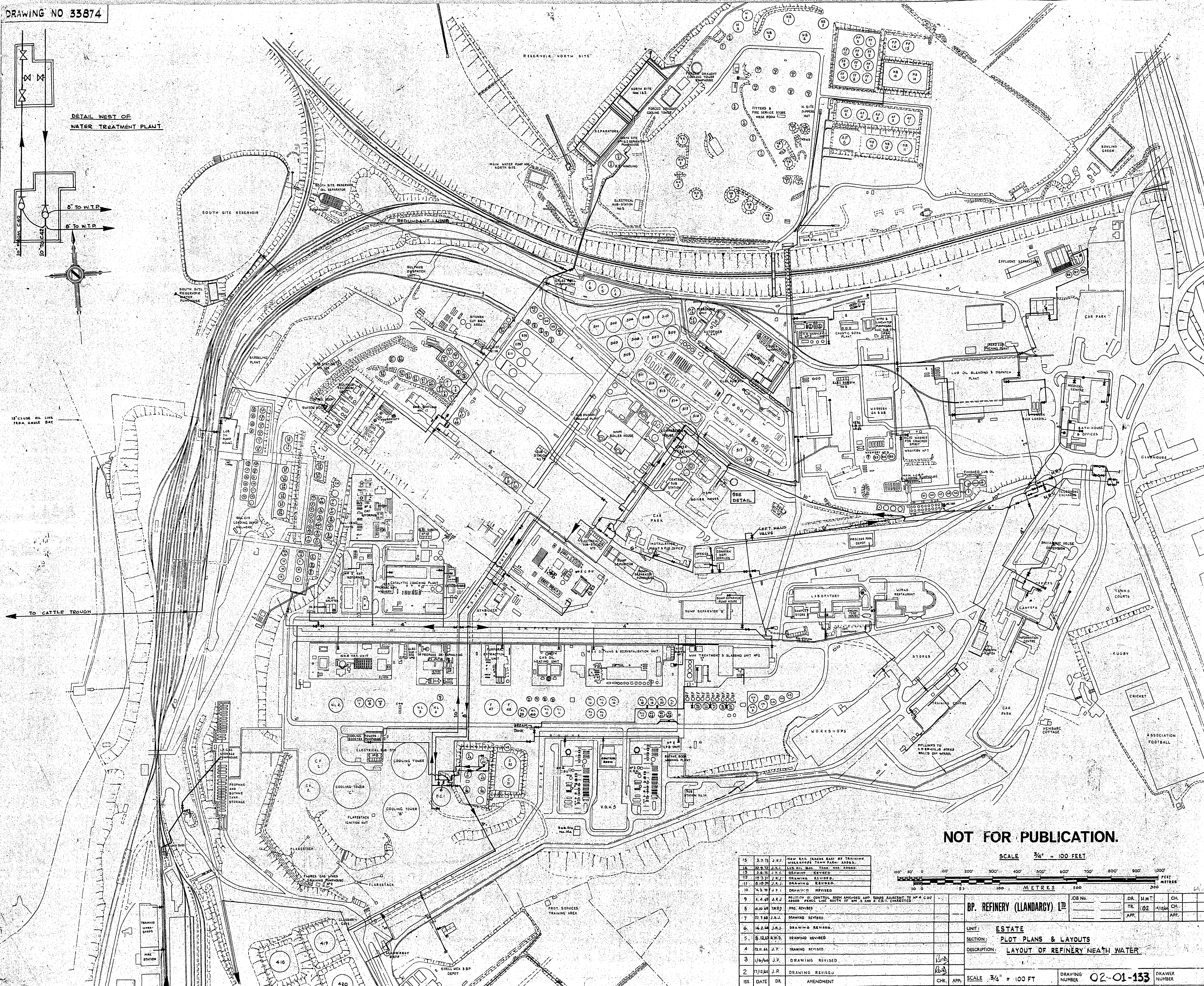
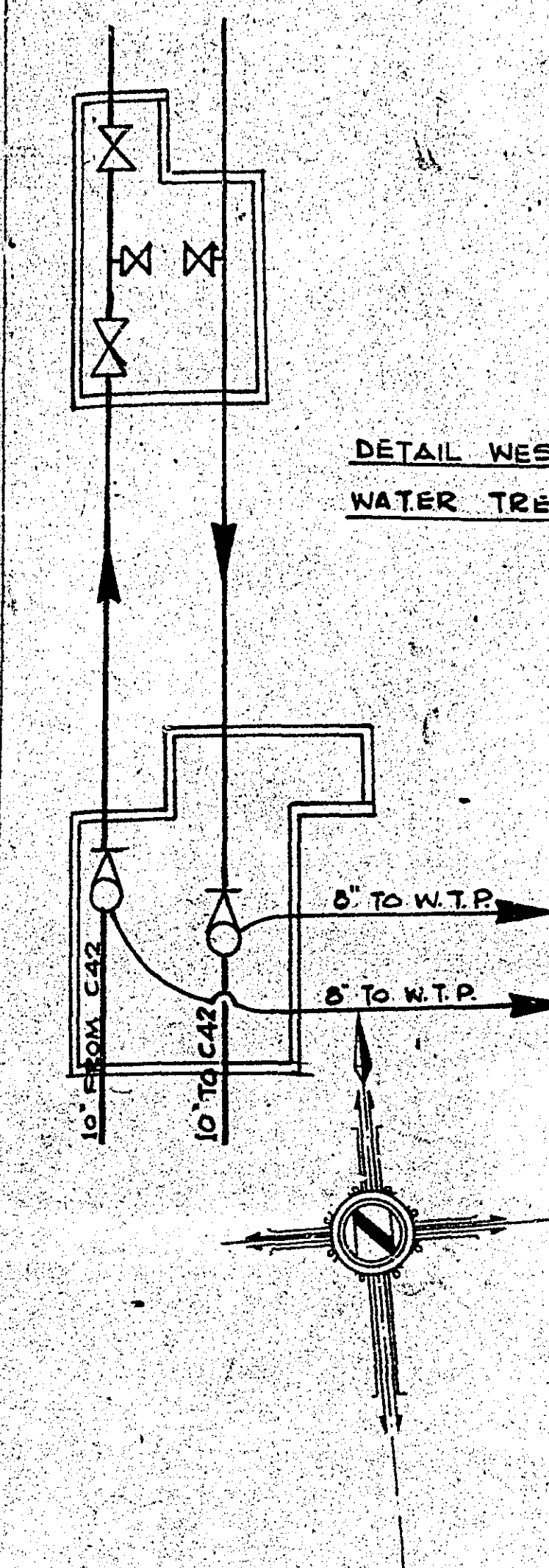
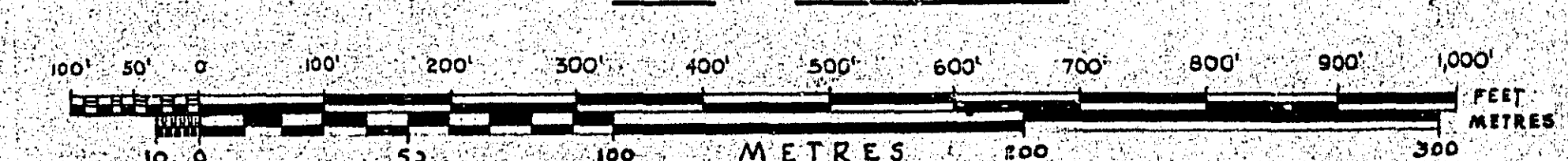




NOT FOR PUBLICATION.

SCALE $\frac{3}{4}" = 100 \text{ FEET}$

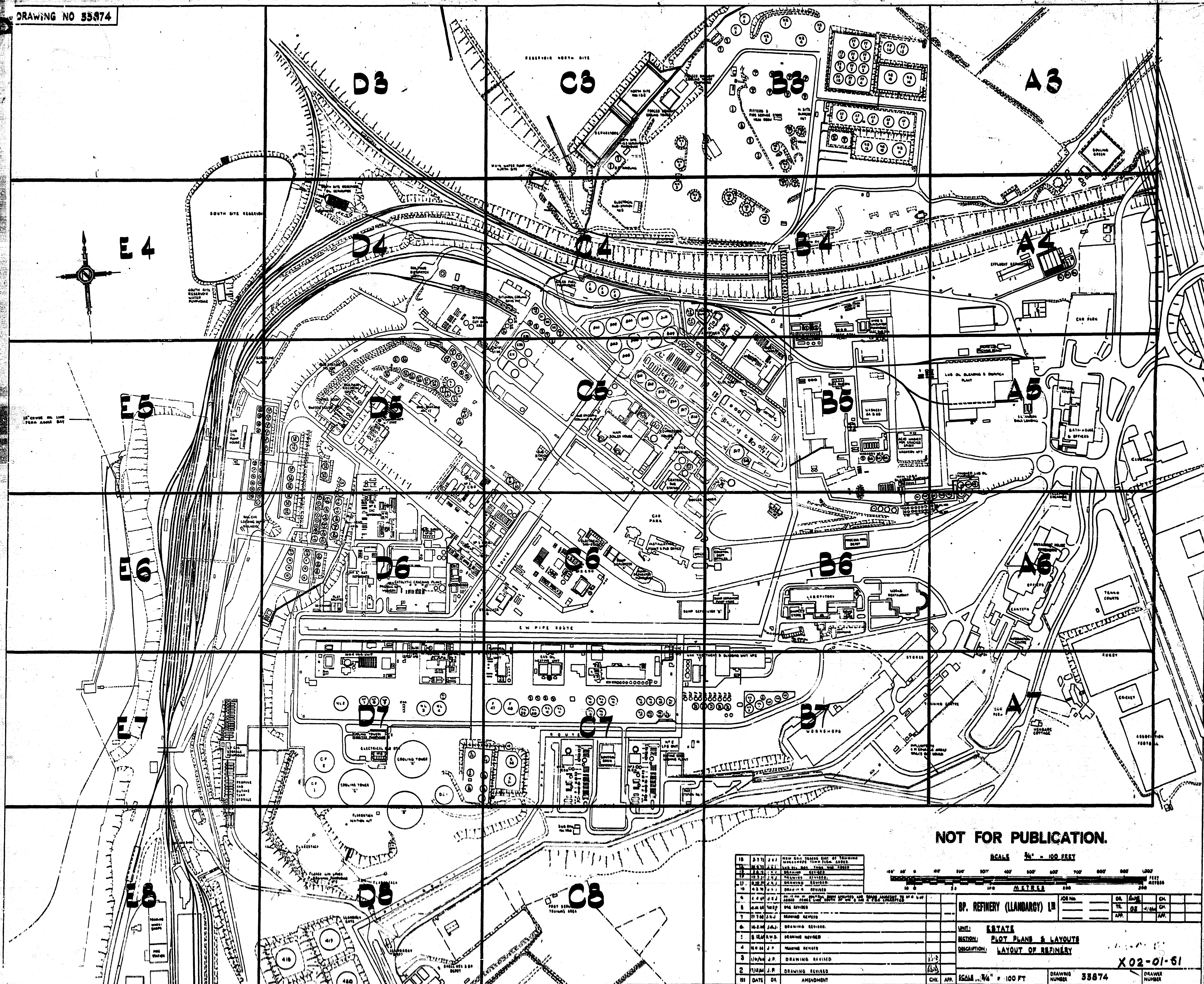


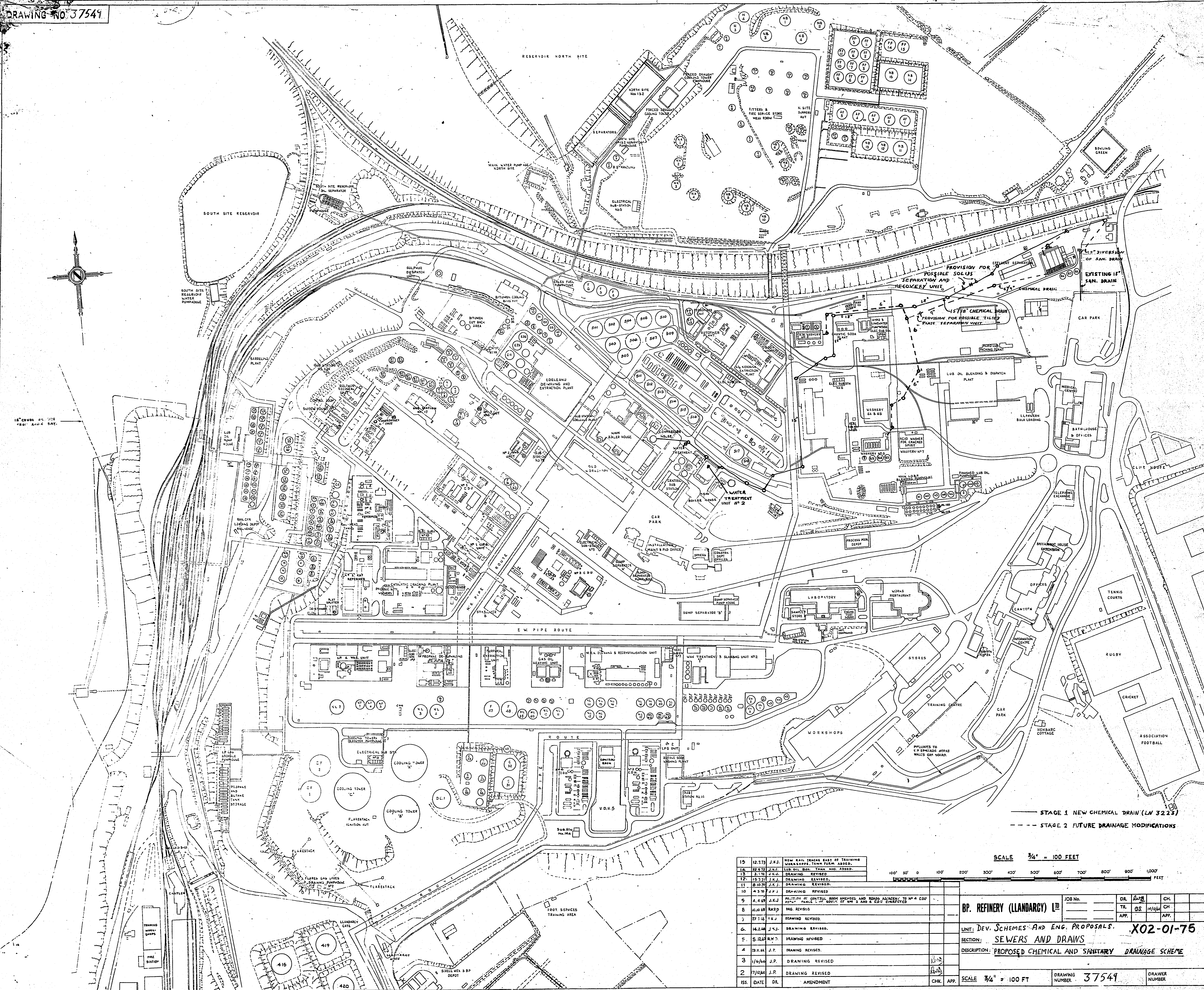
15	3-7-73	J.K.J.	NEW RAIL TRACKS EAST OF TRAINING CAMP. PHOTO TAKEN. APP'D.
14	2-29-73	J.K.J.	LUISOLI BOAR. TANK. MFG. APP'D.
13	3-6-72	J.K.J.	DRAWING REVISED.
12	12-7-71	J.K.J.	DRAWING REVISED.
11	8-10-70	J.K.J.	DRAWING REVISED.
10	4-3-70	J.K.J.	DRAWING REVISED.
9	4-6-69	J.K.J.	POSITION OF CONTROL ROOM AMENDED AND APP'D. SEE LINE SOUTH OF AM. 3.
8	6-10-68	W.M.D.	PRG. REVISED.
7	2-1-68	J.K.J.	DRAWING REVISED.
6	14-2-66	J.K.J.	DRAWING REVISED.
5	8-14-65	R.W.D.	DRAWING REVISED.
4	23-11-64	J.P.	DRAWING REVISED.
3	1-6-64	J.P.	DRAWING REVISED.
2	7/12/64	J.P.	DRAWING REVISED.
ISS.	DATE	DR.	AMENDMENT

BP. REFINERY (LLANDARCY) LTD	JOB No.	DR.	H.M.T.	CH.
		TR.	OS	CH.
	APP.		APP.	

UNIT:	ESTATE
SECTION:	<u>PLOT PLANS & LAYOUTS</u>
DESCRIPTION:	LAYOUT OF REFINERY NEATH WATER

SCALE	3/4" = 100 FT	DRAWING NUMBER	02-01-133	DRAWER NUMBER
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— STAGE 1 NEW CHEMICAL DRAIN (LN 3223)
 - - - STAGE 2 FUTURE DRAINAGE MODIFICATIONS

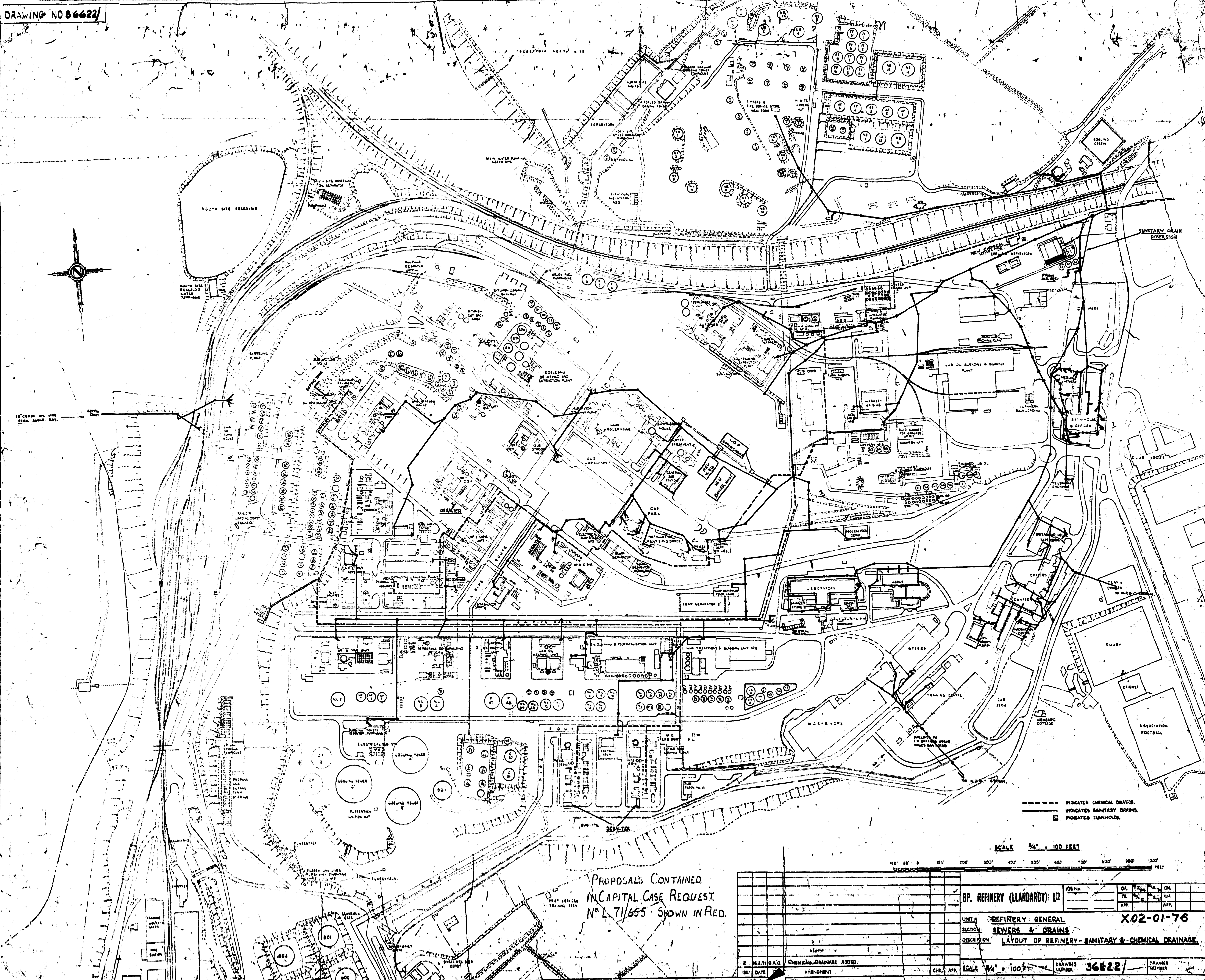
SCALE 3/4" = 100 FEET

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	10.3.71	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

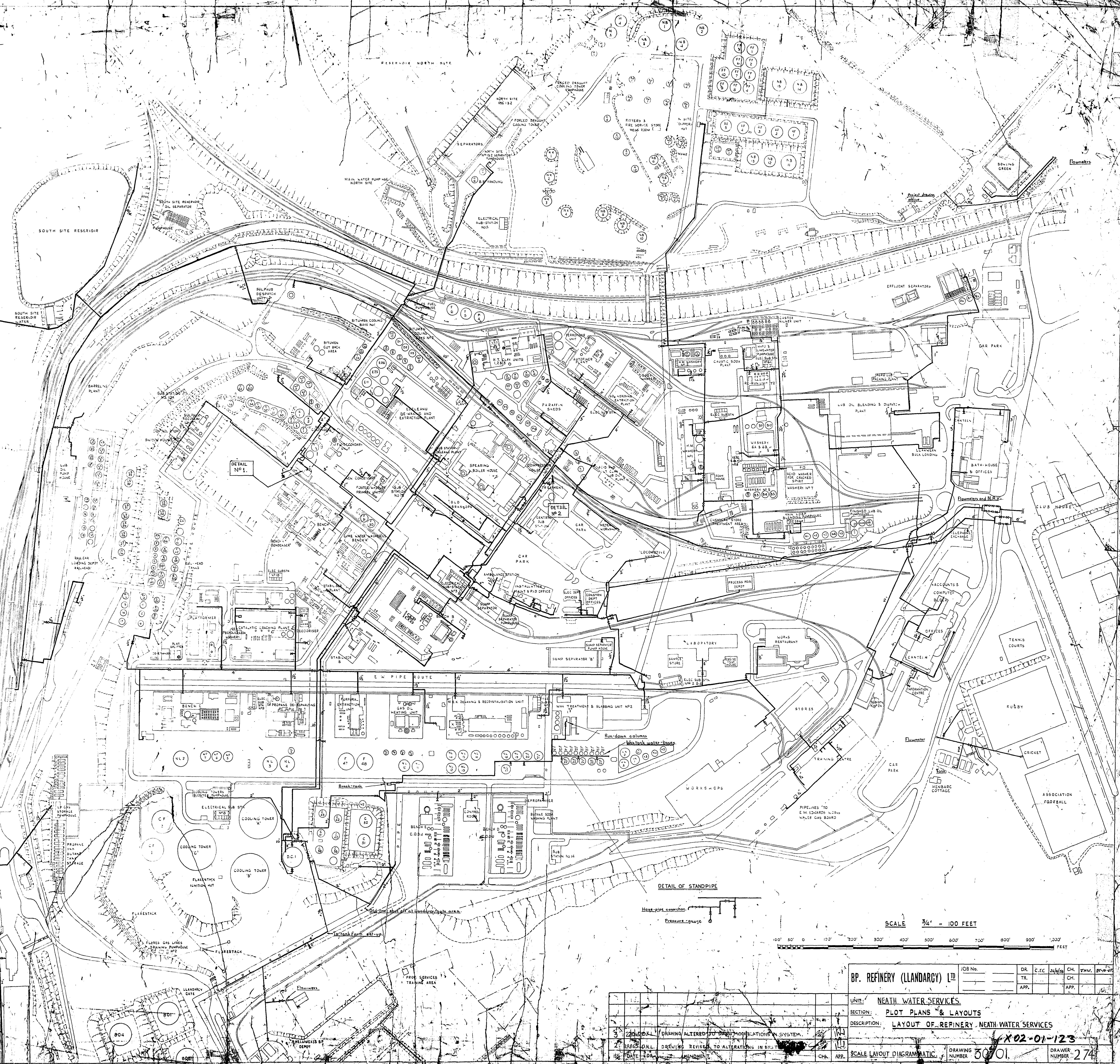
BP. REFINERY (LLANDARCY) LTD. JOB No.
 UNIT: DEV. SCHEMES AND ENG. PROPOSALS. X02-01-75
 SECTION: SEWERS AND DRAINS
 DESCRIPTION: PROPOSED CHEMICAL AND SANITARY DRAINAGE SCHEME

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



PROPOSALS CONTAINED
IN CAPITAL CASE REQUEST
Nº L 71/655 SHOWN IN RED.

BP. REFINERY (LLANDARCY) LTD		JOB No.	DR. No.	CH. No.
UNIT: REFINERY GENERAL		TR. No.	APP. No.	CH. No.
SECTION: SEWERS & DRAINS		X.02-01-76		
DESCRIPTION: LAYOUT OF REFINERY - SANITARY & CHEMICAL DRAINAGE.				
2	1976	G.A.C.	CHEMICAL DRAINAGE ADDED.	CHK. APP.
1	1976	G.A.C.	AMENDMENT	CHK. APP.
SCALE: 1/4" = 100 FT.		DRAWING NUMBER: 36622/		
DATE:		DRAWER NUMBER:		



A horizontal graphic scale bar with markings every 100 feet, ranging from 100' to 1,000'. The word "FEET" is written at the right end of the scale.

BP. REFINERY (LLANDARCY) LTD		JOB No.	DR.	C.F.C.	24/3/59	CH.	T.M.V.	25/3/59
			TR.			CH.		
			APP.			APP.		

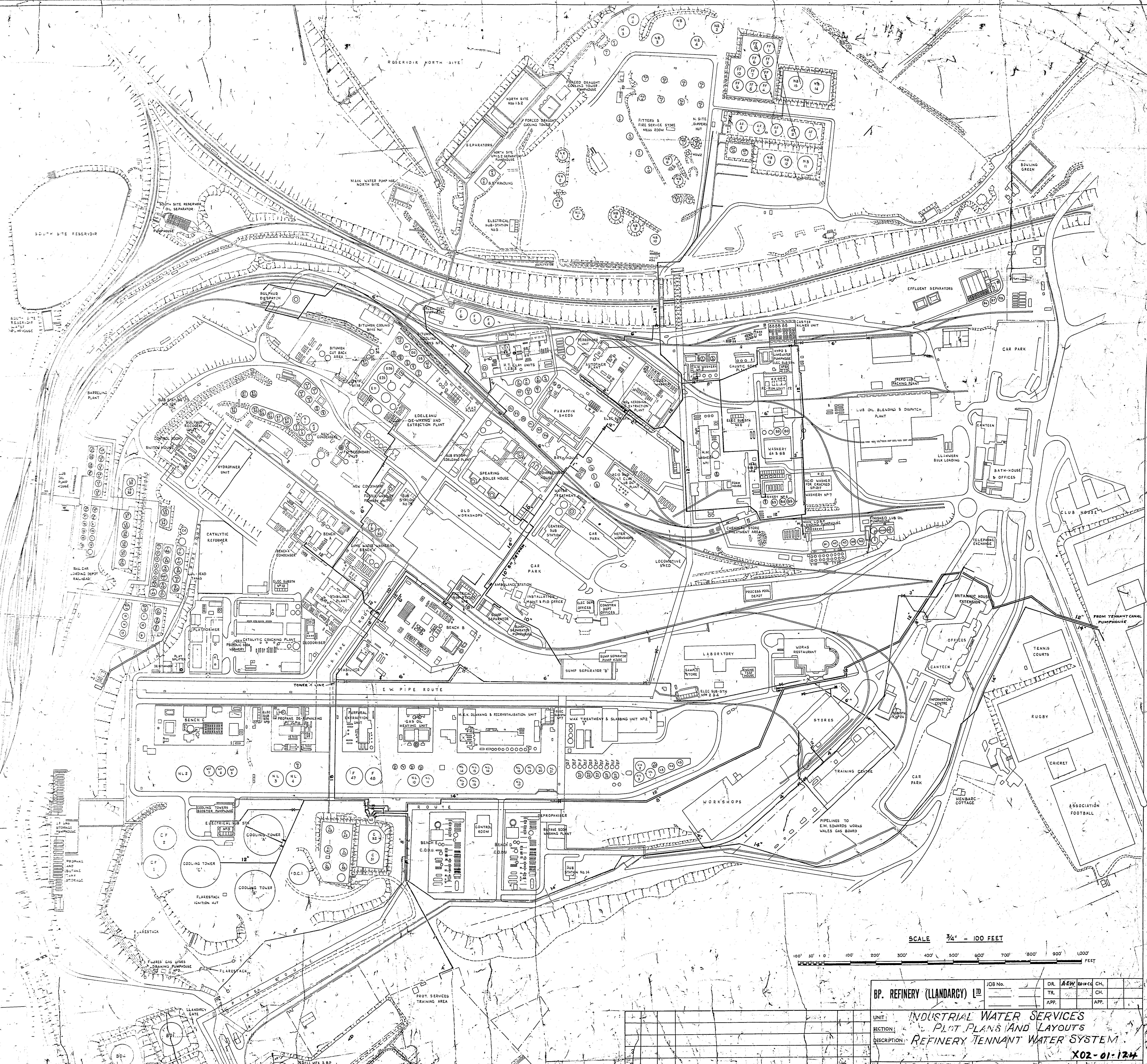
UNIT: NEATH WATER SERVICES

SECTION: PLOT PLANS & LAYOUTS

DESCRIPTION: LAYOUT OF REFINERY NEATH WATER SERVICES

X02-01-123

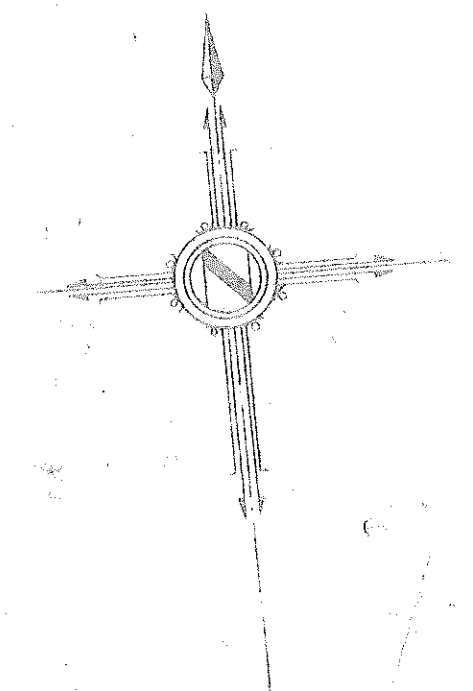
SCALE LAYOUT DIAGRAMMATIC	DRAWING NUMBER	DRAWER NUMBER
	50401	274



SCALE 3/4" = 100 FEET

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

BP. REFINERY (LLANDARCY) LTD		JOB No.	DR. AEW	CH.
		TR.		
		APP.		
UNIT: INDUSTRIAL WATER SERVICES				
SECTION: PLANT PLANS AND LAYOUTS				
DESCRIPTION: REFINERY TENNANT WATER SYSTEM				
		X02-01-124		
IS.	DATE	DR.	APP.	SCALE 3/4" = 100 FT
				DRAWING NUMBER 35027
				DRAWER NUMBER



LEGEND.
 COOLING TOWER 'A' SYSTEM. — x — x —
 TENANT WATER. — — — — —
 TERRACE FIRE-MAIN. — — — — —
 HEATH WATER. — — — — —
 NORTH SITE RES. WATER. — — — — —

LEGEND
 VALVE SHOWN THUS M.H.D.
 HYDRANT SHOWN THUS H.M.D.
 WATER MAIN SHOWN THUS —
 WATER MAINS TO BE INVESTIGATED SHOWN THUS —
 OR SCHEDULE OF VALVES, SEE D.R.G. NO. 100/105 SHEET 2
 OR SCHEDULE OF HYDRANTS, SEE D.R.G. NO. 100/105

D.P. REFINERY (LANDARCY) LTD.
 DATE APPROVED 16/1/70
 SIGNATURE [Signature]
 DEPARTMENT [Department]

SCALE 3/4" = 100 FEET

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

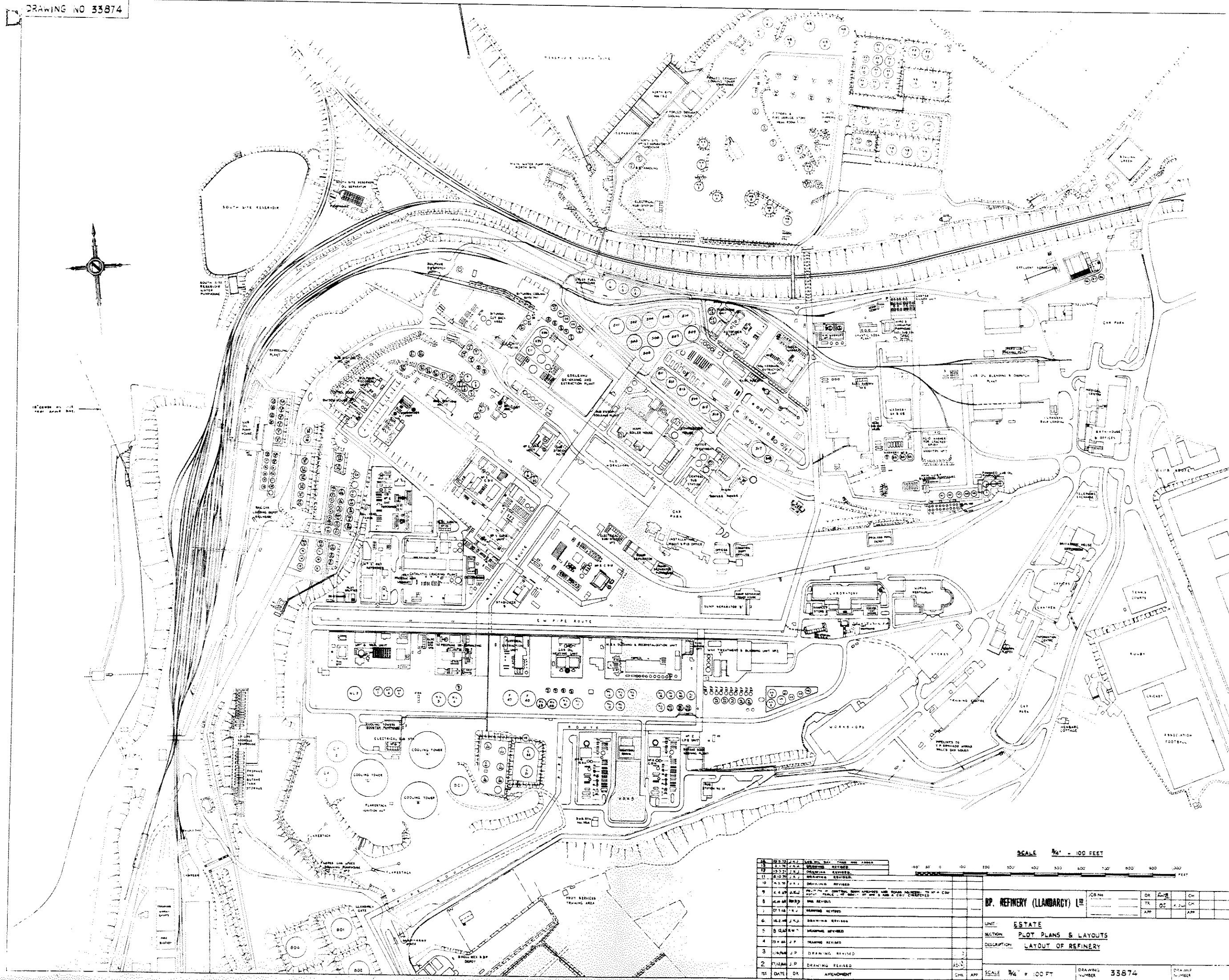
D.P. REFINERY (LANDARCY) LTD.
 JOB No. [Blank]
 DR. WITH 10/70
 CH. [Blank]
 APP. [Blank]

UNIT WATER SERVICES.
 SECTION PLOT PLANS & LAYOUTS.
 DESCRIPTION GENERAL LAYOUT OF REFINERY WATER MAINS.

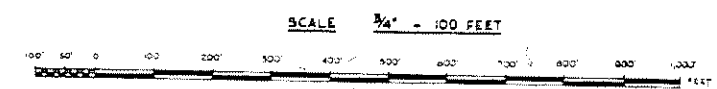
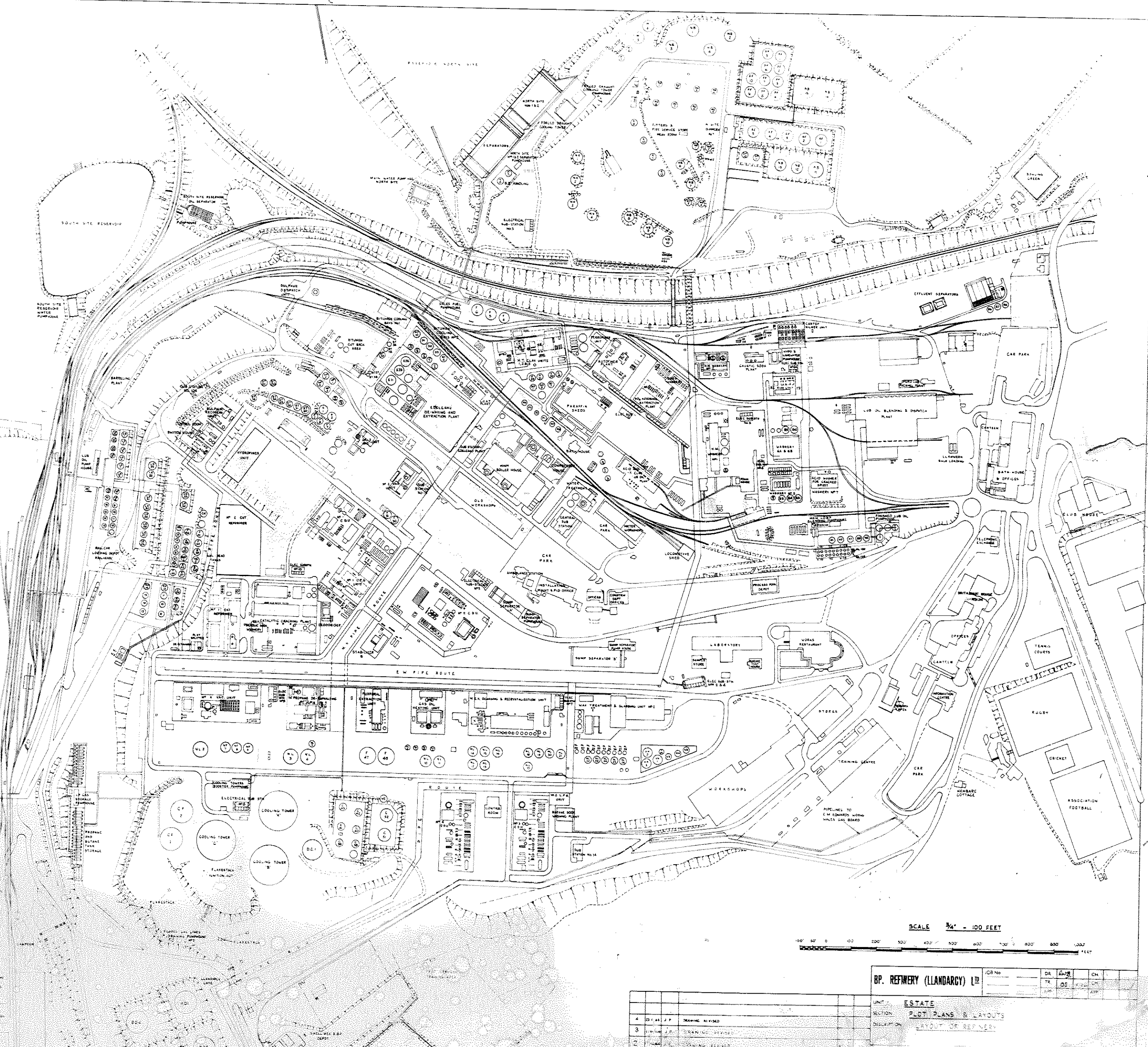
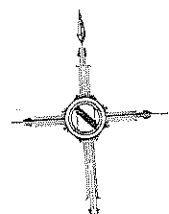
02-01-138

10/70 W.H. LEGEND MODIFIED

SCALE 3/4" = 100 FT. DRAWING NUMBER 37406



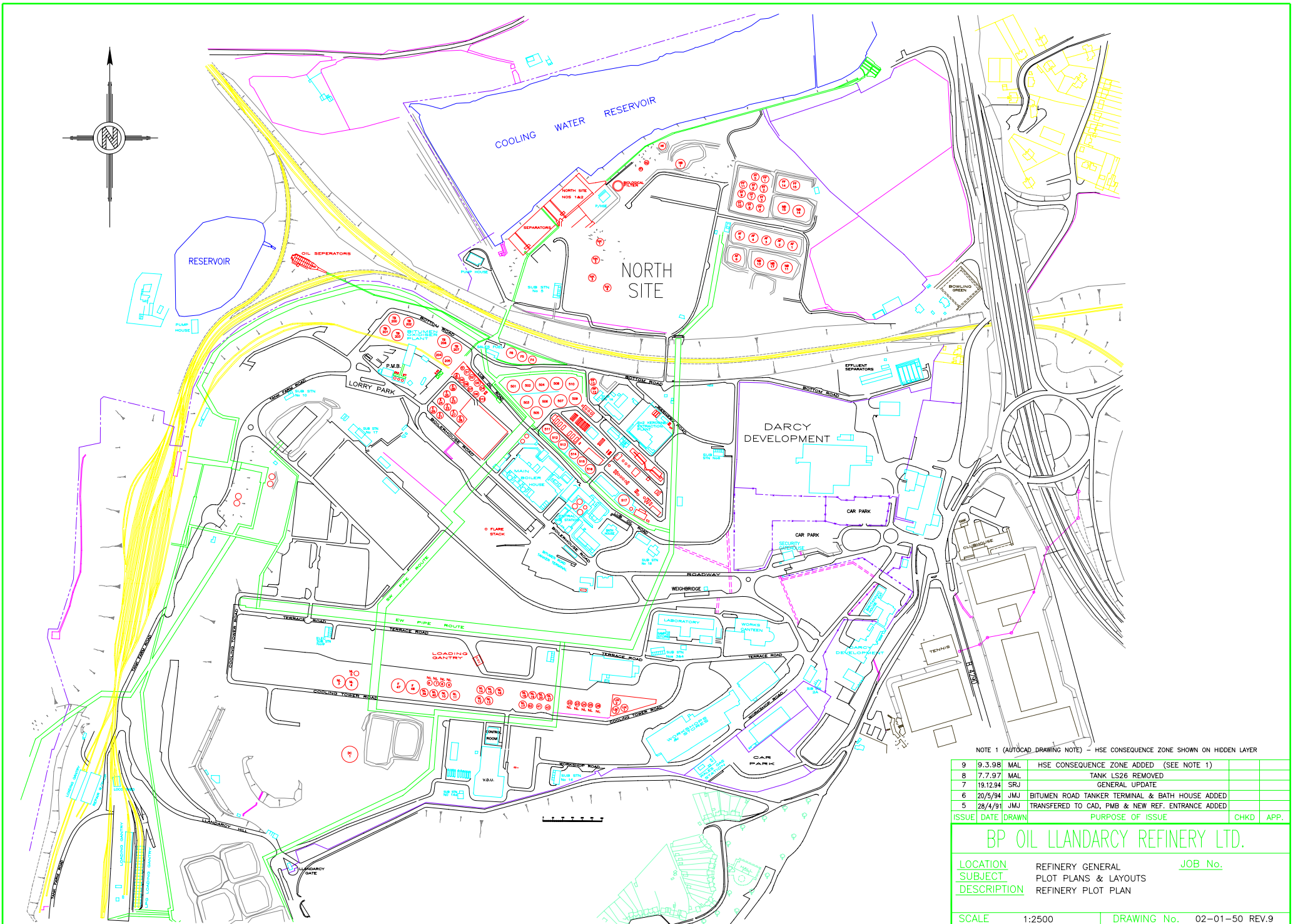
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19	12.22.74	J.P.	DRAWING REVISED														
20	12.22.74	J.P.	DRAWING REVISED														
21	12.22.74	J.P.	DRAWING REVISED														
22	12.22.74	J.P.	DRAWING REVISED														
23	12.22.74	J.P.	DRAWING REVISED														
24	12.22.74	J.P.	DRAWING REVISED														
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BP. REFINERY (LLANDARCY) LTD

NO.	DATE	BY	DESCRIPTION
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3	11.11.66	J.P.	DRAWING REVISED
2	10.11.66	J.P.	DRAWING REVISED
1	09.11.66	J.P.	DRAWING REVISED

UNIT	ESTATE
SECTION	PLOT PLANS & LAYOUTS
DESCRIPTION	LAYOUT OF REFINERY

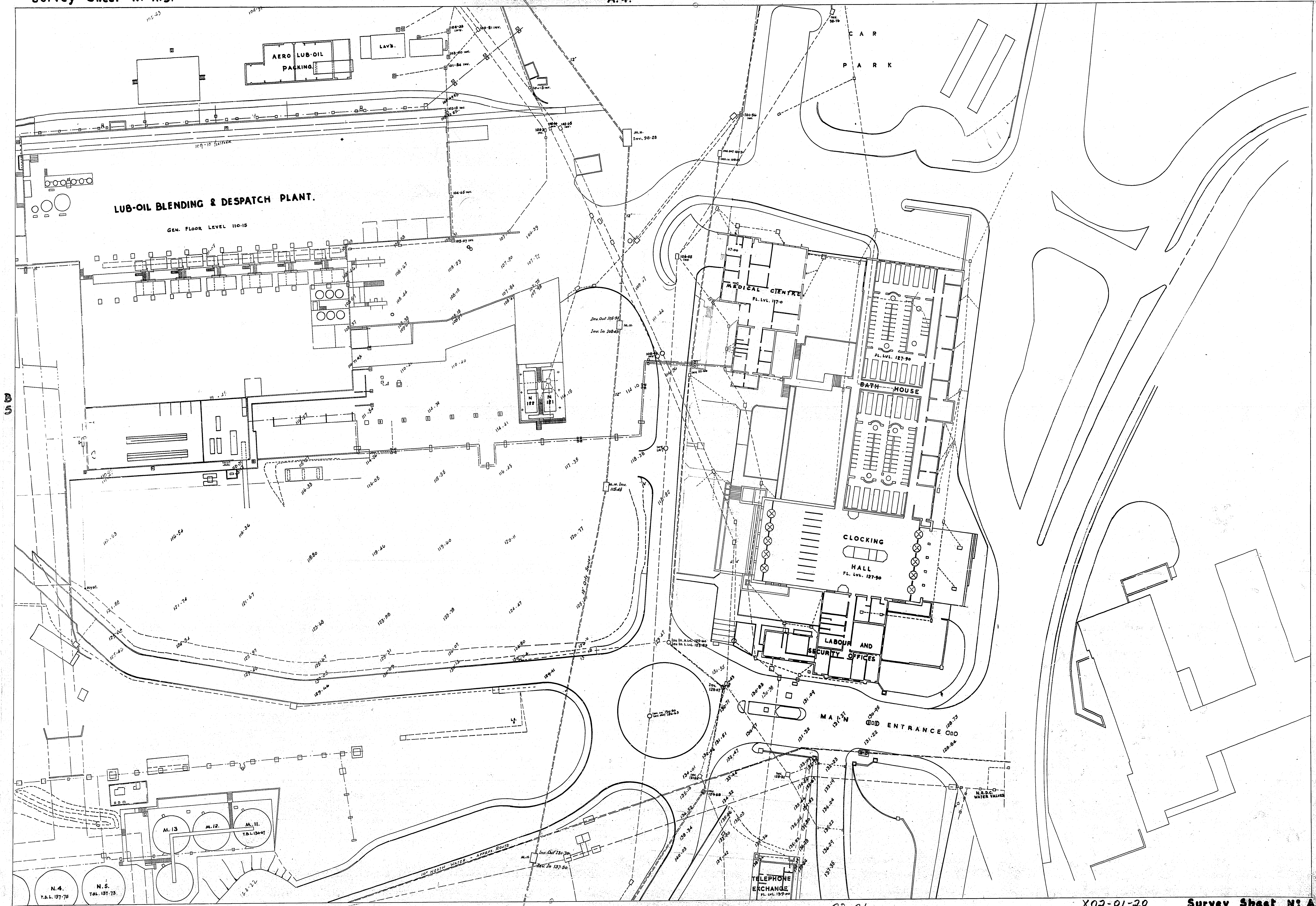


NOTE 1 (AUTOCAD DRAWING NOTE) - HSE CONSEQUENCE ZONE SHOWN ON HIDDEN LAYER

9	9.3.98	MAL	HSE CONSEQUENCE ZONE ADDED (SEE NOTE 1)		
8	7.7.97	MAL	TANK LS26 REMOVED		
7	19.12.94	SRJ	GENERAL UPDATE		
6	20/5/94	JMJ	BITUMEN ROAD TANKER TERMINAL & BATH HOUSE ADDED		
5	28/4/91	JMJ	TRANSFERRED TO CAD, PMB & NEW REF. ENTRANCE ADDED		
ISSUE	DATE	DRAWN	PURPOSE OF ISSUE	CHKD	APP.

BP OIL LLANDARCY REFINERY LTD.

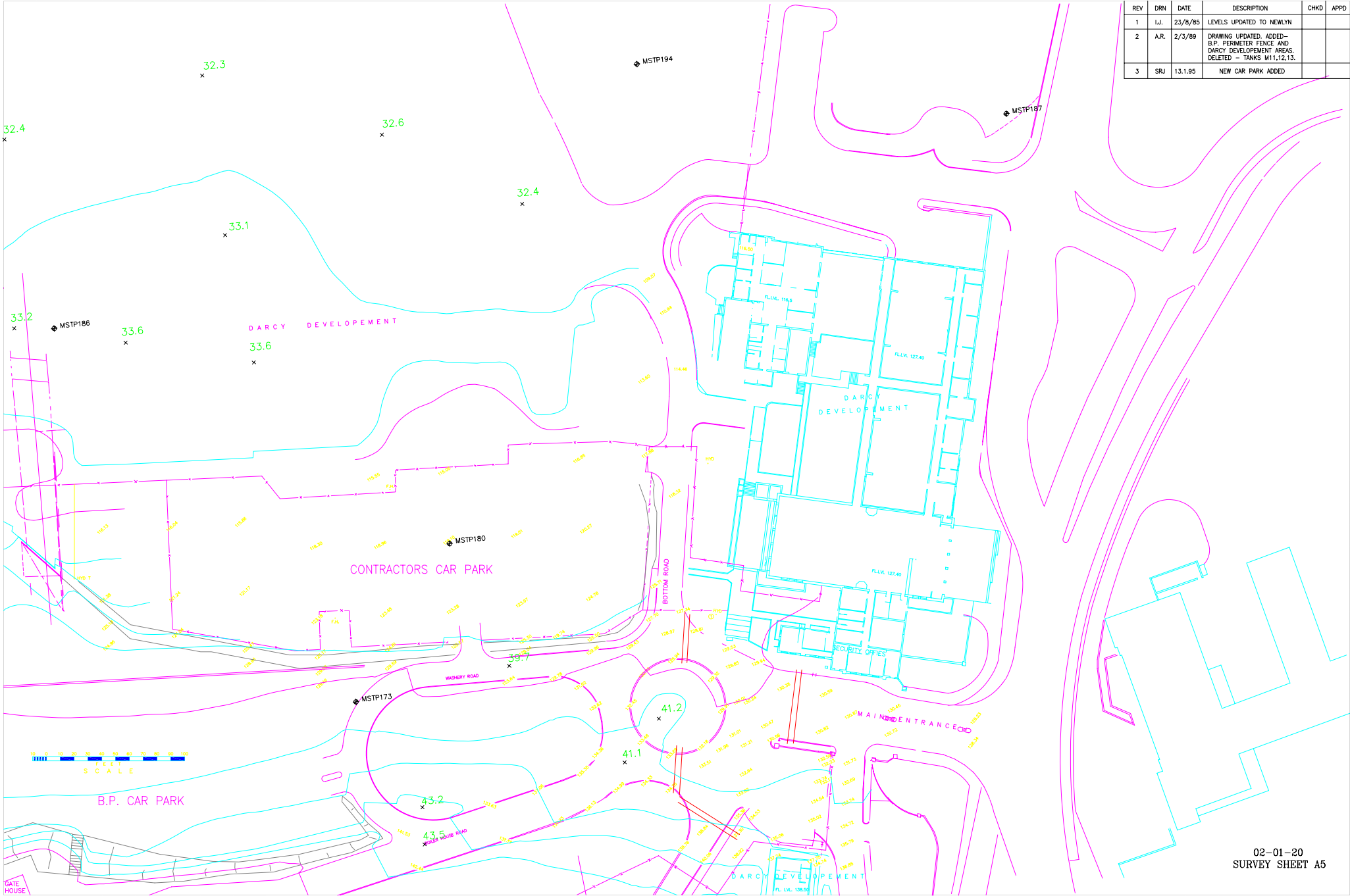
LOCATION	REFINERY GENERAL	JOB No.
SUBJECT	PLOT PLANS & LAYOUTS	
DESCRIPTION	REFINERY PLOT PLAN	
SCALE	1:2500	DRAWING No. 02-01-50 REV.9



A.6.

REV	DRN	DATE	DESCRIPTION	CHKD	APPD
1	I.J.	23/8/85	LEVELS UPDATED TO NEWLYN		
2	A.R.	2/3/89	DRAWING UPDATED. ADDED-B.P. PERIMETER FENCE AND DARCY DEVELOPMENT AREAS. DELETED - TANKS M11,12,13.		
3	SRJ	13.1.95	NEW CAR PARK ADDED		

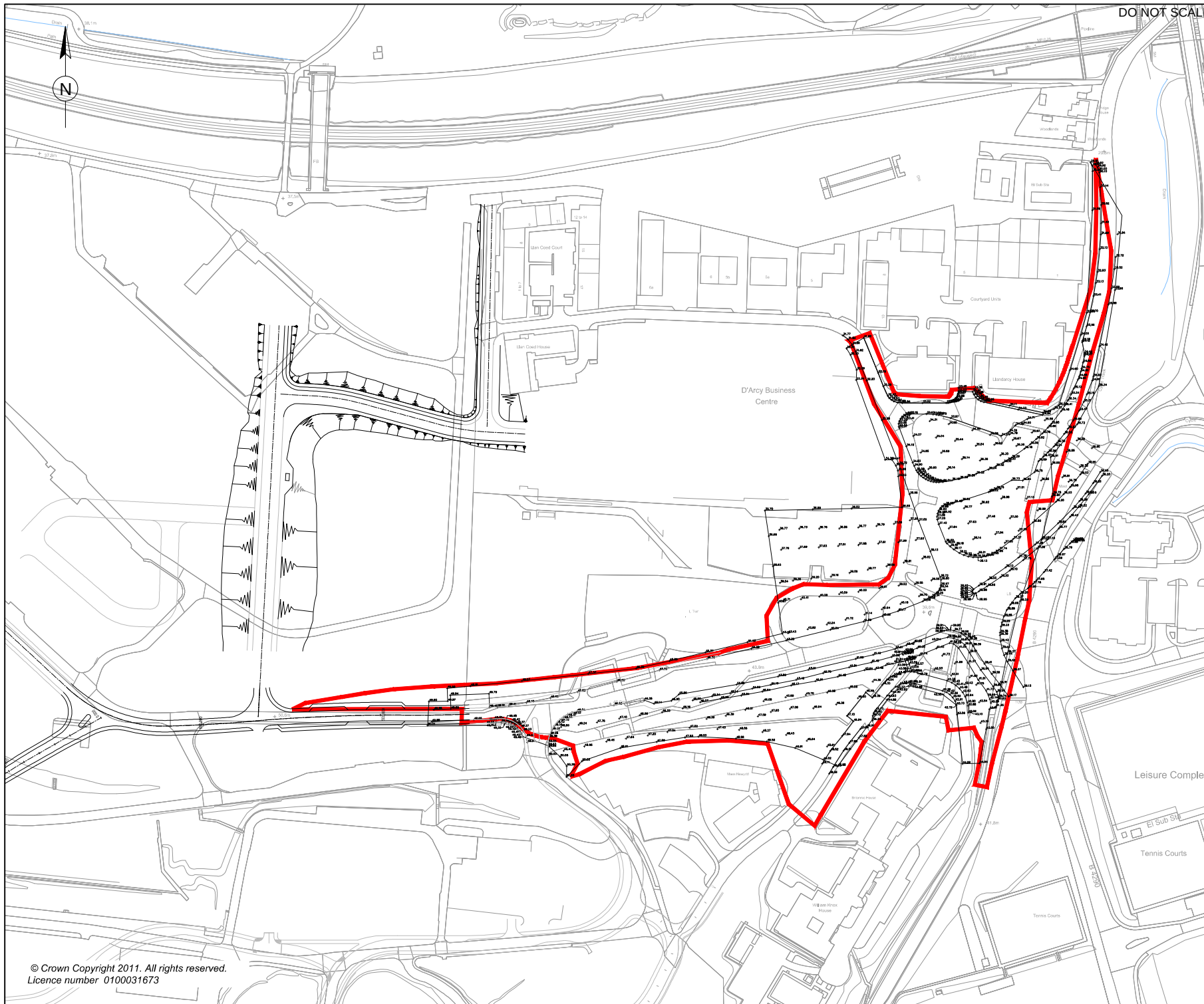
B.5.



A.4.

***APPENDIX F TOPOGRAPHICAL
RECORD OF THE GROUND
LEVELS FOLLOWING THE
COMPLETION OF THE
REDEVELOPMENT
REMEDIATION WORKS***

0 10 100
Metres



DO NOT SCALE

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Licence number 0100031673

P1 21/01/16 FIRST ISSUE MJ ML MP			
Rev.	Date	Description	By Chkd App'd
FOR INFORMATION			S2
ATKINS The Axis 10 Holliday Street Birmingham B1 1TF Tel: +44 (0)1214 835000 Fax: +44 (0)1214 835252 www.atkinsglobal.com			
Copyright © Atkins Limited (2016)			
ST.MODWEN			
Project Title COED DARCY			
Drawing Title MONITOR PHASE 48 CURRENT TOPOGRAPHICAL SURVEY AND ROAD LAYOUT			
Scale 1:1000	Designed ML	Drawn MJ	Checked ML
Original Size A1	Date 21/01/16	Date 21/01/16	Date 21/01/16
Drawing Number 5041216-ATK-DR-C-REM-02175	Revision P 1		

Drawing No. 0100031673 9705041216-ATK-DR-C-REM-02175.dwg

APPENDIX G COMPARISON OF RBSL AND RTC THRESHOLDS

Contaminant	RTC (mg/l)
TPH aliphatic C10-C12	>sat
TPH aliphatic C12-C16	>sat
1,2-Dichloroethane	4.80E+00
1,1,1-Trichloroethane	>sat
Tetrachloroethene	>sat
Trichloroethene	2.85E+01
Vinyl chloride	3.38E-01
Dichloromethane	1.98E+03
Cis-1,2 Dichloroethene	7.40E+01
Trans-1,2 Dichloroethene	8.91E+01
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 - 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 aromatic C7-C8 is considered to comprise toluene only by Atkins 4. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).	

4. Comparison of RBSLs and RTC

As an objective of these works was to establish whether the RBSLs were health protective, the commercial RBSLs and RTC have been compared. This comparison is presented in the tables in this section of the report. As per the approach adopted for the residential and recreational RTC, 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 bolded⁹.
- 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. Further site specific modifications have not been considered at the present stage.

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

The background soil concentration and Soil Code have not been considered within the metals RTC presented and therefore the values presented for metals may not be protective of phytotoxic

⁹ In some cases there may be two RTC, where one RTC is higher than the RBSL and the other lower: one may be bolded and the other not and therefore they remain as draft.

effects. The soft landscaping areas should therefore be suitably designed at the remediation design stage, once such areas are defined.

4.1 Comparison of commercial RBSLs and RTC (shallow soil)

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

Table 4.1 – Comparison of commercial RBSLs and RTC for shallow soil (0.65m below FFL)

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Arsenic	5.00E+02	6.35E+02	6.35E+02	final
Chromium	5.00E+03	3.65E+02	3.65E+02	draft
Cadmium	1.40E+03	2.43E+02	2.43E+02	draft
Mercury (inorganic)	4.80E+02	3.71E+03	3.71E+03	final
Nickel	5.00E+03	1.99E+03	1.99E+03	draft
Selenium	8.00E+03	1.30E+04	1.30E+04	final
Lead	7.50E+02	5.45E+03	5.45E+03	final
Vanadium	1.60E+04	7.59E+03	7.59E+03	draft
Copper	-	1.15E+05	1.15E+05	draft
Zinc	-	9.18E+05	9.18E+05	draft
Benzo(a)pyrene	2.90E+01	2.47E+01	2.48E+01	draft
Benzene	5.00E+00	1.78E+01	9.98E+01	final
Toluene	1.16E+03	4.18E+05 a	4.22E+05 a	final
Ethylbenzene	1.22E+05	1.83E+05 a	1.87E+05 a	final
Xylene	1.21E+05	2.93E+05 a	3.27E+05 a	final
TPH aromatic C7-C8	1.84E+03	4.18E+05 a	4.22E+05 a	final
TPH aromatic C8-C10	9.13E+02	6.21E+04 a	6.62E+04 a	final
TPH aromatic C10-C12	2.65E+04	6.83E+04 a	6.84E+04 a	final
TPH aromatic C12-C16	6.49E+04	6.84E+04 a	6.57E+04	final
TPH aliphatic C6-C8	>1.00E+06	≤1.00E+06 a	≤1.00E+06 a	draft
TPH aliphatic C8-C10	1.59E+05	1.69E+05 a	1.70E+05 a	final
TPH aliphatic C10-C12	1.63E+05	1.71E+05 a	1.71E+05 a	final
TPH aliphatic C12-C16	1.69E+05	1.71E+05 a	1.71E+05 a	final
TPH aromatic C16-C21	5.14E+04	2.85E+04	2.85E+04	draft
TPH aromatic C21-C35	5.14E+04	2.85E+04	2.85E+04	draft
TPH aliphatic C16-C21	>1.00E+06	≤1.00E+06	≤1.00E+06	draft
TPH aliphatic C21-C35	>1.00E+06			draft
Total TPH (Phase 1)	8.14E+04	Not calculated (see note 8)		
Total TPH (Process Area)	4.43E+04			
Total TPH (North Tank Farm)	2.59E+04			

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sand (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/Final
Total TPH (South Tank Farm)	3.72E+04			
1,2-Dichloroethane	2.00E+00	4.01E-01	2.15E+00	draft
1,1,1-Trichloroethane	5.77E+05	4.43E+02	3.14E+03	draft
Tetrachloroethene	1.05E+03	1.03E+02	7.88E+02	draft
Trichloroethene	8.40E+01	7.48E+00	5.49E+01	draft
Vinyl chloride	4.00E+00	4.50E-02	1.74E-01	draft
Dichloromethane	1.65E+03	1.58E+02	7.34E+02	draft
Cis-1,2-Dichloroethene	2.73E+02	8.70E+00	5.30E+01	draft
Trans-1,2 Dichloroethene		1.38E+01	8.77E+01	draft
Notes				
a) based on a value produced from following the approach outlined in SR4 for substances at saturation				
1. It is assumed that no visible free product is present within the top 1.0m of soil The presence of free product should be assessed in accordance with information in the S106 (Ref. 1).				
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 aromatic C7-C8 is considered to comprise toluene only by Atkins				
4. In the S106 (Ref. 1), only one value was presented for 1,2-dichloroethene of 273 mg/kg				
5. '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.				
6. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach				
7. No RTC was produced for total TPH as this will be considered further at validation stage				
8. Asbestos has not been considered here as it is being considered in a separate report				
9. Additivity for TPHs and PAHs to be undertaken in line with guidance in this report				
10. In the S106 (Ref. 1), “-“ was presented for the RBSLs for copper and zinc for a commercial land use				
11. The values for metals may not be protective of phytotoxic effects				

4.2 Comparison of commercial RBSLs and RTC (deep soil)

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

Table 4.2 – Comparison of commercial RBSLs and RTC for deep soil (1m below 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	5.00E+00	7.10E+01	1.52E+02	final
Toluene	3.89E+02	>sat	>sat	final
Ethylbenzene	None	>sat	>sat	final
Xylene	None	>sat	>sat	final

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
TPH aromatic C7-C8	6.17E+02	>sat	>sat	final
TPH aromatic C8-C10	5.47E+02	>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
TPH aliphatic C12-C16	None	>sat	>sat	final
TPH aliphatic C16-C21	None	Not calculated (see note 3)		
TPH aliphatic C21-C35	None			
TPH aromatic C16-C21	None			
TPH aromatic C21-C35	None			
Total TPH (Phase 1)	8.20E+04	Not calculated (see note 9)		
Total TPH (Process Area)	3.50E+04			
Total TPH (North Tank Farm)	1.40E+04			
Total TPH (South Tank Farm)	3.48E+04			
1,2-Dichloroethane	6.50E-01	1.73E+00	2.75E+00	final
1,1,1-Trichloroethane	3.25E+03	>sat	>sat	final
Tetrachloroethene	3.68E+02	3.98E+02	1.06E+03	final
Trichloroethene	2.80E+01	2.88E+01	7.07E+01	final
Vinyl chloride	1.60E+00	1.54E-01	2.14E-01	draft
Dichloromethane	6.65E+02	6.77E+02	9.76E+02	final
Cis-1,2-Dichloroethene	9.10E+01	3.51E+01	6.70E+01	draft
Trans-1,2 Dichloroethene		5.34E+01	1.11E+02	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 the Total Petroleum Hydrocarbon Criteria Working Group (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 91 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				

Contaminant	S106 RBSL (mg/kg)	RTC 1% Sandy loam (mg/kg)	RTC 3% Sandy loam (mg/kg)	Draft/final
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				
12. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).				

4.3 Comparison of commercial RBSLs and RTC (groundwater)

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

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

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Benzo(a)pyrene	None	>sat	final
Benzene	6.00E+00	1.15E+01	final
Toluene	2.29E+02	>sat	final
Ethylbenzene	5.06E+02	>sat	final
Xylene	6.07E+02	>sat	final
TPH aromatic C7-C8	9.70E+01	>sat	final
TPH aromatic C8-C10	None	>sat	final
TPH aromatic C10-C12	None	>sat	final
TPH aromatic C12-C16	None	>sat	final
TPH aromatic C16-C21	None	Not calculated (see note 6)	final
TPH aromatic C21-C35	None		final
TPH aliphatic C6-C8	None	>sat	final
TPH aliphatic C8-C10	None	>sat	final
TPH aliphatic C10-C12	None	>sat	final
TPH aliphatic C12-C16	None	>sat	final
TPH aliphatic C16-C21	None	Not calculated (see note 6)	final
TPH aliphatic C21-C35	None		final
1,2-Dichloroethane	8.20E-01	4.80E+00	final
1,1,1-Trichloroethane	9.89E+02	>sat	final
Tetrachloroethene	1.15E+02	>sat	final
Trichloroethene	1.30E+01	2.85E+01	final
Vinyl chloride	3.00E-01	3.38E-01	final
Dichloromethane	6.24E+02	1.98E+03	final

Contaminant	S106 RBSL (mg/l)	RTC (mg/l)	Draft/Final
Cis-1,2 Dichloroethene	6.80E+01	7.40E+01	final
Trans-1,2 Dichloroethene	6.80E+01	8.91E+01	final
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 68 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. The potential presence of free product should be assessed in accordance with information in the S106 (Ref. 1).			

5. Conclusions and Recommendations

5.1 Commercial RTC

5.1.1 Conclusions

RTC have been derived for a shallow and deep soil source for a commercial land use. As can be seen in Section 4, some RTC were higher than the RBSL and thus the RBSLs would be protective and suitable for use.

In other cases, the RTC were lower than the RBSL and therefore may not be protective of human health based on the assumptions underpinning the RTC. In such cases the RTC have been marked as draft and may require further assessment.

5.1.2 Recommendations

The lower of the RTC/RBSL is recommended for use in order to be protective for the receptor at the site. It is also recommended that the land use assumptions used to develop the CSM are compared to the development plans to establish whether the RTC are suitable for use. For instance, a less permeable soil type than the sand/sandy loam used within the RTC modelling, may result in a higher RTC and less remediation being required. Information regarding the application of the RTC/RBSL is understood to be presented within the remedial strategy and validation plans (as appropriate).

Should exceedances of the RTC/RBSL be reported, it is recommended that the guidelines outlined in the validation plan (in preparation) are followed.

A number of approaches could be considered for those contaminants where the RTC is lower than the RBSL. The recommended approaches include:

- consideration of building development plans on plot specific basis (e.g. areas of hard standing) versus exceedances of RTC/RBSL;

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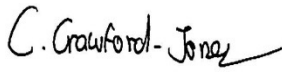
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1. INTRODUCTION

1.1 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 53 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 **Appendix A**.

The intended use for Phase 53 has been declared as residential. The phase boundary is the land edged red on drawing 5041216-REM-DWG-1777, a copy of which is provided in **Appendix A**. The approximate location of Phase 53 in relation to the Development Boundary is shown in **Figure 1** below. Phase 53 covers an area of approximately 38,620m².

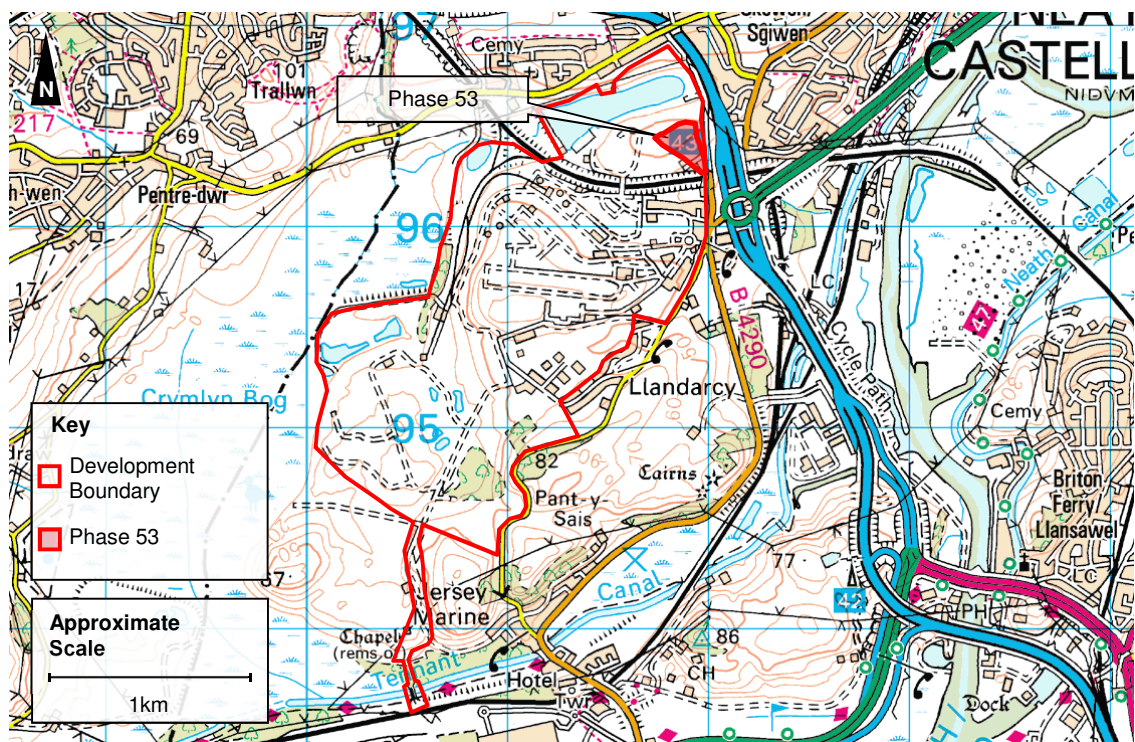


Figure 1 – Location plan

A development layout is yet to be confirmed for Phase 53; however an outline layout is shown on the current masterplan drawing reference 1332/400/MP/SK/TERT Revision H, a copy of which is provided in **Appendix A**.

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 53; and
- Certify that in the Monitor's professional opinion the Redevelopment Remediation Works have been satisfactorily completed for Phase 53 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 **Appendix B**.

1.2 Background

1.2.1 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, 3 and 4 from Schedule 8 of the Section 106 Agreement are reproduced below for reference.

Table 1 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>						
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

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
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
<u>ASBESTOS</u>						
Sum of all Types of ACM	200	300	200	200 ⁴	-	-

Notes

- “-” value not applicable to scenario
- “none” RBSL 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 2 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
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

Notes

“none” theoretical RBSL greater than solubility limit

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 discernible in ambient air
5	Visible hydrocarbon product	Overwhelming Odour

Notes

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

Table 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 site1	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

Testing for the Validation Suite at the following frequency:	Shallow Soils (Residential <1m FFL)	Deeper Soils (Residential >1m below FFL)	Soils (Commercial all relevant depths)
Face of remedial excavations <1m deep	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

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

1.2.2 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/BRRP00083/Cert 53a.

1.3 Information Sources

A summary of the information sources that the Monitor has been provided with in relation to Phase 53 is provided in **Table 5**. 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 **Appendix C**.

Table 5 Information Sources

<i>Ref.</i>	<i>Document Reference</i>	<i>Format</i>	<i>Title</i>	<i>Author</i>	<i>Date Received</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-OSW-TN-0001350	Technical Note	Further Investigation into Reported Oily Sheen in NSE53 (Monitor Phase 53)	Atkins	March 2015
4	5041216-OSW-TN-0001463	Technical Note	Phase 53 – Response to Monitor Comments (RFI0133)	Atkins	September 2015
5	5041216-REM-RPT-0001332	Report	St. Modwen Homes (Monitor Phase 53) Validation Report Revision 1	Atkins	October 2015

1.4**Requests for Information (RFIs) Issued by the Monitor**

The Monitor has raised one RFI in relation to Phase 53, as summarised in **Table 6**. A copy of the RFI is provided in **Appendix D**. A copy of the response received is included in the information sources provided in **Appendix C**.

Table 6 RFI

<i>RFI Ref.</i>	<i>Title</i>	<i>Associated Atkins Document</i>	<i>Date Raised</i>	<i>Complete</i>	<i>Comments</i>
133	Review of Atkins' Validation Report for Monitor Phase 53	St. Modwen Homes (Monitor Phase 53) Validation Report	August 2015	Yes	Updated validation report (Rev 1) received September 2015

2.**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 53. This section of the report is structured as follows:

1. Site Assessment
2. Remediation Strategy
3. Redevelopment Remediation Works
4. Validation

2.1 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.

2.1.1 Desk Study

From the information presented in Atkins' validation report (Information Source 5) 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 with Phase 53. The following is of note:

Phase 53 is located in the north east of the former Llandarcy Oil Refinery Site in an area which comprises three fields with a bowling green in the far south. With reference to the historical maps provided in **Appendix E** it can be seen that Phase 53 was not previously occupied by oil refinery infrastructure.

With regards geology Atkins reports that the British Geology Survey Sheet for Swansea (Sheet 247) Drift Edition indicates that Phase 53 is underlain by Till (Diamicton) which extends across almost all of the area with the exception of the far south. This unit overlies the Carboniferous Pennant Sandstone Formation.

With regards hydrology, Atkins reports that the closest significant water feature is the North Site reservoir which at its closest is 70m to the north of Phase 53. The Tennant Canal is located approximately 670m to the south east and Crymlyn Bog is located approximately 1.2km to the south west of Phase 53.

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'.

Groundwater flow within Phase 53 has been inferred to be radial from the centre of North Site, and so is generally towards the east.

2.1.2 Intrusive Investigations

URS carried out a number of historic 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 two boreholes in the south of Phase 53 and another four boreholes between 40m and 60m to the north of Phase 53 bordering the North Site reservoir.

In 2014 Atkins undertook a site investigation with the aim of supplementing and updating the historical investigation. A total of 101 machine excavated trial pits were undertaken across Phase 53. Details of this site investigation are presented Atkins' validation report (Information Source 5).

Logs from the trial pits indicate ground conditions to be consistent with the reported geology discussed above. Generally the soils comprised superficial deposits over sandstone bedrock, encountered as a weathered zone comprising clayey sandy tabular sandstone gravel, cobbles and occasional boulders.

Groundwater across Phase 53 was generally found to lie within the underlying bedrock.

Atkins reports that potential land contamination was evident in two locations in the east of Phase 53 within the soils in the form of staining, odours and a localised oily sheen. Further investigation in was undertaken in the vicinity of these observations, as reported in Atkins' Technical Note 1350 (Information Source 5). Atkins reports that these investigations found no evidence of contamination and the soils were considered suitable for retention.

Laboratory analysis of the soil samples recovered from Phase 53 did not identify any chemical concentrations in excess of the adopted thresholds for a residential end use. Suspected asbestos was reported to have been encountered in five locations however quantification indicated concentrations below the laboratory method detection limit.

2.2 Remediation Strategy

Schedule 8 of the Section 106 Agreement sets out the minimum remedial action required depending on the intended use and the groundwater regime. As noted above, the intended use for Phase 53 has been declared as residential and groundwater is primarily in rock i.e. 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. Therefore, the following minimum remedial action was considered necessary for Phase 53 in accordance with the requirements listed in the Section 106 Agreement:

- All oil saturated soil should be removed.
- 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.
- The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.
- 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.
- 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.
- 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.

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

- All buried services shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity.
- 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 of the Section 106 Agreement 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 3** of this report.

Based on the above requirements and the findings of the site assessment discussed in Section 2.1 of this report, Atkins considered that no remediation works were necessary.

The Monitor considered the above approach to be appropriate in accordance with the requirements of the Section 106 Agreement.

2.3 Redevelopment Remediation Works

Based on the findings of the site assessment discussed in Section 2.1 of this report, no remediation was considered necessary.

2.4 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 requirements specified in the Section 106 Agreement have been achieved.

It should be noted that in the absence of a detailed layout for the proposed development and confirmed FFLs, it has been assumed that the ground levels following the completion of the redevelopment remediation works represents FFL minus 1m. A topographical record of the ground levels upon which this certificate is based are shown on drawing 5041216-ATK-DR-C-REM-DWG-2007 Rev P1 a copy of which is provided in **Appendix F**.

2.4.1 Aesthetic Criteria

The Section 106 Agreement requires that all soils within the top 1m below FFL must be remediated such that the aesthetic quality, as defined in **Table 3** of this report, is Class 1 or better and that all soils at depths greater than 1m below FFL must be Class 2 or better.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is necessary that all soils above bedrock must be Class 2 or better.

During the investigation undertaken by Atkins, the visual/olfactory assessment identified two areas of concern where potential evidence of hydrocarbon contamination was observed. However, Atkins reports that further investigation in these areas suggested that the observations were likely to be representative of an ochreous seepage that may have been mistakenly identified as oily sheen. Further reference should be made to Atkins' Technical Note 1350 (Information Source 3). Following these works Atkins reports visual/olfactory scores of 0 across Phase 53.

The Monitor is therefore satisfied that the soils within Phase 53 meet the necessary aesthetic criteria as specified in the Section 106 Agreement.

2.4.2 Removal of Oil Saturated Soils

The Section 106 Agreement requires that all oil saturated soil should be removed.

Given that the investigations undertaken by Atkins did not identify any source of free product, no removal of soils was required.

The Monitor is therefore satisfied that oil saturated soils are not present within Phase 53 in accordance with the requirements of the Section 106 Agreement.

2.4.3 **Soil Chemical Quality**

The Section 106 Agreement requires that all soils must be remediated to meet the RBSLs for TPH, BTEX and PAHs at the relevant depth relative to FFL.

Given that Phase 53 represents a residential phase where groundwater is primarily in rock, the relevant depth to FFL, as defined in the Section 106 Agreement, is the level at which bedrock is encountered. This effectively means that all soils from bedrock to FFL must meet the specified RBSL thresholds.

In addition to the RBSLs, in order to assess the significance of any reported contaminant concentrations, validation results have also been screened against Remediation Target Concentrations (RTCs) which have been developed by Atkins. The RTCs are intended to be health protective for a low density residential end-use. It has been agreed previously with NPTCBC that where the RTCs are numerically lower, i.e. more conservative, than the RBSLs, then the RTCs shall be used. A summary of the relevant RBSLs and RTCs is presented in **Appendix G**.

It should be noted that the RBSL/RTC thresholds are depth dependent. Given that the ground levels upon which this certificate is based represent FFL minus 1m, the following section only considers deep soils (those soils greater than 1m below FFL). It should be noted that if the development layout and proposed FFLs differ significantly from the assumed FFLs then further remediation works may be required.

As reported in Atkins' validation report (Information Source 5) chemical analysis of the soil samples recovered from Phase 53 indicated no exceedances of the RBSLs or RTCs for deep soils in a residential setting.

The Monitor is therefore satisfied that the deep soils within Phase 53 meet the necessary chemical quality as specified in the Section 106 Agreement.

With regards the validation of shallow soils from FFL to FFL minus 1m, the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued, so it has therefore been agreed with the NPTCBC that the quality of these soils will be regulated via planning control when the works take place.

2.4.4 **Testing Frequencies**

The Section 106 Agreement requires that the quality of all material placed as fill and/or remaining in-situ post-construction must as a minimum meet the relevant RBSLs and aesthetic standards at the testing frequencies set out in Table 4 of Schedule 8 of the Section 106 Agreement i.e. the sampling of soils shall be undertaken to the minimum frequencies defined.

Given the intention for all soils currently situated within Phase 53 to remain in-situ as deep soils, with shallow soils being imported at a later date, the following minimum testing frequencies are considered to be applicable to the soils currently situated within Phase 53.

- Deep in-situ residential soils at a minimum testing frequency of 1 per 100m² sampled over a 1m depth.

However, it was agreed that given the findings of the desk study and the lack of historical uses within Phase 53, it was agreed with the Monitor prior to the site investigations that the minimum testing frequency could be reduced as long as chemical analysis of the soils did not identify any reasons for concern.

Atkins reports that a total of 101 trial pits were excavated across Phase 53, the area of which is 38,620m². This equates to a testing frequency of 1 per 382m². Although the minimum specified testing frequency has not been achieved, given the lack of historical uses within this area, coupled with the lack of RBSL/RTC exceedances, the Monitor is satisfied that an

appropriate number of validation samples have been collected in order to demonstrate compliance with the testing requirements specified in the Section 106 Agreement.

2.4.5 *Top 0.5m of Quality Controlled Imported Fill*

The Section 106 Agreement requires that a minimum thickness of suitable garden soils are to be provided in residential areas, soils for landscaping in public and commercial areas and sub-base for hardsurfaced areas which shall 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 0 for residential use and type 1 or better for commercial use.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is not yet possible to demonstrate that this requirement has been met. It has been agreed with NPTCBC that the quality of imported soils within the top 1m will be controlled via planning conditions given that the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued.

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

2.4.6 *Removal of Ash, Clinker and Metals*

The Section 106 Agreement requires that visible ash and clinker and metal concentrations above RBSLs are to be removed from soils so that none is retained within the first 1m below FFL in garden areas.

Given that the ground levels upon which this certificate is based represent FFL minus 1m, it is not yet possible to demonstrate that this requirement has been met. As above, the import of soils within the top 1m will therefore be controlled via planning conditions given that the Monitor will have no formal on-going role to control subsequent works once the RRWCC is issued.

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

2.4.7 *Asbestos*

The Section 106 Agreement requires that all soils 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. In this instance, the Environmental Authorities have not declared any more stringent requirements and therefore the RBSLs/RTCs shall apply.

It should be noted that under the scenario for residential phases where groundwater is in rock, as specified in Schedule 8 of the Section 106 Agreement, there is no minimum depth to which the above requirements must be met. However, under the scenario for residential phases where groundwater is in soil it is stated that the asbestos requirements must be achieved to minimum depth of 2m below FFL. On previous residential phases where groundwater is in rock it has been agreed that it is appropriate for this minimum depth of 2m below FFL to also apply.

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.

Atkins' validation report (Information Source 5) states that there was no visible asbestos containing material observed in the soils during the ground investigation. As mentioned in Section 2.1.2 of this report laboratory analysis of soil samples identified suspected asbestos within five samples. These samples underwent quantification and returned results below the laboratory method detection limit.

The Monitor is satisfied that the soils within Phase 53 meet the necessary requirements for asbestos as defined in the Section 106 Agreement.

2.4.8 Groundwater

The Section 106 Agreement requires 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 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.

Observations during the site investigation indicated that groundwater is at significant depth within the underlying bedrock across Phase 53. It is therefore considered unlikely that groundwater would enter the top 1m below FFL.

The Monitor is therefore satisfied that there is no significant risk of groundwater re-contaminating soils within the top 1m below FFL and therefore no further measures as listed in the Section 106 Agreement are considered necessary.

2.4.9 Seepages

The Section 106 Agreement requires that where it is not practicable to address groundwater contamination within bedrock then 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.

Atkins' validation report (Information Source 5) describes an oily sheen present on a groundwater strike at Trial Pit NSE53 within the competent bedrock at 3.0m below ground level (bgl). The overlying soil was reported to be 'clean', with no visual or olfactory evidence of contamination recorded. The trial pits surrounding NSE53 were all excavated to bedrock with no visual or olfactory evidence of contamination recorded within soil or on bedrock. Further investigation was undertaken with one trial pit excavated to the west and one to the east of NSE53. The eastern trial pit was excavated and terminated at 4.0m bgl in weathered sandstone. No groundwater or seepage was noted at this location. The western trial pit encountered a slight seepage at 3.5m bgl within the weathered sandstone bedrock. The soils removed from the trial pit were found to be wet but there was no visual or olfactory evidence of contamination returning a visual/olfactory score of 0/0. It was concluded that due to the absence of visual or olfactory evidence of contamination that the previous identified sheen was likely to have been an ochreous precipitate, rather than hydrocarbon.

Given that the surface of the bedrock will be at significant depth in relation to FFL, there is not considered to be a significant risk of visible discharge of seepages, sheens or iron stained discharge from the bedrock. The Monitor is therefore satisfied that no further measures are necessary in relation to Phase 53.

2.4.10 **Removal of Buried Services**

The Section 106 Agreement requires 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.

No services were identified during the site investigations within Phase 53 and the Monitor is satisfied that buried services are unlikely to be present given the historic land uses.

3. **CERTIFICATION**

3.1 **Redevelopment Remediation Works**

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 7** provides a list of the minimum remedial action required for a residential phase where groundwater is in rock, as described in Section 2.2 of this report, and summarises whether or not each requirement has been satisfied.

Table 7 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 Schedule 8 of the Section 106 Agreement (as applicable depending upon whether such part of the property is intended for use as residential, commercial or recreational land) as a minimum base level standard.	Complete	Refer to Section 2.4 of this report.
All oil saturated soils shall be removed.	Complete	Refer to Section 2.4.2 of this report.
All soils must meet the RBSL for TPH, BTEX and PAHs at the relevant depth relative to FFL.	Complete	Refer to Section 2.4.3 of this report.
All soils must meet the aesthetic criteria Class 2 or better at greater than 1m below FFL.	Complete	Refer to Section 2.4.1 of this report.
The aesthetic quality of soils shall be Class 1 or better for at least the first metre below FFL.	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.1 of this report.

Requirement	Status	Comments
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	Not applicable	The top 1m of soils is yet to be placed. Refer to Section 2.4.6 of this report.
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.	Complete	Refer to Section 2.4.9 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 to a minimum depth of 2m below FFL.	Complete	Refer to Section 2.4.7 of this report.
Irrespective of the intended use of each phase or part thereof, all existing buried services at the property shall be removed and the routes of those services shall be backfilled with material no more permeable than the general material in the vicinity. Where backfill to new underground services may become a pathway for residential pre-transfer date contamination, appropriate control measures such as land drainage or venting measures shall be installed so as to appropriately protect remediated and/or developed areas.	Complete	Refer to Section 2.4.10 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 2.4.8 of this report.

Requirement	Status	Comments
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 2.4.5 of this report.

3.2 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 53.

3.2.1 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 53 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.

4. CONCLUSIONS

4.1 RRWCC

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 by the Monitor on site during the remediation works, the Monitor is satisfied that the Phase 53 redevelopment remediation works appear to have been completed in general accordance with the purpose, objectives and requirements of Schedule 8 of the Section 106 Agreement, having regard to the specified intended uses, and that the purpose, objectives and requirements of

Schedule 8 of the Section 106 Agreement are likely to continue to be met for the foreseeable future without the need for further remedial action in relation to or affecting the area within the phase boundary.

4.2 PWCD

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.

APPENDIX A DECLARATION OF PHASE BOUNDARY, INTENDED USE AND PROPOSED DEVELOPMENT LAYOUT



ST. MODWEN DEVELOPMENTS LIMITED - a ST. MODWEN company

Registration England 892832

Park Point, 17 High Street, Longbridge, Birmingham, B31 2UQ

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

20th March 2015

Our ref:

Coed Darcy Limited
Dumfries House
Dumfries Place
Cardiff
CF10 3ZF

Dear Sirs

**Coed Darcy
Monitor Phase 53
Request for Phase Works Completion Date**

We hereby give our written request seeking the declaration of the Phase Works Completion Date for Monitor Phase 53 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 53 boundary is shown on the attached Drawing No. 5041216-REM-DWG-1777.

The "Intended Use" for Phase 53 is assumed as that of a proposed residential end use and associated highways.

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

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

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