



Wrexham Delivery Office

Discharge of planning conditions relating to
contaminated land

February 2021

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1 Introduction

Plans have been submitted to Wrexham Council for alterations to the existing Delivery Office at Regent Street in Wrexham. Planning permission has been granted but is subject to pre-commencement planning conditions. This report addresses the conditions relating to contamination.

1.1 Site Location

The site is located off Regent Street to the north west of the city centre.

Figure 1.1: Site Location



Source: © Crown Copyright and database right 2021. Ordnance Survey

The development comprises two sorting offices occupying the large central building and the smaller building to the north east. The north western corner of the site is occupied by a workshop and stores. There is a vehicle wash and above ground diesel fuel tank with dispensing pumps in the north. The remainder of the site is covered in macadam paving and used to park vehicles.

1.2 Proposed Development

The proposed development is to enlarge the main sorting office building with a smaller extension adjacent to the existing main building.

Figure 1.2: Proposed Development



Source: Extract from Drawing SL P20020_DWG 0_PR10 (Studio Line Architects)

The other existing buildings and infrastructure (smaller sorting office, workshop, vehicle wash and refuelling point) will be demolished.

1.3 Planning Conditions

Planning approval for this development has been granted (Ref P/2020/0598). Permission has been conditioned with Conditions 5 and 6 relating to contamination:

- '5 No development shall take place until a phased site investigation of the nature and extent of contamination has been carried out and submitted to and approved in writing by the Local Planning Authority. If any contamination is found during the site investigation, no part of the development shall commence until a scheme specifying the measures that will be taken to remediate the site to render it suitable for the development hereby permitted has been submitted to and approved in writing by the local planning authority. The site shall thereafter be remediated in accordance with the approved scheme. If during the course of development any contamination is found that has not been identified in the site investigation, no further

development shall take place on those parts of the site where that contamination has been found until an additional scheme of remediation has been submitted to and approved in writing by the local planning authority for those parts of the site. The relevant parts of the site shall thereafter be remediated in accordance with the additional scheme of remediation'; and

- '6 Each part of the site subject to the remediation under the scheme(s) approved as part of condition 5 shall not be occupied/used until a Validation Report has been completed in respect of that part of the site and submitted to and approved in writing by the Local Planning Authority'.

1.4 Purpose of this report

This report has been prepared to discharge conditions 5. The report also sets out the information required to discharge condition 6 relating to the validation of any remediation required.

1.5 Information Sources

Plans of the proposed development have been submitted with the planning application and are available on the Wrexham Council planning portal.

A ground investigation report has been prepared by Core Geotechnics Ltd.

The drainage strategy is presented on Drawing WRDO-MMD-XX-00-DR-D-001.

2 Discharge of Condition 5

The condition requires a phased ground investigation to be undertaken to determine the underlying ground conditions.

No development shall take place until a phased site investigation of the nature and extent of contamination has been carried out and submitted to and approved in writing by the Local Planning Authority.

A phased ground investigation should comprise a desk study to determine likely ground conditions to enable an initial conceptual site model to be developed. This model is then used to define ground investigations which confirm the conditions beneath the site and allow an appraisal of any further work required to render the site suitable for use.

The Core Geotechnics Report¹ prepared for the site is submitted to discharge this first element of the condition. The report contains a record of a site reconnaissance visit and desk study into the development history of the site. The key findings of this desk study are noted below and have been used to develop the initial conceptual site model.

2.1 Desk Study

The site reconnaissance describes the layout of the site and identifies the present-day structures:

- Main sorting office;
- Smaller sorting office;
- Workshop;
- Vehicle wash; and
- Refuelling area.

Some staining of the concrete plinth surrounding the refuelling point was noted; however this does not appear to be extensive. Beneath the above ground diesel tank is a manhole which is noted may be associated with a previous underground storage tank which is believed to have been decommissioned. The refuelling area is understood to drain to an interceptor.

The underlying geology is indicated to comprise glaciofluvial sheet deposits (sand and gravel) over the Etruria Formation which comprises red and grey mottled mudstones with impersistent bands of sandstone (also known as espleys) that occasionally contain pebbly beds.

The site development history is described in the Core Geotechnics report based on a study of historical Ordnance Survey mapping. The site was undeveloped until between 1960 and 1968 when the two sorting offices are shown. The workshop, vehicle wash and fuel island are shown to have been built between 1988 and 1990. No other changes to the site are noted.

The earliest OS map (dated 1874) shows the railway to the north west with sidings to the east on the other side of Regents Street. To the east and south are residential properties and the River Gwenfro flows to the south east. From 1912 the area to the south sees increased industrial development until 1968, when the land adjacent to the east is shown as a garage and depot. There are two further garages shown to the west.

An historical aerial photograph from 2003 shows the garage to the east to have been demolished and replaced with a large car park, and by 2007 this area has been developed into

¹ Core Geotechnics Ltd Ground Investigation Royal Mail Delivery Office Wrexham Report Number 21009

two high rise residential blocks. Between 2003 and 2006 the area of the garages to the west have been redeveloped into a retail area.

2.2 Initial Conceptual Site Model

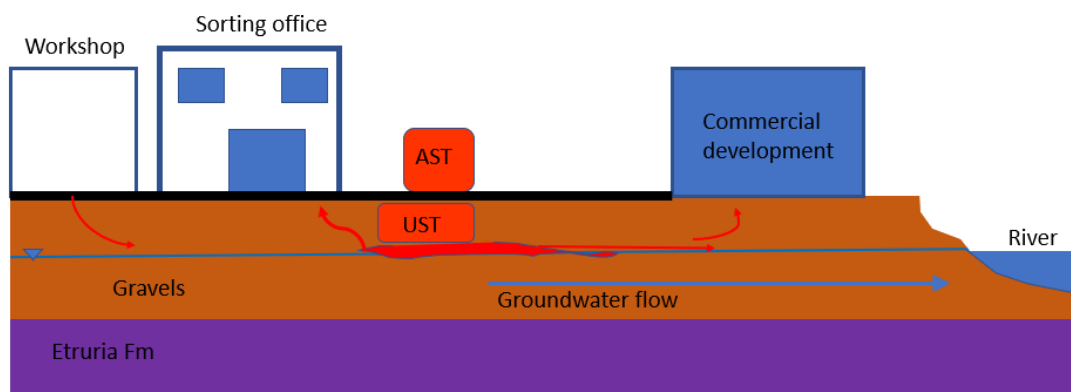
The underlying ground conditions are expected to comprise a thin layer of granular Made Ground used to form a regulation layer over the natural sands and gravels. A layer of glaciofluvial deposits is expected to overlie the underlying Etruria Formation which comprises mudstones. Groundwater is anticipated to be present within the glaciofluvial deposits and flow is anticipated to be towards the southwest to the River Gwenfro.

The site has been developed since the 1960s and comprises a number of buildings and impermeable paving. An underground fuel storage tank (UST) with fuel filling island and workshop are present. The UST has been decommissioned and replaced with a modern above ground tank (AST). It is not known how the UST has been decommissioned.

The UST and fuel island are a potential source of contamination from leaks and spills. Any leaks have the potential to migrate vertically down to the groundwater table and then migrate with groundwater flow. Free phase hydrocarbon may also present a vapour risk to site occupants

The initial conceptual model is shown graphically below.

Figure 2.1: Initial Conceptual Model



Source: Mott MacDonald

2.2.1 Contaminant Linkages

A key element of undertaking a contamination risk assessment is the development of a Conceptual Site Model that describes the environmental features of the Scheme together with the expected interaction of potential contamination sources with the environment. This is done by undertaking a Source – Pathway – Receptor analysis:

- Sources (S) are potential or known contaminant sources e.g. Made Ground;
- Pathways (P) are environmental systems through which a contaminant could migrate e.g. migration through groundwater, human uptake; and
- Receptors (R) are sensitive environmental or human receptors that could be adversely affected by a contaminant e.g. construction workers, groundwater resources.

Where a source, relevant pathway and receptor are identified, a contaminant linkage is considered to be present whereby there is a circumstance through which environmental harm could occur and a potential environmental liability may exist.

Potential Sources

S1: Made Ground used to develop the site may contain contaminants

The nature of the underlying ground is not known but is likely to comprise Made Ground used to create the initial development platform.

S2: Fuel leaks from the UST/AST/Oil tank

Given the age of the UST leaks from corrosion are possible. The AST/oil tank is considered less likely to be a source as these are of modern construction and will have containment systems.

S3: Fuel/oil leaks from the workshop

The nature of the workshop is not known and may be a source of contamination from sumps.

Potential Pathways

P1: Vapour inhalation

P2: Direct contact/ingestion of contaminated soil

The site is covered in impermeable surfacing so this pathway is only relevant to construction workers.

P3: Migration with groundwater

The site is within an urban setting and groundwater will not be used for water supply. The ultimate receptor will be surface water fed by groundwater.

Receptors

The following receptors are considered:

R1: Occupants of the development

R2: Construction workers

R3: Controlled waters (River Gwenfro)

Potential Contaminant Linkages

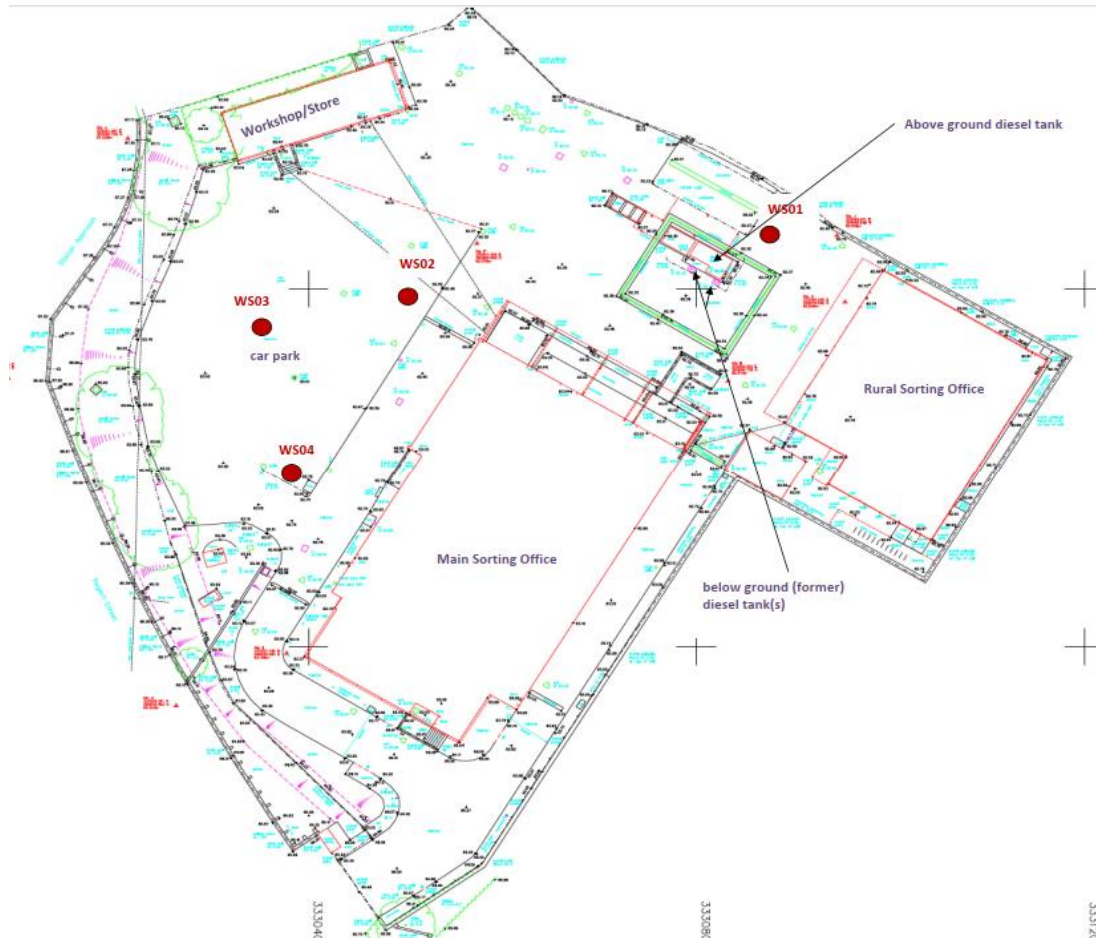
The following linkages are considered to be reasonable:

- S1-P2-R2;
- S2/S3-P2-R2;
- S2/S3-P1-R1;
- S2/S3-P1-R2; and
- S1/S2/S3-P3-R3.

2.3 Ground Investigations

A ground investigation comprising four window sampler boreholes has been undertaken on the site. The location of these boreholes is shown on Figure 1 of the Core Geotechnics report and reproduced in Figure 2.2.

Figure 2.2: Ground Investigation



Source: Core Geotechnics

The borehole logs confirm a thin layer of Made Ground comprising gravel with some ash and bricks varying from 0.35m thick in borehole WS03 to 0.8m in borehole WS01. Borehole WS03 also recorded 2.65m of possible Made Ground comprising gravel of various lithologies. It is possible that an area of soft ground was encountered during the initial development which was infilled with imported gravel.

Groundwater was encountered in each borehole at depths of between 2.5m and 3.0m below surface. The borehole logs recorded a pronounced hydrocarbon odour in borehole WS03 at 3.0m to 4.0m below surface which corresponds with the depth to groundwater.

Samples of soil were obtained from each borehole and subjected to laboratory analysis for a suite of contaminants comprising metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, pH and cyanide. Soil bound concentrations of these contaminants have been compared to generic assessment criteria protective of human health for a commercial end use derived using the CLEA model.

No exceedances of the assessment criteria were recorded.

A sample of soil taken from borehole WS03 between 3.0m and 4.0m depth recorded a concentration of petroleum hydrocarbons of 3400mg/kg. The sample comprised predominantly aliphatic compounds in the diesel range (C10-C24).

Samples of groundwater were obtained from boreholes WS1, WS2 and WS4. Concentrations of metals have been compared to environmental quality standards. Concentrations of some metals were in excess of their EQS:

	EQS (µg/l)	Borehole WS1 (µg/l)	Borehole WS2 (µg/l)	Borehole WS4 (µg/l)
Cadmium	0.09	0.05	0.13	-
Copper	1.0	2.4	3.6	-
Lead	1.2	3.5	0.9	-
Petroleum hydrocarbons	-	410	<10	3400

In addition, the samples from boreholes WS01 and WS04 recorded concentrations of petroleum hydrocarbons generally within the aliphatic C12-C35 range.

The borehole logs recorded some ash within the thin Made Ground present across the site, which may be the source of metal contamination. The exceedances above EQS are however minor and are not considered to present a significant source of groundwater pollution. Borehole WS1 is located on the up hydraulic gradient boundary of the site and concentrations of copper and lead may represent natural background levels.

2.4 Updated Conceptual Site Model

If any contamination is found during the site investigation, no part of the development shall commence until a scheme specifying the measures that will be taken to remediate the site to render it suitable for the development hereby permitted has been submitted to and approved in writing by the local planning authority. The site shall thereafter be remediated in accordance with the approved scheme.

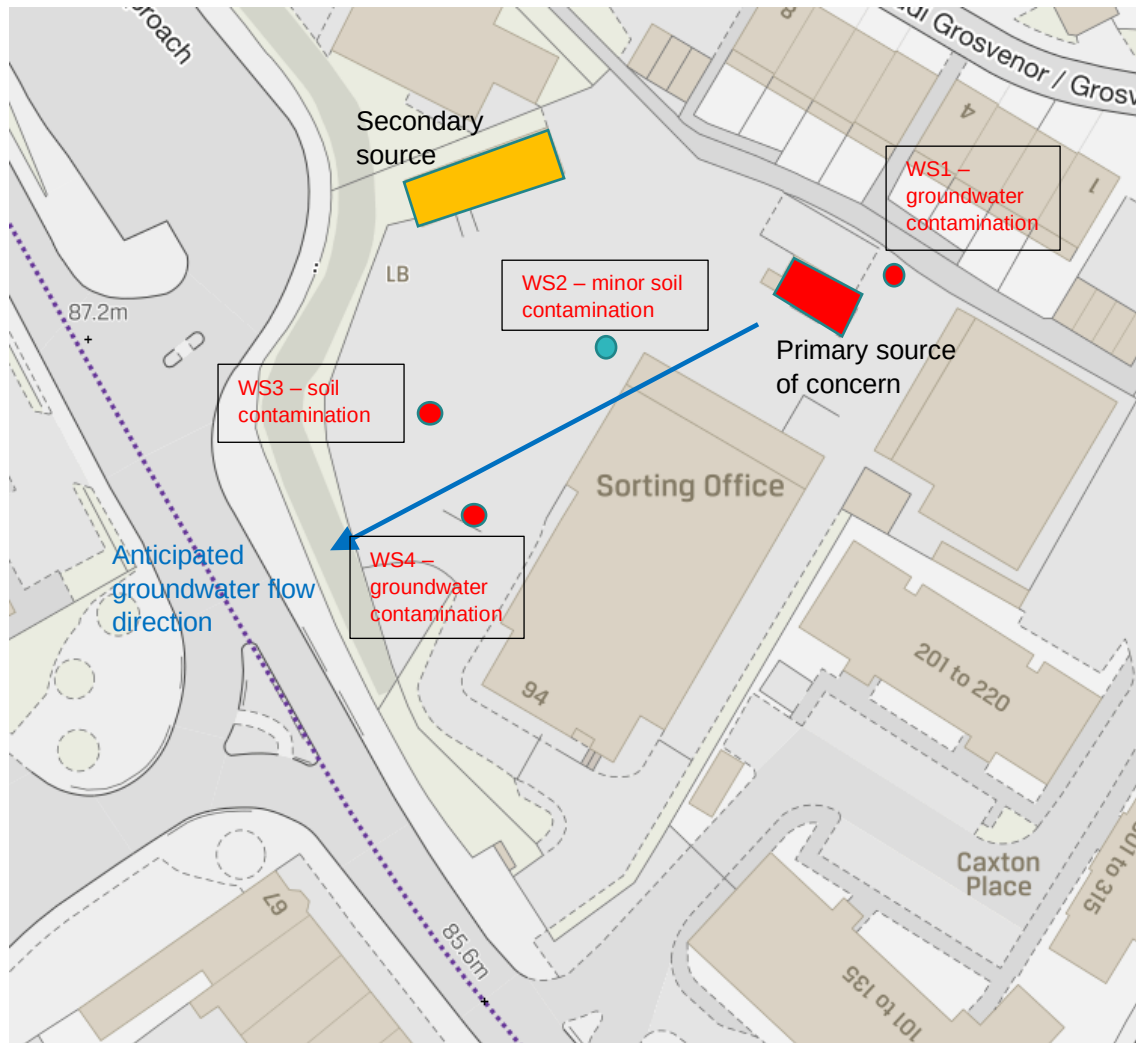
The ground investigation has confirmed the anticipated ground conditions comprising a thin Made Ground over sands and gravels.

Soil samples indicate that concentrations of contaminants within the underlying ground do not pose a significant risk to human health given the site will remain in commercial use. There is however some cause for concern regarding the extent of contamination from petroleum hydrocarbons present within groundwater.

The former UST is a potential source of hydrocarbon contamination and the composition of the contamination noted in soil and groundwater samples is consistent with diesel fuel. Underground tanks are at high risk of leaks and tanks of the age of this installation were commonly single skinned steel tanks, prone to corrosion. Of secondary concern is the workshop which may have a vehicle inspection pit and may have leaked oil and fuel into the subsurface.

Borehole WS1 adjacent to the UST has detected hydrocarbons in the groundwater at a reasonably high concentration of 410µg/l. The concentration in Borehole WS4 is much higher at 3400µg/l, suggesting migration of fuel on the water table in this direction. The ground investigation report does not note the presence or absence of free-phase product on the water table.

Figure 2.3: Revised Conceptual Model



Source: Mott MacDonald

2.4.1 Revised Contaminant Linkages

S1-P2-R2

The ground investigation has confirmed there is a thin layer of Made Ground present. Concentrations of contaminants are not particularly high but a risk to construction workers is considered to exist.

This risk will be mitigated by the contractor adopting safe systems of work which minimise exposure to Made Ground.

S2/S3-P1/P2-R2

The ground investigation has indicated the presence of petroleum hydrocarbons within the underlying ground. Any excavation of these soils has the potential to expose construction workers to risk.

This risk will be mitigated by the contractor adopting safe systems of work which minimise exposure to Made Ground.

S2/S3-P1-R1

There is a possible risk to site occupants within the existing sorting office from the inhalation of vapours from petroleum hydrocarbons migrating beneath the building with groundwater.

Following the development of the new extension there will be a building over an area where petroleum hydrocarbons are present within soils and groundwater.

This presents an ongoing risk to the development.

~~S1~~/S2/S3-P3-R3

The ground investigation has indicated the underlying Made Ground is generally free of mobile contaminants and is not a significant source of groundwater contamination. It is considered reasonable to remove the S1 (Made Ground) source from this linkage.

The ground investigation undertaken has been limited and has indicated a potential issue with hydrocarbons present on groundwater and potentially migrating off site. The likely direction of groundwater flow is considered to be to the south west towards the River Gwenfro, some 150m from the site.

This presents an ongoing risk to the development.

2.5 Proposed Remedial Actions

The proposed development includes the removal of the vehicle wash, workshop and above ground fuel point. In addition, the former UST will be excavated and removed. The sorting office in the north eastern corner will also be removed.

It is proposed to surface the north eastern corner of the site with permeable paving with rainfall collected in a retention system before discharge via the surface water drainage system. This will maintain the existing situation where rainfall does not infiltrate into the underlying ground but is conveyed off site via drainage.

2.5.1 Remedial Objectives

It is a requirement of the planning system that any proposed development is suitable for use. With respect to ground contamination this requirement is met once the site is considered not to present any significant risk to occupants or the wider environment. The objective of the proposed remedial actions will be to break the remaining contaminant linkages. Linkages can be broken by either removing a source or breaking the pathway. Once a linkage has been broken there no longer exists a risk. It is considered impractical to remove receptors from the linkages as this would require the site being abandoned.

Source Removal

The source of contamination is residual fuel that may have leaked from the UST and associated fuelling activities. The UST held diesel fuel which has a carbon range of C12 to C24 and does not contain the more volatile components such as gasoline (C05-C10). Diesel is therefore less volatile.

Pathways

The development will retain a barrier between the underlying soils and above ground human receptors and so only vapour inhalation pathways will be valid for assessing risks to human health.

Groundwater within the glaciofluvial sands and gravels will migrate towards the River Gwenfro. The drainage system proposed will isolate the underlying soils from rainfall infiltration with water conveyed off site via a secure drainage system.

The CLEA model can be used to generate assessment criteria protective of human health. The generic criteria for a commercial end use assumes direct contact with contaminated soil. This pathway is not valid for this site and so site-specific criteria can be generated by only considering the vapour inhalation pathway.

Table 2.1: Site Specific Criteria for Petroleum Hydrocarbons (Diesel Range Highlighted)

	Generic Criteria (mg/kg)	Site Specific Criteria (mg/kg) (Vapour inhalation pathways)
Aliphatic EC 5-6	3200	3200
Aliphatic EC >6-8	7800	7800
Aliphatic EC >8-10	2000	2000
Aliphatic EC >10-12	9700	10000
Aliphatic EC >12-16	59000	83000
Aliphatic EC >16-35	1600000	9000000
Aliphatic EC >35-44	1600000	9000000
Aromatic EC 5-7	26000	28000
Aromatic EC >7-8	56000	65000
Aromatic EC >8-10	3500	3600
Aromatic EC >10-12	16000	19000
Aromatic EC >12-16	36000	210000
Aromatic EC >16-21	28000	3000000
Aromatic EC >21-35	28000	49000000
Aromatic EC >35-44	28000	49000000
Aliphatic and Aromatic EC >44-70	28000	31000000

Source: Mott MacDonald

As can be seen from Table 2.1 the concentrations of petroleum hydrocarbons required to present a significant risk to site occupants from vapour inhalation are very high. These concentrations would require the soil to be saturated with product and so it can be assumed that if free phase product is not present in soil, there is no significant risk from vapour inhalation.

2.5.2 Fuel tanks

The above ground fuel tank and associated fuel lines will be removed. Once this operation has been completed the ground slab surrounding this facility will be broken up and removed, exposing the UST beneath. This tank will be excavated and removed. Once all the redundant infrastructure has been removed the excavation will be inspected for evidence of hydrocarbons. Should hydrocarbon product be found on the water table this will be skimmed off. Any soils found to be saturated with hydrocarbons will be excavated and removed.

The excavation will be verified through visual inspection of the base and sides to verify that there is no free phase product remaining within the soil.

2.5.3 Workshop

The building will be demolished, and the slab broken up. If there are any below ground voids the base will be broken up and the underlying soils inspected for visual evidence of contamination. Should hydrocarbon product be found on the water table this will be skimmed off. Any soils found to be saturated with hydrocarbons will be excavated and removed.

The excavation will be verified through visual inspection of the base and sides to verify that there is no free phase product remaining within the soil.

2.5.4 Vehicle wash

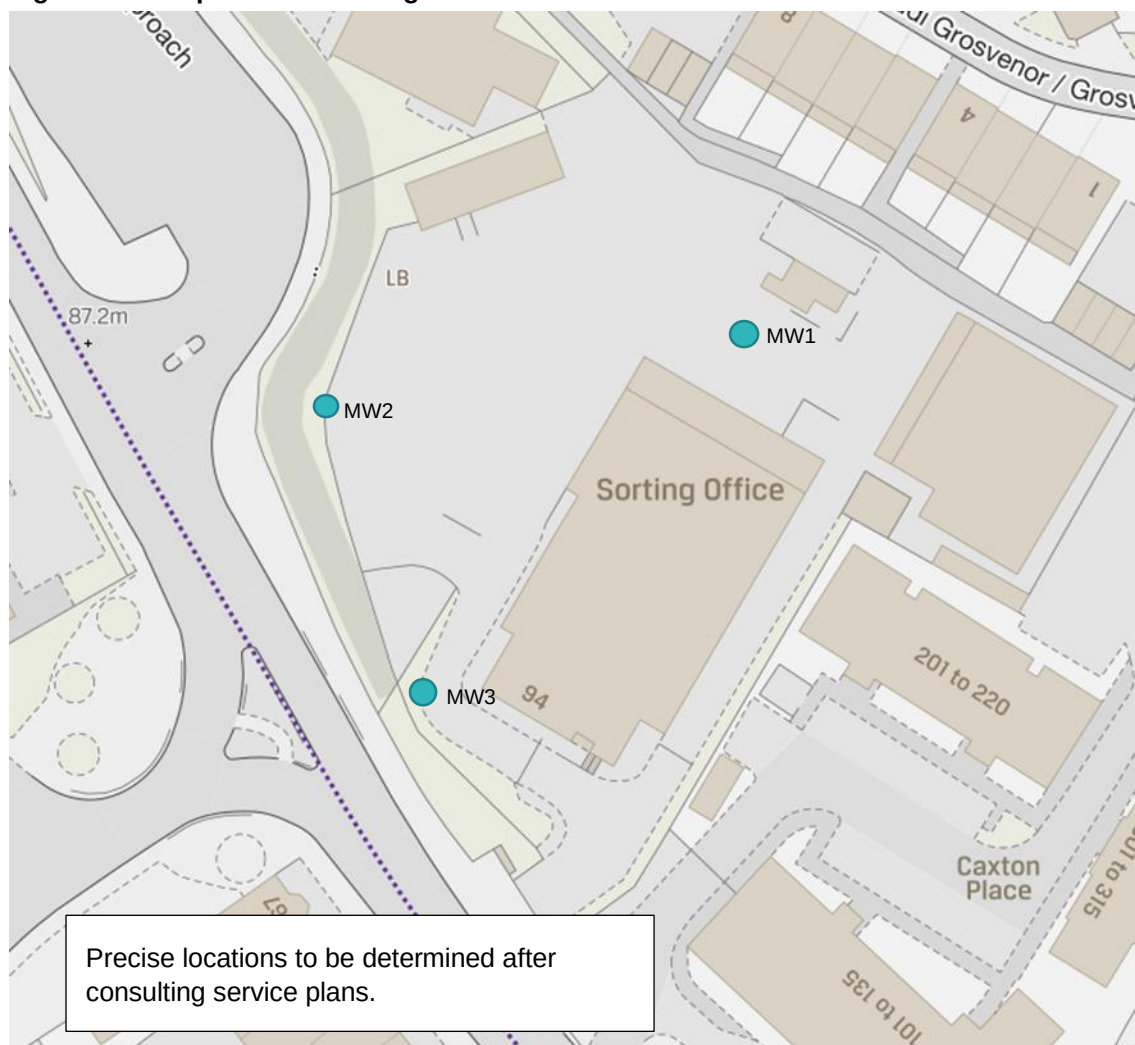
The building will be demolished, and the slab broken up. The underlying soils will be inspected for visual evidence of contamination. Contaminated soils which are saturated with hydrocarbons will be excavated and removed from site.

The excavation will be verified through visual inspection of the base and sides to verify that there is no free phase product remaining within the soil.

2.5.5 Groundwater monitoring

Boreholes WS1, WS2 and WS4 are no longer available having been backfilled once initial groundwater samples were obtained. It is proposed that semi-permanent boreholes be constructed to allow groundwater sampling across the site. These will provide a means of monitoring the quality of groundwater beneath the site as remedial works are completed.

Figure 2.4: Proposed Monitoring Wells



Source: Mott MacDonald

Three monitoring wells are proposed (MW1 – 3). These should be drilled to 6m depth and a 50mm screened piezometer installed. The piezometer should comprise 1m of plain pipe at the top with a bentonite seal above the screened section. It is important that the screened section

straddles the water table to allow monitoring of any free phase product. Each well will be monitored on completion and again after 2 weeks.

The locations of these wells have been chosen to provide site-wide coverage of the area down hydraulic gradient and within the area where petroleum hydrocarbons have been found during the ground investigation.

The remedial strategy for groundwater contaminated with hydrocarbons is source removal. The monitoring wells will be used to monitor groundwater quality before, during and after the construction work. At present it is envisaged that the boreholes would be installed as soon as possible and then groundwater quality monitored fortnightly with a review after three rounds. An interim report would be submitted to the planning authority discussing the results and implications for the site.

2.6 Discovery Strategy

If during the course of development any contamination is found that has not been identified in the site investigation, no further development shall take place on those parts of the site where that contamination has been found until an additional scheme of remediation has been submitted to and approved in writing by the local planning authority for those parts of the site. The relevant parts of the site shall thereafter be remediated in accordance with the additional scheme of remediation.

Should any contamination be discovered during construction works; the work will cease, and an environmental specialist mobilised to inspect the area. Any remedial actions required will be dependent and the scale and type of contamination found. A remedial action plan will be formulated and advised to the local planning authority for approval.

3 Discharge of Condition 6

Each part of the site subject to the remediation under the scheme(s) approved as part of condition 5 shall not be occupied/used until a Validation Report has been completed in respect of that part of the site and submitted to and approved in writing by the Local Planning Authority

A validation report will be prepared and submitted to the local planning authority on completion of all works.

The validation report will comprise a record of the excavations made around the fuel tanks and workshop; records of the condition of the underlying soils and volumes of any material taken off site. A photographic record of all excavations will be included.

Borehole logs and groundwater monitoring results will be provided.

