



FORMER LANGSTONE TECHNOLOGY PARK,
LANGSTONE ROAD, HAVANT -
INTERIM REMEDIATION VERIFICATION REPORT

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EXECUTIVE SUMMARY

Objectives	ADI Group appointed Envirotreat to undertake remediation works as set out in the agreed Remediation Strategy and Method Statement. This work intended to address the identified hydrocarbon contamination and address the requirements of the Environment Agency (potential risks to Controlled waters) and Havant Borough Council (potential risks to Human Health) .
Scope of work	Delineation of the TPH, PAH heavy metals impacted area around WS5 In-situ E-Clay stabilisation of the contaminated soil. Provision of a “Discovery Strategy”. Provision of a comprehensive Validation and Verification Report detailing the works undertaken, supporting documentation and photographic record. Human Health risks will be addressed by the development itself (gas membrane, concrete slab / hardstanding) and the 300 mm clean capping layer in soft landscaped areas
Ground model	The Delta Simons – Report Ref 19-0687.01 dated July 2019 recorded the following: Tarmac and sub-base or grass and topsoil, underlain by Made Ground (granular deposits with brick, concrete and occasional pottery and slate or cohesive deposits with gravels including flint, concrete and occasional brick and chalk) to 3.1 metres below ground level (m bgl) Superficial River Terrace / Brickearth across the majority of the Site comprising silty. Sandy gravelly Clay, with silty peat identified at one location and also clayey, sandy gravel to 5.5 m bgl Weathered Chalk bedrock comprising sandy gravelly clay or clayey sandy gravel with gravel comprising chalk and flints to 6.0 m bgl, over Chalk to a maximum depth of 24.9 m bgl. Fragments of organic material (including decaying wood, rootlets and grass) were also identified at three locations between 0.2 m and 3.1 m bgl. The EA classifies the superficial deposits as Secondary A Aquifers and the Chalk as a Principal Aquifer. The EA data also indicates that the Site is not in a designated groundwater Source Protection Zone (SPZ) however a SPZ 1 (inner zone) is located approximately 170 m to the north east associated with two potable groundwater abstractions listed 460 m to the north and 710 m to the north west. Groundwater was identified within superficial deposits between 2.1 and 2.8 m bgl rising to 2.0 and 2.5 m bgl. Within the two deeper locations groundwater was identified at depths of 5.8 and 6.0 m bgl rising to 3.0 m bgl.

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Human health risk assessment	Human Health risks will be addressed by the development itself (gas membrane, concrete slab / hardstanding) and the 300 mm clean capping layer in soft landscaped areas.
Controlled waters risk assessment	Contaminants of concern were recorded in groundwater sampled from beneath the site. However, concentrations were only marginally elevated above adopted assessment criteria.
Further work	This report covers the soil remediation works ONLY. A Final Validation Report will be issued on completion of both the gas membrane and topsoil validation works.

This executive summary is to be read in conjunction with the remainder of the report and should not be relied upon in isolation.

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A. INTRODUCTION

1. Terms of Reference

Envirotreat Solutions Ltd (hereinafter referred to as Envirotreat) was appointed by ADI Group (hereinafter referred to as 'the client') to undertake and validate remediation of contaminant linkages associated with the development of the former Langstone Technology Park, Havant ('the site').

2. Aims and Objectives

The aim of this interim verification report is to present details on the remediation works undertaken at the site to mitigate risks to human health and to confirm that works have been completed in accordance with the approved Remediation Strategy.

Outstanding remediation actions remain and will be covered under separate cover. These comprise the laying of clean capping in areas of soft landscaping and validation of gas mitigation measures.

Study limitations are provided in Appendix A.

3. Previous Reports

Envirotreat has been provide with the following previous reports pertaining to the site:

Applied Geology – Geotechnical Report on Ground Investigation at Langstone Technology Park – August 2021

Envirotreat has downloaded from the Planning Portal the following Site Investigation Report (some reports relate to the whole site):

Delta Simons – Phase 1 Environmental Assessment – November 2020 – this included several appended historical site investigation reports

Delta Simons – Preliminary Geo-Environmental Risk Assessment – July 2019

Clancy - Remediation Strategy Report Langstone Technology Park, Havant – November 2020

This report shall be read in conjunction with the above reports. Particular attention shall be made to the Remediation Strategy and Method Statement, which sets out the scope of works presented herein.

4. Regulatory Liaison

4.1 Planning Conditions

Planning permission has been granted for the redevelopment of the site (21/00405). This decision notice includes contamination-related pre-commencement planning conditions (conditions 9 and 16). These stipulate that prior to commencement, a site investigation is undertaken, a Remediation Strategy submitted including measures for addressing any unexpected contamination and the submission of a Validation and Verification Report.

It is intended that this report be submitted to the local planning authority to facilitate discharge of planning conditions 9 and 16.

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4.2 Regulatory Controls/ Permits

These works were completed under Envirotreat's Mobile Treatment Licence (MTL) (ref. EPR/EP3499SN).

Due to the scale of the works, formal deployment of the licence was not necessary. The works were undertaken in accordance with the submitted Remediation Method Statement.

B. BACKGROUND INFORMATION

5. Basic Site Details

5.1 Site Location

The wider Langstone Technology Park comprises a roughly rectangular parcel of land occupying an area of approximately 16Ha. The site is located toward the southern periphery of Havant, 600m south of the town centre and 1.5km south-east of Junction 5 of the A3(M).

The wider site comprises a series of large buildings subdivided into leased units of mixed uses. Occupying the centre of the site are a series of buildings including two plant buildings ('Building 2000 and 3000'), offices and amenity complex with associated courtyards ('Building 4000'), a large data and distribution centre ('Building 5000') with a waste storage area to the west, along with three-storey office buildings ('Building 6000 and 7000').

A small nursery is present to the south of Building 5000.

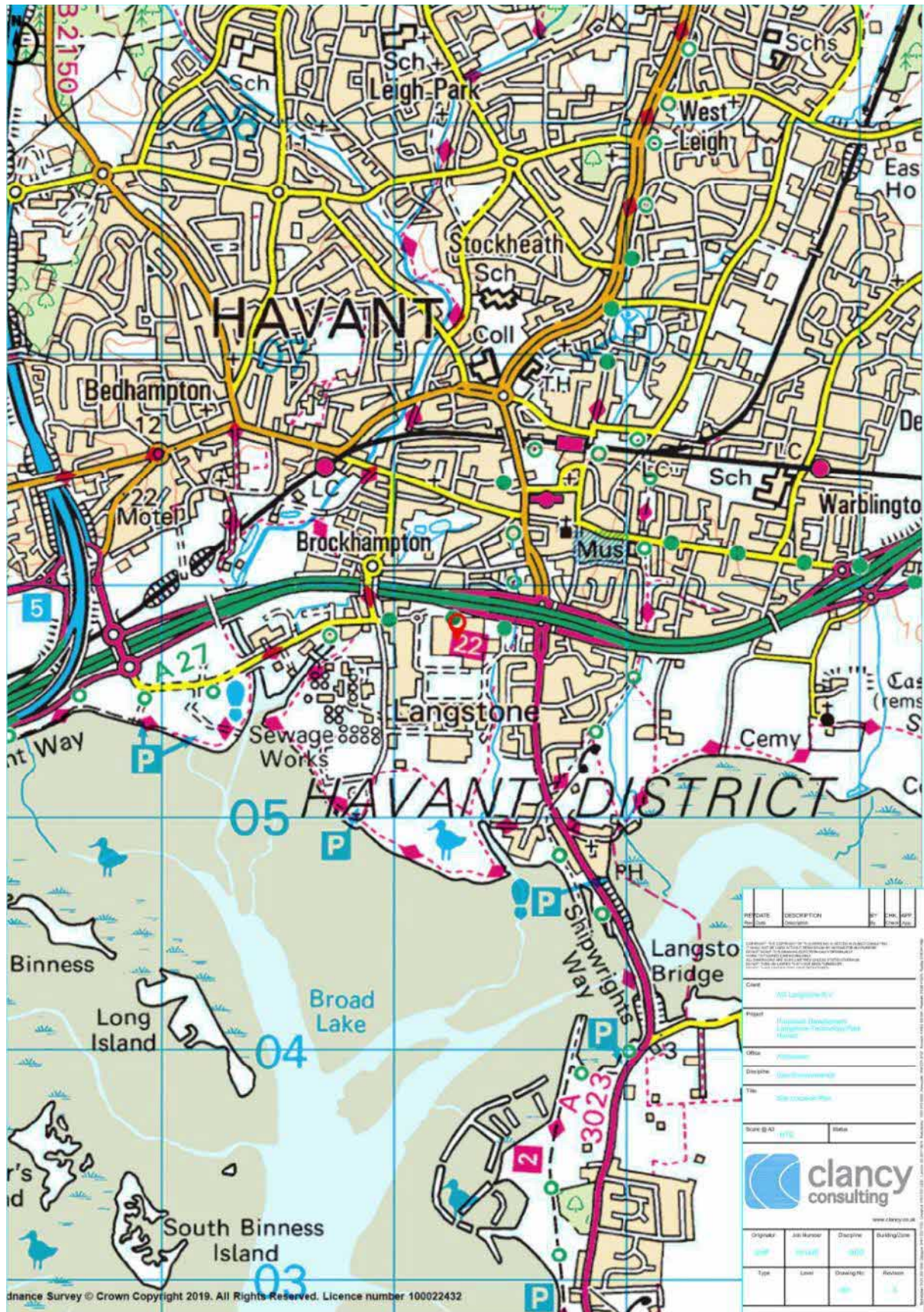
Located in the north of the site is 'Building 1000', a single storey structure built on top of a man-made embankment and understood to contain a number of offices, manufacturing and laboratory units with access tunnels running from the car park to the north to beneath the building.

Toward the south-western corner of the site is a small gymnasium, vehicle washing area (with associated subsurface drainage), a storage area and a number of circular historic tank bases.

Access infrastructure and soft landscaping covers the rest of the site, which include a number of engineered slopes. The remainder of the site is currently occupied by car parking areas (including the majority of the south of the site) – see figures 1 and 2 overleaf.

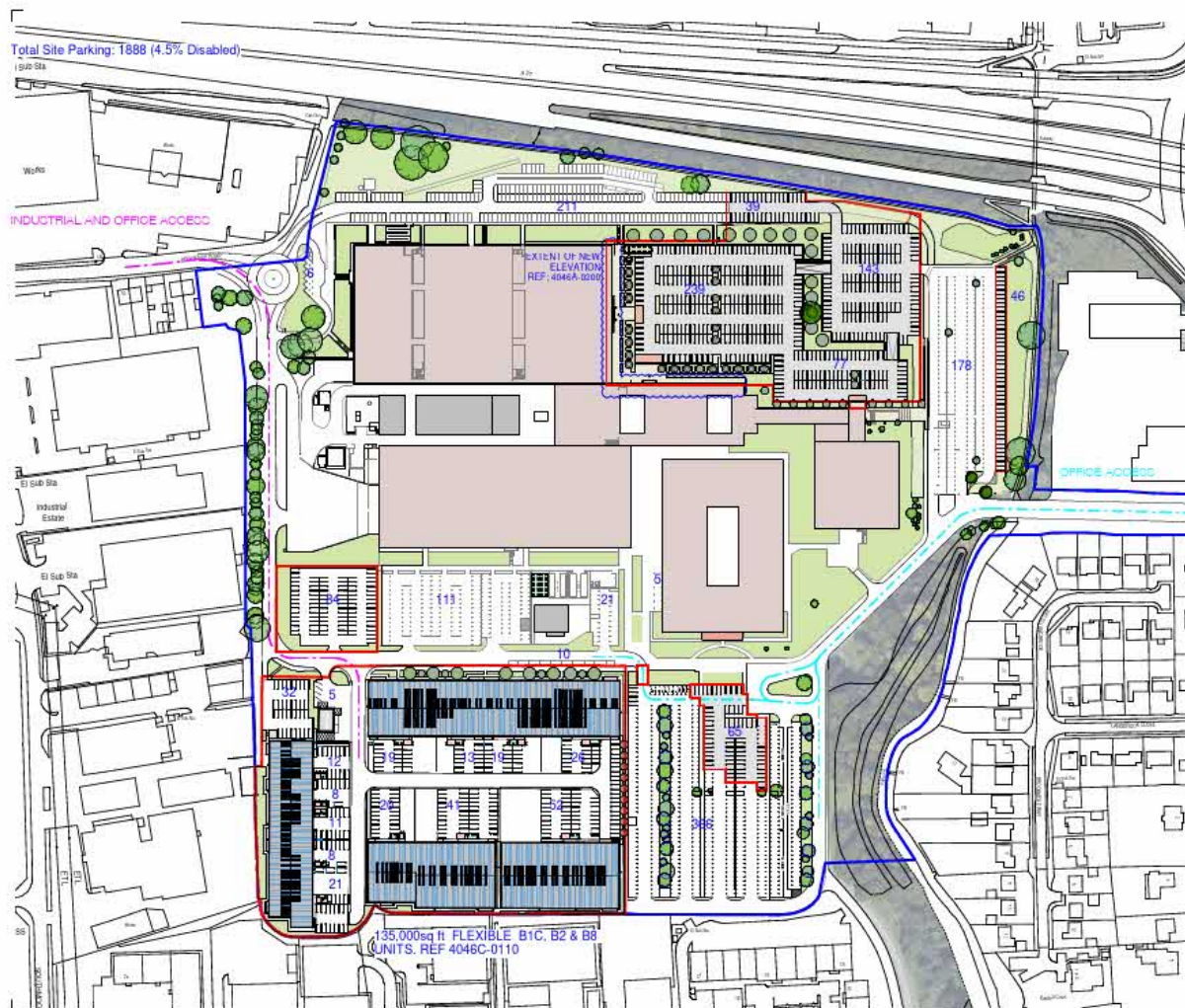
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Figure 1– Site Location



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Figure 2 – Site Location (development area)



5.2 Overall Objectives

Delta Simons and Clancy Consulting identified potential contaminant linkages relating to the historic use of the site and (receptors).

The following scope of works is proposed to address the remediation requirements:

- Delineation of the petroleum hydrocarbon (TPH) impacted area around WS5

- In-situ E-Clay stabilisation of the contaminated soil.

- Provision of a “watching brief” during enabling works

- Provision of a “Discovery Strategy”.

- Provision of a comprehensive Validation and Verification Report detailing the works undertaken, supporting documentation and photographic record.

- Human Health risks will be addressed by the development itself (gas membrane, concrete slab / hardstanding) and the 300 mm clean capping layer in soft landscaped areas.

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5.3 Summary of Environmental Setting

Historic Site Uses

Historical OS maps of the area indicate the site was undeveloped until the early 1900s, when a large sewage works, and engine house occupied the north-eastern section of the site. During the subsequent decades this facility underwent significant expansion. In the mid-1950s, an allotment garden occupied the centre of the site.

In the early to mid-1970s, the site had undergone large-scale redevelopment, resulting in the construction of many of the existing commercial / industrial units. A large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. By the early 1990s the building / electricity substation across the south of the site had been replaced by the existing car park and the site is understood to have been in its current configuration. The surrounding area has comprised a mix of undeveloped, and industrial land uses including mills, sewage works, works and industrial units and a retail park with associated infrastructure.

Ground Conditions

Clancy Consulting recorded the following ground conditions:

Ground conditions encountered in exploratory holes comprised up to 3.10m thickness of Made Ground, underlain by River Terrace Deposits to depths of up to approximately 6.00m bgl. The White Chalk Subgroup was recorded beneath the River Terrace Deposits and proven to a maximum depth of approximately 25.00m bgl.

Groundwater was recorded in the River Terrace Deposits from depths of approximately 2.00m bgl.

Groundwater in the superficial deposits is considered to be in hydraulic conductivity within groundwater in the underlying White Chalk Subgroup Principal Aquifer. Hydrogeology and Hydrology

The nearest surface water feature is the Langstone Mill Channel running north to south adjacent to the eastern boundary of the Site.

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5.4 Development Proposal

Development Team

The site will be redeveloped for commercial end use with associated parking, access and landscaped areas.

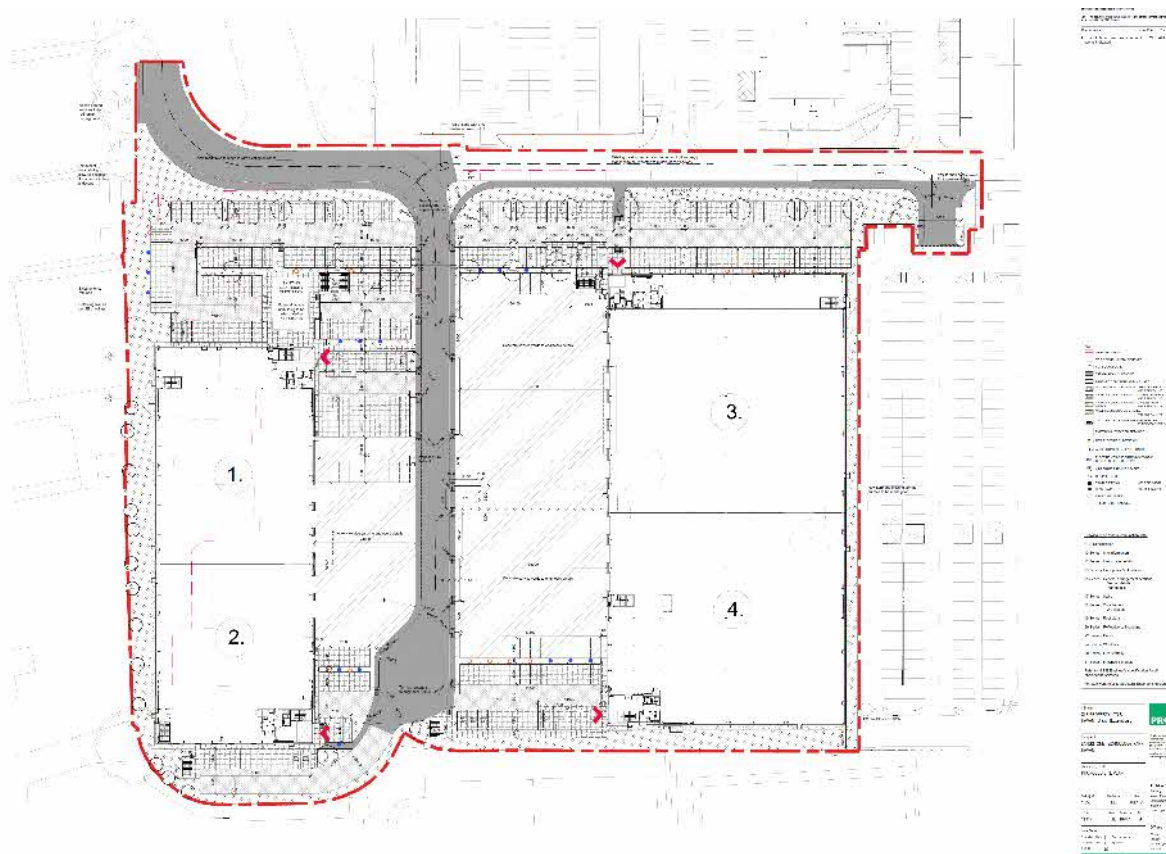
The development will be carried out by:

ADI Group
66 Melchett Rd,
Kings Norton Business Centre,
Birmingham
B30 3HX

Proposed Development

The Proposed development is shown in Figure 3 below.

Figure 3 - Proposed Development



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C.REMEDIATION WORKS

6. Introduction

The CSM identified risks to controlled waters from the leaching of TPH to groundwater. This phase of remediation was undertaken to mitigate this linkage via chemical immobilisation of contaminants within soils.

The overall approach for remediation was as follows:

1. Source Delineation
2. Mobile Treatment Plant Set up
3. E-Clay Stabilisation
4. Validation

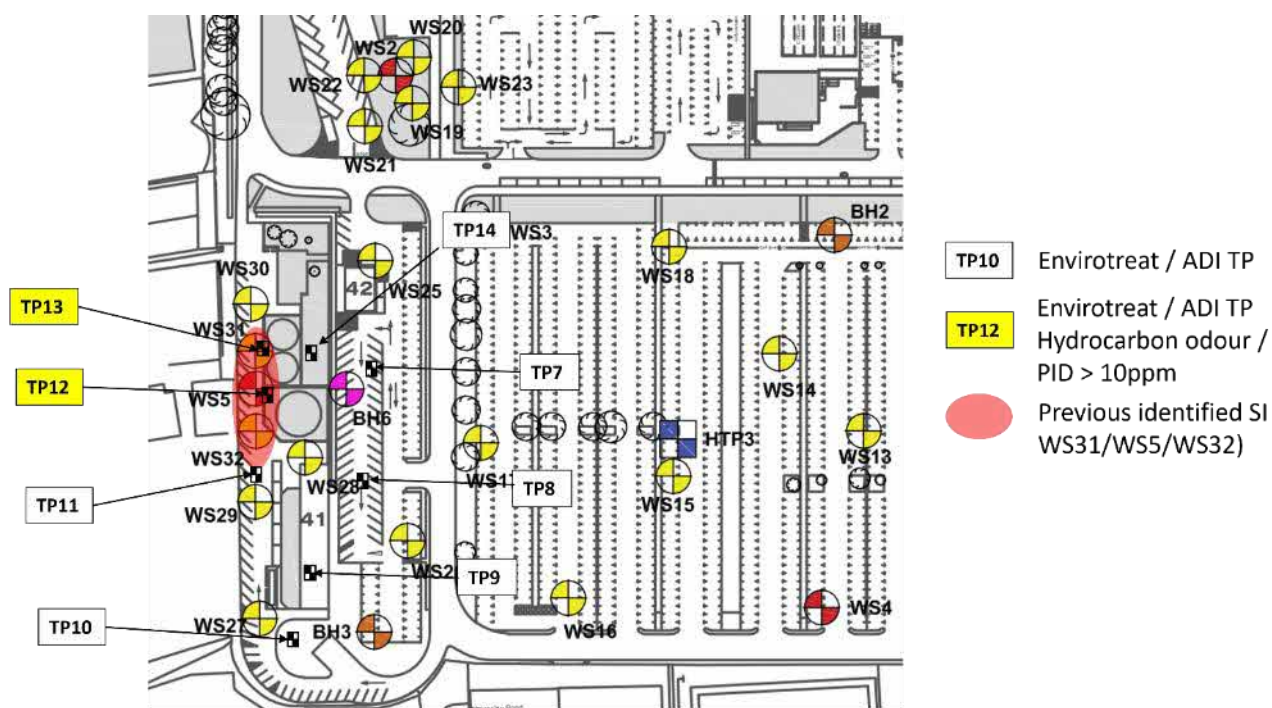
Remediation activities were deemed complete once the delineated source area had been treated and validated.

7. Source Area Delineation

A series of trial pits were excavated on 22nd January 2022 as part of the developer gaining a better understanding of ground conditions for ground improvement. Envirotreat attended site and assessed a number of the trial pits (TP7 to TP14 inclusive) in around an area of the site where contamination had been identified (WS5). Envirotreat utilised a Photo ionisation detector (PID) instrument to undertake headspace analysis of soil samples and olfactory observations.

The finding are summarised in Figure 4 below

Figure 4 – Trial Pit assessment by Envirotreat 22nd January 2022.



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Figure 5 – Approximate Area of Trial Pit assessment by Envirotreat 22nd January 2022.



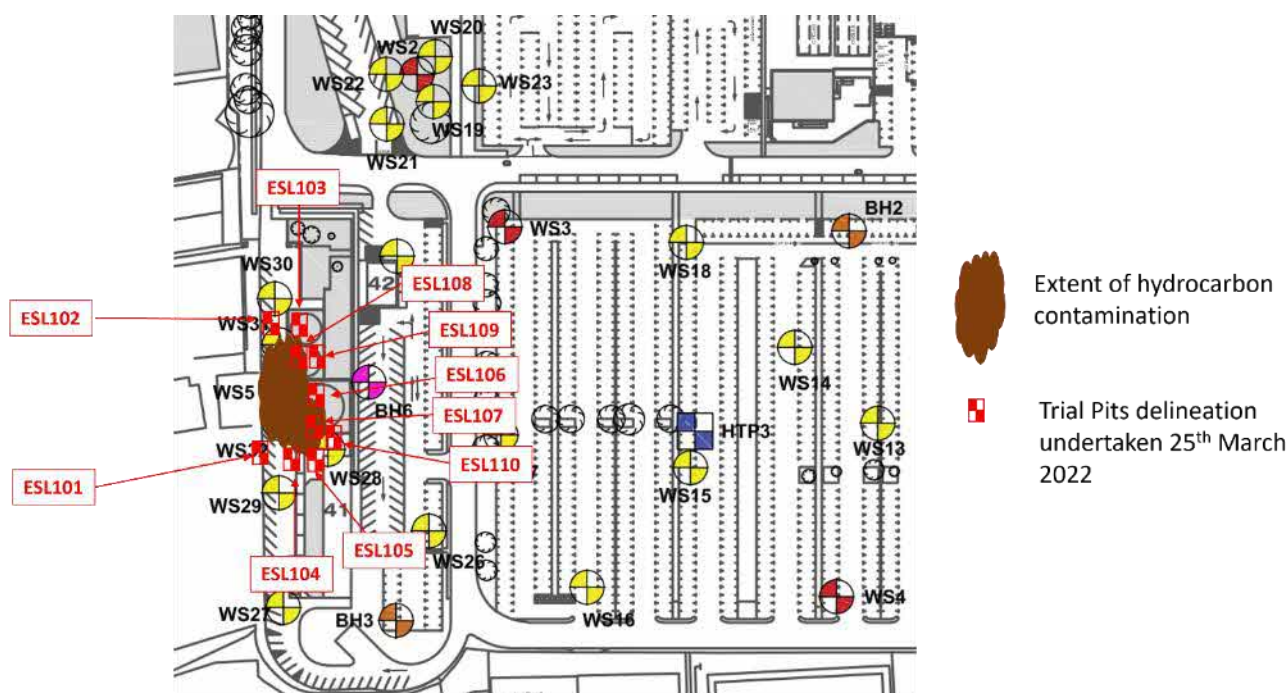
A Remediation Method Statement was prepared and submitted as a prelude to these works being undertaken.

On the 21st March 2022, Envirotreat attended site to fully delineate the hydrocarbon contamination associated with WS5. A series of trial pit excavations (ESL101 to ESL110 inclusive) were undertaken and assessed visually, olfactory and samples taken to support the onsite observations.

The olfactory and PID (headspace) analysis, the readings recorded are summarised in table 1 below.

The identified lateral extent (in light green colouration) of the hydrocarbon contamination is shown in Figure 5 below.

Figure 6 – Lateral Extent of Hydrocarbon Contamination Based on Trial Pit Excavations



The trial pits (ESL101 to ESL110 inclusive) were excavated to a depth of approximately 3 m bgl (or until groundwater was encountered). Soil samples were removed from the outer external face and screened using visual PID headspace analysis to determine the extent of the hydrocarbon impacted area. Confirmatory samples were collected and submitted to a UKAS / MCERTS accredited laboratory for appropriate analysis. This results of this analysis are summarised in table 1 below, the laboratory report is appended to this document.

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Table 1 – Summary of Delineation Trial Sample Analysis Summary

Lab Sample Number	Units	2217817	2217818	2217819	2217820	2217821
Sample Reference		ESL 101	ESL 102	ESL 103	ESL 104	ESL 105
Sample Depth		2.7	2.8	2.8	2.8	2.7
Date Sampled		25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Benzene	ug/Kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total TPH (aliphatic / aromatic) (EC5 - EC35)	mg/kg	< 10	< 10	< 10	< 10	< 10

Table 2 – Summary of Delineation Trial Sample Analysis Summary

Lab Sample Number	Units	2217822	2217823	2217824	2217825	2217826
Sample Reference		ESL 106	ESL 107	ESL 108	ESL 109	ESL 110
Sample Depth		2.8	2.7	2.7	2.8	2.8
Date Sampled		25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Benzene	ug/Kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total TPH (aliphatic / aromatic) (EC5 - EC35)	mg/kg	< 10	60	59	< 10	< 10

The readings taken from the PID during the delineation are summarised in Table 3 below and photos of the trial pitting shown on figures below.

Table 3 – Summary of PID Readings Taken During Delineation of the Hydrocarbon Impacted Area

Trial Pit Location	PID Reading / ppm
ESL101	0.0
ESL102	0.0
ESL103	0.0
ESL104	0.0
ESL105	0.0
ESL106	0.15
ESL107	46.1
ESL108	25.3
ESL109	1.5
ESL110	0.7

A screening value of <10 ppm (equivalent to >3,100 ug/m³ of benzene) was proposed by Clancy Consulting and agreed with the Environmental Health department at Havant Council (as set out in the Validation section of the agreed Remediation Method Statement – appended to this document).

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Figure 7 – Trial Pit Delineation (ESL101)



Note presence of GW at 2.8m bgl

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Figure 8 – Trial Pit Delineation (ESL107)



Note presence of GW at 2.8m bgl – hydrocarbon odour, possible iridescence of GW surface.

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Figure 9 – Trial Pit Delineation (ESL109)



Note presence of GW at 2.8m bgl and slight discolouration of soil at / near groundwater (possible smear zone)

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Figure 10 – Trial Pit Delineation PID Headspace Analysis (ESL109)



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Figure 11 – Trial Pit Delineation PID Headspace Analysis (ESL102)



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Laboratory analysis of the base and side validation samples confirmed that all samples were below the required remediation target criteria (with the exception of ESL 107 and ESL 108). The treatment area was extended as shown in Figures 14 & 15 overleaf (grid sections B and K respectively), prior to the addition of treatment reagents soil samples were assessed using a PID to confirm the extent of the extended grid sections; the results were as below

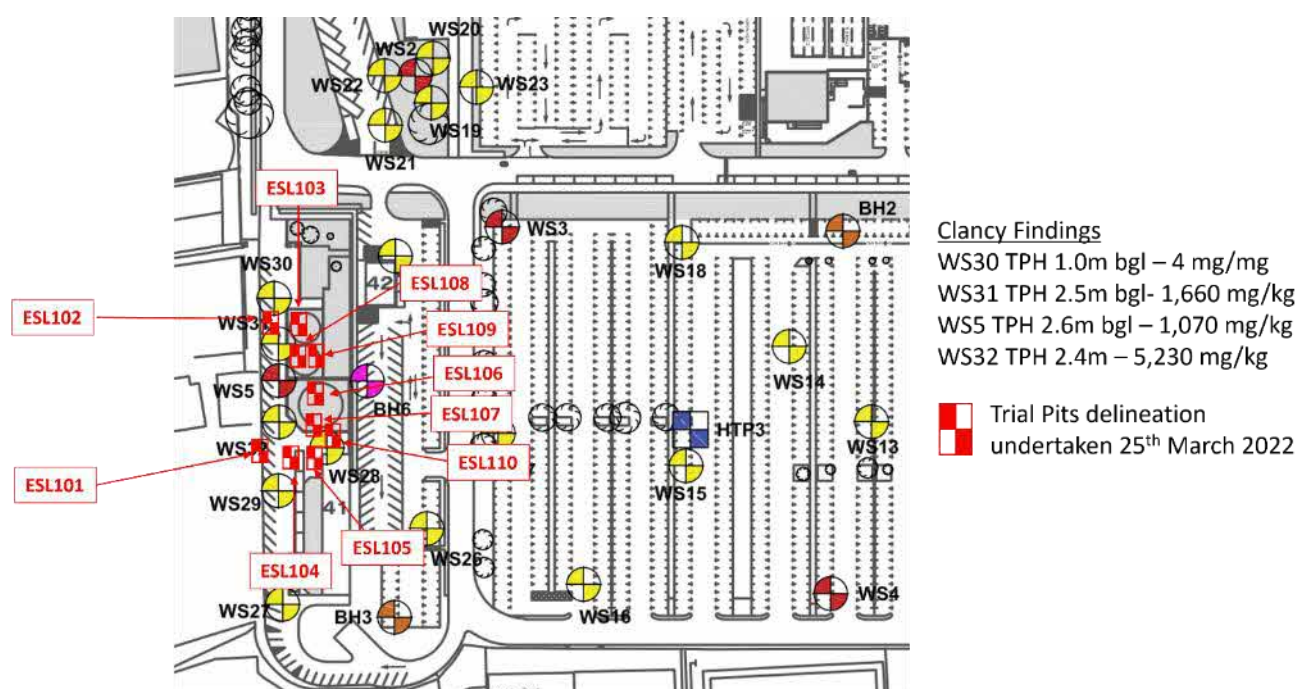
Grid section B – PID = 2.3 ppm

Grid Section K – PID = 0.3 ppm

This confirmed that the lateral extent of the hydrocarbon contamination had been determined (laboratory certificates of analysis are appended to this report).

Clancy had previously undertaken a series of windowless borehole installations in and around WS5, their finding correlated with the Envirotreat delineation.

Figure 12 – Comparison of Envirotreat Trial Pit Delineation & Clancy Windowless Borehole Assessment.

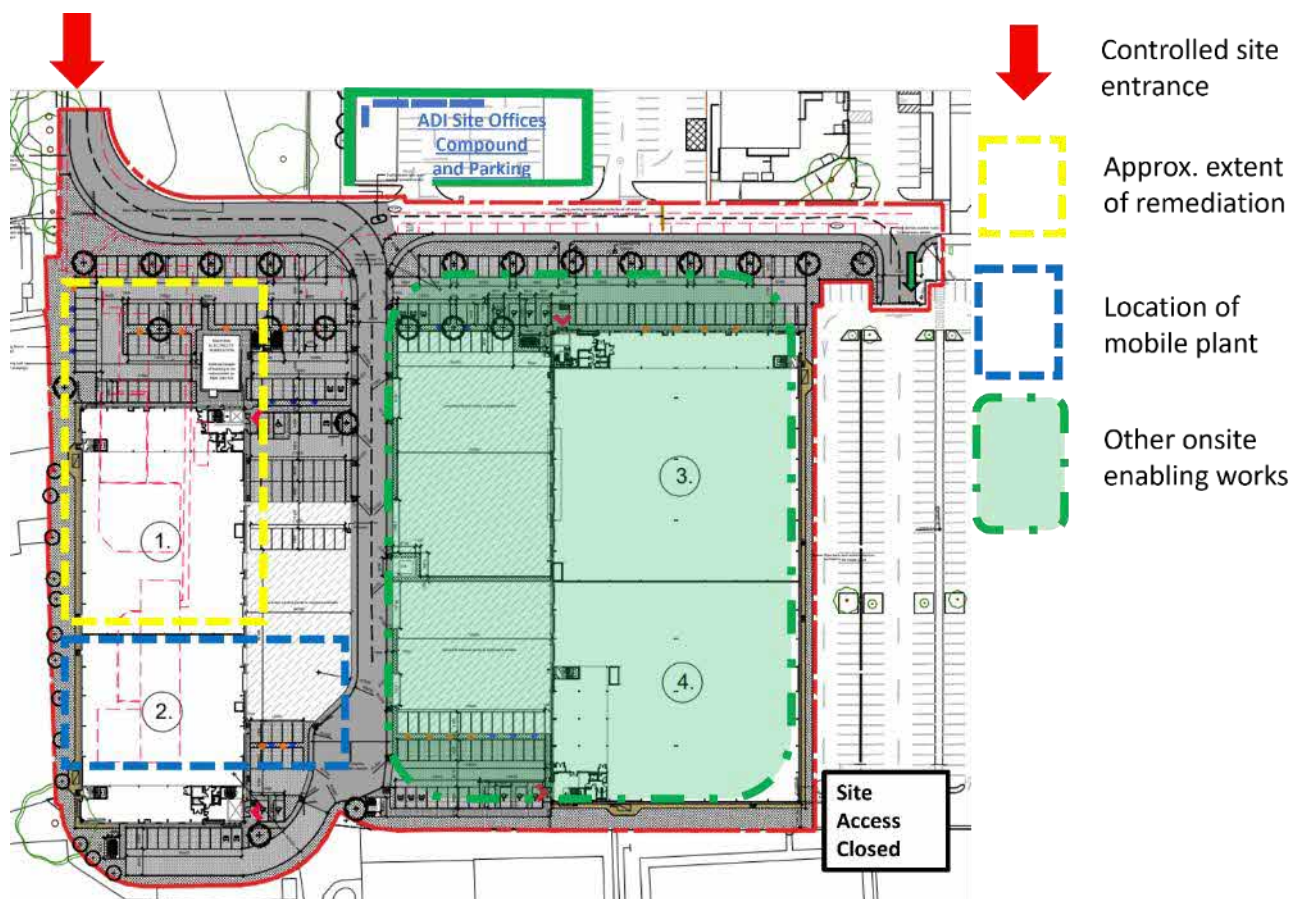


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8. Site Set Up

The Mobile Plant was set up in close proximity to the designated treatment areas and is shown in Figure 13 below.

Figure 13 – Location of Mobile Plant.



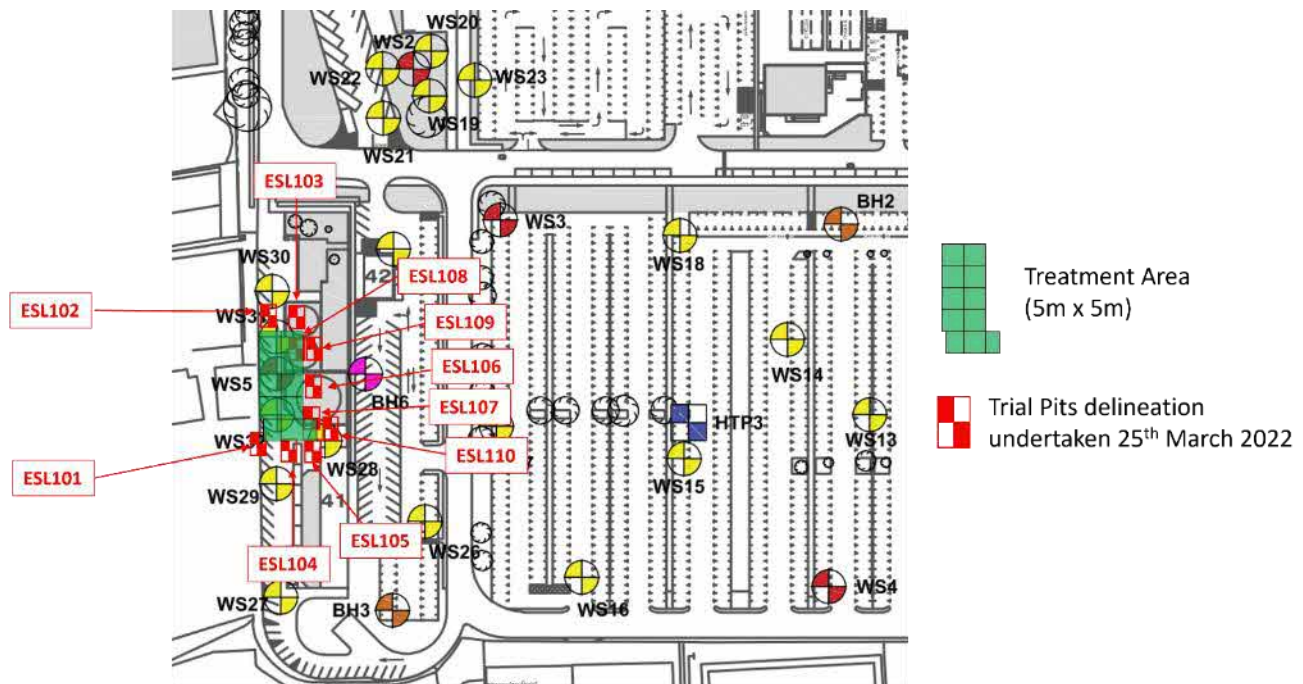
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9. Soil Treatment

The treatment process utilised on-site was *In-Situ* E-Clay Stabilisation.

The delineated area was treated in approximate 5 m by 5 m grid sections, see Figures 14 and 15 below.

Figure 14 – Schematic Showing Treatment Area Grid



Each Treatment Grid was 5m by 5m (unless amended by the Project manager).

Figure 15 – Schematic Showing “Gridding” of Treatment Area



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Area A = 5m by 5m

Area B = 5m by 5.5m (contamination was shown to be extending site wards as per ESL108 PID assessment of treatment zone prior to treatment works confirmed extent).

Area C = 5m by 5m

Area D = 5m by 5m

Area E = 5m by 5m

Area F = 5m by 5m

Area G = 5m by 5m

Area H = 5m by 4m (contamination was shown not to be extending toward the site boundary, as indicated by both ESL101 and during the treatment)

Area I = 5m by 5m

Area J = 5m by 5m

Area K = 5.5m by 3m (contamination was shown to be extending site wards as per ESL107 PID assessment of the treatment zone prior to treatment works confirmed extent).

Remediation Grid A.

Each grid section area was excavated to circa 1.0 m bgl (above the depth of previous identified hydrocarbon contamination).

Excavated soils were stockpiled to one side of the excavation (either on areas of further contaminated areas or treated areas to minimise the risk of potentially cross contaminating other soils).

Further soils were excavated to 2.0 m bgl (again above the depth of previous identified hydrocarbon contamination) and placed locally. This excavation between 1 to 2m bbggl, was only done across half of the 5m by 5m Treatment Grid (ie 5m by 2.5m) this made the treatment manageable (quantity of treatment additive, effective soil mixing, mixing risk of collapse, etc).

During excavation, soils were assessed by the Project Manager using visual, olfactory and VOC headspace assessment to determine whether excavated soils required treatment.

Deeper soils (greater than 2m bgl) within the excavated pit were "loosened up" - disturbed but not fully excavated to allow the Project Manager to assess deeper soils below the groundwater level. The treatment depth was set as being clays which appeared natural in colour and odour.

The E-Clay additive was added to the excavation and in-situ soil mixed to the required depth to treat the soils. The extent of the mixing was determined by the Project Manager in attendance.

Cement was added to the soils to provide a degree of physical stabilisation and this was in turn in-situ soil mixed.

This process was repeated with the second half of the Treatment Grid.

Previously set aside stockpiled soils (0 to 2m bgl - deemed not contaminated) were added to the excavation and ground reinstated.

Remediation Grid B – K.

This process was repeated (B through to K) until all the soils had been treated.

Generally treatment depths were in the order 4.2 to 4.5 m bgl (actual depths could not be determined).

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The site works are shown in figures below.

Figure 16 – Excavation of Treatment Grid Area to 1m bgl.



Figure 17 – Fully excavated Treatment Grid (Half) Section for Treatment.



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Figure 18 – Addition of E-Clay additive and in-situ soil mixing to required depth.

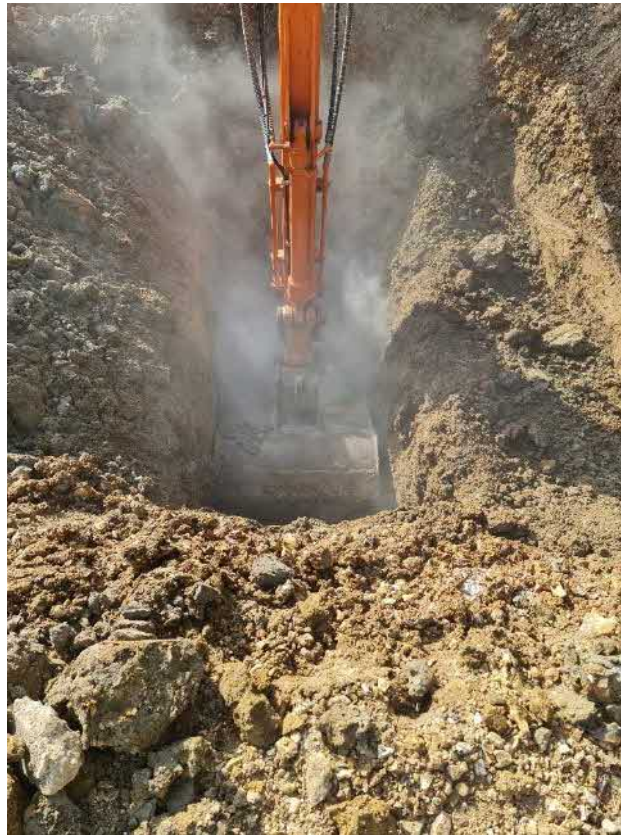


Figure 19 – Addition of E-Clay additive and inn-situ soil mixing to required depth.



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Figure 20 – Reinstatement of treatment Grid area post treatment.



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Figure 21 – Typical visual evidence hydrocarbon contamination (staining and odour).



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Figure 22 – “Clean” clays from base of excavations (natural in appearance, no staining, no odour & no VOC).



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Figure 23 – Area following completion of treatment works..



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D. REMEDIATION VALIDATION

10. Environmental Monitoring

ETL undertook environmental monitoring at key locations around the site and at excavation / treatment areas where required. The environmental monitoring points are shown in Figure 24 below.

The environmental monitoring comprised:

- Noise Monitoring

- VOC Monitoring (using a handheld MiniRea – a 1 ppm threshold was used)

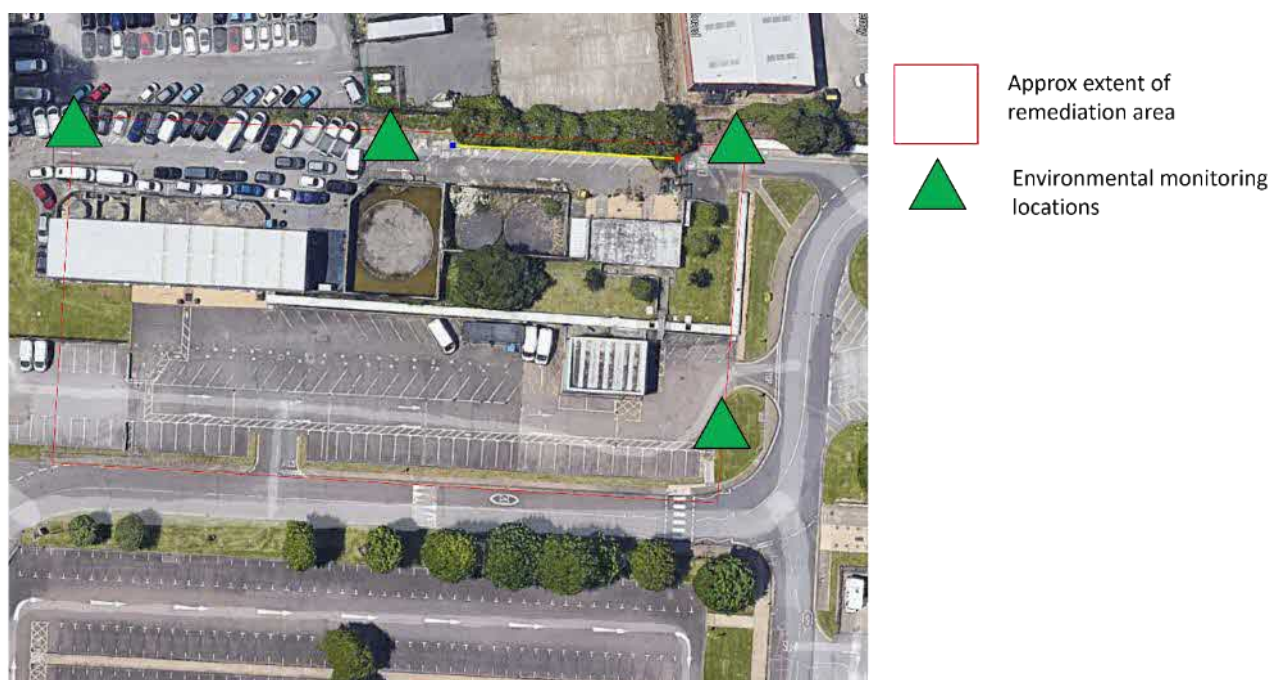
- Dust Monitoring (using a Dustscan measuring Total, Respirable and PM 10, PM 2.5 and PM 1.0)

- Weather Monitoring

Suitable background dust and noise levels could not be established due to the close proximity of other earthworks. On this basis nominal levels were used and local conditions assessed against.

The VOC monitoring is shown in Figure 25 below. Dust monitoring is shown in Figure 26 below.

Figure 24 – Environmental Monitoring Locations.



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Figure 25 – VOC Monitoring and Quality Plan records.



Figure 26 – Dust Monitoring



11. Discovery Strategy

These works will be covered upon completion of the enabling / earthworks.

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12. Soil Treatment Validation

12.1 Validation Criteria

Given that there are no published EQS or DWS for total TPH or PHC fractions, a proxy approach could be used that assess aromatic fractions based on aromatics compounds for which there are published standards. However, given the Environmental Health comments set out in the Remediation Method Statement, Envirotreast proposed a stringent approach in that the laboratory limit of detection (LOD) be utilised for each hydrocarbon fraction to confirm the success of the remediation method, see Table 4.

Table 4 – Agreed Remediation Target Criteria

TPH Hydrdocarbon fraction	Laboratory LOD (ug/l)
Aliphatic >C5-C6	1
Aliphatic >C6-C8	1
Aliphatic >C8-C10	1
Aliphatic >C10-C12	10
Aliphatic >C12-C16	10
Aliphatic >C16-C21	10
Aliphatic >C21-C35	10
Aromatic >C5-C7	1
Aromatic >C7-C8	1
Aromatic >EC8-EC10	1
Aromatic >C10-C12	10
Aromatic >C12-C16	10
Aromatic >C16-C21	10
Aromatic >C21-C35	10

12.3 Soil Treatment Validation

The objective of the source treatment process was to chemically stabilise / immobilise the identified contaminants of concern within the contaminated soils using a combination of proprietary E-Clay and cementitious materials. The treatment was carried out to [primarily] reduce the leachability of identified contaminants within the soils to compliant levels (i.e., below the target thresholds as summarised in Table 4 above).

Representative samples were taken of each batch of soil treated. Composite samples were produced to confirm the efficacy of treatment at an agreed minimum frequency of one sample per 100 m³ of soils treated. In total 6 samples were prepared for subsequent leachate testing, representative of one sample per 100 m³ treated.

Samples were leached utilising current CEN leaching methodology (BS EN 12547-2) and appropriate chemical analysis carried out at a UKAS / MCERTS accredited laboratory.

The analytical results are given in the Results Section below.

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12.4 Results

The analytical results are summarised in Tables 5 and 6 below.

The certificates of analysis are appended to this document

Table 5 – Treated Soil Validation – Leachate Analysis Summary (one of two).

Lab Sample Number		2229933	2229934	2229935
Sample Reference		Treated 1	Treated 2	Treated 3
Date Sampled		04/04/2022	04/04/2022	04/04/2022
Analytical Parameter (Leachate Analysis)	Units			
Monoaromatics & Oxygenates				
Benzene	µg/l	< 1.0	< 1.0	< 1.0
Toluene	µg/l	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	< 10	< 10	< 10
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >C5 - C6	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	< 10	< 10	< 10

Interim Remediation Verification Report

Table 6 – Treated Soil Validation – Leachate Analysis Summary (one of two).

Lab Sample Number		2229936	2229937	2229938
Sample Reference		Treated 4	Treated 5	Treated 6
Date Sampled		04/04/2022	04/04/2022	04/04/2022
Analytical Parameter (Leachate Analysis)	Units			
Monoaromatics & Oxygenates				
Benzene	µg/l	< 1.0	< 1.0	< 1.0
Toluene	µg/l	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	< 10	< 10	< 10
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >C5 - C6	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	< 10	< 10	< 10

The results summarised in table are all below the agreed remediation target criteria (table 4 above) and confirm that E-Clay stabilisation of the identified hydrocarbon contamination has been successful.

E. CONCLUSIONS AND RECOMMENDATIONS

13. Conclusions

Envirotreast has completed the designated remediation works at the former Langstone Technology Park, Havant in accordance with the requirements of the agreed Remediation Strategy and the approved Remediation Method Statement.

The remediation works comprised delineation of the hydrocarbon impacted area and subsequent source treatment by E-Clay Stabilisation.

All validation results for the delineation of the hydrocarbon impacted area and leachate results for the treated soils are below their respective criterion.

The Validation and Verification Report confirms the site remediation works have been carried out successfully in accordance with the agreed Remediation Strategy and Method Statement.

14. Recommendations

Based on the above assessment, the following actions are recommended:

This report be submitted to Havant Borough Council for their approval.

Verification of the outstanding remediation actions will be undertaken and reported accordingly.



Proposed Remediation Method Statement – Langstone Technology Park, Havant

Document No.	Issue Date	Description	Prepared by:	Reviewed by:	Approved by:
DJS/Hav/RMS/0	Feb 2022	Original	David Slater	Simon Farr	Neil McLeod

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Introduction

Envirotreast has been engaged by ADI group to provide a proposed remediation strategy for the Langstone, Havant site to enable discharge of the relevant planning conditions.

This document has been prepared in accordance with the recommendations of the Clancy Consulting Remediation Strategy and comments received from the local council Environmental Health Officer.

This relates to Phase 1 of the development and is concerned with the south western corner of the site. it is understood that the site will be redeveloped for commercial purposes with associated parking and landscaping.

The overall objectives are to address the requirements of Havant Borough Council for the protection of human health and the requirements of the Environment Agency for the protection of groundwater / controlled waters and to enable the discharge of the relevant planning conditions in relation to land contamination

This document should be read in conjunction with the following reports:

Applied Geology – *Geotechnical Report on Ground Investigation at Langstone Technology Park* – August 2021.

Delta Simons – *Phase 1 Environmental Assessment* – November 2020 – this included several appended historical site investigation reports

Delta Simons – *Preliminary Geo-Environmental Risk Assessment* – July 2019

Clancy Consulting – *Supplementary Site Investigation Report* – November 2021

Clancy Consulting - *Remediation Strategy Report Langstone Technology Park, Havant* – November 2021

Site Overview and Plan.

The wider Langstone Technology Park comprises a roughly rectangular parcel of land occupying an area of approximately 16Ha. The site is located toward the southern periphery of Havant, 600m south of the town centre and 1.5km south-east of Junction 5 of the A3(M).

The wider site comprises a series of large buildings subdivided into leased units of mixed uses. Occupying the centre of the site are a series of buildings including two plant buildings ('Building 2000 and 3000'), offices and amenity complex with associated courtyards ('Building 4000'), a large data and distribution centre ('Building 5000') with a waste storage area to the west, along with three-storey office buildings ('Building 6000 and 7000').

A small nursery is present to the south of Building 5000.

Located in the north of the site is 'Building 1000', a single storey structure built on top of a man-made embankment and understood to contain a number of offices, manufacturing and laboratory units with access tunnels running from the car park to the north to beneath the building.

Toward the south-western corner of the site is a small gymnasium, vehicle washing area (with associated subsurface drainage), a storage area and a number of circular historic tank bases.

Access infrastructure and soft landscaping covers the rest of the site, which include a number of engineered slopes. The remainder of the site is currently occupied by car parking areas (including the majority of the south of the site).

The site location is shown in figures 1 & 2 below.

Figure 1 – Site Location [source Clancy].

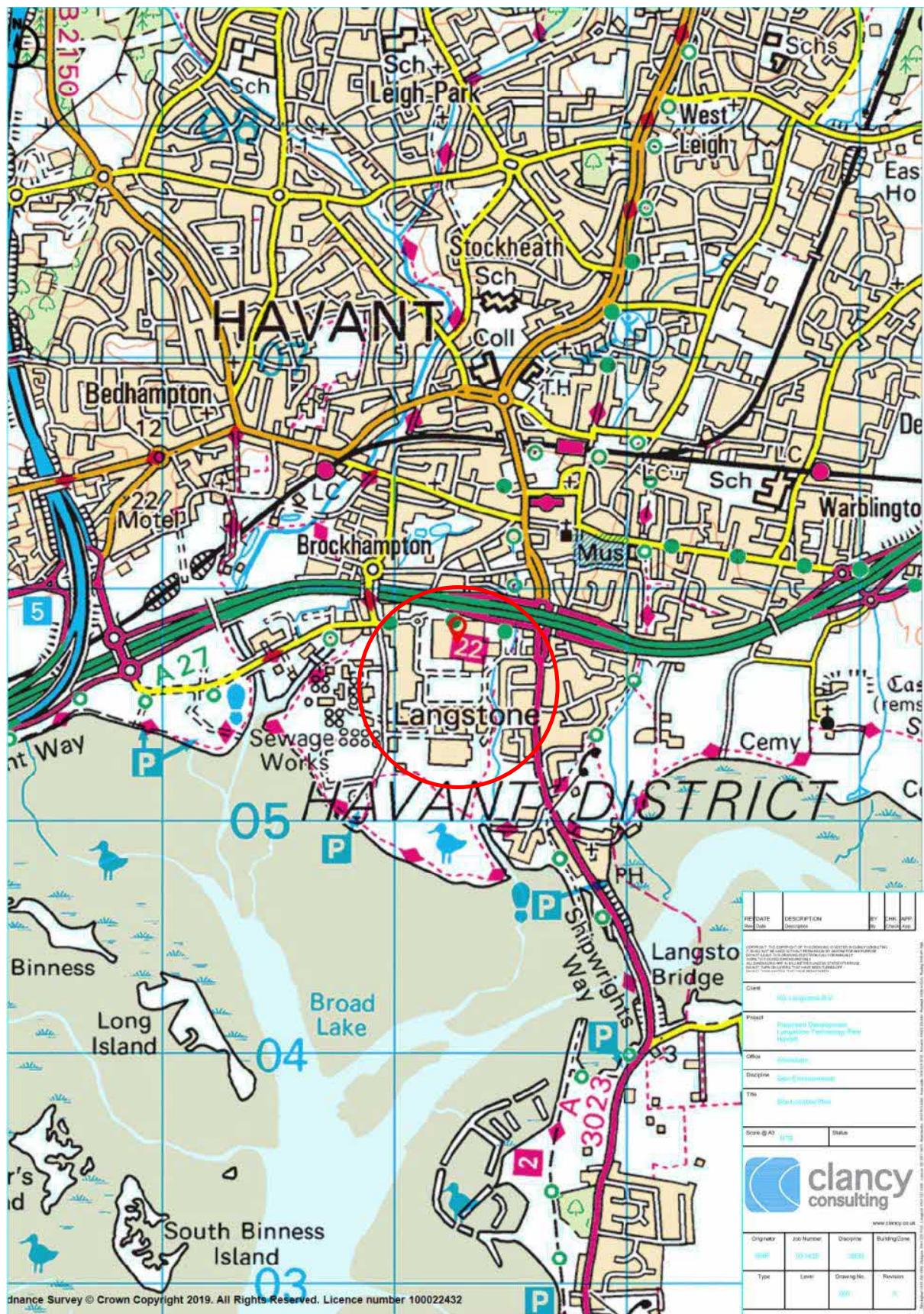
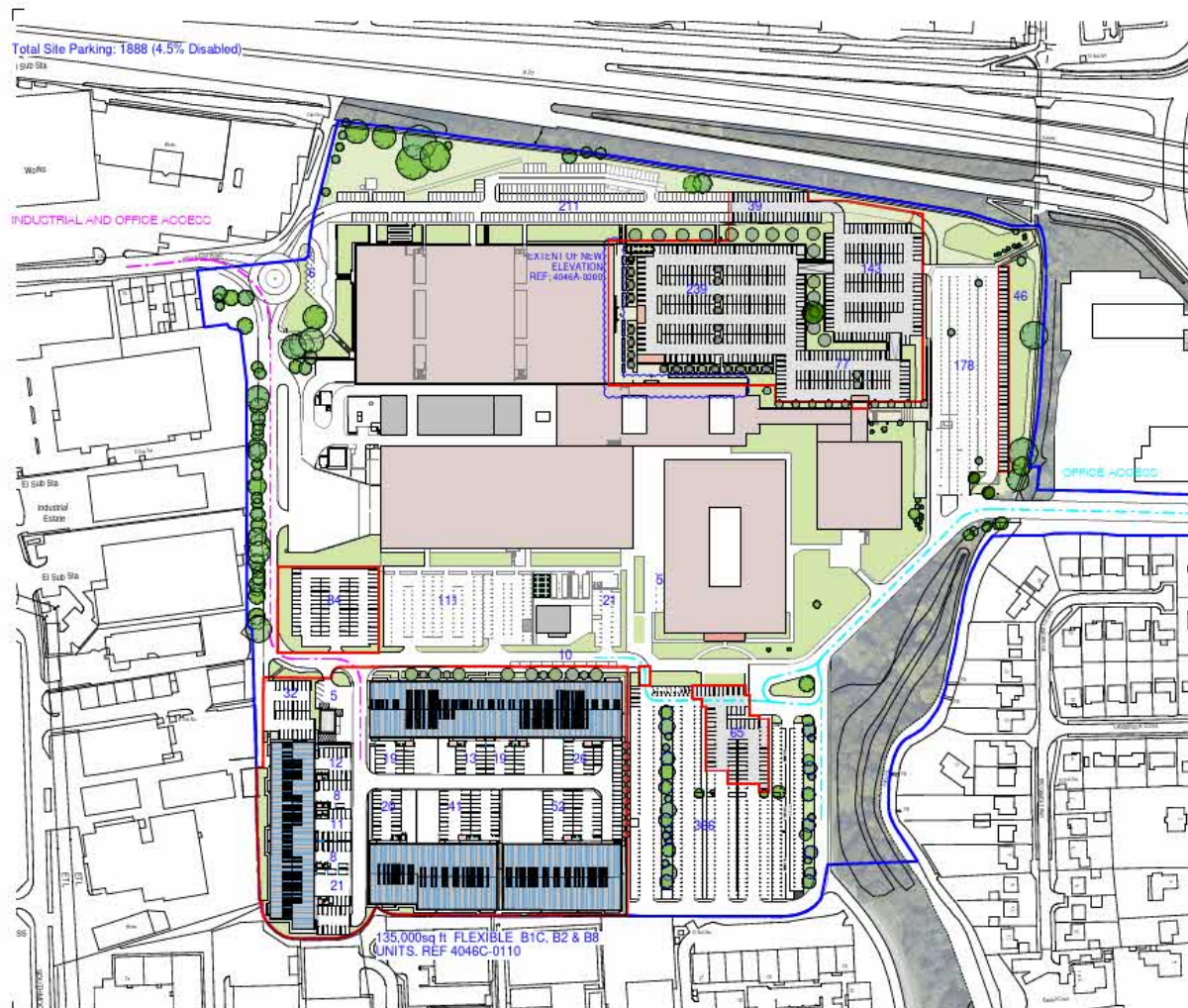


Figure 2 – Site Location (development area)

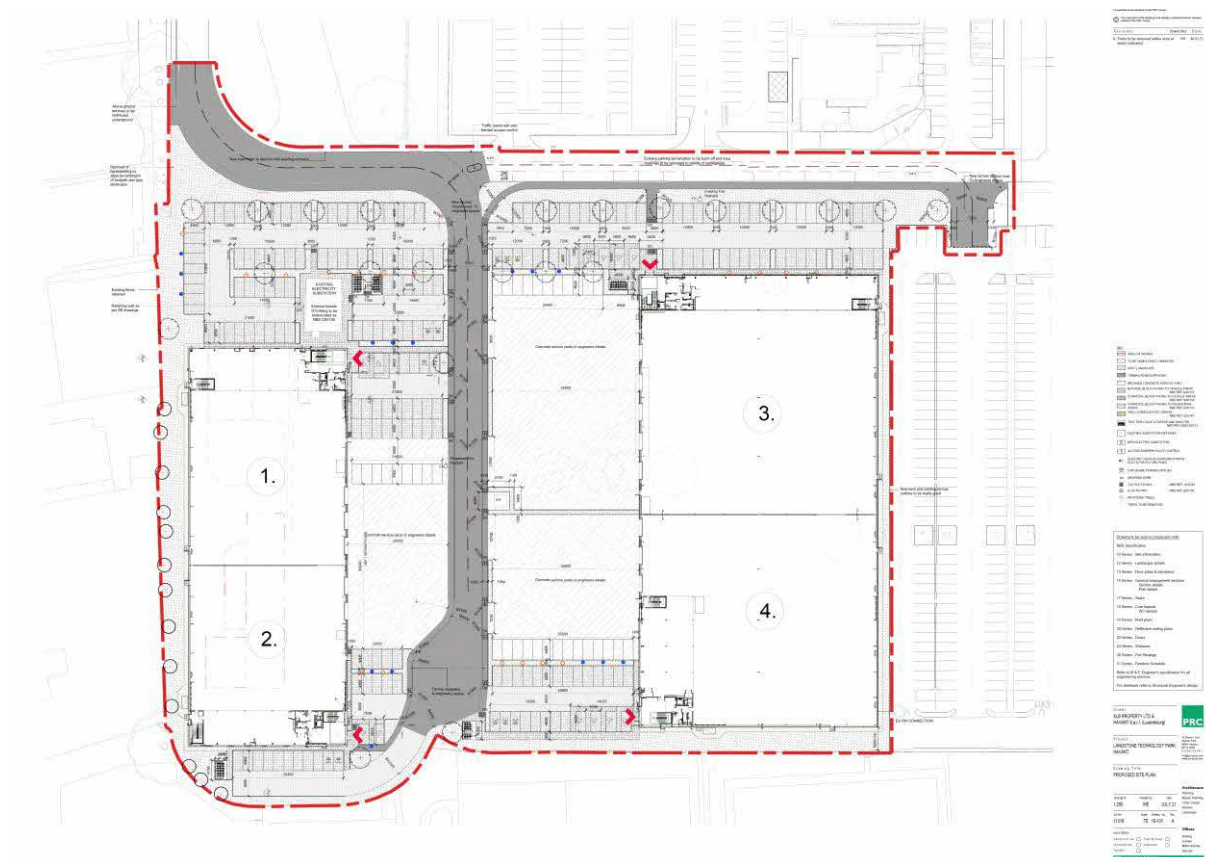


Proposed Development

Following contamination remediation works and subsequent enabling works, the site will be redeveloped for commercial end use with associated parking, access and landscaped areas.

The proposed layout is shown in figure 3 below:

Figure 3 – Development Layout

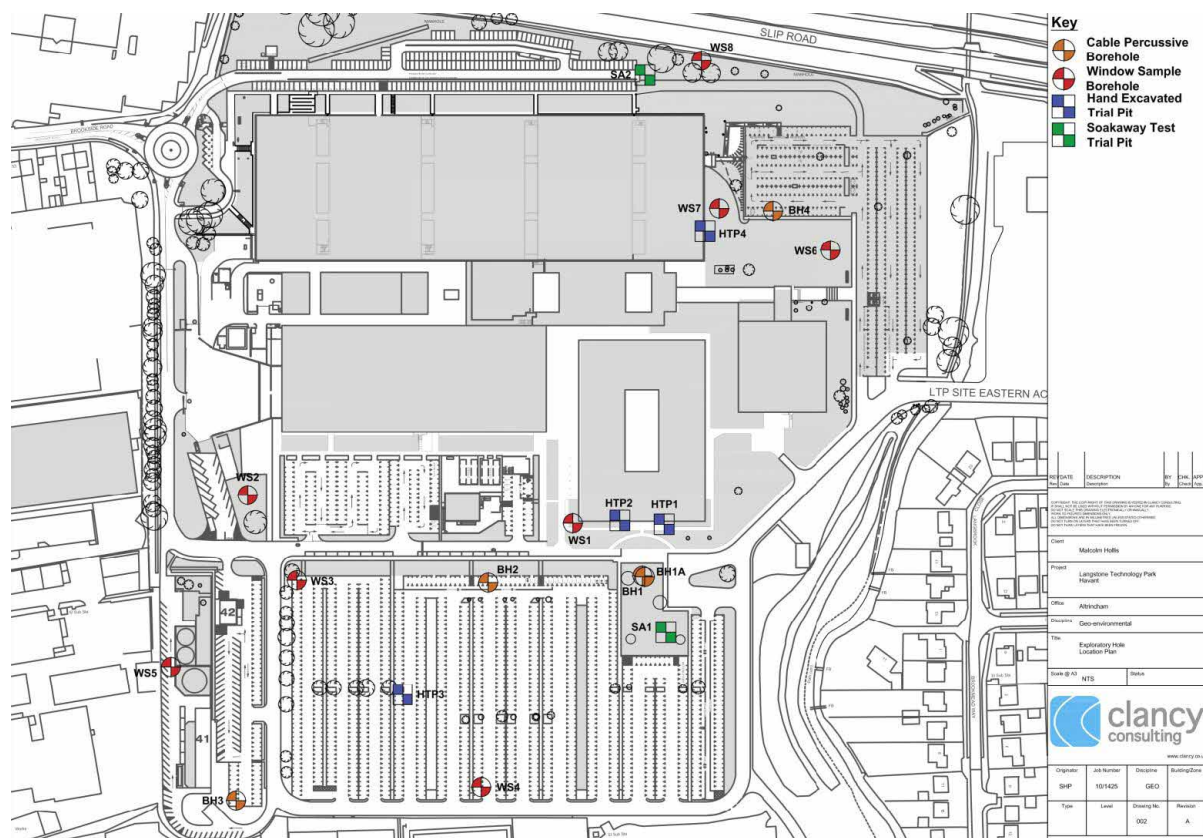


Clancy Consulting Site Investigation – Contamination Summary

Clancy Consulting concluded the following from their 2019 site investigation:

Visual and olfactory evidence of hydrocarbon contamination was recorded within the Made Ground and shallow River Terrace Deposits in boreholes WS02 and WS05 as part of the August 2019 site investigation, located in the west of the site in the vicinity of a historical waste storage area and former fuel tanks. Further visual and olfactory evidence of hydrocarbon contamination was recorded in boreholes WS19, to WS21, WS29, WS31 and WS32, drilled in September 2020 in the vicinity of boreholes WS02 and WS05 to delineate previously recorded contamination. See Figure 4 below.

Figure 4 – Identified Contamination Hotspots



The identified hotspot around WS2 is outside the proposed development area and is not considered further in this strategy. During the remediation works trial pits will be excavated (and soils assessed) in the northern part of the site (directly south of WS2).

Clancy Consulting provided the following contamination summary:

“Contaminants of concern were recorded in groundwater sampled from beneath the site. However, concentrations were only marginally elevated above adopted assessment criteria.

TPH compounds were recorded in Made Ground and natural strata at concentrations in excess of their solubility limits in two hotspot locations focused around boreholes WS02 and WS05. A number of VOC and SVOC compounds were also recorded within samples collected from the hotspot locations. However, no published assessment criteria for these contaminants are currently available. The excavation and off-site disposal of contaminated soils in these locations will lead to the betterment of groundwater quality beneath the site. Excavation works should take place under the supervision of a qualified geo-environmental consultant.

Soil samples should be collected for chemical laboratory analysis to confirm that remaining contaminant concentrations in soils are at acceptable levels.

No significant soil based source of PAH contamination in groundwater was identified beneath the site. It is considered that this is representative of either an off-site source, or an on site source not identified during intrusive investigation works undertaken to date. A contamination watching brief by a qualified geo-environmental consultant is therefore recommended during the groundworks phase of the proposed development on site. If visual or olfactory evidence of contamination is encountered during development, outside those identified during this study,

the consultant would collect additional samples for further assessment into the potential risk these soils pose to groundwater. Guidance would then be given regarding the treatment / disposal of contaminated soils off-site.

Other contaminants were not recorded at concentrations considered to represent a significant risk to human health.”

Planning Conditions

The proposed development was granted planning permission (ref: 21/00405) in 25th August 2021 with a number of conditions. Those relating to contamination are conditions 9 and 16 (pre-commencement conditions) i.e.,

Condition 9

Prior to the commencement of any specific phase of development approved by this planning permission (other than demolition, site clearance, or any other date or stage in development as may be agreed in writing with the Local Planning Authority), an assessment of the nature and extent of contamination at the relevant part of the site, whether originating from within or outside the curtilage, shall be submitted to and approved in writing by the Local Planning Authority.

The assessment may comprise separate reports as appropriate, but shall be undertaken by competent persons and unless specifically excluded in writing by the Local Planning Authority, shall include;

1) An intrusive site investigation based on the proposals outlined within the Preliminary Geo-Environmental Risk Assessment Re'-19-0687.01 (section 6.0); to provide sufficient data and information to adequately identify & characterise any physical contamination on or affecting the site, and to inform an appropriate assessment of the risks to all identified receptors.

2) The results of an appropriate risk assessment based upon (1), and where unacceptable risks are identified, a Remediation Strategy that includes;

- appropriately considered remedial objectives,*
- an appraisal of remedial &/or risk mitigation options, having due regard to sustainability, and;*
- clearly defined proposals for mitigation of the identified risks, and;*

3) A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in any Remediation Strategy required under (2) are complete, identifying any requirements for longer-term monitoring of pollutant linkages, maintenance of engineered mitigation measures, and arrangements for contingency action.

All elements shall be adhered to unless agreed in writing by the Local Planning Authority..

Condition 16

Prior to the occupation of any relevant phase of the permitted development, any verification report for that phase required in accordance with condition 9 shall be submitted to and approved in writing by the Local Planning Authority.

The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan, and must demonstrate that site remediation criteria have been met. Where longer-term monitoring of pollutant linkages is identified as being necessary, the report shall clearly set out plans for monitoring, provision for maintenance, relevant triggers and contingency actions (a "long-term monitoring and maintenance plan").

The long-term monitoring and maintenance plan shall be implemented as approved.

Reason: Having due regard to policies CS11 and DM10 of the Havant Borough Adopted Core Strategy (2011) and DM17 of the Havant Borough Local Plan (Allocations) (2014), Contamination may be present at the site as a result of previous land uses (&/or activities) on site and in the vicinity, that could pose a risk groundwater & local surface water (ecology), to the proposed buildings, and future occupiers of the site.

Following the grant of planning permission, feedback was received from the Havant Borough Council Environmental Health Officer (EHO) in relation to the submitted Clancy Consulting Remediation Strategy and SI reports, the comments received regarding the Clancy Consulting Remediation Strategy and the Envirotreat Proposed Remediation Strategy (this document) were:

The remediation strategy reiterates the intention to effect remediation of the two identified hotspots under a physical source removal strategy (dig & dispose). However, I am aware that an in-situ soil treatment specialist has been instructed to prepare an alternative Remediation Strategy / Method Statement which provides cost & sustainability enhancements, based upon a stabilisation process which retains contaminants in a form which substantially limits their release to groundwater.

"The current application seeks the approval of the Clancy ../005 RS Report as the remedial strategy, and this could be procedurally problematic in that in principle, condition 16 requires verification of works 'required in accordance with condition 9'

I have previously highlighted a risk that source removal works (proposed) could become contrary to c.9 2) (point 2, '...with due regard to sustainability') if the in-situ screening used to guide the depth & extent of works identifies soils with concentrations above screening criteria over a greater area / depth-range to that anticipated. There was not sufficient concern to support an objection to this strategy, but it is for this reason that the alternative (stabilisation) strategy may be preferable. In principle, either strategy is acceptable, and it should be possible to discharge c.9 on the basis of the submitted remedial strategy, whilst leaving the applicant the option to adopt an alternative strategy by agreement of the LPA.

I believe that the 'compliance' clause of the condition 9 wording ('All elements shall be adhered to unless agreed in writing by the Local Planning Authority') would accommodate this flexibility – and it is assumed that where the applicant wishes to pursue an alternative remedial strategy this would be managed in the same manner as a condition discharge under c.9 parts 2) & 3), with a refusal (to agree) having the effect of requiring the remedial strategy submitted with this application be implemented as approved.

Provided that the Development Management service is content that this is procedurally workable, there should be no need to clarify the applicant's intentions ahead of approving the discharge of c.9. On this basis, no objections are raised, and the discharge of c.9 is supported / recommended."

Conceptual Site Model

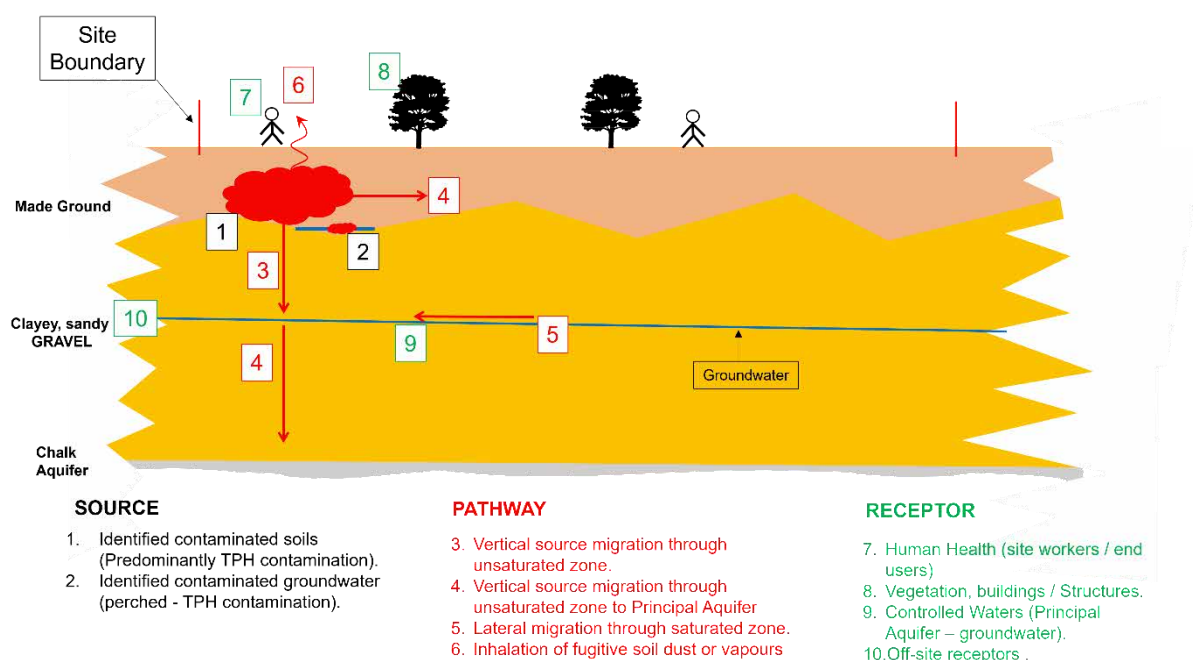
In order to assess the risks posed by potential on-site contamination sources, a conceptual site model (CSM) has been developed based on the intended end uses for the site as a whole (which is a simplification of the environmental setting of the site). The CSM is used to identify any potential pollutant linkages, which may exist when the three key elements described below are present:

- **A source** – a substance which is in, on or under the land and has the potential to cause harm when exposed to a receptor
- **A receptor** – something which could be adversely affected when exposed to a contamination source such as humans, controlled waters or an ecological system
- **A pathway** – a mechanism by which a receptor is exposed to a contamination source

Each element can exist in isolation without posing a significant risk, and it is only when the three elements are linked that a potential risk can exist and a potential pollutant linkage be created, whereby contamination can travel from a source, via an identifiable pathway, to a receptor.

Based on our understanding of the site as a whole and the identified contamination issues a pre-remediation CSM has been developed as shown in Figure 5 below. The pre-remediation CSM assumes that there is vertical migration of groundwater into the River Terrace deposits (and vertical migration into the underlying principal chalk aquifer)..

Figure 5 – Pre-Remediation Conceptual Site Model



The prime contaminant of concern has been identified in the Clancy Consulting Remediation Strategy Report as Total Petroleum Hydrocarbons (TPH) (both within the soil and groundwater). Comments received from the EHO also recommended consideration be given to Copper, Zinc, vanadium, Nickel and Poly Aromatic Hydrocarbons (PAHs) as all were noted to exceed their respective EQS.

In accordance with the requirements of Land Contamination Risk Management (LCRM) methodology (and the requirements of the planning conditions / EHO comments) a remediation options appraisal has been carried out and is summarised below:

Options Appraisal

Selection of the most appropriate remediation options should be cognisant of the nature and extent of contamination and site constraints. Furthermore, it must represent a combination of:

Practicability:

Efficacy; and

Durability.

The following remediation options were considered, taking into account the identified soil and groundwater contamination on the site together with other project considerations such as site logistics, programme and cost.

1. 'Do Nothing'
2. Excavation and off-site disposal
3. Site capping
4. E-Clay Stabilisation
5. Bioremediation
6. In-situ chemical oxidation:
7. Pump and Treat:

The options were appraised as follows:

1. 'Do Nothing':

This is not considered to be an option as there is an identified risk to both human health and controlled water receptors.

2. Excavation and off-site disposal:

This option would remove the source contamination and as a consequence remove the identified risks to receptors. This strategy would not immediately address the risk from impacted groundwater. Groundwater contamination would improve following source removal. Timescales are relatively short and predictable. This option is not considered to be acceptable due to extremely high cost and environmental implications (lorry movements etc and impact on the local community). It is also not a sustainable approach as there is no reuse of material and an implicit requirement to import fill material.

3. Site capping:

This option would remove the pathway linkage for human health, however, will not address the risk to groundwater.

4. E-Clay Stabilisation:

This option would address soil and groundwater contamination by chemically stabilising (chemically immobilising) the identified contaminants of concern and as a

consequence, remove the identified risks to receptors. Timescales are short and predictable with rapid improvement in groundwater quality. This approach will negate any requirement for off-site disposal or for imported fill. The treatment process is sustainable and remediation costs are significantly less than off-site disposal.

5. Bioremediation:

Similar to off-site disposal, bioremediation would remove the source contamination and lead to a long-term improvement in groundwater quality. Timescales would be circa 8-12 weeks under favourable conditions (biopile setup, weather conditions and monitoring). Due to site constraint this would have a detrimental effect on programme, on the basis of overall timescales, reduced working space and the presence of deep excavations. Bioremediation would not address any risk associated elevated mobile metal pollutants.

6. In-situ chemical oxidation:

Oxidation chemicals would need to be injected (introduced) into the contaminated part of the site through a grid of boreholes. The chemicals would then assist natural degradation processes. This would not address the soil source. Given the inability of the strategy to treat all soils, this would likely be inefficient and open-ended.

7. Pump and Treat:

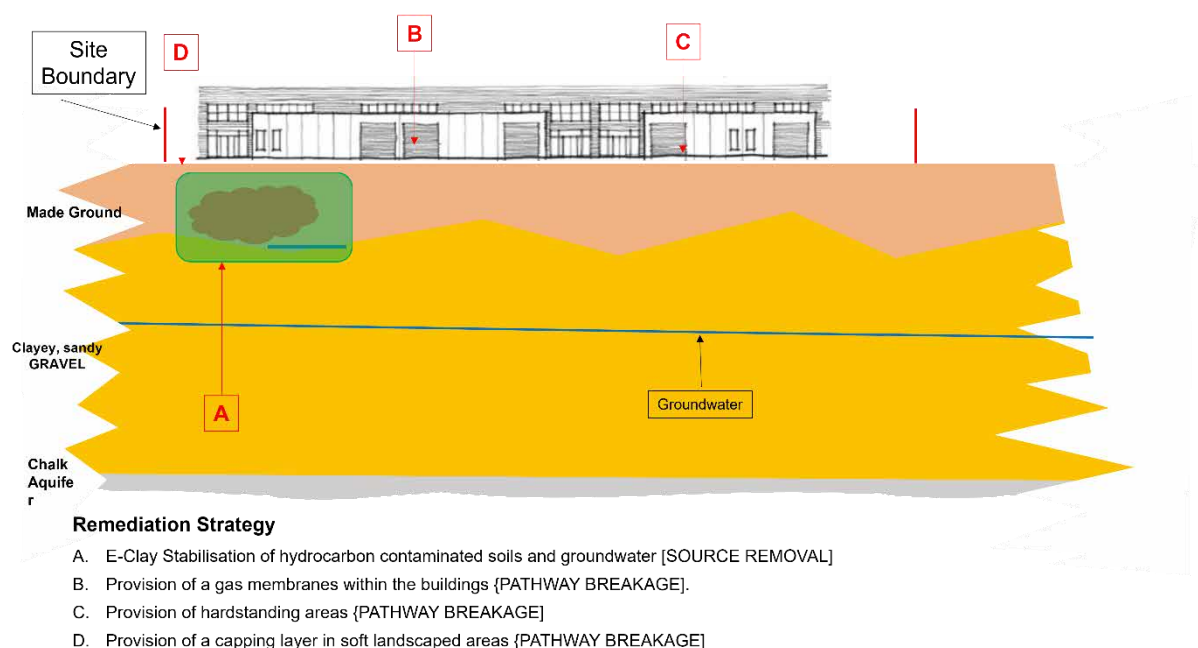
This would involve the extraction and treatment of contaminated groundwater. This would not address the soil source. Given the inability of the strategy to treat all soils, this would likely be inefficient and open-ended.

Following a remediation options appraisal, the strategy best suited to address the identified human health and groundwater contamination risks would be E-Clay Stabilisation. It is proposed to remediate the identified soil and groundwater contamination within the made ground and upper horizons of River Terrace Gravels by E-Clay Stabilisation (source treatment). This will address the identified / potential risk to controlled waters. The E-Clay Technology is described in Section 5 below.

The necessary protection of human health will be achieved by a pathway breaks via capping or hardstanding.

The post-remediation CSM is as shown in Figure 6 below.

Figure 6 – Post-Remediation Conceptual Site Model



Proposed Remediation Strategy

Based on the findings of the Clancy Consulting investigative Reports, recommendations provided in their Remediation Strategy and comments received from the EHO the following Remediation Strategy is proposed to address the requirements of the Environment Agency and Havant Borough Council:

Delineation of the TPH /PAH heavy metals impacted area around WS5 (and WS4 / WS2)

In-situ E-Clay stabilisation of the contaminated soil.

Provision of a “Discovery Strategy”.

Provision of a comprehensive Validation and Verification Report detailing the works undertaken, supporting documentation and photographic record.

Human Health risks will be addressed by the development itself (gas membrane, concrete slab / hardstanding) and the 300 mm clean capping layer in soft landscaped areas.

Delineation around WS5

A series of trial pits will be advanced around the recorded location of WS5. Clancy Consulting identified WS5 as a potential contamination hotspot and a requirement for remediation, the delineation will extend to the north, south and east of the WS5 location.

Soil removed from each trial pit will be assessed using a combination of visual and olfactory methods along with onsite testing using a Photo Ionisation Detector (PID) for hydrocarbons to determine the lateral and vertical extent of contamination. All PID readings will be recorded and included within the final Validation and Verification Report.

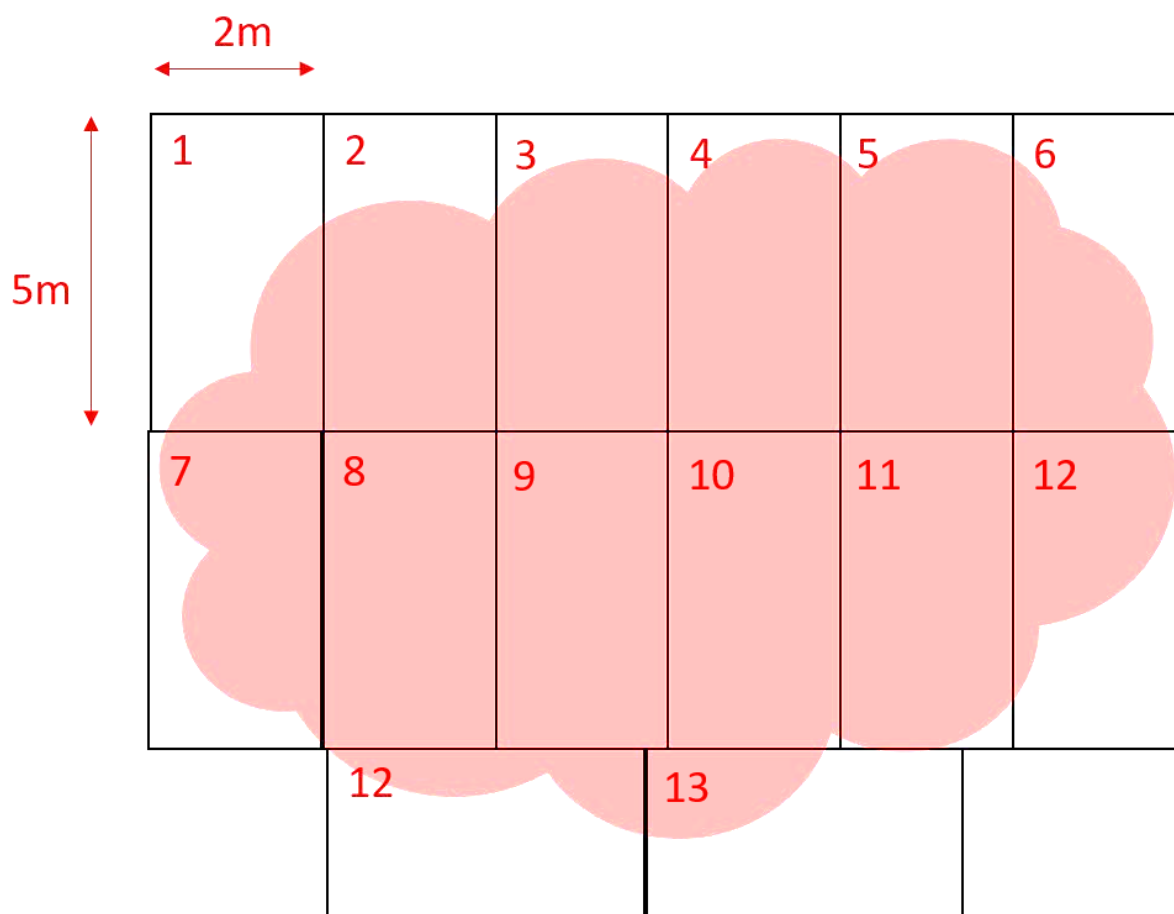
Confirmatory samples will be collected and submitted to a UKAS / MCERTS laboratory for appropriate analysis. The results will be compared against the agreed criteria for remediation.

In-Situ E-Clay Stabilisation

The treatment process will involve the use of E-Clay Stabilisation (suitable to chemically immobilise the identified contaminants of concern within the soils and associated groundwater). Cementitious materials will also be added to provide a degree of physical stabilisation – the treatment process will produce a friable material.

The *in-situ* treatment approach will involve the treatment area was gridded up to ensure the correct quantity of E-Clay slurry was applied to the contaminated soils. This is shown schematically on Figure 7 below.

Figure 7 – Gridding up treatment Area (example only - not site specific – to be determined following delineation).



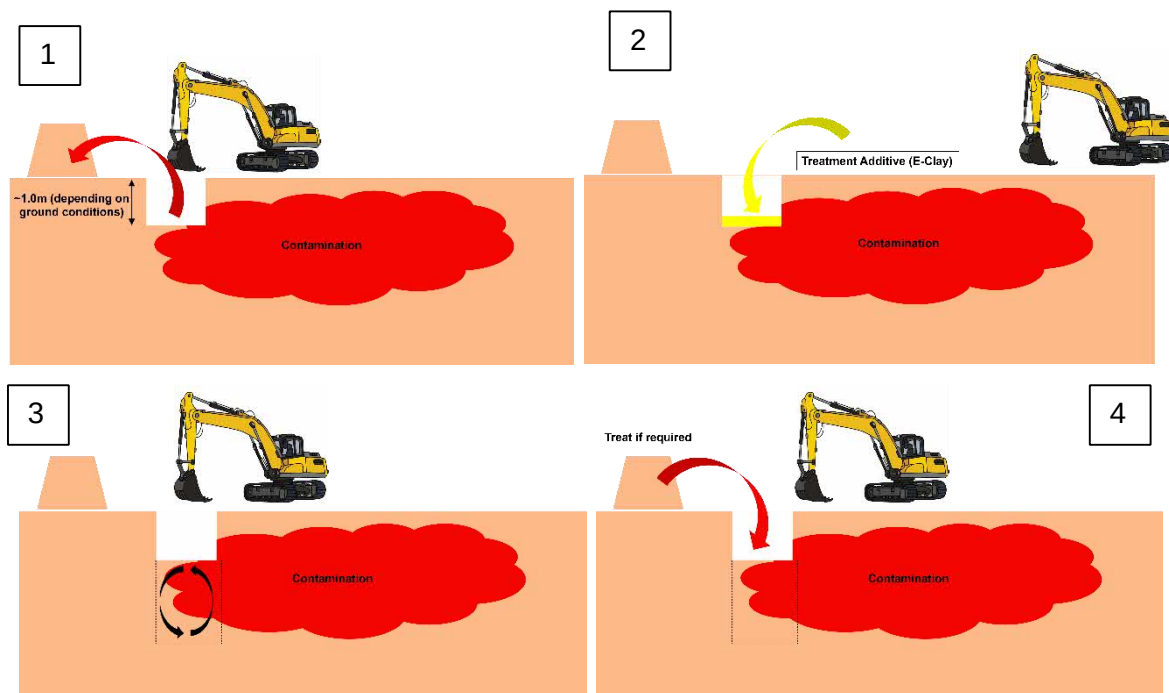
Each area is treated with the addition of E-Clay product as determined by the Project Manager based on treatment volumes, contaminants of concern, contamination loading, etc.

In each treatment area the local site level is reduced to remove surface soils (nominally 1m). These soils will be temporarily set aside. The E-Clay product will be into the void spaces created during the initial reduced level dig. Cementitious materials will be also added and mixed until homogenous mix of treatment additives and soil is achieved. In -situ soil mixing will be undertaken to the required depth based on the SI and delineation undertaken. Previously set aside soils will then be replaced and further treated until homogenous, if these are shown to contaminated (ie requiring treatment), then they will be treated similarly.

Once complete further areas are treated until the whole contamination area is treated.

The *in-situ* treatment process is shown schematically in Figure 8 below:

Figure 8 - Schematic Showing *In-Situ* Treatment Process



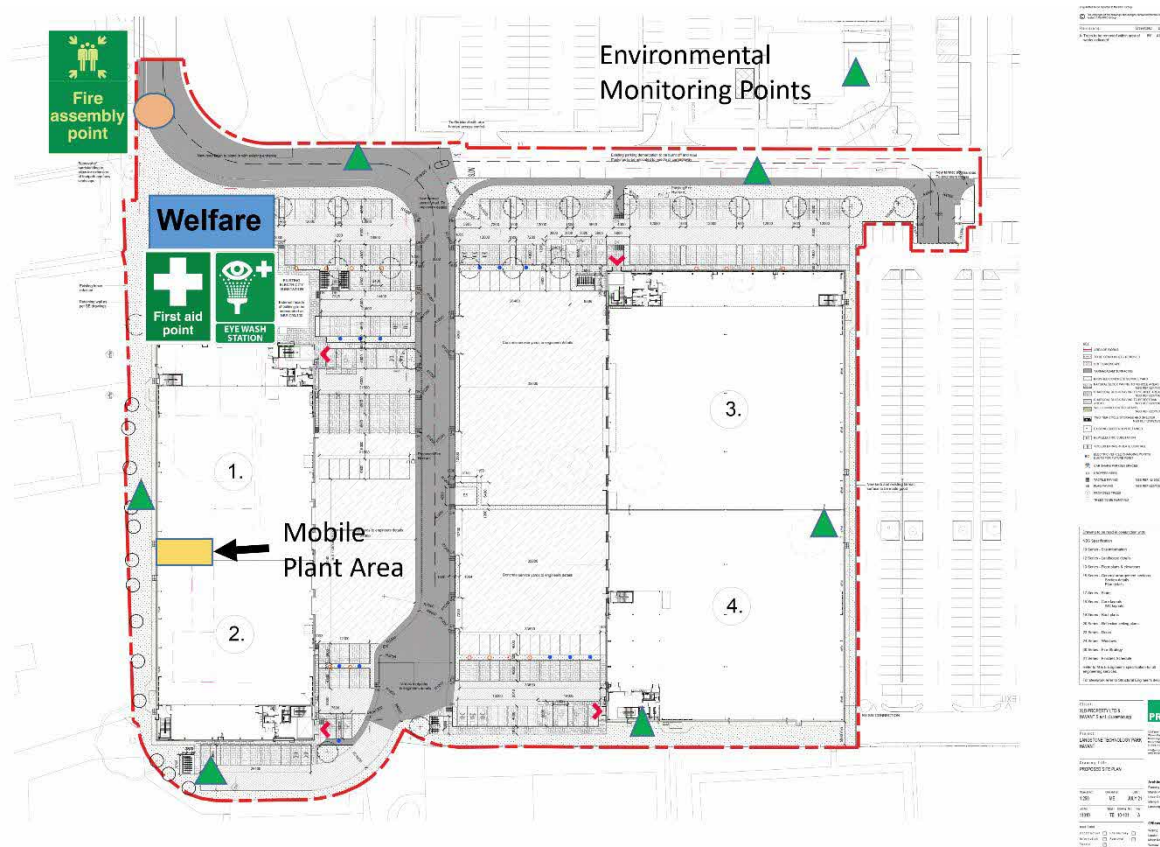
Validation of the treated materials will be carried out by a granular leach testing methodology by an accredited laboratory. Representative samples will be taken at a frequency of one sample for every 250 m³ of soils treated.

The remediation target criteria are designed to protect controlled waters, see details within Validation section.

Should any treated sample fail to achieve the designated remediation target criteria then the material will be retreated to achieve compliance.

The proposed site set up is shown in Figure 9 overleaf but may be subject to change based on site logistics and phasing of works

Figure 9 – Proposed Site setup



(actual site setup dependent on main / principal contractor requirements).

Provision of a Discovery Strategy

A Discovery Strategy will be employed throughout the remediation works, which will incorporate suitable protocols to address the requirements of any relevant planning condition relating to unexpected contamination. These protocols are designed to provide an acceptable methodology for addressing contamination '*not previously identified*' as and when encountered.

Protocol Flowchart 1 will be adopted for the validation of soils not previously investigated.

Protocol Flowchart 2 will be adopted for the necessary Quarantine Process.

The Discovery Strategy will also cover identification of any previously unknown below ground fueling infrastructure (i.e. USTs, fuel pipes, fill points and interceptors). From a review of available licensing, planning and historic map information, the likelihood of unknown redundant USTs being present is considered to be low. If encountered, the infrastructure will be removed as set out above, with any associated contaminated soils and/ or groundwater being treated in accordance with Protocol Flowchart 1.

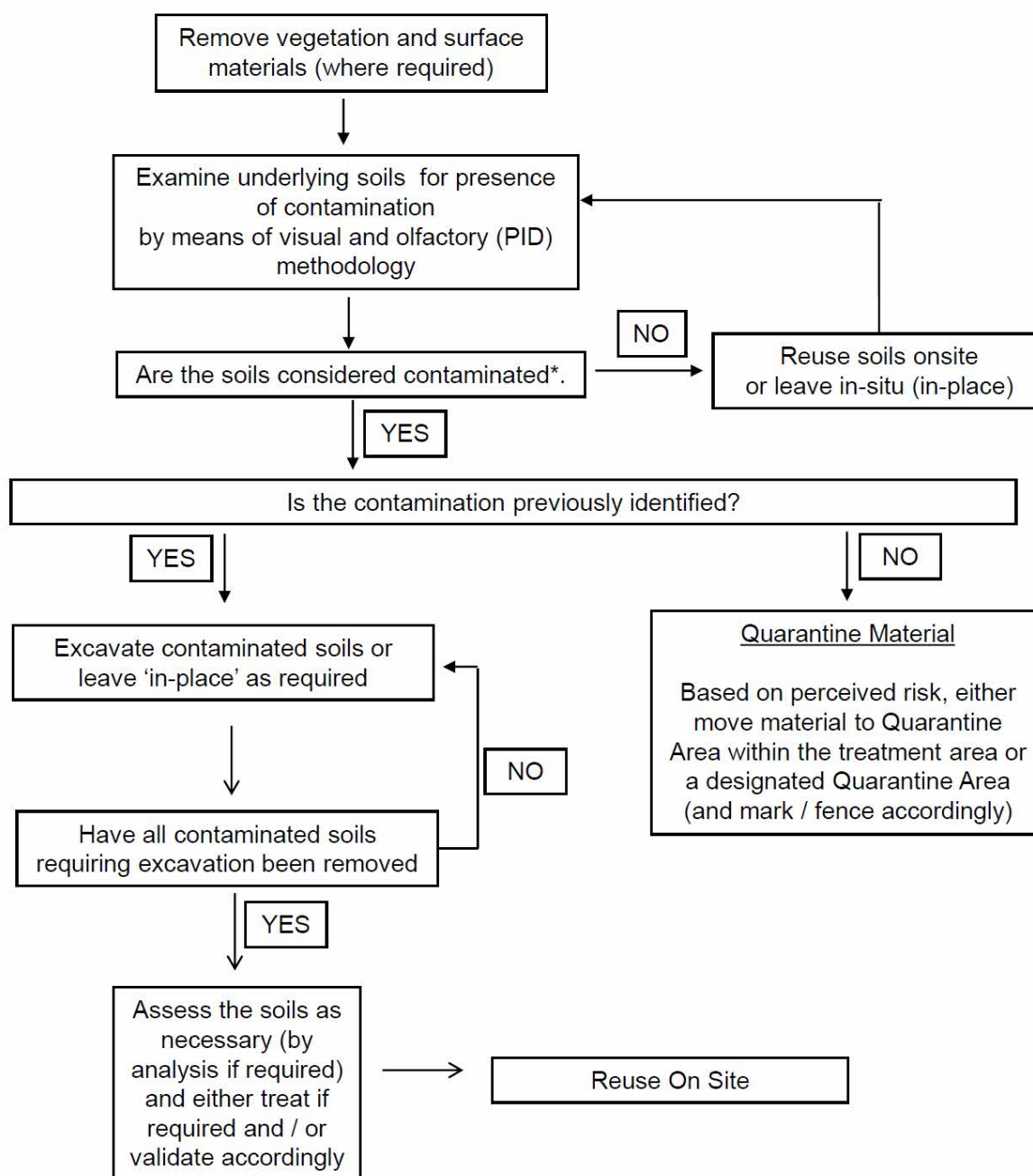
Quarantine Process

The Quarantine Process referred to in Protocol Flowchart 1 is designed to enable a full assessment of the quarantined material to be carried out. Any material designated for inclusion in the Quarantine Process would either be quarantined at the point of discovery (if movement is not considered practical or if there is a risk of cross-contamination by moving) or moved to a designated Quarantine Area.

Following assessment, the material would either be managed onsite to address the identified risks associated with the material or disposed of offsite in accordance with the designated waste classification (in accordance with the designated WM3 classification / WAC assessment]. The regulatory bodies would be notified on the agreed course of action for each quarantined material.

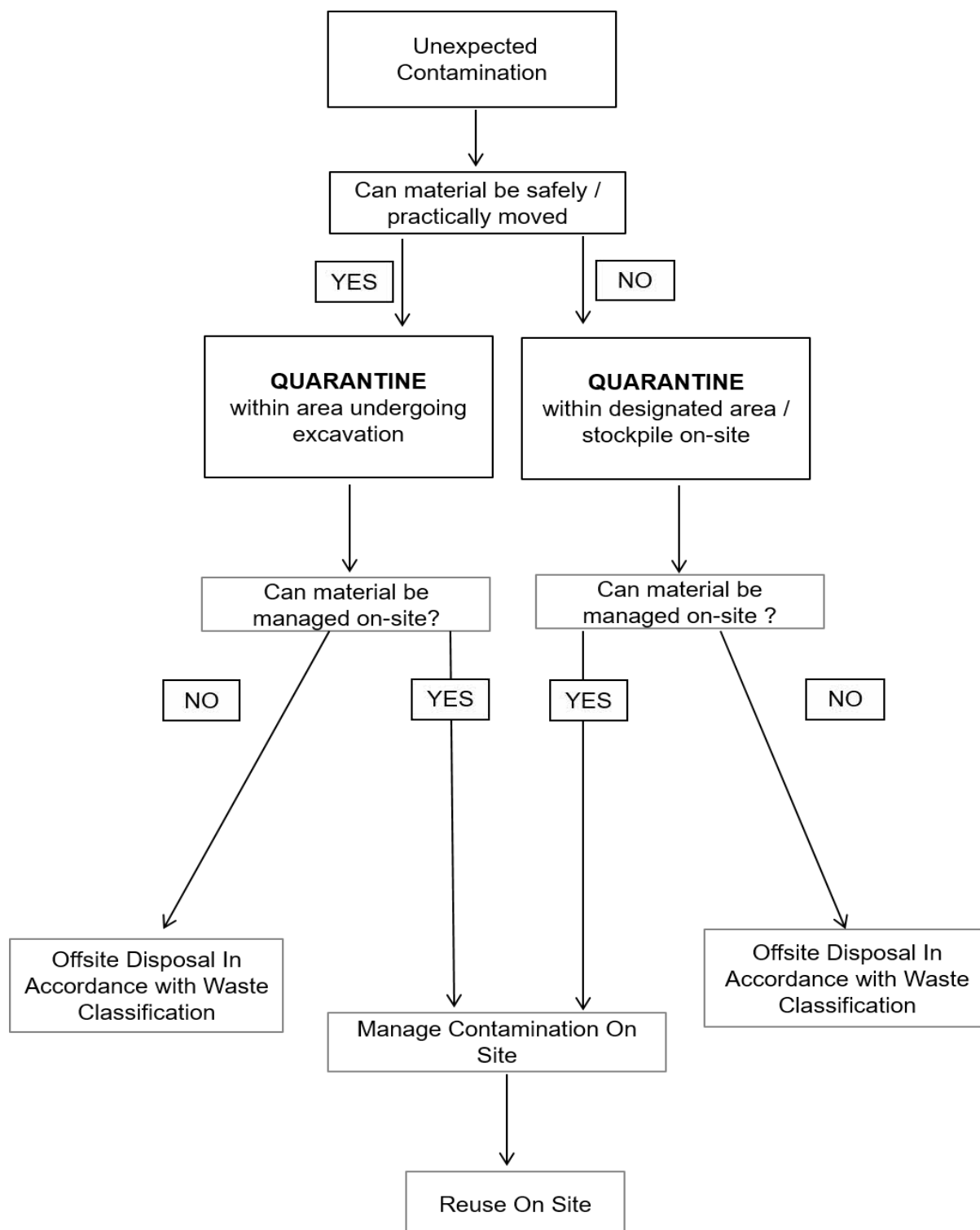
It is considered that the Discovery Strategy will negate any requirement to delay the project whilst any unexpected contamination is being addressed.

Protocol Flowchart 1



(*) contamination will be assessed on the basis of rapid sampling techniques as necessary, such as use of PID/FID to monitor volatiles in addition identify materials displaying visual, olfactory or physical properties (including hydrocarbon sheens / staining on soils and groundwater) that may be suspected of representing a contamination risk

Protocol Flowchart 2



Organisational Structure / Key Personnel

It would be the intention for Envirotreast to carry out the required remediation works.

The proposed organisational structure is shown in Figure 10 below:

Figure 10 - Proposed Organisational Structure.



Envirotreast contact details are as follows:

LCP House,
Pensnett Trading Estate,
Kingswinford,
West Midlands.
DY6 7NA.
01384 288876

Key contacts are:

Neil Mcleod (Technical Director - 07968 496927 – neil.mcleod@envirotreast.com)

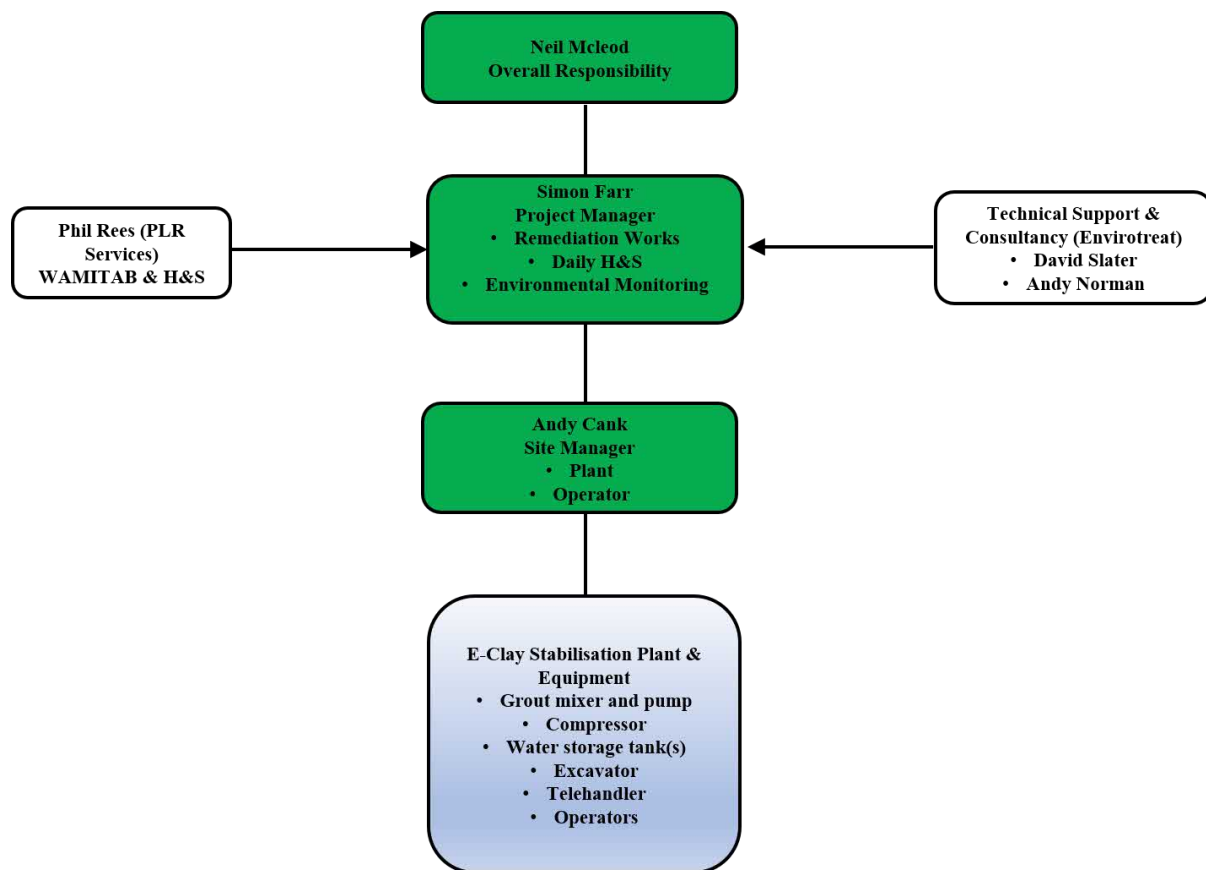
Simon Farr (Project Manager - 07803 174046 – simon.farr@envirotreast.com)

Andy Norman (Principal Consultant – 07949 423059 – andy.norman@envirotreast.com)

David Slater (Technical Manager - 07949 205896 – david.slater@envirotreast.com)

Neil McLeod is responsible for application of the remediation technologies in accordance with the procedures and safe systems of work outlined in this document.

Figure 11 – Site Responsibilities.



The Project Manager and Technical Manager (Simon Farr and / or David Slater) responsibilities would be as follows:

All site works

Safety issues

Quality issues

Compilation, revision and maintenance of the quality system

Health and safety risk assessments identifying potential hazards and risks to site operatives are to be completed and communicated to those all involved through a site induction process implemented prior to works commencing on-site. All prevailing site health & safety procedures take precedence.

A Site-Specific Quality Plan will be prepared which will set out all the quality control and quality assurances protocols along with required monitoring / recording procedures to ensure the precise application of the technology.

Quality Risk Assessments identifying potential risks to the quality of operations on-site are to be completed and communicated to those involved. The assessment sheets will also include controls and measures to ensure quality is stringently adhered to at all times during application of the remediation process. These assessments will form part of the overall validation process.

A comprehensive Site-Specific Health & Safety Method Statement will be produced including welfare requirements, COSHH, PPE, manual handling, noise, etc to ensure the safety of those working on site and to protect the surrounding environment.

WAMITAB Supervision

Philip Rees will be act as WAMITAB / Health and Safety advisor for Envirotreast.

Induction and Instruction

All staff will undertake a site induction by ADI and Envirotreast. This will include requirements in line with current COVID-19 guidelines.

The Project Manager would be responsible for ensuring that all Envirotreast staff are fully inducted, trained and supervised in all remediation activities to be carried out on-site. The induction and instruction will be recorded in the Safety & Environmental Plan held on site and a copy can be provided where necessary. If any of the work activities change during the course of a project, an assessment of the hazards and risks associated with the work activity would be undertaken and further job-specific training would be given by the Site Manager / Project Manager as required. All personnel attending site would be required to read the Health, Safety and Environmental Plan, undergo appropriate induction and sign the record accordingly.

Quality Control

A daily / weekly record of works (including hours operated, volumes treated, site checks, plant records, etc) will be documented. The record sheets will be reviewed by the Envirotreast Project Manager and on approval will be signed and incorporated into the Site-Specific Quality Plan held on site.

All works will be undertaken in accordance (not exclusively) with;

HSG66 - Protection of workers and the general-public during development of contaminated land.

Managing Health and Safety in construction - Construction (Design and Management) Regulations 2015 – HSE Publication (L153).

Validation

The soil delineation will be validated by visual and olfactory methods initially and confirmed via the collection of samples from the sides and base of the excavated areas. These will be screened using rapid on site instrument (PID). A concentration reading by PID of 10 ppm has been proposed by Clancy (equivalent to >3,100 ug/m³ of benzene) and agreed by the Environmental Health at Havant Council. All PID readings taken during the delineation work will be recorded and included within the final Validation and Verification Report. Confirmatory soil samples will be collected and submitted to a UKAS/MCERTS accredited laboratory for analysis, the target concentration for remediation has been proposed as in table 1 below, i.e. soil concentrations confirmed above this level will require remediation.

Clancy has not derived risk-based value for soils above which remediation would be required. They report that soils containing concentrations of PHC fractions above solubility limits should be deemed to present an unacceptable risk and thus require remediation. Environmental Health (Havant Council) made the following comment on this point:

“Section 3.4 provides a clarification on the application of aqueous solubility levels to guide source removal works. This was requested as it was unclear how solubility limits were to be applied so as to be relevant to a controlled waters receptor. The new text refers to temperature-dependent solubility limits used within the CLEA model. It is my understanding that these values are relevant to the assessment of vapour exposure & plant-uptake pathways – indicating a saturation of vapour pressure limited by either a phase-transition via pore-water (sol) or direct to vapour (vap). This is not the same as describing the maximum soil concentration which is capable of contributing to dissolved-phase groundwater concentrations (or indeed the concentration which is likely to give rise to ‘saturated’ groundwater, where the maximum dissolved-phase concentrations are likely to be reached). In this way, the sol/vap values are not directly informative of soil concentrations that would represent a ‘negligible-acceptable’ risk to controlled waters.

The proposal to screen soil concentrations to human health-based sol/vap values is in line with USEPA procedure, and is considered conservative under UK system for human health assessments. Given the relationship with absolute solubility, and the sol concentrations quoted in Appendix II; I would consider these values to be acceptable as an arbitrary benchmark for controlled waters risks where values are available, but I would caution that the lack of available values (e.g. for non-volatile but soluble- and environmentally harmful-) substances should not be regarded as indicating that these substances do not pose a risk to controlled waters.

The success of remedial works in the absence of a specific controlled waters risk assessment (under a strategy of general betterment) is necessarily reliant upon appropriate expertise in the operation of oversight & active management of both the remedial works (and their verification), and the watching brief (referred to on pg.7). I am content for this to be picked up as a condition 16 matter but for the benefit of the applicant, I would highlight that condition discharge issues might arise where appropriate expertise is not exercised in the application of Appendix II values during remedial works and groundworks phases of the development.”

Samples of treated soils will be collected at a frequency of 1 per 250 m³ and submitted to a UKAS /MCERTS accredited laboratory. The samples will be leached in accordance with the ISO EN 12457 series methodology and the resulting leachates analysed for TPH-CWG.

Given that there are no published EQS or DWS for total TPH or PHC fractions, a proxy approach could be used that assess aromatic fractions based on aromatics compounds for which there are published standards. However given the Environmental Health comments above, Envirotreat propose a stringent approach in that the laboratory limit of detection (LOD) be utilised for each hydrocarbon fraction to confirm the success of the remediation method.

These are presented in the table below.

Table 1 – Proposed Remediation Target Criteria

PHC fraction	Laboratory LOD (ug/l)
Aromatic >C5-C7	1
Aromatic >C7-C8	1
Aromatic >EC8-EC10	1
Aromatic >C10-C12	10
Aromatic >C12-C16	10
Aromatic >C16-C21	10
Aromatic >C21-C35	10
Aliphatic >C5-C6	1
Aliphatic >C6-C8	1
Aliphatic >C8-C10	1
Aliphatic >C10-C12	10
Aliphatic >C12-C16	10
Aliphatic >C16-C21	10
Aliphatic >C21-C35	10

Environmental Monitoring and Site Controls.

Control of Mud and Debris.

The control and prevention of mud and debris being transported off-site will be dependent upon a number of factors. These include the weather and / or the amount of traffic and personnel travelling across the site.

Mitigating measures should therefore reflect the type of operation being carried out and it is not expected that stringent controls, such as those implemented on licensed landfill sites for the control of mud and debris, will need to be applied.

The potential risk for movement of mud and debris off-site is low to negligible during the project and negligible following completion.

Visual inspection of all vehicles will be undertaken before allowing them to move off-site.

Control of Potentially Polluting Leaks, Spillages and Aerial Emission.

A number of control measures will be undertaken to minimise the perceived risks and hazards associated with the remediation process.

All work will be carried out within a designated area to protect the surrounding environment from potential spillages within the working area.

Bagged dry additives are proposed, this will minimise the risk to underlying soils or windage. Bagged additives will be added directly to treatment area.

Fire on the Operating Site.

Due to proposed remediation works, the potential risk from fire to the surrounding environment is negligible. Wastes that are classified as explosive or highly flammable (Special Waste Hazard code H1, H3-A and H3-B) have not been identified on-site.

Identification of the type, composition and relevant hazardous properties of the contaminants on-site is an integral part of the site investigation stage. This information ensures that all wastes, whatever their nature and composition, can be treated and handled in accordance with the hazards they represent.

The emergency procedures for a fire or explosion on-site are detailed in the Fire Action Plan within the site-specific Health and Safety file, in accordance with the Health and Safety at Work Act 1974, and in collaboration with the local Fire Authority.

ALL fires or explosions on-site are considered an emergency and will be treated as such. To prevent the occurrence of a fire or explosion on-site, smoking and the use of naked flames will be prohibited within the treatment zone and fuel storage area.

Only suitably trained personnel, in accordance with the manufacturer's specifications, will carry out maintenance on plant and equipment. Relevant training will be given to all personnel on what to do in the event of a fire and in the use of the firefighting equipment.

Waste Quantity Measurement Systems.

Envirotreast are not operating a licensed landfill and as such there is not expected to be any material transported on or off the site (with regards to the treatment process) during the project. Waste Quantity Management Systems are not therefore applicable.

Asbestos Contaminated Materials / Control of Dust.

Asbestos contaminated materials have not been identified on site. Should asbestos containing materials be encountered during the works it will be necessary to carry out a detailed assessment of the nature and quantity of asbestos to determine the risk classification as shown in figure 7 below (and in accordance with the Cl:aire CAR-SOIL guidelines) and also to determine whether the asbestos contamination is above or below the 0.1% hazardous threshold. This will determine the course of action required for addressing the material i.e. either treatment for reuse on-site in designated areas of the site if low risk / non-notifiable or offsite disposal to a suitably licensed landfill site if considered to be notifiable and Licenced Asbestos Work.

Should further quantities of asbestos contaminated material be identified as part of the remediation works, then material will be quarantined pending analysis and assessment to determine appropriate course of action.

Appropriate environmental controls will be implemented to monitor and control dust emissions from the site which will also control the potential risks associated with the potential release of asbestos fibres.

These environmental controls will include (as a minimum):

Damping down on dry days to minimise the risk of dust being generated which could potentially impact on offsite receptors. The damping down process will also control the potential release of asbestos fibres. A suitable water supply will be available at all times for this purpose

The implementation of effective dust monitoring which will be undertaken at areas of the site deemed to pose a potential risk to offsite receptors. Should the monitoring demonstrate at any time that the potential risk is a concern then the works will cease immediately, and the methodology will be reviewed and demonstrated to be acceptable prior to remediation works recommencing on-site. The monitoring process will be fully supervised by Envirotreat and daily records will be maintained in the Quality Plan.

Control of Dust.

It is unlikely that dust will be generated from the excavation process.

There is a medium risk of dust associated with the treatment additives. Suitable control measures will be utilised to control dust (ie in-situ treatment, damping down, breaking bagged additives below ground, dust nets, etc)

Daily dust monitoring assessments will be undertaken by Envirotreat at key Environmental Monitoring Locations (see Figure below 17) – these will be recorded in the quality Plan.

Background monitoring will be undertaken to determine baseline levels.

Control of Odours and VOCs.

There is a potential that odours could be generated from the remediation works. Volatilisation and the production of odours are therefore deemed to be of medium risk. The pathway identified for the transport of odours across the site boundary is via air emissions, with potential receptors being site operatives, the public, neighbours and site visitors.

Control measures will include in-situ treatment, therefore negating the requirement to excavated contaminated soils.

Simple olfactory monitoring and VOC monitoring (via hand held PID) will be undertaken by Envirotreat at key Environmental Monitoring Locations (see Figure below 12) during operating days and records of any odours noted in the site logbook.

Background monitoring will be undertaken to determine baseline levels for odours and 1ppm Benzene adopted at the site boundary.

Control of Noise.

Receptors at risk are site operatives and the local community. Noise during the works may originate from the plant and vehicles delivering / removing materials to / from the site.

Noise monitoring (via a hand-held noise meter) will be undertaken by Envirotreat at key Environmental Monitoring Locations (see Figure below 12) during operating days and records of any odours noted in the site logbook.

The delivery process is not generally noisy and will only take place during sociable working hours.

Background monitoring will be undertaken to determine baseline levels.

Figure 12 – Environmental Monitoring Locations



Maintenance Procedures.

Maintenance of all plant and equipment required for the treatment process.

Checks of all plant and equipment will take place on a daily basis and will be recorded within the Quality Plan (a copy of which will be stored on site during the remediation works).

Contamination

No off-site vehicle or machine / plant traffic movement will be allowed without prior first being decontaminated.

All site operatives will not be allowed to leave site without changing work wear and washing as required – facilities will be provided.

Records.

All records regarding the installation, commissioning, operation and maintenance procedures will be noted within the site logbook.

Site Demobilisation.

On completion of the activities summarised above, all plant and equipment associated with the remediation works will be cleaned down (where applicable) and safely removed from site.

Regulatory Requirements

It would not be necessary to formally deploy Envirotreast's Mobile Treatment Permit for the soil excavation and disposal works.

There is a formal requirement to notify the Environment Agency at least 7 days prior to the commencement of the works.

Operational Requirements.

The following equipment will be utilised for the remediation (treatment) works:

Welfare facilities (to include changing area, toilets, washing facilities and rest / canteen) – to be provided by the Main Contractor

Excavator.

Telehandler

Mobile Plant (grout mixer and pumps, air compressor, water tanks).

The following staffing levels are proposed:

Plant Operatives

Project Manager

Site Supervision

Other requirements:

Site-Specific Health & Safety File

Health & Safety Risk Assessment and Method Statement

Site-Specific Quality Plan File

Personal Protective Equipment:

Personal Protective Equipment will be provided for onsite personnel where deemed necessary (i.e. where engineering controls and safe systems of work are not considered an effective safeguard against risks to safety and health) in accordance with the Personal Protective Equipment at Work Regulations 1992.

Minimum site PPE includes the provision of the following to ISO standards:

Safety Helmet

Hi-Visibility Jacket / Waistcoat

Safety Boots

Builders Gloves

Eye Protection

Ear Protection (to be determined on-site)

Warning signs indicating that construction activities are in progress will be displayed in and around the site where required.

A weekly general inspection of conditions on-site including, noise control, dust control, boundary fences etc, etc will be carried out by an Envirotreast representative and recorded and contained within the quality plan. Further to this an inspection of any plant and equipment hired by Envirotreast will be undertaken and recorded and again contained within the quality plan.

Inspection of plant and equipment will be carried out by the specialist contractor, prior to start-up each day. Inspection is primarily for possible leakages and/or any potential health hazards. If any item appears unsatisfactory it should be reported to an Envirotreast representative and this should be noted, and appropriate action taken.

A Health & Safety file will be compiled and maintained on site.

A Quality File will be compiled and maintained on site.

Hours of Operation.

The proposed working hours on site are as follows:

Weekdays: 08:00hrs - 17:00hrs

Saturday N/A

Sunday/Bank Holidays N/A

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-

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t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 22-48039

Project / Site name: Havant

Samples received on: 28/03/2022

Your job number:

**Samples instructed on/
Analysis started on:** 28/03/2022

Your order number:

Analysis completed by: 04/04/2022

Report Issue Number: 1

Report issued on: 04/04/2022

Samples Analysed: 10 soil samples

Signed:

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-48039
Project / Site name: Havant

Lab Sample Number	2217817	2217818	2217819	2217820	2217821
Sample Reference	ESL 101	ESL 102	ESL 103	ESL 104	ESL 105
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)					
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	17
Total mass of sample received	kg	0.001	NONE	0.5	0.5

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-48039
Project / Site name: Havant

Lab Sample Number				2217822	2217823	2217824	2217825	2217826
Sample Reference				ESL 106	ESL 107	ESL 108	ESL 109	ESL 110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	66	< 0.1	47	< 0.1	26
Moisture Content	%	0.01	NONE	8.8	14	9.1	15	15
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5	0.5

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	8.5	7.2	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	11	9.2	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	40	38	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	MCERTS	< 10	59	55	< 10	< 10

TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	10	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	50	40	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	MCERTS	< 10	60	59	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-48039

Project / Site name: Havant

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2217817	ESL 101	None Supplied	None Supplied	Light brown clay and sand with gravel.
2217818	ESL 102	None Supplied	None Supplied	Light brown clay and sand with gravel.
2217819	ESL 103	None Supplied	None Supplied	Light brown clay and sand with gravel and stones.
2217820	ESL 104	None Supplied	None Supplied	Light brown clay and sand with gravel and stones.
2217821	ESL 105	None Supplied	None Supplied	Brown clay and sand with gravel.
2217822	ESL 106	None Supplied	None Supplied	Brown clay and sand with gravel and stones.
2217823	ESL 107	None Supplied	None Supplied	Brown clay and sand with gravel.
2217824	ESL 108	None Supplied	None Supplied	Brown clay and sand with gravel and stones.
2217825	ESL 109	None Supplied	None Supplied	Light brown clay and sand with gravel.
2217826	ESL 110	None Supplied	None Supplied	Light brown clay and sand with gravel and stones.

Analytical Report Number : 22-48039

Project / Site name: Havant

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total



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Analytical Report Number : 22-50309

Project / Site name: Langstone Havant

Samples received on: 07/04/2022

Your job number:

**Samples instructed on/
Analysis started on:** 07/04/2022

Your order number:

Analysis completed by: 15/04/2022

Report Issue Number: 1

Report issued on: 15/04/2022

Samples Analysed: 6 leachate samples

Signed:

Martyna Langer
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 22-50309
Project / Site name: Langstone Havant

Lab Sample Number	2229933	2229934	2229935	2229936	2229937
Sample Reference	Treated 1	Treated 2	Treated 3	Treated 4	Treated 5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	04/04/2022	04/04/2022	04/04/2022	04/04/2022	04/04/2022
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)					

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 22-50309
Project / Site name: Langstone Havant

Lab Sample Number	2229938
Sample Reference	Treated 6
Sample Number	None Supplied
Depth (m)	None Supplied
Date Sampled	04/04/2022
Time Taken	None Supplied
Analytical Parameter (Leachate Analysis)	

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 22-50309
Project / Site name: Langstone Havant

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	ISO 17025
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

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Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total