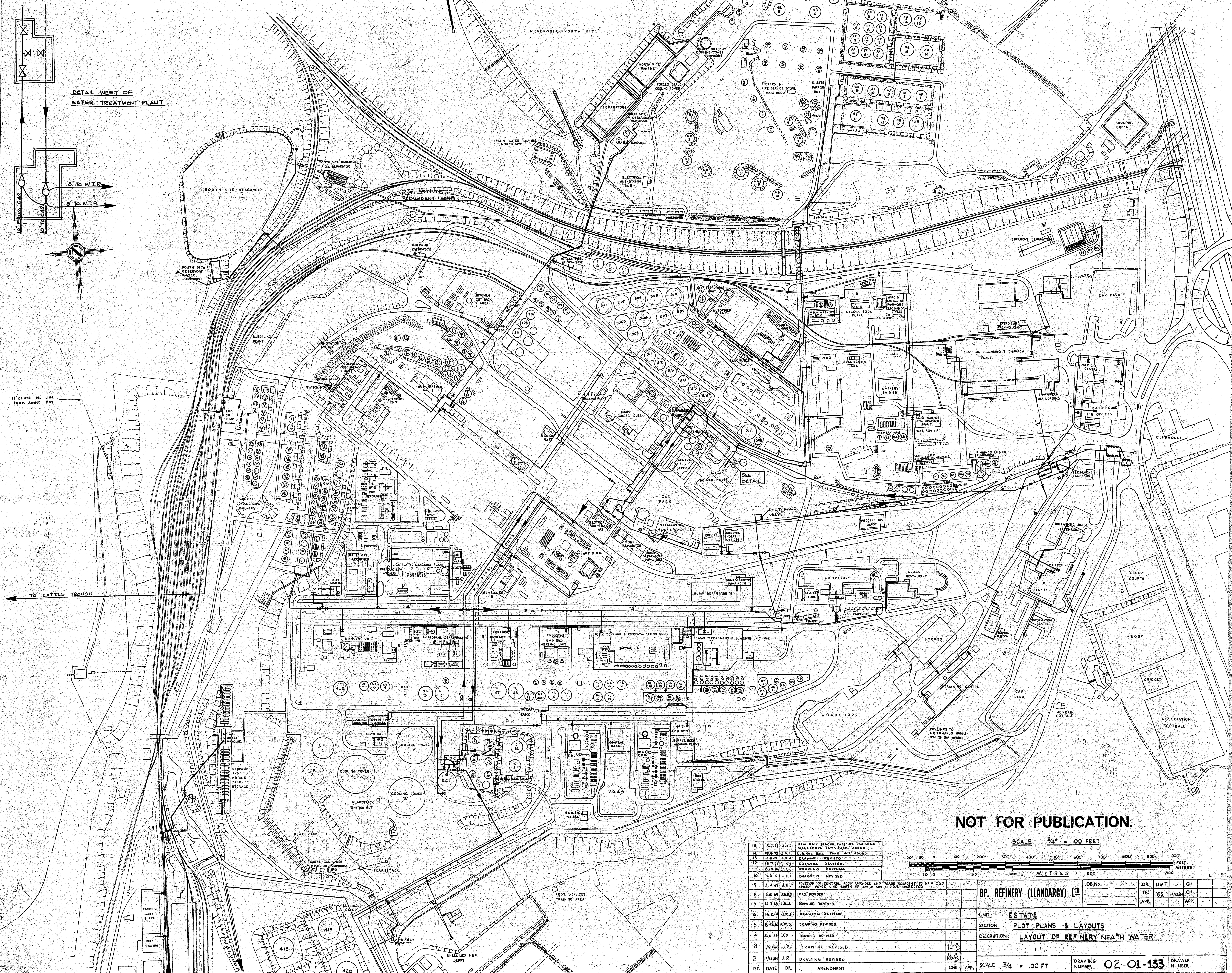
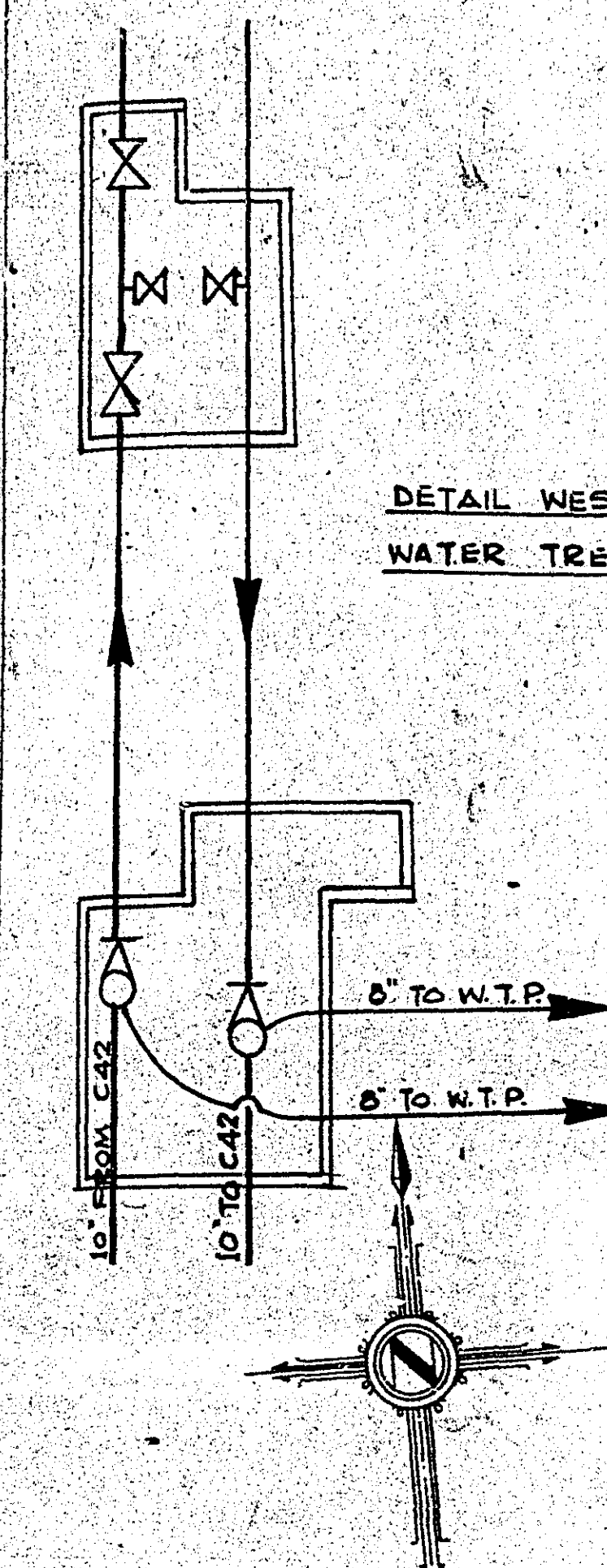
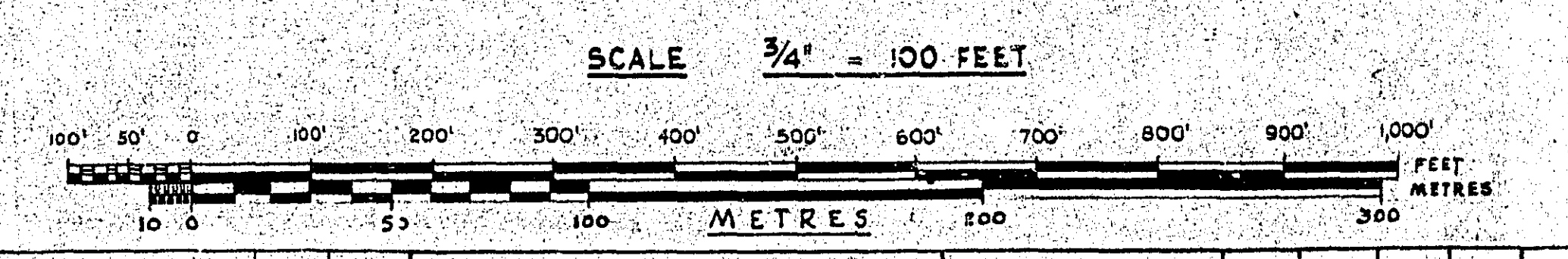




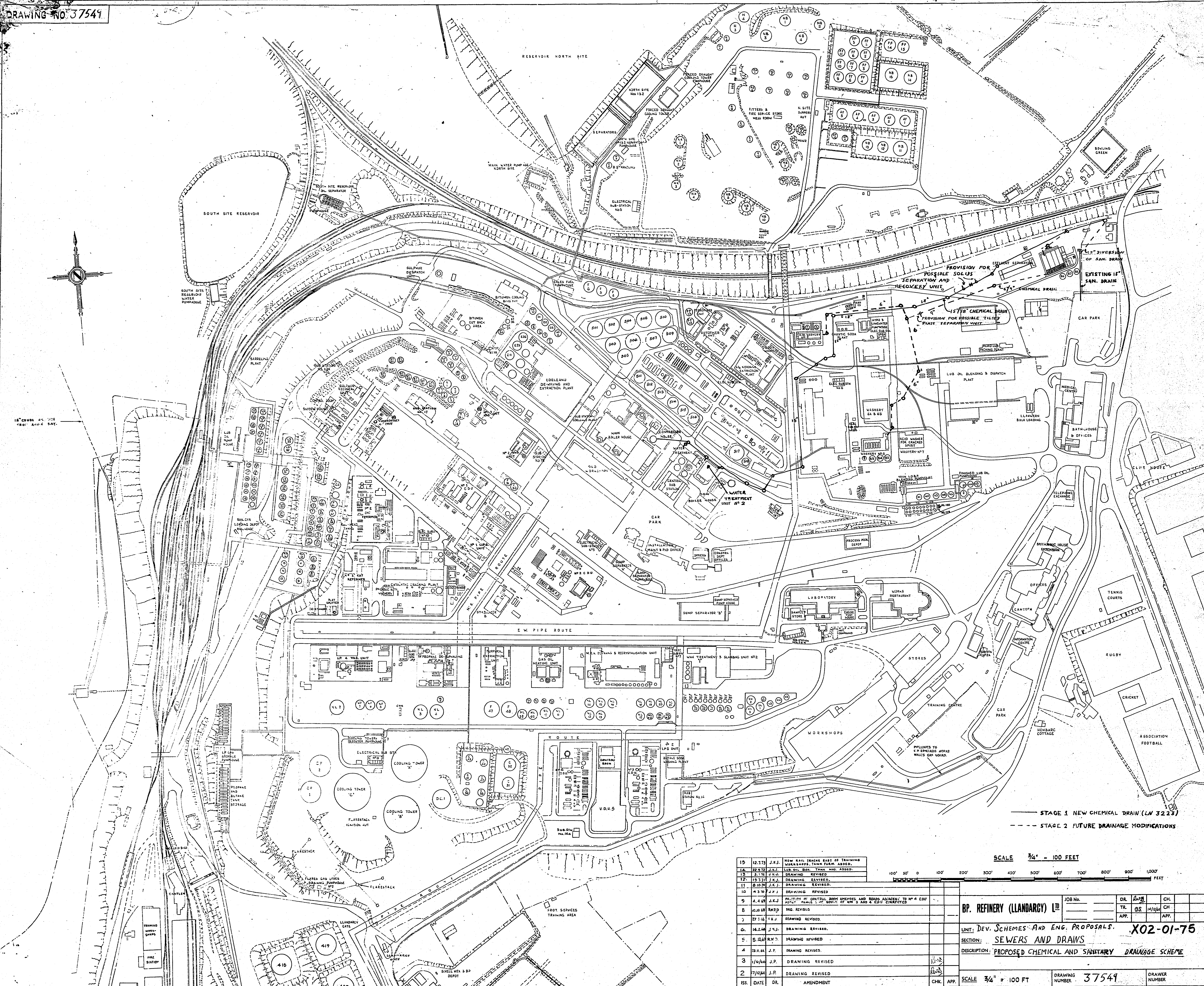
NOT FOR PUBLICATION.



15	3.7.71	J.K.J.	NEW RAIL TRACKS EAST OF TRAINING WORKSHOPS TANK PARK ADDED.
14	22.9.70	J.K.J.	LUB OIL BLNDG. TANK PARK ADDED.
13	3.6.70	J.K.J.	DRAWING REVISED.
12	12.7.71	J.K.J.	DRAWING REVISED.
11	8.10.70	J.K.J.	DRAWING REVISED.
10	24.3.70	J.K.J.	DRAWING REVISED.
9	4.4.69	J.K.J.	REVISION TO CENTRAL ROAD ADDED AND ROAD ADJACENT TO N° 4 COR. ADDED FENCE LINE SOUTH OF N° 3 AND A.C.B. CORRECTED.
8	10.10.68	J.K.J.	DRG. REVISED.
7	21.7.68	J.K.J.	DRAWING REVISED.
6	14.2.68	J.K.J.	DRAWING REVISED.
5	12.12.67	J.K.J.	DRAWING REVISED.
4	23.11.66	J.K.J.	DRAWING REVISED.
3	1/6/64	J.K.J.	DRAWING REVISED.
2	7/12/64	J.K.J.	DRAWING REVISED.
1	DATE	DR.	AMENDMENT

BP. REFINERY (LLANDARCY) LTD		JOB NO.	DR.	H.M.T.	CH.
UNIT: ESTATE			TR.	OS	CH.
SECTION: PLOT PLANS & LAYOUTS			APP.		APP.
DESCRIPTION: LAYOUT OF REFINERY NEATH WATER					
SCALE 3/4" = 100 FT		DRAWING NUMBER	02-01-133		
		DRAWER NUMBER			





— STAGE 1 NEW CHEMICAL DRAIN (LN 3223)
 - - - STAGE 2 FUTURE DRAINAGE MODIFICATIONS

SCALE 3/4" = 100 FEET

100' 50' 0 100' 200' 300' 400' 500' 600' 700' 800' 900' 1000' FEET

15	12.7.73	J.K.J.	NEW RAIL TRACKS EAST OF TRAINING WORKSHOPS, TANK FARM, ADDED.
14	22.9.72	J.K.J.	LUB OIL BKG. TANK HAS ADDED.
13	3.1.72	J.K.J.	DRAWING REVISED.
12	10.7.71	J.K.J.	DRAWING REVISED.
11	8.10.70	J.K.J.	DRAWING REVISED.
10	4.3.70	J.K.J.	DRAWING REVISED.
9	4.4.69	J.K.J.	POSITION OF CONTROL ROOM AMPLIFIED AND ROADS ADJACENT TO NO. 4 CDU ADDED. FENCE L. OF ROAD OF NO. 3 AND 4 CDUs CHANGED.
8	6.10.68	R.M.D.	DWG. REVISED.
7	27.1.68	J.K.J.	DRAWING REVISED.
6	16.2.66	J.K.J.	DRAWING REVISED.
5	5.12.65	R.M.D.	DRAWING REVISED.
4	23.8.64	J.P.	DRAWING REVISED.
3	1/6/64	J.P.	DRAWING REVISED.
2	7/12/64	J.P.	DRAWING REVISED.
155	DATE	DR.	AMENDMENT

BP. REFINERY (LLANDARCY) LTD. JOB No. DR. *Law* CH. TR. OS. *H/19/64* CH. APP. APP.
 UNIT: DEV. SCHEMES AND ENG. PROPOSALS. X02-01-75
 SECTION: SEWERS AND DRAINS
 DESCRIPTION: PROPOSED CHEMICAL AND SANITARY DRAINAGE SCHEME

SCALE 3/4" = 100 FT. DRAWING NUMBER 37549. DRAWER NUMBER

*A E I F TO O RA ICAL
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4. Comparison of RBSLs and RTC

As an objective of these works was to establish whether the RBSLs were health protective, the RBSLs and RTC have been compared. This comparison is presented in the tables in this section of the report. Within the tables within this section, the lower of the RBSL/RTC has been bolded. Therefore where the RBSL has been bolded, it is protective in comparison to the RTC:

- If the RBSL and the RTC are equal, the RBSL is bolded.
- If the RTC is lower than the RBSL, the RTC is bolded ¹⁶.
- If the RBSL is lower than the RTC, the RBSL is bolded.

Where the RTC are greater than the RBSL or the RTC are equal to the RBSL, the values have been marked as final to illustrate that the RBSL is protective. Where the RTC are lower than the RBSL, further site specific modifications could be considered to establish whether the RTC is unnecessarily conservative and these have been marked as draft.

The RBSL should be used in all cases, except where the RTC is bolded. In this event, the relevant RTC should therefore be adopted.

These further site specific modifications have not been considered at the present stage. However, information provided herein could be used to inform such an evaluation.

4.1 Comparison of residential RBSLs and RTC (shallow soil)

The residential RBSLs and RTC for a shallow soil source are compared in Table 4.1 below.

Table 4.1 – Comparison of residential RBSLs and RTC for shallow soil

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	6.40E+01	6.40E+01 a	6.40E+01 a	final
Chromium	1.30E+02	7.80E+01 a	7.80E+01 a	draft
Cadmium	2.60E+00	3.00E+00 b	3.00E+00 b	final
Mercury (inorganic)	1.00E+00	1.00E+00 b	1.00E+00 b	final
Nickel	5.00E+01	7.50E+01 b	7.50E+01 b	final
Selenium	3.00E+00	3.00E+00 b	3.00E+00 b	final
Lead	3.37E+02	3.37E+02 a	3.37E+02 a	final
Vanadium	4.16E+02	1.13E+02	1.15E+02	draft
Copper	4.78E+02	1.43E+02 a	1.43E+02 a	draft
Zinc	2.00E+02	4.78E+02 a	4.78E+02 a	final
Benzo(a)pyrene	9.00E-01	2.11E+00	2.42E+00	final
Benzene	1.20E-01	4.93E-02	1.92E-01	draft
Toluene	3.60E+01	8.69E+01	3.29E+02	final
Ethylbenzene	4.10E+01	3.82E+01	1.93E+02	draft
Xylene	3.20E+01	1.72E+01	1.31E+02	draft

¹⁶ In some cases there may be two RTC, where one RTC is higher and the other lower: one may be bolded and the other not and therefore they remain as draft.

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
TPH aromatic C7-C8	1.25E+02	8.69E+01	3.29E+02	draft
TPH aromatic C8-C10	9.40E+01	1.48E+01	1.03E+02	draft
TPH aromatic C10-C12	1.18E+02	5.73E+01	2.21E+02	draft
TPH aromatic C12-C16	1.31E+02	1.42E+02	4.14E+02	final
TPH aliphatic C6-C8	8.34E+03	6.98E+01	1.69E+04 *	draft
TPH aliphatic C8-C10	1.12E+02	9.76E+00	8.71E+01	draft
TPH aliphatic C10-C12	3.20E+03	1.78E+03 *	4.18E+03 *	draft
TPH aliphatic C12-C16	4.51E+03	5.10E+03 *	5.31E+03 *	final
TPH aromatic C16-C21	8.20E+01	2.72E+02	5.77E+02	final
TPH aromatic C21-C35	1.13E+03	8.88E+02	1.14E+03	draft
TPH aliphatic C16-C21	9.42E+04	1.45E+05	1.45E+05	final
TPH aliphatic C21-C35	9.48E+04			final
Total TPH (Phase 1)	1.72E+03	none (see note 9)		
Total TPH (Process Area)	2.60E+03			
Total TPH (North Tank Farm)	1.10E+03			
Total TPH (South Tank Farm)	1.02E+03			
1,2-Dichloroethane	4.00E-02	1.90E-03	1.02E-02	draft
1,1,1-Trichloroethane	1.54E+02	2.23E+00	1.73E+01	draft
Tetrachloroethene	1.10E+01	4.55E-01	3.62E+00	draft
Trichloroethene	1.00E+00	3.82E-02	3.04E-01	draft
Vinyl chloride	1.00E-02	2.02E-04	8.20E-04	draft
Dichloromethane	5.00E+00	4.58E-01	1.56E+00	draft
Cis-1,2-Dichloroethene	4.00E+00	3.93E-02	2.55E-01	draft
Trans-1,2 Dichloroethene		6.71E-02	4.64E-01	draft
Notes				
1. It is assumed that no visible free product is present within the top 1.0m of soil				
2. Metal RTC derived considering Soil Codes and background data a – based on background soil concentration b – based on Soil Code				
3. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
4. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
* 5. The RTC for TPH aliphatic C10-C12 and TPH aliphatic C12-C16 for 1% sand and TPH aliphatic C6-C8, TPH aliphatic C10-C12 and TPH aliphatic C12-C16 for 3% sandy loam are based on a value produced from following the approach outlined in SR4 for substances at saturation				
6. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 4 mg/kg				
7. 'Total' TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
8. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
9. No RTC was produced for total TPH as this will be considered further at validation stage				
10. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.2 Comparison of residential RBSLs and RTC (deep soil)

The residential RBSLs and RTC for a deep soil source are compared in Table 4.2 below.

Table 4.2 – Comparison of residential RBSLs and RTC for deep soil (1m FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
Benzo(a)pyrene	none	>sat	>sat	final
Benzene	4.00E-01	4.60E-01	9.87E-01	final
Toluene	5.20E+01	>sat	>sat	final
Ethylbenzene	1.40E+02	2.90E+02	8.12E+02	final
Xylene	5.80E+01	9.14E+01	2.56E+02	final
TPH aromatic C7-C8	1.46E+02	>sat	>sat	final
TPH aromatic C8-C10	2.57E+02	7.10E+01	2.09E+02	draft
TPH aromatic C10-C12	1.39E+03	>sat	>sat	final
TPH aromatic C12-C16	none	>sat	>sat	final
TPH aliphatic C6-C8	none	>sat	>sat	final
TPH aliphatic C8-C10	1.58E+02	4.25E+01	1.25E+02	draft
TPH aliphatic C10-C12	none	>sat	>sat	final
TPH aliphatic C12-C16	none	>sat	>sat	final
TPH aliphatic C16-C21	none	none (see note 3)		
TPH aliphatic C21-C35	none			
TPH aromatic C16-C21	none			
TPH aromatic C21-C35	none			
Total TPH (Phase 1)	9.18E+03	none (see note 9)		
Total TPH (Process Area)	4.10E+03			
Total TPH (North Tank Farm)	3.80E+03			
Total TPH (South Tank Farm)	2.79E+03			
1,2-Dichloroethane	1.00E-01	1.11E-02	1.76E-02	draft
1,1,1-Trichloroethane	1.60E+02	1.08E+01	2.59E+01	draft
Tetrachloroethene	3.40E+01	2.30E+00	6.12E+00	draft
Trichloroethene	2.00E+00	1.88E-01	4.63E-01	draft

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
Vinyl chloride	4.00E-02	9.30E-04	1.29E-03	draft
Dichloromethane	8.40E+01	4.19E+00	6.04E+00	draft
Cis-1,2-Dichloroethene	7.00E+00	2.06E-01	3.92E-01	draft
Trans-1,2 Dichloroethene		3.32E-01	6.89E-01	draft
Notes				
1. Where the lower of the vapour or aqueous saturation limits have been exceeded by the RTC calculated, the hazard quotient is considered to be less than 1 and as such >sat has been presented				
2. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
3. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered and therefore no RTC value has been presented here				
4. “none” indicates theoretical RBSL greater than solubility limit				
5. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 7 mg/kg				
6. ‘Total’ TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
7. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
8. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
9. No RTC was produced for total TPH as this will be considered further at validation stage				
10. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.3 Comparison of residential RBSLs and RTC (groundwater)

The residential RBSLs and RTC for a groundwater source are compared in Table 4.3 below.

Table 4.3 – Comparison of residential RBSLs and RTC for groundwater (1m FFL)

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Benzo(a)pyrene	none	>sat	final
Benzene	7.00E-01	8.88E-02	draft
Toluene	4.70E+01	9.64E+01	final
Ethylbenzene	1.02E+02	1.34E+01	draft
Xylene	4.30E+01	4.10E+00	draft
TPH aromatic C7-C8	2.00E+01	9.64E+01	final
TPH aromatic C8-C10	2.20E+01	9.85E-01	draft
TPH aromatic C10-C12	none	3.87E+00	draft
TPH aromatic C12-C16	none	>sat	final
TPH aromatic C16-C21	none	none (see note 6)	final
TPH aromatic C21-C35	none		final
TPH aliphatic C6-C8	none	1.40E+00	draft

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
TPH aliphatic C8-C10	none	2.96E-02	draft
TPH aliphatic C10-C12	none	2.28E-02	draft
TPH aliphatic C12-C16	none	>sat	final
TPH aliphatic C16-C21	none	none (see note 6)	final
TPH aliphatic C21-C35	none		final
1,2-Dichloroethane	2.00E-01	3.73E-02	draft
1,1,1-Trichloroethane	1.93E+02	1.31E+01	draft
Tetrachloroethene	2.20E+01	1.66E+00	draft
Trichloroethene	2.60E+00	2.22E-01	draft
Vinyl chloride	6.00E-02	2.48E-03	draft
Dichloromethane	1.50E+02	1.30E+01	draft
Cis-1,2 Dichloroethene	1.50E+01	5.47E-01	draft
Trans-1,2 Dichloroethene	1.50E+01	6.75E-01	draft
Notes			
1. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation			
2. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins			
3. "none" indicates theoretical RBSL greater than solubility limit			
4. In the S106 (Ref. 1), only one value was presented for 1,2-Dichloroethene of 15 mg/l.			
5. Where indoor and outdoor values were presented by RBCA, these have been integrated in line with SNIFFER (2003). Where both indoor and outdoor values derived by RBCA were greater than the saturation limit, >sat has been presented. Where indoor values were presented by RBCA, and the outdoor values were >sat, only the indoor values have been presented. Therefore >sat indicates that the theoretical RTC is greater than solubility limit.			
6. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered			
7. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report			

4.4 Comparison of recreational RBSLs and parks RTC (shallow soil)

The residential RBSLs and RTC for a shallow soil source are compared in Table 4.4 below.

Table 4.4 – Comparison of recreational RBSLs and RTC for shallow soil

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	6.40E+01	6.40E+01 a	6.40E+01 a	final
Chromium	2.00E+02	7.80E+01 a	7.80E+01 a	draft
Cadmium	2.60E+00	3.00E+00 b	3.00E+00 b	final
Mercury (inorganic)	1.00E+00	1.00E+00 b	1.00E+00 b	final
Nickel	7.50E+01	7.50E+01 b	7.50E+01 b	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Selenium	3.00E+00	3.00E+00 b	3.00E+00 b	final
Lead	3.37E+02	3.37E+02 a	3.37E+02 a	final
Vanadium	6.40E+02	3.51E+02	3.51E+02	draft
Copper	4.78E+02	1.43E+02 a	1.43E+02 a	draft
Zinc	2.00E+02	4.78E+02 a	4.78E+02 a	final
Benzo(a)pyrene	9.00E-01	2.14E+00	2.14E+00	final
Benzene	1.30E+01	2.62E+01	2.75E+01	final
Toluene	8.11E+03	2.16E+04 *	2.14E+04 *	final
Ethylbenzene	4.74E+03	9.67E+03 *	9.45E+03 *	final
Xylene	7.94E+03	1.72E+04 *	1.50E+04 *	final
TPH aromatic C7-C8	2.13E+04	2.16E+04	2.14E+04	final
TPH aromatic C8-C10	4.03E+03	2.23E+03	2.31E+03	draft
TPH aromatic C10-C12	4.59E+03	2.30E+03	2.34E+03	draft
TPH aromatic C12-C16	4.80E+03	2.33E+03	2.35E+03	draft
TPH aliphatic C6-C8	6.06E+05	2.94E+05 *	2.94E+05 *	draft
TPH aliphatic C8-C10	1.21E+04	5.88E+03 *	5.74E+03 *	draft
TPH aliphatic C10-C12	1.21E+04	5.70E+03	5.83E+03	draft
TPH aliphatic C12-C16	1.21E+04	5.80E+03	5.86E+03	draft
TPH aromatic C16-C21	3.64E+03	1.45E+03	1.45E+03	draft
TPH aromatic C21-C35	3.64E+03	1.45E+03	1.45E+03	draft
TPH aliphatic C16-C35	2.43E+05	1.59E+05	1.59E+05	draft
TPH aliphatic C21-C35	2.43E+05			draft
Total TPH (Phase 1)	9.06E+03	none (see note 10)		
Total TPH (Process Area)	1.08E+04			
Total TPH (North Tank Farm)	9.42E+03			
Total TPH (South Tank Farm)	6.35E+03			
1,2-Dichloroethane	4.50E+00	9.52E+00	1.07E+01	final
1,1,1-Trichloroethane	2.79E+04	5.80E+04 *	5.80E+04 *	final
Tetrachloroethene	6.41E+02	1.29E+03 *	1.29E+03 *	final
Trichloroethene	1.93E+02	3.79E+02	4.55E+02	final
Vinyl chloride	7.00E-01	1.29E+00	1.33E+00	final
Dichloromethane	2.41E+02	5.07E+02	5.12E+02	final
Cis-1,2-Dichloroethene	6.32E+02	3.92E+02	4.68E+02	draft
Trans-1,2 Dichloroethene	6.32E+02	1.11E+03	1.40E+03	final
Notes				
1. It is assumed that no visible free product is present within the top 1.0m of soil				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
2. Metal RTC derived considering Soil Codes and background data a – based on background soil concentration b – based on Soil Code				
3. Xylene - the lowest RTC of the three isomers has been presented. Users must consider total exposure from all xylene isomers and not consider them in isolation				
4. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
* 5. The RTC for toluene, ethylbenzene, xylene, TPH aliphatic C6-C8, TPH aliphatic C8-C10, 1,1,1-trichloroethane and tetrachloroethene are based on a value produced from following the approach outlined in SR4 for substances at saturation				
6. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered				
7. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 632 mg/kg				
8. 'Total' TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
9. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
10. No RTC was produced for total TPH as this will be considered further at validation stage				
11. Asbestos has not been considered here as it is being considered in a separate report				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

4.5 Comparison of recreational RBSLs and parks RTC (deep soil)

The residential RBSLs and RTC for a deep soil source are compared in Table 4.5 below.

Table 4.5 – Comparison of recreational RBSLs and RTC for deep soil (1m FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Benzo(a)pyrene	none	>sat	>sat	final
Benzene	4.80E+01	4.32E+02	9.28E+02	final
Toluene	none	>sat	>sat	final
Ethylbenzene	none	>sat	>sat	final
Xylene	none	4.78E+02	1.33E+03	draft
TPH aromatic C7-C8	none	>sat	>sat	final
TPH aromatic C8-C10	none	>sat	>sat	final
TPH aromatic C10-C12	none	>sat	>sat	final
TPH aromatic C12-C16	none	>sat	>sat	final
TPH aliphatic C6-C8	none	>sat	>sat	final
TPH aliphatic C8-C10	none	>sat	>sat	final
TPH aliphatic C10-C12	none	>sat	>sat	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
TPH aliphatic C12-C16	none	>sat	>sat	final
TPH aromatic C16-C21	none	none (see note 4)		
TPH aromatic C21-C35	none			
TPH aliphatic C16-C21	none			
TPH aliphatic C21-C35	none			
Total TPH (Phase 1)	none	none (see note 8)		
Total TPH (Process Area)	none			
Total TPH (North Tank Farm)	none			
Total TPH (South Tank Farm)	none			
1,2-Dichloroethane	6.00E+00	1.04E+02	1.66E+02	final
1,1,1-Trichloroethane	none	>sat	>sat	final
Tetrachloroethene	1.78E+03	>sat	>sat	final
Trichloroethene	2.69E+02	>sat	>sat	final
Vinyl chloride	1.60E+01	8.21E+00	1.14E+01	draft
Dichloromethane	6.22E+03	>sat	>sat	final
Cis-1,2-Dichloroethene	8.81E+02	1.92E+03	3.66E+03	final
Trans-1,2 Dichloroethene		3.10E+03	6.42E+03	final
Notes				
1. Where the lower of the vapour or aqueous saturation limits has been exceeded by the RTC calculated, the hazard quotient is considered to be less than 1 and as such >sat has been presented				
2. Xylene - Users must consider total exposure from all xylene isomers and not consider them in isolation. It should be noted that the value presented is the lowest of the aqueous or vapour saturation limits. The lowest saturation limit of the three isomers has been presented.				
3. TPH aromatic C7-C8 is considered to comprise toluene only by Atkins				
4. TPH >C16 are not considered to be volatile according to TPHCWG. Consequently the inhalation of vapour pathways have not been considered and therefore no value has been presented here				
5. “none” indicates theoretical RBSL greater than solubility limit				
6. ‘Total’ TPH RBSL derived for an area of development, based on individual RBSL and available mass fraction TPH data in soil at time of derivation, using the inverse weighted average approach.				
7. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
8. No RTC was produced for total TPH as this will be considered further at validation stage				
9. Asbestos has not been considered here as it is being considered in a separate report				
10. In the S106, only one value was presented for 1,2-dichloroethene of 881 mg/kg				
11. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				

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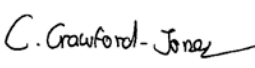
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Scope

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 33 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 have been notified to the Monitor by letter, a copy of which is provided in **Appendi A**.

The phase boundary for Phase 33 is the land edged red on drawing 5041216-REM-DWG-1935, a copy of which is provided in **Appendi A**. The approximate location of Phase 33 in relation to the Development Boundary is shown in **Figure** below. Phase 33 covers an area of approximately 20,600m².

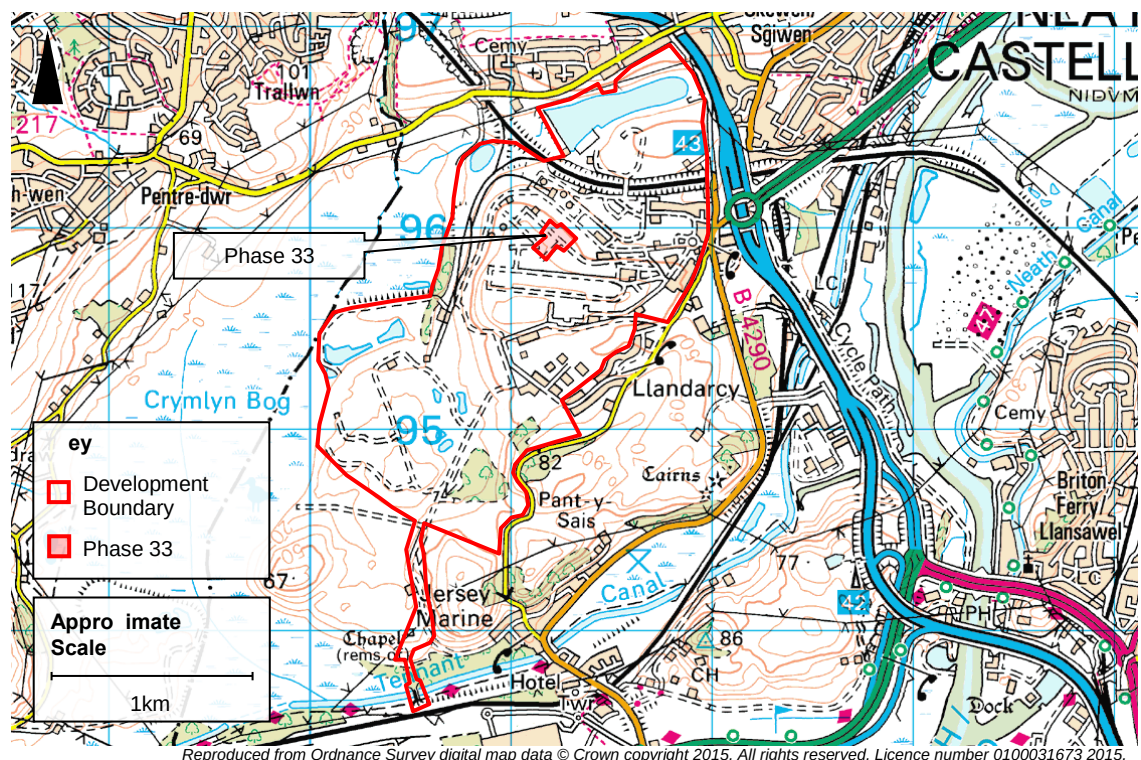


Figure Location plan

The intended use for Phase 33 has been declared as a primary school with associated playing fields. Reference should be made to the Glancy Nicholls Architects drawing no. 10029/A101 dated November 2014 which illustrates the proposed layout. A copy of the drawing is

provided in **Appendi A**. Reference should also be made to the current masterplan drawing reference 1332/400/MP/SK/TERT Revision H which shows the wider development proposals. A copy of the masterplan drawing is also provided in **Appendi A**.

It should be noted that the Section 106 Agreement does not specify remediation requirements for schools. Given this, bespoke remediation requirements have been developed specifically for schools as well as associated playing fields, details of which are provided in Atkins' report ref. 5041216- REM-RPT-1275 rev. 1 dated January 2015, a copy of which is included in the information sources presented in **Appendi C**. The Monitor and NPTCBC have confirmed their acceptance of these criteria, which therefore form the basis against which this certificate has been prepared.

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

- Describe the remedial action which in the Monitor's professional opinion has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 33; and
- Certify that in the Monitor's professional opinion the Redevelopment Remediation Works have been satisfactorily completed for Phase 33 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 is provided in **Appendi B**.

Bac ground

Objectives of the Redevelopment Remediation Works

Part One of Schedule 8 of the Section 106 Agreement 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 the Phase. 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 Risk Based Screening Levels (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 and 3 from Schedule 8 of the Section 106 Agreement are reproduced below for reference. Table 4 has been replaced with an updated table developed by Atkins specifically for schools and associated playing fields as presented in Atkins' report ref. 5041216- REM-RPT-1275 rev. 1. The remediation requirements that Atkins has developed for schools and playing fields is based on a combination of the various requirements specified in the Section 106 Agreement, hence Tables 1, 2 and 3 remain applicable to Phase 33.

Table Summary of Soil RBSLs

<i>Contaminant</i>	<i>Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg)¹</i>			<i>Land-Use Specific RBSL Soil below 1m depth (mg/kg)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
<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
Total TPH (Phase 1) ³	1717	81413	9061	9182	81956	None
Total TPH (Process Area) ³	2601	44344	10830	4098	35014	None

<i>Contaminant</i>	<i>Land-Use Specific Soil RBSL Surface to 1m below FFL (mg/kg)¹</i>			<i>Land-Use Specific RBSL Soil below 1m depth (mg/kg)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
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

<i>Contaminant</i>	<i>Land-Use Specific RBSL (mg/l)</i>		
	<i>Residential</i>	<i>Commercial</i>	<i>Recreational</i>
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

Land-Use Specific RBSL (mg/l)

Contaminant	Residential	Commercial	Recreational
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 discernible in ambient air
5	Visible hydrocarbon product	Overwhelming Odour

otes

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

<i>Testing for the Validation Suite at the following frequency:</i>	<i>Deeper Soils (Schools and Playing Fields >1m below FFL)</i>
Imported soil from verified greenfield site	1 per 500m ³ ex situ, composite of 5 regular sub-samples
Imported soil from brownfield site ¹	1 per 100m ³ ex situ, composite of 5 sub-samples
0.5-1m below FFL in-situ	Regular grid of 1 per 100m ² , sample over 1m depth
>1m below FFL in-situ in building areas	Regular grid of 1 per 200m ² , sample over 1m depth
>1m below FFL in-situ in open space areas	Regular grid of 1 per 400m ² , sample over 1m depth
Face of remedial excavations <1m deep	n/a
Face of remedial excavations >1m deep	1 per 10m ² , minimum of 1 per face, worst case VO sample
Along redundant service excavations	1 per 20m of trench, worst case VO sample
Stockpiled excavated site materials for re-use	1 per 100m ³ ex situ, composite of 5 sub-samples
Soil treated ex-situ and homogenised	1 per 200m ³ , composite of 5 regular sub-samples

Notes

"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 Target Concentrations (RTC)

It should be noted that in addition to the RBSLs specified in the Section 106 Agreement (as listed in **Tables** and above), Atkins has also developed Remediation Target Concentrations (RTCs). The RTCs are intended to be health protective and it has been agreed previously with NPTCBC that where the RTCs are numerically lower than the RBSLs, the RTCs shall be used. A summary of the RBSLs and RTCs for schools and playing fields is presented Atkins' report ref. 5041216- REM-RPT-1275 revision 1, dated January 2015, a copy of which is included in the information sources presented in **Appendix C**.

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/BRRP00078/Cert 33a.

Information Sources

A summary of the information sources that the Monitor has been provided with in relation to Phase 33 is provided in **Table** . Unless otherwise stated, the Monitor has relied solely on these information sources as the basis for issuing this RRWCC. Upon a review of the information sources, in the Monitor's 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 the Monitor unless noted in the following sections.

Electronic copies of the information sources are provided in **Appendi C**.

Table Information Sources

<i>Ref.</i>	<i>Document Reference</i>	<i>Format</i>	<i>Title</i>	<i>Author</i>	<i>Date</i>
1	39991-044-785-FR1287	Report	Whole Site Investigation BP Llandarcy Refinery	URS	August 2005
2	44382742/BRRP0001	Report	BP Llandarcy Refinery Desk Study	URS	July 2007
3	5041216-REM-RPT-000216	Report	Derivation of Remediation Target Criteria (Revision 3)	Atkins	January 2010
4	5041216-REM-RPT-1275	Report	Redevelopment Requirements: Proposed Schools (Revision 1)	Atkins	January 2015
5	5041216-REM-RPT-1455	Report	Derivation of Soil Remediation Target Criteria for Newly Identified Volatile Organic Compounds	Atkins	September 2015
6	5041216-OSW-TN-1485	Technical Note	Response to Monitor Comments RFI148	Atkins	October 2015
7	5041216-REM-RPT-0001393	Report	Monitor Phase 33 Validation Report (Revision 1)	Atkins	October 2015

Requests for Information RFIs Issued by the Monitor

The Monitor has raised two RFIs in relation to Phase 33, as summarised in **Table 10**. Copies of the RFIs are provided in **Appendix B**. Copies of the responses received are included in the information sources provided in **Appendix C**.

Table 10 RFIs

<i>RFI Ref.</i>	<i>Title</i>	<i>Associated Atkins Document</i>	<i>Date Raised</i>	<i>Complete</i>	<i>Comments</i>
148	Review of Atkins' Validation Report for Phase 33	Monitor Phase 33 Validation Report	April 2015	Yes	Response to RFI and updated validation report received Oct 2015
158	Review of Atkins' Report 5041216-REM-RPT-1455 "Derivation of Soil Remediation Target Criteria for Newly Identified Volatile Organic Compounds"	Derivation of Soil Remediation Target Criteria for Newly Identified Volatile Organic Compounds	November 2015	Yes	No formal response received.

DESCRIPTION OF THE REMEDIAL ACTION

The following section provides a description of the remedial action that has been carried out for the purposes of completing the Redevelopment Remediation Works in relation to Phase 33. 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

From the information presented in Atkins' validation report (Information Source 7) it is evident that Atkins has reviewed the findings of previous site investigations and desk studies to develop an understanding of both potential and actual contamination within Phase 33. The following is of note:

Phase 33 is located in the central part of the former refinery. With reference to the historical maps provided in **Appendix E** it can be seen that the following infrastructure was situated within and around Phase 33:

- No.1 LPG Unit and Stabiliser,
- No.2 Crude Distillation Unit (CDU) and associated stack in the south of Phase 33;
- Workshops associated with boiler house maintenance in the north of Phase 33;
- Lime water washeries in the west of Phase 33;
- A small electrical substation in the northwest of Phase 33.

With regards geology, Atkins reports that the British Geological Survey Sheet for Swansea (Sheet 247) Drift Edition indicates that this part of the refinery is underlain Till (Diamicton) heterogeneous glacial deposits overlying Hughes Member (Pennant Sandstones).

With regards hydrogeology, groundwater within Phase 33 is generally situated within the underlying bedrock and flow is considered to be radial, generally towards the southwest. The underlying sandstones are classified as a Secondary A Aquifer, which are defined by the Environment Agency as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers'.

The closest surface water feature to Phase 33 is the South Site Reservoir, which is located approximately 410m north west of the phase. The Crymlyn Bog Site of Special Scientific Interest (SSSI) is located approximately 440m west of Phase 33. The Containment Area Lagoons are approximately 720m to the southwest.

Intrusive Investigations

Historical Site Investigations

URS carried out a number of historical site investigations on behalf of the operator of the former refinery, as reported in URS' site investigation report FR1287 (Information Source 1). These investigations included 17 exploratory holes within Phase 33.

It is reported that visual and olfactory evidence of contamination was observed in 13 of the exploratory holes, ranging from the presence of ash, slag, hydrocarbon staining, sheens on groundwater and slight to very strong hydrocarbon odours. Free product was encountered in five of the exploratory holes.

The available laboratory data from the historical site investigation indicate the presence of heavy-end hydrocarbon contamination. The data have been screened against the RBSL/RTCs and Atkins reports that there was one exceedance against the thresholds for deep soils greater than 1m below FFL in a residential setting. The exceedance was noted for mercury (50mg/kg) at 0.5m below ground level (bgl) in trial pit WSTP139 which was located at the north western edge of the proposed school building. There were no exceedances of the RBSLs for deep soils greater than 1m below FFL in the samples taken from soils within the proposed outdoor spaces.

Atkins reports that historical groundwater sampling data were screened against the relevant RBSL/RTCs and no exceedances were identified.

Asbestos was detected in two soil samples; one for trace crocidolite in trial pit WSTP139 at 0.5m bgl within the school building footprint, and one for trace amosite in borehole WSMW013 in the area of the proposed playing fields.

URS designated two Special Process Areas within Monitor Phase 33 based on increased risks from contamination associated with an electricity substation and the boiler house workshop. It is noted that free product was encountered in one trial pit within the approximately location of the boiler house workshop.

Recent Site Investigations

In addition to the historical site investigations undertaken by URS, Atkins undertook a further site investigation in March 2015. This included the excavation of a further 68 machine excavated trial pits across Phase 33. Details of the site investigation are presented in Atkins' validation report (Information Source 7).

Ground conditions were shown to be consistent with the reported geology discussed above and generally the soils comprised made ground, underlain by glacial soils over sandstone bedrock. The bedrock was encountered as a weathered zone at depths between 1.1m and 4.4m bgl.

Atkins reports that visual and/or olfactory evidence of contamination was observed in 48 of the trial pits up to a maximum of Class 5, as defined in **Table** of this report, indicating the presence of free product.

Atkins reports that laboratory analysis of soil samples recovered from the trial pits indicated seven exceedances of the RBSL/RTCs within the footprint of the proposed school. Six exceedances were for Aliphatic range C8-C10 and one was for mercury. The greatest concentration of the Aliphatic range C8-C10 was encountered at 0.5m bgl in trial pit IP4076. The mercury exceedance was noted at 0.5m bgl in trial pit IP4085.

Atkins reports that there were no exceedances against the RBSL/RTCs for deep soils within the proposed outdoor spaces.

Atkins reports one notable groundwater strike within trial pit IP4129 which was reported as a fast ingress with hydrocarbon sheen on the surface. However this was considered to represent localised perched groundwater rather than true groundwater which it is assumed lies within the deeper bedrock. No further groundwater monitoring information is presented by Atkins.

Atkins states that suspected asbestos fibres were identified in nine soils samples recovered from the footprint of the proposed school building and in 15 soil samples recovered from the proposed outdoor spaces. Atkins reports that all of these samples underwent quantitative analysis which indicated six exceedances against the RBSL/RTCs, with a maximum concentration of 0.213%.

Remediation Strategy

Schedule 8 of the Section 106 Agreement sets out the minimum remedial action required depending on the intended use. However, as discussed in Section 1.1 of this report, the Section 106 Agreement does not specify remediation requirements for schools.

Atkins has therefore developed remediation criteria specifically in relation to schools and associated playing fields, details of which are provided in Atkins' report ref. 5041216- REM-RPT-1275 rev. 1 dated January 2015 (Information Source 4). The minimum requirements are as follows:

- All significant areas of oil-saturated soils and free product should be removed;
- All soils must be remediated so as to meet the adopted thresholds for residential (shallow) end use beneath the surface to 1m below FFL;

- Beneath proposed buildings, all soils must be remediated so as to meet the adopted thresholds for residential (deep) end use at depths >1m below FFL;
- Recreational (>1m below FFL) criteria will be adopted for soils at depth (>1m below FFL) within open space areas (including playing fields and proposed hardstanding etc). Where these lie immediately adjacent to proposed buildings, a suitable stand-off will be adopted utilising the residential criteria.
- The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.
- The aesthetic quality of soils shall be Class 2 or better at depths of between 1 – 2m below FFL and Class 4 or better at depths >2m beneath FFL.
- Where encountered near surface, groundwater will be assessed in line with the thresholds presented in Appendix E (of Atkins' report ref. 5041216- REM-RPT-1275) in line with the residential and recreational splits indicated above.
- 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.

In addition to the minimum remedial action requirements outlined above, Schedule 10 of the Section 106 Agreement states that:

- 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.
- 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.
- 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** .

Redevelopment Remediation or s

The redevelopment remediation works that have been completed for Phase 33 are described in Atkins' validation report (Information Source 7) and can be summarised as follows:

- Further investigation in locations where elevated visual/olfactory observations had been identified during the site investigations;
- Further investigation in locations where free product had been identified;
- Removal of unsuitable soils where RBSL/RTC exceedances had been identified;

- Removal of asbestos identified in the soil;
- Removal of buried services; and
- Reclamation of buried structures to provide the development profile.

Atkins reports that 30,675m³ of soils were removed from Phase 33 and that 39,338m³ of fill will be required to achieve the indicative FFLs. This material is yet to be placed.

The Monitor attended site to observe the works and was generally satisfied that the works were being carried out appropriately and that the requirements of the Section 106 Agreement were likely to be achieved.

It should be noted that the remediation works that have been carried out were focused on addressing specific areas of concern that had been identified in the site investigations, rather than a more general turnover of soils as has been seen on a number of previous Phases elsewhere on the site. Whereas these previous Phases involved a general turnover of soils, allowing a more comprehensive inspection of the soils and increased confidence over the presence of contamination, the trial pit based approach adopted on this Phase means there is an inherent risk that contamination may have been missed. Nevertheless, the testing frequencies specified in the Section 106 Agreement are relatively conservative and furthermore the Section 106 Agreement does not specify the exact manner in which the works should be undertaken, so the Developer has not contravened any requirements in this respect. The Monitor is therefore satisfied that the works have been undertaken in accordance with the requirements of the Section 106 Agreement.

Validation

With reference to the remediation requirements discussed in Section 2.2 of this report, the following sections aim to demonstrate whether or not the minimum requirements have been achieved.

It should be noted that Atkins' validation report (Information Source 7) states that the current ground levels following the completion of the redevelopment remediation works represents FFL minus 1 to 2m. A topographical record of the ground levels upon which this certificate is based is shown on drawing 5041216-ATK-DR-C-REM-DWG-2100 Rev P1 a copy of which is provided in **Appendix F**.

Atkins has also prepared an isopachyte drawing 5041216-ATK-DR-C-REM-DWG-2218 Rev P1 a copy of which is also provided in **Appendix F**, which is reported to compare the current ground levels following the completion of the remediation works to the proposed FFLs (it is noted that the drawing title indicates that the drawing compares levels at the base of remediation excavation to the proposed FFLs but Atkins has indicated this is not correct). The isopachyte drawing indicates that the current ground levels range from FFL minus 3.66m to FFL plus 0.69m. On average the current ground levels are FFL minus 1.47m.

Given the variability of the ground levels, in order to ensure a consistent approach this certificate has been prepared on the assumption that the existing ground levels represent FFL minus 1m. However it should be noted that based on the ground levels presented in the isopachyte drawing discussed above, it will be necessary to remove some soils to achieve FFL. Furthermore, in locations where the current ground levels are greater than FFL minus 1m, it will be necessary to either remove the soils down to FFL minus 1m and replace with acceptable soils, or otherwise validate the existing soils to ensure they meet the necessary quality requirements for soils in the top 1m.

Aesthetic Criteria

The remediation requirements for schools and playing fields, as described in Section 2.2 of this report, requires that the aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL, Class 2 or better at depths 1m and 2m below FFL and Class 4 or better at depths greater than 2m beneath FFL. The aesthetic criteria are defined in **Table** of this report.

Given that the ground levels upon which this certificate are based generally represent FFL minus 1m, the top 1m of soils are yet to be placed and therefore the aesthetic criteria that are applicable to the remaining soils within Phase 33 are: the soils within the top 1m bgl shall be Class 2 or better; and soils below 1m bgl shall be Class 4 or better.

Atkins reports that during the site investigation soils were logged in accordance with the specified aesthetic criteria. Soils achieving an aesthetic classification of greater than 2 at depths down to 1m bgl; or greater than 4 at depths below than 1m bgl were considered unsuitable.

As discussed in Section 2.1.2.2 of this report, visual and/or olfactory evidence of contamination was observed in 48 trial pits up to a maximum of Class 5, indicating the presence of free product. Atkins reports that these observations were screened against the depth-specific aesthetic requirements discussed above, and this identified eight locations where the depth-specific criteria had been exceeded. Two of these locations were beneath the footprint of the proposed school building and the remaining six were within the open spaces.

Atkins reports that the area within and immediately adjacent to the footprint of the proposed school building was deemed the most sensitive in terms of exceedances of the aesthetic criteria. Following the works described in Section 2.3 of this report, the area was re-inspected via 22 shallow trial pits between 1 and 1.5m bgl, i.e. from 2 to 2.5m below FFL. Atkins reports that the necessary aesthetic criteria had been achieved.

Further investigation was also undertaken where increased visual/olfactory scores had been recorded in the open spaces. In these locations, soils within the vicinity of the original trial pits were re-excavated, but across a wider area than the original trial pit in order to ensure that representative ground conditions were encountered, rather than the re-worked arisings associated with the original trial pit. The soils were again logged in accordance with the aesthetic criteria and where necessary unsuitable soils were removed.

Atkins reports that following the completion of these works all remaining soils within Phase 33 are considered to be suitable in accordance with the specified aesthetic criteria.

Removal of Oil Saturated Soils

The remediation requirements for schools and playing fields, as described in Section 2.2 of this report, requires that all significant areas of oil saturated soils and soil containing free product shall be removed.

With reference to the aesthetic criteria specified in **Table** of this report, oil saturated soils or soils containing free product are considered to represent visual/olfactory classifications of 5.

Atkins' validation report (Information Source 7) states that works were undertaken to remove the oil saturated soils and free product that had been identified during the site investigations. Given the works that have been undertaken, and the visual/olfactory observations discussed in Section 2.4.1 above, the Monitor is satisfied that oil saturated soils appear to have been removed from Phase 33.

Soil Chemical Quality

The remediation requirements for schools and playing fields, as described in Section 2.2 of this report, requires that all soils must be remediated so as to meet the adopted thresholds for residential (shallow) end use beneath the surface to 1m below FFL. Beneath proposed buildings, all soils must be remediated so as to meet the adopted thresholds for residential (deep) end use at depths greater than 1m below FFL. The recreational criteria (>1m below FFL) will be adopted for soils at depths greater than 1m below FFL within open space areas (including playing fields and proposed hardstanding etc). Where these lie immediately adjacent to proposed buildings, a suitable stand-off will be adopted utilising the residential criteria.

Given that the ground levels upon which this certificate is based generally represent FFL minus 1m, the two criteria that are applicable to Phase 33 are:

- All soils beneath proposed buildings must meet the adopted thresholds for soils in a residential setting greater than 1m below FFL; and
- All soils within open spaces must meet the adopted thresholds for soils in a recreational setting greater than 1m below FFL.

As discussed in Section 1.2.1.1 of this report, the relevant RBSL/RTC thresholds are presented in Atkins' report ref. 5041216- REM-RPT-1275 revision 1, dated January 2015, a copy of which is included in the information sources presented in **Appendi C**.

Atkins reports that 261 soil samples recovered during the site investigation underwent laboratory analysis which indicated a number of RBSL/RTC exceedances. Following these investigations, Atkins reports that further action was considered necessary within the footprint of the proposed building area as well as in the open space areas due to RBSL/RTC exceedances as well as elevated visual/olfactory observations. As discussed in Section 2.3 of this report approximately 30,675m³ of soils were removed from these areas.

Atkins reports that following the removal of these soils, 25 validation samples were collected which underwent laboratory analysis and were found to be acceptable. The depths of the remediation excavations were determined on the basis of a visual/olfactory assessment, with the excavations being terminated on acceptable soils.

In addition to the above, Atkins reports that further investigation of elevated visual/olfactory observations within the southwest corner of Phase 33 around trial pits IP4141, IP4128, IP4129 indicated very strong non-hydrocarbon odours and a 'tarry' texture to the soils. Chemical analysis of soil samples collected from the area indicated the presence of hydrocarbons associated with the former refinery operations as well as a number of other compounds which were measured as tentatively identified compounds (TICS) during analysis. These compounds were 2-methylphenol, 4-methylphenol 2-methylnaphthalene, dimethyl disulphide, methyl ethyl disulphide and diethyl disulphide.

RBSL/RTCs did not exist for these compounds and therefore Atkins derived specific screening criteria as permitted by the Section 106 Agreement. Further details are presented in Atkins' report 5041216-REM-RPT-1455 (Information Source 5). The Monitor and NPTCBC were satisfied that the RTCs specified in the report were appropriate.

Atkins reports that the impacted soils were removed and validation was undertaken on the basis of a visual/olfactory assessment which determined the extent of the remedial excavation, followed by soil sampling and laboratory analysis. Atkins reports that 30 soil samples underwent laboratory analysis and the compounds listed above were not detected. Furthermore there were no exceedances of the RBSL/RTCs for soils greater than 1m below FFL in open space areas.

The Section 106 Agreement also requires that the soils must be tested in accordance with minimum validation testing frequencies. As discussed above, given that there are no specific requirements in relation to schools, Atkins has developed bespoke criteria, including minimum testing frequencies, as set out in Atkins' report ref. 5041216- REM-RPT-1275 rev. 1 dated January 2015 (Information Source 4). This report specifies the following minimum testing frequencies which are relevant to Phase 33 given the scope of works that have been undertaken:

- In situ soils beneath proposed buildings must be tested at a minimum frequency of 1 per 200m²; and
- In situ soils within open spaces must be tested at a minimum frequency of 1 per 400m².

As discussed in Section 2.1.2.2 of this report, a total of 68 trial pits were excavated across Phase 33. Atkins reports that 21 of these trial pits were situated within the footprint of the proposed school building and 47 trial pits were excavated within the proposed open spaces.

The proposed school building occupies an area of approximately 2,600m². The excavation of 21 trial pits equates to a testing frequency of 1 per 124m² which complies with specified the minimum testing frequency of 1 per 200m².

The open spaces occupy an area of approximately 18,000m². The excavation of 47 trial pits equates to a testing frequency of 1 per 383m² which complies with the specified minimum testing frequency of 1 per 400m².

In summary the Monitor is satisfied that the soils within Phase 33 appear to meet the necessary chemical quality requirements and appear to have been tested in accordance with the minimum testing frequencies specified.

It should be noted that if the development layout or proposed FFLs differ significantly from those assumed, or if the intended use should change, then further remediation works may be required.

With regards the validation of shallow soils from FFL to FFL minus 1m, it should be noted that the Monitor will have no formal on-going role to control any subsequent import of material once this RRWCC has been issued. It has therefore been agreed with NPTCBC that such importing of material will need to be controlled by the Local Planning Authority as the Monitor will have no formal on-going role to control once this RRWCC has been issued.

Groundwater Quality

The remediation requirements for schools and playing fields, as described in Section 2.2 of this report, requires that where groundwater is encountered near surface it is to be assessed in line with the defined thresholds.

As discussed in Section 2.1 of this report, groundwater is situated within the underlying bedrock which is deep in comparison to the proposed FFLs. Atkins' validation report (Information Source 7) states that free phase seepages were observed where bedrock was exposed in the southwest corner of Phase 33. As a result, the surface of the bedrock was broken out and a collection trench was excavated to allow monitoring. Observations over a four month period indicated no further seepages of free phase product from the bedrock bedding planes, although a slight hydrocarbon sheen was reported on the groundwater seepages.

Given the depth to FFL it is considered unlikely that groundwater would impact shallow soils in the final development. Furthermore, given the data from historical groundwater sampling data, which did not indicate RBSL/RTCs exceedances, no further assessment groundwater was considered necessary.

The Monitor is satisfied that there does not appear to be a significant risk from shallow groundwater and it is considered unlikely that there would be visible discharge of seepages, sheens or iron staining. Therefore no further control measures are considered necessary in relation to Phase 33.

Asbestos

The remediation requirements for schools and playing fields, as described in Section 2.2 of this report, requires that 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.

Given that the ground profile upon which this certificate is based represents FFL minus 1m, the asbestos requirements are therefore only relevant to the top 1m of soils remaining in situ.

As discussed in Section 2.1.2.2 of the report, suspected asbestos fibres were identified in nine soils samples recovered from the footprint of the proposed school building and in 15 soil samples recovered from the proposed outdoor spaces. Atkins reports that all of these samples underwent quantitative analysis which indicated six exceedances against the RBSL/RTCs. Three of the exceedances were from soils within the footprint of the proposed school building and the other three exceedances were from soils within the proposed open spaces. Atkins reports that all soils were removed where asbestos exceedances had been identified.

Whilst Atkins does not appear to have recovered validation samples after the removal of these soils, the Monitor is satisfied that given the scope of works undertaken which involved a general reduction in ground levels and wholesale removal of soils, then the impacted soils are likely to have been removed to a sufficient depth.

The Monitor is therefore satisfied that the soils within Phase 33 appear to meet the necessary requirements for asbestos.

Removal of Buried Services

The Section 106 Agreement states that irrespective of the intended use, all existing 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. 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.

Atkins' validation report (Information Source 7) states that metal pipework was encountered in two trial pits; IP4084 at a depth of 0.5m bgl and IP4145 at a depth of 1.3m bgl; and a concrete pipe was encountered in trial pit IP4131 at 2.0m bgl. Atkins reports that these pipelines were chased out for their entire length and removed. Impacted soils, if present, were also removed. In addition, the photos presented in Atkins' validation report indicate a number of pipelines within buried concrete structures. These were also broken out and removed.

The Monitor is therefore satisfied that buried services appear to have been removed from Phase 33 in accordance with the requirements of the Section 106 Agreement. However, it should be noted that given the nature of the site investigation which comprised a series of trial pits, rather than a general turn-over of soils, it is possible that other buried services could have been missed and may still be present within Phase 33.

Recontamination of Soils

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.

As discussed above, the top 1m of soils are yet to be placed and furthermore, given that observations indicate groundwater to be within the bedrock at significant depth below the FFL, the risk of recontamination of the top 1m of soils is considered unlikely. In addition, given that free product and oil saturated soils have been removed from within Phase 33, as described in Section 2.4.2 of this report, the recontamination of soils is considered unlikely.

As such, the Monitor is satisfied that the installation of land drains and/or the raising of the site ground levels above those already proposed is not necessary in relation to Phase 33.

Fill to Achieve FFL

The Section 106 Agreement requires that the build-up of the final elevation after completion of the redevelopment remediation works must comprise 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 1 or better for recreational use.

Given that the ground levels upon which this certificate are based generally represent FFL minus 1m, the top 1m of soils, including the top 0.5m of quality controlled imported fill materials, are yet to be placed. As such this requirement is yet to be met for this phase.

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

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

CERTIFICATIO

Redevelopment Remediation or s

The following section aims to confirm whether or not in the Monitor's 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. **Table** provides a list of the minimum remedial action required for a school building with associated playing fields, as described in Section 2.2 of this report, and summarises whether or not each requirement has been satisfied.

Table Certificate Summary

<i>Requirement</i>	<i>Status</i>	<i>Comments</i>
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.
The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL and that the aesthetic quality of soils shall be Class 2 or better at depths of between 1 – 2m below FFL and Class 4 or better at depths >2m beneath FFL.	Complete	Refer to Section 2.4.1 of this report.
All significant areas of oil saturated soils and soil containing free product shall be removed.	Complete	Refer to Section 2.4.2 of this report.
All soils must be remediated so as to meet the adopted thresholds for residential (shallow) end use beneath the surface to 1m below FFL. Beneath proposed buildings, all soils must be remediated so as to meet the adopted thresholds for residential (deep) end use at depths >1m below FFL. The recreational criteria (>1m below FFL) will be adopted for soils at depth (>1m below FFL) within open space areas (including playing fields and proposed hardstanding etc). Where these lie immediately adjacent to proposed buildings, a suitable stand-off will be adopted utilising the residential criteria.	Complete	Refer to Section 2.4.3 of this report.
Where encountered near surface, groundwater will be assessed in line with the defined thresholds.	Complete	Refer to Section 2.4.4 of this report.
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.	Complete	Refer to Section 2.4.5 of this report.

Requirement	Status	Comments
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 2.4.6 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 2.4.7 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.	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.8 of this report.

Preventative Measures

In addition to preparing the RAPWCS and RRWCC, the Monitor 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.

The Monitor has not received any such documentation or requests in relation to Phase 33.

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.

Atkins is yet to undertake a detailed ground gas assessment for Phase 33 but this will be necessary in order to specify appropriate gas and vapour protection measures. Such measures will need to be agreed with the relevant regulatory authorities prior to installation.

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This RRWCC confirms that in the Monitor's professional opinion, and on the basis of the information provided within the information sources as well as observations made on site by the Monitor during the remediation works, the Monitor is satisfied that the Phase 33 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 due regard to the specified intended uses. The Monitor is satisfied 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 by CDL once CDL is satisfied that the remediation necessary for the specified intended uses 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.

Limitations

Should the development layout or proposed FFLs differ significantly from those that have been assumed, or if the intended use should change, then further remediation works may be required.

Atkins' validation report (Information Source 7) upon which this certificate is based states that the current ground levels following the completion of the redevelopment remediation works represents FFL minus 1 to 2m. An isopachyte drawing prepared by Atkins ref. 5041216-ATK-DR-C-REM-DWG-2218 Rev P1, a copy of which is provided in **Appendix F**, which compares the current ground levels to the proposed FFLs indicates that the current ground levels range from FFL minus 3.66m to FFL plus 0.69m. On average the current ground levels are FFL minus 1.47m.

Given the variability of the ground levels, in order to ensure a consistent approach this certificate has been prepared on the assumption that the existing ground levels represent FFL minus 1m. However it should be noted that based on the ground levels presented in the isopachyte drawing discussed above, it will be necessary to remove some soils to achieve FFL. Furthermore, in locations where the current ground levels are greater than FFL minus 1m, it will be necessary to either remove the soils down to FFL minus 1m and replace with acceptable soils, or otherwise validate the existing soils to ensure they meet the necessary quality requirements for soils in the top 1m.

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ST. MODWEN DEVELOPMENTS LIMITED - a ST. MODWEN company

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

25th July 2014

Our ref:

Coed Darcy Limited
Dumfries House
Dumfries Place
Cardiff
CF10 3ZF

Dear Sirs

Coed Darcy
Phase 33 - Proposed School and Playing Fields
Request for Phase Works Completion Date

We hereby give our written request seeking the declaration of the Phase Works Completion Date for Phase 33 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 33 boundary is shown on the attached Drawing No. 5041216-REM-DWG-1935.

The "Intended Use" for Phase 33 is confirmed as that of a primary school and associated playing fields.

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

Yours faithfully

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

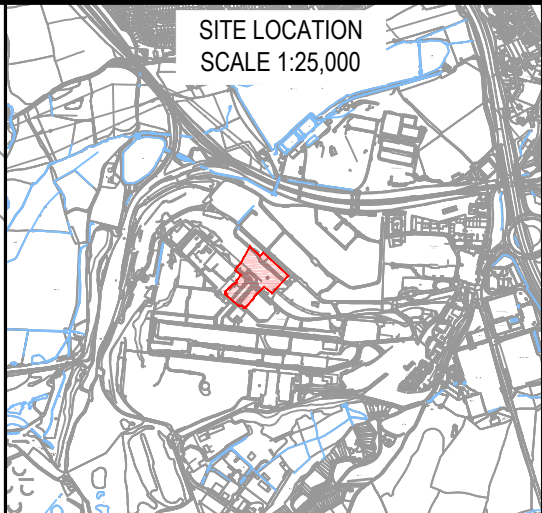
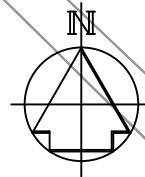
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ATKINS

5041216-REM-DWG-1935



KEY



MONITOR BOUNDARY PHASE 33

REVISIONS

Drawn By

Checked By

Date

PURPOSE OF ISSUE

Rev.

Authorised for issue

Date

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CLIENT



PROJECT

COED DARCY

DRAWING TITLE

MONITOR BOUNDARY PHASE 33

SCALES

1:1000

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JSD

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CO-ORD CHECK

MM

DATE

05.05.15

DATE

05.05.15

DATE

22.05.15

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SHEET

A3

PLOT DATE

27.05.15

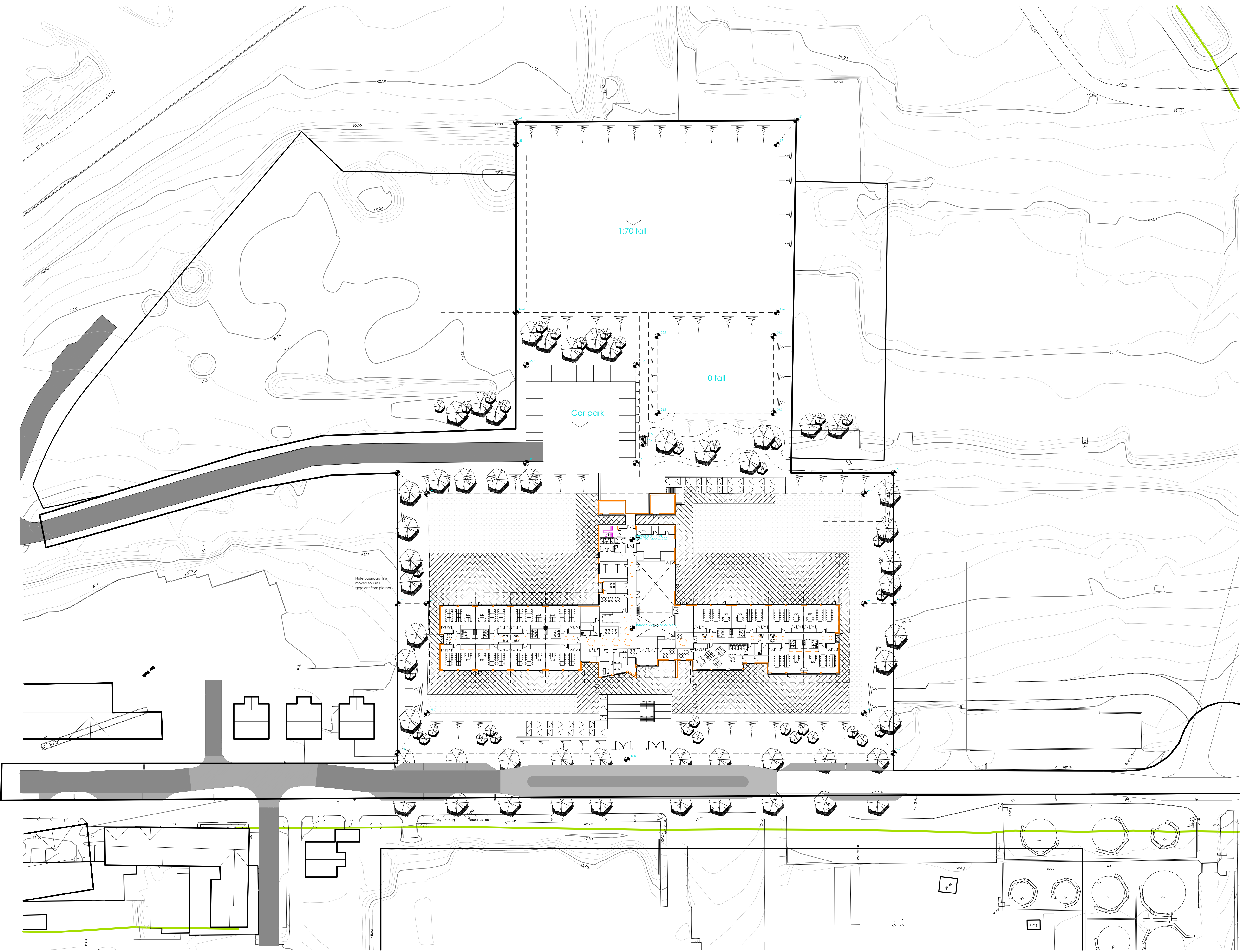
DRAWING NO

5041216-REM-DWG-1935

REV

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This drawing to be read in conjunction with all specifications and all other consultants design information. Any contradictions between this drawing and any other design information to be advised to the contract administrator and author immediately.

The contractor to site measure, check and verify all information issued, and confirm the correctness of the contents prior to the commencement on site.

The contractor to comply with all current statutory legislation, Building Regulations, British Standards, and good building practice.

Do not scale from this drawing.

Revision		Date	Init.
rev	description	date	dr by ap by

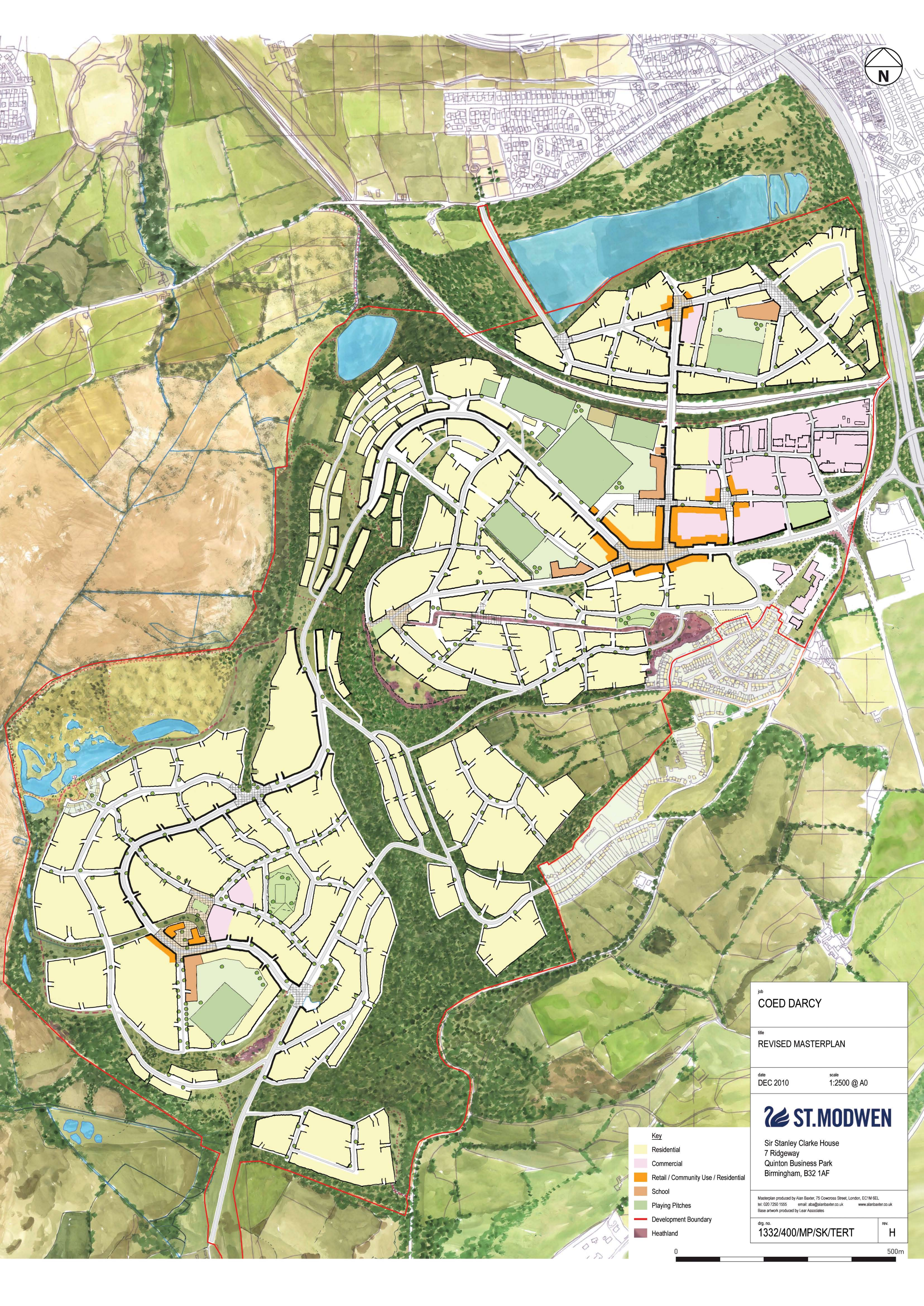
client: St Modwen			
project: Coed Darcy Primary School			
title: Proposed Site Plan			
date: 21.11.2014	scale: 1:500@A1	status: -	
drawn by: BB	job No: 10029	dwg No: A101	rev : ----
checked by: GCJ			
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- Key**
- Residential
 - Commercial
 - Retail / 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	
drp. no. 1332/400/MP/SK/TERT	rev. H

0 500m

***A E I B SC E LE OF T E
SECTION A REE E T***

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 RE ESTS FOR
I FOR ATIO RFI***

Contract Name:	Coed Darcy Monitor	RFI No:
Contract Number:	GNP/NJR/13773-2	Date Raised: 25 June 2015
Subject:	Review of Atkins' Validation Report for Monitor Phase 33	
To:	Michelle Lee	Atkins
Cc:	Mike Poland	Atkins
From:	Rhys Mander	AECOM

Comments

The following queries are raised in relation to Atkins' Validation Report for Monitor Phase 33 (report ref. 5041216-OSW-RPT-0001393):

- Section 3.1.1 - This section states that 20 historical boreholes were undertaken across Phase 33. This does not correlate with the number presented on Drawing 5041216-REM-DWG-1937.
- Section 3.1.2 - MSMW57 is referred to, but not indicated on Drawing 5041216-REM-DWG-1937.
- Section 5.2 - This section states that 257 samples were taken from 68 trial pits, but samples appear to have only been tested from 61 trial pits.
- Section 5.2 - Bedrock is discussed in terms of trial pit IP4077 but this is stated as not to be indicative of the whole site. Please clarify.
- Drawing 5041216-REM-DWG-1978 - This drawing shows two trial pits where pipework was encountered however three trial pits are noted in section 5.2 and on the trial pit logs.
- No MCERTs have been provided within this report.
- It is noted that further remediation works are required in order to satisfy the requirements of the Section 106 Agreement. It should be noted that the RRWCC will only be issued once these works have been completed and appropriately validated.
- The finalised validation report will need to include a topographical record of the ground profile pre-investigation, at the base of the remediation excavation and the finished ground profile.

Date: 25 June 2015

Contract Name: Coed Darcy Monitor RFI No:
Contract Number: GNP/NJR/13773-2 Date Raised: 16 November 2015
Subject: Review of Atkins' Report 5041216/REM/RPT/1455 "Derivation of Soil Remediation Target Criteria for Newly Identified Volatile Organic Compounds"
To: Mike Poland Atkins
From: Rhys Mander Aecom

Comments

The following queries/observations are made in relation to Atkins' Report 5041216/REM/RPT/1455 "Derivation of Soil Remediation Target Criteria for Newly Identified Volatile Organic Compounds":

- The general approach for deriving the RTCs is appropriate and consistent with the requirements of the Section 106 Agreement.
- A reasonable review of toxicological and physico-chemical data sources has been made for three alkyl disulphide contaminants of concern.
- The naphthalene inhalation HCV has been used for the derivation of the 2-methylnaphthalene RTC but without justification other than saying 'it was considered an appropriate alternative'. It would be preferable for the report to provide some information as to why the naphthalene inhalation HCV is considered appropriate (or at least precautionary) for assessing 2-methylnaphthalene.
- Using the toxicology and physchem parameters for 2-methylphenol and 4-methylphenol taken from the published CL:AIRE/EIC GAC document is considered to be reasonable.
- The 'Parks' scenario modelling is consistent with the earlier Atkins reports for the site. Since those reports, Defra has endorsed a public open space 'parks' assessment approach (the C4SL project), which could be considered a more appropriate approach (i.e. more widely peer reviewed). However, the Atkins 'parks' scenario parameters are more precautionary than the C4SL parameters and therefore using the RTCs derived in this report will be more health protective than if the newer C4SL parameters were used.
- The RTCs are for inhalation only exposure pathways and are therefore only suitable for validating soils at depth (>1m) below the development site. This was done since the compounds were originally encountered in deeper soils. The report assumes that it will be unacceptable for these compounds to be present in shallow soil, thus meaning that any detection of the compounds in shallow soil will be unacceptable. It would be useful to have shallow soil RTC for these novel compounds in order to check that the laboratory method detection limit (MDL) is sufficiently low to detect these compounds at acceptable concentrations.

The key comments in the above are that:

1. The report should provide some justification for using naphthalene inhalation toxicity information for the 2-methylnaphthalene assessment; and
2. The lack of shallow soil RTC means that any detection of these compounds in shallow soil will be considered unacceptable (as appears to be acknowledged by the report) and require remediation, or alternatively the developer will have to derive a shallow soil RTC. It would be preferable to derive shallow soil RTC at this stage to confirm that laboratory detection limits for validating shallow soils are adequate for these VOCs.

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A E I E HISTORICAL A S