

**New Settlement Area, Heyford Park,
Oxfordshire**

**Dorchester Phase 5,
Contamination Hotspot: Remediation Works
Verification Report**

For: Urban Regen Ltd.

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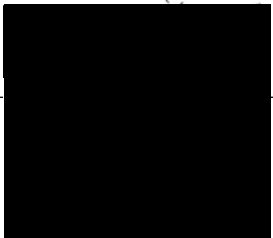

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1. Introduction

- 1.1. Planning permission for the redevelopment of the former RAF/USAF Upper Heyford airbase was granted by Cherwell District Council (CDC) on the 2nd November 2012, reference 10/01642/OUT. The site, which is being converted to commercial and residential uses, is known as Heyford Park and is divided between the Flying Field Area (FFA) and New Settlement Area (NSA). Urban Regen Ltd. (URL) was instructed by the consortium of Dorchester Heyford Park Group Ltd and Bovis Homes to carry out demolition, remediation and preparatory earthworks across the NSA to prepare various zones for residential development. Dorchester Group and Bovis have divided the site into a number of development phases, and the URL works are referenced to these various phases.
- 1.2. The above planning consent contains the following conditions relating to contamination remediation; particularly pertinent to the works detailed in this report is Condition 26.

24	<i>No operational development approved by this planning permission shall take place (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), until the following components of a scheme to deal with the risks associated with contamination of the site shall each be submitted to and approved, in writing, by the local planning authority:</i>
a.	<i>A preliminary risk assessment which has identified:</i>
(i)	<i>- all previous uses.</i>
(ii)	<i>- potential contaminants associated with those uses.</i>
b.	<i>A conceptual model of the site indicating sources, pathways and receptors.</i>
c.	<i>Potentially unacceptable risks arising from contamination at the site.</i>
d.	<i>A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.</i>
e.	<i>The site investigation results and the detailed risk assessment (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.</i>
f.	<i>A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action. Any changes to these components require the express consent of the local planning authority. The scheme shall be implemented as approved.</i>
25	<i>Prior to occupation of any new build dwellings, a verification report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation 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 to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the local planning authority.</i>

26	<i>If during development contamination not previously identified is found to be present at the site then no further development within 20m of the contamination shall be carried out until the developer has submitted to and obtained written approval from the local planning authority for an addendum to the method statement. This addendum to the method statement shall detail how this unsuspected contamination will be remediated (if necessary) and thereafter this will be carried out as approved before any development within 20m recommences. Following completion of any such additional remediation, a verification report shall be submitted within 3 months of the completion of the works for the approval of the Local Planning Authority in writing.</i>
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- 1.3. A Remediation Strategy (ref: EED10658-109_S_12.2.3_FA, September 2012) prepared by Waterman Energy, Environment and Design Ltd. (Waterman) on behalf of Dorchester Group, together with a Demolition and Remediation Method Statement produced by Vertase F.L.I. Ltd. were submitted to the Local Planning Authority (Cherwell District Council). The Council subsequently approved the discharge of Condition 24 on the 02nd November 2012. Whilst the role of Waterman has changed within the remediation scheme, and Vertase FLI is no longer involved with the site, the principles of the Remediation Strategy remain the same and have been adopted by URL in their role as Principal Remediation Contractor to Dorchester Group and Bovis.
- 1.4. For clarity, SGP re-submitted an updated Remediation Strategy (R1742-R01-v3) in April 2014 that reflects the changed contractual circumstances with respect to contamination remediation. Approval of the revised Strategy was received from the CDC EHO in October 2014.
- 1.5. Smith Grant LLP (SGP) has been instructed by URL to advise upon the implementation of the remediation works, carry out all necessary inspections and monitoring of the works, and to produce verification reports as the preparatory earthworks in each phase are completed by URL to assist in the discharge of Condition 25 and, if required, Condition 26.
- 1.6. An area of previously unidentified contamination has been discovered within Phase 5 of the development; in order to fulfil the requirements of Condition 26 SGP has notified CDC in writing of the presence of the unexpected contamination (letter ref: R1742-190618, issued 20th June 2018). Characterisation of the contamination indicated that it could be managed under the provisions of the existing Remediation Strategy, no amendments were therefore required.
- 1.7. SGP has since inspected the URL remediation earthworks carried out in relation to the discovered contamination hotspot and has collected validation samples of the stripped soil surfaces and replaced soils for determination of compliance with the agreed remediation target values (RTVs). This report describes the works carried out in the area (the extents of which are shown on Drawing D01) and the analysis undertaken, drawing conclusions and making recommendations concerning the further works required by Dorchester Homes in order to fully discharge Planning Conditions 25 and 26. A proposed development layout plan corresponding to the impacted and surrounding area has also been provided (0521-PH5-102).

2. Remediation Strategy

2.1. Expected Contamination

2.1.1. The wider development comprises an area of the former Upper Heyford Airbase, latterly developed and used by the United States Airforce, which has been decommissioned and is used in part for civilian purposes, including commercial and residential uses as part of Heyford Park. Identified known or potential contamination sources determined from the historical uses of the site and site investigations were generally found to be minor, consisting of low-level but pervasive contamination by metals / metalloids and PAHs, with localised hydrocarbons associated with bulk fuel storage tanks and the potential for asbestos in pipe laggings and gaskets, insulation board and cement-bound products, or as dispersed fibre in made ground. The key identified potential contamination hot-spots in the wider site were fuel hydrocarbons associated with bulk underground fuel storage tanks (USTs).

2.1.2. Natural background contamination may be present in the bedrock and soils. The site lies within or adjacent to the "ironstone domain" as described in DEFRA Technical Guidance Sheet TGS01 "Arsenic", July 2012; the site lies within 1km of mapped outcrops of ironstones within the Jurassic sedimentary rocks. Within the ironstone domain, the normal background concentration (NBC) of arsenic is reported to be 220 mg/kg; the NBC is defined as the upper 95% confidence limit of the 95th percentile of topsoil concentrations. The normal background concentration of vanadium within the ironstone domain is reported by BGS to be >128 mg/kg. Both values substantially exceed the Remediation Strategy 'Table B1' criteria for cover soils.

2.2. Unexpected Contamination – Hydrocarbon Hotspots

2.2.1. Condition 26 of the Planning Permission for the site contains the requirement that when unexpected contamination is encountered an addendum remediation method statement is to be produced for implementation. This is then to be followed by a verification plan which is to be submitted to the Local Planning Authority within 3 months of completion of the works. Provision has therefore been made within the Remediation Strategy for the discovery of unexpected contamination which includes the investigation of any such materials by a suitably qualified Environmental Consultant, with subsequent verification reporting to be issued to CDC as necessary.

2.2.2. The removal of hydrocarbon contamination is already detailed within the approved Strategy and as such it is considered that revision of the Strategy is not required if unexpected hydrocarbon hotspots are encountered. Hydrocarbon contaminated soils can therefore be dealt with via the techniques described in the Strategy, comprising of the key following actions:

- excavation of hydrocarbon contaminated soils under supervision of a suitably qualified Environmental Consultant up to either site boundaries, retained buildings, services or intact bedrock;
- removal of contaminated soils offsite to a secure bunded stockpile which is to be placed on an impermeable membrane / paved surface until the material is either suitably disposed of or treated;
- collection of verification samples from the side walls and bases of excavations where contaminated materials are removed at a frequency of 1 composite sample per 15m² of exposed surface (minimum 3 samples) for submission to an accredited laboratory for fractionated hydrocarbon analysis, and;
- the assessment and recording of any residual contamination present on intact rock surfaces, for which there is no requirement to excavate.

2.2.3. Verification sampling, as described above, is necessary to demonstrate that any residual hydrocarbon contamination does not pose a significant risk to controlled waters by reference to the soil standards agreed by Waterman with the Environment Agency (Waterman Remediation Strategy: Tables B2 and B3). The criteria are organised in two tiers according to the distance of hot-spots from the southern / southeastern (down-gradient) boundary of the site. As the hydrocarbon hotspot detailed in this report is greater than 250m from the southeast boundary the results of the verification sampling are to be compared with the criteria set out in Table B3 of the Waterman Strategy, which is reproduced in table 2.1 below.

Table 2.1. Screening Criteria, Hydrocarbon Hot-spots >250m from southeastern site boundary (from Waterman Table B3)

Petroleum Hydrocarbon Fraction	Target Concentration >250m (mg/kg)
Aliphatic C8-C10	240
Aliphatic C10-C12	1000
Aliphatic C12-C16	1000
Aliphatic C16-C21	1000
Aliphatic C21-C35	1000
Aromatic C10-C12	23
Aromatic C12-C16	1000
Aromatic C16-C21	1000
Aromatic C21-C35	1000

3. Description of Works

3.1. Preliminary Investigation

- 3.1.1. Following the discovery of additional underground storage tanks (USTs) within the area of the former petrol station in Phase 5 (the removal and validation of which will be reported separately in the main UST Validation Report), a trial-pitting exercise was carried out on the 07th June 2018 to ensure that no further tanks were present in the immediate vicinity. In the two trial pits excavated to the west / northwest of the USTs, suspected hydrocarbon contamination (described as bitumen impacted soils and diesel impacted gravels) was encountered, as discussed in letter 'R1742-190618' issued to CDC.
- 3.1.2. The presence of hydrocarbon contamination within the suspect materials was subsequently confirmed by laboratory analysis (Exova report ref: 18/8828), which is discussed in more detail in Section 4. It was therefore considered that further investigation was required to determine the extents of the contamination hotspot, with the removal of gross hydrocarbon contamination where encountered.

3.2 Hydrocarbon Contamination Removal

- 3.2.1 The works initially consisted of a surface strip of soils not exhibiting any significant contamination indicators by URL under the guidance of SGP. These soils typically comprised a thin veneer of weathered limestone bedrock fill and an underlying stratum of light brown clay, which was presumedly placed to act as a capping layer over the buried soils. These soils were inspected for visual and olfactory indicators of contamination and were screened using a photoionization detector (PID) for the presence of volatile organic compounds (VOCs). Materials that did not display significant contamination indicators and demonstrated VOC concentrations below 10ppm were deemed potentially suitable for replacement. These soils were stockpiled adjacent to the excavation and were sampled for hydrocarbon analysis in order to assess their suitability for replacement, as discussed in section 4.
- 3.2.2 Following removal and segregation of the clean soil cover, excavation of the grossly contaminated soils commenced. Observed contamination indicators included moderate to strong hydrocarbon odours, grey stained soils, black viscous product (often amongst degraded metal drums), and PID readings of soils above 10ppm (the highest reading observed exceeded 400ppm). Where hydrocarbon contamination was present, this tended to extend to the underlying weathered limestone bedrock or rockhead (encountered at between approximately 2.5m and 4m bgl, deepening to the west), where the excavation would cease.
- 3.2.3 The eastern extent of the excavation comprised natural weathered bedrock demonstrating some residual staining, for which there is no requirement for removal, and the excavation ceased on the western extent due to the consistent absence of any significant contamination indicators. The northern and southern extents of the excavation were constrained by the

presence of roads and services and contamination indicators, as described earlier, were apparent on the eastern sides of these wall faces implying that impacted materials may extend beyond the treated area. The extents of the excavation (which had a total area of approximately 1,200m²) are shown on Drawing D01.

- 3.2.4 Situated amongst the hydrocarbon impacted soils a number of small caches of broken asbestos cement sheeting was encountered temporarily causing the excavation to cease. The area was dampened down using water which had collected within the excavation and suitably qualified URL staff proceeded to handpick the visible asbestos containing materials (ACM) wearing protective masks and latex lined gloves. The ACM was double-bagged in appropriate bags which were then zip-tied. A total of five bags were filled with ACM which were removed from site for disposal. The excavation of hydrocarbon contaminated soils then re-commenced.
- 3.2.5 Following the excavation of the contaminated soils, URL removed the materials to a quarantine area within the wider NSA where it will remain stockpiled until a decision is made to either treat the material or dispose of it to a suitable receiving facility. Two stockpiles are present within the area: the main stockpile of hydrocarbon contaminated materials, and a smaller stockpile of material excavated in the vicinity of the identified ACM.
- 3.2.6 During removal of the contaminated materials a significant inflow of water entered the excavation from the west. Black product and an iridescent sheen was observed on the pooled water, likely due to having flowed through hydrocarbon impacted soils. Following the excavation of all feasibly removable contaminated soils (i.e. not constrained by the presence of roads / services to the north and south), the water was pumped into the recently emptied USTs directly to the east of the hotspot.
- 3.2.7 It was considered that the existing acceptability criteria for hydrocarbons set out in the approved Remediation Strategy remained applicable and that no significant modification to the Strategy was required. Subsequent to the removal of the grossly contaminated soils, SGP collected validation samples from the sidewalls and the base of the excavation to assess the potential for any residual hydrocarbon contamination that could present a risk to either current or future receptors. The locations from where validation samples were collected are indicated on Drawing D01.
- 3.2.8 Upon receipt of laboratory results confirming that the soils stockpiled adjacent to the hotspot were suitable to be retained these were replaced within the excavated area and compacted.

4. Inspections and Testing

- 4.1. Subsequent to the preliminary investigation carried out on the 07th June 2018, SGP attended the site on twelve occasions during the remediation earthworks carried out in relation to the Phase 5 contamination hotspot. The dates and activities undertaken during SGP attendance, cross referenced to the site inspection photographic record (Appendix A) and Laboratory Analysis Reports (Appendix B) are summarised in Table 4.1 below.

Table 4.1 SGP Inspection Summary

Date	SGP Activities	Record
07/06/2018	Attendance to oversee the excavation of two trial pits to determine the potential presence of USTs; samples collected from suspected hydrocarbon contamination observed within the trial pits.	Appendix B - 18/8828
12/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators.	Appendix A - Photos: 1-4
13/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from excavation extents.	Appendix A - Photos: 5-8 Appendix B - 18/9273
14/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from potentially recoverable material.	Appendix A - Photos: 9-11 Appendix B - 18/9273
20/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators.	Appendix A - Photos: 12-18
21/06/2018	Observation of hydrocarbon hotspot and ACM removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of sample of suspected ACM.	Appendix A - Photos: 19-22 Appendix B - 18/9818
22/06/2018	Observation of hotspot excavation, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from potentially recoverable material.	Appendix A - Photos: 23-25 Appendix B - 18/9818
25/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators.	Appendix A - Photos: 26-28
26/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators.	Appendix A - Photos: 29-32
27/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from potentially recoverable material and from excavation extents.	Appendix A - Photos: 33-37 Appendix B - 18/10066

Date	SGP Activities	Record
28/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from potentially recoverable material and from excavation extents.	Appendix A - Photos: 38-42 Appendix B - 18/10241
29/06/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from excavation extents.	Appendix A - Photos: 43-46 Appendix B - 18/10241
02/07/2018	Observation of hydrocarbon hotspot removal, directing which soils may potentially be retained and which require removal based on the absence/presence of contamination indicators; collection of validation samples from potentially recoverable material and from excavation extents.	Appendix A - Photos: 47-53 Appendix B - 18/10441

4.2 Preliminary Investigation

4.2.1 As described previously, suspected hydrocarbon contamination was encountered within Phase 5 of the development during a trial pitting exercise carried out on the 07th June 2018. The contamination was variable and comprised both black product contained within clay soils at between 2-2.5m bgl, and a black sandy gravel with a strong hydrocarbon odour and PID readings up to 20ppm at between 0.8-1.6m bgl. Samples of both the product and suspected hydrocarbon impacted gravels (Exova report ref: 18/8828; 'TP1-S1-PRODUCT' and 'TP2-S1, respectively) were collected and analysed for a range of determinants which confirmed that the former was a viscous tar, possibly bitumen, and the latter contained elevated hydrocarbon concentrations across multiple fractions. VOC and SVOC analysis was also undertaken on the tar product which demonstrated low to negligible concentrations.

4.2.2 The confirmed presence of hydrocarbon contamination by diesel and bitumen tar warranted further investigation and the removal of all soils in the area that demonstrated significant indicators of contamination, including both visual and olfactory, or the detection of elevated VOCs with a PID.

4.3 Validation Samples Analysis: Retained Soils

4.3.1 URL initially stripped potentially clean soils overlying the hotspot which did not exhibit visual or olfactory indicators of contamination. These soils were then screened with a PID and providing the reading was below 10ppm the material was side-cast for potential replacement following receipt of laboratory analysis carried out on samples of the material which were collected at an approximate frequency of 1 composite per 250m³.

4.3.2 Sixteen samples were submitted to accredited laboratory, Exova Jones, Flintshire, for full TPHCWG banding and BTEX analysis. The results of the validation testing (Exova report refs: 18-9273 (S1-S3), 18-10066 (S5), 18-10241 (S6-S16) and 18-10441 (S17)) are compared to the assessment criteria set out table B3 of the approved Remediation Strategy, as summarised in Table 4.2 below.

Table 4.2 Validation Screening Summary for Replacement Soils

Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Table B3	
			Screening criteria* (mg/kg unless stated)	Exceedance Concentration & location
Aliphatic C5-C6	16	<0.1	-	-
Aliphatic C6-C8	16	<0.1-0.6	-	-
Aliphatic C8-C10	16	<0.1-0.9	240	None
Aliphatic C10-C12	16	<0.2-129.6	1000	None
Aliphatic C12-C16	16	<4-193	1000	None
Aliphatic C16-C21	16	<7-34	1000	None
Aliphatic C21-C35	16	<7-319	1000	None
Aromatic C6-C7	16	<0.1	-	-
Aromatic C7-C8	16	<0.1	-	-
Aromatic C8-C10	16	<0.1	-	-
Aromatic C10-C12	16	<0.2-15.7	23	None
Aromatic C12-C16	16	<4-39	1000	None
Aromatic C16-C21	16	<7-81	1000	None
Aromatic C21-C35	16	<7-469	1000	None
Benzene	16	<0.005	0.08 (Table B1)	None
Toluene	16	<0.005	120 (Table B1)	None
Ethylbenzene	16	<0.005-0.012	65 (Table B1)	None
m/p-Xylene	16	<0.005-0.012	42 (Table B1)	None
o-xylene	16	<0.005	44 (Table B1)	None

4.3.3 Hydrocarbon concentrations were below the assessment criteria for all 16 of the validation samples collected from the soils stockpiled for potential replacement. No criteria are derived within Table B3 for BTEX compounds and so screening thresholds were utilised from Table B1 of the Waterman Strategy (chemical criteria for material in the capping layer), none of which were exceeded. These soils were therefore deemed suitable for replacement within the excavation.

4.3.4 Sample 'PH5-HS-S4' (Exova report ref: 18-9818) was collected from material that appeared to be uncontaminated by hydrocarbon contamination but within the area of ACM deposits within the hotspot. This material was therefore isolated from the other recovered soils and was sampled for an asbestos screen. Chrysotile fibre bundles were detected within the sample and it was therefore decided that this material should be removed to the contamination stockpile area. These soils were then added to the smaller stockpile of contaminated materials excavated in the vicinity of the ACM deposits.

4.4 Validation Samples Analysis: Excavation Walls and Base

4.4.1 Contaminated soils determined through visual and olfactory assessment or with elevated PID readings were removed by mechanical excavator and were temporarily stockpiled within the wider NSA area pending further assessment. Hydrocarbon impacted soils were typically present above the bedrock and therefore the impacted soils were removed down to bedrock

in accordance with the Strategy. A detailed photographic record during the remedial works is presented in Appendix B.

4.4.2 SGP collected validation samples from the extents of the excavation sidewalls in order to confirm that residual contamination was not present at unacceptable concentrations. Samples were also collected from the base of the excavation from weathered bedrock in order to assess whether the bedrock had been significantly impacted by the observed hydrocarbon contamination. Samples were collected at an approximate frequency of 1 sample per 15m² of exposed sidewall in accordance with the strategy, with a reduced frequency of 1 sample per 67m² collected from the base of the excavation. Validation sample locations are indicated on Drawing D01.

4.4.3 Forty-five samples were submitted to accredited laboratory, Exova Jones, Flintshire, for full TPHCWG banding and BTEX analysis. The results of the validation testing (Exova report refs: 18-9273 (SS1-SS6), 18-10066 (SS7-SS15), 18-10241 (SS16-SS33) and 18-10441(SS34-45)) are compared to assessment criteria set out table B3 of the approved Remediation Strategy, as summarised within Table 4.3 below:

Table 4.3 Validation Screening Summary for Excavation Side Walls and Base

Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Table B3	
			Screening criteria* (mg/kg unless stated)	Exceedance Concentration & location
Aliphatic C5-C6	45	<0.1-6.5	-	-
Aliphatic C6-C8	45	<0.1-34.5	-	-
Aliphatic C8-C10	45	<0.1-29.7	240	None
Aliphatic C10-C12	45	<0.2-342.6	1000	None
Aliphatic C12-C16	45	<4-479	1000	None
Aliphatic C16-C21	45	<7-384	1000	None
Aliphatic C21-C35	45	<7-7752	1000	10 (SS1, SS5, SS31-34, SS36, SS38-39 & SS44)
Aromatic C6-C7	45	<0.1	-	-
Aromatic C7-C8	45	<0.1	-	-
Aromatic C8-C10	45	<0.1-2.4	-	-
Aromatic C10-C12	45	<0.2-136.6	23	9 (SS1, SS3-6, SS31-33 & SS36)
Aromatic C12-C16	45	<4-126	1000	None
Aromatic C16-C21	45	<7-361	1000	None
Aromatic C21-C35	45	<7-3358	1000	6 (SS1, SS31-33, SS36 & SS38)
Benzene	45	<0.005	0.08 (Table B1)	None
Toluene	45	<0.005-0.029	120 (Table B1)	None
Ethylbenzene	45	<0.005-0.728	65 (Table B1)	None
m/p-Xylene	45	<0.005-1.622	42 (Table B1)	None
o-xylene	45	<0.005-0.075	44 (Table B1)	None

- 4.4.4 Hydrocarbon concentrations were below the assessment criteria within the majority of the validation samples collected with the exceptions of samples SS1, SS3, SS4, SS5, SS6, SS31, SS32, SS34, SS35, SS36, SS38, SS39 and SS44 with respect to the Aliphatic hydrocarbon range C21-35 and/or the Aromatic hydrocarbon ranges C10-12 and C21-35. The majority of the exceedances were detected within samples collected from the eastern ends of the northern and southern sidewalls where contamination was observed but was unable to be excavated due to the presence of roads and services constraining the excavation. The only exceptions to this were relatively minor exceedances detected in samples SS39 and SS44 of the Aliphatic carbon range C21-35 at concentrations of 1,540mg/kg and 2,123mg/kg, respectively. These samples were collected from the eastern sidewall where residual contamination was observed on natural weathered bedrock; they are not, however, considered to be indicative of the presence of unacceptable levels of contamination and in any case, it is not a requirement of the strategy to remove impacted bedrock.
- 4.4.5 None of the samples collected from either the base or western sidewall exceeded the screening criteria for any of the hydrocarbon ranges tested for.
- 4.4.6 No criteria are derived within Table B3 for BTEX compounds and so screening thresholds were utilised from Table B1 of the Waterman Strategy (chemical criteria for material in the capping layer), none of which were exceeded.
- 4.4.7 Drawing D02 indicates the locations of the samples with the concentrations of hydrocarbons relative to the RTVs.

5. Conclusions and Recommendations

5.1. Verification of Remediation

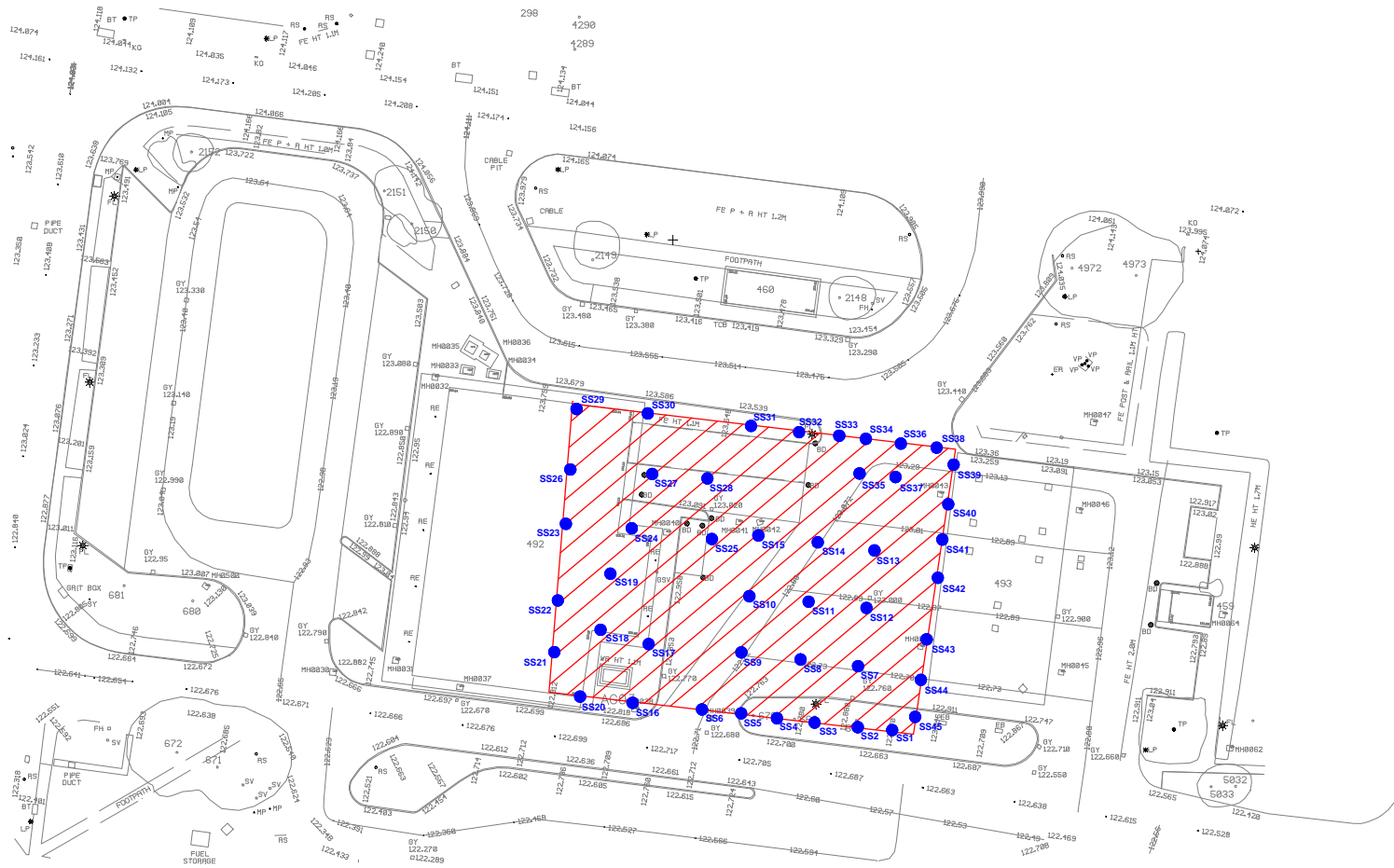
- 5.1.1. Contamination indicators identified during a preliminary inspection were further investigated and confirmed an area of at least 1,200m² to be potentially impacted by hydrocarbons within a layer of soils above bedrock. URL has remediated the hydrocarbon hotspot in the Phase 5 area by removing impacted soils for ex-situ treatment or disposal to the extents currently feasible, however, due to the presence of roads constraining the excavation to the north and south residual contamination remains in these areas.
- 5.1.2. Validation samples collected from the base and western sidewall of the excavation confirmed residual concentrations below the assessment criteria, whereas 2 samples collected from the eastern sidewall demonstrated minor exceedances; these are not, considered to be indicative of the presence of unacceptable levels of contamination requiring removal, however more significant exceedances in the eastern parts of the northern and southern extent of the remediation excavation contained moderate exceedances indicating the contaminated extends beyond the treated area at these locations.
- 5.1.3. Soils overlying the hydrocarbon hotspot that did not display contamination indicators or PID readings over 10ppm have been stripped, sampled at a frequency approximating 1 sample per 250m³ and tested for fractionated hydrocarbon analysis. All of the samples recorded hydrocarbon concentrations below the accepted screening criteria therefore the soils have been replaced within the excavation.

5.2. Ground Gas / Vapour Hazards

- 5.2.1. URL have completed remediation of the hydrocarbon impacted soils within the Phase 5 area to the extents currently feasible. Residual vapours may remain within either the impacted bedrock, the retained soils and/or the impacted soils underlying the roads to the north and south. Whilst no visible evidence of mobile contaminants was observed (i.e. free product) the potential for vapour migration exists, or further liquid / dissolved phase migration if sources underlying the roads to the north or south are mobilised.
- 5.2.2. It is therefore recommended that further risk assessment is completed through the installation of monitoring wells to determine the risk associated with residual vapours, or alternatively a precautionary approach should be adopted through the installation of a ventilated void within the floor construction and installation of a gas membrane specific for hydrocarbon resistance within all new buildings in the area; this corresponds to future plots 294-300 according to the development layout plan provided by Dorchester Homes (Ref: 0521-PH5-102). This precautionary measure is outside the scope of the approved Remediation Strategy and so will require approval from the EHO before implementation.

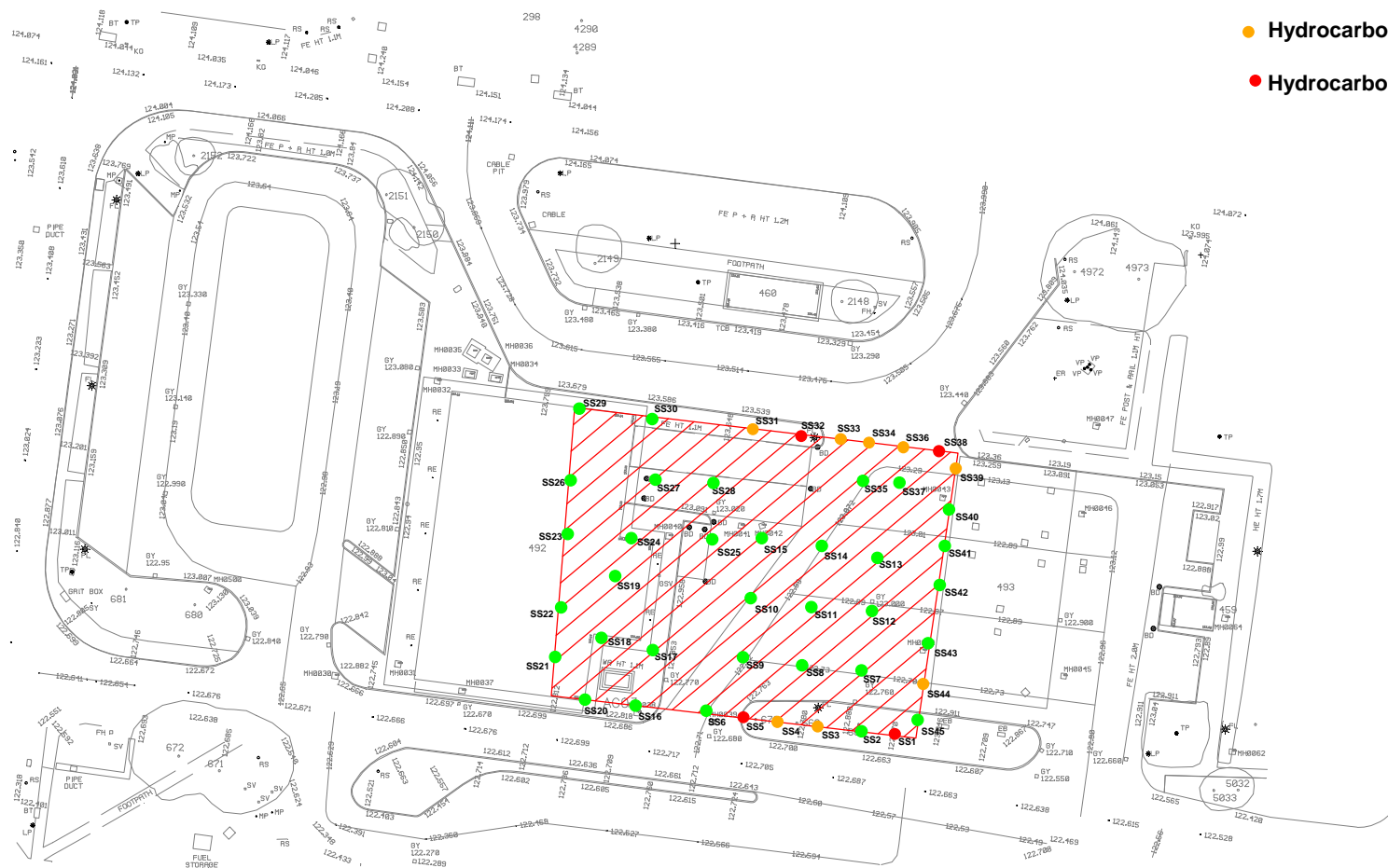
- 5.2.3. A number of partially constructed buildings are present to the south of the impacted area: as these are within 20m of the hotspot (on the side where exceedances of the criteria were recorded) the vapour assessment should consider the potential for lateral migration to impact these dwellings.
- 5.2.4. SGP concludes that the remedial works carried out to date with respect to the Phase 5 contamination hotspot have been completed in accordance with the agreed strategy, although it is anticipated that further excavation of contaminated materials will occur to the north of the excavated area which should be undertaken using the same approach described in this report.
- 5.2.5. United Utilities guidelines require production of a water pipeline risk assessment (WRAS) to evaluate whether there is a requirement for protected water supply pipes on the development. This should be carried out upon completion of the remediation works within Phase 5 and should utilise the investigation findings detailed in this report.
- 5.3. Limitations
- 5.3.1. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.
- 5.4. This report has been prepared by Smith Grant LLP, for the sole and exclusive use of Urban Regen Ltd. and Dorchester Homes, and the benefit of this report may not be assigned to any third party without the prior agreement in writing of Smith Grant LLP.
- 5.5. Reasonable skill, care and diligence have been exercised within the timescale and budget available, and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the whole report and not on extracts which may lead to incomplete or incorrect conclusions when taken out of context. This report reviews and relies upon site investigations largely conducted by others. If errors or omissions in previous work have been noted then these have been duly noted, however SGP accepts no responsibility for advice given on the basis of incorrect factual information provided to it.

DRAWINGS



● Stripped Surface Sample Locations

Project:	
Hayford Park, Upper Hayford	
Drawing:	
Dorchester Phase 5: Contamination Hotspot Excavation Extents and Sample Location Plan	
Drawn:	Checked:
SM	BJT
Date:	Scale:
18.07.18	1:750 @ A4
Job No:	Dwg No:
R1742b	R1742b-R16-D01



 Hotspot Excavation Extents

 Hydrocarbon Concentrations < RTVs

 Hydrocarbon Concentrations 1-5x RTVs

 Hydrocarbon Concentrations 5-10x RTVs

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email: consult@smithgrant.co.uk

Project:	
Heyford Park, Upper Heyford	
Drawing:	
Dorchester Phase 5: Contamination Hotspot Hydrocarbon Concentrations of Samples Relative to RTVs	
Drawn:	Checked:
SM	BJT
Date:	Scale:
27.07.18	1:750 @ A4
Job No:	Dwg No:
R1742b	R1742b-R16-D02

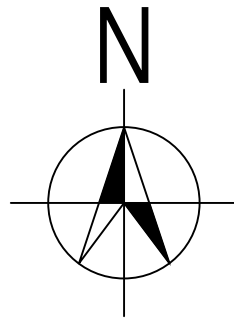


- REVISIONS:
- A. 2016-01-13. Patio length updated for Type 1A, Type 1A-SA, SP4, Type 2, SP2, SP1, Type 3D, Type 4A, SP6 house types as per client request. SO
 - B. 2016-04-19. Footprints for house type SP1 updated. Layout amended. Plots 288 & 296 changed from SP7 to SP7A and plots 289 & 297 changed from SP7(h) to SP7B at clients request. AJA/DW
 - C. 2016-05-04. Footprints for house types Type 3D, SP2 & SP6 amended and affected surrounding areas updated. Footpath in front of plot 289 widened and retractable bollards indicated. Plots 250-262 positions and parking areas adjusted. Plots 255-257 handed. 2m wide footpath added in front of plots 242-249. All as per Client's request. PVA
 - D. 2016-07-13. SP1 & SP2 footprint references amended at client request. MED
 - E. 2016-08-04. Gate for plot 263 and division fence for plot 290 repositioned. DW
 - F. 2016-09-29. External enclosures amended for clarity at client request. MED
 - G. 2016-10-07. Fence added to the rear of plot 288 to allow rear access for existing property. AJA
 - H. 2016-11-18. Street lighting indicated. AJA
 - I. 2017-01-13. Rear boundary fence to the rear of plots 287 and 288 moved to allow for diverted water main. AJA
 - J. 2017-02-22. Parking spaces between Plots 245 and 247 swapped their position and number as per client request. SO
 - K. 2017-03-17. Single garages increased in width to 3253mm. AJA
 - L. 2017-03-24. Rumble strips on private drives leading to gravel amended to tarmac/block paving and sheds removed. AJA
 - M. 2017-07-07. Overall width behind plots 287 and 288 fence and existing boundary increased to 2.4m. AJA
 - N. 2017-07-14. Footpath linking front door and driveway added to plot 250. AJA
 - O. 2017-11-03. Area to the rear of visitors parking changed from block paving to tarmac at clients request. AJA

LEGEND			
SITE BOUNDARIES			
	APPLICATION BOUNDARY		
EXISTING VEGETATION			
	EXISTING TREE TO BE RETAINED WITH MAINTENANCE CANOPY SIZE		EXISTING IPA
			EXISTING VEGETATION TO BE REMOVED
EXTERNAL BOUNDARY TREATMENTS			
	1800mm HIGH SCREEN WALL WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR MATERIALS)		600mm HIGH SCREEN WALL WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR MATERIALS)
	1800mm HIGH CLOSE BOARD TIMBER FENCE		900mm HIGH METAL ESTATE RAILINGS
	900mm HIGH FIBRE WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR MATERIALS)		1800mm HIGH PLOT DIVISION PANEL FENCE
	1800mm HIGH TIMBER MATCHBOARD ACCESS GATE		RETRACTABLE METAL BOLLARD
NUMBERING			
12	PLOT NUMBERS	G12	GARAGE NUMBERS
P12	PARKING NUMBERS	V	VISITOR PARKING
(h)	PLOT HANDING	C	CASUAL PARKING
MISCELLANEOUS			
	CHIMNEY		GARAGE ACCESS
	STREET LIGHTING COLUMN		PERSONNEL ACCESS
	AFFORDABLE HOUSING - INTERMEDIATE		AFFORDABLE HOUSING - RENTED
	BN HARVESTING WITH 1.5m TURNING CIRCLE		BN HARVESTING
	ROTARY DRYER		COMPOST BIN
	WATER BUTT		

GROUND SURFACING			
	MARSHALLS KEYBLOCK BLOCK PAVING COLOUR: BRENDA		RAMP / RUMBLE STRIP TO ENGINEERS DESIGN
	TARMAC		PAVING SLABS
	BN SLAB		LOOSE STONE GRID SYSTEM
			450mm x 450mm MARSHALLS SAKON BUFF PATIO SLABS
LANDSCAPING			
	PROPOSED NEW TREE WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR GRAFT DETAIL)		PROPOSED SHRUB & HEDGEROW WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR GRAFT DETAIL)
	PROPOSED BULB PLANTING WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR GRAFT DETAIL)		PROPOSED GRASS PLANTING WITH 100mm TYPICAL LAYOUT (100mm x 100mm FOR GRAFT DETAIL)

ACCOMMODATION SCHEDULE					
OPEN MARKET					
Name	Stories	Bedrooms	sqft		
TYPE 1A	2 Storey	3 Bed house	1023ft ²	1	
TYPE 1A-SA (side access)	2 Storey	3 Bed house	1038ft ²	2	
SP4	2 Storey	4 Bed house	1206ft ²	3	
TYPE 2	2 Storey	4 Bed house	1219ft ²	1	
SP7A	2.5 Storey	4 Bed House	1394ft ²	2	
SP7B	2.5 Storey	4 Bed House	1394ft ²	2	
SP2-V2	3 Storey	4 Bed house	1562ft ²	2	
SP1-V3	2.5 Storey	4 Bed house	1723ft ²	4	
SP1-V2	2.5 Storey	4 Bed house	1723ft ²	5	
SP1-V4	2.5 Storey	4 Bed house	1704ft ²	1	
TYPE 3D	2.5 Storey	5 Bed house	1942ft ²	7	
TYPE 4A	2.5 Storey	5 Bed house	2229ft ²	9	
SP6	3 Storey	5 Bed house	2671ft ²	3	
TOTAL				42	
AFFORDABLE HOUSING UNITS - RENTED					
Name	Stories	Bedrooms	sqft		
AF2	2 Storey	2 Bed house	782ft ²	10	
AF3	2 Storey	3 Bed house	910ft ²	1	
AF3-SA (side access)	2 Storey	3 Bed house	924ft ²	2	
S461	2 Storey	4 Bed house	1166ft ²	1	
S461-SA (side access)	2 Storey	4 Bed house	1166ft ²	1	
TOTAL				15	
AFFORDABLE HOUSING UNITS - INTERMEDIATE					
Name	Stories	Bedrooms	sqft		
AF2	2 Storey	2 Bed house	782ft ²	2	
AF3-SA (side access)	2 Storey	3 Bed house	924ft ²	1	
TOTAL				3	
TOTAL AFFORDABLE UNITS				18	



APPENDIX A

Remediation Earthworks Photolog

1.



12.06.18 – Initial strip of surface soils not demonstrating contamination indicators along southern extent of excavation.

2.



12.06.18 – Stockpile of recovered soils retained for replacement after contamination removal.

3.



12.06.18 – Excavation of hydrocarbon contaminated soils along southern extent down to weathered bedrock.

4.



12.06.18 – Hydrocarbon contaminated soils temporarily stockpiled within excavation pending removal offsite; residual staining present on lower reaches of southern sidewall.

5.



13.06.18 – Continuation of soil strip of materials not demonstrating contamination indicators.

6.



13.06.18 – Continued excavation of hydrocarbon contaminated soils down to weathered bedrock.

7.



13.06.18 – Material added to stockpile of soils retained for replacement.

8.



13.06.18 – Temporary stockpiling of hydrocarbon impacted materials within excavation.

9.



14.06.18 – Inflow of water into excavation from western wall; black product observed floating on surface.

10.



14.06.18 – Pooled water within excavation following inflow from western wall.

11.



14.06.18 – Temporary stockpiling of hydrocarbon impacted materials within excavation.

12.



20.06.18 - Continued excavation of hydrocarbon contaminated soils down to weathered bedrock.

13.



20.06.18 – Iridescent sheen observed on pooled water within excavation.

14.



20.06.18 – Removal of hydrocarbon impacted soils to quarantine area within wider NSA area.

15.



20.06.18 – Cache of broken fragments of ACM cement sheeting discovered within contamination hotspot.

16.



20.06.18 – Pooled water used to dampen down discovered ACM cement sheeting to reduce potential for fibre dispersal.

17.



20.06.18 – Soils excavated from area above ACM sheeting dampened down using pooled water.

18.



20.06.18 – View of eastern extent of excavation following removal of hydrocarbon contaminated soils.