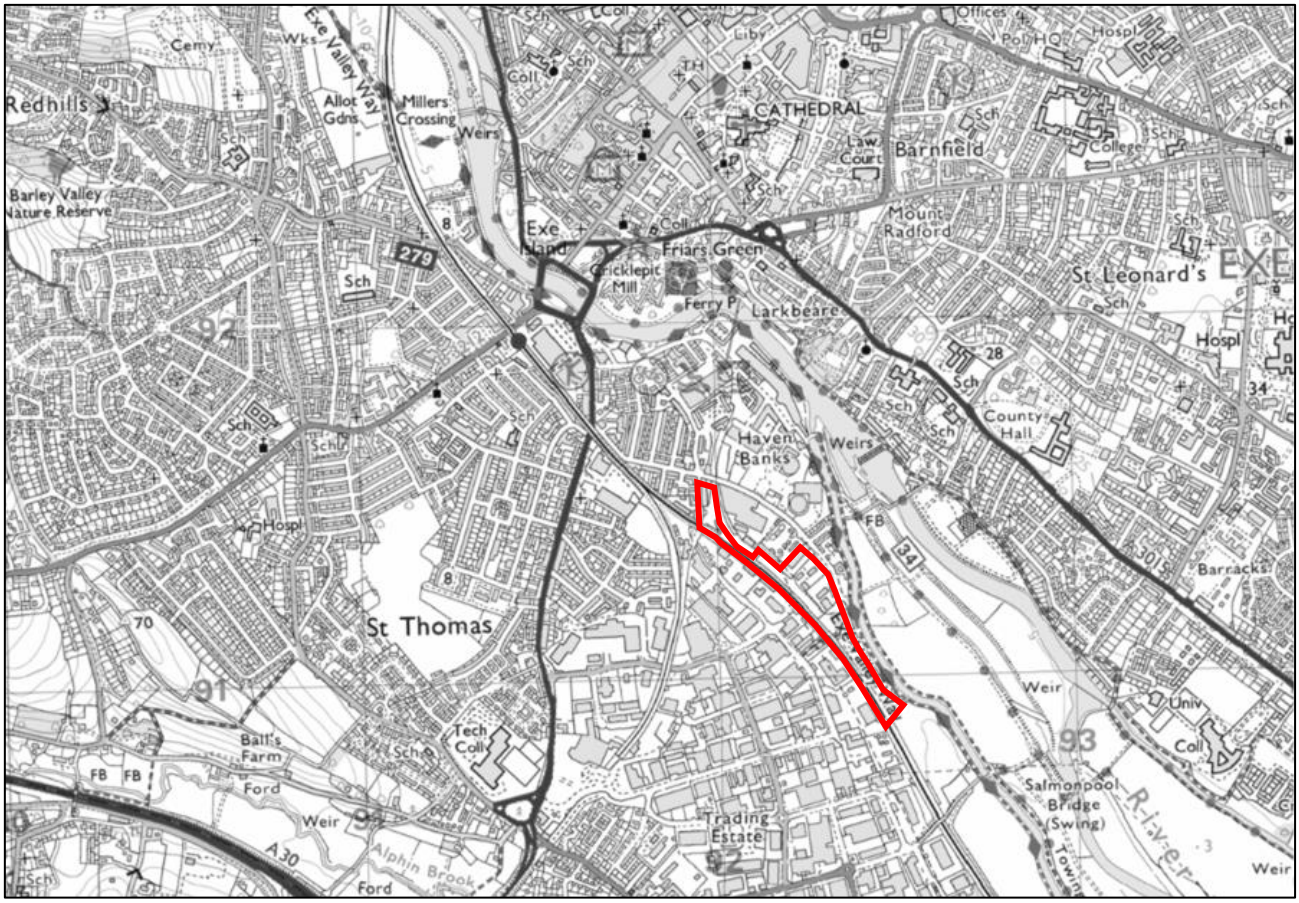
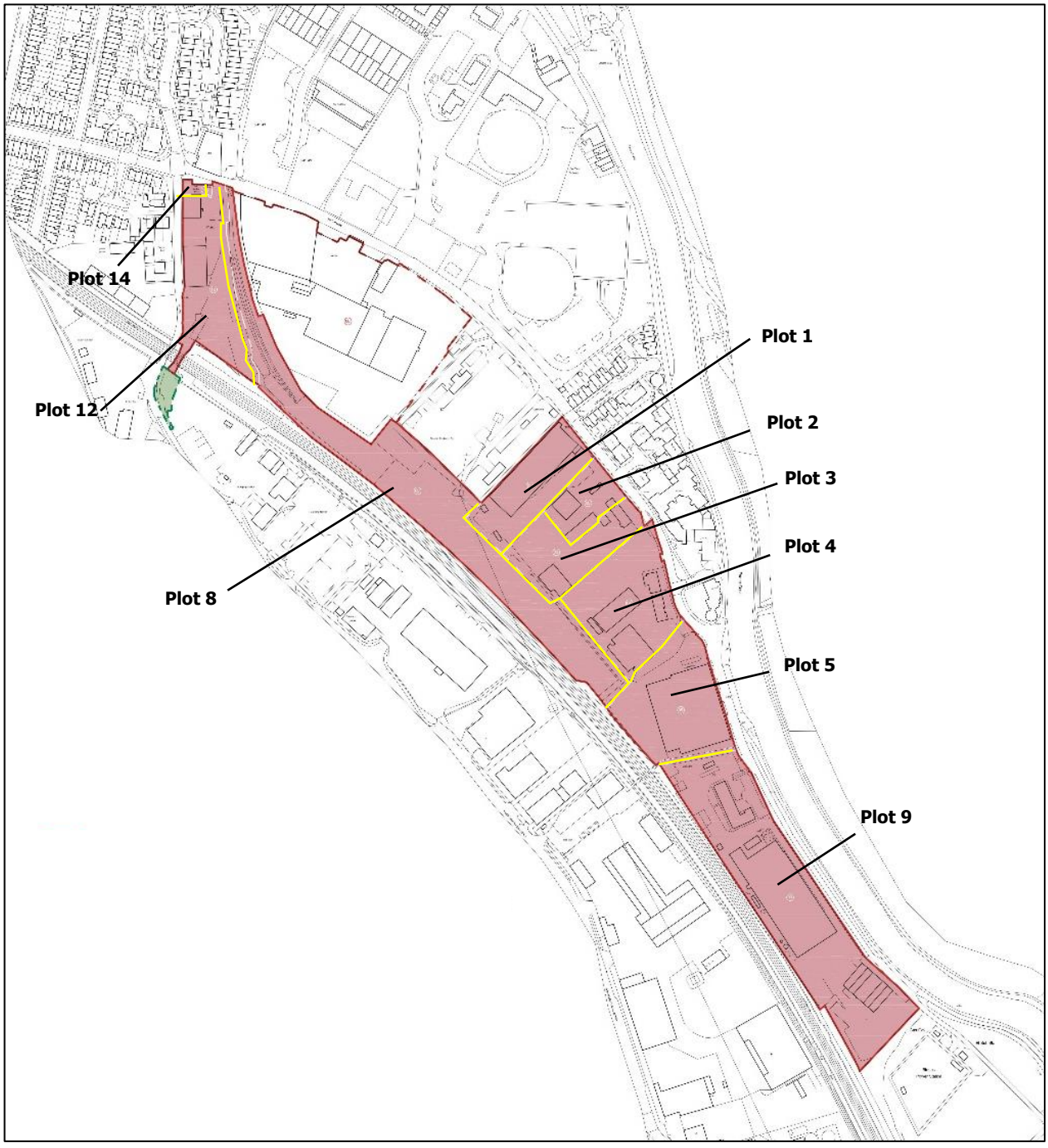


Figure 2.2 Site Layout



2.2 Site Description

The site covers approximately 6ha and comprises a series of plots used primarily for industrial purposes. Numerous commercial buildings still exist across the site, together with significant areas of hardstanding.

A site walkover was conducted on the 2nd December 2022. Access was not available for Plots 1, 2 or 3, which were only able to be observed from the road. Site photographs are presented in Appendix C.

2.2.1 Plot 1

Access couldn't be gained during the site walkover, however visual observation from Water Lane shows Plot 1 to be occupied by a large industrial shed of breeze block and corrugated metal construction with a pitched roof. It is set within a yard comprising hardstanding, which contained motor vehicles and items including discarded drums.

2.2.2 Plot 2

Access was not available to Plot 2, which is presently occupied by RC Roofing who utilise the plot as a scaffolders yard. Within the yard there are two open sided sheds constructed largely of scaffolding, which are used to store various materials. The centre of the site is occupied by a flat roofed brick building with a plastic tank (likely fuel) situated on top. The yard comprises hardstanding where a number of waste skips are situated.

2.2.3 Plot 3

Access to plot 3 was unavailable for the site walkover. The site is currently occupied by Greenslades Tours. The site comprises a hard standing yard used to store coaches and buses. There is a one storey, flat roofed brick build adjacent to Water Lane currently used as office space. There are two buildings within the yard, one is a large corrugated metallic shed with pitched roof, while the other is a workshop of brick build with a corrugated metal roof.

2.2.4 Plot 4

Plot 4 is currently vacant but historically was used by SecAnim as a vehicle workshop and transport hub. There are currently 4 empty buildings on site, two of these are directly adjacent to Water Lane and comprise single storey brick constructs with pitched roofs. Although presently empty it is understood these were used as office space.

The third building is a single storey vehicle workshop of brick construction with a pitched metallic roof. Inside the workshop are a number of motor vehicle pits and various pieces of discarded equipment, there is also an internal partition where changing rooms and office space were situated.

The fourth building is an industrial shed with a pitched metal roof and a large open entrance. Currently the shed is in a state of disrepair with a number of discarded wheelie bins, old oil drums and a derelict motor vehicle inside, while an empty IBC which previously stored 40% Ferric Chloride Solution was also present.

On the south-western side of the shed is a large above ground metallic diesel tank, from which an above ground fuel line runs to the north of the shed to locations of former pumps, where fuel was dispensed. Currently both the tank and pipework look in reasonable condition, although there was evidence of staining on the tank, along the pipe-run and at the pumps.

2.2.5 Plot 5

Plot 5 is currently occupied by Exeter Maritime Services and comprises of a large corrugated metal shed with a pitched roof used as both office space and as a workshop. Access to the workshop was not available during the site visit. This plot is situated within an area of hardstanding. A yard to the south of the plot is used to store plant, machinery, materials and some old boats.

On the northern boundary is an old breeze block bund / base, which could potentially have been the former location of a fuel tank.

2.2.6 Plot 8

Plot 8 comprises a thin strip of land along the western the southern boundary of the site. It comprises a crushed gravel road running south-easterly from Water Lane into a carparking area that is situated on soft ground. At the time of the site visit a large number of vehicles were stored on the plot, however there were no obvious signs of contamination.

2.2.7 Plot 9

Plot 9 is not currently occupied, however it is understood it was previously occupied by SecAnim as an animal product facility. Access to the buildings on Plot 9 was not available during the site inspection.

In the north of the plot, close to the entrance, is a small portacabin and weigh bridge. In the north-western corner is an electricity sub-station, adjacent to which is a metal tank (contents unknown) and a concrete bund within which were concrete blocks which were likely the bases of former tanks.

Also in the north of the plot is a single storey office block of wooden construction, to the west of which is a large cylindrical tank which stored liquid oxygen.

The central part of the plot is occupied by the largest building, which is an industrial facility with corrugated metal facades and pitched roof. Adjacent to the north and west of this building are various large pipes, tanks and chimneys associated with the former industrial processes.

The southern part of plot 9 is occupied by an old building of varying construction, including brick and metal, and with a pitched roof of likely asbestos cement construction. The use of this building is unclear.

The external areas of Plot 9 are generally of concrete hardstanding and contain a variety of discarded items, including tanks, bins and a trailer.

2.2.8 Plot 12

Plot 12 is situated at the northern end of the site. It is currently occupied by Colas Ltd who are an infrastructure contractor. The site comprises a warehouse of corrugated metal construction with a pitched roof and a smaller office building with a pitched corrugated metal roof. The yard is of hardstanding and some soft ground to the south of the plot where a number of concrete bunded areas are used to store drums of bitumen. There are also a number of wooden pallets and metal drums located around the site.

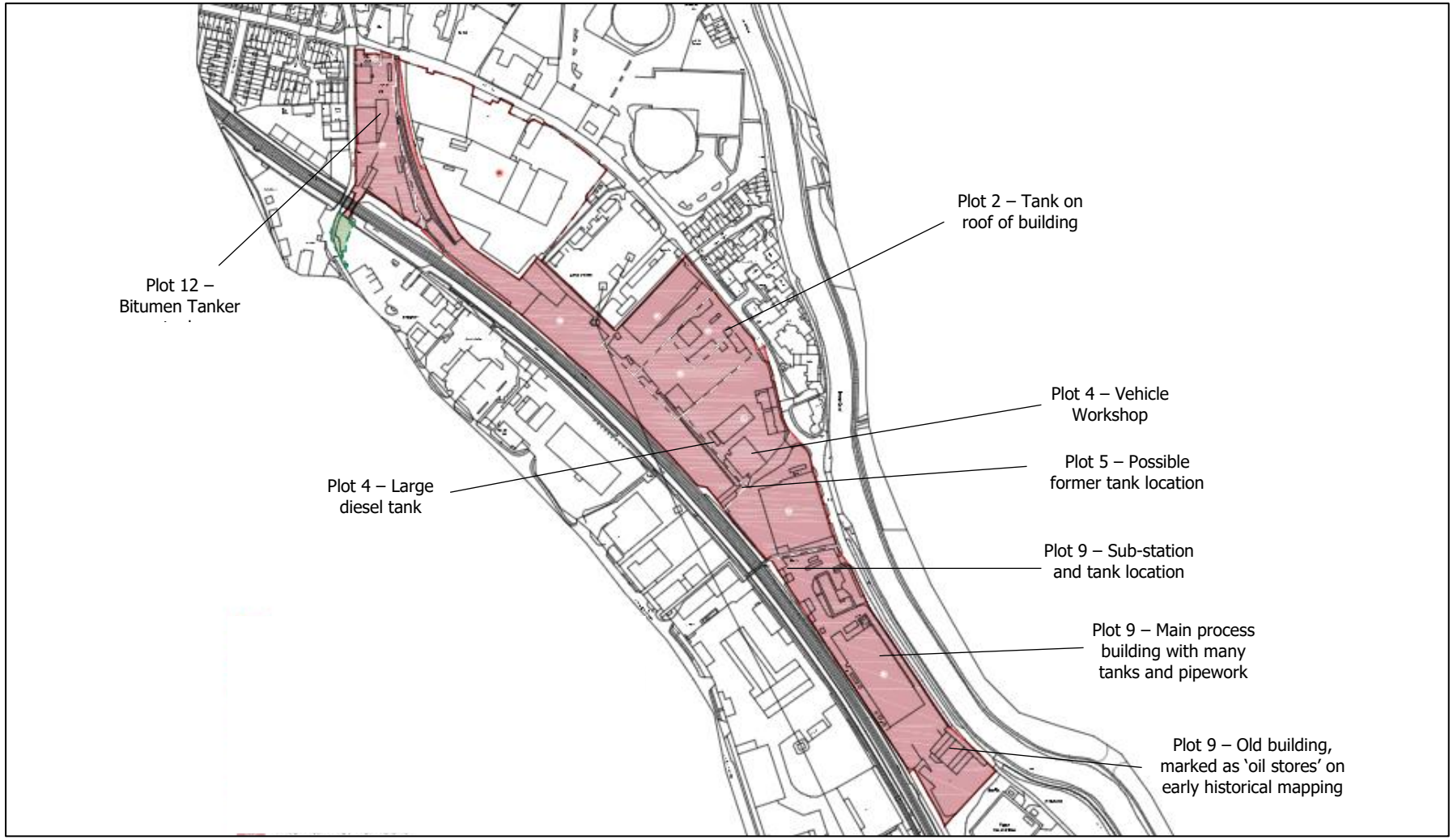
To the east of the larger building is a bunded area where a tanker containing bitumen emulsion was located. Former railway tracks are visible running through the site.

2.2.9 Plot 14

Plot 14 is a two storey office building of brick construction with a flat roof known as Casting House.

Figure 2.3 shows the locations of some of the main features identified by the site inspection.

Figure 2.3 Main Site Features



2.3 Surrounding Land Use

The site is generally bound by Water Lane to the east, beyond which is the Exeter Canal and River Exe. To the west is the Exeter St Thomas railway line, beyond which are numerous commercial and industrial premises, including a recycling centre. Adjacent land uses (but outside the subject plots) include an electricity sub-station, vehicle servicing, a former gas works (to the north) and several small businesses.

To the north-west of the site lies a built-up residential area, while to the south are further industrial premises and areas of open space.

2.4 Potential Sources of Contamination

The site has a history of industrial use and the site walkover has identified a number of potential sources such as tanks, fuel infrastructure, industrial processes and storage of various substances, as described above. The Groundsure Report also identifies a number of historical uses and features that may be potential contamination sources (see Appendix A).

Environmental Permits are recorded on the site relating to the incineration of animal carcasses and burning of waste oil on Plot 9, while a minor pollution incident is recorded on Plot 8, relating to the release of organic chemicals to land.

In addition, there is a record of Plot 4 being a waste transfer station, and the southern end of Plot 9 being a scrapyard.

2.5 Sensitive Land Use

No sensitive land use designations are recorded on the site.

2.6 Proposed Development

It is understood that it is proposed to redevelop the site for mixed residential and commercial use.

3.0 Ground Conditions

3.1 Geology

The geological map of the area shows the site to be underlain by Quaternary Alluvium deposits which in turn overlie a sedimentary bedrock comprising the Alphington Breccia Formation.

3.2 Mining and Extraction

There are no records of mining or extraction on or close to the site.

3.3 Radon

The site is located in an area where less than 1% of domestic residences are above the National Radiological Protection Board (NRPB) action level for radon of 200Bq/m^3, and no radon protection measures are considered necessary.

3.4 Ground Stability

British Geological Survey (BGS) data presented in the Groundsure Geoinsight report (Appendix A) identifies the following potential ground instability hazards on the site:

Table 3.1 Summary of Potential Ground Instability

Potential Instability Factor	Maximum Hazard Potential
Collapsible Ground	Negligible
Compressible Ground	Moderate
Ground Dissolution	Negligible
Landslide Risk	Very Low
Running Sand	Low
Shrinking or Swelling Clay	Very Low

The most significant ground stability hazard is the risk of from compressible ground, which has moderate hazard potential. All other ground stability hazards on the site are rated as low to negligible.

3.5 Made Ground and Landfills

The are no records suggesting the presence of significant thicknesses of fill or Made Ground on or close to the site. A landfill is recorded immediately south of Plot 9, which is listed as being authorised for inert, household, commercial and industrial waste.

3.6 Hydrogeology

Both the superficial Alluvium and Breccia bedrock beneath the site are classed as Secondary (A) Aquifers, meaning the underlying geology has potential to supply water from more permeable layers on a local scale, and may be important for supplying baseflow to rivers.

The site is outside any Groundwater Source Protection Zones, meaning it is outside the catchment of a groundwater source from which water is abstracted for public potable supply.

3.6.1 Groundwater Abstractions

There are no groundwater abstractions recorded within 1km of the site, other than a temporary licence to abstract groundwater for pollution remediation purposes.

4.0 Hydrology

4.1 Watercourses

The nearest watercourses are the Exeter Canal and River Exe. The canal is located immediately east of the site beyond Water Lane, while the River Exe flows in a south-easterly direction beyond the canal approximately 200m from the site at its closest point.

4.2 Flood Risk

The site is shown to be located almost entirely in Flood Zone 3, meaning it is within the predicted extent of flooding from the River Exe.

4.3 Water Quality

The latest available water quality data for the River Exe gives a 'fail' classification for chemical quality and a 'moderate' classification for ecological quality in 2019.

4.4 Site Drainage

It is assumed drainage from most of the site is dominated by run-off to the on-site man-made drainage systems, although infiltration will occur in areas of rough ground.

5.0 Site History

5.1 Historical Mapping

The following is a summary of the relevant history of the site and its immediate surroundings, based on a review of historical Ordnance Survey (OS) maps. Available mapping dates from 1879. Table 5.1 presents a summary of the significant developments and activities that have taken place on, or in the vicinity of the site, based on a selection of the available maps and plans (presented in Appendix B).

Table 5.1 Summary of Site History

Date	On-Site Features	Surrounding Area
1879-90	The site is generally shown to stretch across multiple fields, with the south-western part of the site indicated as marshland. The part of the site which currently forms the access from the north (part of the current Plot 8) is shown to be occupied by a branch (Basin Branch) of the Great Western Railway which borders the site to the south-west A number of buildings labelled as 'oil stores' are shown to exist at the southern end of the site (Plot 9), and that section of site is shown to be occupied by trees and labelled as Spring Gardens, which includes some glasshouses at the northern end. Some cottages are shown on Plot 5.	The Great Western Railway line is shown to run along the western site boundary, while the Exeter Canal runs close to part of the eastern boundary. Directly to the north of the site lies a gas works, beyond which is the intersection of the Exeter Canal and the River Exe. Land surrounding the site either side of the railway line and canal is shown to consist primarily of agricultural fields, with a number of farms and cottages in the immediate vicinity Directly west of site on the opposite side of the railway line rom Plots 12 and 8 is a sewage depot. A number of water pumps are shown in the adjacent land south-west of the site, and residential properties are located approximately 500m to the west and north-west.
1904-5	No significant changes.	Land to the north adjacent to the Basin Branch is shown to have new industrial development, including an electricity works and engineering works. The sewage depot is now expanded into a sewage disposal works and further to the west is a new branch of the Great Western Railway.
1932	A small building is shown just within Plot 2 on Water Lane. Plot 1 is shown to be allotment gardens. Three small buildings are shown within Plot 12.	A 'stone works' is shown adjacent to the entrance to Plot 8 in the north. Residential development is shown to the north-west of site, while a greyhound stadium is shown approximately 200m to the west.
1949-52	Buildings are shown in the north on Plot 12. Plots 2 to 4 are shown as allotment gardens.	Tanks are shown across Water from Plots 2/3.

Date	On-Site Features	Surrounding Area
1959-64	A works building is shown on Plot 1.	'Works' are shown between Plot 1 and the entrance to Plot 8. Further development has occurred across the railway line to the west and south-west, including an iron foundry. Both the sewage works and the Greyhound Stadium are no longer shown.
1968-70	Plots 2 and 3 are shown to be occupied by an Oil Depot, Plot 5 by a timber yard and Plot 9 by an animal by-products factory. The buildings on Plot 12 have been extended and it is now labelled as an iron foundry. Plot 1 is shown to be an engineering works, with a tank shown at the south-western end of the building Non-specific industrial buildings are shown on Plot 4, including a tank.	The works between Plot 1 and the Plot 8 entrance are shown to be an engineering works, transformer station and warehouse. The tanks across Water Lane from Plots 2 & 3 are shown to be an oil depot, adjacent to which is a 'machine depot'
1988-92	The southern end of Plot 9 is shown as a scrap yard. The oil depot is now labelled 'industrial estate'	Significant further industrial development is shown to the south-west. The oil depot and machine depot across Water Lane have been replaced by residential properties.
2002	The Basin Branch is now labelled as dismantled.	No significant changes.
2010	No significant changes.	A power station is shown adjacent to the site to the south.
2014	No significant changes.	No significant changes.

5.2 Summary of Site History

The site was free of significant development until the middle of the 20th century when it developed from predominantly agricultural to industrial use.

The surrounding area, particularly to the west beyond the railway line, has seen significant industrial development at the same time as the site

5.2.1 Plot 1

Plot 1 is shown as open ground and then allotments up until the 1958 mapping, when it is then shown as a works. The 1967 mapping shows a large tank in the south of the plot. The available mapping and site walkover would suggest the layout has changed little to the present day.

5.2.2 Plots 2 & 3

Plot 2 & 3 are shown as open ground and then allotments up until the 1967 mapping which then shows the presence of an oil depot, including a tank. The buildings shown on the 1967 mapping have essentially the same layout as seen during the walkover.

5.2.3 Plot 4

Plot 4 is shown as open ground and then allotments up until the 1967 mapping when industrial buildings appear with the same layout as seen currently. An above ground tank is shown on the mapping in 1968 but is no longer present.

5.2.4 Plot 5

Plot 5 is shown to be occupied by some cottages and a farm until 1968 when two larger buildings are shown and the site is labelled as a "Timber Yard". The site remains largely unchanged until the buildings appear to have joined into one, as they currently remain today.

5.2.5 Plot 8

Plot 8 is predominantly shown on mapping since the late 19th century until the 1960s as forming part of a railway spur connecting the 'Basin Branch' with the Great Western Railway to the south of site. This remained the case until the 1990s when the railway was removed.

5.2.6 Plot 9

Plot 9 is shown to have some buildings labelled as 'oil stores' from the late 19th century, which appear to remain today. The rest of the site was gardens / allotments until the 1960s when the current layout of the animal by-products factory is shown. The southern end of the site was labelled as a scrap yard from the 1980s.

5.2.7 Plot 12 & 14

Plots 12 and 14 are shown as open ground up until 1905 where a railway line is shown to bisect plot 12. Three small buildings are shown on the 1932 mapping which have been added to with larger buildings by 1950. Further development is shown by 1968, with the buildings labelled as 'Exeter Iron Foundry'.

5.3 Previous Investigations

A Contaminated Land Assessment was carried out in 1995 by Frank Graham Consulting Engineers Ltd for Plots 1, 2 and 3, which comprise the former oil depot and engineering works, as detailed in the following report;

- '*Water Lane, Exeter, Contaminated Land Assessment*' Frank Graham Consulting Engineers Ltd, October 1995

The investigation works comprised 8 trial pits, 5 of which were excavated on the former oil depot (i.e. within Plots 2 & 3). The investigation include on-site testing for petroleum hydrocarbons and laboratory analysis of soil samples for metals, sulphate, sulphur, pH, and PAHs.

Made Ground was encountered to up to 2.2mbgl, which overlay alluvial clay, silt and gravel. Groundwater encountered in the trial pits commonly had an oily sheen and the soils below the water table displayed a hydrocarbon odour. The presence of hydrocarbons was confirmed by the on-site testing, while elevated concentrations of lead, nickel and PAHs were also noted.

6.0 Conceptual Site Model

6.1 Introduction

The information obtained from the desk-based study has been collated and evaluated to develop a Conceptual Model for the site.

The site has been assessed in line with current UK guidelines, namely the Contaminated Land (England) Regulations 2000 and Part IIA of the Environmental Protection Act 1990, and follows the procedures set out in the Environmental Agency 'Land Contamination Risk Management' (LCRM) framework.

LCRM provides the technical framework for structured decision making about land contamination and replaces 'Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11', which built on previous work carried out under the Contaminated Land Research Programme of the former Department of the Environment. LCRM has adopted and refined the methodology and terminology that has been used in contaminated land risk assessment for a number of years.

LCRM defines the three essential elements to any risk:

- A contaminant **source** - a substance that is in, on or under land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body.
- A **pathway** - a route or means by which a receptor can be exposed to, or affected by a contaminant.

Each of these elements can exist independently, and create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of source-pathway-receptor is described as a **contaminant linkage** or **pollutant linkage**.

The following describes a Preliminary Risk Assessment and presents a Stage 1 Conceptual Model for the site, based on the proposed mixed use.

6.2 Hazard Identification

6.2.1 Potential Contamination Sources

There is potential for significant contamination to exist associated with the past and current industrial uses at the site, which include a railway line, oil depot, engineering works, warehouse, meat processing factory, scrap yard and a number of above ground tanks. In addition there are nearby sources of potential contamination such as the former gas works, machine depot and landfill. Each of these former uses will include specific sources such as tanks (several are shown on historical maps and noted in the Groundsure report), process areas, chemical stores and electrical sub-stations. Any Made Ground imported to the site or a result of demolition can contain a range of contaminants, including metals, organics and asbestos.

Table 6.1 presents a summary of the potential sources on the site

Table 6.1 Summary of Potential Contaminant Sources

Structure / Process	Potential Contaminants
Soil contaminated with substances associated with past on-site uses including oil depot, motor vehicle yards, engineering works, rail line, scrapyard, meat processing plant and numerous above ground tanks. **(S1)**	• Asbestos • Petroleum Hydrocarbons • Metals • PAHs • PCBs • VOCs • Ground gases (methane and carbon dioxide)
Contaminants associated with off-site industrial land use including the gas works, oil depot and various works. **(S2)**	• Metals • Cyanide • Sulphate • PAHs • Petroleum hydrocarbons • Phenols
Ground gases originating from the former landfill recorded adjacent to Plot 9. **(S3)**	• Ground gases (methane and carbon dioxide)

6.2.2 Potential Receptors

The following are considered as potential receptors assuming a future mixed use developemnt.

- **Future site users** – Occupiers of the proposed development;
- **Buildings (including foundations)** and **below ground services / infrastructure** – Concrete foundations, drinking water supply pipes and other service infrastructure;

- **Groundwater –** Underlying Secondary A Aquifers within the alluvial deposits and breccia bedrock directly beneath the site;
- **Surface Water –** River Exe;
- **Flora -** Any planting proposed as part of the development.

6.2.3 Potential Contamination Pathways

The following are considered potential contamination pathways given the nature of the site and the potential contaminative sources identified, and assuming a future mixed use.

- Ingestion and dermal absorption through direct contact with contaminated soils and soil-derived dusts;
- Consumption of homegrown produce grown in contaminated soils;
- Inhalation of airborne soil-derived dust/particulate matter;
- Migration and inhalation of gases and vapour;
- Contamination of drinking water pipes by contaminated material leading to the ingestion of contaminated drinking water;
- Attack on concrete foundations by aggressive soil conditions;
- Leaching of contaminants by percolating rainwater and dissolution, followed by horizontal and vertical migration through the unsaturated zone to shallow groundwater.
- Migration via the saturated zone to surface watercourses;

6.3 Preliminary Risk Assessment

Risks from land contamination in the UK are assessed on the 'suitability for use' principle, whereby pollutant linkages are considered with regard to the intended end use of the site, and the specific exposure pathways and receptors associated with that use.

The initial CSM forms the basis for the design of subsequent stages of investigation, which should aim to confirm (or otherwise) the presence and significance of the potential pollutant linkages highlighted by the

CSM. The risk assessment has been carried out assuming a future **residential land use with private gardens,** as this is considered to be the most sensitive potential future use.

For the purpose of this report, the environmental risks associated with each potential pollutant linkage have been initially assessed based on the available information using the following scale:

Table 6.2 Environmental Risk Classification

Risk Level	Description
Very Low / Negligible	The contaminant linkage may not be complete or is otherwise very unlikely to result in significant effects*, and further investigation should not be necessary
Low	Significant effects* are unlikely and further investigation may not be necessary, but should be considered
Medium	Significant effects* are a possibility and further investigation is recommended
High	Significant effects* are likely and further investigation is required
Very High	The is evidence that significant effects* are currently occurring, or are likely to occur, and immediate action is required.

*Significant effects are considered to be any of the following;

- Exposure of site users to levels of contamination that may constitute significant harm as defined by Part IIA of the Environmental Protection Act
- An impact on controlled waters from contamination in contradiction of the aims of the Water Framework Directive, which may constitute Part IIA significant harm
- Exposure of an ecological system, or part thereof, to levels of contamination that may constitute Part IIA significant harm
- Exposure of crops, domesticated animals and animals subject to hunting / fishing rights to levels of contamination that may constitute Part IIA significant harm
- Exposure of construction and underground service materials to levels of contamination which may cause damage or exceed industry thresholds

In accordance with LCRM, professional judgement has been employed to evaluate the risk on a qualitative basis using available information.

Based on the potential sources, pathways and receptors associated with the proposed residential development, an initial Conceptual Site Model has been developed, and is summarised in Table 6.3.

Table 6.3 Conceptual Site Model

Area / Structure	Contaminants (Chemicals of Concern)	Pathway	Receptor	Risk	Comment / Recommended Actions
Source 1 Soil contaminated with substances associated with past on-site uses including oil depot, engineering works, rail line, scrap, meat processing plant and numerous above ground tanks. **Source 2** Contaminants associated with off-site industrial land use including the gas works, oil depot and various works. **Source 3** Ground gases originating from the former landfill recorded adjacent to Plot 9.	Asbestos, metals, cyanide, sulphate, PAHs, petroleum hydrocarbons, VOCs, PCBs, phenol, methane, carbon dioxide	Ingestion and dermal adsorption through direct contact	Humans (Future site users)	**Medium / High**	Given the industrial site history, there is potential for significant contamination to be present, most likely as localised 'hotspots'. Further investigation is required to determine if significant sources are present.
		Consumption of Homegrown Produce		**Medium**	
		Inhalation of dust / particulates		**Medium**	
		Inhalation of vapours / gases		**Medium / High**	
		Direct contact	Buildings / Foundations / Services	**Medium**	There is potential for significant contamination to be present that would have implications for new services, and investigation works are recommended.
		Leaching and migration through unsaturated zone	Groundwater	**Low/ Medium**	Further investigation is recommended to determine if any significant risks exist to groundwater, although the low sensitivity of the shallow groundwater reduces these risks somewhat.
		Leaching and migration via the saturated zone	River Exe	**Low / Medium**	The distance to the River Exe reduces the risks of it being affected by contamination from the site, but cannot be ruled out and should therefore be determined through investigation.
		Plant Uptake	Flora	**Medium**	Investigation is required to provide information on the suitability of the soils as a growing medium.

7.0 Conclusions and Recommendations

7.1 Preliminary Risk Assessment

Based on the information reviewed during this survey, the risks from land contamination (except those to construction workers) are considered to be medium-high. The risks reflect the potential for significant contamination beneath the site given the range of potential sources, and the sensitivity of the proposed development, which will likely include a significant residential element.

The risks would have to be reassessed should the intended site use be changed.

7.1.1 Construction Workers

Given the unique exposure scenario for any construction, investigation or maintenance worker involved in groundworks or excavations, the risks are considered separately from those to other receptors which are described above.

There is always a risk of exposure to contamination for those involved in ground disturbance. Measures should be taken to minimise exposure of such workers to these risks, in accordance with common good practice.

7.2 Future Work Requirements

There is potential for significant contamination to be present associated with the past and current industrial uses on the site. Ground investigations will therefore be necessary to identify any areas of significant contamination and any associated unacceptable risks or liabilities, and would also be a requirement of the planning authority to support the planning application.

Ground investigation work should consider the specific site uses of each plot and would likely comprise a combination of boreholes and trial pits to allow assessment of soil conditions, groundwater quality and the ground gas regime. The investigations should allow an assessment of the general contamination status of the site, but also target specific source areas such as tanks, process areas, chemical stores etc.

It is recommended that any investigation includes a geotechnical element to allow collection of data relating to the physical properties of the ground in order to inform foundation design, pavement construction etc.

Overall, an outline scope of an initial ground investigation covering the entire site may comprise something along the lines of the following:

- 10 cable percussion boreholes to target depths of 10 – 15mbgl;
- 30 – 40 window sample boreholes to target depths of 5mbgl;
- 20 – 30 machine excavated trial pits;
- 3 months of ground gas monitoring;
- Appropriate chemical and geotechnical laboratory analysis of soil and water samples;

Further phases of investigation may be required depending on the initial findings.