westenviro ltd

Former Hambly's Garage, Pelynt, Looe, Cornwall

Remediation Scheme Report

Ref. 21011-R2

August 2021

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Former Hambly's Garage, Pelynt, Looe, Cornwall

Remediation Scheme Report

Report No. 21011-R2

Client:
Paul & Sophie Boxall

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1. Introduction

1.1 Background

Westenviro Ltd has been instructed by Paul & Sophie Boxall of Pelynt Post Office and Spar Store, to prepare a detailed Remediation Scheme Report 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 Previous Reports

Westenviro Ltd has previously prepared the following report on the site, for submission to Cornwall Council in support of discharge of planning conditions for the development:

> Report no. 21011-R1, January 2021: Former Hambly's Garage, Pelynt, Looe: Preliminary Risk Assessment Report.

A site investigation and assessment report was subsequently commissioned by the Client:

> Wheal Jane Consultancy, June 2021: Former Hambly's Garage, Jubilee Hill, Pelynt: Phase II Ground Investigation Report, reference SI20441PH2.

Elements of the previous reports have been summarised in the current report but reference should be made to the full text and appendices of these reports for details of the previous investigation and assessment works.

1.3 Purpose and Scope of Detailed Remediation Scheme Report

The purpose of the Detailed Remediation Scheme Report (sometimes referred to as a "Phase 3" report) is to identify and appraise remediation options and define remediation actions necessary to make areas of the site that will be redeveloped for residential and commercial uses, suitable for their proposed uses.

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, updated 19 April 2021) 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 Cornwall Council guide entitled Land Affected by Contamination – Developers Guide and Information Requirements for Planning Applications (Version 2, July 2021).

1.4 Description of Proposed Development

The development has been described in the planning application (PA20/10043) as: Demolition of existing buildings, erection of six dwellings, erection of three Class E units, with associated access, parking and landscaping provision.

The proposed development comprises 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.

The Site Characterisation Report did not identify levels of soil or groundwater contamination considered to be of concern on the Site. However a requirement for remediation actions has been identified in respect of decommissioning and removal of relict tanks and feed line infrastructure from the Site's former petrol filling station use.

1.5 Limitations

The scope of this report is limited to the provision of a factual and interpretative contamination report. The scope of this report does not include geotechnical sampling, testing or interpretation or mining investigation.

Westenviro Ltd has reviewed and assessed information from the Client, Wheal Jane Consultancy Ltd and others. Westenviro Ltd does not warrant and is not responsible for the accuracy of the information provided to it. The conclusions, opinions and recommendations presented in this report are based upon this information.

Interpretation of results from the contamination sampling is based on the observations reported of conditions encountered in the exploratory holes excavated, together with the analytical test results received, and are made in the context of the development proposals which the client has made Westenviro aware of at the time of the assessment. Conditions between exploratory holes may vary from those revealed at the positions of the exploratory holes and may change due to works on the site, spillages or other occurrences, between the completion of the delineation sampling and the commencement of the development.

The remediation scheme is presented for the purposes of discharge of planning conditions. Whilst works contractors will be expected to take account of the requirements of the scheme, it does not comprise a Design, Health and Safety Risk Assessment or Method Statement and does not remove the responsibilities of works contractors in relation to these aspects.

1.6 Generic Assessment Criteria Used in Report

To assess the chemical suitability of the site for the proposed uses, reported concentrations of contaminants are compared with *generic assessment criteria* applicable to standard end uses. The assessment criteria used published by Land Quality Management Ltd and the Chartered Institution of Environmental Health, are referred to as Suitable for Use Levels (S4UL) and have been obtained from the following publication:

Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

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 in the Preliminary Risk Assessment and may differ non materially from the area stated in the planning application forms.

2.2 Current Use of Site

The site is currently largely unused; the area of the former forecourt is used for car parking for users of the existing Post Office and Spar store. 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.

3. Summary of Site Investigation Report

3.1 Findings

Wheal Jane Consultancy carried out an agreed scope of ground investigation comprising five windowless sample boreholes to maximum 5.45m depth and seven machine excavated trial pits to maximum 3.30m depth. A water sample was also obtained from an historic exploratory hole. Installations were also completed for gas and groundwater monitoring. A total of four monitoring visits were completed.

Chemical analysis results from soil samples were compared against both commercial and residential guideline values. No exceedances of commercial guideline values were recorded. Two exceedances were recorded against residential (with consumption of home grown produce) guideline values, for arsenic and lead however both exceedances were recorded in samples from natural mudstone at over 2m depth and are not considered to pose a risk to future residential site users. Levels of TPH and PAH were well below guideline values and levels of BTEX and MTBE were below laboratory detection limits. Asbestos was not detected in any of the samples analysed.

Analysis of a groundwater sample indicated that levels of TPH, PAH, BTEX and dissolved metals, excepting arsenic, were below guideline values from freshwater Environmental Quality Standards and UK Drinking Water Standards. A modest exceedance of the arsenic standard was observed, likely due to natural mineralisation rather than pollution.

Ground gas monitoring showed non detectable concentrations of methane, a maximum concentration of carbon dioxide of 5.8% and a maximum concentration of carbon monoxide of 61 ppm. No detectable borehole gas flow rate was observed. Concentrations of carbon monoxide decreased over the four rounds to maximum 8ppm and it is assumed that the initial high readings were transient due to the drilling works introducing oxygen into previously anaerobic conditions with decomposing organic matter.

The Conceptual Site Model presented in the Phase II investigation report identified a moderate risk in respect of radon, requiring basic radon protection measures for proposed buildings, and a low to moderate risk in relation to TPH, PAH, BTEX and MTBE that could remain present in or close to relict tank infrastructure. Risks from contaminants in the made ground and natural ground, from asbestos, and from ground gas and volatile vapours, were assessed as low.

3.2 Recommendations

Recommendations in the Phase II investigation report apply to the forecourt area. They included compilation of a Phase III remediation strategy report, the decommissioning and removal of relict tanks and fuel lines by specialist contractors prior to development, removal or treatment in situ of impacted soil and groundwater, and testing of samples taken from the sides and base of the excavations following tank removal, and of any material to be removed from site for disposal. A verification report should also be produced.

4. Remediation Objectives, Assessment Areas and Time Frame

4.1 Objectives

The following remediation objectives have been established:

Identify areas where no remediation actions, other than the Watching Brief referred to below, are required, so that the relevant pre-commencement planning conditions may be partially discharged to allow work to commence in these areas;
Define remediation criteria and appraise options for remediation of the former forecourt area including dealing with tanks and any residual impacted soil adjacent, and justify the preferred options;
Present a detailed remediation scheme for the forecourt remediation works, including environmental controls necessary to protect the water environment and identification of good practice guidance to be followed in completing these works;
Provision of a Watching Brief protocol for dealing with any unexpected potentially contaminated material encountered during groundworks on the site;
Verification of satisfactory completion of the works by recording measurements, sampling and testing.

4.2 Assessment Areas

For the purpose of this report the following remediation assessment areas have been identified. These are defined spatially in Figure 2.

The residential development area, comprising a triangular area of ground in the south-east of the Site. There are no remediation or verification requirements identified in this area of the Site, other than basic radon protection, however the Watching Brief protocol should be observed during groundworks in this area.
The commercial development area, comprising the remainder of the site to the north and north-west, excepting the forecourt area. There are no remediation or verification requirements identified in this area of the Site, other than basic radon protection, however the Watching Brief protocol should be observed during groundworks in this area.
The forecourt area between the existing garage building, the Jubilee Hill frontage and the Shute House boundary, including the area where disused underground storage tanks formerly used for fuel storage are located. Remediation requirements in this area are associated with the removal of the relict tanks and fuel lines and are described in detail in Section 5.

4.3 Time Frame

The time frame for the remediation scheme will be dependent on factors such as the discharge of pre-commencement planning conditions, the build programme and the extent and nature of COVID19 restrictions remaining in place. It is therefore not possible to provide specific dates, however the general approach recommended to addressing the planning conditions and programming the works will be as follows:

Applying for discharge of the pre-commencement planning conditions related to contamination (Conditions 4, and 5), on completion of this report. Discharge of these conditions will allow remediation works to be programmed either in advance of or in conjunction with other groundworks on the forecourt area of the site to be progressed;

Concurrently, applying for partial discharge of the pre-occupation Condition 6 for defined areas of the site where no requirement for remediation or verification, other than observation of the Watching Brief protocol, has been identified. This will allow development on the unimpacted areas of the Site to be progressed;

For reasons outlined in the following section, the forecourt remediation should be programmed to take place after the demolition (to ground slab level) of the existing garage building.

5. Remediation Criteria and Options Appraisal: Forecourt Area

5.1 Remediation Criteria

Future use of the forecourt area will be as part of the commercial development, including the site access road. There will also be a surface water attenuation tank beneath the access road. In terms of CLEA standard use classes, this area is considered to be represented by a commercial end use.

No exceedances of commercial end use guideline values were recorded in the Phase II site investigation; even the more onerous residential (with produce consumption) guideline values were not exceeded. However whilst this might suggest that remediation would not be required, it is known that disused former fuel storage tanks, and possibly fuel feed lines and vent pipes, are present in the forecourt area. The tanks were not permanently decommissioned to current recognised standards and there is a potential for localised hydrocarbon impact in tank bedding and surround materials.

Remediation criteria are thus defined in terms of the permanent decommissioning of the tanks, dealing with localised contamination in bedding and backfill materials, and protecting existing and future drainage infrastructure from adverse impacts:

1. Relict tanks, feed pipes and vent pipes, will be permanently decommissioned to ensure that releases of residual hydrocarbon impact can not occur over the long term.
2. Residual hydrocarbon impact on bedding and surround materials, or if encountered in natural soils, will be remediated such that no unacceptable risk to commercial end users remains, and no risk from presence or migration of free phase hydrocarbons to existing or future drainage infrastructure remains.

5.2 Remediation Options Appraisal

Tank Decommissioning

Options for permanent decommissioning of the tanks comprise the following:

1. Decommission in place, by removal of residual fuel/tank bottoms and infilling with concrete;
2. Decommission and remove tanks and contents for disposal off-site.

Advantages of Option 1 are that excavation and disposal, and associated cost, is minimised. However there are several disadvantages. Construction of foundations and drainage infrastructure for the new development would be impeded and there is a risk that residual contamination within the tanks could be released in the long term if the tanks corrode. Furthermore access to bedding and surround materials, which could be impacted by hydrocarbons, would not be possible.

Advantages of Option 2 are that the removal of the tanks will leave the site unconstrained, that long term impacts from residual tank contents will be avoided and that access to impacted bedding and surround materials will be unencumbered. Disadvantages include the cost of off-site disposal and the need to keep excavations stable and dewatered.

The proposed development drawings show that the locations of the tanks will either be below the footprint of the proposed new store, or in an area where a drainage attenuation tank is proposed. Therefore the option to decommission the tanks in place is not considered to be viable. The remediation scheme is therefore based on the selected option, removal of the tanks and contents for disposal off-site.

Residual Contamination in Bedding/Surround Material and Soil

Options for dealing with bedding/surround material and soil with residual contamination comprise the following:

1. Physical, chemical or biological treatment and re-use of material on site;
2. Excavation, characterisation and off-site treatment and/or disposal.

A range of possible physical, chemical or biological treatment approaches could be considered within Option 1 if this option was considered to be favourable (Possible methods are listed in the Land Contamination Risk Management Options Appraisal Matrix spreadsheet for VOCs and non-halogenated hydrocarbons). Advantages of this approach are that excavation, material haulage and disposal costs could be minimised. Disadvantages include the time needed to implement the scheme, including monitoring and regulatory requirements, potential high setup costs for a limited volume of material and the difficulty of working in an area constrained by existing buildings, drainage infrastructure and access.

Advantages of Option 2 include the relative short time needed (although excavated material will need to be quarantined on site pending characterisation including waste classification) and the relative simplicity of the monitoring and verification requirements. Disadvantages include the cost of haulage and off-site treatment and disposal. However these are expected to be limited by the relatively small volume of material expected to require remediation, probably less than 100 m3.

The development proposals involve excavation for a number of drainage attenuation tanks which will result in surplus excavated soil, and there will therefore be no future on-site use for any material treated on site. There is therefore no advantage to be gained by on-site remedial treatment of any impacted material as it will in any case need to be taken off site as surplus for disposal. This negates the advantages of Option 1 and therefore the remediation scheme is based on the selected option, excavation, characterisation and off-site treatment or disposal.

On this basis, it is not considered necessary to use the Options Appraisal Matrix spreadsheet to assess further the range of possible physical, chemical or biological treatment approaches available.

6. Detailed Remediation Scheme: Forecourt Area

6.1 Scope and Layout

The scope of the remediation comprises tank decommissioning works and remediation of any impacted adjacent bedding/surround or natural soils, in the forecourt area. The forecourt area is bounded by the garage building wall, the frontage with Jubilee Hill, the boundary with Shute House and a manhole chamber cover on the surface water drain that crosses the site. Two "tank farm" areas have been identified from available information and the inferred layout of the forecourt area is shown in Figure 3.

Tank farm area 1 is assumed to be 7m x 6m in plan area. The tanks may have been installed within a chamber structure, construction details unknown. The longer side is parallel to and 1-2m offset from the wall of the existing garage building (a sewer pipe is assumed to run along the building edge) and the corner of the area is approximately 3m from the southern corner of the garage building. These measurements will need to be confirmed on site. There are two disused 500 gallon (2275 litre) tanks installed in 1956 and one 1000 gallon (4550 litre) tank installed in 1962. These formerly stored petrol and were taken out of use when the filling station closed in 1987. They are reported to have been filled either with concrete or with aggregate (possibly with cement slurry), and capped with a concrete slab.

Tank farm area 2 is located approximately 7m from the south-eastern boundary with Shute House and approximately 5m from a chamber cover on the surface water drain, in the centre of the forecourt and close to the overhead electricity line crossing the forecourt. Its dimensions are not known but it possibly installed in a chamber structure. A manhole is recorded on the survey plan of this area, possibly a fill point. The status of this manhole should be confirmed on site prior to excavation commencing.

Tank farm 2 is reported to contain a single 4000 gallon (18200 litre) tank, installed in 1970 that originally stored petrol but was converted to store diesel fuel in 1980. After closure of the filling station it remained in use for fuelling coaches until around 2001. In 2008 it was reported to have been emptied but not decommissioned and was stated to have around 130 litres of diesel fuel remaining in the bottom of the tank. It is not known if any later decommissioning work was carried out.

These tanks, and any chamber structures, require permanent removal as outlined below. There may also be fuel feed lines present, originally feeding pump islands near to the front of the forecourt area (a former above ground diesel feed line to a pump to the rear of the boundary with Croft Cottage is no longer extant) that require location and removed. Vent pipes, connecting to extant vents on the side of the current garage building, will also be removed.

The recent site investigation did not identify elevated petroleum hydrocarbons or detectable BTEX/MTBE in the wider site so any hydrocarbon impact on bedding/surround material is expected to be highly localised, possibly contained within any chamber structures present. The scope of the remediation will involve the excavation of bedding/surround material, segregation and temporary stockpiling in a quarantine area for testing and classification for subsequent removal off-site for treatment and/or disposal. If it is found during excavation that hydrocarbon impact has extended beyond the bedding/surround material, the impacted soil will be chased out and handled in the same manner.

6.2 Constraints

A number of site specific constraints are identified below:

1. Current use of the forecourt area as a car park, and all public access, will need to be discontinued for the duration of the works on the forecourt area.
2. Tank Farm 1 is located close to the wall of the existing garage. Excavation could destabilise this wall and it is therefore necessary that work to decommission this area is carried out after demolition of the existing garage building. When the building is demolished, the position of the vent pipes should be marked on the forecourt surface.
3. The existing surface water drain running across the forecourt area is close to the tank farm excavation areas. During decommissioning works, to prevent possible pollution in the event of damage, the drain should be plugged and surface water should be overpumped between the manhole on the north-east side of the forecourt area, and the manhole adjacent to the Jubilee Hill frontage.
4. Groundwater is high in the forecourt area and appropriate water control measures will need to be taken, possibly including siltbuster and oil-water separator treatment. A temporary lagoon for storage of dewatering water may be required.
5. The locations of the former tank areas will be affected by future drainage and foundation construction, including foundations of the new shop building affecting the tank farm 1 area and an attenuation tank affecting the tank farm 2 area. All chamber structures will require removal and the excavations will require temporary backfilling with suitable inert material following decommissioning.
6. Quarantine areas must be located on impermeable surfaces such as former building ground slabs, and remote from existing drainage.

6.3 Environmental Consultant Attendance

During the remediation works described in Sections 6.4 to 6.5 below, a full time watching brief will be carried out by an environmental consultant, who will also be responsible for taking and scheduling samples for analysis and consigning them to the testing laboratory.

6.4 Tank Decommissioning and Removal Requirements

Generally tank decommissioning will be carried out is accordance with the following guidance:

1. Environment Agency guidance on the gov.uk website[1]
2. Before You Dig, Garages and Filling Stations, Guidance for Developers, Environmental Protection UK, 2020
3. Fire Safety, Public Advice. Petrol Stations – Methods of Rendering Underground Storage Tanks Safe from Risk of Fire/Explosion. FS-PAN704, West Yorkshire Fire and Rescue Service, 2017
4. Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations, 4th Edition, APEA/Energy Institute, 2018 (The "Blue Book"), particularly Chapter 12, Decommissioning.

The following operations will be carried out:

1. Uncovering. The existing forecourt surfacing will be carefully removed to expose the top of the tanks and any chamber structure present. Surround material will be removed by hand to

[1] https://www.gov.uk/guidance/prevent-groundwater-pollution-from-underground-fuel-storage-tanks/decommissioning-an-underground-storage-tank

expose tank covers, filling points and feed/vent pipe connections. Any feed/vent pipes will be chased out, drained (residual product collected for off site disposal) and removed.

2. Inspection. The tank cover will be carefully opened up to confirm if any tank infilling has taken place and the nature of any infilling. Any cutting tools used must be non-sparking; if power tools are used they may need to be intrinsically safe. No hot cutting will be allowed.
3. Removal of residual product (Bottoming) – if tank not previously infilled. Residual product will be recovered using an appropriate safe method. No entry of personnel into the tanks will be allowed. Recovered product will be placed in suitable containers for hazardous waste disposal off-site.
4. Creation of inert atmosphere inside the tank (Inerting) – if tank not previously infilled or if infill has not completely filled the tank. This will be carried out in accordance with procedures in the Blue Book. Permissible options will include hydrophobic foam, nitrogen foam or nitrogen gas. If the latter method is used the atmosphere in the tank should be tested and purging continued until less than 5% oxygen is present. Water fill or dry ice methods will not be used. The inerting should take place shortly before tank removal.
5. Uplift of Tank: Once inerted, the tank can be lifted out of the ground following an appropriate lifting assessment taking account of the presence of any infill material. Tanks should be lifted using purpose made plant or using fabric straps and not using unprotected steel cables or chains. The recovered tanks should be placed in a bunded quarantine area prior to removal from site.
6. Tank Dismantling. This should only take place on site if necessary to reduce the size of the tank for road transport purposes, or if an infilled tank is too heavy to lift as a whole. Only cold cutting equipment should be used. The first step will be to cut an opening in the top of the tank to allow natural ventilation. Systematic dismantling should then proceed from the top downward. As all tanks on the site are likely to have contained leaded petrol, the prohibition of hot cutting will apply to the entire dismantling.

During these operations, appropriate safety signage, monitoring equipment including PID and oxygen meter, appropriate signage, fire extinguishing equipment and a supply of water, and spill kits, will be maintained on the site.

6.5 Excavation and Disposal of Residual Hydrocarbon Contamination

Bedding and surround material from around the tanks, probably comprising sand fill, will be excavated concurrently with and subsequent to the removal of the tanks. The excavated material will be initially segregated on the basis of visual/olfactory assessment (assisted by use of a PID) into assumed uncontaminated and assumed contaminated fractions. Both sets of material will be placed into quarantine areas.

Following removal of surround/bedding material, any chamber structures will be removed and natural soil behind will be assessed in the same way with any evident areas of contamination chased out and placed into the quarantine areas.

Quarantine areas will be formed on existing concrete slabs on the site, with edge bunds provided and covered by impermeable membrane sheets. Whilst awaiting the results of analysis and consignment off-site, the stockpiled soils will be covered with impermeable membrane sheets. Material will be sampled by the environmental consultant from the stockpiles and analysed for TPH, BTEX, PAH and WAC to enable the classification of the waste to be carried out.

The stockpiles will be classified individually and consigned to appropriately permitted treatment or disposal sites using registered waste carriers. Copies of hazardous waste consignment notes/waste transfer notes will be retained for inclusion in the verification report.

Following completion of the excavation works, the sides and base of the excavation will be

sampled by the environmental consultant on a minimum frequency of 1 sample per side and 1 per base, and minimum 1 sample per 40m2 area. If following receipt of analysis results, the verification acceptance criteria given in Appendix 1 are not met, the affected area will be further chased out and resampled.

6.6 Imported Backfill Requirements

If imported material is required to backfill the excavations it will be required to be inert and without artificial contamination. Material consisting of quarry-sourced China Clay sand may be assumed to meet this requirement. Any other material will require evidence of its status from a certificate of analysis from the supplier, or from sample analysis and testing carried out by the environmental consultant at a minimum frequency of 1 sample per 50 m3. Appendix 2 provides the acceptance criteria for imported backfill.

If required to facilitate import of material a U1 waste exemption will be registered for the site.

6.7 Verification Requirements

The following will be covered in verification reporting prepared by the environmental consultant:

Contemporary written and photographic record of the decommissioning and removal of the tanks;
Contemporary written and photographic record of the excavation of the bedding and surround material and any other impacted soils;
Analytical test certificates of stockpiled materials;
Waste consignment/transfer records for materials taken off site;
Analytical test certificates for sampling of base/sides of excavations, demonstrating compliance with verification acceptance criteria;
Analytical test certificates for sampling of imported backfill material, identifying the source of material demonstrating compliance with imported backfill acceptance criteria;
If required, an assessment of any residual risks.

The verification report for the forecourt area will be submitted to the planning authority on the completion of the works described above, together with a certificate from the environmental consultant confirming that the works have been completed in accordance with this scheme.

7. Watching Brief Protocol for Unforeseen Contamination

7.1 Scope

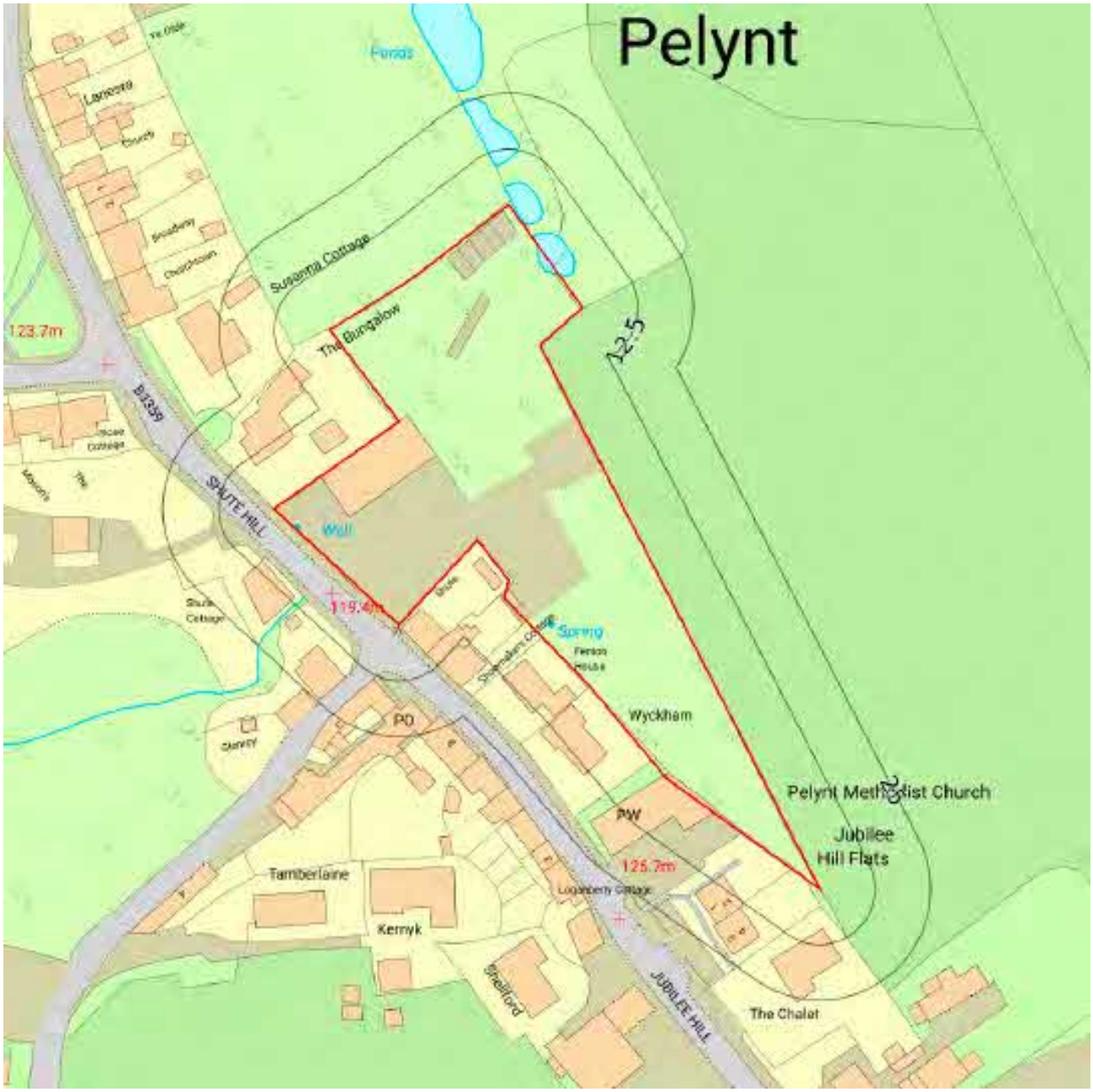
This protocol covers the entire site including parts of the forecourt area outside the two tank farm areas.

7.2 Procedure

Groundworkers will be made aware that there is a possibility that unexpected contamination may be encountered during ground disturbance, including removal of existing concrete ground slabs, at the site. The following procedure will be implemented by the works contractor in the event that material suspected of being contaminated is encountered on the site. Such material might include the presence of fuel or oil, buried wastes, suspect asbestos-containing materials or soils/groundwater with an unusual colour or odour.

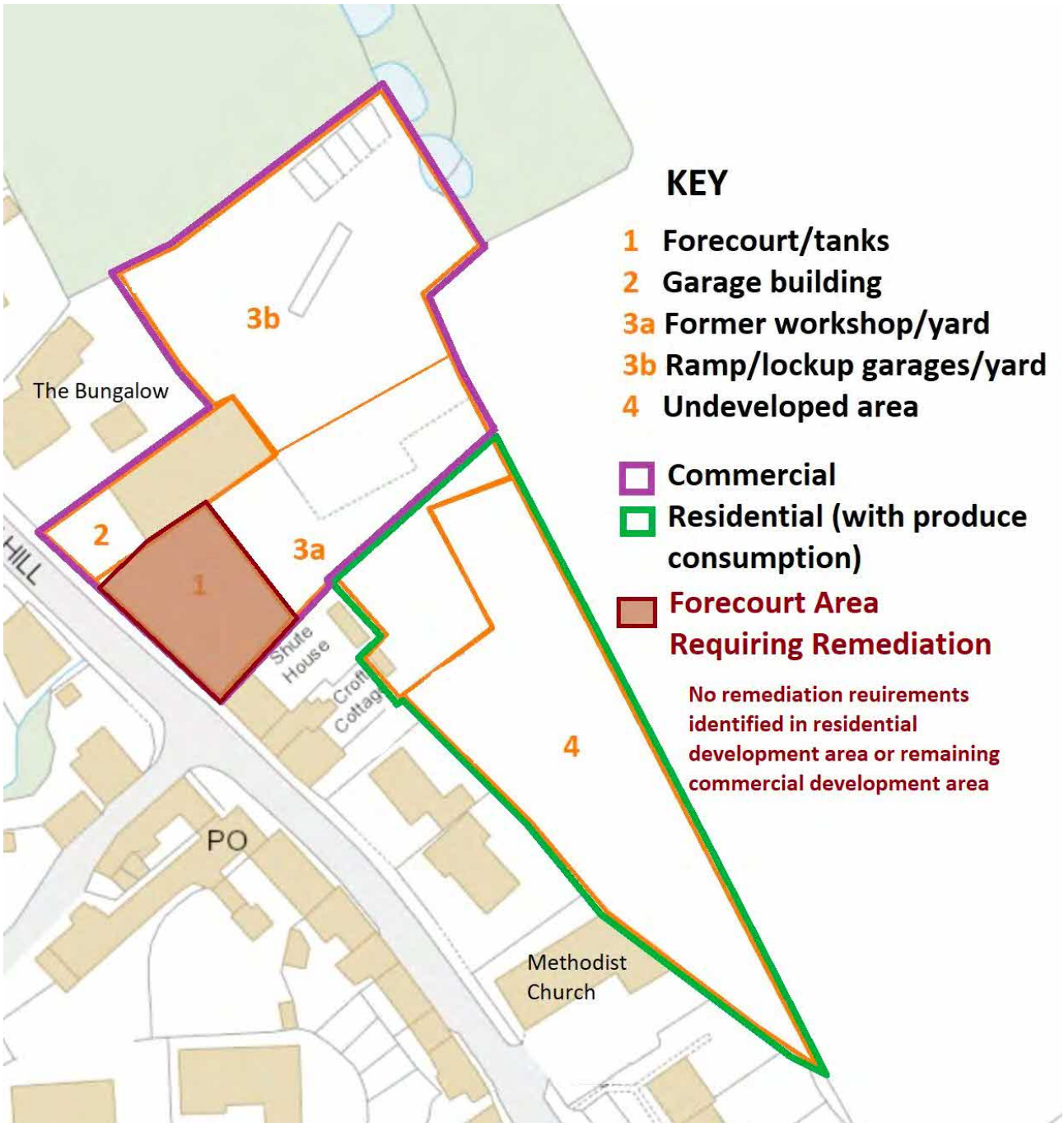
1. Work in the affected area will cease and the area will be fenced off and if necessary covered to prevent exposure of ground workers and spreading of the contamination;
2. The environmental consultant will be notified to attend the site to inspect and take samples for testing;
3. If the environmental consultant agrees, the material may be excavated and moved to a quarantine area, though it may need to be stockpiled separately from other excavated material. Otherwise, the area will need to remain quarantined;
4. If the environmental consultant considers that the finding will require a material change in the remediation scheme, the environmental consultant will inform the planning authority and the Contaminated Land Officer. In this event work in the affected area will remain suspended pending formal agreement of additional remediation requirements by the planning authority, in accordance with Condition 7 of the planning consent;
5. Work should not restart in the affected area until the environmental consultant informs the works contractors that any approvals required from the planning authority have been obtained. Any additional remediation works should also be completed before development works restart in the affected area.

Figure 1: Site Location Plan



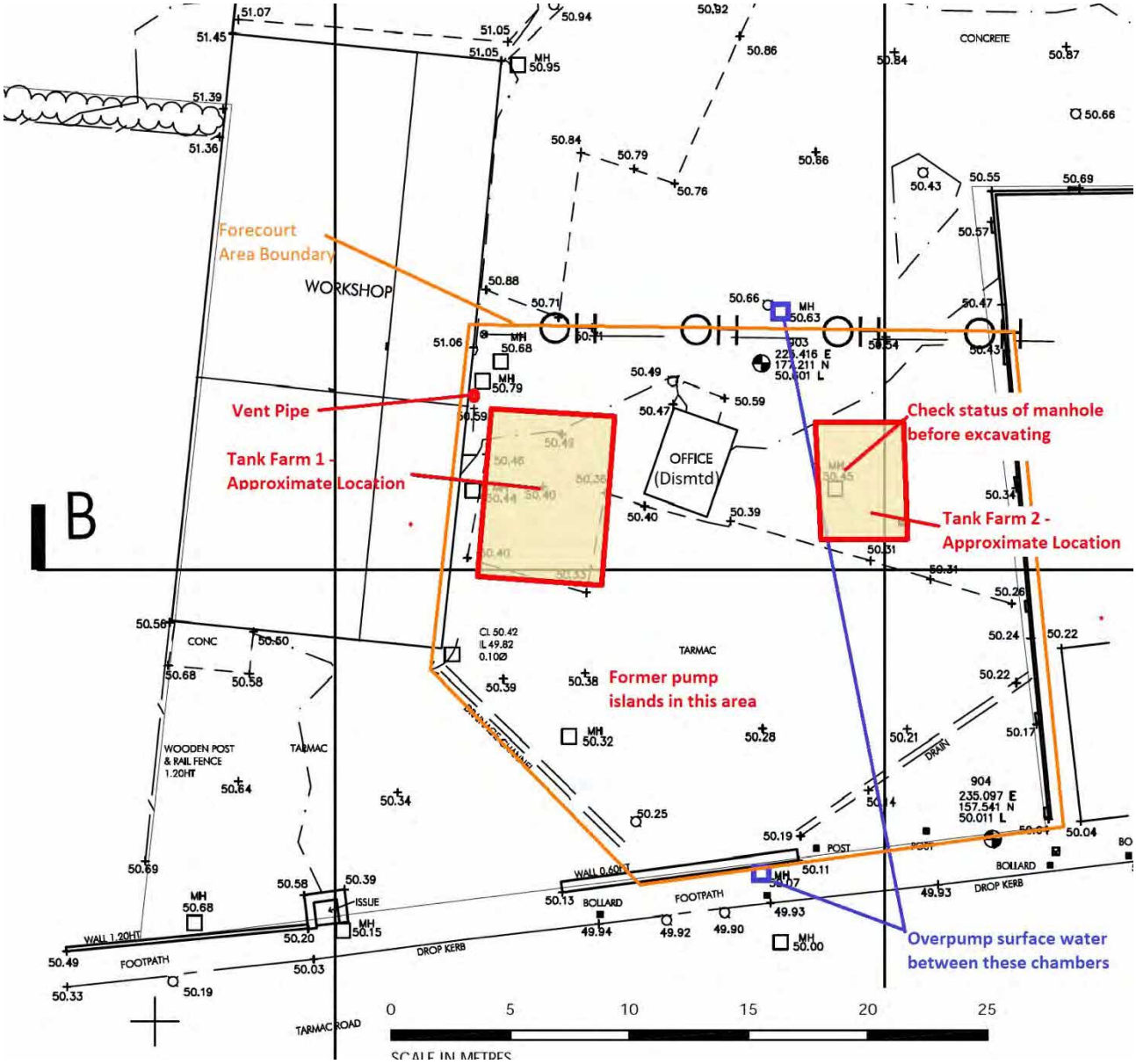
Note: Red line shows site boundary. Scale 1:1,250 approximate. Buffer lines at 12.5m and 25m from site boundary.

Figure 2: Site Plan – Existing Showing Remediation Area and Future End Uses



Note: plan not to scale.

Figure 3: Plan of Forecourt Area showing Approximate Tank Farm Area Locations



Note: Scale as shown. Plan is based on Client supplied survey drawing 14064.1.002 dated January 2015.

Appendix 1

Verification Acceptance Criteria

The following acceptance criteria are defined for verification testing of sides and base of excavations in the tank farm area. They have been defined on the basis of LQM/CIEH Suitable for Use Levels (S4UL)[1] defined for the Commercial end-use, or the total BTEX, TPH and PAH criteria, consistent with inert waste limits. The table below summarises the maximum permitted levels of contaminants. In the event that it is not possible to extend excavations to chase out all contaminants, for example at site boundaries or underground services, further risk assessment may need to be carried out.

Maximum Levels of Contaminants in Verification Samples (All values mg/kg unless stated)

Determinand	Maximum Level Permitted
Asbestos ID	0.1% n/a
Arsenic	640 LQM
Cadmium	190 LQM
Chromium (III)	8600 LQM
Copper	68000 LQM
Lead	2330 C4SL
Mercury (assumed elemental)	58 LQM
Nickel	980 LQM
Selenium	12000 LQM
Zinc	730000 LQM
Total BTEX	6 Inert
TPH aliphatic >C5-C6	See total TPH
TPH aliphatic >C6-C8	See total TPH
TPH aliphatic >C8-C10	See total TPH
TPH aliphatic >C10-C12	See total TPH
TPH aliphatic >C12-C16	See total TPH
TPH aliphatic >C16 -C35	See total TPH
TPH aromatic >C5-C7	See total TPH
TPH aromatic >C7-C8	See total TPH
TPH aromatic >C8-C10	See total TPH
TPH aromatic >C10-C12	See total TPH
TPH aromatic >C12-C16	See total TPH
TPH aromatic >C16-C21	See total TPH
TPH aromatic >C21-C35	See total TPH
TPH aromatic >C35-C44	See total TPH
Total TPH	500 Inert
Acenaphthene	See total PAH
Acenaphthylene	See total PAH
Anthracene	See total PAH
Benzo[a]anthracene	See total PAH
Benzo[a]pyrene	35 LQM
Benzo[b]fluoranthene	44 LQM

[1] Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3495

Determinand	Maximum Level Permitted
Benzo[ghi]perylene	See total PAH
Benzo[k]fluoranthene	See total PAH
Chrysene	See total PAH
Dibenzo[ah]anthracene	3.5 [LQM]
Fluoranthene	See total PAH
Fluorene	See total PAH
Indeno[1,2,3-cd]pyrene	See total PAH
Naphthalene	See total PAH
Phenanthrene	See total PAH
Pyrene	See total PAH
Total PAH	100 [Inert]

Note: n/a = Generic screening value not available/applicable
LQM = LQM/CIEH Generic Assessment Criteria, 2nd Edition,, 2009, based on 1% SOM
C4SL = Category 4 Screening Level (DEFRA, 2013)
Inert = Limits set to be consistent with WAC inert thresholds.

Appendix 2

Backfill Import Requirements

The following requirements are provided for imported soil to be used to backfill the tank farm areas.

General Requirements

Imported backfill material will consist of one of the following:

1. inert natural soils not containing elevated levels of artificial contaminants and complying with the maximum permitted levels identified below.
2. Quarry sourced processed materials derived from natural materials such as China Clay sand, or Type 1 sub-base complying with Highways Agency specification clause 803.

Imported backfill material will be of acceptable physical quality, not susceptible to moisture and capable of compaction, and able to support construction of attenuation tank structures, pavements and hard surfacing.

Contaminant levels in imported backfill shall be no greater than the LQM/CIEH Suitable for Use Levels (S4UL)[1] defined for the Residential (with consumption of home-grown produce) end-use, or the total TPH and PAH limits established to be consistent with inert waste limits. These standards are consistent with the levels of contaminants present in natural soils on the site. The table below summarises the maximum permitted levels of common contaminants:

Maximum Levels of Contaminants in Imported Backfill (All values mg/kg unless stated)

Determinand	Maximum Level Permitted
Asbestos ID	Detection n/a
Arsenic	37 LQM
Cadmium	11 LQM
Chromium (III)	910 LQM
Copper	2400 LQM
Lead	200 C4SL
Mercury (assumed elemental)	1.2 LQM
Nickel	130 LQM
Selenium	250 LQM
Zinc	3700 LQM
TPH aliphatic >C5-C6	42 LQM
TPH aliphatic >C6-C8	100 LQM
TPH aliphatic >C8-C10	27 LQM
TPH aliphatic >C10-C12	130 LQM
TPH aliphatic >C12-C16	See total TPH
TPH aliphatic >C16 -C35	See total TPH
TPH aromatic >C5-C7	70 LQM
TPH aromatic >C7-C8	130 LQM
TPH aromatic >C8-C10	34 LQM

[1] Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015.

Determinand	Maximum Level Permitted
TPH aromatic >C10-C12	74 LQM
TPH aromatic >C12-C16	260 LQM
TPH aromatic >C16-C21	See total TPH
TPH aromatic >C21-C35	See total TPH
TPH aromatic >C35-C44	See total TPH
Total TPH	500 Inert
Acenaphthene	See total PAH
Acenaphthylene	See total PAH
Anthracene	See total PAH
Benzo[a]anthracene	7.2 LQM
Benzo[a]pyrene	2.2 LQM
Benzo[b]fluoranthene	2.6 LQM
Benzo[ghi]perylene	See total PAH
Benzo[k]fluoranthene	77 LQM
Chrysene	15 LQM
Dibenzo[ah]anthracene	0.24 LQM
Fluoranthene	See total PAH
Fluorene	See total PAH
Indeno[1,2,3-cd]pyrene	27 LQM
Naphthalene	2.3 LQM
Phenanthrene	95 LQM
Pyrene	See total PAH
Total PAH	100 Inert

Note: n/a = Generic screening value not available/applicable
LQM = LQM/CIEH Generic Assessment Criteria, 2nd Edition,, 2009, based on 1% SOM
C4SL = Category 4 Screening Level (DEFRA, 2013)
Inert = Limits set to be consistent with WAC inert thresholds.