



Photograph 3: Arisings from TP02 including plastic, fire hoses cables and pipes



Photograph 4: TP02 Excavation with cables and pipes visible



Photograph 5: TP03 Arisings



Photograph 6: TP03 free product on groundwater



Photograph 7: Ashy arisings from TP04



Photograph 8: TP04 excavation



Photograph 9: Arisings from TP05



Photograph 10: TP05 Excavation



Photograph 11: Arisings from TP06



Photograph 12: TP06 excavation with visible pipework and water at base



Photograph 13: Sandy ashy arisings from TP07



Photograph 14: TP07 excavation - predominantly ash



Photograph 15: Arisings from TP08 with metal waste visible



Photograph 16: TP08 Excavation



Photograph 17: Arisings from TP10 - possible china clay used in refinery processes and disposed of in the Tip



Photograph 18: TP10 excavation with possible china clay used in refinery processes and disposed of in the Tip



Photograph 19: TP11 arisings



Photograph 20: TP11 Excavation



Photograph 21: Largely ashy arisings from TP12



Photograph 22: TP12 Excavation



Photograph 23: TP13 arisings



Photograph 24: TP13

Appendix H Review of the Current Remedial Target Concentrations and Risk Based Screening Levels

Technical Note

Project: Coed Darcy

Subject: Review of the Current Remedial Target Concentrations and Risk Based Screening Levels

Client:	St Modwen Developments	Version:	Draft R3
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I Introduction

The Coed Darcy site (previously the BP Llandarcy Oil Refinery, Neath) comprises an area of approximately 170 hectares and is undergoing redevelopment for a mixture of residential, commercial, educational and recreational land use. To date, approximately 20 hectares of the Site has been developed.

Remediation of site won materials and acceptance of imported soil has been historically based on Risk Based Screening Levels (RBSLs) and Remedial Target Criteria (RTCs) developed by URS and Atkins (Atkins 2010, 2011). The most recent review of these criteria was undertaken by Atkins in 2010, however, changes have since been made to the published toxicological data and the risk assessment models which were used to derive these existing RBSLs and RTCs.

PJA has been commissioned by St Modwen Developments Ltd (the Client) to undertake a review of the existing RBSLs and RTCs, based on current published guidance and how they are applied to the site. This technical note presents the findings of the review, together with proposals for the development of revised Site Assessment Criteria (SAC) for the remainder of the site redevelopment.

2 RBSLs and RTCs

A detailed human health risk assessment was undertaken by URS between 2003 and 2004, from which the initial RBSLs were derived (Atkins 2010). The risk assessment was undertaken based on published guidance at the time which included the Contaminated Land Reports (CLR7-10), the Contaminated Land Exposure Assessment (CLEA) software, Soil Guideline Values (SGV) and associated toxicology reports. The RBSLs also took into consideration background soil concentrations and phytotoxicity criteria.

The RBSLs were derived for three land uses, residential with the consumption of vegetables, commercial and recreational. The recreational land use was based on the residential without consumption of produce scenario, excluding the inhalation of indoor vapour pathway. RBSLs were derived for soil at depths between Finished Floor Level (FFL) and 1m below FFL and soil below 1m below FFL.

RBSLs for the inhalation of vapours from a groundwater source were also derived using Risk Based Corrective Action (RBCA). These RBSLs for contaminant concentrations in groundwater were based solely on vapour risk to human health rather than risk to controlled waters receptors. It is understood this was based on an assumed depth to groundwater of 1m.

The RBSLs were subsequently formalised in the Deed of Planning Obligations Pursuant to S106 of the Town and Country Planning Act 1990, relating to Land at Llandarcy, Neath Port Talbot, South Wales (Atkins, 2010).

A review of the RBSLs was subsequently undertaken by Atkins in 2010. By this time, the Contaminated Land Reports and the CLEA model software had been replaced with updated guidance documents SR2, SR3 and SR4 and CLEA model software versions v1.04-v1.06. Atkins used the updated guidance and CLEA model v1.05 to derive RTCs, also considering site specific data which had been used in the derivation of the RBSLs. The RTCs were derived for soil from FFL to 1m below FFL, soil at depth greater than 1m below FFL and groundwater at depth greater than 1m below FFL.

An RTC was adopted if it was less than the existing RBSL or phytotoxicity criteria presented in the Soil Code (MAFF, 1998). Where background concentrations for a contaminant were greater than the derived human health criteria or phytotoxicity criteria the background concentration was adopted as the RTC (Atkins, 2010 and Atkins, 2011).

3 **Proposals for Revisions to the RTCs/RBSLs**

3.1 **Changes to Published HHRA Guidance**

Since the development of the RTCs, a further revision of published toxicological and modelling guidance for human health risk assessment has taken place. In 2012, revised Statutory Guidance for Part 2A of the Environmental Protection Act was published (DEFRA, 2012). To support the revision a Defra research project was undertaken resulting in the publication of SP1010 Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination (CL:AIRE, 2014). Revisions to the toxicological assessment and modelling methodology were recommended and Category 4 Screening Levels for six contaminants

(arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI, and lead) were derived. Two new standard land uses, public open spaces near residential housing and public parks were also proposed. A revised version of the CLEA model was subsequently issued in 2015 which included the library data sets from the SP1010 research project.

In 2015, Land Quality Management and the Chartered Institute of Environmental Health published Suitable 4 Use Levels (S4ULs) for human health risk assessment (Nathanail *et al.*, 2015). The derivation of the S4ULs took into consideration some of the modelling changes proposed in the SP1010 report, however, the toxicological basis for the derivation of the S4ULs was different to that of the C4SLs. The S4ULs were developed from Health Criteria Values (HCV) as defined in SR2, which represent a tolerable or minimal level of risk, whilst the C4SLs were based on Low Level of Toxicological Concern (LLTC) which represents low but not minimal risk.

3.2 Proposals for Revised Site SAC

3.2.1 Aesthetic Criteria

In addition to the RBSLs, the remediation requirements defined within the S106 were also based on visual and olfactory aesthetic criteria. The classification system for these aesthetic criteria, as defined within the S106, is presented in Table 1. To maintain consistency it is proposed that these criteria will continue to be applied to future ground investigation and remediation requirements, however, revisions are proposed to the depth intervals to which the criteria apply.

Table 1: Scale of Aesthetic Criteria (from S106)

Class	Visual	Olfactory
0	No visible staining of soil, no visible suspect ACM	No detectable odour on soil
1	Occasional staining of soil, no visible suspect ACM	Faint odour on soil
2	Frequent staining of soil	Distinct but not strong odour on soil
3	Occasional heavy staining of soil	Strong odour on soil
4	Heavy staining of soil	Strong odour discernible in ambient air
5	Visible hydrocarbon product	Over whelming Odour

The depths to which visual and olfactory criteria apply are shown in Table 2 and visually represented on the enclosed Figure 1 and Figure 2.

Table 2: Revised Scale of Aesthetic Criteria

Class	Depth in Residential Areas	Depth in POS and Commercial Areas	Visual	Olfactory
0	FFL to 0.6m below FFL (upper contact soils)	FFL to 0.3m below FFL (upper contact soils)	No visible staining of soil, no visible suspect ACM	No detectable odour on soil
1	NA	NA	Occasional staining of soil, no visible suspect ACM	Faint odour on soil
2	0.6m below FFL to 2.0m below FFL	NA	Frequent staining of soil	Distinct but not strong odour on soil
3	NA	0.3m below FFL to 1m	Occasional heavy staining of soil	Strong odour on soil
4	>2.0m below FFL	>1m below FFL	Heavy staining of soil	Strong odour discernible in ambient air

3.2.2 SAC for Upper Contact Layer

The RBSLs and RTCs for shallow soil currently refer to the upper 1.0m of the site. Previously following remediation, the site has been left at a formation level representing the base of any near surface cover to be placed (i.e. approximately 0.5m below FFL based on previous S106 guidance). The required near surface cover is then placed by the developer as part of the subsequent construction

It is proposed that the depth of soil to which the assessment criteria for near surface ‘contact’ soil corresponds to is amended to 0.6m for the residential scenario. This typically reflects requirements for near surface soils in most residential scenarios on similar sites. In terms of SACs for these shallow (residential FFL to 0.6m depth) soils, it is also proposed that current S4ULs and C4SLs are adopted to provide robust criteria comparable to other development sites (Appendix A).

The thickness of contact cover required in areas of open space and landscaping and commercial areas, is proposed as a nominal 0.3m. However, this will vary depending on the particular landuse and exposure scenario. For example, a greater thickness of contact cover and higher quality will be needed in areas or proposed allotments than for car parks in commercial areas with impermeable hardstanding. The SAC for contact layer in this scenario will similarly be based on robust up to date S4ULs and C4SLs appropriate for that particular landuse.

Where natural background concentrations of contaminants for the local area are likely to exceed S4ULs or C4SLs, it is proposed that the background concentration is used as the SAC. This is

consistent with the methodology used by URS and Atkins for the RBSLs and RTCs on the Coed Darcy site for previous plots.

The RBSLs and RTCs for metals also took phytotoxicity into consideration, however, this was based on the data presented in the Soil Code. Atkins (2010) recognised that using criteria from the Soil Code was likely to be overly conservative as the criteria were designed to avoid long term damage to the soils and enhance the ability of the soil to support plant growth rather than actual phytotoxic effects. It is therefore proposed that, due to the conservative nature of the Soil Code values, the revised SAC is based on human health assessment criteria and background soil concentrations.

In line with the above, the proposed SAC to be adopted for upper contact soils for residential land, public open space and commercial land are presented in Appendices A, B and C respectively.

3.2.3 SAC below Upper Contact Layer

RBSLs and RTCs are currently available for materials below 1.0m depth. The revised SAC for materials in residential areas below surface cover will apply to materials placed below the clean cover at depths of greater than 0.6m below FFL.

The SAC for fill materials placed in commercial areas and POS will correspond to fill material placed beneath the surface soil/construction layer depths greater than 0.3m below FFL (or the appropriate thickness as indicated in 3.2.2).

RTCs were previously derived for materials assuming that exposure of site users to contaminants in soils would only be via the inhalation of indoor and outdoor vapour pathways. Exposure via soil and indoor dust ingestion, consumption of homegrown produce and soil adhering to homegrown produce, skin contact with soils adhering to indoor dust, inhalation of indoor dust and inhalation of soil dust were not considered due to the material being placed at depths greater than 1.0m.

It is proposed that new SAC will be derived for materials using the most recent CLEA model and published guidance. Initially one set of SACs will be derived for depths from 0.6m below FFL to 2.0m below FFL assuming that receptor exposure is via the inhalation of indoor and outdoor vapour and the consumption of home-grown produce and soil adhering to home-grown produce. This is based on information presented in Environment Agency report SR3 which states that for many crop plants roots are between 1.0m and 2.0m, with the highest density of roots occurring in the top 0.8m with the exception of trees.

Exceedances of the SAC and VO4 at depth greater than 2m in all landuse scenarios will generally trigger a secondary assessment of risk which may include further human health DQRA. Depending on the levels of failure SACs will also be derived for material placed at depths greater than 2.0m below FFL. These SAC will assume that that site receptor exposure is solely via the inhalation of indoor and outdoor vapour only due to the depth of the material below ground level.

SAC will be derived for 1% and 2.5% soil organic matter content, in line with S4ULs and C4SLs.

SAC for asbestos in fill materials will also be presented as part of the proposed SAC for fill materials. In line with historical assessment, this will be based on the depth of placement below FFL.

3.2.4 Risk to Human Health from Volatile Contaminants in Groundwater

Risk to site users from vapours associated with volatile contaminants in groundwater has previously been assessed using RBSLs and RTCs derived using RBCA. In 2017, the Society of Brownfield Risk Assessment (SOBRA) published Generic Assessment Criteria ($GAC_{gw vap}$) for the assessment of risk to human health from volatile contaminants in groundwater. The $GAC_{gw vap}$ were derived using the CLEA model and were based on chemical data and exposure parameters also used in the derivation of the C4SLs, the LQM/CIEH S4ULs and the EIC/CL:AIRE/AGS GACs.

It is proposed that initial screening of the concentrations of contaminants in groundwater is in future undertaken using the $GAC_{gw vap}$ rather than the RBSLs/RTCs for groundwater. The $GAC_{gw vap}$ are not intended to be used for DQRA or as remediation criteria and do not take account of the presence of NAPL. If concentrations of contaminants in groundwater exceed the $GAC_{gw vap}$, or NAPL is present, then further Detailed Quantitative Risk Assessment will be required.

SOBRA $GAC_{gw vap}$ are presented in Appendix D. Note: these criteria assume a shallow depth to groundwater and hence are overly conservative for many parts of the Coed Darcy site.

3.2.5 Risk to Controlled Waters Receptors

The current RTCs and RBSLs do not consider risk to Controlled Waters receptors. In order to consider the risks to Controlled Waters on a more sitewide basis, it is proposed that a Controlled Waters Risk Assessment for the remainder of former refinery will be undertaken. The works are intended to provide greater visibility on groundwater risk issues and the focus on areas where additional risk management may be justified.

In line with the size of the site and its historical use and ground conditions, it is proposed that the site will be divided into zones based on historical use to identify contaminant sources and the primary controlled waters receptor for each zone. Remedial Targets Methodology (RTM) will be used to provide a risk baseline for each zone and historical ground investigation information will then be used to undertake preliminary QRA. The exercise will more clearly define the effective theoretical contaminant loading on the aquifer and provide a base against which to measure actual groundwater concentrations.

Given the known historical impacts of the refinery it is likely to be cost prohibitive to reduce residual concentrations to values in the baseline analysis. However, the original RAP programme made significant strides in reducing risk from point sources. Similarly, the early phases of development reclamation and remediation further reduced gross areas of contamination within the body of the site and provided greater clarity on the distribution of residual contamination. These secondary actions, whilst not reducing risk in totality, are an important additional contribution to reducing effective contaminant loading on the aquifer over and above what was originally conceived in the RAP.

Due to the loss of many historical monitoring wells in response to site clearance and habitat destruction associated with the trapping and translocation of Great Crested Newts from Southern Tank Farm, further monitoring and well installation may be required to enable full Controlled Waters DQRA following the preliminary assessment. It is proposed that the locations of these are agreed in advance with the regulators following the baseline exercise indicated above.

3.3 Approach to Quality Variability

It is proposed to retain the same testing regime set out within the S106. It is also anticipated that the current dataset gathered during the last five years continues to provide representative information from which decisions on the extent of further remediation and testing can be undertaken.

Inevitably there will be variability within the dataset which will indicate local failure of the proposed criteria. The actions to be taken to mitigate against residual risk will depend on the nature and frequency of the failure, the type of contaminant, the aesthetic criteria and the specific pollutant linkage.

Remedial action in the event of local failures of the proposed criteria may comprise:

- excavation and treatment of the local hot spot;

- enhanced protection systems such as formal 'clean cover' systems and difficult-dig layers to break direct contact pathways between receptors and contaminants such as metals, asbestos and non-volatile organic contaminants such as heavy-end TPH fractions, and to prevent inadvertent excavation into material with VO >0;
- enhanced protection systems such as capillary break layers to prevent the upward migration of contaminants via capillary action;
- enhanced protection systems such as organic vapour barriers to break vapour inhalation pathways between receptors and volatile contaminants such as benzene, naphthalene and light-end TPH fractions.

Potential enhanced protection systems are illustrated on Figure 2.

SAC are presented in the Technical Note for a range of scenarios for the upper soil contact layer. The SAC will also vary with increasing depth and the nature of the contaminant pathway. Depth dependant criteria are not presented for every scenario, however, the principle of depth variability for SACs in both soil and groundwater is an important principle this Technical Note seeks to establish and being applicable to the Coed Darcy site.

The applicability of different risk management methods and further refinement of an SAC will be subject to technical appraisal on a plot-by-plot basis and agreement with the regulators.

4 References

Atkins (2010) Coed Darcy. Derivation of Remediation Target Criteria

Atkins (2011) Coed Darcy. Derivation of Commercial Remediation Target Criteria

Environment Agency (2009) Updated technical background to the CLEA model. Science Report SC050021/SR3

Ministry of Agriculture, Fisheries and Food (MAFF), Welsh Office, Agriculture Department, October 1998. The Soil Code: Code of Good Agricultural Practice for the Protection of Soil

Nathanail, c. P., McCaffrey, C., Gillett, A. G., Ogden, R. C. and Nathanial, J. F. (2015) The LQM/CIEH S4 ULs for human Health Risk Assessment. Land Quality Press, Nottingham.

Appendix A SAC for Residential Land Use

Table A1: SAC (Metals) for Upper Contact Layer FFL to 600mm below FFL (Residential Land Use)

Contaminant	Current RBSL/RTC (mg/kg)	Proposed SAC (mg/kg)
Arsenic	64 ^a	64 ^a
Cadmium	2.6 ^b	11 ^d
Chromium	78 ^a	N/A
Chromium III	N/A	910 ^d
Chromium IV	N/A	6 ^d
Inorganic Mercury	1 ^c	40 ^d
Nickel	50 ^c	130 ^d
Selenium	3 ^c	250 ^d
Lead	337 ^a	337 ^a
Vanadium	113 ^b	410 ^d
Copper	143 ^a	2400 ^d
Zinc	478 ^a	3700 ^d
Asbestos		Zero fibres
a Based on background soil concentrations b Site Specific Human Health Criteria c Based on the Soil Code d LQM/CIEH S4UL		

Table 3: SAC (Organic Contaminants) for Upper Contact Layer FFL to 600mm below FFL (Residential Land Use)

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
Benzene	0.0493	0.087	0.12	0.17
Toluene	36	130	36	290
Ethylbenzene	38.2	47	41	110
Xylenes	17.2	56	32	130
TPH Aromatic >C5-C7	0.0493	70	0.192	140
TPH Aromatic >C7-C8	86.9	130	125	290
TPH Aromatic >C8-C10	14.8	34	94	83
TPH Aromatic >C10-C12	57.3	74	118	180
TPH Aromatic >C12-C16	131	140	131	330
TPH Aromatic >C16-C21	82	260	82	540
TPH Aromatic >C21-C35	888	1100	1130	1500
TPH Aliphatic >C5-C6	30.1	42	172	78
TPH Aliphatic >C6-C8	69.8	100	8340	230
TPH Aliphatic >C8-C10	9.76	27	87.1	65
TPH Aliphatic >C10-C12	1780	130(48)vap	3200	330(118)vap
TPH Aliphatic >C12-C16	4510	1100(24)sol	4510	2400(59)sol

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
TPH Aliphatic >C16-C21	94200	65000(8.48)sol*	94200	92000(21)sol*
TPH Aliphatic >C21-C35	94800		94800	
Total TPH (Phase 1)	1720	N/A	1720	N/A
Total TPH (Process Area)	2600	N/A	2600	N/A
Total TPH (North Tank Farm)	1100	N/A	1100	N/A
Total TPH (South Tank Farm)	1020	N/A	1020	N/A
1,2-Dichloroethane	0.0019	0.0071	0.0102	0.011
1,1,1-Trichloroethane	2.23	8.8	17.3	18
Tetrachloroethene	0.455	0.18	3.62	0.39
Trichloroethene	0.0382	0.016	0.304	0.034
Vinyl Chloride	0.000202	0.00064	0.00082	0.00087
Dichloromethane	0.458	0.458	1.56	1.56
Cis 1,2, dichloroethene	0.0393	0.0393	0.255	0.255
Trans 1,2 dichloroethene	0.0671	0.0671	0.464	0.464
Acenaphthene	588	210	1380	510
Acenaphthylene	N/A	170	N/A	420
Anthracene	8270	2400	14800	5400
Benzo(a)anthracene	7.56	7.2	16.5	11
Benzo(a)pyrene	0.9	2.2	0.9	2.7
Benzo(b)fluoranthene	20	2.6	23.9	3.3
Benzo(g,h,i)perylene	235	320	248	340
Benzo(k)fluoranthene	216	77	243	93
Chrysene	1500	15	2220	22
Dibenz(a,h)anthracene	1.97	0.24	2.39	0.28
Fluoranthene	822	280	1630	560
Fluorene	615	170	1390	400
Indeno(1,2,3-c,d)pyrene	19.2	27	23.6	36
Phenanthrene	N/A	95	N/A	220
Pyrene	563	620	1150	1200
Phenol	162	120	349	200
Mercury (methyl)	6.28	11	11.3	11
Mercury (elemental)	0.0607	1.2	0.583	1.2
Naphthalene	0.585	2.3	5.05	5.6
1,1,1,2-Tetrachloroethane	0.353	1.2	2.78	2.8
1,1,2,2-Tetrachloroethane	0.659	1.6	3.63	3.4
Carbon tetrachloride	0.00656	0.00656	0.0541	0.0541
Chlorobenzene	1.06	0.46	3.38	1.0

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
Proposed SAC based on S4ULs with the exception of dichloromethane, cis 1,2 dichloroethene, trans 1,2 dichloroethene and carbon tetrachloride.				
^{sol} S4UL presented exceeds the solubility saturation limit				
^{vap} S4UL presented exceed the vapour saturation limit				

Appendix B SAC for Public Open Space near Residential Housing

Table 4: SAC (Inorganic Contaminants) for Upper Contact Layer in Public Open Space near Residential Housing (FFL to 300mm below FFL)

Contaminant	Current RBSL/RTC (mg/kg)	Proposed SAC (mg/kg)
Arsenic	64 ^a	79 ^d
Cadmium	2.6 ^b	120 ^d
Chromium	78 ^a	N/A
Chromium III	N/A	1500 ^d
Chromium VI	N/A	7.7 ^d
Inorganic Mercury	1 ^c	120 ^d
Nickel	75 ^c	230 ^d
Selenium	3 ^c	1100 ^d
Lead	337 ^a	630 ^e
Vanadium	351 ^b	2000 ^d
Copper	143 ^a	12000 ^d
Zinc	478 ^a	81000 ^d
Asbestos		Zero fibres
a-Based on background soil concentration		
b Site Specific Human Health Criteria		
c Based on the Soil Code		
d LQM/CIEH S4UL POS near residential housing		
e C4SL		

Table 5: SAC (Organic Contaminants) for Public Open Space near Residential Housing (FFL to 300mm below FFL)

Contaminant	Current RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RTC (3%SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
Benzene	13	72	13	72
Toluene	8110	56000	8110	56000
Ethylbenzene	4740	24000	4740	24000
Xylenes	7940	41000	7940	42000
TPH Aromatic>C5-C7	26.2	56000	27.5	56000
TPH Aromatic >C7-C8	21300	56000	21300	56000
TPH Aromatic >C8-C10	2230	5000	2310	5000
TPH Aromatic >C10-C12	2300	5000	2340	5000

Contaminant	Current RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RTC (3%SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
TPH Aromatic >C12-C16	2330	5100	2350	5100
TPH Aromatic >C16-C21	1450	3800	1450	3800
TPH Aromatic >C21-C35	1450	3800	1450	3800
TPH Aliphatic >C5-C6	294000	570000(304)sol	294000	590000
TPH Aliphatic >C6-C8	294000	600000	294000	610000
TPH Aliphatic >C8-C10	5740	13000	5740	13000
TPH Aliphatic >C10-C12	5700	13000	5700	13000
TPH Aliphatic >C12-C16	5800	13000	5860	13000
TPH Aliphatic >C16-C21	1450	N/A	1450	N/A
TPH Aliphatic >C16-C35	159000	250000	159000	250000
TPH Aliphatic >C21-C35	159000	250000	159000	250000
Total TPH (Phase 1)	9060	N/A	9060	N/A
Total TPH (Process Area)	10800	N/A	10800	N/A
Total TPH (North Tank Farm)	9420	N/A	9420	N/A
Total TPH (South Tank Farm)	6350	N/A	6350	N/A
1,2-Dichloroethane	4.5	29	4.5	29
1,1,1-Trichloroethane	27900	140000	27900	140000
Tetrachloroethene	641	1400	641	1400
Trichloroethene	193	120	193	120
Vinyl Chloride	0.7	3.5	0.7	3.5
Dichloromethane	241	241	241	241
Cis 1,2, dichloroethene	392	392	468	468
Trans 1,2 dichloroethene	632	632	632	632
Acenaphthene	5640	15000	5350	15000
Acenaphthylene	N/A	15000	N/A	15000
Anthracene	26800	74000	26800	74000
Benzo(a)anthracene	20.8	29	21.1	29
Benzo(a)pyrene	0.9	29	0.9	29
Benzo(b)fluoranthene	21.3	7.1	21.3	7.2
Benzo(g,h,i)perylene	218	640	218	640
Benzo(k)fluoranthene	215	190	215	190
Chrysene	2090	57	2090	57
Dibenz(a,h)anthracene	2.16	0.57	2.16	0.57
Fluoranthene	3570	31000	3570	31000
Fluorene	3570	9900	3570	9900
Indeno(1,2,3-c,d)pyrene	21.2	82	21.2	82
Phenanthrene	N/A	3100	N/A	3100
Pyrene	2680	7400	2680	7400

Contaminant	Current RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RTC (3%SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
Phenol	859	440	859	690
Mercury (methyl)	19.4	40	19.4	N/A
Mercury (elemental)	4.3	16	12.9	N/A
Naphthalene	955	4900	1430	4900
1,1,1,2-Tetrachloroethane	498	1400	533	1400
1,1,2,2-Tetrachloroethane	516	1400	539	1400
Carbon tetrachloride	111	111	128	128
Chlorobenzene	170	11000	170	13000
Proposed SAC based on S4ULs with the exception of dichloromethane, cis 1,2 dichloroethene, trans 1,2 dichloroethene and carbon tetrachloride				
^{sol} S4UL presented exceeds the solubility saturation limit				

Appendix C SAC for Public Park Land Use

Table C1: SAC (Inorganic Contaminants) for Public Park Land Use (FFL to 300mm below FFL)

Contaminant	Current RTC (mg/kg*)	Proposed SAC (mg/kg)
Arsenic	64 ^a	170 ^d
Cadmium	2.6 ^b	532 ^d
Chromium	78 ^a	N/A
Chromium III	N/A	33000 ^d
Chromium VI	N/A	220 ^d
Inorganic Mercury	1 ^c	240 ^d
Nickel	75 ^c	3400 ^d
Selenium	3 ^c	1800 ^d
Lead	337 ^a	200 ^e
Vanadium	351 ^b	5000 ^d
Copper	143 ^a	44000 ^d
Zinc	478 ^a	170000 ^d
Asbestos		Zero fibres
a-Based on background soil concentration b Site Specific Human Health Criteria c Based on the Soil Code d LQM/CIEH S4UL Public Park Land Use e C4SL *RTCs for Public Open Space		

Table C2: SAC (Organic Contaminants) for Public Park Land Use (FFL to 300mm below FFL)

Contaminant	Current RTC (1% SOM) (mg/kg)*	Proposed SAC (1% SAC) (mg/kg)	Current RTC (3% SOM) (mg/kg)*	Proposed SAC (2.5% SOM) (mg/kg)
Benzene	13	90	13	100
Toluene	8110	87000vap(869)	8110	95000vap(1920)
Ethylbenzene	4740	17000vap(518)	4740	22000vap(1220)
Xylenes	7940	17000sol(478)	7940	24000sol(1120)
TPH Aromatic>C5-C7	26.2	76000(1220)sol	27.5	84000(2260)sol
TPH Aromatic >C7-C8	21300	87000(869)vap	21300	95000(1920)sol
TPH Aromatic >C8-C10	2230	7200(613)vap	2310	8500(1500)vap
TPH Aromatic >C10-C12	2300	9200(364)sol	2340	9700(899)sol
TPH Aromatic >C12-C16	2330	10000	2350	10000
TPH Aromatic >C16-C21	1450	7600	1450	7700
TPH Aromatic >C21-C35	1450	7800	1450	7800
TPH Aliphatic >C5-C6	294000	95000(304)sol	294000	130000(558)sol
TPH Aliphatic >C6-C8	294000	150000(144)sol	294000	320000(736)sol
TPH Aliphatic >C8-C10	5740	14000(78)sol	5740	21000(451)vap
TPH Aliphatic >C10-C12	1780	21000(48)sol	5700	24000(283)vap

Contaminant	Current RTC (1% SOM) (mg/kg)*	Proposed SAC (1% SAC) (mg/kg)	Current RTC (3% SOM) (mg/kg)*	Proposed SAC (2.5% SOM) (mg/kg)
TPH Aliphatic >C12-C16	4510	25000(24)sol	5860	26000(142)sol
TPH Aliphatic >C16-C21	5700	N/A	5700	N/A
TPH Aliphatic >C16-C35	5800	450000	5860	490000
TPH Aliphatic >C21-C35	1450	N/A	1450	N/A
Total TPH (Phase 1)	9060	N/A	9060	N/A
Total TPH (Process Area)	10800	N/A	10800	N/A
Total TPH (North Tank Farm)	9420	N/A	9420	N/A
Total TPH (South Tank Farm)	6350	N/A	6350	N/A
1,2-Dichloroethane	4.5	21	4.5	24
1,1,1-Trichloroethane	27900	57000vap(1425)	27900	76000vap(2915)
Tetrachloroethene	641	810sol(424)	641	1100sol(951)
Trichloroethene	193	70	193	91
Vinyl Chloride	0.7	4.8	0.7	5.0
Dichloromethane	241		241	
Cis 1,2, dichloroethene	392		468	
Trans 1,2 dichloroethene	632		632	
Acenaphthene	5640	29000	5350	30000
Acenaphthylene	N/A	29000	N/A	30000
Anthracene	26800	150000	26800	150000
Benzo(a)anthracene	20.8	49	21.1	56
Benzo(b)fluoranthene	21.3	13	21.3	15
Benzo(g,h,i)perylene	218	1400	218	1500
Benzo(k)fluoranthene	215	370	215	410
Chrysene	2090	93	2090	110
Dibenz(a,h)anthracene	2.16	1.1	2.16	1.3
Fluoranthene	3570	6300	3570	6300
Fluorene	3570	20000	3570	20000
Indeno(1,2,3-c,d)pyrene	21.2	150	21.2	170
Phenanthrene	N/A	6200	N/A	6200
Pyrene	2680	15000	2680	15000
Phenol	859	760dir(8600)	859	1500dir(9700)
Mercury (methyl)	19.4	68	19.4	N/A
Mercury (elemental)	4.3	30vap(25.8)	12.9	N/A
Naphthalene	955	1200(76.4)sol	1430	1900(183)sol
1,1,1,2-Tetrachloroethane	498	1500	533	1800
1,1,2,2-Tetrachloroethane	516	1800	539	2100
Carbon tetrachloride	111		128	
Chlorobenzene	170	1300(675)sol	170	2000(1520)sol

Contaminant	Current RTC (1% SOM) (mg/kg)*	Proposed SAC (1% SAC) (mg/kg)	Current RTC (3% SOM) (mg/kg)*	Proposed SAC (2.5% SOM) (mg/kg)
*RTCs for Public Open Space				

Appendix D SAC for Commercial Land Use and Road Corridors

Table D1: SAC (Metals) for Commercial Land Use and Road Corridors (FFL to 300mm below FFL)

Contaminant	Current RTC (mg/kg)	Proposed SAC (mg/kg)
Arsenic	500	640
Cadmium	243	190
Chromium	365	N/A
Chromium III	N/A	8600
Chromium IV	N/A	33
Inorganic Mercury	480	120
Nickel	1990	980
Selenium	8000	12000
Lead	750	2330
Vanadium	7590	9000
Copper	115000	68000
Zinc	918000	730000
Asbestos		Zero fibres

a RBSL, b RTC, c CIEH/LQM S4UL, d C4SL

Table C2: SAC (Organic Contaminants) Commercial Land Use and Road Corridors (FFL to 300mm below FFL)

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
Benzene	5	27	5	47
Toluene	1160	56000vap (869)	1160	110000vap (1920)
Ethylbenzene	122000	5700vap (518)	122000	13000vap (1220)
Xylenes	121000	5900sol (576)	121000	14000sol (1350)
TPH Aromatic >C5-C7	N/A	26000 (1220) ^{sol}	N/A	46000 (2260) ^{sol}
TPH Aromatic >C7-C8	1840	56000 (869) ^{vap}	1840	110000 (1920) ^{sol}
TPH Aromatic >C8-C10	913	3500 (613) ^{vap}	913	8100 (1500) ^{vap}
TPH Aromatic >C10-C12	26500	16000 (364) ^{sol}	26500	28000 (899) ^{sol}
TPH Aromatic >C12-C16	64900	36000 (169) ^{sol}	64900	37000
TPH Aromatic >C16-C21	28500	28000	28500	28000
TPH Aromatic >C21-C35	28500	28000	28500	28000
TPH Aliphatic >C5-C6	N/A	3200 (304) ^{sol}	N/A	59000 (558) ^{sol}
TPH Aliphatic >C6-C8	1000000	78000 (144) ^{sol}	1000000	17000 (322) ^{sol}
TPH Aliphatic >C8-C10	159000	2000 (78) ^{sol}	159000	4800 (190) ^{vap}
TPH Aliphatic >C10-C12	163000	9700 (48) ^{sol}	163000	23000 (118) ^{vap}

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
TPH Aliphatic >C12-C16	169000	59000 (24)sol	169000	82000 (59)sol
TPH Aliphatic >C16-C21	1000000	N/A	1000000	N/A
TPH Aliphatic >C16-C35	N/A	1600000	N/A	1600000
TPH Aliphatic >C21-C35	1000000	1600000	1000000	1600000
Total TPH (Phase 1)	81400	N/A	81400	N/A
Total TPH (Process Area)	44300	N/A	44300	N/A
Total TPH (North Tank Farm)	25900	N/A	25900	N/A
Total TPH (South Tank Farm)	37200	N/A	37200	N/A
1,2-Dichloroethane	0.401	0.67	2.15	0.97
1,1,1-Trichloroethane	443	660	3140	1300
Tetrachloroethene	103	19	788	42
Trichloroethene	7.48	1.2	54.9	2.6
Vinyl Chloride	0.045	0.059	0.174	0.077
Dichloromethane	158		734	
Cis 1,2, dichloroethene	8.70		53	
Trans 1,2 dichloroethene	13.8		87.7	
Acenaphthene	N/A	84000 (57.0)sol	N/A	97000 (141)sol
Anthracene	N/A	520000	N/A	540000
Benzo(a)anthracene	N/A	170	N/A	170
Benzo(b)fluoranthene	N/A	44	N/A	44
Benzo(g,h,i)perylene	N/A	3900	N/A	4000
Benzo(k)fluoranthene	N/A	1200	N/A	1200
Chrysene	N/A	350	N/A	350
Dibenz(a,h)anthracene	N/A	3.5	N/A	3.6
Fluoranthene	N/A	23000	N/A	23000
Fluorene	N/A	63000 (30.9)sol	N/A	68000
Indeno(1,2,3-c,d)pyrene	N/A	500	N/A	510
Pyrene	N/A	54000	N/A	54000
Phenol	N/A	440dir(10,000)	N/A	690dir(10,000)
Mercury (methyl)	N/A	320	N/A	
Mercury (elemental)	N/A	58vap(25.8)	N/A	
Naphthalene	N/A	190 (76.4)sol	N/A	460 (183)sol

Contaminant	Current RBSL/RTC (1% SOM) (mg/kg)	Proposed SAC (1% SOM) (mg/kg)	Current RBSL/RTC (3% SOM) (mg/kg)	Proposed SAC (2.5% SOM) (mg/kg)
1,1,1,2-Tetrachloroethane	N/A	110	N/A	250
1,1,2,2-Tetrachloroethane	N/A	270	N/A	550
Carbon tetrachloride	N/A	N/A	N/A	N/A
Chlorobenzene	N/A	56	N/A	130

Appendix D SoBRA GAC_{gwvap}

Table 6: SoBRA GAC_{gwvap} for Residential Land Use

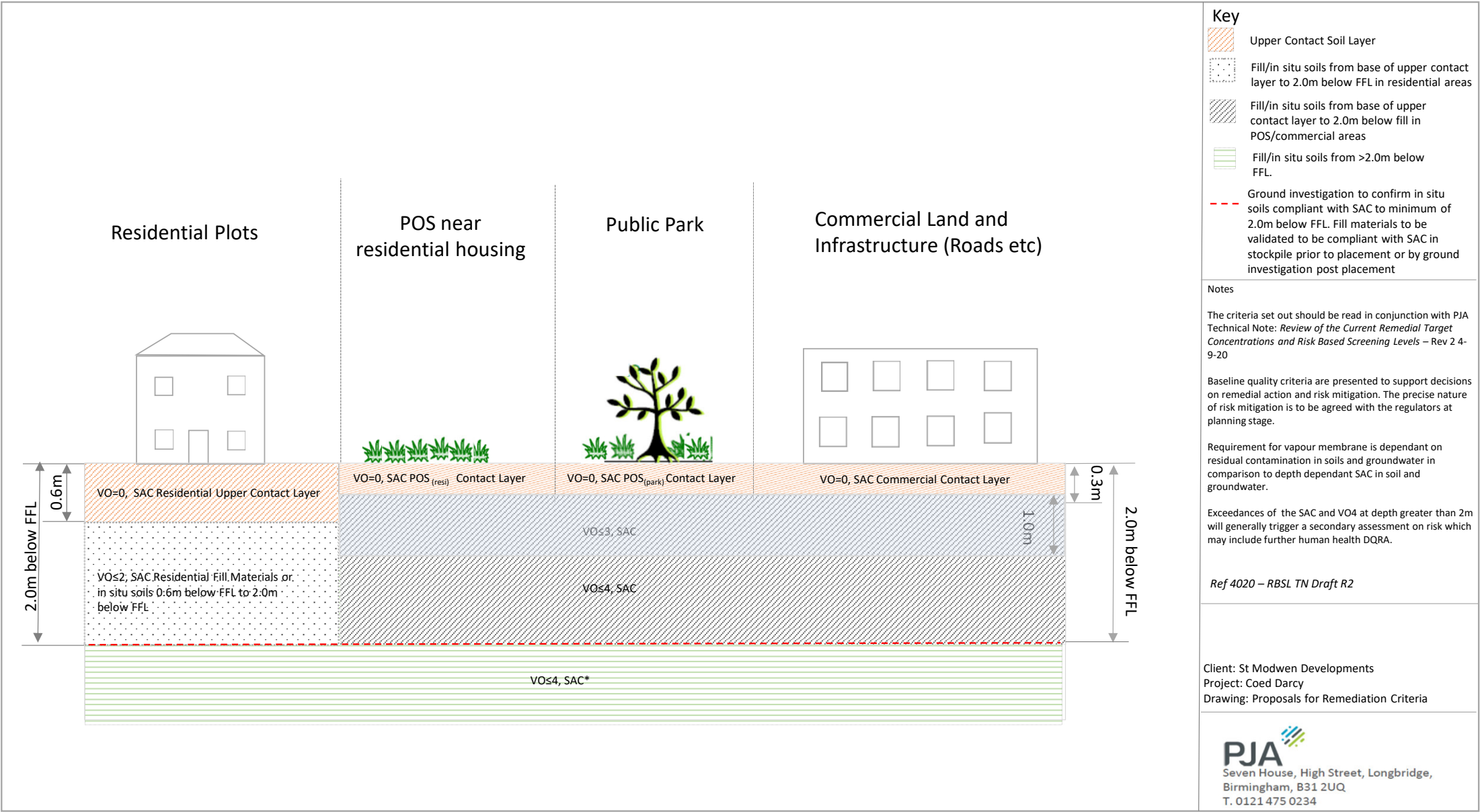
Contaminant	Residential RBSL (µg/l)	Residential GAC _{gwvap} (µg/l)	Aqueous Solubility (µg/l)
TPH Aliphatic EC5-EC6	N/A	1,900	35,900
TPH Aliphatic >EC6-EC8	None	1,500	5,370
TPH Aliphatic >EC8-EC10	None	57	427
TPH Aliphatic >EC10-EC12	None	37	34
TPH Aliphatic >EC12-EC16	None	N/A ^a	0.759
TPH Aliphatic >EC16-EC21	None	N/A ^a	0.00254 ^b
TPH Aliphatic >EC21-EC35	None	N/A ^a	N/A
TPH Aromatic EC5-EC7	N/A	210,000	1,780,000
TPH Aromatic >EC7-EC8	20,000	220,000	590,000
TPH Aromatic >EC8-EC10	22,000	1,900	64,600
TPH Aromatic >EC10-EC12	None	6,800	24,500
TPH Aromatic >EC12-EC16	None	39,000	5,750
TPH Aromatic >EC16-EC21	None	N/A ^a	653
TPH Aromatic >EC21-EC35	None	N/A ^a	6.61
Benzene	700	210	1,780,000
Toluene	47,000	230,000	590,000
Ethylbenzene	102,000	10,000	180,000
Xylenes	43,000	9,500 ^c	200,000
1,2-dichloroethane	200	8.9	8,680,000
Dichloromethane	150,000	3,300	20,080,000
Tetrachloroethene	22,000	34	225,000
Trichloroethene	2600	5.7	1,370,000
Vinyl Chloride	60	0.62	2,760,000
1,2-Dichloroethene	15,000	130 ^d	7,550,000
1,1,1-Trichloroethane	193,000	3000	1,300,000

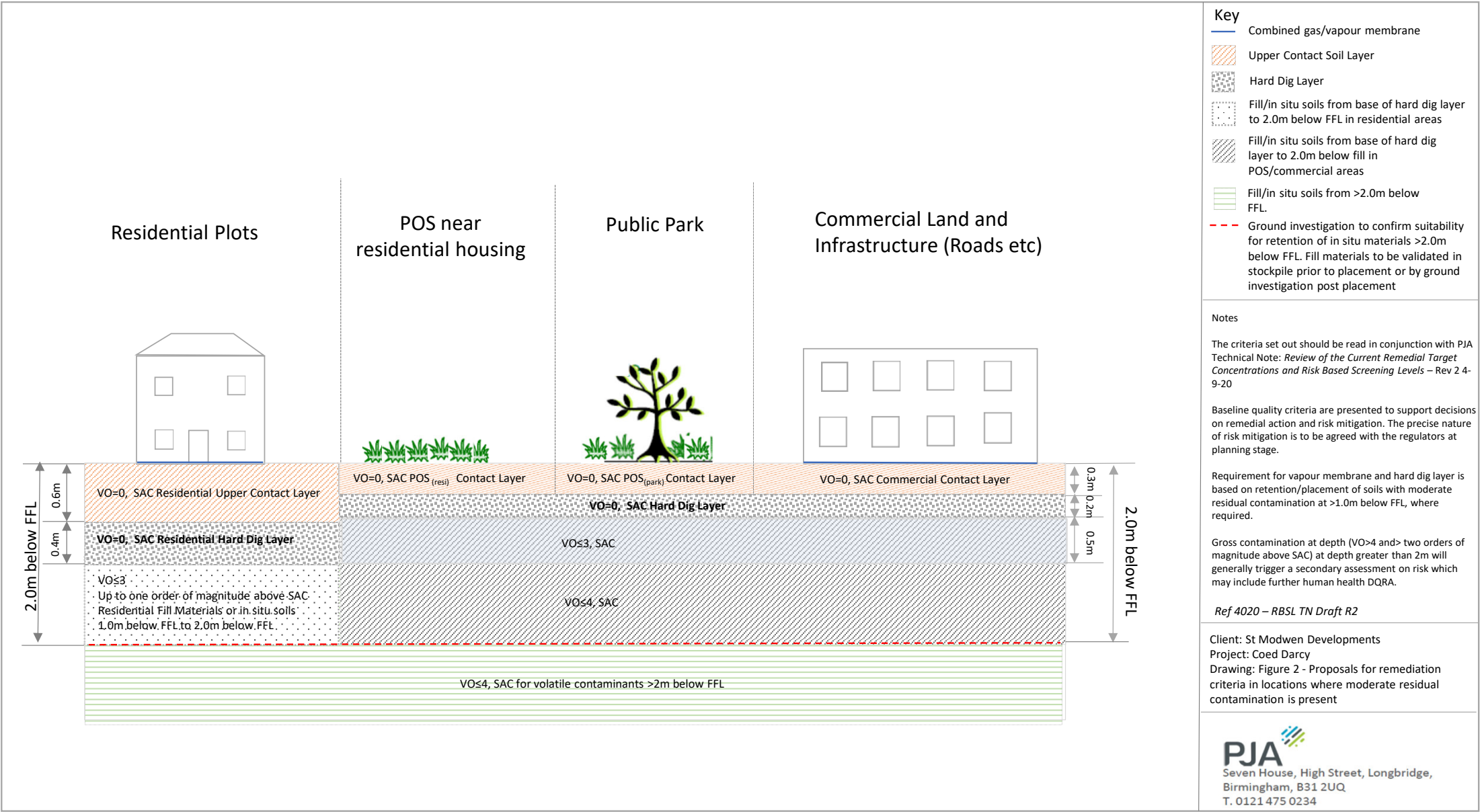
'none'=theoretical RBSL greater than solubility limit
 a GAC_{gwvap} not derived due to being insufficiently volatile
 b Aqueous solubility for TPH Aromatic C16-35
 c GAC_{gwvap} for meta-Xylene
 d GAC_{gwvap} for cis-1,2,dichloroethene

Table 7: SoBRA GAC_{gwvap} for Commercial Land Use

Contaminant	Commercial RBSL (µg/l)	Commercial GAC _{gwvap} (µg/l)	Aqueous Solubility (µg/l)
TPH Aliphatic EC5-EC6	N/A	190,000 (sol)	35,900
TPH Aliphatic >EC6-EC8	None	150, 000 (sol)	5,370
TPH Aliphatic >EC8-EC10	None	5,700 (sol)	427
TPH Aliphatic >EC10-EC12	None	3,600 (sol)	34
TPH Aliphatic >EC12-EC16	None	N/A ^a	0.759
TPH Aliphatic >EC16-EC21	None	N/A ^a	0.00254 ^b
TPH Aliphatic >EC21-EC35	None	N/A ^a	N/A
TPH Aromatic EC5-EC7	N/A	20,000,000 (sol)	1,780,000
TPH Aromatic >EC7-EC8	97,000	21,000,000 (sol)	590,000
TPH Aromatic >EC8-EC10	None	190,000 (sol)	64,600
TPH Aromatic >EC10-EC12	None	660,000 (sol)	24,500
TPH Aromatic >EC12-EC16	None	3,700,000 (sol)	5,750
TPH Aromatic >EC16-EC21	None	N/A ^a	653
TPH Aromatic >EC21-EC35	None	N/A ^a	6.61
Benzene	6000	20,000	1,780,000
Toluene	229,000	21,000,000	590,000
Ethylbenzene	506,000	960,000	180,000
Xylenes	607,000	940,000 ^c	200,000
1,2-dichloroethane	820	850	8,680,000
Dichloromethane	624,000	370,000	20,080,000
Tetrachloroethene	115,000	4,600	225,000
Trichloroethene	13,000	530	1,370,000
Vinyl Chloride	300	63	2,760,000
1,2-Dichloroethene	68,000	13,000 ^d	7,550,000
1,1,1-Trichloroethane	989,000	290,000	1,300,000

'none'=theoretical RBSL greater than solubility limit
 a GAC_{gwvap} not derived due to being insufficiently volatile
 b Aqueous solubility for TPH Aromatic C16-35
 c GAC_{gwvap} for meta-Xylene
 d GAC_{gwvap} for cis-1,2 dichloroethene





Appendix I Remediation Action Plan (RAP) – Previous SI06 Schedule 7

SCHEDULE 7

The RAP Works

Purpose, objectives and requirements of the RAP Works

Part 1

1. Purpose and objectives of the RAP Works

- 1.1 The RAP Works (a programme of ongoing voluntary Remedial Action in relation to Pre-Transfer Date Environmental Matters at or in the vicinity of the Property) have been agreed between the Owner and the relevant Environmental Authorities in lieu of the imposition of formal Remedial Action requirements by any such Environmental Authorities.
- 1.2 The current requirements and status of the RAP Works are as set out in Table 1 below.
- 1.3 The parties to this Agreement agree that the purpose and objectives of the RAP Works are the carrying out of the appropriate Remedial Action necessary, and sufficient in the context of both the current use of the Property and the Intended Use or such other use as may be determined from time to time:
 - 1.3.1 to prevent (or where that is not possible, minimise, remedy or mitigate as far as reasonably practicable the effects of) migration from the Property of Pre-Transfer Date Contamination and any Developer Contamination; and
 - 1.3.2 to assess with a frequency agreed as sufficient by the relevant Environmental Authorities and keep under review:
 - (a) the condition of the Environment at and (provided appropriate access is procured (the Developer having used reasonable endeavours to obtain it)) in the vicinity of the Property, including any controlled waters that are or may be affected by such condition, and (provided appropriate access is procured (the Developer having used reasonable endeavours to obtain it)) any land adjoining or adjacent to the Property; and
 - (b) the progress and effectiveness of natural attenuation processesin order in each case to demonstrate whether or not any Pre-Transfer Date Environmental Matters are posing or may pose an unacceptable risk to the Environment beyond the boundaries of the Property in the light of Environmental Law; and
 - 1.3.3 to prevent (or where that is not possible, minimise, remedy or mitigate as far as reasonably practicable the effects of) any harm to the Environment or any pollution of controlled waters or any possibility of such harm or pollution being caused in each case by or as a result of any Pre-Transfer Date Environmental Matter including the containment of free phase Hydrocarbons within the Property boundaries; and
 - 1.3.4 to avoid where reasonably practicable any Environmental Claim by any relevant Environmental Authority in relation to or in connection with any Pre-Transfer Date Environmental Matter, including without limitation to avoid service on any party in relation to or in connection with any Pre-Transfer Date Environmental Matters of:
 - (a) a "remediation notice" under Part IIA of the Environmental Protection Act 1990; or

- (b) a "works notice" under Chapter 1 of Part VII of the Water Resources Act 1991; or
 - (c) a notice under Section 59 of the Environmental Protection Act 1990 requiring removal of waste or the carrying out of steps to eliminate or reduce the consequences of deposited waste; or
 - (d) the imposition of a requirement by any relevant Environmental Authority for any party to carry out any Remedial Action pursuant to EU Directive 2004/35/CE of 21 April 2004 and/or pursuant to any legislation implementing such Directive in England and Wales, or to recover the costs of the taking of such Remedial Action by any such Environmental Authority; and
- 1.3.5 to take all reasonably practicable steps to seek to secure the final and unconditional acceptance by the relevant Environmental Authority of the surrender of the Waste Management Licence as soon as reasonably practicable.

Table 1
Current RAP Works and Status

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Whole Site	Continued demonstration of natural attenuation of dissolved phase hydrocarbons. Consultation with EA and CCW	Six monthly: - Liquid level measurements - Analytical samples from 120 ground and surface water sample locations. Locations specified in the semi-annual reports submitted to the Environment Agency. - Six-monthly reporting of trends. Regular update meetings (minimum bi-annually) with EA and CCW for lifetime of RAP	NA	Routine programme of groundwater level and quality and product thickness monitoring. Annual scope to be agreed with EA on rolling basis.	Ongoing since 2000. Annual reductions in scope have been agreed with EA on basis of data received.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Western flank of main site / Crymlyn Bog / Boundary with North Reservoir	- Potential for cross boundary free product migration at various locations along boundary - Dissolved-phase hydrocarbon migration	- Monitor 30 'sentinel' wells along northwest and southeast boundaries of North Site for presence of free product. Locations included in 'Whole Site' above. - Install permanent product interception trench system along boundary of North Site, if sentinel well data suggests a risk of downgradient product migration occurring and in any event install a product interception trench to, at a minimum, replace the current sentinel wells prior to redevelopment (300 x 4 metres minimum). Any interception trench must prevent further downgradient migration of free product and allow recovery of intercepted product.	1	Continued six-monthly monitoring of free product thickness, and assess potential for further downgradient migration. All works to be protective of future public health and safety assuming unrestricted recreational access.	Sentinel well installations complete on North Site, and listed in semi-annual monitoring reports.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Western flank of main site / Crymlyn Bog / Boundary with North Reservoir (cont.)		2. Product interception and recovery, consisting of the following programme elements: 1. Design-level investigations to assess specific requirements 2. Design and Installation of permanent system to intercept and recover free-phase product 3. Diffuse discharge of water arising from interception system to Bog, via purpose-constructed wetland features. 4. System-specific monitoring of surface and groundwater Above programme of works to include the following as a minimum: • Railhead (install 200 x 4 metre trench, and 200 metre linear wetland feature) • Railhead to South reservoir (install 250 x 4 metre trench, interception only, ie, no wetland) • Between North and South reservoirs (install 100 x 2 metre interception and recovery trench only)	2 3 4	Install permanent measures to prevent free product from crossing the site boundary and entering Crymlyn Bog to satisfaction of EA and CCW Diffuse discharge of water arising from interception system to Bog, via purpose-constructed wetland features to reduce dissolved hydrocarbon load and without requirement for a discharge consent. Prevent ochreous precipitate discharges from site to the Crymlyn Bog arising from the interception feature. All works to satisfaction of EA and CCW. All works to be protective of future public health and safety assuming unrestricted recreational access.	Some additional wells installed in 2000 to monitor for free-product.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Western flank of main site / Crymlyn Bog / Boundary with North Reservoir (cont.) C:1998905v1	Free-phase seepage leading to gross-contamination of surface soils in interior of site.	Design and Install 'Inland' free-product interception and collection system between Railhead and Main Site (200 x 3 metres, interception and recovery trench only).	5	Install permanent system to prevent free product migration to railhead to satisfaction of EA and NPT.	Not commenced.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Containment Area	Free product migration from filled area into Crymlyn Bog, Crymlyn Bog Lagoon, and South Bay.	Product interception and recovery, consisting of the following programme elements:		Remove free product with a temporary in-situ system to extent practicable until recovery is asymptotic from a system which hydraulically influences the free product contaminated filled area to the satisfaction of EA	System installed in 2005, recovery ongoing.
		1. Complete design-level investigations to assess specific requirements 2. Design and Installation of permanent system to intercept and recover free-phase product 3. System-specific monitoring		Install permanent measures to prevent free product from:	Temporary (plywood bund) system in place; regularly maintained.
		Above programme of Works to include the following as a minimum:	6	• leaving site boundary and entering Crymlyn Bog • entering Crymlyn Bog Lagoon from filled area in Tip	Some survey information collected along Tip perimeter
		• Filled area; expand on existing system; upgrade to 12 pumping wells	7	• entering the licensed area from Tank farm	Some site investigation and monitoring data available to assist in design.
		• Northern Tip perimeter adjacent to Crymlyn Bog (install permanent engineered and covered 500 x 1 metre product interception and recovery feature in place of current plywood bund)	8	in all cases permitting the free flow of groundwater past the interception features and to permit recovery of product, all to satisfaction of EA, NPT and CCW.	
		• Filled area to South Bay/Crymlyn Bog (install 500 x 4 metre, product interception and recovery trench)	9		
		• From north Tank Farm into licensed area (ie, South Bay, and Crymlyn Bog lagoon install 300 x 4 metre product interception and recovery trench)			

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Containment Area	Hydrocarbon-containing peat and sludges.	Excavation and treatment of peats and sludges in (all quantities estimated and unverified): • South Bay (15,000m3) • West Bay (10,000 m3) • Crymlyn Bog Lagoon (20,000m3)	10 11 11	Removal and treatment to achieve restoration quality standards agreed with the Environment Agency of hydrocarbon contaminated surface and near surface soil and sediment to satisfaction of EA.	7,000 m3 peats/sludges removed from lagoon and treated in 2006/7.
	Surrender of Waste Management Licence EAWML34004 (licence status active, but landfill 'closed or closing').	In addition to free-product issues above, the following are also required: • Agree programme of works with EA to permanently restore Tip and secure Waste Management Licence surrender.	6, 12 12	Surrender Waste Management Licence.	Design work commenced to utilise material from Area 1. Ongoing.
	Dissolved-phase hydrocarbon discharge to Crymlyn Bog.	• Ensuring of long term security and immobilisation of wastes in the filled area. • Construct permeable cap and re-profile filled area with cover material (at least 50,000 m2) • Construct engineered wetland in lagoon (15,000 m2) to reduce dissolved hydrocarbon load in surface water exiting Tip. • alterations to drainage regime such that flow to Crymlyn Bog from the site is diffuse, rather than from a point-source, as currently exists.	13 14	Reduce dissolved phase hydrocarbon load in groundwater and surface water leaving the Tip and entering Crymlyn Bog.	
				All works to be protective of future public health and safety assuming unrestricted recreational access.	

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
South Tank Farm	Potential dissolved-phase hydrocarbon discharge to stream discharging to Crymlyn Bog to south	- Constructed wetland (2500 m2), - groundwater monitoring programme	15	Reduction of dissolved phase hydrocarbon load to Crymlyn Bog	Monitoring
North Reservoir and East Bay	- Basal sludges. - Reconfigure reservoir to meet near pre-refinery conditions as part of return of land to the landowner. - Restoration of original drainage patterns.	Design and implement sludge removal and treatment programme for (all quantities estimated and unverified): - North Site Reservoir (40,000 m3), - East Bay (5,000m3) - API Separators (5,000 m3) Isolate reservoir from site drainage system Drain reservoir Remove dam Restore and landscape valley	16 17 18 19 16, 17 20 16, 17	- Sludge removed, treated to satisfaction of EA dependent on fate and disposed of or re-used. - Water removed, treated as required and disposed of. No discharge of NSR water to Crymlyn Bog permitted unless otherwise agreed with appropriate Environmental Authorities. - Valley restored to near pre-refinery conditions so as to be suitable for uncontrolled recreational access. - Dam removed and materials re-used. - Post restoration water management programme implemented consistent with restored valley. All works to be protective of future public health and safety assuming unrestricted recreational access.	Sludge removal from East Bay (part complete); no work on reservoir yet. Not commenced. Not commenced. Not commenced. Not commenced.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
South Reservoir	Hydrocarbon contaminated sludges to which contaminated groundwater discharges.	1. Design and implement programme of sludge removal and treatment (estimated at 5,000 m3). 2. Prevent / mitigate hydrocarbon seepage from walls and floor of reservoir (150 m) 3. "Soften" walls and landscape to satisfaction of CCW to enhance ecological value	21	Retain significant portion of South Reservoir as "clean" water feature. Reduction of hydrocarbon seepage from walls of reservoir as far as possible to satisfaction of EA. Discharge re-routed. CCW sign off on 'softening' and landscaping to increase ecological value. All works to be protective of future public health and safety assuming unrestricted recreational access.	Not commenced
Southern edge of process area / Llandarcy Bog	Potential free product migration to Llandarcy Bog. Dissolved-phase hydrocarbon discharge to bog/culverted drain.	Intercept free product. Six-monthly water monitoring programme (as specified in 'Whole Site', above) Construct linear wetland (100 m2).	22 23	Install permanent product interception feature. Reduce dissolved phase hydrocarbon load and ochreous precipitate discharges from site as far as possible to satisfaction of EA. All works to be protective of future public health and safety assuming unrestricted recreational access.	Completed in 2005. Not commenced, monitoring ongoing.

Site Area / Potential Receptor	Key Issues	Scope of Currently Envisaged Remedial Action	Figure Reference	Performance Criteria	Works to Date
Eastern process area / Neath valley and river	Potential cross boundary free product migration into railway cutting.	Monitor 30 sentinel wells for free-phase product on six-monthly basis. Install permanent product interception trench system along boundary of North Site, if sentinel well data suggests a risk of downgradient product migration occurring and in any event install such a trench to, at a minimum, replace the current sentinel wells prior to redevelopment (500 x 3 metres minimum). Any interception trench must prevent further downgradient migration of free product and allow recovery of intercepted product.	24	Install permanent interception feature to prevent free product migration downgradient and permit recovery of intercepted product.	Sentinel well installation complete. Groundwater monitoring only.
	Known and or suspected presence of free phase hydrocarbon and chlorinated hydrocarbons. Dissolved hydrocarbon and chlorinated hydrocarbon migration away from areas of product.	Either containment of hydrocarbon and chlorinated hydrocarbon product, vapour and dissolved phase, or; source-reduction solution (of area 30,000m ²) to render containment permanently unnecessary, with the following programme elements: 1. Design-level investigations 2. Feasibility tests 3. System implementation and installation 4. Groundwater and air and soil vapour monitoring programme	25	Permanent maintenance of acceptable risk to agreed controlled waters receptors (River Neath and Crymlyn Bog) to the satisfaction of EA and NPT.	Limited work may be required for the RAP subject to results of long term monitoring. Substantial additional (containment) work likely to be required in the event of development.

Figure references are references to the RAP Plan annexed to this Deed

Report References (The following reports contain information which may be of relevance to the development and implementation of the RAP. This list is not exhaustive.):

Report Title	URS Report Ref.	URS Job no.	Issue Date
Environmental Liability Assessment, Llandarcy Refinery Desk Study Findings Vol 1	2048R	37491-001	29-Sep-97
Environmental Liability Assessment Llandarcy Refinery Interpretative Report Vol 2	2049R	37491-002	30-Sep-97
Risk Assessment Methodology Document (see DR810)	2271R	39991-001-401/PI	05-Aug-98
Report - Phase II, Stage 1 Data Report, BP Llandarcy Refinery - Neath, W Glamorgan - for BP Llandarcy Refinery LTD	R642	39991-001	26-Aug-98
Draft Report - Phase II Interim Data Assessment - BP Llandarcy Refinery, Neath, W Glamorgan	DR664	39991-002	06-Nov-98
Preliminary Sludge Treatability Study Report	DR666	39991-001	10-Nov-98
Phase 2 Site Assessment Vol 1, 2 and 3 Phase 2 Final Data Report	DR785	39991-004	28-Jul-99
Risk Assessment Methodology	DR810	39991-005	13-Sep-99
Draft Summary Report Stage 1 Solvent Recovery Pilot Test, DiMe Plant Area	DR829	39991-007	17-Nov-99
Water Balance Report	R835A	39991-009	14-Jan-00
Remedial Action Plan	DR869r3	39991-005	18-Feb-00
Synopsis of Site Assessment and Proposed Remedial Works on behalf of BP Llandarcy Refinery	R896	39991pfound	31-May-00
Phase 2 Site Assessment Crymlyn Bog Historical Spill	DR898	39991-011	12-Jun-00
Routine GW Monitoring Mar - Sept 2000 Vol 1 Draft Report	CD954	39991-013	01-Jan-01
Data & Risk Assessment of the Main Tank Farm	DR946	39991-017	05-Jan-01
Draft Remedial Plan, Vanadium Lagoon	DR962	39991-016	01-May-01
Additional Site Characterisation & Remedial Action Plan	DR963	39991-016	02-May-01
Final Report - Phase II Investigation & Human Health Risk Assessment for BP OIL, Swansea	FR979	39991-019	13-Jul-01
Monitoring Data Summary Report (Sept 2000)	DR980	39991-013	18-Jul-01
Monitoring Data Summary Report (March 2001)	DR980	39991-013	18-Jul-01
Progress Report on the Constructed Wetland Pilot Tests	DR1042	39991-016	01-Feb-02
Final Report - Sept 2001 Monitoring Data Summary Report - BP Llandarcy Refinery, Neath	FR1044	39991-023	08-Feb-02
Water Balance Addendum	DR1031	39991-016	01-Apr-02
South Site Reservoir Sampling Results	6681	39991-025	14-Jun-02
Site Characterisation & Remedial Action Plan Llandarcy Bog	DR1078A	39991-041	31-Jul-02
March 2002 Monitoring Data Summary Report	DR1081	39991-029	02-Aug-02
DiMe Mineralisation Tests	6732/MC	39991-016	16-Aug-02

Report Title	URS Report Ref.	URS Job no.	Issue Date
Informational Supplement for DiMe Plant Area	DR1096	39991-022	01-Sep-02
Results of Sentinel Well Product Mobility	6767	39991-032	12-Sep-02
Site Characterisation Works & Bypass Ditch Outline Design North Site Reservoir	DR1111	39991-016	12-Feb-03
September 2002 Monitoring Data Summary Report	DR1119	39991-036	28-Feb-03
Oil Recovery Tests Containment Area	DR1130	39991-026	25-Apr-03
March 2003 Monitoring Data Summary Report	DR1137	39991-036	01-Jul-03
Draft Factual Report - Site Investigation	DR1140	39991-035-785	10-Jul-03
Draft Factual Report DiMe Area	DR1144	39991-037	11-Jul-03
Rail Cutting Inspection	DR1161	39991-032	06-Aug-03
Specification Report Llandarcy Bog Interception & Recovery System	DR1168	39991-041-785	22-Aug-03
September 2003 Monitoring Data Summary Report	DR1191	39991-036	13-Feb-04
Draft Factual Report Whole Site Investigation	DR1209	39991-044	01-Jun-04
Whole Site Remediation Strategy	DR1224A	39991-035	29-Jun-04
Draft Report Outline Remedial Options Assessment - BP Llandarcy Refinery, Neath, W Glamorgan	DR1158	39991-037	19-Jul-04
March 2004 Monitoring Data Summary Report	DR1220	39991-049	30-Jul-04
September 2004, Monitoring Data Summary Report	R1263	39991-055	14-Dec-04
Solvent Pit RAP Issues: Additional Llandarcy Bog Water Samples	7601	39991-056-785	26-Jan-05
Area 1 - Main Workshop Former Degreasing Pit Investigation	R1278	39991-056	28-Jan-05
Draft Report Containment Area Perimeter Trench Performance Specification	BPRP0005	39991-054	01-May-05
Report on the Constructed Wetland Pilot Tests. Issue no.1	R1236	39991-021	25-May-05
Soil Stockpile Sampling Report. BP Llandarcy Barn Store & Waste Tip - Issue no 1 - DRAFT	R1304	44382527	01-Jun-05
Final Factual Report Site Investigation Phase 1 Area	FR1275	39991-035	22-Jul-05
Groundwater Monitoring and Sampling- BP Oil Llandarcy Refinery	DR1307	44382526-1943	01-Aug-05
Final Factual Report Whole Site Investigation	FR1287	39991-044-785	12-Aug-05
Groundwater Monitoring and Sampling - Factual Report	DR1356	44382526	01-Sep-05
Tip Closure and Completion Strategy Report	R1360	44382538	15-Mar-06
March 2006 Groundwater Report	R1396	44382534	11-Aug-06

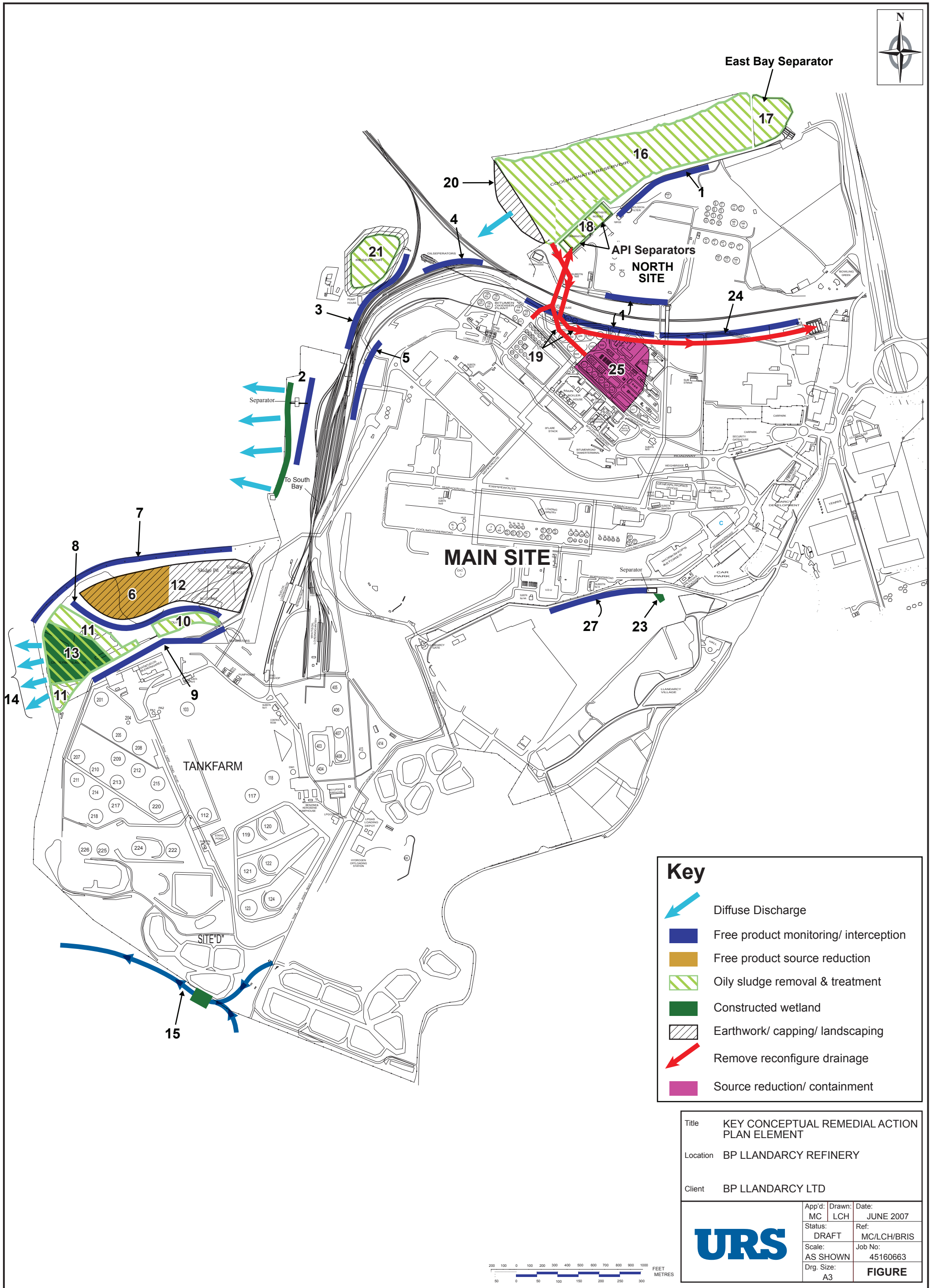
Part 2

1. Developer obligations regarding RAP Works

- 1.1 The Developer shall carry out or procure the carrying out of all outstanding Remedial Action identified in Table 1 above in order to achieve the purpose and objectives set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Part 1 of this Schedule and the performance criteria specified in Table 1 (and shall do so to the satisfaction of relevant Environmental Authorities) subject to any variations thereto that may be required in writing by the relevant Environmental Authorities from time to time.
- 1.2 The Developer shall carry out or procure the carrying out of all such further Remedial Action (whether identified in Table 1 above or not) necessary, including any that may be requested or required at any time by any Environmental Authority, acting lawfully, in order to achieve the purpose and objectives set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Part 1 of this Schedule and the performance criteria specified in Table 1 and any such further Remedial Action which a reasonable and prudent owner of the Property bearing full legal responsibility for all Pre-Transfer Date Environmental Matters would otherwise regard as necessary or appropriate from time to time in order to achieve the purpose and objectives set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Part 1 of this Schedule and the performance criteria specified in Table 1 and shall in each case do so to the satisfaction of the relevant Environmental Authorities provided that nothing in this sub-paragraph shall oblige the Developer to perform Remedial Action in relation to Unknown Off-Site Contamination or any Pre-Transfer Date Personal Injury.
- 1.3 The Developer shall take all reasonable steps promptly to create and thereafter maintain an open and constructive dialogue between it and the relevant Environmental Authorities regarding the progress and all other aspects of the RAP Works (including any impact or potential impact on any aspect of the RAP Works of any aspect of the Redevelopment Remediation Works and the inter-relationship between the two) and shall procure that any person acting on its behalf in connection with the RAP Works shall do the same. Without prejudice to the generality of the foregoing, the Developer shall:
 - 1.3.1 Convene a formal meeting with the relevant Environmental Authorities and representatives of the Authority to take place before or as soon as reasonably practicable after the Transfer Date in order to discuss with such Environmental Authorities the current status of the RAP Works, the Developer's plans for redevelopment of the Property as an Urban Village, the future programme of RAP Works in the light of those plans and the Redevelopment Remediation Works and to agree a schedule for future meetings between the Developer, those acting on its behalf and the relevant Environmental Authorities and the Authority such schedule to include as a minimum 6 monthly RAP Works review meetings; and
 - 1.3.2 Promptly comply with all lawful requests for information regarding any aspect of the RAP Works received from any Environmental Authority or the Authority at any time.
- 1.4 The Developer shall, and shall procure that any person acting on its behalf in relation to any aspect of the RAP Works required by this schedule shall, at all times comply with the requirements of Schedule 10 (General Remediation Requirements).

2. Variations to the RAP Works

- 2.1 The Developer shall promptly notify CDL, the Monitor and the Authority if at any time it is notified by a relevant Environmental Authority that such Environmental Authority requires a variation to the RAP Works in which case the following procedure shall apply:
- 2.1.1 As soon as reasonably practicable after serving a notice under paragraph 2.1 above, the Developer shall prepare proposals for the variation to the RAP Works that are consistent with the purpose and objectives of the RAP Works as set out in this Schedule and the standards of prevailing Environmental Law and shall provide a copy of such proposals to CDL the Monitor and the Authority. Any such proposal shall contain a detailed statement of the health risk assessment and general methodology from which the proposed variation to the RAP Works has been derived.
 - 2.1.2 Not earlier than the day of submission of its proposals to CDL the Monitor and the Authority in accordance with sub-paragraph 2.1.1 above, the Developer may submit a written request to the appropriate Environmental Authorities, copied at the same time to CDL, the Monitor and the Authority, for approval of the variation to the RAP Works. The Developer shall provide to the appropriate Environmental Authorities with its request copies of the health risk assessment and general methodology referred to in sub-paragraph 2.1.1 above and a copy of this Agreement clearly drawing attention to the purpose, objectives and requirements of the RAP Works set out therein and the proposed changes thereto.
 - 2.1.3 Each of the Developer, CDL and the Monitor shall be free at any time to make such submissions to the appropriate Environmental Authorities in relation to the Developer's proposals as they see fit, provided such submissions are made in writing and copied to each other and to the Authority at the same time.
 - 2.1.4 The Developer shall ensure that the RAP Works achieve compliance with any variation to the specification for the RAP Works approved in writing by the appropriate Environmental Authorities pursuant to this paragraph 2.1, as if they were also set out in the Table to this Schedule.
 - 2.1.5 No such proposed variation to the RAP Works shall be implemented unless it has been approved in writing by the Environmental Authorities in accordance with this paragraph 2.1 (or if the Developer has only oral approval (or non objection) of the relevant Environmental Authorities no such proposed variation to the RAP Works shall be implemented unless the Developer notifies the relevant Environmental Authorities in writing (copied at the same time to CDL and the Monitor) that it proposes to proceed with the implementation of the proposed variation to the RAP Works 10 Working Days after the date of such notice and no written objection of any relevant Environmental Authority is received within such 10 Working Day period in respect of the same).
 - 2.1.6 Any reference in this Deed to the RAP Works shall be to the RAP Works as varied in accordance with this paragraph 2.1.



Appendix J Remediation Redevelopment Works Completion Certificates



Coed Darcy Monitor

Phase 20 RRWCC
Collection Chamber

FINAL

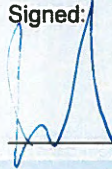
3 June 2014

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BRRP00045 / Cert 20b

Prepared for:
Coed Darcy Limited

UNITED
KINGDOM &
IRELAND



Rev	Date	Details	Prepared by	Checked by	Approved by
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Scope

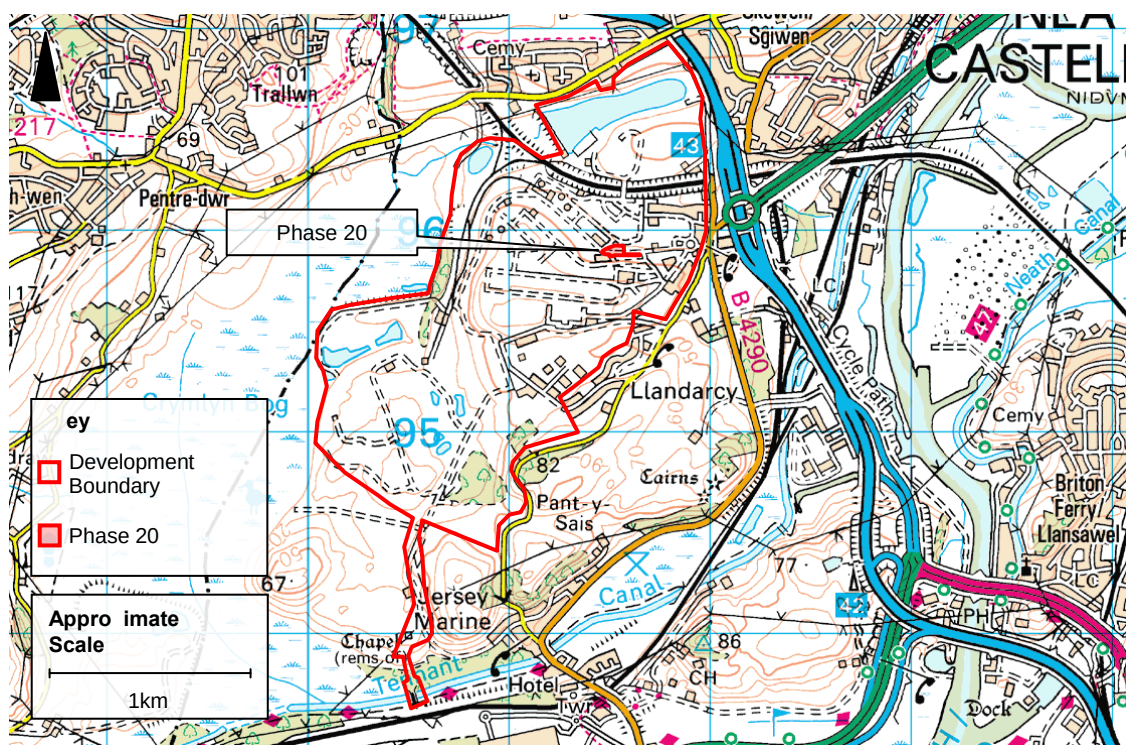
This Redevelopment Remediation Works Completion Certificate (RRWCC) has been prepared with reference to the following agreements:

- Section 106 Agreement dated 8 February 2008 between Neath Port Talbot Borough Council ("NPTCBC"), St Modwen Developments Limited ("SMD"), St Modwen Properties Plc ("SMP"), BP Oil Llandarcy Refinery Limited ("BPLR") and Coed Darcy Limited ("CDL"); and
- Remediation and Maintenance Agreement dated 23 May 2008 ("RMA") between SMD, SMP and CDL.

Unless advised otherwise, definitions used in this RRWCC can be found in the Section 106 Agreement and/or the RMA.

This RRWCC has been prepared for Phase 20 in response to the receipt of a written request from SMD pursuant to clause 4.3 of the RMA. The Phase Boundary and Intended Use on which this RRWCC is based were notified to URS by letter, a copy of which is provided in **Appendi A**.

The Phase Boundary for Phase 20 is the land edged in red on drawing 5041216-REM-DWG-1279, a copy of which is provided in **Appendi A**. The approximate location of Phase 20 in relation to the Development Boundary is shown in **Figure** below. The area of Phase 20 is approximately 0.46 hectares.



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Figure Location plan

The intended use for Phase 20 has been declared as a temporary collection chamber in the short term and commercial/residential in the long term (residential flats above retail properties). With reference to the definitions provided in the Section 106 agreement this is considered to comprise a commercial phase providing that no dwellings are situated on the ground floor and that there are no outdoor spaces associated with the dwellings.

The proposed development layout is illustrated on drawing 332/400/MP/SK/TERT, a copy of which is also provided in **Appendix A**.

In accordance with the requirements of URS' Deed of Appointment, this RRWCC shall:

- Describe the remedial action which in URS' professional opinion has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 20; and
- Certify that in URS' professional opinion the Redevelopment Remediation Works have been satisfactorily completed for Phase 20 in accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the intended use.

A copy of Schedule 8 of the Section 106 Agreement which outlines the requirements for redevelopment remediation works is provided in **Appendix B**.

Bac ground

Objectives of the Redevelopment Remediation Works

Part One of Schedule 8 of the Section 106 Agreement, a copy of which is provided in **Appendix B**, outlines the purpose and objectives of the Redevelopment Remediation Works as follows:

- The purpose and objectives of the Redevelopment Remediation Works are the carrying out of all such remedial action over and above that actually carried out as part of the RAP Works that is necessary in order to make each part of the Property suitable for its Intended Use. A part of the property will only be suitable for its Intended Use if and when the Phase Works Completion Date (PWCD) is declared in respect of that part of the Property.
- This objective will be deemed to be met for the purposes of the Section 106 Agreement and the RMA on the date specified in a notice from CDL declaring the PWCD for Phase 20. The PWCD will be declared once CDL is satisfied that the remediation necessary for the specified Intended Use for the Phase has been completed.

Part Two of Schedule 8 of the Section 106 Agreement places a number of obligations on SMD as the Developer. The main obligations pertinent to this Phase are as follows:

- The Developer shall carry out or procure the carrying out of all Remedial Action necessary in order to achieve the purpose and objective as outlined in Part 1 of Schedule 8 of the Section 106 Agreement. The design and specification of any remediation shall take account of the principles and objectives and the design assumptions for the RAP Works and shall not prejudice the achievement and future sustainability of these principles and objectives.
- In order to determine the need for Remedial Action in the first place it is necessary to undertake an appropriate site assessment. This assessment needs to take account of the

site history, potential and/or actual measured extent of contamination and the associated implied risk. Only by developing a thorough understanding of both potential and actual contamination will it be possible to confirm that all necessary Remedial Action likely to have been completed. This obligation should be satisfied through completion of an appropriate desk study and intrusive investigation.

- The RBSLs set out in Tables 1 and 2 [in Schedule 8 of the Section 106 Agreement] and the aesthetic criteria, remediation quality and scope (including the depth below Final Finished Level (FFL) to which quality standards are achieved), as the same may be varied in accordance with this Schedule 8, shall be achieved for each part of the Property at the minimum validation frequencies set out in Clause 8 of Part 3 (as applicable depending upon whether such part of the Property is intended for use as residential, commercial or recreational land) as a minimum base level standard.

It should be noted that SMD has procured the services of Atkins Ltd. to assist in discharging the above obligations.

Tables 1, 2, 3 and 4 from Schedule 8 of the Section 106 Agreement are provided below for reference.

Table Summary of Soil RBSLs

Contaminant	Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg) ¹			Land-Use Specific RBSL Soil below 1m depth (mg/kg)		
	Residential	Commercial	Recreational	Residential	Commercial	Recreational
<u>METALS & METALLOIDS</u>						
Arsenic	64	500	64	-	-	-
Cadmium	2.6	1400	2.6	-	-	-
Chromium	130	5000	200	-	-	-
Mercury	1	480	1	-	-	-
Nickel	50	5000	75	-	-	-
Selenium	3	8000	3	-	-	-
Lead	337	750	337	-	-	-
Vanadium	416	16000	640	-	-	-
Copper	200	-	200	-	-	-
Zinc	478	-	478	-	-	-
<u>ORGANIC SPECIES</u>						

Contaminant	Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg) ¹			Land-Use Specific RBSL Soil below 1m depth (mg/kg)		
	Residential	Commercial	Recreational	Residential	Commercial	Recreational
Benzene	0.12	5	13	0.4	5	48
Benzo(a)pyrene ²	0.9	29	0.9	none	none	none
Toluene	36	1160	8110	52	389	none
Ethylbenzene	41	122000	4740	140	none	none
Xylenes	32	121000	7940	58	none	none
1,2-Dichloroethane	0.04	2	4.5	0.1	0.65	6
Dichloromethane	5	1650	241	84	665	6220
Tetrachloroethene	11	1050	641	34	368	1780
Trichloroethene	1	84	193	2	28	269
Vinyl Chloride	0.01	4	0.7	0.04	1.6	16
1,2 Dichloroethene	4	273	632	7	91	881
1,1,1-Trichloroethane	154	577000	27900	160	3250	none
TPH Aromatic EC>C7-C8	125	1840	21337	146	617	none
TPH Aromatic EC>C8-C10	94	913	4025	257	547	none
TPH Aromatic EC>C10-C12	118	26515	4589	1394	none	none
TPH Aromatic EC>C12-C16	131	64875	4799	none	none	none
TPH Aromatic EC>C16-C21	82	51449	3639	none	none	none
TPH Aromatic EC>C21-C35	1130	51449	3639	none	none	none
TPH Aliphatic EC>C6-C8	8335	8517587	606191	none	none	none
TPH Aliphatic EC>C8-C10	112	158890	12075	158	none	none
TPH Aliphatic EC>C10-C12	3204	163360	12094	none	none	none
TPH Aliphatic EC>C12-C16	4513	169032	12117	none	none	none
TPH Aliphatic EC>C16-C21	94174	3429944	242573	none	none	none
TPH Aliphatic EC>C21-C35	94820	3429944	242573	none	none	none

Contaminant	Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg) ¹			Land-Use Specific RBSL Soil below 1m depth (mg/kg)		
	Residential	Commercial	Recreational	Residential	Commercial	Recreational
Total TPH (Phase 1) ³	1717	81413	9061	9182	81956	None
Total TPH (Process Area) ³	2601	44344	10830	4098	35014	None
Total TPH (North Tank Farm) ³	1104	25875	9419	3802	13974	None
Total TPH (South Tank Farm) ²	1015	37230	6349	2792	34797	None
<u>ASBESTOS</u>						
Sum of all Types of ACM	200	300	200	200 ⁴	-	-

Notes

- “-” value not applicable to scenario
- “none” RSBL value exceeds soil saturation limits and free phase assessment appropriate
- 1 Lower value of human health RBSL or Soil Code value if higher than background LCL value (applicable to metals & metalloids only)
- 2 Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach
- 3 ‘Total’ TPH RBSL derived for an area of development, based on individual RBSLs provided and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach
- 4 Refer to Section 106 Agreement for specification of relevant depth ranges

Table Summary of RBSLs for groundwater

Contaminant	Land-Use Specific RBSL (mg/l)		
	Residential	Commercial	Recreational
TPH Aliphatic EC>C6-C8	none	none	none
TPH Aliphatic EC>C8-C10	none	none	none
TPH Aliphatic EC>C10-C12	none	none	none
TPH Aliphatic EC>C12-C16	none	none	none
TPH Aliphatic EC>C16-C21	none	none	none

Contaminant	Land-Use Specific RBSL (mg/l)		
	Residential	Commercial	Recreational
TPH Aliphatic EC>C21-C35	none	none	none
TPH Aromatic EC>C7-C8	20	97	none
TPH Aromatic EC>C8-C10	22	none	none
TPH Aromatic EC>C10-C12	none	none	none
TPH Aromatic EC>C12-C16	none	none	none
TPH Aromatic EC>C16-C21	none	none	none
TPH Aromatic EC>C21-C35	none	none	none
Benzene	0.7	6	198
Benzo(a)pyrene	none	none	none
Toluene	47	229	none
Ethylbenzene	102	506	none
Xylenes	43	607	none
1,2-Dichloroethane	0.2	0.82	45
Dichloromethane	150	624	none
Tetrachloroethene	22	115	none
Trichloroethene	2.6	13	813
Vinyl Chloride	0.06	0.3	18
1,2-Dichloroethene	15	68	none
1,1,1-Trichloroethane	193	989	none

otes

“none” theoretical RBSL greater than solubility limit

Table Scale of Aesthetic Criteria

Class	Visual	Olfactory
0	No visible staining of soil, no visible suspect ACM	No detectable odour on soil
1	Occasional staining of soil, no visible suspect ACM	Faint odour on soil
2	Frequent staining of soil	Distinct but not strong odour on soil
3	Occasional heavy staining of soil	Strong odour on soil
4	Heavy staining of soil	Strong odour discernable in ambient air
5	Visible hydrocarbon product	Overwhelming Odour

Notes

Visible suspect ACM refers to asbestos containing material visible to the naked eye which a reasonable and prudent person used to managing asbestos may suspect to be asbestos containing.

Table Minimum Validation Testing Frequencies

Testing for the Validation Suite at the following frequency:	Shallow Soils (Residential <1m FFL)	Deeper Soils (Residential >1m below FFL)	Soils (Commercial all relevant depths)
Imported quarried material	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples
Imported soil from verified greenfield site	1 per 250m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples
Imported soil from characterised brownfield site ¹	1 per 25m ³ ex situ, composite of 5 sub-samples	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples
0.5-1m below FFL in-situ	Regular grid of 1 per 50m ² , sample over 0.5m depth	n/a	Regular grid of 1 per 400m ² , sample over 0.5m depth
>1m below FFL in-situ	n/a	Regular grid of 1 per 100m ² , sample over 1m depth	Regular grid of 1 per 400m ² , sample over 0.5m depth
Stockpiled excavated site materials for re-use	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples	1 per 400m ³ ex situ, composite of 5 sub-samples
Face of remedial excavations <1m deep	1 per 10m, minimum of 1 per face, worst case VO sample	n/a	1 per 15m, minimum of 1 per face, worst case VO sample

Testing for the Validation Suite at the following frequency:	Shallow Soils (Residential <1m FFL)	Deeper Soils (Residential >1m below FFL)	Soils (Commercial all relevant depths)
Face of remedial excavations >1m deep	n/a	1 per 10m ² , minimum of 1 per face, worst case VO sample	1 per 15m ² , minimum of 1 per face, worst case VO sample
Along redundant service excavations	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample
Soil treated ex-situ and homogenised	1 per 200m ³ , composite of 5 regular sub-samples	1 per 200m ³ , composite of 5 regular sub-samples	1 per 500m ³ , composite of 5 regular sub-samples

otes

“1” Validation suite to reflect prior use of the originating brownfield site and the design and purpose of the relevant area of Coed Darcy.

“VO” Visual/olfactory (i.e. aesthetic) observation

Remediation Action Plan (RAP) Works

In addition to meeting the requirements of the Redevelopment Remediation Works, the Developer must also complete a series of statutory remedial works which are referred to as the RAP Works. The requirements for the RAP Works are outlined in Schedule 7 of the Section 106 Agreement.

It is intended that this report, which is the RRWCC, will be complemented by a RAP Works Completion Statement (RAPWCS) in order to provide the information required by CDL to enable the PWCD to be declared.

Details of the scope of works and associated validation completed to satisfy the RAP requirements pertinent to this Phase are reported separately in RAPWCS ref. 49310747/BRRP00044/Cert 20a.

Information Sources

A summary of the information sources that URS has been provided with in relation to Phase 20 is provided in **Table** :

Table Information Sources

Ref.	Document Reference	Format	Title	Author	Date
1	44382742/BRRP0001	Report	BP Llandarcy Refinery Desk Study	URS	05/07/07
2	5041216-REM-RPT-783	Report	Geo-Environmental Assessment Report. Temporary Collection Chamber (Monitor Phase 20)	Atkins	11/05/12
3	5041216-REM-RPT-000819	Report	Validation Report. Temporary Collection Chamber (Monitor Phase 20)	Atkins	09/12

Ref.	Document Reference	Format	Title	Author	Date
4	5041216-PLOTS-TN-000845	Technical Note	Coed Darcy – Monitor Phase 20. Response to Monitor Comments RFI107	Atkins	25/03/13
5	5041216-PLOTS-TN-1130	Technical Note	Coed Darcy – Monitor Phase 20. Response to Monitor Comments Email 20 June 2013	Atkins	08/05/14

Electronic copies of the Information Sources are provided in **Appendix C**.

Unless otherwise stated, URS has relied solely on the above Information Sources as the basis for issuing this RRWCC. Upon a review of the Information Sources, in URS' reasonable professional opinion, such information and the manner in which it was obtained appears sufficiently up to date, reliable and robust to justify such reliance. No verification of the data has been completed by URS unless noted in the following sections.

Requests for Information RFIs Issued by RS

A number of RFIs have been raised by URS in relation to Phase 20, a summary of which is provided below. Copies of the RFIs are provided in **Appendix C**. Copies of the responses received are included in **Appendix C**.

Table RS RFIs

RFI Ref.	Title	Associated Atkins Document	Date Raised	Complete	Comments
-	Email titled Coed Darcy Temporary Collection Chamber (Monitor Phase 20)	Geo-Environmental Assessment Report Temporary Collection Chamber (Monitor Phase 20)	12/6/12	Yes	Email correspondence regarding the intended use
RFI 107	Coed Darcy Monitor RFI107 – RE: Coed Darcy_Monitor Phase 20	Validation Report Temporary Collection Chamber (Monitor Phase 20)	18/10/12	Yes	Refer to Atkins Technical Note TN845
RFI 116	Coed Darcy Monitor – RFI116	Validation Report Temporary Collection Chamber (Monitor Phase 20)	20/06/13	Yes	Refer to Atkins Technical Note TN1130

DESCRIPTION OF REMEDIAL ACTION

The following section provides a description of the remedial action which has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 20. This section of the report is structured as follows:

1. Site Assessment

2. Remediation Strategy
3. Redevelopment Remediation Works
4. Validation

Site Assessment

As discussed above, the Section 106 Agreement requires the Developer to undertake an appropriate site assessment which needs to take account of the site history, potential and/or actual measured extent of contamination and the associated implied risk. The Section 106 Agreement also states that only by developing a thorough understanding of both potential and actual contamination will it be possible to confirm that all necessary Remedial Action is likely to have been completed. This obligation should be satisfied through completion of an appropriate desk study and intrusive investigation.

Desk Study

It can be seen from the list of Information Sources provided in **Table** in this report that Atkins has prepared a number reports and technical notes regarding Phase 20. It is evident that Atkins has reviewed the information collected during a number of previous investigations and desk studies to develop a thorough understanding of both potential and actual contamination. The following is of note:

Atkins reports that Phase 20 comprises an irregular shaped area of land of approximately 0.46 hectares which slopes down towards the north. An aerial photograph provided in the Atkins' investigation report (Information Source 2) shows roads on the southern and western boundaries.

Atkins reports that the historical maps provided in URS' Phase 1 report (Information Source 1) indicate the presence of a substation (substation 18) and an unidentified building within the northern section of Phase 20. A copy of the historical plan is included in **Appendix E**. It is also noted that prior to the refinery closure Phase 20 was predominantly a grassed slope. The substation does not appear to be present on the aerial photograph used by Atkins in the investigation report. Atkins further reports that historical maps pre-dating the refinery provided within the URS report show a railway line terminating within the northern part of the phase.

Atkins reports that historically Phase 20 was bordered by the following land uses:

- To the north (and therefore down-slope): The DiMe plant which historically included various plant, tanks and substations.
- To the east: The main refinery access and a security lodge.
- To the south (and therefore up-slope): The canteen, the former laboratory/technical building, tank storage areas and sump separators.
- To the west: The 'new' boiler house and the central substation.

Intrusive Investigations

Details of the findings of intrusive investigations undertaken by Atkins, and historically by URS, are summarised in Atkins' Geo-environmental Assessment Report (Information Source 2). URS is satisfied that sufficient intrusive investigations were completed to develop a thorough understanding of the site conditions prior to remediation.

Atkins excavated a series of eleven trial pits (reference CATP and FTS), eight of which were within Phase 20 and the other three of which were close to Phase 20 to the north. Atkins also used data from three URS trial pits and one URS borehole within Phase 20. The following is of note from these locations:

Made ground was reported to depths of 2.25 mbgl and was predominantly granular with inclusions of ash, clinker, concrete, brick and sandstone. Atkins also reported encountering reinforced concrete slab at a depth of 0.5 mbgl in the western part of Phase 20, and at a depth of 0.9 mbgl in the southern part of Phase 20 as reported by URS in a previous assessment. Atkins also reported pipe work, rubber hosing and relict services at a number of locations.

Natural soils, where encountered were reported to comprise sandy gravelly clays overlying sandstone bedrock. The depth to bedrock was reported to be between 0.15m and 2.25m, with the upper surface of the bedrock noted as highly weathered.

Groundwater was encountered at four locations at the base of the superficial deposits between 2.1m and 2.7 mbgl. Atkins note that previous works by URS infer groundwater flow to be towards the north-northeast in this area.

Atkins reported that the exploratory hole logs indicated evidence of localised free phase hydrocarbon and visual/olfactory evidence of hydrocarbon up to a visual/olfactory score of 5/4 as defined in **Table** at FTS4. It is noted that the Phase boundary was altered following this assessment and FTS4 is no longer within Phase 20. Atkins reports that there were no exceedences of the adopted thresholds for a Commercial phase within the laboratory results and that asbestos containing material was not detected. It is noted that laboratory analysis did not include Polychlorinated Biphenyl (PCBs) which are a potential contaminant associated with historic substations.

Atkins reported that groundwater results from WSME077 from March 2011 indicated the following exceedences of the adopted thresholds:

- TPH Aliphatic C₈-C₁₀ of 185 µg/l against an agreed RTC of 29.6 µg/l.
- TPH Aliphatic C₁₀-C₁₂ of 779 µg/l against an agreed RTC of 22.8 µg/l.

Free phase hydrocarbon was also detected at this location in May 2011 at a reported thickness of 0.13m.

Atkins recommended a series of remediation works to comply with the requirements of the Section 106 agreement as detailed below in Section 2.2.

Remediation Strategy

Schedule 8 of the Section 106 Agreement sets out the minimum remedial action required depending on the intended use and the groundwater regime. As discussed above, Phase 20 is considered to comprise a commercial phase. Groundwater across Phase 20 is primarily in soil. The following minimum requirements are specified for a Commercial end use where groundwater is in soil:

- All oil saturated soils and soil containing free product other than minor sheens shall be removed to a minimum depth of 2 m FFL or 0.5 m below the likely lowest seasonal groundwater elevation following development of the intended Urban Village, whichever is the deeper. This depth is to be established by consideration of all available groundwater level monitoring data.

- All soils must meet the RBSL for TPH to at least 1m below FFL.
- All soils must meet in bulk, considering both dispersed fibres and pieces of ACM, the RBSL for ACM to at least 1m below FFL and any visible ACM encountered during construction in the first 1m below FFL is to be removed.
- Where there is a risk of the migration in ground of hazardous gas or contaminated liquid into remediated areas, the Developer shall take all appropriate measures to prevent this occurring. Such measures could include the installation of interception trenches and management of discharge from those. The Developer shall monitor whatever measures are put in place after their installation to continue to demonstrate their effectiveness.
- Where necessary, seeps, sheens and iron rich discharges from the bedrock must be controlled such that there is no visible discharge at surface and little or no odour. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.

Furthermore, Schedule 10 of the Section 106 Agreement states that:

- All buried services shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity.
- The final 0.5m of materials shall comprise quality controlled imported fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end-use and meeting aesthetic type 0 for residential use and type 1 or better for commercial use as specified in **Table** of this report.

Based on the above requirements, Atkins' Remediation Strategy recommended the following redevelopment remediation works for Phase 20:

- Inspection of existing wells for retention and protection during works;
- Monitoring of existing wells to determine the presence of remaining free phase product;
- Recovery of free product from existing wells;
- Excavation and recovery of free product from the vicinity of FTS4;
- Removal of existing structures, services and the excavation of soils possessing a visual/olfactory score >3 as defined in **Table** ; and
- Review of required validation testing and further trial pitting if required.

In addition further works were also proposed to facilitate the development of the area:

- Removal of existing concrete, relict services and unsuitable geotechnical materials;
- Reprofilling of the final surface to achieve a stable, free draining surface; and,
- On-going liaison with Atkins' drainage team relating to the design of the proposed chamber.

URS was satisfied that the proposed approach and considers the above to be in line with the requirements of the Section 106 Agreement. However it is noted that the remedial strategy

was developed when the Phase included FTS4 whereas the Phase boundary submitted for Monitor certification does not include this location.

Redevelopment Remediation works

The redevelopment remediation works that have been completed for Phase 20 are described in Atkins' Validation Report (Information Source 3) and can be summarised as follows:

- Turnover of soils and reprofiling, including the removal of remnant drainage runs, removal of concrete obstructions associated with a separator, removal of an access road and removal of remnant hydrocarbon impacted materials (May-June 2012); and
- Validation site investigation (June 2012).

Atkins reports that approximately 0.5 litres of product was recovered from borehole WSMW077 between April and May 2012 prior to the remediation works. The product is reported to have been situated within the bedrock at a depth of approximately 3.5mbgl.

Excavations in Phase 20 are reported to have been to the sandstone bedrock for remedial works with no breaking of bedrock for the remedial works. However, subsequent excavations that were required during installation of the temporary collection chamber extended into the bedrock with a maximum depth in the region of 4.5m in comparison to the original ground level. Atkins reports that during the remediation works less than 10m³ of unacceptable soils were removed from Phase 20. These soils were reported to be heavily stained with an visual/olfactory classification of 3/2 as defined in **Table 1**.

It is reported that due to the removal of concrete obstructions and drainage runs it was necessary to import 800m³ of material for the reinstatement and re-profiling of Phase 20.

It is noted that the extent of the remedial works was limited due to the requirement to maintain unrestricted access along a haul road on the northern boundary of Phase 20. It was therefore not possible to undertake the planned soil removal at FTS4. As this location is now outside of the Phase boundary, this is considered acceptable. It is noted however that this item will remain outstanding and will be required prior to certification of that land under a different Phase.

URS' Observations During the Redevelopment Remediation Works

URS attended site during the redevelopment remediation works and is satisfied that the works appear to have been carried out in accordance with the Remediation Strategy and the requirements of the Section 106 Agreement.

Validation

With reference to Section 2.2 of this report, the following sections aim to demonstrate whether or not the requirements of the Section 106 Agreement have been satisfied.

Aesthetic Criteria

The Section 106 Agreement requires that for a commercial phase all oil saturated soils and soil containing free product other than minor sheens shall be removed to a minimum depth of 2m below FFL or 0.5m below the likely lowest seasonal groundwater elevation, whichever is the deeper.

As discussed above, Atkins reports less than 10m³ of unacceptable soils were removed from Phase 20 during the remediation works. Following the works, seven validation trial pits (P20 001 to P20 007) were excavated in June 2012. All seven pits are reported to have been taken to bedrock, which was encountered at depths from 0.5mbgl to 1.84mbgl. Atkins' visual/olfactory records for each of the pits indicate maximum aesthetic classifications of 2/1 (P20 001 in the made ground) as defined in **Table 1**. In addition, logs are provided for three additional locations along the southern boundary of the phase where bedrock was encountered at surface. As there was no recoverable sample at these locations, no visual/olfactory records are provided.

As discussed above Atkins also reported that approximately 0.5 litres of product was recovered from borehole WSMW077 between April and May 2012 prior to the remediation works. During subsequent monitoring rounds (up to August 2012), Atkins report that free phase product thickness' was less than 5mm. Atkins consider the presence of minor quantities of free phase hydrocarbon in the bedrock to be consistent with conditions encountered in Monitor Phase 3, up-slope of Phase 20.

The product is reported to have been situated within the bedrock at a depth of approximately 3.5mbgl and is therefore deeper than the 2m below FFL threshold specified in the Section 106 Agreement. Atkins report that the only contamination observed during excavation for the temporary collection chamber was a small pocket of hydrocarbon staining at approximately 3m depth.

Atkins concludes that the residual product observed in borehole WSMW077 is not considered to represent a widespread or significant source of contamination. URS considers this acceptable.

In summary, URS is satisfied that Phase 20 meets an appropriate aesthetic quality given the intended end-use and the requirements of the Section 106 Agreement.

Soil Chemical Quality Validation Criteria

The Section 106 Agreement requires that for a commercial phase all soils must meet the RBSLs specified in the Section 106 Agreement at the specified depths and in particular the RBSL for TPH to at least 1m below FFL.

In addition to the RBSLs stated in the Section 106 Agreement, Remediation Target Concentrations (RTCs) have been developed by Atkins. The RTCs are intended to be health protective and it has been agreed previously with NPTCBC's Environmental Health Department that where the RTCs are numerically lower than the RBSLs, the RTCs shall be used. A summary of the RBSLs and RTCs is presented in **Appendix F**.

In order to demonstrate that the requirements of the Section 106 Agreement have been achieved, Atkins undertook a programme of validation trial pitting across Phase 20 and collected soil samples for testing.

With reference to **Table 1** in this report, the minimum validation testing frequency for in situ soils within a commercial phase is a regular grid of 1 sample per 400m². From the data presented in Atkins' validation report (Information Source 3) it appears that 11 samples were collected from the seven pits. Phase 20 is reported to occupy an area of approximately 0.46ha, which implies that a sampling frequency of 1 sample per 418m² has been achieved. This marginally exceeds the minimum frequency as specified in the Section 106 Agreement.

With reference to drawing no. 5041216-PIR(a)-DWG-1250 presented in Atkins' validation report (Information Source 3) URS is satisfied that the samples have been collected across a

reasonably regular grid. There is a lack of samples in the eastern edge of the phase but it is reported that this area was not accessible due to the requirement to maintain slopes in the ground surface. It is also noted that no samples were collected from the narrow section of the phase that extends to the east, due to the presence of bedrock at surface. Given these restrictions URS considers the sampling frequency to be acceptable.

Atkins reports that there were no exceedences against the RBSL/RTC thresholds.

In summary URS is satisfied that the soils across Phase 20 meet the necessary RBSLs and/or RTCs in accordance with the Section 106 Agreement.

Asbestos

With reference to Atkins' validation report (Information Source 3) seven samples were collected in January 2013 for asbestos analysis.

All seven samples indicated the potential presence of asbestos on initial screening. Quantified analysis was carried out on four of the seven samples. Three of the four samples contained less than 10ppm asbestos and one sample contained 18ppm asbestos. This is below the RBSL threshold of 300ppm for a commercial phase.

Following the validation report an RFI was raised noting that the above sampling did not meet the requirements of the Section 106 in that not all asbestos potentially detected was quantified and there was an insufficient sampling frequency. Atkins subsequently undertook additional sampling as detailed in Technical Note 1130 (Information Source 5). This sampling comprised the collection of eight shallow samples in December 2013 with a further four collected in April 2014. The depth of the samples is not provided, however URS understand they were collected from the top 0.5m of soil. Asbestos was detected in all but one sample and was quantified to a concentration of up to 33ppm which is below the RBSL of 300 ppm for a commercial phase.

The 12 samples provide a frequency of 1 sample per 383m², which is in accordance with the required frequency of 1 per 400 m². It is noted however that these samples are concentrated in the western half of the Phase. This appears to be due to the construction of a road in the eastern area. On the basis that this road will prevent exposure to asbestos in this area of the site, this sampling distribution is considered acceptable.

In summary URS is satisfied that the soils across Phase 20 meet the RBSL for asbestos.

Groundwater Validation Criteria

There are no relevant groundwater validation criteria for a commercial phase and no groundwater validation data has been presented by Atkins.

The Section 106 Agreement states that wherever there is a risk that following construction of the Urban Village groundwater or organic phase liquid may contaminate soils within the top 1m below FFL such that any of the relevant RBSLs and/or aesthetic criteria may be exceeded, then all necessary steps should be taken to mitigate these risks. This may involve the installation of land drains and/or the raising of the site ground levels.

Data indicates groundwater levels to be significantly below the FFL for Phase 20 and therefore the risk of such recontamination is considered low. As such, URS is satisfied that the installation of land drains and/or the raising of the site ground levels is not necessary in relation to Phase 20.

Measures to Prevent Contamination Migration

The Section 106 Agreement states that for a commercial phase, where there is a risk of the migration in ground of hazardous gas or contaminated liquid into remediated areas, the Developer shall take all appropriate measures to prevent this occurring.

Land immediately up-gradient of Phase 20 (i.e. to the south of Phase 20) has been remediated in line with the requirements of the Section 106 Agreement. URS is satisfied that there is little or no risk of migration in ground of hazardous gas or contaminated liquid into Phase 20.

Seepages

The Section 106 Agreement states that for a commercial phase, where necessary, seeps, sheens and iron rich discharges from the bedrock must be controlled such that there is no visible discharge at surface and little or no odour.

No such seepages are reported in Atkins' reports and URS' observations suggest discharge at surface from the bedrock is unlikely.

Fill Material

As discussed above, Atkins reports that the remediation excavation was taken to bedrock throughout the Phase. Therefore the fill materials placed upon the bedrock must be acceptable in accordance with the requirements of the Section 106 Agreement.

During the reprofiling works excavated materials were segregated at source based on a visual/olfactory assessment by an Atkins engineer. Material judged to be acceptable was placed along with other site-won material to form the finished profile to FFL. As the final design of this area has not been completed, Atkins are unable to confirm that the current levels represent FFL, however they assume that they will be similar.

On completion, a series of trial pits were excavated to allow samples to be collected for testing to ensure compliance with the RBSL and RTC criteria discussed earlier in this report. The results of the chemical analysis are presented in Atkins' Validation Report (Information Source 3).

Atkins reports that approximately 800m³ of material was placed within Phase 20 to create the finished profile. Two samples were collected from the fill material prior to use, equating to a sampling frequency of approximately 1 sample per 400m³ of fill material.

With reference to **Table** in this report, the scenario 'stockpiled excavated site materials for re-use' is considered appropriate for this phase, which requires a minimum validation testing frequency of 1 sample per 400m³ of fill material from a composite of 5 sub samples for a commercial end-use. It can be seen that the testing frequency achieved meets the minimum frequencies specified however it is not clear from the Atkins report that these samples were taken from a composite of five sub-samples.

Atkins reports that there were no RBSL/RTC exceedances within these two samples. URS therefore considers this material to be acceptable for use.

Finished Levels

As noted above, following the completion of the redevelopment remediation works, the finished profile is reported to be at a similar level to the final finished level, however this has

not been confirmed. The as-built levels following completion of the remediation works are shown on Atkins drawing 5041216/300SD/DWG/1259 a copy of which is provided in the validation report in **Appendix C** (Information Source 3).

It is specified in the Atkins validation report that the developer is required to build up the final elevation after completion of the RAP and Redevelopment Remediation Works with a minimum of 0.5m of quality controlled fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end use and meeting aesthetic type 1 or better for commercial end use.

It should be noted that any subsequent import of material and/or removal of material from the development phase following certification will need to be controlled by the Local Planning Authority as URS will have no formal on-going role to control subsequent works once the RRWCC is issued.

It should also be noted that if there is any significant change in the development proposals or the proposed FFLs then reconsideration of the information contained within this report may be necessary. Notwithstanding this, it is understood that the redevelopment remediation works that have been completed are aimed at being conservative to allow for minor alterations to FFLs.

Removal of Buried Services

The Section 106 Agreement states that irrespective of the intended use, all existing buried services shall be removed. It is assumed that this refers only to redundant services.

As discussed in Atkins' validation report (Information Source 3) Phase 20 was subject to a turnover which involved the excavation of all soils to bedrock during which any such services were removed.

URS is satisfied that there do not appear to be redundant buried services present within Phase 20.

CERTIFICATION

Redevelopment Remediation Works

The following section aims to confirm whether or not in URS' professional opinion the Redevelopment Remediation Works have been satisfactorily completed in accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the intended use, which has been declared as commercial.

Validation is required in order to confirm that the requirements set out in the Section 106 Agreement have been met. With reference to the minimum remedial action required, as listed in Section 2.2 of this report, **Table 1** below provides a summary of whether or not in URS' professional opinion these objectives have been satisfied.

Table Certificate Summary

Requirement	Status	Comments
The RBSLs and the aesthetic criteria, remediation quality and scope (including the depth below FFL to which quality standards are achieved) shall be achieved for each part of the Property at the minimum validation frequencies set out in Clause 8 of Part 3 of the Section 106 Agreement (as applicable depending upon whether such part of the Property is intended for use as residential, commercial or recreational land) as a minimum base level standard.	Complete	Refer to Section 2.4 of this report.
All oil saturated soils and soil containing free product other than minor sheens shall be removed to a minimum depth of 2m below FFL or 0.5m below the likely lowest seasonal groundwater elevation following development of the intended Urban Village, whichever is the deeper. This depth is to be established by consideration of all available groundwater level monitoring data.	Complete	Refer to Section 2.4.1 of this report.
All soils must meet the RBSL for TPH to at least 1m below FFL.	Complete	Refer to Section 2.4.2 of this report.
All soils must meet in bulk, considering both dispersed fibres and pieces of ACM, the RBSL for ACM to at least 1m below FFL and any visible ACM encountered during construction in the first 1m below FFL is to be removed.	Complete	Refer to Section 2.4.3 of this report.
Wherever there is a risk that following construction of the Urban Village groundwater or organic phase liquid may contaminate soils within the top one metre below FFL such that any of the relevant RBSLs and/or aesthetic criteria specified in Schedule 8 may be exceeded, the Developer shall ensure that all necessary steps are taken to mitigate these risks. Suitable measures may include, but not be limited to, the installation of land drains and/or the raising of the site ground levels such that groundwater will not be able to influence shallow soil quality.	Complete	Refer to Section 2.4.4 of this report.
Where there is a risk of the migration in ground of hazardous gas or contaminated liquid into remediated areas, the Developer shall take all appropriate measures to prevent this occurring. Such measures could include the installation of interception trenches and management of discharge from those. The Developer shall monitor whatever measures are put in place after their installation to continue to demonstrate their effectiveness.	Complete	Refer to Section 2.4.5 of this report.

Requirement	Status	Comments
Where necessary, seeps, sheens and iron rich discharges from the bedrock must be controlled such that there is no visible discharge at surface and little or no odour. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.	Complete	Refer to Section 2.4.6 of this report.
To provide a minimum thickness of suitable garden soils in residential areas, soils for landscaping in public and commercial areas and sub-base for hardsurfaced areas, the Developer shall build up the final elevation after completion of the RAP and Redevelopment Remediation Works with a minimum of 0.5m of quality controlled imported fill materials suitable for the use to which they are to be put and of better quality than all RBSLs for the relevant end-use and meeting aesthetic type 0 for residential use and type 1 or better for commercial use as specified in Schedule 8 of the Section 106 Agreement. For the avoidance of doubt, the minimum remediation standards set out above therefore assume that the first half metre below FFL will comprise such imported material in all circumstances of residential and commercial end-use.	Complete	Refer to Section 2.4.7 of this report.
Irrespective of the intended use of each phase or part thereof, all existing buried services at the Property shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity. Where backfill to new underground services may become a pathway for residential Pre-Transfer Date Contamination, appropriate control measures such as land drainage or venting measures shall be installed so as to appropriately protect remediated and/or developed areas.	Complete	Refer to Section 2.4.9 of this report.

Preventative Measures

In addition to preparing the RAPWCS and RRWCC, URS is also obliged, if requested by CDL, to review any certificate or other documentation produced to CDL by or on behalf of the Developer purporting to confirm that Preventative Measures have been completed or are not required in relation to any Phase or part thereof providing CDL in writing of its professional opinion as to:

- whether the author is suitably qualified to issue the certificate; and
- whether the certificate contains or reflects any manifest error, omission or bias, etc. and certifies that the land is fit for its purpose.

Ground Gas

The Section 106 Agreement states that a proprietary and appropriate ground gas resistant membrane and appropriate venting system shall be installed in all structures that will be

entered by people and any structure where there is a potential for gas accumulation if ground gas is present.

Whereas Atkins has not carried out an assessment of ground gases specifically in relation to Phase 20, it is recognised in Atkins' validation report (Information Source 3) that this will need to be addressed as and when the design of the proposed redevelopment is confirmed.

URS shall, if requested by CDL, review any certificate or other documentation purporting to confirm that Preventative Measures have been completed or are not required.

CO CL SIO S

RR CC

This RRWCC confirms that in URS' professional opinion, and on the basis of the information provided within the Information Sources and observations made by URS during the remediation works, URS is satisfied that the Phase 20 redevelopment remediation works appear to have been completed in general accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the specified Intended Uses, and that the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement are likely to continue to be met for the foreseeable future without the need for further remedial action in relation to or affecting the area within the Phase Boundary.

C

The PWCD will be declared once CDL is satisfied that the remediation necessary for the specified Intended Use for the Phase has been completed. This report, which is the RRWCC, will be complemented by a RAPWCS in order to provide the information required by CDL to enable the PWCD to be declared.

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RO OSE E ELO E T LA O T



ST. MODWEN DEVELOPMENTS LIMITED - a ST. MODWEN company

Registration England 892832

Sir Stanley Clarke House, 7 Ridgeway, Quinton Business Park, Birmingham, B32 1AF

T: 0121 222 9400 W: www.stmodwen.co.uk

3rd June 2013

Our ref: SLS/NW/2160

**Coed Darcy Limited
Dumfries House
Dumfries Place
Cardiff
CF10 3ZF**

Dear Sirs

**Coed Darcy
Phase 20 – Temporary Drainage Collection Chamber
Request for Phase Works Completion Date**

We hereby give our written request seeking the declaration of the Phase Works Completion Date for Phase 20 of Coed Darcy as required under Clause 4.6 of the Remediation Agreement made between Coed Darcy Limited, St. Modwen Developments Limited and St. Modwen Properties PLC dated 23rd May 2008.

The Phase 20 boundary is shown on the attached Drawing No. 5041216-REM-DWG-1279.

The "Intended Use" for Phase 20 is confirmed as that of temporary collection chamber in the short term and comprise commercial/residential properties (Residential flats above retail properties) in the longer term, based on the current Masterplan.

As required by the Remediation Agreement, we have copied this letter to the Monitor.

Yours faithfully

A handwritten signature in blue ink, appearing to read "Neil Williams".

Neil Williams

For and on behalf of St. Modwen Developments Limited

Cc Rhys Mander, Llancoed House, Coed Darcy, Neath, SA11 8AZ

St. Modwen Properties PLC

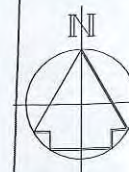
Head Office & Registered Office: Sir Stanley Clarke House, 7 Ridgeway, Quinton Business Park, Birmingham, B32 1AF

T: [0121] 222 9400 W: www.stmodwen.co.uk

Registration: England 349201

ATKINS

5041216-REM-DWG-1279



Key:
Phase Boundary
(Monitor Phase 20)

± 50.6m

REVISIONS	Drawn By	Checked By	Date

PURPOSE OF ISSUE	Rev.	Authorised for issue	Date

Atkins Limited
Telford Office
Cornerstone House
Stafford Park 13
Telford TF3 3AZ
Tel 01952 201234
Fax 01952 200981

Birmingham Office
The Axis, 10 Holliday Street
Birmingham
West Midlands B1 1TF
Tel 0121 483 5000
Fax 0121 483 5252

©

THIS DRAWING IS NOT TO BE SCALED

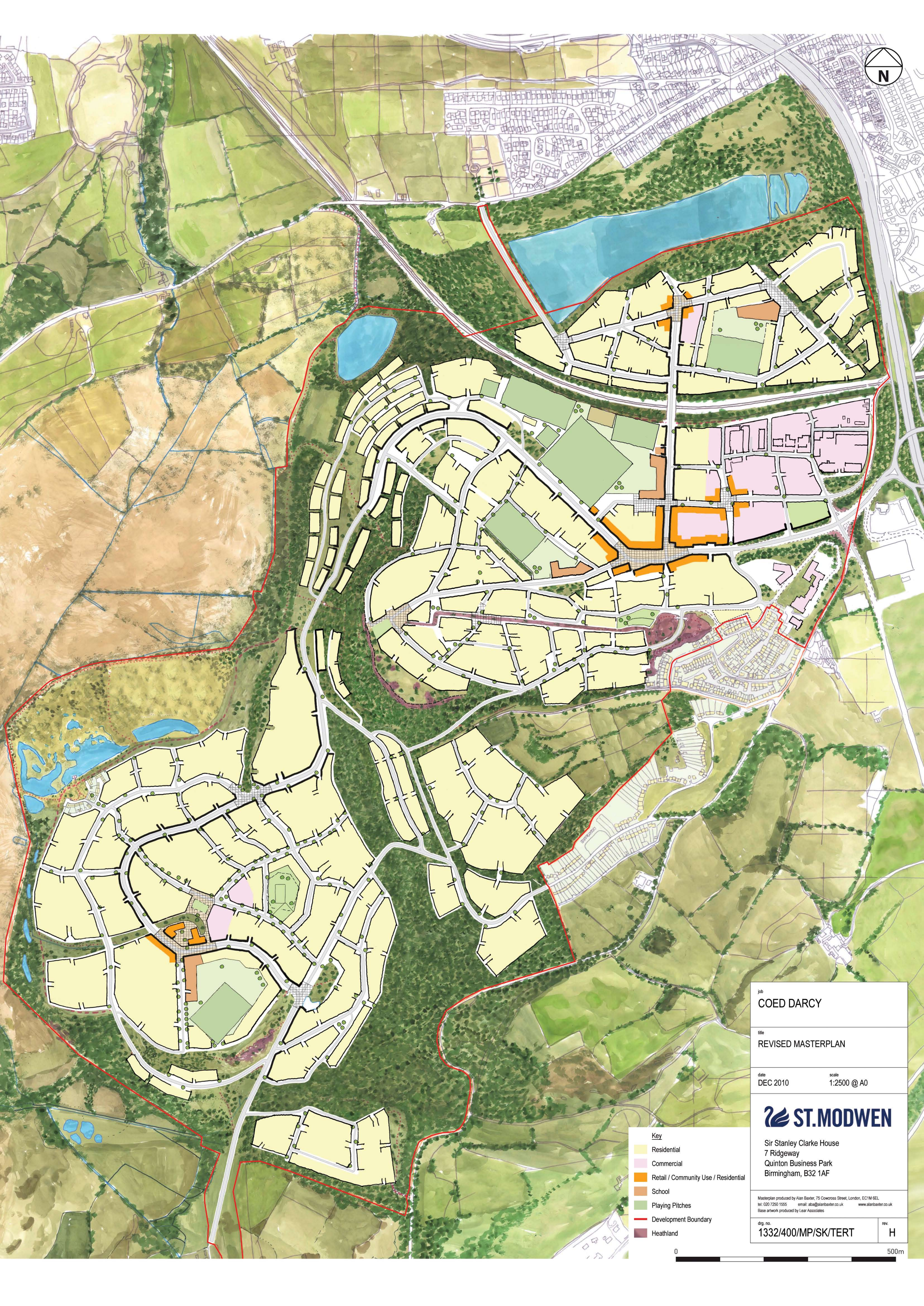
CLIENT
ST.MODWEN

PROJECT
Coed Darcy

DRAWING TITLE
Monitor Phase 20 Boundary

SCALES	DRAWN	CHECKED	CO-ORD CHECK
1:1000	AJ	AM	ML
DATE	DATE	DATE	DATE
09/08/12	09/08/12	09/08/12	09/08/12

DRAWING NO	SHEET	PLOT DATE	REV
5041216-REM-DWG-1279	A3		



- Key**
- Residential
 - Commercial
 - Retail / Community Use / Residential
 - School
 - Playing Pitches
 - Development Boundary
 - Heathland

job COED DARCY	
title REVISED MASTERPLAN	
date DEC 2010	scale 1:2500 @ A0
 ST.MODWEN	
Sir Stanley Clarke House 7 Ridgeway Quinton Business Park Birmingham, B32 1AF	
Masterplan produced by Alan Baxter, 75 Cowcross Street, London, EC1M 6EL tel: 020 7250 1555 email: aba@alanbaxter.co.uk www.alanbaxter.co.uk Base artwork produced by Lear Associates	
drg. no. 1332/400/MP/SK/TERT	rev. H

0 500m

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SCHEDULE 8

Redevelopment Remediation Works

Purpose, objectives and requirements of the Redevelopment Remediation Works

Part 1

1. Purpose and objectives of the Redevelopment Remediation Works

- 1.1 The purpose and objectives of the Redevelopment Remediation Works are the carrying out of all such Remedial Action over and above that actually carried out as part of the RAP Works that is necessary in order to make each part of the Property suitable within the meaning of paragraph 1.2 below for its Intended Use or such other use as may be determined from time to time.
- 1.2 A part of the Property will only be suitable for its Intended Use or such other use as may be determined from time to time if and when the Phase Works Completion Date is declared in respect of that part of the Property.

Part 2

2. Developer's obligations regarding Redevelopment Remediation Works

- 2.1 The Developer shall carry out or procure the carrying out of all Remedial Action necessary in order to achieve the purpose and objectives set out in Part 1 of this Schedule.
- 2.2 The design and specification of the Redevelopment Remediation Works shall take appropriate account of the principles and objectives (as set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Schedule 7 hereto) and the design assumptions of the RAP Works and shall not prejudice the achievement and future sustainability of these principles and objectives of the RAP Works or the RAP Works themselves.
- 2.3 The Redevelopment Remediation Works may reduce the reliance on the RAP Works to achieve the principles and objectives of the RAP Works set out in sub-paragraph 1.3 (including 1.3.1-1.3.5 thereof) of Schedule 7 hereto but must not increase that reliance.
- 2.4 The RBSLs set out in Tables 1 and 2 below and the aesthetic criteria, remediation quality and scope (including the depth below Final Finished Level to which quality standards are achieved) as also set out in Part 3 below, as the same may be varied in accordance with this Schedule 8, shall be achieved for each part of the Property at the minimum validation frequencies set out in clause 8 of Part 3 (as applicable depending upon whether such part of the Property is intended for use as residential, commercial or recreational land) as a minimum base level standard.
- 2.5 Without prejudice to the requirement to achieve the RBSLs set out in Tables 1 and 2 as a minimum base level standard, the Developer shall ensure that all necessary remediation targets are developed and used to determine the extent and quality of remediation appropriate to the development design and purpose of the Urban Village and the Pre-Transfer Date Contamination.
- 2.6 The Developer shall promptly notify CDL and the Monitor if at any time it or any person acting on its behalf identifies a substance present at, in, on or under the

Property, or has reasonable cause to suspect such presence, for which no RBSL is specified in Tables 1 or 2 of Part 3 below in which case the following procedure shall apply:

- 2.6.1 As soon as reasonably practicable after serving a notice under paragraph 2.6 above, the Developer shall prepare proposals for soil and groundwater RBSLs for the substance identified that are consistent with the purpose and objectives of the Redevelopment Remediation Works as set out in Part 1 of this Schedule and the standards of prevailing Environmental Law and shall provide a copy of such proposals to CDL the Monitor and the Authority. Any such proposal shall contain a detailed statement of the health risk assessment and general methodology from which the proposed RBSLs have been derived.
 - 2.6.2 Not earlier than 10 Working Days after submitting its proposals to CDL the Monitor and the Authority in accordance with sub-paragraph 2.6.1 above, the Developer shall submit a written request to the appropriate Environmental Authorities, copied at the same time to CDL the Monitor and the Authority, for approval of the use of the proposed RBSLs. The Developer shall provide to the appropriate Environmental Authorities with its request copies of the health risk assessment and general methodology referred to in sub-paragraph 2.6.1 above and a copy of this Agreement clearly drawing attention to the purpose, objectives and requirements of the Redevelopment Remediation Works set out therein and the proposed changes thereto.
 - 2.6.3 Each of the Developer, CDL and the Monitor shall be free at any time to make such submissions to the appropriate Environmental Authorities in relation to the Developer's proposals as they see fit, provided such submissions are made in writing and copied to each other and the Authority at the same time.
 - 2.6.4 The Developer shall ensure that the Redevelopment Remediation Works achieve compliance with any RBSLs approved in writing by the appropriate Environmental Authorities pursuant to this paragraph 2.6, as if they were also set out in Tables 1 and 2 of Part 3 of this Schedule.
- 2.7 The Developer may at any time propose variations to the requirements of clauses 3 to 8 inclusive of this Schedule 8 below to the appropriate Environmental Authorities and to the Authority pursuant and to the extent required to comply with the Planning Permission to take account of changes of circumstances since the date of this Agreement, provided no variation shall be proposed that is in any way prejudicial to the achievement of the purpose and objectives of the Redevelopment Remediation Works as set out in Part 1 above and, in particular, the achievement of the RBSLs set out in Tables 1 and 2 above (as previously amended in accordance with paragraph 2.6 above if applicable) and provided further that
- 2.7.1 Any such proposals shall be submitted in writing to CDL the Monitor and the Authority at least 10 Working Days before they are submitted to any Environmental Authority;
 - 2.7.2 Any such proposal submitted to any Environmental Authority shall be copied to CDL the Monitor and the Authority at the same time;
 - 2.7.3 The Developer shall enclose a copy of this Agreement with any such proposal made to any Environmental Authority clearly drawing attention to the

purpose, objectives and requirements of the Redevelopment Remediation Works set out therein and the proposed changes thereto;

- 2.7.4 Each of the Developer, CDL and the Monitor shall be free to make such submissions to the appropriate Environmental Authorities in relation to the Developer's proposals as they see fit, provided such submissions are made in writing and copied to each other and the Authority at the same time.
 - 2.7.5 Subject to paragraph 2.7.6 no such proposed variation shall be implemented unless, it has been approved in writing by the appropriate Environmental Authorities in accordance with the requirements of this clause 2.7.
 - 2.7.6 If the Developer has only oral approval (or non objection) to a proposed variation from the relevant Environmental Authorities, no such proposed variation shall be implemented unless the Developer notifies the relevant Environmental Authorities in writing (copied at the same time to CDL the Monitor and the Authority) that it proposes to proceed with the implementation of the proposed variation to the Redevelopment Remediation Works 10 Business Days after the date of such notice and no written objections of any relevant Environmental Authority are received within such 10 Business Day period in respect of the same.
 - 2.7.7 Any reference in this Agreement to the Redevelopment Remediation Works shall be to the Redevelopment Remediation Works as varied in accordance with this paragraph 2.
- 2.8 The Developer shall, and shall procure that any person acting on its behalf in relation to any aspect of the Redevelopment Remediation Works required by this Schedule 8 shall, at all times comply with the requirements of Schedule 10 (General Remediation Requirements).

Part 3

Table 1 – Summary of Soil RBSLs

Contaminant	Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg) ¹			Land-Use Specific RBSL Soil below 1m depth (mg/kg)		
	Residential	Commercial	Recreational	Residential	Commercial	Recreational
METALS & METALLOIDS						
Arsenic	64	500	64	-	-	-
Cadmium	2.6	1400	2.6	-	-	-
Chromium	130	5000	200	-	-	-
Mercury	1	480	1	-	-	-
Nickel	50	5000	75	-	-	-
Selenium	3	8000	3	-	-	-
Lead	337	750	337	-	-	-
Vanadium	416	16000	640	-	-	-
Copper	478	-	478	-	-	-
Zinc	200	-	200	-	-	-
ORGANIC SPECIES						
Benzene	0.12	5	13	0.4	5	48
Benzo(a)pyrene ²	0.9	29	0.9	none	none	none
Toluene	36	1160	8110	52	389	none
Ethylbenzene	41	122000	4740	140	none	none
Xylenes	32	121000	7940	58	none	none
1,2-Dichloroethane	0.04	2	4.5	0.1	0.65	6
Dichloromethane	5	1650	241	84	665	6220
Tetrachloroethene	11	1050	641	34	368	1780
Trichloroethene	1	84	193	2	28	269
Vinyl Chloride	0.01	4	0.7	0.04	1.6	16
1,2 Dichloroethene	4	273	632	7	91	881
1,1,1-Trichloroethane	154	577000	27900	160	3250	none
TPH Aromatic EC>C7-C8	125	1840	21337	146	617	none
TPH Aromatic EC>C8-C10	94	913	4025	257	547	none
TPH Aromatic EC>C10-C12	118	26515	4589	1394	none	none
TPH Aromatic EC>C12-C16	131	64875	4799	none	none	none
TPH Aromatic EC>C16-C21	82	51449	3639	none	none	none
TPH Aromatic EC>C21-C35	1130	51449	3639	none	none	none

TPH Aliphatic EC>C6-C8	8335	8517587	606191	none	none	none
TPH Aliphatic EC>C8-C10	112	158890	12075	158	none	none
TPH Aliphatic EC>C10-C12	3204	163360	12094	none	none	none
TPH Aliphatic EC>C12-C16	4513	169032	12117	none	none	none
TPH Aliphatic EC>C16-C21	94174	3429944	242573	none	none	none
TPH Aliphatic EC>C21-C35	94820	3429944	242573	none	none	none
Total TPH (Phase 1) ³	1717	81413	9061	9182	81956	none
Total TPH (Process Area) ³	2601	44344	10830	4098	35014	none
Total TPH (North Tank Farm) ³	1104	25875	9419	3802	13974	none
Total TPH (South Tank Farm) ²	1015	37230	6349	2792	34797	none
ASBESTOS						
Sum of all Types of ACM	200	300	200	200 ⁴	-	-

“-“ value not applicable to scenario

“none” RSBL value exceeds soil saturation limits and free phase assessment appropriate

¹ Lower value of human health RBSL or Soil Code value if higher than background LCL value (applicable to metals & metalloids only)

² Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach

³ ‘Total’ TPH RBSL derived for an area of development, based on individual RBSLs provided and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.

⁴ See text below for specification of relevant depth ranges

Table 2 – Summary of RBSLs for Groundwater

Contaminant	Land-Use Specific RBSL (mg/l)		
	Residential	Commercial	Recreational
TPH Aliphatic EC>C6-C8	none	none	none
TPH Aliphatic EC>C8-C10	none	none	none
TPH Aliphatic EC>C10-C12	none	none	none
TPH Aliphatic EC>C12-C16	none	none	none
TPH Aliphatic EC>C16-C21	none	none	none
TPH Aliphatic EC>C21-C35	none	none	none
TPH Aromatic EC>C7-C8	20	97	none
TPH Aromatic EC>C8-C10	22	none	none
TPH Aromatic EC>C10-C12	none	none	none
TPH Aromatic EC>C12-C16	none	none	none
TPH Aromatic EC>C16-C21	none	none	none
TPH Aromatic EC>C21-C35	none	none	none
Benzene	0.7	6	198
Benzo(a)pyrene	none	none	none
Toluene	47	229	none
Ethylbenzene	102	506	none
Xylenes	43	607	none
1,2-Dichloroethane	0.2	0.82	45
Dichloromethane	150	624	none
Tetrachloroethene	22	115	none
Trichloroethene	2.6	13	813
Vinyl Chloride	0.06	0.3	18
1,2-Dichloroethene	15	68	none
1,1,1-Trichloroethane	193	989	none

“none”= theoretical RBSL greater than solubility limit

3. Scale of aesthetic criteria

Table 3 – Scale of aesthetic criteria

Class	Visual	Olfactory
0	No visible staining of soil, no visible suspect ACM	No detectable odour on soil
1	Occasional staining of soil, no visible suspect ACM	Faint odour on soil
2	Frequent staining of soil	Distinct but not strong odour on soil
3	Occasional heavy staining of soil	Strong odour on soil
4	Heavy staining of soil	Strong odour discernable in ambient air
5	Visible hydrocarbon product	Overwhelming Odour

3.1 Visible suspect ACM refers to asbestos containing material visible to the naked eye which a reasonable and prudent person used to managing asbestos may suspect to be asbestos containing.

3.2 All references in Table 1 above to depths to which minimum RBSLs are to be achieved are expressed below, relative to FFL following completion of construction of the intended Urban Village.

4. Residential End-Use where Groundwater is Primarily in Rock

4.1 This remediation scenario is intended to refer to residential end-use in areas where there is limited soil material over bedrock, little perched groundwater is present in that soil, and the water table is normally first encountered in bedrock. Areas of the Property with these characteristics include the more elevated parts of the former process area and of the southern tank farm. The minimum Remedial Action required in this scenario is as follows:

4.2 All oil saturated soil should be removed.

4.3 All soils must be remediated so as to meet the RBSLs for TPH, BTEX and PAHs at the relevant depth relative to FFL and the aesthetic criteria Class 2 or better at greater than 1m below FFL.

4.4 The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.

4.5 Soils where there is visible ash and clinker, or metal concentrations above RBSLs, are to be removed so that none is retained within the first metre below FFL in garden areas.

4.6 Where it is not practicable to address groundwater contamination within bedrock this must be controlled, e.g. where seeps, sheens and iron staining discharge from the bedrock. Acceptable methodologies for remediation may include, but are not limited to, the use of land drainage via interceptors. Control measures should result in no visible discharge at surface and little or no odour observable.

4.7 All soil potentially containing dispersed asbestos fibres or visible ACM must be removed or remediated to meet in bulk, considering both dispersed fibres and pieces

of ACM, the appropriate ACM RBSL, or to meet the requirements of relevant Environmental Authorities, whichever is the more conservative.

5. Residential End-Use where Groundwater is in soil

- 5.1 This remediation scenario is intended to refer to residential end-use in areas where there is sufficient soil material over bedrock to commonly contain perched groundwater such that the water table is normally first encountered in soil. Areas of the Property with these characteristics include the lower parts of the former process area and of the southern tank farm and the north site tank farm. The minimum Remedial Action required in this scenario is as follows.
- 5.2 All oil saturated soils and free product shall be removed.
- 5.3 Soils must be remediated so as to meet the RBSLs for TPH, BTEX and PAHs to a minimum depth of 0.5m below the likely seasonal minimum groundwater depth following development of the intended Urban Village. This depth is to be established by consideration of all available groundwater level monitoring data relevant for each area. All soil must meet aesthetic criteria Class 2 or better to the same depth.
- 5.4 All soil must meet aesthetic criteria Class 1 or better to at least 1m below FFL.
- 5.5 Soils where there is visible ash and clinker or metal concentrations above RBSLs to be replaced to at least 1m below FFL.
- 5.6 All soil potentially containing dispersed asbestos fibres or visible ACM must be removed or remediated to meet in bulk, considering both dispersed fibres and pieces of ACM, the appropriate ACM RBSL, or the requirements of relevant Environmental Authorities, whichever is the more conservative, to a minimum depth of 2m below FFL.
- 5.7 Where there is a risk of the migration in ground of hazardous gas or vapour or contaminated liquid into remediated areas, the Developer shall take all necessary measures appropriate to prevent this occurring, including monitoring whatever measures are put in place after their installation to continue to demonstrate their effectiveness. Such measures could include the installation of interception trenches and management of discharge from these.
- 5.8 Where necessary, seeps, sheens and iron rich discharges from the bedrock must be permanently controlled such that there is no visible discharge at surface and little or no odour detectable. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.

6. Commercial End-Use where Groundwater is in soil

- 6.1 This remediation scenario is intended to refer to commercial end-use in areas where there is sufficient soil material over bedrock to commonly contain perched groundwater such that the water table is normally first encountered in soil. The area identified for commercial development in the Masterplan is the lower part of the former process area, which in general terms has these characteristics. Based on the Masterplan, no commercial developments are currently envisaged where groundwater is primarily encountered only in rock; in the event such development is proposed, Remedial Action consistent with the standards specified below would be required, adapted as necessary to local conditions.

- 6.2 All oil saturated soils and soil containing free product other than minor sheens shall be removed to a minimum depth of 2 m FFL or 0.5 m below the likely lowest seasonal groundwater elevation following development of the intended Urban Village, whichever is the deeper. This depth is to be established by consideration of all available groundwater level monitoring data.
- 6.3 All soils must meet the RBSL for TPH to at least 1m below FFL.
- 6.4 All soils must meet in bulk, considering both dispersed fibres and pieces of ACM”, the RBSL for ACM to at least 1m below FFL and any visible ACM encountered during construction in the first 1m below FFL is to be removed.
- 6.5 Where there is a risk of the migration in ground of hazardous gas or contaminated liquid into remediated areas, the Developer shall take all appropriate measures to prevent this occurring. Such measures could include the installation of interception trenches and management of discharge from those. The Developer shall monitor whatever measures are put in place after their installation to continue to demonstrate their effectiveness.
- 6.6 Where necessary, seeps, sheens and iron rich discharges from the bedrock must be controlled such that there is no visible discharge at surface and little or no odour. Acceptable methodologies for remediation may include, but are not limited to the use of land drainage via interceptors.

7. Public Open Space

- 7.1 The Developer shall remediate areas of the Property which will not be developed for residential or commercial end-uses based on those areas falling into one of the following three broad categories of land-use:
- 7.1.1 Well managed parks and public gardens;
- 7.1.2 More lightly managed areas where public access is encouraged;
- 7.1.3 Areas to which access is discouraged but occasional access and/or trespassing is possible.
- 7.2 The degree of protection that will need to be afforded to people will be largely dependent upon how the access to these areas is encouraged/discouraged and managed. For guidance only, access may be discouraged by physical barriers such as fencing, or vegetation, or actively managed by the provision of walkways along which controlled access is encouraged. The topography of the site may encourage children to use bikes, potentially causing rutting of the ground surface and exposing soils at depth. Detailed designs in this regard will be prepared by the Developer approved by CDL and agreed with the Environmental Authorities to (i) protect human health considering the reasonably anticipatable use of the land (ii) achieve the relevant RBSLs (recreational RBSLs being provided in Table 1 above) to an appropriate depth and (iii) include an appropriate scheme of validation testing.

8. Validation

- 8.1 As a minimum validation of RBSL's will be required to include:
- 8.1.1 Determining the necessary extent of remedial excavations: this will be the responsibility of the Developer;

- 8.1.2 Quality assurance of imported materials, including testing of imported materials for contamination if it is intended to use reclaimed aggregates, top soil, etc: this will be the responsibility of the Developer, however, CDL may elect to validate such materials in-situ, once they are finally placed for construction;
- 8.1.3 Quality assurance of soils treated on the site for re-use: this will be the responsibility of the Developer, however, CDL will validate such materials in-situ, once they are finally placed for construction, and;
- 8.1.4 Quality assurance of soils for which no remedial works are identified: this will be the responsibility of the Developer, however, CDL will validate such materials.

8.2 As a minimum, sampling at the following frequencies should be undertaken.

Table 4 - Minimum Validation Testing Frequencies.

Testing for the Validation Suite at the following frequency:	Shallow Soils (Residential <1m FFL)	Deeper Soils (Residential >1m below FFL)	Soils (Commercial all relevant depths)
Imported quarried material	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples	1 per 1000m ³ ex situ, composite of 5 regular sub-samples
Imported soil from verified greenfield site	1 per 250m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples	1 per 500m ³ ex situ, composite of 5 regular sub-samples
Imported soil from characterised brownfield site ¹	1 per 25m ³ ex situ, composite of 5 sub-samples	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples
0.5-1m below FFL in-situ	Regular grid of 1 per 50m ² , sample over 0.5m depth	n/a	Regular grid of 1 per 400m ² , sample over 0.5m depth
>1m below FFL in-situ	n/a	Regular grid of 1 per 100m ² , sample over 1m depth	Regular grid of 1 per 400m ² , sample over 0.5m depth
Stockpiled excavated site materials for re-use	1 per 50m ³ ex situ, composite of 5 sub-samples	1 per 100m ³ ex situ, composite of 5 sub-samples	1 per 400m ³ ex situ, composite of 5 sub-samples
Face of remedial excavations <1m deep	1 per 10m, minimum of 1 per face, worst case VO sample	n/a	1 per 15m, minimum of 1 per face, worst case VO sample
Face of remedial excavations >1m deep	n/a	1 per 10m ² , minimum of 1 per face, worst case VO sample	1 per 15m ² , minimum of 1 per face, worst case VO sample
Along redundant service excavations	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample	1 per 20m of trench, worst case VO sample
Soil treated ex-situ and homogenised	1 per 200m ³ , composite of 5 regular sub-samples	1 per 200m ³ , composite of 5 regular sub-samples	1 per 500m ³ , composite of 5 regular sub-samples

¹ Validation suite to reflect prior use of the originating brownfield site and the design and purpose of the relevant area of Coed Darcy.

VO = visual / olfactory (ie aesthetic) observation

- 8.3 The quality of all material placed as fill and/or remaining in-situ post-construction of the Urban Village must as a minimum meet the relevant RBSLs and aesthetic standards at the frequencies set out above (in either case as the same may be amended in accordance with this Schedule).
- 8.4 In all circumstances, CDL and/or the Monitor may at its discretion take additional samples if it has reason to suspect that material may not meet the relevant RBSLs and

aesthetic standards (in either case as the same may be amended in accordance with this Schedule).

- 8.5 All validation samples obtained by CDL and/or the Monitor whether according to the above frequencies or on a discretionary basis must on analysis be of the same or better quality than the relevant RBSLs and meet or exceed the relevant aesthetic criteria (in either case as the same may be amended in accordance with this Schedule).

A E I C I FOR ATIO SO RCES

A E I RS RFIs

