

## Former Hambly's Garage, Pelynt, Looe, Cornwall

### Phase 1 Preliminary Risk Assessment Report

#### Report No. 21011-R1

**Client:**

Paul & Sophie Boxall

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Figure 1: Site Location Plan

Figure 2: Aerial Photograph with Site Walkover Observations

Figure 3: Site Plan showing Assessment Areas and Proposed Development End Uses

Figure 4: Plan of Forecourt and Tanks extracted from A. Robin Hood Report

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Figure 6: Proposed Development Plan

Appendix 1: Site Photographs

Appendix 2: Groundsure Enviro + Geo Insight Report

Appendix 3: Groundsure Historical Maps

## 1. Introduction

### 1.1 Background

Westenviro Ltd has been instructed by Paul & Sophie Boxall of Pelynt Post Office and Spar Store, to undertake a Phase 1 Desk-Based Preliminary Risk Assessment for a proposed mixed-use commercial/retail and residential development at the former Hambly's Garage, Jubilee Hill, Pelynt, Looe PL13 2JZ (hereafter referred to as "the site").

### 1.2 Information Reviewed

Westenviro Ltd has obtained, reviewed and assessed information from the following sources:

- A site walkover including selected photographs (see Appendix 1);
- A Groundsure Enviro + Geo Insight data report for the site, dated January 2021 (see Appendix 2);
- Current and historical Ordnance Survey (OS) maps (see Appendix 3);
- Data from online mapping and aerial imagery presented by British Geological Survey (BGS), Environment Agency (EA), Cornwall Council, UK Soil Observatory (UKSO) and Google Earth;
- Previous site investigation reports for the site (these reports have not been appended for reliance and copyright reasons but are available on the Cornwall Council online planning register):
  - November 2001 investigation by A. Robin Hood & Associates, sourced from Cornwall Council online planning register (Planning reference E2/05/00718/OUT);
  - September 2008 investigation by SLR Consulting Ltd, provided by client (text of report only available), also see online planning register, Planning reference PA20/10043;
- Information on planning history of the Site and surrounding areas, from Cornwall Council online records; and
- Information on mining history, from mapping prepared by A. K. Hamilton Jenkin and held by Cornwall Record Office.

### 1.3 Purpose and Scope of Study

The purpose of the Report is to collect and examine existing available information, and carry out a site walkover to identify near surface evidence of potential contamination impact, in order to provide an assessment of potential in-ground environmental risks and liabilities associated with the proposed redevelopment of the site as described in Section 1.4.

The main objectives of the Phase 1 Preliminary Risk Assessment are to:

- Evaluate the environmental setting of the site and to identify sensitive receptors;
- Identify and evaluate possible source-pathway-receptor linkages;
- Formulate a Conceptual Site Model (CSM) to consider the significance of the source-pathway-receptor linkages and assess risks to receptors; and
- Identify if further investigation is required and recommend a scope.

This Report has been undertaken in accordance with current relevant guidance and best practice as set out in DEFRA/Environment Agency Land Contamination Risk Management (LCRM) Framework (8 October 2020) and Contaminated Land Report (CLR) 11, British Standard BS10175:2011 + A2: 2017, NHBC/Environment Agency/CIEH Guidance for the Safe Development of Housing on Land Affected by Contamination (R&D Publication 66: 2008) and in accordance with

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Cornwall Council guide entitled Land Affected by Contamination – Developers Guide and Information Requirements for Planning Applications (Version 1, June 2017).

#### 1.4 Description of Proposed Development

The proposed development is understood to comprise a mixed-use commercial/retail and residential development consisting of six houses with gardens and three commercial units together with access, parking and landscaping provision. The commercial units and associated access and parking are to be located on the west and north parts of the site (on the footprint of the former garage) and the houses are to be located on the south-eastern part of the site (an area largely undeveloped in the past). In terms of standard end-uses defined for contamination assessment, the proposed development may be defined as part Commercial, a low sensitivity end-use, and part Residential (with consumption of home grown produce), a high sensitivity end-use.

#### 1.5 Limitations

This Assessment has been produced in accordance with the principles of LCRM and BS10175:2011+A2:2017 in relation to a Preliminary Risk Assessment (Tier 1 Assessment in LCRM terminology). It provides an assessment of the potential contamination status of the ground below the site based upon the information made available to Westenviro Ltd at the time of the study and on surface observations from a site walkover. Although reference may be made to issues other than those related to contamination, any comments relating to such matters are for information only.

Westenviro Ltd has reviewed and assessed information from the Client, Groundsure Ltd, and others. Westenviro Ltd does not warrant the accuracy of the information provided to it. The conclusions, opinions and recommendations presented in this report are based upon this information. No additional intrusive investigation or sampling has been undertaken by Westenviro.

## 2. Site Location and Description

### 2.1 Site Location

The site is a 0.57 Ha (approximate) area of land located at the former Hambly's Garage, Jubilee Hill, Pelynt, Looe, Cornwall. The postcode attributable to the site is PL13 2JZ. The site is centred at National Grid Reference 220423, 054993. The site location is shown in Figure 1.

The Site is located on the north-east side of Jubilee Hill (B3359 East Taphouse to Looe road) in Pelynt village and is accessed through the property frontage. It consists of an irregular shaped plot consisting of the former garage and coach parking areas in the north and west, and a largely undeveloped triangular area extending to the south-east.

The site boundary used in this report is based on the planning application redline boundary. The site area has been established from the boundary defined in the Groundsure GIS model and may differ non materially from the area stated in the planning application forms.

### 2.2 Current Use of Site

The site is currently unused. The former garage building remains extant although in a state of some dereliction. Walls of former lockup garages and an inspection ramp are present in the north of the site.

### 2.3 Current Use of Surrounding Area

Current land uses in the surrounding area are identified in Table 2.3. Information considered to be of potential significance to land contamination on the site is shown in bold text.

**Table 2.3 Current Land Uses in Surrounding Area**

Direction	Current Use
North-west	Residential (The Bungalow) with village centre and church beyond.
North-east	A wooded area, ponds and a camping field.
East	Agricultural pastureland.
South	Residential and a church, with a garage beyond.
West	Jubilee Hill (B3359) and residential and retail properties.

### 2.4 Observations from Site Walkover

#### *Methodology*

A site walkover was carried out on 11<sup>th</sup> January 2021, during a period of damp cloudy weather. The site walkover comprised examination on foot of the site and its immediate surrounds. Any information considered to be of potential significance to land contamination on the site is shown in bold text. Key observations are shown on the aerial photograph in Figure 2. Selected photographs are reproduced in Appendix 1.

#### *Site Layout - General*

The site consists of a former garage, forecourt, a yard area formerly used as a coach depot and an undeveloped area. The former garage building is extant although is a derelict state. The forecourt area and part of the yard area are currently in use for car parking for the Clients' Post Office and Spar village store located to the south. These areas are demarcated in Figure 2 and described in more detail below.

General groundslope on the site is a gentle fall in a south westerly direction towards the frontage. However the undeveloped area to the south-west has a pronounced fall in a north-westerly

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direction towards the forecourt area.

The site is assumed to be provided with mains water, electricity and telecoms services.

Invasive plants, eg Japanese Knotweed *fallopia japonica* were not observed, however the walkover was carried out in the winter when foliage would not be visible.

#### *Sub-Area 1 – Forecourt Area*

The area formerly comprising the garage forecourt is located to the south of the extant garage building and north-east of the village street (Jubilee Hill). It comprises areas of potholed asphalt surfacing in poor condition and areas of concrete surfacing in varied condition. In the centre the base of a former kiosk is located. No evidence of pump islands is visible but they are believed to have been located south-west of the former kiosk.

Limited evidence is visible of the underground fuel tanks. A vent pipe is observed on the side of the garage building and a possible fill point is located on the south-east side of the forecourt area. There is no extant evidence of previous investigation boreholes/monitoring wells. A number of drainage channels including a culverted stream run beneath the forecourt area.

#### *Sub Area 2 – Garage Building and Frontage*

The former garage building is set back from the road frontage by a few metres, providing an asphalt surfaced access to the neighbouring property (The Bungalow). The garage building is a block walled and rendered two storey height building with timber roof trusses. The roof appears to be formed from felt and chipboard and is heavily degraded and the building is no longer weathertight. In the roof of the northern part of the garage, formerly occupied by a sign painting business, an unsupported length of ducting is present at roof height, assumed to be from a former extraction fan.

An inspection pit infilled with hardcore is visible in the concrete floor and a lowered area probably represents the location of a former hydraulic car lift. There is some discolouration on the floor but it is not clear if this resulted from former garage activities or from water ingress. No visible evidence of asbestos containing material was observed but its potential presence can not be excluded.

An overhead electrical feed passes over the centre of the building, running from the pole mounted transformer in Sub Area 4.

On the frontage of the area is a small enclosure in which a swan necked 75mm pipe discharges a continuous flow of water into a gully. This feature is mapped as a well on OS mapping. Although appearing to be artesian, it is understood to be a piped feed from a spring at higher elevation in the grounds of The Bungalow. It is separate from the culverted stream that crosses the yard and forecourt areas.

#### *Sub Area 3 – Yard Area including Site of Former Workshop, Inspection Ramp and Lock-Up Garages*

This area includes a large flat, concrete surfaced area to the rear of the forecourt currently forming part of the car park. A number of manhole covers are present indicating the culverted stream and drainage runs crossing the area. In the southern part of this area, on the Croft Cottage boundary, an open sided shed is present in a derelict state understood formerly to have housed a diesel pump for the coach depot. No evidence of the pump remains extant.

To the east of the area in use for car parking is the concrete floor of a former workshop building, now demolished. A large inspection pit is present that has been infilled with hardcore/demolition rubble. Further rubble, appearing to consist of inert materials from the demolition, is present to the

north of the former building. No visible evidence of asbestos containing material was observed but its potential presence can not be excluded.

To the north-west of the garage building, a large yard area, partially overgrown, is present. It is surfaced in hardcore consisting of granite and slaty material (shillet). This material may have originated from the Caradon Hill area and may be derived from historical mining wastes. To the northeast of the garage building a vertical pipe in the ground may be a former borehole or may be a drainage-related feature.

In the north of the yard area two mass concrete walls formed an inspection ramp for large vehicles (assumed, coaches). No evidence of staining on the concrete between the ramps was evident. To the east of this ramp are remains from a former building, assumed to have been a terrace of lockup garages, including broken concrete panels and metal doors. A more modern set of block walled lockup garages are located to the north of the ramp; these are unroofed and derelict, but no evidence of staining of floors was visible from outside. On the north-east boundary of the area an intake from a pond feeds water into a culvert that runs beneath the yard area. There is also an open ditch running along the site boundary.

#### *Sub Area 4 – Undeveloped Area to South-East*

This area is crossed by a number of ditches with flows of running water observed, draining to a chamber in the corner of the yard area on the Shute House boundary. A narrow culvert crosses the drain providing access to this area, which slopes up to the south-east corner of the Site.

The area is roughly vegetated and appears to have had scrub vegetation including trees removed in the past. There is no evidence of previous use (the culvert is too narrow to allow coaches to have crossed) and where visible the substrate appears to comprise natural clayey soil.

A pole mounted electrical transformer is present on the south-western boundary of the area near to the Methodist church.

#### *Surrounding Area Layout*

Refer to Table 2.3 above.

#### *Potentially Contaminative Land Uses: On Site*

- Former petrol filling station in forecourt area including underground storage tanks;
- Vehicle repair and maintenance activities and sign painting in former garage;
- Coach repair and maintenance in former workshop and parking and operation in yard area;
- Dispensing of diesel fuel at former pump in yard area;
- Possible use of mining waste material as hardcore in yard area.

#### *Potentially Contaminative Land Uses: Off Site*

A further garage and former petrol filling station is present on the opposite side of Jubilee Hill, 50m south of the site. It is not considered to be hydraulically up-gradient of the site. No other sources of potential current contamination were observed in the surrounding area.

### 3. Environmental Setting and Site History

#### 3.1 Review of Environmental Setting and Planning Information

A review of information from the data sources identified in Section 1.2 is presented in Table 3.1 below. Information considered to be of potential significance to land contamination on the site is shown in bold text.

**Table 3.1 Environmental Setting and Planning Information**

<b>Aspect</b>	<b>Review</b>
<b>Geology</b>	<p>According to the Groundsure report, which is based on BGS 1:50,000 scale geological mapping, there are no made ground or natural superficial deposits recorded beneath the site. The site is underlain by solid strata of the Bovisand Formation, comprising slate, siltstone and sandstone.</p> <p>A fault line is mapped trending north-west to south-east, parallel to the road frontage of the site (7m south-west, inferred, displacement unknown) and a further fault line is mapped trending south-west to north-east (78m north-west, inferred, reverse or thrust fault).</p> <p>A single BGS borehole record is located 68m south-east of the Site, for a well at Jubilee Hotel. It records 0.45m of "subsoil" underlain by 27.0m of "Blue Stone".</p> <p>Records from the site investigation carried out by SLR in 2008 record the following geological conditions at the site:</p> <ul style="list-style-type: none"> <li>• Made Ground, composition not recorded, from ground surface to between 0.3m and 1.1 metres below ground level (mbgl) (not present in all exploratory locations);</li> <li>• Tank Backfill, composition not recorded, to 2.3m bgl in one borehole;</li> <li>• Alluvium, comprising silty clay or silty gravel with organic matter, from the base of the made ground to between 1.0m and 2.0m bgl;</li> <li>• Weathered Bovisand Formation bedrock, comprising gravelly clay, clayey gravel and thinly laminated very weak slate, recorded to the base of the holes at maximum 4.7m bgl.</li> </ul> <p>According to the Groundsure report risks from geohazards such as shrink-swell clays, landslides, ground dissolution, compressible deposits, collapsible deposits and running sands, are identified as negligible or very low.</p>
<b>Background Contaminant Concentrations</b>	<p>According to BGS data in the Groundsure report, estimated background concentrations of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in natural topsoil in the area are as follows:</p> <ul style="list-style-type: none"> <li>• Arsenic 15-25 mg/kg</li> <li>• Lead 100 mg/kg</li> <li>• Bioaccessible Lead: 60 mg/kg</li> <li>• Cadmium 1.8 mg/kg</li> <li>• Chromium 90-120 mg/kg</li> <li>• Nickel 15-30 mg/kg</li> </ul> <p>Estimated background concentrations of arsenic, cadmium, chromium, lead and nickel are considered to be low relative to residential and commercial use Generic Assessment Criteria.</p>
<b>Radon</b>	<p>According to the Groundsure report the site lies within an area where between 5% and 10% of homes are above the action level for radon. Based upon the UK Radon map data and Building Research Establishment (BRE) guidance, basic radon protection measures are indicated to be necessary in the construction of new residential buildings or extensions in the area.</p>



Aspect	Review
<b>Hydrogeology</b>	<p>According to the Groundsure report, the Bovisand Formation is classified by the Environment Agency as a Secondary A Aquifer, containing permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Soil leaching potential is identified as high, representing soil that can readily transmit a wide range of pollutants.</p> <p>Water was struck at 3.3m below ground level in the aforementioned BGS borehole.</p> <p>Previous site investigations carried out on the site identified very shallow groundwater in made ground at levels at between 0.21m and 0.66m bgl and in one borehole in the bedrock at between 0.76m and 1.15m bgl. The report identified a hydraulic gradient to the west at between 2.5% and 4.5%.</p> <p>The site is not located within a groundwater source protection zone. There are no active potable or non-potable groundwater abstraction records within 1 km of the site.</p> <p>Two historical abstraction records within 1 km of the site refer to a single abstraction for general farming and domestic use, 625m south-east of the site. These are referenced to Trelay Farm, Pelynt.</p> <p>OS mapping refers to a well on the western edge of the site, however this is believed to refer to a collection chamber for culverted drainage beneath the site. A spring is also mapped in the south-eastern area of the site. The presence of springs on what is a ridge of high ground may be related to geological faulting in the area.</p>
<b>Surface Water</b>	<p>According to the Groundsure report, the nearest surface water feature is an inland river not influenced by tidal action, 10m south-west of the site. This is shown to flow westwards to join the Polperro River, which flows south south towards the coast. The site is recorded as being within the Polperro River catchment.</p> <p>There is also understood to be a stream culverted beneath the northern part of the site, running from a group of ponds located to the north-east to a chamber on the western edge of the site and thence into the above referenced stream.</p> <p>There are no current or historical surface water abstraction records within 500m of the site.</p>
<b>Flooding and Drainage</b>	<p>Reference should be made to flood risk assessment prepared for the development for details of flood risks to the site.</p> <p>According to the Groundsure report the site is not indicated to be within a Zone 2 or 3 flood plain. The highest risk of surface water flooding identified on the site is a flood depth of 0.1-0.3m in a 1 in 30 year return period event.</p> <p>According to the Groundsure report and EA online data, the site is considered to be at a very low risk of flooding from rivers and the sea and a negligible risk from groundwater flooding.</p>
<b>Protected Designations</b>	<p>According to the Groundsure report, the site is not within, or within 500m of, any area with protected environmental designations (SSSIs etc).</p> <p>Features of heritage interest (scheduled ancient monuments, listed buildings etc) within 250m include a number of listed buildings and gravestones in Pelynt village, the closest being Shute House, 13m south-west of the site.</p>
<b>Planning</b>	<p>According to planning records on the Cornwall Council online planning register there are two previous planning application records for the site, made to the predecessor Caradon District Council:</p> <ul style="list-style-type: none"> <li>• E2/01/00251/OUT, Outline Planning application for residential development and alteration to existing vehicular/pedestrian access to highway. The application was refused in March 2003 on affordable housing provision grounds. It was supported by the 2001 A. Robin Hood site investigation report.</li> <li>• E2/05/00718/OUT, Outline planning application for residential development and alteration to existing vehicular/pedestrian access to highway. This application</li> </ul>

Aspect	Review
	<p>was conditionally granted in November 2006 but was not implemented and is assumed to have expired. Conditions included Condition 18 requiring a site investigation and a remediation scheme to be carried out and submitted to and approved by the planning authority prior to commencement of development. There is no evidence that this condition was discharged although it is likely that the 2008 SLR contamination report was prepared with this intention.</p> <p>A current planning application is under consideration by Cornwall Council:</p> <ul style="list-style-type: none"> <li>PA20/10043 Demolition of existing buildings, erection of six dwellings, erection of three Class E units, with associated access, parking and landscaping provision. The incomplete 2008 SLR contamination report was submitted in support of this application. The Cornwall Council Public Protection Service as consultees has identified the need for a Preliminary Risk Assessment carried out to current standards and based on up to date information to be submitted, which this report is intended to provide. Planning conditions requiring site investigation, risk assessment, remediation and verification are likely to be imposed if the application is permitted.</li> </ul> <p>Planning records (PA15/05260, PA17/05898) relating to residential development in the grounds of Shoemakers Cottage, abutting the site to the south-west, have no information of relevance to land contamination.</p>

### 3.2 Review of Land Use and Regulatory Information

A review of land use and regulatory information from the data sources identified in Section 1.2 is presented in Table 3.2 below. Information considered to be of potential significance to land contamination on the site is shown in bold text. Clarification of specific entries is provided below the table.

**Table 3.2 Land Use and Regulatory Information for Site and Surrounding Area**

Aspect	On Site	Surrounding Area
<b>Past Land Use</b> including tanks, energy features, petrol stations, garages, military land (Groundsure report sections 1, 2)	<b>Four historical land use records found on site for a garage (dates 1973 to 1985).</b> See below.	<b>Two historical land use records found within 100m for a further garage (dates 1973-1985).</b> See below. Records found within 100m for an unspecified quarry, 76m southwest (1881) and a smithy, 84m north-west (1958).
<b>Current Industrial Land Use</b> including recent industrial land use, current or recent petrol stations, electricity cables, gas pipelines, sites determined as contaminated land, control of major accident hazards sites, explosives sites, hazardous and dangerous substances storage/use, licensed industrial activities and pollutant release, radioactive substance authorisations, licensed discharges to controlled waters, pollutant releases, pollution incidents and inventory records (Groundsure report section 4)	<b>One Pollution Incident record found (1m south-east).</b> See below.	<b>One recent industrial land use record found within 100m, for vehicle repair, testing and servicing. One current or recent petrol station record found within 100m.</b> See below.
<b>Waste and Landfill</b> including active or recent landfill, historical landfill, historical waste sites, licensed waste sites, waste exemptions (Groundsure report section 3)	No data found	Eight records found 81m northwest – 110m north at Hall Barton Farm, for a range of waste exemptions related to agricultural activities. See below.

Aspect	On Site	Surrounding Area
<b>Mining, Ground Workings and Natural Cavities</b> including natural cavities, Britpits data, surface ground workings, underground workings, historical mineral planning areas, non coal mining mining cavities, JPB mining areas data, coal mining, brine areas, gypsum areas, tin mining and clay mining (Groundsure report section 18)	Two records found for vein minerals. See below. One record found for surface ground workings, for ponds (date 1978).	No data found

Note: relevant regulatory information in the surrounding area is identified in this table if within 100m of the site boundary, or at greater distance if it is considered that the site could potentially have been impacted by the activity. Geolocation may be approximate and distances stated may vary from the actual distance.

**Garage on-site, Pollution Incident:** See Section 3.3. The records are considered to refer to the former Hambly's garage. The pollution incident was recorded on 24<sup>th</sup> December 2002 involving diesel fuel as the pollutant. The incident was considered a Category 3 (minor) impact to water, with no impact to land or air reported. No further information is available however it is assumed that the incident was related to the site.

**Garage/Petrol Station off-site:** See Section 3.3. The records are located between 47m south-west and 60m south-west and refer to a separate garage, Pelynt Garage. The current or recent petrol station record is described as obsolete.

Shafts, Mining and Minerals: The Groundsure report states that "localised small scale underground mining for vein mineral may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered". Mining history mapping prepared by A. K. Hamilton Jenkin shows no mining features in Pelynt parish and the area is not within a mining district.

Waste exemptions: Waste exemptions are made available for certain specified activities considered to pose a low risk to the environment and allowable waste types and quantities are limited. Evidence of off-site registration of farm-based waste exemptions, in the absence of other records, is not considered to be of significance to assessment of land contamination risks.

### 3.3 Review of Site and Surrounding Area History

A review of information on history of the site and surrounding area, from the data sources identified in Section 1.2 is presented in Table 3.3 below. Information considered to be of potential significance to land contamination on the site is shown in bold text.

**Table 3.3 History of Site and Surrounding Area**

Date	On Site	Surrounding Area
1881 and 1882 OS mapping	The site is shown as an area of undeveloped land in assumed agricultural use. A watercourse running in a south-westerly direction crosses the centre of the site. Two springs and three ponds are also shown on the site.	<b>Smithy present 20m south-east.</b> A range of buildings, assumed mainly residential, are present fronting the village street, north-west and south-west of the site. Two ponds are present abutting the site to the north-east and 25m north-east.
1907 OS mapping	Site remains undeveloped. One pond has been infilled and another is shown as marshy ground. Water trough present on road frontage.	<b>Smithy no longer identified</b> however building remains.
1956 (A. Robin Hood report reviewed in Section 4 below)	<b>Garage building constructed and two underground petrol tanks installed.</b>	No data.

Date	On Site	Surrounding Area
1958 OS mapping	Garage features not mapped. No changes evident from 1907 mapping (limited detail on small scale mapping)	No changes evident from 1907 mapping (limited detail on small scale mapping)
1965 to 1972 (A. Robin Hood report)	<b>Further two underground fuel tanks constructed.</b>	No data
1973 to 1978 OS mapping	<b>Garage building in western part of site is mapped. Small rectangular building to the south of this, probably a kiosk for fuel sales at the pump island. A linear feature consistent with the extant inspection ramp is mapped in the north of the site.</b> All ponds on the site have been filled in. A well is shown on the frontage of the site to the west.	<b>Further garage and forecourt mapped 50m south.</b> Additional ponds are mapped to the north of the site. Sewage works 170m west.
1980 to 1985 OS mapping	No change evident	No change evident.
1987 (A. Robin Hood report)	<b>Petrol retail ceased. Three underground tanks decommissioned.</b>	No data.
1995, 2001 and 2003 OS mapping	<b>Further workshop building present on eastern boundary of site. Row of five lock-up garages present to east of ramp in northern part of site.</b>	No change evident.
1999 and 2005 Aerial photograph	<b>Garage and workshop building present. Lock up garages to east of ramp no longer present, new lock up garages building present in northern corner of site. Small shed present on western side of south-eastern area with coaches parked to east (1999). Central area of site covered by hardstanding.</b> South-eastern corner undeveloped and vegetated.	Village development present to south-west and north-west of site. <b>Garage forecourt 50m south has canopy over.</b>
2009 Aerial photograph	<b>Workshop building cleared, pile of demolition rubble on east boundary. Lock-up garages to north have been de-roofed.</b> Garage building remains extant. No vehicles parked on site.	No change evident.
2010 OS mapping	Scale too small to show detail.	No change evident.
2016 Aerial photograph	No change evident.	No change evident.
2019 Aerial photograph	Frontage area in use as informal car park. Roof of garage building in derelict state.	No change evident.
2021 OS Mapping	Scale too small to show detail.	Scale too small to show detail.

Note: relevant historical activities in the surrounding area are identified in this table if within 100m of the site boundary, or at greater distance if it is considered that the site could potentially have been impacted by the activity.

## 4. Previous Site Investigation Reports

### 4.1 A. Robin Hood Associates, November 2001

This report was prepared on behalf of the then site operators and was described as a “report on preliminary site examinations for hydrocarbon contaminants associated with underground fuel tank installations and associated garage use”. It included desk-based study, a site walkover and intrusive site investigation.

The report was prepared whilst the site was in use as a coach depot and maintenance garage and contains contemporary information on the site history and operations. It is reported that the site was in use from the 1920s, with the then current buildings and facilities dating from the mid 1950s. The report identified the following storage tanks for fuel:

- Two 500 gallon petrol tanks, installed in 1956, size each 1.2m dia x 2.4m long, located close to the main garage building to the south-east, decommissioned in 1987 (filled with concrete and capped);
- One 1000 gallon petrol tank, installed in 1965, size 1.8m dia x 2.6m long, located close to the main garage building to the south-east, decommissioned in 1987 (filled with concrete and capped);
- One 4000 gallon petrol tank, installed in 1972, reported to be 1.9m dia x 2.9m long (though this is inconsistent with the stated capacity), converted to diesel storage in 1980, located close to the boundary with Shute House. This tank remained in use by the coach operator at the time of the report and fed a fuel pump located adjacent to the boundary with Croft Cottage.

The report noted that a series of culverted watercourses and land drains cross the site intercepting water from springs that formerly fed ponds located within the site boundaries.

Figure 4, extracted from the report, shows the layout of these features in the forecourt area of the site.

Site investigations comprised a number of boreholes and trial pits covering the site, with soil and groundwater samples taken. Groundwater samples were simple grab samples from the boreholes and trial pits. Water samples were also taken from the main culverted watercourse. There is no record of well installations.

The report recorded observations including that the highest concentrations of hydrocarbons were present in the packing sand around the tanks and that contamination levels in the surrounding clay formations were “minor”. No impact was observed near the diesel pump by the boundary with Croft House.

A few soil samples were tested for total hydrocarbons, a maximum concentration of 730 mg/kg being recorded. High concentrations of dissolved and emulsified hydrocarbons were recorded in two grab samples from trial pit excavations but given the limitations inherent in analysing this type of sample, no meaningful conclusions can be drawn.

Given the limited number of soil samples tested, the lack of speciation of the hydrocarbon testing, the lack of testing for other contaminants, the passage of nearly 20 years and the use of out of date assessment criteria, it is not considered that meaningful conclusions concerning distribution of contamination of the site or risk to future site users can be drawn from the report, however the contemporary information on site operations and tank storage is useful from a preliminary assessment perspective.

## 4.2 SLR Consulting Ltd, September 2008

SLR was commissioned by Cornwall Mining Services Ltd in 2008 to prepare a combined Phase 1 hazard identification and assessment and Phase 2 risk estimation and evaluation report for the site. The report was intended to enable discharge of planning condition 18 of conditional consent E2/05/00718/OUT, for a proposed housing development, however there is no record of it having been submitted to the then local planning authority, Caradon District Council. The report also makes reference to a soil contamination study by Cornwall Consultants Ltd in 2007 but this report has not been located by Westenviro and also appears not to have been submitted to the local planning authority.

Only the text of the SLR report is available; no drawings or appendices (containing for example environmental data, photographs, exploratory hole logs, chemical analysis certificates, monitoring data and assessment criteria) have been provided.

SLR described the former petrol filling station area as comprising two former rows of pump islands and a sales kiosk. They refer to the former 500 gallon tanks and the 1000 gallon tanks as having been filled with loose aggregate (this differs from the statement in the A. Robin Hood report that they were infilled with concrete). They state that the 4000 gallon diesel tank in the south-east of the frontage area was emptied except for around 130 litres of residual fuel. They note that the standing groundwater level within the chamber of the tank farm (presumably a concrete enclosure containing the tank) was 0.4m below ground level, assumed to equate to groundwater standing level.

Site investigation was carried out by SLR in August 2008 and included drilling of five boreholes installed with groundwater/gas monitoring wells, excavation of ten trial pits, collection of soil samples, monitoring of volatile organic vapours and groundwater and ground gas monitoring. Samples of made ground, natural soil and groundwater were analysed for a range of determinands and a generic risk assessment carried out.

Chemical analysis results for individual samples have not been provided however SLR has identified the following contaminants with elevated concentrations in soil samples both from the SLR investigation and from the preceding Cornwall Consultants investigation (relative to residential assessment criteria in use at the time):

Arsenic – maximum 7100 mg/kg (elevated in made ground);  
Cadmium – maximum 65 mg/kg (elevated in made ground);  
Lead – maximum 1800 mg/kg (elevated in made ground);  
Nickel – maximum 320 mg/kg (elevated in made ground);  
Gasoline range organics – maximum 410 mg/kg (forecourt area – tank and pump islands);  
Benzene – maximum 9.8 mg/kg (forecourt area – tank and pump islands);  
Toluene – maximum 52 mg/kg (forecourt area – tank and pump islands);  
m and p xylene – maximum 63 mg/kg (forecourt area – tank and pump islands);  
Aliphatic hydrocarbons C5-C6 – maximum 11 mg/kg (forecourt area – tank and pump islands);  
Aliphatic hydrocarbons >C6-C8 – maximum 73 mg/kg (forecourt area – tank and pump islands);  
Aliphatic hydrocarbons >C8-C10 – maximum 49 mg/kg (forecourt area – tank and pump islands);  
Aromatic hydrocarbons >C8-C10 – maximum 180 mg/kg (forecourt area – tank and pump islands);  
Aromatic hydrocarbons >C10-C12 – maximum 21 mg/kg (forecourt area – tank and pump islands);  
Benzo(a)pyrene – maximum 35 mg/kg (forecourt area – tank and pump islands);  
Dibenz (a,h) anthracene – maximum 6.6 mg/kg (forecourt area – tank and pump islands).

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Groundwater monitoring recorded standing levels between 0.2m and 1.15m depth, in the made ground or the underlying bedrock. Groundwater samples were recovered by low flow methods from the monitoring wells following installation. Chemical analysis results for individual samples have not been provided however SLR has identified the following contaminants with elevated concentrations in groundwater samples (relative to Environmental Quality Standards and Drinking Water Standards current at the time of the investigation):

Arsenic – maximum 0.09 mg/l  
MTBE<sup>1</sup> – maximum 0.05 mg/l  
Fluoranthene – maximum 0.00024 mg/l  
Benzo(b)fluoranthene – maximum 0.00054 mg/l  
Benzo(k)fluoranthene – maximum 0.00016 mg/l  
Benzo(a)pyrene – maximum 0.00047 mg/l  
Indeno(123cd)pyrene – maximum 0.00046 mg/l  
Benzo(ghi)perylene – maximum 0.00082 mg/l

The majority of exceedances recorded were from a sample from a single borehole stated to be located to the west (down-gradient) of the 4000 gallon tank.

Ground gas monitoring took place over three visits between August and September 2008. Trace amounts of methane were recorded and carbon dioxide up to 6.1% in one borehole with gas flows of 0.1 to 0.3 l/hr, giving a gas screening value of 0.0183 l/hr and equivalent to Characteristic Situation 1 under current BS8485 guidance. SLR suggested that this be increased conservatively to Characteristic Situation 2 pending further monitoring. There is no evidence that further monitoring was carried out.

However the current review indicates that many of the gas readings were likely taken when the well response zones were drowned out by high groundwater levels, rendering the monitoring data suspect.

SLR concluded that potential risks to residential site users exist from soil contamination by metals, hydrocarbons and PAH, and (pending further monitoring) from ground gas, likely requiring remediation works to remove contamination sources and provide gas protection measures to buildings. Radon protection would also be required. Risks to controlled waters from metals, MTBE, petroleum hydrocarbons and PAH were also indicated, however SLR considered that remedial works to deal with potential human health impacts would be sufficient to improve groundwater quality on the site.

There is no evidence to indicate that recommendations for further investigation or remediation on the site made by SLR have been carried out.

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<sup>1</sup> Methyl Tert-Butyl Ether, an unleaded petrol additive.

## 5. Conceptual Site Model

### 5.1 Introduction

Based on the review of the site history and environmental setting reported in the preceding section the following principal observations may be made:

- The site has been in use as a garage, petrol filling station, coach operators workshop and depot from the 1950s (and possibly earlier since the 1920s) until the 1980s. Petrol retail ended in around 1980 and some tanks were filled but a diesel tank continued in use by the coach operator until the late 1980s and its current condition is unknown.
- The garage building remains extant but is unused and no longer weathertight.
- The petrol retail and tank storage was limited to a forecourt area to the south of the existing garage building which is down-gradient of the rest of the site;
- To the east and north-east of the garage and forecourt area is a large former yard area, also containing a concrete ramp, a block of derelict lockup garages and concrete floor slabs for a former workshop (also containing an infilled inspection pit), and a previous block of lockup garages;
- The former yard area is surfaced with granite and slate/shale (shillet) hardcore. This may have been sourced from former mine wastes, possibly in the nearby Caradon Hill area.
- In the south corner of the yard area, a former diesel pump was located.
- To the south-west of the yard area, the triangular area extending to the rear of the Methodist chapel appears to have remained undeveloped and the soil substrate appears to consist of natural clayey soil.
- Several ditches containing flowing water, culverted watercourses and drains cross the site, following the groundslope which is generally to the south-west, except for the triangular area to the south-east, which falls in a north-westerly direction.
- Previous investigations have been carried out on the site in 2001 and 2007-8. The earlier investigation was not carried out to current standards and records of the later investigations are incomplete. Whilst there is no useable data for quantitative risk assessment purposes, the information has been useful in informing the current qualitative desk based assessment as shown in the following bullet points.
- The previous investigations identify elevated metal contamination in made ground where it is present across the site. This is at a level higher than local background concentrations.
- Hydrocarbon and PAH impact in soil has been identified in the forecourt area, mainly close to the former tanks. No impact was observed near the former diesel pump in the yard area.
- Detectable concentrations of MTBE and various PAH compounds exceeding assessment criteria were found in groundwater samples from a well downgradient of the former 4000 gallon tank but not recorded in other wells. A high dissolved arsenic value was also recorded.
- Potential off site contamination sources identified including a further petrol station 50m south and a former smithy are not considered to be significant potential sources of contamination affecting the site;

In terms of the sub-areas defined in Section 2.4, the main area of potential hydrocarbon (petrol and/or diesel) contamination possibly affecting soil and groundwater is the forecourt area, sub-area 1. There may also be hydrocarbon contamination (mineral oils) in the former workshop area, sub-area 2, and the former yard area, sub-area 3. Made ground in these sub-areas may be contaminated with elevated metals. Sub-area 4 appears to have been undeveloped and no contamination sources are evident.

Figure 2 provides a spatial representation of key features of the site and Figure 3 shows the subdivision of the site into assessment areas.



## 5.2 Proposed Use of Site

The proposed development is understood to comprise a mixed-use commercial/retail and residential development consisting of six houses with gardens and three commercial units together with access, parking and landscaping provision. Figure 6 provides the proposed layout.

In terms of standard end-uses defined for contamination assessment, the proposed development may be defined as part Commercial, a low sensitivity end-use, and part Residential (with consumption of home grown produce), a high sensitivity end-use. Figure 3 shows the spatial layout of the different end uses.

The development block plan submitted with the current planning application shows that the residential development area consists of the triangular area of land to the south-east (sub-area 4), most of which is undeveloped, but also including the south eastern portion of the former coach operators yard and former workshop building (Sub-area 3a, southern part). The commercial development area covers the forecourt (sub-area 1), former garage (sub-area 2) and the majority of the former coach operators yard area (Sub-areas 3a, northern part, and 3b).

The preliminary risk assessment, and outline conceptual model, developed below takes into account the different development sensitivities and the likely contamination profile of the sub-areas.

## 5.3 Methodology

The DEFRA/Environment Agency Land Contamination Risk Management (LCRM) framework defines the framework for contaminated land risk assessment in the UK. Note that this process does not consider physical risks from mining related features, not addressed in this report.

Three stages of risk assessment are defined: **Preliminary**, **Generic Quantitative** and **Detailed Quantitative**. An outline **Conceptual Model** that identifies **Potential Contaminant Linkages** (referred to under the former CLR11 guidance as Potential Pollutant Linkages) between a contaminant **Source**, a **Receptor** and a linking **Pathway**, should be established at the **Preliminary Risk Assessment** stage. This outline **Conceptual Model** should be developed to take account of all the existing information available at the time. It allows information required from subsequent environmental site investigation to be identified. As further information becomes available the outline **Conceptual Model** is updated.

Production of a **Conceptual Model** requires an assessment of **Risk** to be made. For there to be a **Risk** there must be a **Potential Contaminant Linkage**. **Risk** is a combination of the **Likelihood** of an event occurring and the **Severity** of the event.

Guidance is provided Annex 4 of the National House Building Council/Environment Agency/Chartered Institute of Environmental Health R&D publication 66, Guidance for the Safe Development of Housing on Land Affected by Contamination (NHBC/EA/CIEH, 2008) which updates and supersedes CIRIA C552: Contaminated Land Risk Assessment, A Guide to Good Practice (Rudland et al., 2001).

Based on R&D66, Annex 4, four categories of **Likelihood** of an event can be defined:

- **High Likelihood:** There is a contaminant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution;

- **Likely:** There is a contaminant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term;
- **Low Likelihood:** There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term; and
- **Unlikely:** There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Similarly, based on R&D66, Annex 4, four categories of **Severity** of an event can be defined:

- **Severe:** Highly elevated concentrations **likely** to result in “significant harm” to human health as defined by the EPA 1990, Part 2A, if exposure occurs.
- **Medium:** Elevated concentrations which **could** result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs.
- **Mild:** Exposure to contaminants **unlikely** to lead to “significant harm” to human health; and
- **Minor:** No measurable effect on humans.

A contaminant linkage must first be established before probability is classified. If there is no contaminant linkage then there is no potential risk. If there is no contaminant linkage then there is no need to apply tests for probability and consequence.

Once the **Likelihood** of an event occurring and its **Severity** have been classified, the table below can be used to define a **Risk Category**.

Severity	Severe	Medium	Mild	Minor
Likelihood				
High Likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/Low	Low
Low Likelihood	Moderate	Moderate/Low	Low	Very Low
Unlikely	Moderate/Low	Low	Very Low	Very Low

These **Risk Categories**, and the further actions that may be required as a result, may be defined as follows

- **Very High:** There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring;
- **High:** Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action;
- **Moderate:** It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild.;
- **Low:** It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild; and

- **Very Low:** It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

There is no potential risk if no contaminant linkage has been established.

#### 5.4 Conceptual Site Model and Risk Assessment Summary: Residential

Based on the data reviewed and the site walkover reported above the following table 5.4a presents the outline Conceptual Site Model summary for the area proposed for residential development. This is based on the proposed use class as residential (with produce consumption) and the site in its current condition. Observations are outlined in Table 5.4b on the following page.

**Table 5.4a Outline Conceptual Site Model Table: Residential Area**

Source	Pathway	Receptor	Risk (before mitigation)	Observation
Background level of arsenic in natural soils (Sub-area 4)	Soil ingestion, inhalation, direct contact	Construction workers; Future residential users of the site	Very Low	1
Elevated levels of heavy metals in made ground soils possibly derived from mining waste (Sub-area 3a south)	Soil ingestion, inhalation, direct contact	Construction workers; Future residential users of the site	Moderate	2
	Leaching into groundwater beneath site	Migration into surface waters	Very Low	3
Elevated levels of PAH and TPH (mineral oils and diesel) in soils resulting from maintenance and operation of coaches (Sub-area 3a south)	Soil ingestion, inhalation, direct contact	Construction workers; Future residential users of the site	Moderate/Low	4
	Leaching into groundwater beneath site	Migration into surface waters	Low	5
Potential presence of asbestos-containing materials (Sub-area 3a south)	Inhalation, direct contact	Construction workers; Future residential users of the site	Moderate/Low	6
Ground gas and volatile vapours from made ground including former pond infill and from hydrocarbon impact in forecourt area	Migration through made ground and granular soils and ingress into buildings	Buildings; Future residential users of the site	Low	7
Volatile contaminants capable of permeating polyethylene water pipes	Permeation into water pipes	Future residential users of the site	Moderate/Low	8
High background level of Radon in the area	Migration through subsoil and into buildings	Future residential users of the site	High/Moderate	9

**Table 5.4b Conceptual Site Model Observations: Residential Area**

Observation	Risk Justification, Further Action or Mitigation Required, Risk after Mitigation
1	Background total concentrations of arsenic in soils at 15-25 mg/kg would not exceed residential (with produce consumption) use Generic Assessment Criteria for arsenic. Furthermore experience indicates that background arsenic in natural soils in Cornwall is likely to be of low bioaccessibility (typically below 20%) and these concentrations of natural arsenic are unlikely to pose a risk to future site users. On this basis the current risk from background arsenic in Sub-Area 4 is assessed as <b>Very Low</b> .
2	Higher levels of heavy metals could be associated with made ground soils possibly derived from mining waste. Elevated levels of arsenic, cadmium, lead and nickel have been recorded in made ground samples from previous investigations though the sample locations are not known. On this basis the current risk from heavy metals in made ground in Sub-area 3a is assessed as <b>Moderate</b> .
3	Arsenic in mineral form is generally of low leachability. SLR has reported a single detection of elevated dissolved arsenic in groundwater however the location of this detection is not known. In general the risk of impact on surface waters from leaching of metals from made ground soils is considered to be <b>Very Low</b> .
4	There is potential for localised areas of elevated hydrocarbons (mineral oils) used in repair and maintenance of coaches, for example, lubricants. There may have been localised spillage of diesel in the area of the diesel pump in the south of Sub-Area 3a. There is no evidence of bulk fuel storage in this area and it is upgradient of the tank areas in the forecourt. On this basis the risks are assessed as <b>Moderate/Low</b> .
5	Elevated hydrocarbons in the former yard area are likely to be localised and likely sorbed on to soil. Investigations reported by SLR did not suggest that groundwater impact in this area was significant. Although there is the potential for leaching to occur, the risk of impact on surface waters from leaching of hydrocarbons from soils in the former yard areas is considered to be <b>Low</b> .
6	No visual evidence of potential asbestos-containing materials has been observed during the site walkover or recorded in previous site investigations but its presence can not altogether be excluded. It could be present as fragments of cement-bound material or fibrous material in made ground materials or demolition rubble in the former yard area. If present, if remaining moist in soil strata it is likely to be a low risk but this risk could increase if it is disturbed. On this basis the risk to the residential area of the site is assessed as <b>Moderate/Low</b> .
7	The majority of the housing area is on undeveloped ground with no ground gas/vapour source and a clay substrate that will retard migration of ground gases. There is made ground including pond infill in the yard area (Sub-area 3) and also the potential for organic vapours from volatile hydrocarbons in the forecourt area (Sub-area 1) that could migrate in granular fill/soil. However this will be mitigated by the high water table and also the likely degradation or loss of volatile compounds over time. On this basis the risk to the residential area of the site is assessed as <b>Moderate/Low</b> .
8	Volatile contaminants can permeate polyethylene water pipes and cause tainting to potable water supplies. This is unlikely to happen to pipes within the residential area but could occur where new water pipes are laid across the forecourt area. The risk is therefore assessed as <b>Moderate/Low</b> .
9	Radon is a radioactive gas generated by secular decay of uranium naturally present in granite rocks present at depth beneath Cornwall. As a gas, it can migrate through the ground and enter buildings. Between 5% and 10% of homes in the area are above the action level for radon. On this basis the risk to the residential occupants on the site in the absence of radon protection measures is assessed as <b>High/Moderate</b> .

## 5.5 Conceptual Site Model and Risk Assessment Summary: Commercial

Based on the data reviewed and the site walkover reported above the following table 5.5a presents the outline Conceptual Site Model summary for the area proposed for retail/commercial development (including car parking and deliveries). This is based on the proposed use class as commercial and the site in its current condition. Observations are outlined in Table 5.5b on the following page.

**Table 5.5a Outline Conceptual Site Model Table: Commercial Area**

Source	Pathway	Receptor	Risk (before mitigation)	Observation
Elevated levels of heavy metals in made ground soils possibly derived from mining waste (Sub-areas 1, 2, 3)	Soil ingestion, inhalation, direct contact	Construction workers; Future commercial users of the site	Low	1
	Leaching into groundwater beneath site	Migration into surface waters	Very Low	2
Elevated levels of TPH, BTEX/MTBE, from petrol and diesel in forecourt area including leaks/spills from tank storage in forecourt (Sub-area 1)	Soil ingestion, inhalation, direct contact	Construction workers; Future commercial users of the site	Low	3
	Leaching into groundwater beneath site	Migration into surface waters	Moderate/Low	4
Elevated levels of PAH and TPH (mineral oils and diesel) in soils resulting from garage and maintenance and operation of coaches (Sub-areas 2, 3)	Soil ingestion, inhalation, direct contact	Construction workers; Future commercial users of the site	Low	5
	Leaching into groundwater beneath site	Migration into surface waters	Low	6
Potential presence of asbestos-containing materials (Sub-areas 1, 2, 3)	Inhalation, direct contact	Construction workers; Future commercial users of the site	Low	7
Ground gas and volatile vapours from made ground including former pond infill and from hydrocarbon impact in forecourt area	Migration through made ground and granular soils and ingress into buildings	Buildings; Future commercial users of the site	Moderate/Low	8
Volatile contaminants capable of permeating polyethylene water pipes	Permeation into water pipes	Future commercial users of the site	Moderate	9
High background level of Radon in the area	Migration through subsoil and into buildings	Future commercial users of the site	Moderate	10

**Table 5.5b Conceptual Site Model Observations: Commercial Area**

Observation	Risk Justification, Further Action or Mitigation Required, Risk after Mitigation
1	Higher levels of heavy metals could be associated with made ground soils possibly derived from mining waste. Elevated levels of arsenic, cadmium, lead and nickel have been recorded in made ground samples from previous investigations though the sample locations are not known. However exposure of commercial users is expected to be limited. On this basis the current risk from heavy metals in made ground in Sub-area 3a is assessed as <b>Low</b> .
2	Arsenic in mineral form is generally of low leachability. SLR has reported a single detection of elevated dissolved arsenic in groundwater however the location of this detection is not known. In general the risk of impact on surface waters from leaching of metals from made ground soils is considered to be <b>Very Low</b> .
3	There is a potential for elevated hydrocarbons including BTEX/MTBE components of petrol to be present in soils as a result of historical leaks and spills from underground tanks and pipework. These losses could occur after closure if tanks are not fully decommissioned, however they may also attenuate naturally over time. Exposure of commercial users is expected to be limited and migration on to other sub-areas is not likely as the forecourt is downgradient of the rest of the site. On this basis the risks are assessed as <b>Low</b> .
4	There is potential for hydrocarbons lost from tanks or present in soils to migrate either as separate phase hydrocarbons (free product) or dissolved in groundwater. SLR indicated that there may have been dissolved phase hydrocarbons in a monitoring well downgradient of the 4000 gallon tank. There is a potential for these to enter surface watercourses crossing the site in culverts however the risk of significant impact being caused to these watercourses is assessed as <b>Moderate/Low</b> .
5	There is potential for localised areas of elevated hydrocarbons (mineral oils) used in repair and maintenance of coaches, for example, lubricants. However exposure of commercial users is expected to be limited. There is no evidence of bulk fuel storage in these sub-areas and they are upgradient of the tank areas in the forecourt. On this basis the risks are assessed as <b>Low</b> .
6	Elevated hydrocarbons in the former yard area are likely to be localised and likely sorbed on to soil. Investigations reported by SLR did not suggest that groundwater impact in this area was significant. Although there is the potential for leaching to occur, the risk of impact on surface waters from leaching of hydrocarbons from soils in the former yard areas is considered to be <b>Low</b> .
7	No visual evidence of potential asbestos-containing materials has been observed during the site walkover or recorded in previous site investigations but its presence can not altogether be excluded. It could be present as fragments of cement-bound material or fibrous material in made ground materials or demolition rubble in the former yard area. If present, if remaining moist in soil strata it is likely to be a low risk but this risk could increase if it is disturbed. However exposure of commercial users is expected to be limited. On this basis the risk to the commercial area of the site is assessed as <b>Low</b> .
8	There is made ground including pond infill in the forecourt and yard areas also the potential for organic vapours from volatile hydrocarbons in the forecourt area (Sub-area 1) that could migrate in granular fill/soil and enter buildings directly from the ground. Migration of ground gases and volatile vapours will be mitigated by the high water table and also the likely degradation or loss of volatile compounds over time. On this basis the risk to the commercial area of the site is assessed as <b>Moderate/Low</b> .
9	Volatile contaminants can permeate polyethylene water pipes and cause tainting to potable water supplies. This could occur where new water pipes are laid across the forecourt area. The risk is therefore assessed as <b>Moderate</b> .
10	Radon is a radioactive gas generated by secular decay of uranium naturally present in granite rocks present at depth beneath Cornwall. As a gas, it can migrate through the ground and enter buildings. Between 5% and 10% of homes in the area are above the action level for radon. On this basis the risk to the commercial occupants on the site in the absence of radon protection measures is assessed as <b>Moderate</b> .

## 6. Conclusions and Recommendations

### 6.1 Conclusions of Preliminary Risk Assessment

The following conclusions have been drawn from the Preliminary Risk Assessment:

- The western and northern parts of the site have been used as a petrol filling station, garage and coach operating and maintenance depot from the 1950s until the early 2000s. The south-eastern part of the site appears to have remained undeveloped.
- The former garage forecourt area is located at the lowest point of the site, including the frontage with Jubilee Hill.
- Former underground storage tanks are present at two locations in the forecourt area. Three tanks located close to the former garage building have reportedly been decommissioned in place in 1987 (though it is unclear what they were filled with). The fourth tank, near the boundary with Shute House, remained in use for diesel storage until after 2001 and its current status is not known.
- There is evidence from previous investigations, albeit incomplete, of elevated concentrations of metals in samples from made ground in the previously developed parts of the site, and of petroleum hydrocarbon, MTBE and PAH impact, albeit not at high concentrations, in soil and groundwater in the former forecourt area, downgradient of the disused fuel tanks.
- There is a potential for ground gas and volatile vapours to be present that may result in a requirement for gas/vapour protection measures. Previous monitoring is not considered to be reliable;
- High levels of radon are likely to be present in the subsoil and will require appropriate protection measures.
- Potential off site contamination sources identified including a further petrol station 50m south and a former smithy are not considered to be significant potential sources of contamination affecting the site;
- The proposed mixed-use development layout shows the residential development area comprising houses with gardens in the triangular area of the site to the south-east, mostly on the previously undeveloped area but also including a small area of the former coach depot.
- The proposed commercial development area comprising a retail unit and two other commercial units, an access road, delivery areas and car parking, mostly hard surfaced, will be located on the western and northern areas including the forecourt area and the majority of the former coach depot area.
- The majority of the potentially contaminated area is within the proposed commercial development area and will be mostly hard surfaced. Most of the proposed residential development area is on previously undeveloped ground and it is upgradient of the former forecourt and tanks.

### 6.2 Recommendations

#### *Planning*

The site will require a contamination investigation, risk assessment and/or remediation and verification works including final decommissioning and removal of the former underground fuel storage tanks. These requirements are considered to be relatively routine and are not considered to be undeliverable in the context of the proposed development. Therefore they can be secured by appropriately worded planning conditions.

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*Site Investigation and Risk Assessment*

Contamination site investigation is required to provide data to support a risk assessment of the Potential Contaminant Linkages identified in the Conceptual Site Model presented in Section 5 above. The scope should include shallow window sampler boreholes with groundwater and ground gas monitoring installations in the garage/forecourt area and close to the former diesel pump and trial pits in the former coach depot and undeveloped areas. Soil and groundwater sampling and ground gas/vapour monitoring will need to be carried out, the latter to comprise at least three rounds carried out in suitable atmospheric conditions. Testing of soil and groundwater samples will be required for the determinands identified in the Conceptual Site Model at a UKAS accredited laboratory.

Figure 5 shows the proposed layout of exploratory holes for the site investigation.

The scope of risk assessment will be dependent on the findings of the investigation. As a minimum, a Tier 2 Generic Assessment will be required. Depending on the findings, more detailed risk assessment may also be necessary.

*Remediation and Verification*

Remediation requirements are beyond the scope of the current report and in any case need to be defined following completion of the investigation and risk assessment phase. Provision of a remediation scheme and verification plan are expected to be conditioned by the planning authority. As a minimum it is expected that former tanks and any contents will need to be permanently decommissioned and removed, and any impacted soil and groundwater found in proximity to the tanks treated in situ or excavated for off site treatment or disposal following waste classification.

Remediation works will need to be subject to verification, to confirm that remediation objectives have been met and risks to future site users and the water environment mitigated.



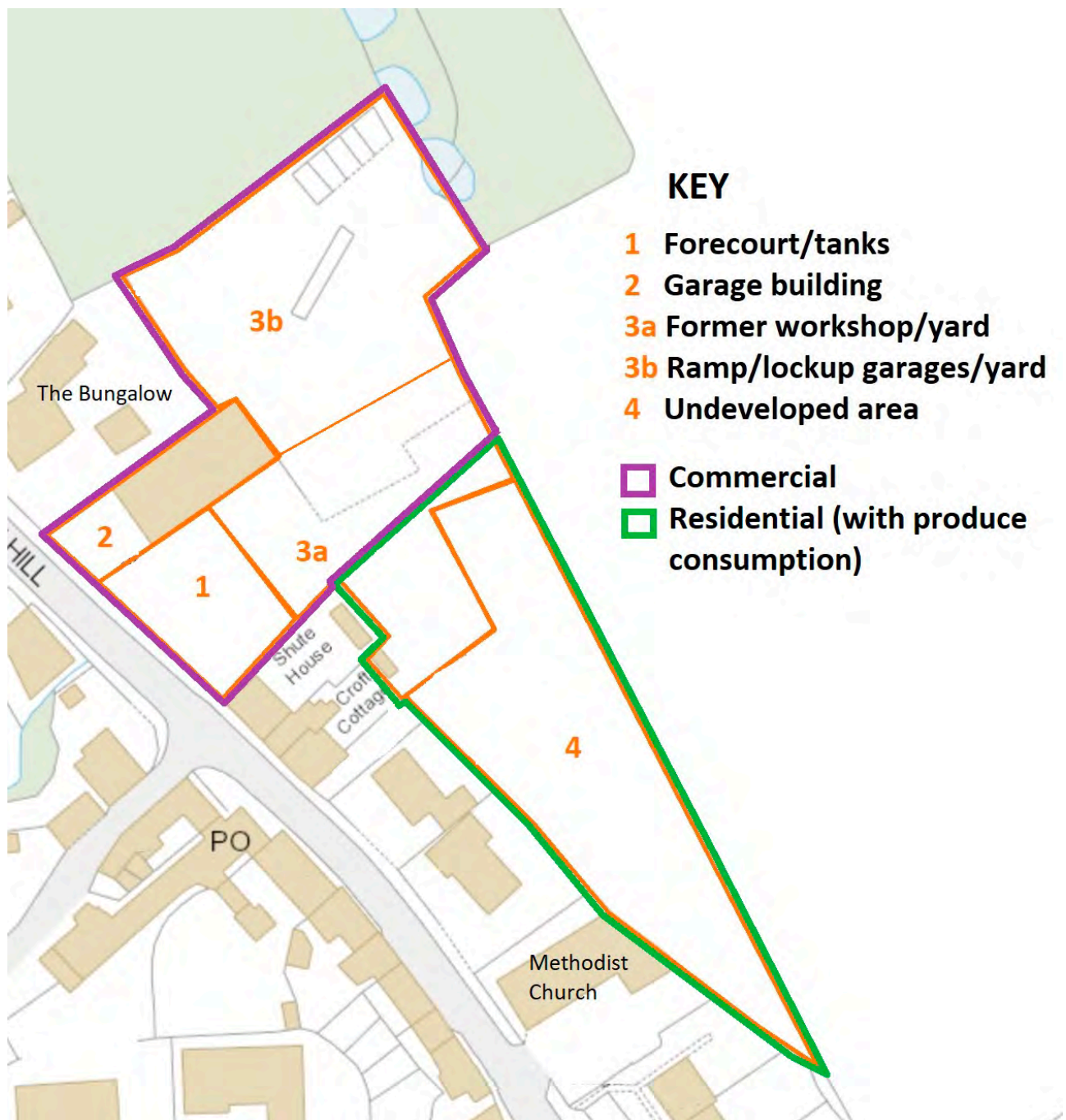


Figure 2: Aerial Photograph with Site Walkover Observations



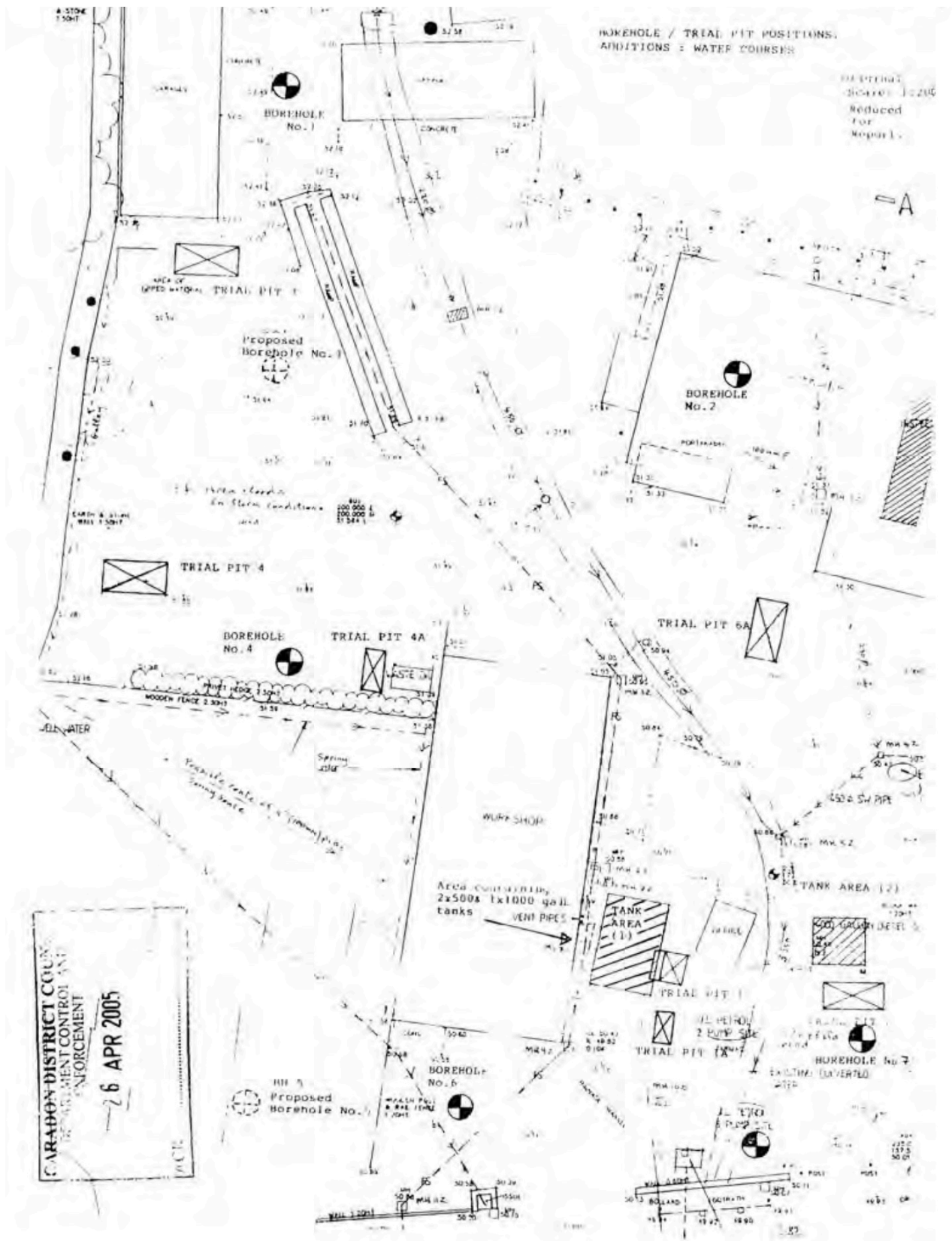
Note: plan not to scale. Red line shows site boundary. Position of features approximate and not surveyed.

**Figure 3: Site Plan showing Assessment Areas and Proposed Development End Uses**



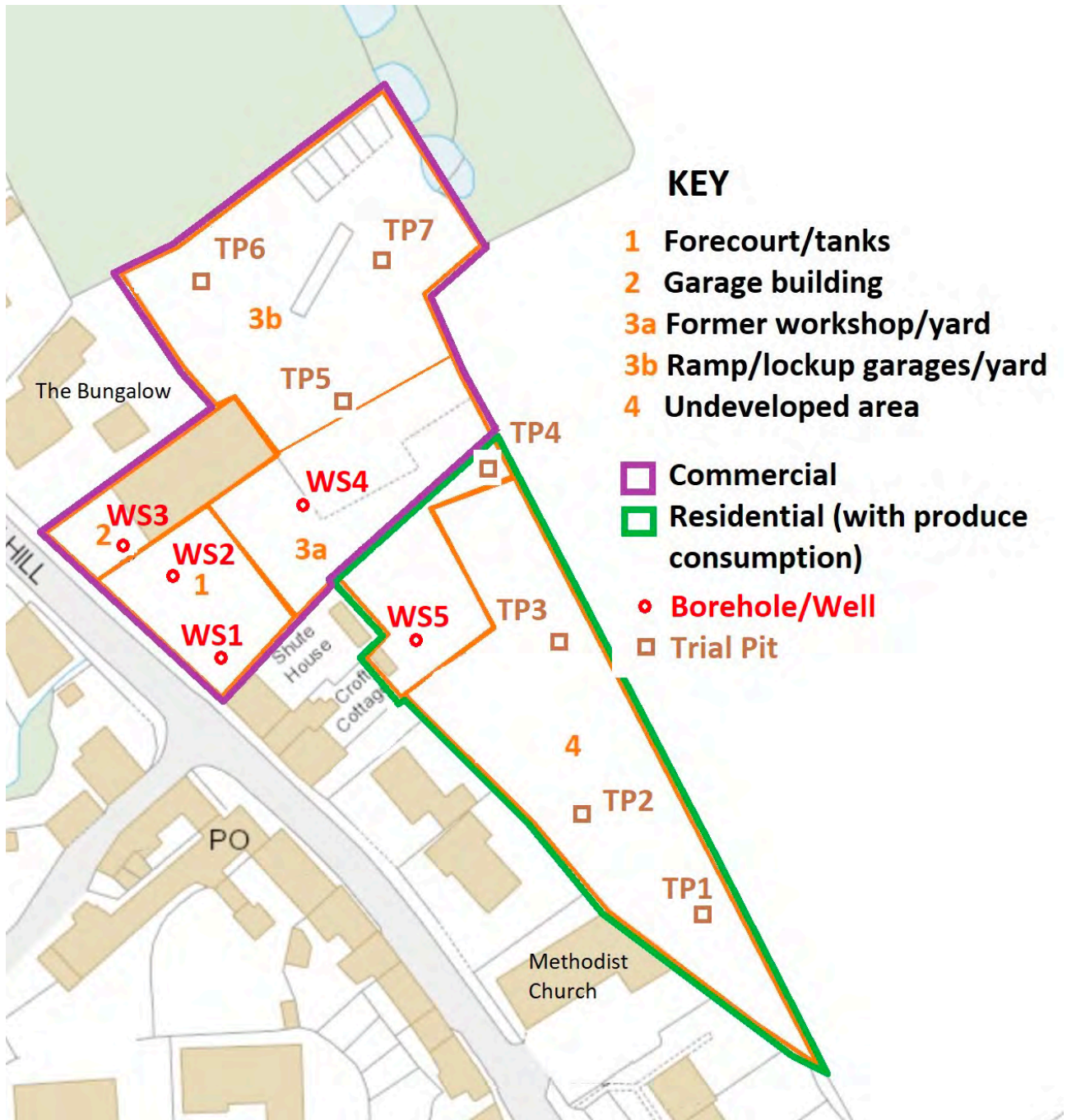
Note: plan not to scale.

Figure 4: Plan of Forecourt and Tanks extracted from A. Robin Hood Report



Note: plan not to scale and may have been distorted by microfilming process.

Figure 5: Proposed Site Investigation Plan



Note: plan not to scale.

Figure 6: Proposed Development Layout



Note: Extracted from GTH Block Plan drawing reference 2775-DR-A-050-001. Plan not to scale