

Product Information		Inventory		Sales		Marketing		Customer		Financial	
Product Details		SKU	Barcode	Quantity	Unit Price	Total Price	Discount	Net Price	Customer Name	Customer Address	Customer Phone
Product Name	Product Description	SKU	Barcode	Quantity	Unit Price	Total Price	Discount	Net Price	Customer Name	Customer Address	Customer Phone
PROD-001	Widget A	WGT-A-001	1234567890123	100	10.00	1000.00	0.00	1000.00	Customer A	123 Main St, New York, NY 10001	212-555-1234
PROD-002	Widget B	WGT-B-002	9876543210987	200	20.00	4000.00	0.00	4000.00	Customer B	456 Main St, Los Angeles, CA 90001	310-555-5678
PROD-003	Widget C	WGT-C-003	5678901234567	50	50.00	2500.00	0.00	2500.00	Customer C	789 Main St, Chicago, IL 60601	312-555-9012
PROD-004	Widget D	WGT-D-004	3456789012345	300	30.00	9000.00	0.00	9000.00	Customer D	101 Main St, Houston, TX 77001	713-555-3456
PROD-005	Widget E	WGT-E-005	2345678901234	150	15.00	2250.00	0.00	2250.00	Customer E	234 Main St, Phoenix, AZ 85001	602-555-2345
PROD-006	Widget F	WGT-F-006	8901234567890	80	80.00	6400.00	0.00	6400.00	Customer F	567 Main St, San Antonio, TX 78201	214-555-8901
PROD-007	Widget G	WGT-G-007	6789012345678	120	12.00	1440.00	0.00	1440.00	Customer G	890 Main St, San Diego, CA 92101	619-555-6789
PROD-008	Widget H	WGT-H-008	4567890123456	250	25.00	6250.00	0.00	6250.00	Customer H	123 Main St, Dallas, TX 75201	214-555-4567
PROD-009	Widget I	WGT-I-009	3456789012345	180	18.00	3240.00	0.00	3240.00	Customer I	456 Main St, San Jose, CA 95101	408-555-3456
PROD-010	Widget J	WGT-J-010	2345678901234	90	90.00	8100.00	0.00	8100.00	Customer J	789 Main St, Austin, TX 78701	512-555-2345
PROD-011	Widget K	WGT-K-011	1234567890123	110	11.00	1210.00	0.00	1210.00	Customer K	101 Main St, Fort Worth, TX 76101	817-555-1234
PROD-012	Widget L	WGT-L-012	9876543210987	160	16.00	2560.00	0.00	2560.00	Customer L	234 Main St, San Francisco, CA 94101	415-555-9876
PROD-013	Widget M	WGT-M-013	5678901234567	130	13.00	1690.00	0.00	1690.00	Customer M	567 Main St, Jacksonville, FL 32201	904-555-5678
PROD-014	Widget N	WGT-N-014	3456789012345	220	22.00	4840.00	0.00	4840.00	Customer N	890 Main St, San Jose, CA 95101	408-555-3456
PROD-015	Widget O	WGT-O-015	2345678901234	170	17.00	2890.00	0.00	2890.00	Customer O	123 Main St, Austin, TX 78701	512-555-2345
PROD-016	Widget P	WGT-P-016	1234567890123	140	14.00	1960.00	0.00	1960.00	Customer P	456 Main St, San Jose, CA 95101	408-555-3456
PROD-017	Widget Q	WGT-Q-017	9876543210987	190	19.00	3610.00	0.00	3610.00	Customer Q	789 Main St, Austin, TX 78701	512-555-2345
PROD-018	Widget R	WGT-R-018	5678901234567	160	16.00	2560.00	0.00	2560.00	Customer R	101 Main St, Fort Worth, TX 76101	817-555-1234
PROD-019	Widget S	WGT-S-019	3456789012345	210	21.00	4410.00	0.00	4410.00	Customer S	234 Main St, San Francisco, CA 94101	415-555-9876
PROD-020	Widget T	WGT-T-020	2345678901234	180	18.00	3240.00	0.00	3240.00	Customer T	567 Main St, Jacksonville, FL 32201	904-555-5678
PROD-021	Widget U	WGT-U-021	1234567890123	150	15.00	2250.00	0.00	2250.00	Customer U	890 Main St, San Jose, CA 95101	408-555-3456
PROD-022	Widget V	WGT-V-022	9876543210987	120	12.00	1440.00	0.00	1440.00	Customer V	123 Main St, Austin, TX 78701	512-555-2345
PROD-023	Widget W	WGT-W-023	5678901234567	170	17.00	2890.00	0.00	2890.00	Customer W	456 Main St, San Jose, CA 95101	408-555-3456
PROD-024	Widget X	WGT-X-024	3456789012345	200	20.00	4000.00	0.00	4000.00	Customer X	789 Main St, Austin, TX 78701	512-555-2345
PROD-025	Widget Y	WGT-Y-025	2345678901234	190	19.00	3610.00	0.00	3610.00	Customer Y	101 Main St, Fort Worth, TX 76101	817-555-1234
PROD-026	Widget Z	WGT-Z-026	1234567890123	160	16.00	2560.00	0.00	2560.00	Customer Z	234 Main St, San Francisco, CA 94101	415-555-9876
PROD-027	Widget AA	WGT-AA-027	9876543210987	130	13.00	1690.00	0.00	1690.00	Customer AA	567 Main St, Jacksonville, FL 32201	904-555-5678
PROD-028	Widget AB	WGT-AB-028	5678901234567	180					Customer AB		
PROD-029	Widget AC	WGT-AC-029	3456789012345	220					Customer AC		
PROD-030	Widget AD	WGT-AD-030	2345678901234	170					Customer AD		
PROD-031	Widget AE	WGT-AE-031	1234567890123	140					Customer AE		
PROD-032	Widget AF	WGT-AF-032	9876543210987	190					Customer AF		
PROD-033	Widget AG	WGT-AG-033	5678901234567	160					Customer AG		
PROD-034	Widget AH	WGT-AH-034	3456789012345	210					Customer AH		
PROD-035	Widget AI	WGT-AI-035	2345678901234	180					Customer AI		
PROD-036	Widget AJ	WGT-AJ-036	1234567890123	150					Customer AJ		
PROD-037	Widget AK	WGT-AK-037	9876543210987	120					Customer AK		
PROD-038	Widget AL	WGT-AL-038	5678901234567	170					Customer AL		
PROD-039	Widget AM	WGT-AM-039	3456789012345	200					Customer AM		
PROD-040	Widget AN	WGT-AN-040	2345678901234	190					Customer AN		
PROD-041	Widget AO	WGT-AO-041	1234567890123	160					Customer AO		
PROD-042	Widget AP	WGT-AP-042	9876543210987	130					Customer AP		
PROD-043	Widget AQ	WGT-AQ-043	5678901234567	180					Customer AQ		
PROD-044	Widget AR	WGT-AR-044	3456789012345	220					Customer AR		
PROD-045	Widget AS	WGT-AS-045	2345678901234	170					Customer AS		
PROD-046	Widget AT	WGT-AT-046	1234567890123	140					Customer AT		
PROD-047	Widget AU	WGT-AU-047	9876543210987	190					Customer AU		
PROD-048	Widget AV	WGT-AV-048	5678901234567	160					Customer AV		
PROD-049	Widget AW	WGT-AW-049	3456789012345	210					Customer AW		
PROD-050	Widget AX	WGT-AX-050	2345678901234	180					Customer AX		
PROD-051	Widget AY	WGT-AY-051	1234567890123	150					Customer AY		
PROD-052	Widget AZ	WGT-AZ-052	9876543210987	120					Customer AZ		
PROD-053	Widget BA	WGT-BA-053	5678901234567	170					Customer BA		
PROD-054	Widget BB	WGT-BB-054	3456789012345	200					Customer BB		
PROD-055	Widget BC	WGT-BC-055	2345678901234	190					Customer BC		
PROD-056	Widget BD	WGT-BD-056	1234567890123	160					Customer BD		
PROD-057	Widget BE	WGT-BE-057	9876543210987	130					Customer BE		
PROD-058	Widget BF	WGT-BF-058	5678901234567	180					Customer BF		
PROD-059	Widget BG	WGT-BG-059	3456789012345	220					Customer BG		
PROD-060	Widget BH	WGT-BH-060	2345678901234	170					Customer BH		
PROD-061	Widget BI	WGT-BI-061	1234567890123	140					Customer BI		
PROD-062	Widget BJ	WGT-BJ-062	9876543210987	190					Customer BJ		
PROD-063	Widget BK	WGT-BK-063	5678901234567	160					Customer BK		
PROD-064	Widget BL	WGT-BL-064	3456789012345	210					Customer BL		
PROD-065	Widget BM	WGT-BM-065	2345678901234	180					Customer BM		
PROD-066	Widget BN	WGT-BN-066	1234567890123	150					Customer BN		
PROD-067	Widget BO	WGT-BO-067	9876543210987	120					Customer BO		
PROD-068	Widget BP	WGT-BP-068	5678901234567	170					Customer BP		
PROD-069	Widget BQ	WGT-BQ-069	3456789012345	200					Customer BQ		
PROD-070	Widget BR	WGT-BR-070	2345678901234	190					Customer BR		
PROD-071	Widget BS	WGT-BS-071	1234567890123	160					Customer BS		
PROD-072	Widget BT	WGT-BT-072	9876543210987	130					Customer BT		
PROD-073	Widget BU	WGT-BU-073	5678901234567	180					Customer BU		
PROD-074	Widget BV	WGT-BV-074	3456789012345	220					Customer BV		
PROD-075	Widget BV	WGT-BV-075	2345678901234	170					Customer BV		
PROD-076	Widget BW	WGT-BW-076	1234567890123	140					Customer BW		
PROD-077	Widget BX	WGT-BX-077	9876543210987	190					Customer BX		
PROD-078	Widget BY	WGT-BY-078	5678901234567	160					Customer BY		
PROD-079	Widget BZ	WGT-BZ-079	3456789012345	210					Customer BZ		
PROD-080	Widget CA	WGT-CA-080	2345678901234	180					Customer CA		
PROD-081	Widget CB	WGT-CB-081	1234567890123	150					Customer CB		
PROD-082	Widget CC	WGT-CC-082	9876543210987	120					Customer CC		
PROD-083	Widget CD	WGT-CD-083	5678901234567	170					Customer CD		
PROD-084	Widget CE	WGT-CE-084	3456789012345	200					Customer CE		
PROD-085	Widget CF	WGT-CF-085	2345678901234	190					Customer CF		
PROD-086	Widget CG	WGT-CG-086	1234567890123	160					Customer CG		
PROD-087	Widget CH	WGT-CH-087	9876543210987	130					Customer CH		
PROD-088	Widget CI	WGT-CI-088	5678901234567	180					Customer CI		
PROD-089	Widget CJ	WGT-CJ-089	3456789012345	220					Customer CJ		
PROD-090	Widget CK	WGT-CK-090	2345678901234	170					Customer CK		
PROD-091	Widget CL	WGT-CL-091	1234567890123	140					Customer CL		
PROD-092	Widget CM	WGT-CM-092	9876543210987	190					Customer CM		
PROD-093	Widget CN	WGT-CN-093	5678901234567	160					Customer CN		
PROD-094	Widget CO	WGT-CO-094	3456789012345	210					Customer CO		
PROD-095	Widget CP	WGT-CP-095	2345678901234	180					Customer CP		
PROD-096	Widget CQ	WGT-CQ-096	1234567890123	150					Customer CQ		
PROD-097	Widget CR	WGT-CR-097	9876543210987	120					Customer CR		
PROD-098	Widget CS	WGT-CS-098	5678901234567	170					Customer CS		
PROD-099	Widget CT	WGT-CT-099	3456789012345	200					Customer CT		
PROD-100	Widget CU	WGT-CU-100	2345678901234	190					Customer CU		
PROD-101	Widget CV	WGT-CV-101	1234567890123	160					Customer CV		
PROD-102	Widget CW	WGT-CW-102	9876543210987	130					Customer CW		
PROD-103	Widget CX	WGT-CX-103	5678901234567	180					Customer CX		
PROD-104	Widget CY	WGT-CY-104	3456789012345	220					Customer CY		
PROD-105	Widget CZ	WGT-CZ-105	2345678901234	170					Customer CZ		
PROD-106	Widget DA	WGT-DA-106	1234567890123	140					Customer DA		
PROD-107	Widget DB	WGT-DB-107	9876543210987	190					Customer DB		
PROD-108	Widget DC	WGT-DC-108	5678901234567	160					Customer DC		
PROD-109	Widget DD	WGT-DD-109	3456789012345	210					Customer DD		
PROD-110	Widget DE	WGT-DE-110	2345678901234	180					Customer DE		
PROD-111	Widget DF	WGT-DF-111	1234567890123	150					Customer DF		
PROD-112	Widget DG	WGT-DG-112	9876543210987	120					Customer DG		
PROD-113	Widget DH	WGT-DH-113	5678901234567	170					Customer DH		
PROD-114	Widget DI	WGT-DI-114	3456789012345	200					Customer DI		
PROD-115	Widget DJ	WGT-DJ-115	2345678901234	190					Customer DJ		
PROD-116	Widget DK	WGT-DK-116	1234567890123	160					Customer DK		
PROD-117	Widget DL	WGT-DL-117	9876543210987	130					Customer DL		
PROD-118											

Location	Zone	Depth	Asbestos	Type
TPE 157	E	0.10-	0-	
TPE163	E	0.10-0.00	0-	
TPE166	E	0.10-0.00	0-	
TPE178	E	0.10-0.00	0-	
TPE179	E	0.10-0.00	Loose fibres in soil	<0.001
TPE196	E	0.10-0.00	0-	
TPE207	E	0.10-0.00	0-	
TPE223	E	0.10-0.00	Loose fibres in soil	-
TPE229	E	0.10-0.00	Loose fibres in soil	0.0378
TPE 230	E	0.10-0.10	0-	
TPE 232	E	0.10-0.10	0-	
IP 9	E	0.20-	0-	
IP070	E	0.20-	0-	
TP 6061	E	0.20-	0-	
TP 6062	E	0.20-	0-	
TP 6100	E	0.20-	0-	
TPE154	E	0.20-	0-	
TPE 159	E	0.20-	0-	
TPE 162	E	0.20-0.00	0-	
TPE 165	E	0.20-0.00	0-	
TPE205	E	0.20-0.00	0-	
TPE224	E	0.20-0.00	Loose fibres in soil	<0.001
TPE228	E	0.20-0.00	0-	
TPE 227	E	0.20-0.20	0-	
TPE 157	E	0.25-	-	
TP 6063	E	0.30-	0-	
TP 6067	E	0.30-	0-	
TPE153	E	0.30-	0-	
TPE156	E	0.30-	0-	
TPE 164	E	0.30-0.00	0-	
TPE197	E	0.30-0.00	0-	
TPE 231	E	0.30-0.30	Loose fibres in soil	0.0014
TP 6069	E	0.40-	0-	
TP 6064	E	0.40-	0-	
TP 6068	E	0.40-	0-	
TP 6069	E	0.40-	0-	
TPE152	E	0.40-	0-	
TPE 155	E	0.40-	0-	
IP 001	E	0.50-	-	
IP 003	E	0.50-	-	
IP 010	E	0.50-	-	
IP 012	E	0.50-	-	
IP 013	E	0.50-	-	
IP 029	E	0.50-	-	
IP 036	E	0.50-	-	
IP 1	E	0.50-	-	
IP 126	E	0.50-	0-	
IP 134	E	0.50-	0-	
IP 198	E	0.50-	0-	
IP 2	E	0.50-	-	<0.001
IP 212	E	0.50-	0-	
IP 3	E	0.50-	-	
IP 36	E	0.50-	0-	
IP 37	E	0.50-	0-	
IP 446	E	0.50-	0-	
IP 458	E	0.50-	0-	
IP 462	E	0.50-	0-	
IP 477	E	0.50-	0-	
IP 6	E	0.50-	0-	
IP 7	E	0.50-	Loose fibres in soil	<0.001
IP 91	E	0.50-	0-	
IP027	E	0.50-	-	
IP035	E	0.50-	-	
IP060	E	0.50-	-	
IP061	E	0.50-	-	
IP069	E	0.50-	0-	
IP070	E	0.50-	0-	
IP404	E	0.50-	Soil containing loose	0.0056
IP405	E	0.50-	0-	
IP407	E	0.50-	0-	
IP425	E	0.50-	0-	
IP434	E	0.50-	0-	
IP435	E	0.50-	0-	
IP449	E	0.50-	0-	
TPE 158	E	0.50-	-	
TPE 170	E	0.50-	-	
IP020	E	0.50-	-	
IP021	E	0.50-	0-	
IP022	E	0.50-	0-	
IP027	E	0.50-	-	
IP050	E	0.50-	Loose fibres in soil	<0.001
IP051	E	0.50-	0-	
IP052	E	0.50-	0-	
IP089	E	0.50-	0-	
IP127	E	0.50-	0-	
IP141	E	0.50-	Loose fibres in soil	<0.001
IP142	E	0.50-	-	
IP143	E	0.50-	0-	
IP174	E	0.50-	0-	
IP199	E	0.50-	0-	
IP200	E	0.50-	0-	
IP206	E	0.50-	0-	
IP210	E	0.50-	0-	
IP211	E	0.50-	0-	
IP213	E	0.50-	0-	
IP401	E	0.50-	0-	
IP402	E	0.50-	0-	
IP406	E	0.50-	0-	
IP408	E	0.50-	0-	
IP426	E	0.50-	0-	
IP433	E	0.50-	0-	
IP436	E	0.50-	0-	
IP445	E	0.50-	0-	
IP448	E	0.50-	0-	
IP456	E	0.50-	0-	
IP459	E	0.50-	0-	
IP460	E	0.50-	0-	
IP461	E	0.50-	0-	
IP004	E	0.50-	0-	
IP005	E	0.50-	0-	
IP103	E	0.50-	Loose fibres in soil	<0.001
IP104	E	0.50-	0-	
IP105	E	0.50-	0-	
IP141	E	0.50-	0-	
IP142	E	0.50-	0-	
IP172	E	0.50-	Loose fibres in soil	<0.001
IP173	E	0.50-	0-	
IP197	E	0.50-	Loose fibres in soil	<0.001
IP209	E	0.50-	-	
IP212	E	0.50-	Loose fibres in soil	0.0012
IP214	E	0.50-	0-	
TPE 5005	E	0.50-	0-	
TPE166	E	0.50-0.00	0-	
IP038	E	0.60-	0-	
TP 6068	E	0.60-	0-	
TPE 154	E	0.80-	0-	
TPE 157	E	0.80-	0-	
TPE 162	E	0.80-0.00	0-	
TPE 196	E	0.80-0.00	-	
TPE223	E	0.80-0.00	0-	
TPE224	E	0.80-0.00	0-	
TPE229	E	0.80-0.00	0-	
TP 6063	E	0.90-	0-	
TP 6100	E	0.90-	0-	
TPE 164	E	0.90-0.00	0-	
TPE228	E	0.90-0.00	0-	
IP 9	E	1.00-	-	
IP060	E	1.00-	-	
IP069	E	1.00-	-	
IP062	E	1.00-	-	
IP199	E	1.00-	-	
IP209	E	1.00-	-	
TPE153	E	1.00-	-	
TPE 159	E	1.00-	-	
TPE163	E	1.00-0.00	0-	
TPE178	E	1.00-0.00	0-	
TPE179	E	1.00-0.00	0-	
TPE206	E	1.00-0.00	0-	
TPE207	E	1.00-0.00	0-	
TPE 227	E	1.00-1.00	-	
TPE 230	E	1.00-1.00	0-	
POS 100	E	0.50-0.50	Loose fibres in soil	Trace
POS 101	E	0.50-0.50	0	
POS 102	E	0.50-0.50	0	
POS 103	E	0.50-0.50	0	
POS 104	E	0.50-0.50	0	
POS 105	E	0.50-0.50	0	
POS 106	E	0.50-0.50	0	
POS 107	E	0.50-0.50	0	
POS 108	E	0.50-0.50	-	
POS 109	E	0.50-0.50	0	
POS 110	E	0.50-0.50	0	
POS 110	E	1.50-1.50	-	
POS 111	E	0.50-0.50	0	
POS 112	E	0.50-0.50	0	
POS 113	E	0.50-0.30	0	
POS 114	E	0.50-0.50	0	
POS 58	E	0.50-0.50	0	
POS 59	E	0.50-0.50	0	
POS 66	E	0.50-0.50	0	
POS 67	E	0.50-0.50	0	
POS 68	E	0.50-0.50	0	
POS 69	E	0.50-0.50	-	
POS 70	E	0.50-0.50	0	
POS 71	E	0.50-0.50	0	
POS 72	E	0.50-0.50	0	
POS 73	E	0.50-0.50	0	
POS 74	E	0.50-0.50	0	
POS 75	E	0.50-0.50	0	
POS 76	E	0.50-0.50	0	
POS 77	E	0.50-0.50	0	
POS 78	E	0.50-0.50	0	
POS 79	E	0.50-0.50	0	
POS 80	E	0.50-0.50	0	
POS 81	E	0.50-0.50	0	
POS 82	E	0.50-0.50	Loose fibres in soil	<0.001
POS 83	E	0.50-0.50	0	
POS 84	E	0.50-0.50	Loose fibres in soil	<0.001
POS 85	E	0.50-0.50	0	
POS 86	E	0.50-0.50	0	
POS 87	E	0.50-0.50	0	
POS 88	E	0.50-0.50	0	
POS 89	E	0.50-0.50	0	
POS 90	E	0.50-0.50	0	
POS 91	E	0.50-0.50	0	
POS 92	E	0.50-0.50	0	
POS 93	E	0.50-0.50	0	
POS 94	E	0.50-0.50	0	
POS 95	E	0.50-0.50	0	
POS 96	E	0.50-0.50	Loose fibres in soil	0.0066
POS 97	E	0.50-0.50	0	
POS 98	E	0.50-0.50	0	
POS 99	E	0.50-0.50	0	
POS 115	E	0.50-0.50	Not Detected	
POS 116	E	0.50-0.50	Not Detected	
POS 118	E	0.30-0.30	Detected	0.036
POS 119	E	0.50-0.50	Not Detected	
POS 120	E	0.50-0.50	Not Detected	
POS 121	E	0.50-0.50	Not Detected	
POS 122	E	0.50-0.50	Not Detected	
POS 123	E	0.50-0.50	Detected	<0.001
IP 0449 R	E	0.5	Not Detected	
TPE 0229 R	E	0.1	Detected	not quant

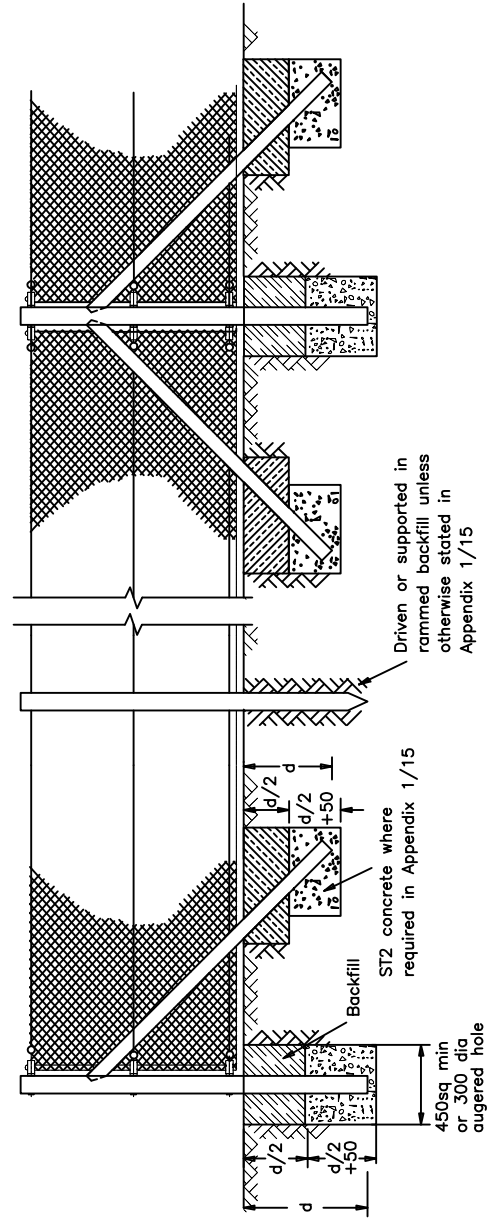
Inventory Management System - Q3 2023												
Item ID	Item Name	Category	Unit	Current Stock	Reorder Point	Supplier	Lead Time (Days)	Unit Cost	Total Value	Last Audit	Notes	Warehouse
001	Widget A	Electronics	Box	150	100	Supplier X	5	\$120	\$18,000	2023-07-15	Good	Warehouse 1
002	Widget B	Electronics	Box	200	150	Supplier Y	7	\$90	\$18,000	2023-07-10	Good	Warehouse 1
003	Widget C	Electronics	Box	180	120	Supplier Z	6	\$100	\$18,000	2023-07-12	Good	Warehouse 1
004	Widget D	Electronics	Box	160	110	Supplier X	5	\$112.5	\$18,000	2023-07-14	Good	Warehouse 1
005	Widget E	Electronics	Box	140	90	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
006	Widget F	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
007	Widget G	Electronics	Box	190	140	Supplier X	5	\$94.7	\$18,000	2023-07-16	Good	Warehouse 1
008	Widget H	Electronics	Box	130	80	Supplier Y	7	\$138.4	\$18,000	2023-07-09	Good	Warehouse 1
009	Widget I	Electronics	Box	165	115	Supplier Z	6	\$109.1	\$18,000	2023-07-12	Good	Warehouse 1
010	Widget J	Electronics	Box	155	105	Supplier X	5	\$116.1	\$18,000	2023-07-14	Good	Warehouse 1
011	Widget K	Electronics	Box	145	95	Supplier Y	7	\$124.3	\$18,000	2023-07-11	Good	Warehouse 1
012	Widget L	Electronics	Box	175	135	Supplier Z	6	\$102.7	\$18,000	2023-07-13	Good	Warehouse 1
013	Widget M	Electronics	Box	185	145	Supplier X	5	\$97.3	\$18,000	2023-07-16	Good	Warehouse 1
014	Widget N	Electronics	Box	135	85	Supplier Y	7	\$133.3	\$18,000	2023-07-09	Good	Warehouse 1
015	Widget O	Electronics	Box	160	110	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
016	Widget P	Electronics	Box	150	100	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
017	Widget Q	Electronics	Box	140	90	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
018	Widget R	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
019	Widget S	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
020	Widget T	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
021	Widget U	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
022	Widget V	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
023	Widget W	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
024	Widget X	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
025	Widget Y	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
026	Widget Z	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
027	Widget AA	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
028	Widget AB	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
029	Widget AC	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
030	Widget AD	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
031	Widget AE	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
032	Widget AF	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
033	Widget AG	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
034	Widget AH	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
035	Widget AI	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
036	Widget AJ	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
037	Widget BA	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
038	Widget BB	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
039	Widget BC	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
040	Widget BD	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
041	Widget BE	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
042	Widget BF	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
043	Widget BG	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
044	Widget BH	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
045	Widget BI	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
046	Widget BJ	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
047	Widget CA	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
048	Widget CB	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
049	Widget CC	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
050	Widget CD	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
051	Widget CE	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
052	Widget CF	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
053	Widget CG	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
054	Widget CH	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
055	Widget CI	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
056	Widget CJ	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
057	Widget DA	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
058	Widget DB	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
059	Widget DC	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
060	Widget DD	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
061	Widget DE	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
062	Widget DF	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
063	Widget DG	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
064	Widget DH	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
065	Widget DI	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
066	Widget DJ	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
067	Widget EA	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
068	Widget EB	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
069	Widget EC	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
070	Widget ED	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
071	Widget EE	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
072	Widget EF	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
073	Widget EG	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
074	Widget EH	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
075	Widget EI	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
076	Widget EJ	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
077	Widget FA	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
078	Widget FB	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
079	Widget FC	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
080	Widget FD	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
081	Widget FE	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
082	Widget FF	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
083	Widget FG	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
084	Widget FH	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
085	Widget FI	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
086	Widget FJ	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
087	Widget GA	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
088	Widget GB	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
089	Widget GC	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
090	Widget GD	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
091	Widget GE	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
092	Widget GF	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
093	Widget GG	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
094	Widget GH	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
095	Widget GI	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
096	Widget GJ	Electronics	Box	150	110	Supplier Z	6	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
097	Widget HA	Electronics	Box	140	100	Supplier X	5	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
098	Widget HB	Electronics	Box	170	130	Supplier Y	7	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
099	Widget HC	Electronics	Box	180	140	Supplier Z	6	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
100	Widget HD	Electronics	Box	160	120	Supplier X	5	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
101	Widget HE	Electronics	Box	150	110	Supplier Y	7	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
102	Widget HF	Electronics	Box	140	100	Supplier Z	6	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
103	Widget HG	Electronics	Box	170	130	Supplier X	5	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
104	Widget HH	Electronics	Box	180	140	Supplier Y	7	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
105	Widget HI	Electronics	Box	160	120	Supplier Z	6	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
106	Widget HJ	Electronics	Box	150	110	Supplier X	5	\$120.0	\$18,000	2023-07-14	Good	Warehouse 1
107	Widget IA	Electronics	Box	140	100	Supplier Y	7	\$128.6	\$18,000	2023-07-11	Good	Warehouse 1
108	Widget IB	Electronics	Box	170	130	Supplier Z	6	\$105.9	\$18,000	2023-07-13	Good	Warehouse 1
109	Widget IC	Electronics	Box	180	140	Supplier X	5	\$100.0	\$18,000	2023-07-16	Good	Warehouse 1
110	Widget ID	Electronics	Box	160	120	Supplier Y	7	\$112.5	\$18,000	2023-07-12	Good	Warehouse 1
111	Widget IE	Electronics	Box	150	110	Supplier Z	6	\$120.0				

Financial Statement														
Item	Unit	Quantity	Unit Price	Total Price	Unit	Quantity	Unit Price	Total Price	Unit	Quantity	Total Price			
1	kg	100	1.50	150.00	2	kg	200	2.00	400.00	3	kg	300	3.00	900.00
4	kg	400	4.00	1600.00	5	kg	500	5.00	2500.00	6	kg	600	6.00	3600.00
7	kg	700	7.00	4900.00	8	kg	800	8.00	6400.00	9	kg	900	9.00	8100.00
10	kg	1000	10.00	10000.00	11	kg	1100	11.00	12100.00	12	kg	1200	12.00	14400.00
13	kg	1300	13.00	16900.00	14	kg	1400	14.00	19600.00	15	kg	1500	15.00	22500.00
16	kg	1600	16.00	25600.00	17	kg	1700	17.00	28900.00	18	kg	1800	18.00	32400.00
19	kg	1900	19.00	36100.00	20	kg	2000	20.00	40000.00	21	kg	2100	21.00	44100.00
22	kg	2200	22.00	48400.00	23	kg	2300	23.00	52900.00	24	kg	2400	24.00	57600.00
25	kg	2500	25.00	62500.00	26	kg	2600	26.00	67600.00	27	kg	2700	27.00	72900.00
28	kg	2800	28.00	78400.00	29	kg	2900	29.00	84100.00	30	kg	3000	30.00	90000.00
31	kg	3100	31.00	96100.00	32	kg	3200	32.00	102400.00	33	kg	3300	33.00	108900.00
34	kg	3400	34.00	115600.00	35	kg	3500	35.00	122500.00	36	kg	3600	36.00	129600.00
37	kg	3700	37.00	136900.00	38	kg	3800	38.00	144400.00	39	kg	3900	39.00	152100.00
40	kg	4000	40.00	160000.00	41	kg	4100	41.00	168100.00	42	kg	4200	42.00	176400.00
43	kg	4300	43.00	184900.00	44	kg	4400	44.00	193600.00	45	kg	4500	45.00	202500.00
46	kg	4600	46.00	211600.00	47	kg	4700	47.00	220900.00	48	kg	4800	48.00	230400.00
49	kg	4900	49.00	240100.00	50	kg	5000	50.00	250000.00	51	kg	5100	51.00	260100.00
52	kg	5200	52.00	270400.00	53	kg	5300	53.00	280900.00	54	kg	5400	54.00	291600.00
55	kg	5500	55.00	302500.00	56	kg	5600	56.00	313600.00	57	kg	5700	57.00	324900.00
58	kg	5800	58.00	336400.00	59	kg	5900	59.00	348100.00	60	kg	6000	60.00	360000.00
61	kg	6100	61.00	372100.00	62	kg	6200	62.00	384400.00	63	kg	6300	63.00	396900.00
64	kg	6400	64.00	409600.00	65	kg	6500	65.00	422500.00	66	kg	6600	66.00	435600.00
67	kg	6700	67.00	448900.00	68	kg	6800	68.00	462400.00	69	kg	6900	69.00	476100.00
70	kg	7000	70.00	490000.00	71	kg	7100	71.00	504100.00	72	kg	7200	72.00	518400.00
73	kg	7300	73.00	532900.00	74	kg	7400	74.00	547600.00	75	kg	7500	75.00	562500.00
76	kg	7600	76.00	577600.00	77	kg	7700	77.00	592900.00	78	kg	7800	78.00	608400.00
79	kg	7900	79.00	624100.00	80	kg	8000	80.00	640000.00	81	kg	8100	81.00	656100.00
82	kg	8200	82.00	672400.00	83	kg	8300	83.00	689600.00	84	kg	8400	84.00	707600.00
85	kg	8500	85.00	726500.00	86	kg	8600	86.00	745600.00	87	kg	8700	87.00	765900.00
88	kg	8800	88.00	787200.00	89	kg	8900	89.00	808100.00	90	kg	9000	90.00	829600.00
91	kg	9100	91.00	840100.00	92	kg	9200	92.00	862400.00	93	kg	9300	93.00	884900.00
94	kg	9400	94.00	907600.00	95	kg	9500	95.00	930500.00	96	kg	9600	96.00	956400.00
97	kg	9700	97.00	972900.00	98	kg	9800	98.00	993600.00	99	kg	9900	99.00	1019600.00
100	kg	10000	100.00	1040000.00	101	kg	10100	101.00	1060100.00	102	kg	10200	102.00	1080400.00
103	kg	10300	103.00	1100900.00	104	kg	10400	104.00	1121600.00	105	kg	10500	105.00	1142500.00
106	kg	10600	106.00	1163600.00	107	kg	10700	107.00	1184900.00	108	kg	10800	108.00	1206400.00
109	kg	10900	109.00	1228100.00	110	kg	11000	110.00	1249600.00	111	kg	11100	111.00	1270900.00
112	kg	11200	112.00	1292400.00	113	kg	11300	113.00	1313600.00	114	kg	11400	114.00	1334900.00
115	kg	11500	115.00	1356500.00	116	kg	11600	116.00	1377600.00	117	kg	11700	117.00	1400900.00
118	kg	11800	118.00	142400.00	119	kg	11900	119.00	1446400.00	120	kg	12000	120.00	1480000.00
121	kg	12100	121.00	1504100.00	122	kg	12200	122.00	1527600.00	123	kg	12300	123.00	1556100.00
124	kg	12400	124.00	1585600.00	125	kg	12500	125.00	1615000.00	126	kg	12600	126.00	1644400.00
127	kg	12700	127.00	1673900.00	128	kg	12800	128.00	1703200.00	129	kg	12900	129.00	1732500.00
130	kg	13000	130.00	1762000.00	131	kg	13100	131.00	1771600.00	132	kg	13200	132.00	1801000.00
133	kg	13300	133.00	1830400.00	134	kg	13400	134.00	1859600.00	135	kg	13500	135.00	1888500.00
136	kg	13600	136.00	1917600.00	137	kg	13700	137.00	1947200.00	138	kg	13800	138.00	1976400.00
139	kg	13900	139.00	2005900.00	140	kg	14000	140.00	2035200.00	141	kg	14100	141.00	2064400.00
142	kg	14200	142.00	2093600.00	143	kg	14300	143.00	2123200.00	144	kg	14400	144.00	2152500.00
145	kg	14500	145.00	2201600.00	146	kg	14600	146.00	2231200.00	147	kg	14700	147.00	2260400.00
148	kg	14800	148.00	2289600.00	149	kg	14900	149.00	2309200.00	150	kg	15000	150.00	2338000.00
151	kg	15100	151.00	2366900.00	152	kg	15200	152.00	2396800.00	153	kg	15300	153.00	2425600.00
154	kg	15400	154.00	2454400.00	155	kg	15500	155.00	2504000.00	156	kg	15600	156.00	2532400.00
157	kg	15700	157.00	2560900.00	158	kg	15800	158.00	2589600.00	159	kg	15900	159.00	2616900.00
160	kg	16000	160.00	2644000.00	161	kg	16100	161.00	2701600.00	162	kg	16200	162.00	2729600.00
163	kg	16300	163.00	2757600.00	164	kg	16400	164.00	2785600.00	165	kg	16500	165.00	2812500.00
166	kg	16600	166.00	2839600.00	167	kg	16700	167.00	2901200.00	168	kg	16800	168.00	2929600.00
169	kg	16900	169.00	2957600.00	170	kg	17000	170.00	3000000.00	171	kg	17100	171.00	3028400.00
172	kg	17200	172.00	3056000.00	173	kg	17300	173.00	3101600.00	174	kg	17400	174.00	3130400.00
175	kg	17500	175.00	3200000.00	176	kg	17600	176.00	3259200.00	177	kg	17700	177.00	3288000.00
178	kg	17800	178.00	3316800.00	179	kg	17900	179.00	3385600.00	180	kg	18000	180.00	3414400.00
181	kg	18100	181.00	3443600.00	182	kg	18200	182.00	3512000.00	183	kg	18300	183.00	3540800.00
184	kg	18400	184.00	3569600.00	185	kg	18500	185.00	3628000.00	186	kg	18600	186.00	3656800.00
187	kg	18700	187.00	3684800.00	188	kg	18800	188.00	3753600.00	189	kg	18900	189.00	3782400.00
190	kg	19000	190.00	3810000.00	191	kg	19100	191.00	3880000.00	192	kg	19200	192.00	3908800.00
193	kg	19300	193.00	3936800.00	194	kg	19400	194.00	4006400.00	195	kg	19500	195.00	4035200.00
196	kg	19600	196.00	4064000.00	197	kg	19700	197.00	4132800.00	198	kg	19800	198.00	4161600.00
199	kg	19900	199.00	4189600.00	200	kg	20000	200.00	4300000.00	201	kg	20100	201.00	4328800.00
202	kg	20200	202.00	4357600.00	203	kg	20300	203.00	4406400.00	204	kg	20400	204.00	4435200.00
205	kg	20500	205.00	4464000.00	206	kg	20600	206.00	4512000.00	207	kg	20700	207.00	4540800.00
208	kg	20800	208.00	4568000.00	209	kg	20900	209.00	4617600.00	210	kg	21000	210.00	4646400.00
211	kg	21100	211.00	4675200.00	212	kg	21200	212.00	4744000.00	213	kg	21300	213.00	4772800.00
214	kg	21400	214.00	4801600.00	215	kg	21500	215.00	4890000.00	216	kg	21600	216.00	4918400.00
217	kg	21700	217.00	4947200.00	218	kg	21800	218.00	5016000.00	219	kg	21900	219.00	5044800.00
220	kg	22000	220.00	5072000.00	221	kg	22100	221.00	5169600.00	222	kg	22200	222.00	5198400.00
223	kg	22300	223.00	5227200.00	224	kg	22400	224.00	5326400.00	225	kg	22500	225.00	5355200.00
226	kg	22600	226.00	5384000.00	227	kg	22700	227.00	5452800.00	228	kg	22800	228.00	5481600.00
229	kg	22900	229.00	5510400.00	230	kg	23000	230.00	5600000.00	231	kg	23100	231.00	5628800.00
232	kg	23200	232.00	5657600.00	233	kg	23300	233.00	5756800.00	234	kg	23400	234.00	5785600.00
235	kg	23500	235.00	5814400.00	236	kg	23600	236.00	5904000.00	237	kg	23700	237.00	5932800.00
238	kg	23800	238.00	5961600.00	239	kg	23900	239.00	6051200.00	240	kg	24000	240.00	6080000.00
241	kg	24100	241.00	6108800.00	242	kg	24200	242.00	6208000.00	243	kg	24300	243.00	6236800.00
244	kg	24400	244.00	6265600.00	245	kg	24500	245.00	6316000.00	246	kg	24600		

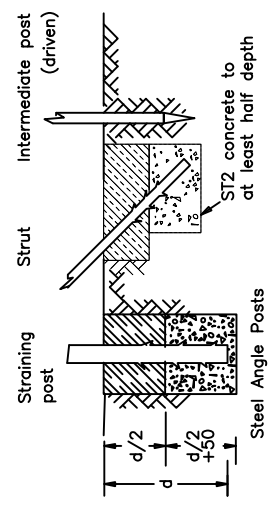
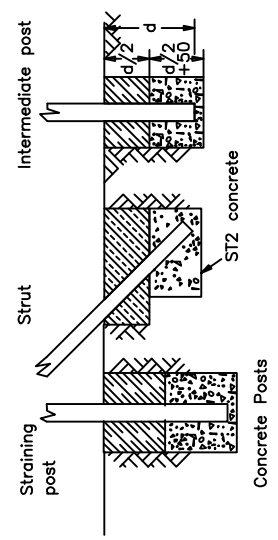
[illegible]

Appendix F – Typical Fencing Details

NOTE: TYPICAL FENCING DETAIL ONLY< ALL PROPOSED FENCING IS SUBJECT TO
PRIOR AGREEMENT WITH THE LOCAL PLANNING AUTHORITY



DETAIL FOR TIMBER POSTS



VARIATIONS FOR POSTS OF MATERIALS OTHER THAN TIMBER

NOTES

1. B.S.1722 Part 1 applies unless otherwise stated.
2. Dimensions of foundation, type and size of posts, struts and mesh, etc. shall be taken from B.S.1722 Part 1 appropriate to the height and with any other requirement described in Appendix 1/15 and on the Drawings.
3. Plastic coating when required in Appendix 1/15 shall comply with Specification Clauses 2604 and 2605.
4. Plastic coating material shall not be acceptable where serious damage has occurred to the coating before or during erection. Minor defects must be sprayed with an approved plastic paint within 24 hours of erection.
5. All timber shall comply with Specification Clause 304 unless otherwise stated in Appendix 1/15.
6. Where a fence forms a boundary between the highway and private property the wire shall be fixed to the highway side unless otherwise stated in Appendix 1/15.
7. Timber posts and struts may be supported in rammed backfill unless otherwise stated in Appendix 1/15.
8. ALL DIMENSIONS ARE IN MILLIMETRES.

HIGHWAY CONSTRUCTION DETAILS		FENCES, STILES & GATES		ACCOMMODATION WORKS CHAIN LINK FENCES		Drawing No.
						H11
D	MAY 04					
C	MAR 98					
B	AUG 93					
A	DEC 91					
Issue		Date				

Appendix I. RBSLs and RTCs

Contaminant	Minimum of RTC (1%) / RBSL mg/kg	Minimum of RTC (3%) / RBSL mg/kg
Arsenic	64 a	64 a
Chromium	78 a	78 a
Cadmium	2.6	2.6
Mercury (inorganic)	1 b	1 b
Nickel	75 b	75 b
Selenium	3 b	3 b
Lead	337 a	337 a
Vanadium	351	351
Copper	143 a	143 a
Zinc	478 a	478 a
Benzo(a)pyrene	0.9	0.9
Benzene	13	13
Toluene	8110	8110
Ethylbenzene	4740	4740
Xylene	7940	7940
TPH aromatic C7-C8	21300	21300
TPH aromatic C8-C10	2230	2310
TPH aromatic C10-C12	2300	2340
TPH aromatic C12-C16	2330	2350
TPH aliphatic C6-C8	294000 *	294000 *
TPH aliphatic C8-C10	5740 *	5740 *
TPH aliphatic C10-C12	5700	5830
TPH aliphatic C12-C16	5800	5860
TPH aromatic C16-C21	1450	1450
TPH aromatic C21-C35	1450	1450
TPH aliphatic C16-C35	159000	159000
TPH aliphatic C21-C35	159000	159000
Total TPH (Phase 1)	9060	9060
Total TPH (Process Area)	10800	10800
Total TPH (North Tank Farm)	9420	9420
Total TPH (South Tank Farm)	6350	6350
1,2-Dichloroethane	4.5	4.5
1,1,1-Trichloroethane	27900	27900
Tetrachloroethene	641	641
Trichloroethene	193	193
Vinyl chloride	0.7	0.7
Dichloromethane	241	241
Cis-1,2-Dichloroethene	392	468
Trans-1,2 Dichloroethene	632	632
Acenaphthene	5340	5350
Anthracene	26800	26800
Benzo(a)anthracene	20.8	21.1
Benzo(b)fluoranthene	21.3	21.3
Benzo(g,h,i)perylene	218	218
Benzo(k)fluoranthene	215	215
Chrysene	2090	2090
Dibenz(ah)anthracene	2.16	2.16
Fluoranthene	3570	3570
Fluorene	3570	3570
Indeno(1,2,3-cd)pyrene	21.2	21.2
Pyrene	2680	2680
Phenol	859	859
Mercury (methyl)	19.4	19.4
Mercury (elemental)	4.3	12.9
Naphthalene	955	1340
TPH aromatic C5-C7	26.2	27.5
TPH aliphatic C5-C6	294000	294000
1,1,1,2-Tetrachloroethane	498	533
1,1,2,2-Tetrachloroethane	516	539
Carbon tetrachloride	111	128
Chlorobenzene	170	170

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 C5-C6, TPH aliphatic C6-C8 and TPH aliphatic C8-C10 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. '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.
8. Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach
9. Asbestos has not been considered here as it is being considered in a separate report
10. Additivity for TPHs and PAHs to be undertaken in line with guidance in Atkins report 5041216-REM-RPT-00216
11. Elemental mercury is based on the inhalation pathway only and the saturation limit has been presented
12. TPH aromatic C5-C7 is considered to comprise benzene only

Lowest of the Remedial Target Criterion/Risk Based Screening Level for Parks land use, Deep Soil (>1m)

Contaminant	Minimum of RTC (1%) / RBSL mg/kg	Minimum of RTC (3%) / RBSL mg/kg
Benzo(a)pyrene	>sat	>sat
Benzene	48	48
Toluene	>sat	>sat
Ethylbenzene	>sat	>sat
Xylene	478	1330
TPH aromatic C7-C8	>sat	>sat
TPH aromatic C8-C10	>sat	>sat
TPH aromatic C10-C12	>sat	>sat
TPH aromatic C12-C16	>sat	>sat
TPH aliphatic C6-C8	>sat	>sat
TPH aliphatic C8-C10	>sat	>sat
TPH aliphatic C10-C12	>sat	>sat
TPH aliphatic C12-C16	>sat	>sat
TPH aromatic C16-C21	>sat	>sat
TPH aromatic C21-C35	>sat	>sat
TPH aliphatic C16-C21	>sat	>sat
TPH aliphatic C21-C35	>sat	>sat
Total TPH (Phase 1)	>sat	>sat
Total TPH (Process Area)	>sat	>sat
Total TPH (North Tank Farm)	>sat	>sat
Total TPH (South Tank Farm)	>sat	>sat
1,2-Dichloroethane	6	6
1,1,1-Trichloroethane	>sat	>sat
Tetrachloroethene	1780	1780
Trichloroethene	269	269
Vinyl chloride	8.21	11.4
Dichloromethane	6220	6220
Cis-1,2-Dichloroethene	881	881
Trans-1,2 Dichloroethene	881	881
Acenaphthene	>sat	>sat
Anthracene	>sat	>sat
Benzo(a)anthracene	>sat	>sat
Benzo(b)fluoranthene	>sat	>sat
Benzo(g,h,i)perylene	>sat	>sat
Benzo(k)fluoranthene	>sat	>sat
Chrysene	>sat	>sat
Dibenz(ah)anthracene	>sat	>sat
Fluoranthene	>sat	>sat
Fluorene	>sat	>sat
Indeno(1,2,3-cd)pyrene	>sat	>sat
Pyrene	>sat	>sat
Phenol	>sat	>sat
Mercury (methyl)	>sat	>sat
Mercury (elemental)	>sat	>sat
Naphthalene	>sat	>sat
TPH aromatic C5-C7	432	928
TPH aliphatic C5-C6	>sat	>sat
1,1,1,2-Tetrachloroethane	>sat	>sat
1,1,2,2-Tetrachloroethane	>sat	>sat
Carbon tetrachloride	301	778
Chlorobenzene	>sat	>sat

Notes

- 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
- 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.
- TPH aromatic C7-C8 is considered to comprise toluene only by Atkins
- 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
- '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.
- Benzo(a)pyrene RBSL to be compared against sum of 16 US EPA Priority List PAHs using Toxicity Equivalence approach
- Asbestos has not been considered here as it is being considered in a separate report
- Additivity for TPHs and PAHs to be undertaken in line with guidance in Atkins report 5041216-REM-RPT-00216
- TPH aromatic C5-C7 is considered to comprise benzene only

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Coed Darcy

Validation Report
Monitor Phase 43

St Modwen Developments Limited



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Table of contents

Chapter	Pages
1. Introduction	6
1.1. Client Brief & Scope of Works	6
1.2. Scope of Work	6
1.3. Soil Quality Assessment Standards	6
1.4. Information Sources	7
1.5. Limitations	8
2. Review of Available Information	9
2.1. The Site	9
2.2. Published Geology	13
2.3. Hydrogeology & Hydrology	13
3. Historical Ground Investigation by URS	14
3.1. General	14
3.2. Recorded Ground Conditions	14
3.3. Soil and Groundwater Contamination	16
4. Previous Investigation by Atkins	17
4.1. Ground Investigation (July 2009)	17
4.2. Free Product Recovery (November 2009)	18
4.3. Hardstanding Clearance and Shallow Drainage Removal	20
4.4. Ground Investigation (2011)	21
5. Requirements of the Section 106	25
5.1. Remedial Action Plan (RAP) Works	25
5.2. Redevelopment Remediation Works	26
6. Remedial and Plot Preparatory Works	28
6.1. Scope of Works	28
6.2. Phase 1 (2011-12)	28
6.3. Phase 2 (2013)	29
6.4. Phase 3 (2014)	30
6.5. Utilities Corridor	31
6.6. Plot Reprofilling Works and Earthworks Volumes	31
7. Validation/Verification	33
7.1. General	33
8. Summary and Conclusions	36
Drawings	38
Appendices	39
Appendix A. Adopted thresholds (DiMe)	40
Appendix B. Historic Logs	41
Appendix C. Exploratory Hole Logs (REC, 2009)	42
Appendix D. Laboratory Analysis (2009 GI)	43
Appendix E. Atkins Technical Note 242	44
Appendix F. Selected Photographs (Hardstanding Removal)	45
Appendix G. Exploratory Hole Logs (Atkins, 2011)	46
Appendix H. Laboratory Analysis (2011 GI)	47
Appendix I. SMD Letter re proposed variation of Schedule 7	48
Appendix J. NPTCBC Letter re proposed variation of Schedule 7	49

Appendix K.	Selected Photographs (Remedial Works)	50
Appendix L.	Borehole Monitoring Trends	51
Appendix M.	Laboratory Analysis (Basal Sampling)	52
Appendix N.	Stockpile testing prior to reuse	53
Appendix O.	Exploratory Hole Logs (Post remediation Trial Pitting)	54
Appendix P.	Laboratory Analysis (In situ testing)	55
Appendix Q.	Laboratory Analysis (Shallow Groundwater)	56

Glossary of Terms

Term	Meaning / Definition
CSM	Conceptual Site Model
RBSL	Risk Based Screening Level
ACM	Asbestos Containing Material
TPH	Total Petroleum Hydrocarbons
PAH	Polycyclic aromatic Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
FFL	Finished Floor Level
mAOD	metres Above Ordnance Datum
RAP	Remedial Action Plan
VO	Visual/Olfactory Observations
BGL	Below Ground Level

1. Introduction

1.1. Client Brief & Scope of Works

Atkins Limited (Atkins) has been commissioned by St. Modwen Developments Ltd (St Modwen) to provide consultancy advice with regard to the redevelopment of the former Llandarcy Oil Refinery as Coed Darcy.

The following report has been prepared to bring together all of the information relating to part of the former refinery to confirm the suitability of this area for redevelopment in line with the specific requirements of the S106 and enable St. Modwen to achieve sign off by the Monitor.

For the purpose of Monitor sign off, this area is proposed as Monitor Phase 43, as shown on Drawing 5041216-REM-DWG-1666.

Due to the presence of identified solvent contamination within the underlying soils and groundwater, part of the former DiMe Plant has been previously designated as an 'Exclusion Area' (refer to Drawing 5041216/DIME/ENG/842). This prevents the inclusion of 'occupiable structures' within any proposed development on this area. In line with the presence of this Exclusion Area, the majority of Monitor Phase 43 is shown as an area of proposed Sports Pitches on the current Masterplan.

In the absence of definitive information relating to the proposed end use and development levels across Monitor Phase 43, the following report makes the following assumptions:

- That sports pitches extend across the full extent of Monitor Phase 43.
- The current ground levels across Monitor Phase 43 (refer to Drawing 5041216-ATK-REM-DWG-1844) represent a depth of 1m below FFL

The above assumptions are consistent with those adopted in previous human health risk assessment relating to the proposed pitches, which assumes the placement of a further 1m depth of soils as part of their construction (Atkins report 5041216/REM/RPT/316).

1.2. Scope of Work

Monitor Phase 43 lies within the central part of the former refinery and comprises the former DiMe Plant, New Bath House, Central Substation and Main Boiler House (refer to Drawing 5041216-REM-DWG-983).

This report will present the following:

- A review of available desk study information relating to Monitor Phase 43.
- A summary of historic ground investigation information (1999-2003) and pre-remediation ground conditions.
- A summary of more recent (2009-2011) ground investigation by Atkins
- Details of remedial and plot preparatory works undertaken.
- Details of all validation/further investigation in order to confirm that the remedial works were successfully carried out and to demonstrate that this area is now suitable for use in line with the required criteria.

1.3. Soil Quality Assessment Standards

To maintain consistency of approach, the assessment standards for historical and recent data are those stated in the S106 Agreement for the redevelopment of the former Llandarcy refinery as Coed Darcy (Dewey & LeBoeuf report GNP/NJR/13773-2).

Details of a visual and aesthetic classification system, previously presented within the S106 for the proposed development, is provided as Table 1.1. Atkins proposes to continue to use this system for the classification of all soils encountered, to aid assessment of each area in terms of the required remediation requirements.

Where relevant, the visual/olfactory classification for each strata is stated on the relevant exploratory hole log.

Table 1.1 – 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 present.	Overwhelming odour.

* 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.

The S106 for the proposed development presents a series of contamination thresholds referred to as Risk Based Screening levels (RBSLs). These levels are defined in the S106 as being the 'minimum base level standard' for redevelopment remediation works (Schedule 8, Part 2, Paragraph 2,5). RBSLs are provided for a proposed residential, commercial and recreational end use.

In the absence of specific RBSLs relating to an area of proposed sports pitches, Atkins carried out supplementary Human Health Risk Assessment to define a series of Remediation Target Criteria (RTC) based on the key contaminants of concern. Details of Atkins' risk assessment are presented in Atkins report 5041216/REM/RPT/316 as defined in Section 1.4. For ease of reference, a table showing a summary of the adopted thresholds for Monitor Phase 43 is provided in Appendix A.

Details of the adopted frequency of testing, for this area, are presented in Section 7.

Compliance with the redevelopment remediation requirements stated within Schedule 8 of the S106 form the basis for obtaining the relevant sign off from the Monitor.

1.4. Information Sources

Information reviewed as part of the following assessment has been obtained from the following sources:

- URS BP Llandarcy Refinery Desk Study 44382742/BRRP0001, July 2007
- URS Report FR1287 Final Factual Report for Ground Investigation, August 2005
- Section 106 Deed of Planning Obligations (Dewey & LeBoeuf report GNP/NJR/13773-2), February 2008
- Atkins report 5041216/REM/RPT/316. Remediation Target Criteria for the DiMe Area, February 2010.
- Atkins report 5041216/REM/RPT/616 DRAFT. Geoenvironmental Assessment & Outline Remediation Strategy, August 2011.
- Atkins report 5041216/REM/RPT/372. DiMe Area, Controlled Waters Risk Assessment, November 2011.
- Atkins Report 5041216/PLOTS/RPT/1016. Commercial Area Validation Report, May 2015.
- Monitor Report BRRP0005, DiMe Investigation Summary, April 2009
- Atkins 5041216/ENG/239/OTH/JM/SPEC/0042, Issue 03 Demolition Specification, April 2009.

Details of other reports relating to historical ground investigation across Monitor Phase 43, are referred to in Section 3.

1.5. Limitations

As previously indicated, this report has been prepared with the sole intention of providing sufficient information to enable St. Modwen to obtain Monitor sign off for Monitor Phase 43 in accordance with criteria set out in the Section 106 Agreement for the proposed redevelopment of the former Llandarcy refinery (refer to section 1.4). Whilst the report may be relevant for submission as part of a reserved matters planning application, additional reports and submissions are likely to be required as part of any future plot development.

Validation and investigative works to date have been carried out predominantly to investigate contamination across this area and do not include a review of any geotechnical issues or constraints that may exist which would need to be taken into account as part of any proposed redevelopment.

In addition, it should be noted that ground and groundwater conditions can vary over time and between sampling points. Whilst this report provides information relating to the removal of identified pipework and below ground structures encountered during the works, where relevant, unidentified pipework and/or structures may still exist in situ in this area.

The following assessment assumes that Monitor Phase 43 is proposed for redevelopment as sports pitches in the final development. Where a change in proposed end use is proposed, reassessment of the data will be required in order to confirm the need for additional investigation and/or further remediation.

2. Review of Available Information

2.1. The Site

2.1.1. General

The following report relates to Monitor Phase 43, as shown on Drawing 5041216/REM/DWG/1666, which occupies an area of approximately 75,000m² within the central part of the former refinery.

The northern boundary of Monitor Phase 43 is defined by a railway cutting of approximately 13m depth.

The majority of Monitor Phase 43 comprises an area of the former refinery referred to as the DiMe Plant. Surface water and shallow groundwater from across the former DiMe Plant was carried historically by the existing drainage network across this area across the adjacent railway cutting and discharged to North Site Reservoir.

Demolition of existing infrastructure across the former DiMe Plant is understood to have commenced in 2000, prior to acquisition of the former refinery by St. Modwen. The completion of these works resulted in a flat area of surface concrete slabs/hardstanding at a level of approximately 40.2m AOD. Hardstanding and existing below ground structures were subsequently removed from across this area by Hawk in 2010 (refer to Appendix F).

Demolition of buildings, within the southern part of Monitor Phase 43, was carried out by Cuddy Group on behalf of St. Modwen during 2009/2010.

Reclamation works have been subsequently carried out in a number of phases across Monitor Phase 43, as detailed in Section 6.

2.1.2. Historical Use

A summary of 'key' historical processes, based on extracts from URS Report 44382741 (refer to Section 1.4) is presented as Table 2.1.

The location of each of these areas is highlighted on Drawing 5041216-REM-DWG-983.

Former DiMe Plant

Aerial photographs of the former DiMe dated 1970 and 1978 are presented in URS Monitor report BRRP0001.

The former DiMe Plant represents the area where one of the final stages in the production of lubrication oils took place within the refinery.

The DiMe Plant is recorded to have been constructed on the site of the former Kerosene and Paraffin Plant, during a period of expansion of the refinery during the 1960s-1970s. The DiMe Plant is reported to have remained operational until production at the refinery ceased in 1998.

Within the DiMe, two chlorinated solvents (1, 2 Dichloroethane ('Di') and Methylene Chloride ('Me')) were used to remove the waxy components of the oil resulting in a slack wax product and a dewaxed oil.

Solvents are reported to have been stored in three bunded tanks, within the DiMe, the bases of which are suggested as being unsurfaced (URS Report DR1144).

Monitor report BRRP0001 highlights that "*solvent losses were known to have occurred through gradual leakage and occasional larger scale releases at the filter and chiller units, which were operated under considerable pressure*". The slab upon which these units lay, is suggested to have been unbunded until the late 1980s.

Main Boiler House

This building was demolished by others, prior to acquisition of the site by St. Modwen in 2008.

Anecdotal information, obtained from former employees of the refinery, suggests the following information relating to this area:

“The Power station plot comprised of an old and a newer power station, each having its own water treatment plant, utilising both sulphuric acid and caustic soda, which treated water pumped from the Tennant Canal.

The old power station which was built in the early 1950’s consisted of 5 Spearing Boilers each rated at 150,000 lbs per hour steam generation. In the early 1970’s a new bigger Simon Carves power station was build to satisfy the increased steam demand particularly of the New Lubricating Complex, which was built in 1971. As rationalisation occurred then initially 2 of the 5 spearing boilers were moth balled and when crude oil processing ceased in 1985 then the newer power station was shut down and demolished in the late 1980’s.

The old power station of 3 smaller boilers was retained as they provided greater flexibility for the remaining operations, which was predominantly the manufacture of base oils for finished lube oil blending + additives and speciality products including bitumen. Each power station also had turbine generators and provided the power requirements for the refinery and could export surplus electricity into the grid. Both power stations burnt heavy fuel oil and natural gas and for a period of time some burning of propane precipitated asphalt (ppa) took place as a dual fuel.

The old power station had 2 brick built circa 300 ft stacks and these were demolished with the old power station in circa 2001/2. The new power station had a circa 300 ft reinforced concrete stack which was demolished with the new power station circa late 1980’s”.

Table 2.1 – Extract from ‘Historical Operations Summary’ (as taken from URS Desk Study Report 4438274)

Site Area Ref (refer to Drawing 5041216/REM/DWG/983)	Plant Description	History of Plant	Operational Until	Most Recent Operation	General Operational Description	Raw Materials	Minor constituents/additives/catalysts
3	Washeries & Kerosene Treatment	Paraffin sheds are understood to have been decommissioned in the early 1970s when the new lube oil box was constructed.	Active as Kerosene treatment until approximately the end of the 1960s. Some washeries continued until the 1980s.	Kerosene production until the plant was decommissioned and replaced by the new Lube Oil Box (see below)	Main operations were related to the treatment of kerosenes (paraffins) using sulphuric acid to take out the aromatics (odour issue and generation of health issues when burned). The by product of the operation was acid tar. The process also used clay presses to polish the kerosene and to remove the final impurities and stabilise the oxidation properties. The clay treatment reduces the oxidation process (and prevents the oil turning black). Unlike the lube oil production the clay used in the kerosene treatment could be re-used for a period of time. Clay waste is believed to have been disposed of in the site tip. Paraffin sheds also had a dewaxing process to take the wax out of the paraffin. The paraffin was refrigerated using ammonia (gaseous) and then filtered.	Kerosene/Paraffin	n/a
3	DiMe Plant	See above	Lube Oil production area from early 1970s until site closure in 2000	Lube Oil Production	The DiMe replaced the following; VDU (VAC C), propane deasphalting unit (PDA), Furfural Unit, Gas Oils Heater (instead of steam from site) and MEK dewaxing. In the new Lube Oil Complex the DiMe Plant replaced the old MEK Plant. A new PDA was constructed with a new furfural process which was maintained for aromatic treatment to remove aromatics from lube oil through aromatics extraction. The ferrofiner unit was used for polishing to remove sulphur from the lube oil.	Oil from VDU 5	Dichloroethane (Di) and Methylene Dichloride (Me), furfural, other corrosion controllers and oxygen inhibitors
5	Central Substation	In place in early 1950s	On-going	Substation	Transformers containing PCB oils in early 1950s to 1980s.	n/a	PCB containing oils historically within the transformers. Asbestos and bitumen coated cables may also have been used.

6	Water Treatment	In place in early 1950s	Closure in 1999	Water Treatment			
7	Main Boiler House	Spearings boiler house built in 1950s – five boilers	Closure in 1999	Power and steam generation	Main boiler house was oil fired.	Gas and fuel oil for burning	n/a
7	Old Boiler House	Pre-1950s	Main boiler house built	Power and steam generation	Similar operation to the main boiler but likely to have used coal as fuel as oil was a precious commodity.	Coal	n/a
12	Edeleanu Unit	Early 1950s	Late 1970s	Some tanks still present. Used as a bundle cleaning areas using high pressure water rather than chlorinated solvents.	The main process was as an SO2 solvent dewaxing plant. Treating kerosenes/middle distillates to take waxy components out with SO2 extraction.	SO2 and liquid ammonia	Likely to have anti-corrosion additives or oxygen inhibitors. Likely to be in small scale and used in 5 gallon containers which would last a few months.
60	Simon Carves Power Station	Constructed in the early 1970s	1989/1990	Power Station	Dual fuel single boiler power station	Imported gas or refinery produced gas (in early operations)	n/a
63	Sales Fuel Oil	1950s	Mid 1980s	Storage of recovered oil	Sales Fuel Pump House	n/a	n/a

Central Sub Station, Central Control Room and New Bath House

The following descriptions are based upon extracts from Atkins report 5041216/ENG/239/OTH/JM/SPEC/0042 (Issue 03), which was prepared to enable a package of demolition works within the former refinery during late 2009 to mid 2010.

The Central Substation and Central Control Room comprised two connected flat roof, brick and concrete structure buildings of three to four storey height and dating back to the 1950s/70s respectively. Both the Central Substation and Central Control Room are recorded to have possessed a basement. Both buildings were demolished and the basement removed as part of a phase of demolition works across the site by Cuddy Group in late 2009/early 2010.

The New Bath House comprised 'a two storey height, inclined roof, metal and concrete building complex. This building replaced the Old Bath House, which lay near the Main Site Entrance and was demolished in 2009.

Asbestos surveys are reported to have been undertaken and the asbestos removed by the demolition contractors, prior to the start of any demolition works within this area carried out on behalf of St. Modwen.

2.2. Published Geology

The British Geological Survey Sheet for Swansea (Sheet 247) Drift Edition (Ref. 3) suggests Monitor Phase 43 to be underlain by Glacial Drift (undifferentiated) overlying Carboniferous, Upper Pennant Measures. Solid strata are suggested to dip towards the north.

There are no recorded faults shown to cross beneath the area of the proposed pitches.

2.3. Hydrogeology & Hydrology

The Upper Pennant measures, which are shown on geological maps to underlie Monitor Phase 43, are considered to be a Secondary A Aquifer. A Secondary 'A' aquifer is 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.'

URS FR1287 Figure 9 suggests groundwater to lie at shallow depth (approximately 40m AOD) underlying the former DiMe and rising to around 45mAOD beneath the southern part of Monitor Phase 43, consistent with the general topography. Groundwater flow direction is suggested to be towards the north east.

Discussion relating to potential risks associated with Controlled Waters has been previously presented in Atkins report 5041216/REM/RPT/372.

3. Historical Ground Investigation by URS

3.1. General

The former refinery is known to have been historically investigated by URS on a number of occasions on behalf of the previous siteowners BP.

Due to the presence of known solvent contamination within the underlying soils and groundwater, the former DiMe plant was also subject to a number of specific investigations, as detailed in Table 3.2.

Details of recorded ground conditions across Monitor 43, based on historical investigation, are discussed below. For ease of reference, ground conditions within each of the various historical process areas are discussed separately.

The location of previous ground investigation by URS within Monitor Phase 43 is shown on Drawing 5041216-DIME-DWG-976. Copies of relevant exploratory hole logs are presented as Appendix B.

3.2. Recorded Ground Conditions

Several phases of investigation, including trials on potential remedial techniques, have been carried out across the DiMe between 1998 and 2003, a compilation of which is presented in URS Report DR114 and further details of which are provided in Table 3.1.

Table 3.1 - Summary of Previous Investigations across the former DiMe.

Report Type	Reference and Date	Location	Details
URS 'Draft Factual Report, DiMe Area, BP Llandarcy Refinery	DR1144 July 2003	Former DiMe Plant	Factual Report for Ground Investigation.
URS Draft Report, Outline Remedial Options Assessment, BP Llandarcy Refinery	DR1158 July 2004	Former DiMe Plant	Discussion of remedial options associated with any potential redevelopment.
URS Letter Result of DiMe Mineralisation Tests	39991-016/6732/MC Aug 2002	Former DiMe Plant	Assessment of thermal remediation techniques
URS Report 'Informational Supplement for DiMe Plant Area, BP Llandarcy Oil Refinery'.	DR1096 Sept 2002	Former DiMe Plant	Overview of key issues
URS Report 'Draft Summary Report – Stage 1 Solvent Recovery'	DR829 1999	Former DiMe Plant	Assessment of suitability of solvent recovery

3.2.1. Former DiMe Plant

Based on the finding of historical ground investigation, URS Report DR114 describes the geological succession beneath the former DiMe Plant to comprise a 'heterogeneous sequence that can be broadly split into 3 zones A, B and C', as described below.

Zone A:

Directly below the concrete slab, which covers the majority of the DiMe Plant Area, up to 4m of coarse grained fill materials including ash, clinker and brick fragment exists.

This unit is variable in thickness and may reflect post demolition levelling of the site which was used prior to 1973 for other purposes. Strong hydrocarbon and solvent odours were noted within this unit which was observed to be saturated within the lower metre with a straw yellow product. This Unit is noted as being fairly loose and wet and was encountered at almost all investigative locations within the DiMe Plant Area.

Zone B:

Beneath the coarse material of Zone A, a succession of firm clayey silts is indicated, with occasional thin sandy and/or gravelly horizons typically of limited thickness and based on comparison of logs from adjacent borings, laterally discontinuous.

Zone B can be further subdivided into i) sandy and gravelly silts and clays which...extend to approximately 5-7m, and which were typically non-cohesive at shallow depths, becoming stiffer and drier with depth, and were typically underlain by ii) a generally cohesive boulder clay unit, comprising a stiff grey-brown clay or silty matrix in which varying proportions of gravel, cobbles and occasionally boulders were encountered, extending to rockhead. In general, the boulder clay unit was characterised by an absence of water, though more permeable horizons were noted as a more sandy or gravelly and typically orange or orange brown in colour did indicate the presence of localised groundwater.

Notably a peat layer was observed within MSMW223, at a depth of 6.7m. The process of peat deposition in this area is an almost exclusively post glacial phenomenon indicating that both glacial and fluvial processes have contributed to the complex depositional sequence beneath the DiMe area.

Zone C:

Zone 'C', the bedrock unit, was encountered at depths of between 7m and 20m across the DiMe area and was observed to consist of grey sandstone and siltstone, with occasional traces of coal, consistent with that encountered across the main site. Overlying the bedrock and at the contact with Zone B was a progressively less-weathered sandstone, As observed during the installation of many bedrock wells across the site, water production generally increased close to rockhead consistent with this weathered zone.

3.2.2. Main Boiler House

Based on a review of historical ground investigation, ground conditions beneath this part of Monitor Phase 43 are indicated to comprise shallow (<1.3m depth) Made Ground overlying variable natural soils (silts, clays, sands and gravels) containing boulder and cobble sized sandstone fragments. Sandstone bedrock was encountered at depths of between 2.7m bgl (WSTP127) and 4.7m bgl (WSMW072).

Hydrocarbon staining and odours were noted at several locations, including a 'black tarry product' within the natural silts in WSMW072 (1.2m depth) and 'thick black oil and a heavy hydrocarbon odour' in WSTP129 (up to 1m depth).

Natural soils beneath this area are recorded as being 'soft' in WSMW074 (>1m bgl) and 'very soft' in WSMW072 (>4m bgl).

'Peat' is recorded to have been encountered in MSMW221 at depths of between 15.5m and 16.8m and 17.0m to 17.2m bgl. Underlying natural soils at this location are described as comprising a 'firm dark grey fibrous silty clay with traces of wood'.

3.2.3. Central Sub Station, Central Control Room and New Bath House

A review of historical ground investigation for this part of Monitor Phase 43 suggests the presence of predominantly loose granular Made Ground to depths of up to 2.7m bgl (WSTP142) and containing fragments of brick, whole bricks and occasional clay pipe. Made Ground beneath 1m depth in WSMW076 is described to contain 'frequent sandstone cobbles and small to medium boulders'.

Underlying natural soils were recorded as a variety of soft silty clay, sands and silts and locally stained in places. Bedrock was not encountered within any of the historical exploratory holes across this area.

3.3. Soil and Groundwater Contamination

In line with the historical use of solvents within the DiMe, contamination across this area of the site differs from elsewhere within the refinery.

Since March 2000, groundwater monitoring and sampling has been undertaken on a six monthly basis around the refinery and including wells across the former DiMe. This bi-annual 'RAP Monitoring' was taken over by Atkins in 2008. Additional groundwater sampling was also carried out, in conjunction with several phases of ground investigation, across the DiMe between 1998 and 2003.

An assessment of available historical monitoring data from across the DiMe, indicates free product to have been historically recorded in the majority of wells, up to a maximum thickness of 7.456m in MSMW222 (2003). Product thicknesses, in excess of 4m, have also been recorded historically in a number of other wells (DSB025S2, DSB027S2, DSB030S2, MSMW222D1 and MSMW222S3 as shown on Drawing 5041216/DIME/DWG/976). The maximum recorded thicknesses of product would appear to have been recorded during 2003 to 2005.

Free phase dense non-aqueous phase liquids (DNAPLs) of 1,2 dichloroethane and methylene chloride were historically inferred beneath the DiMe, based upon the recorded concentrations during investigation relative to their relative solubilities. The location of inferred DNAPLs is suggested as having been 'adjacent and down gradient to the solvent storage areas and surrounding the former filter and chiller units' (refer to Drawing 5041216-REM-DWG-820). This area represents the northern part of the proposed pitches.

The main DiMe exclusion area (DiMe Core) comprises an irregular shape area of approximately 2.5ha, the extent of which is based on analytical results for chlorinated hydrocarbons (refer to Drawing 5041216/REM/DWG/842).

With the exception of the former DiMe Plant, the contamination identified within existing soils across Monitor Phase 43 during historical ground investigation is consistent with the identified contamination across the remainder of the former refinery and predominantly comprises localised areas of elevated inorganic metals, metalloids, Polyaromatic Hydrocarbons (PAH) and petroleum hydrocarbons (TPH).

Historical monitoring (1999 to 2003) of existing wells across the area of the former Main Boiler House and Central Sub Station does not indicate the presence of any free product. Central Sub Station, Central Control Room and New Bath House.

Due to the demolition of existing buildings, prior to acquisition of the site by St. Modwen, a potential for asbestos also exists across Monitor Phase 43.

4. Previous Investigation by Atkins

4.1. Ground Investigation (July 2009)

Preliminary Atkins ground investigation works by Atkins focussed upon the area of the former DiMe Plant, the majority of which now falls within Monitor Phase 43.

The works were carried out in July 2009, the objective of which was to confirm the ground conditions identified by previous investigation and to install new monitoring wells to replace those damaged/destroyed during the demolition and hardstanding removal works. The works comprise the following scope of works:

- 13 no. cable percussive boreholes to depths of between 4.5m bgl and 14.2m bgl
- 8 no rotary (open) boreholes to depths of between 4.0 and 28.0m bgl

The locations of relevant exploratory holes are shown on Drawing 5041216-REM-DWG-980. This shows 7 of the boreholes to lie outside of the Monitor Phase 43 boundary. Copies of relevant exploratory hole logs are presented in Appendix C.

A review of the updated ground conditions beneath the former DiMe Plant, based on the findings of additional ground investigation by Atkins, is presented in Table 4.1.

Table 4.1 - Summary of Recorded Ground Conditions Underlying the DiMe

Lithology	Primary Composition	Secondary Composition	Thickness	
			Min.	Max.
Made Ground	Concrete Loose brown – black sandy fine to medium GRAVEL, Loose clayey, sandy GRAVEL with rubble, Loose grey –black fine to coarse silty GRAVEL Loose orange-brown SAND Black-orange-brown sandy –silty CLAY	Gravel and cobbles of brick, clinker, sandstone, wood fragments, with ash, slag, polystyrene foam.	0.1m	4.8m
Granular Drift Deposits Sand and Gravels	Dense grey / greenish grey coarse GRAVEL Very loose to medium dense brown-grey silty sandy GRAVEL Loose grey gravelly SAND	Gravel is typically sub-rounded to sub-angular.	0	4.1m
Cohesive Drift Deposits Silty or Clayey Sands and Gravels	Firm reddish-brown / black slightly gravelly CLAY Loose dark grey very silty CLAY with cobbles Loose dark grey- dark brown sandy silty CLAY with cobbles Stiff dark grey CLAY with gravel and cobbles	Gravel is rounded to sub-angular, there are angular to sub-rounded cobbles of sandstone Cobbles are rounded predominantly of sandstone though some mudstone cobbles present (weathered bedrock)	1.6m	19.2m

Lithology	Primary Composition	Secondary Composition	Thickness	
			Min.	Max.
Bedrock	Strong, grey fine -coarse grained SANDSTONE Soft, light brown SILTSTONE Grey-brown silty MUDSTONE	Occasional coal bands, thin interbedded bands of siltstone,	thickness not proven > 18.9m	

Consistent with previous investigation/assessment, the depth to bedrock beneath the DiMe was found to increase towards the north (between 6.0mbgl in MSMW064 to 19.7mbgl in MSMW066 – refer to Drawing 5041216/DIME/DWG/976). Assuming a consistent level of 40.2mAOD across the surface of the former DiMe Plant, this infers a bedrock surface at between 20.5m and 34.2m AOD beneath this area. The surface of the bedrock at DME3 was noted as being weathered to a depth of 500mm (13.7m to 14.2m bgl).

Coal was identified at the following locations during the investigation:

- DME5 (20.0m to 21.2m bgl)
- RO6 (21.6m to 22.0m bgl)
- RO7 (26.2m to 26.5m bgl)
- RO8 (12.8m to 13.1m, 13.7m to 13.9m and 14.5 to 14.7m bgl)

Natural soils underlying the DiMe were found to vary, being described as a variety of sandy clays, silts, sands and gravels.

A concrete slab was recorded in DME3, at 0.6m to 0.7m depth.

A total of 32 samples, representing a variety of Made Ground and natural soils from across the former DiMe Plant were selected for chemical analysis, a laboratory certificate for which is presented in Appendix D. Of these samples, 8 are shown to lie outside of Monitor Phase 43 but have been included in the assessment as evidence of the localised extent of contamination across this area. Strong odours were noted during drilling within shallow Made Ground and natural soils, predominantly within the northern part of the DiMe.

Comparison with the relevant RTCs for the DiMe (refer to Appendix A) and the recreational RBSLs (>1m depth) indicates two exceedences for 1,2 Dichloroethane in DME03 (D6 and D10). These samples represent natural soils at depths of 6.5m and 10.0m bgl respectively and this location lies within the northern part of Monitor Phase 43.

4.2. Free Product Recovery (November 2009)

Due to the presence of identified free product within historical wells across the former DiMe, a series of drawdown tests were carried out by Atkins during November 2009.

Draw down tests were undertaken at eight locations within the DiMe, as determined by the thickness of product recorded in existing wells. The objective of the tests was to determine whether the recorded product represented discrete bodies of product 'trapped' within the well installation at each location or whether the presence of product at these locations was representative of a wider mobile pool of product underlying the former DiMe Plant.

Draw down tests were undertaken at the following locations DSB021S1, DSB022S1, DSB027S2, DSB025S1 & S2, DSB024S1, MSMW0224S2 and MSMW069S1 (refer to Drawing 5041216/DIME/DWG/976) the results of which are presented graphically in Appendix E. Relevant exploratory hole logs suggest wells to be screened, within a variety of Made Ground and natural soils, as outlined in Table 4.3.

Table 4.3 - Summary of installation details

Well reference	Installation Response Zone	Screened Strata
DSB021S1	1.0m to 3.0m	Made Ground (0 to 2.3m depth)/Natural Silt
DSB022S1	0.7m to 3.0m	Made Ground (0 to 2.7m depth)/Natural Silt
DSB024S1	1.5m to 4.0m	Natural Silts and gravels
DSB025S1	1.0m to 3.5m	Natural Silts, sands and gravels
DSB025S2	5.7m to 6.7m	Natural gravel and cobbles
DSB027S2	5.6m to 6.8m	Natural Silt. Frequent coarse gravel and cobbles
MSMW224S2	3.5m to 6.0m	Natural gravel
MSMW069S1	2.5 to 5.5m	Natural clay

On completion of each test, the depths to groundwater and product (if present) were recorded at frequent intervals over a minimum period of at least 30 minutes. All product removed during the tests was removed from the DiMe for recycling off site.

The results of the tests indicate product rebound in five of the wells, as detailed in Table 4.4. It is noted that, with the exception of DSB025, the final thickness of product recorded at each location was generally less than previous measured values.

Table 4.4 Summary of recorded product thicknesses on completion of the tests

Exploratory Hole	Thickness of product pre test (m)	Thickness of product post test (m)	Variation in product thickness (m)
DSB021S1	0.30	0.02	-0.28
DSB022S1	0.06	0.01	-0.05
DSB024S1	0.16	ND	-0.16
DSB025S1	1.23	1.32	+0.09
DSB025S2	4.58	0.11	-4.47
DSB027S2	1.09	0.94	-0.15
MSMW069S1	0.40	ND*	-0.40
MSMW224S2	0.14	ND	-0.14

*ND Non Detected

In order to assess for further, or delayed, rebound at each of the test locations, the eight wells were also monitored 24 hours after the completion of the tests (refer to Table 4.5). The results of this later monitoring suggest a small percentage of further rebound over the 24hr period and, in some instances, product thicknesses in excess of those initially recorded (DSB025, DSB027 and 22). No product was detected in DSB024, MSMW069 or MSMW224, which are all installed within natural soils.

Table 4.5 Summary of recorded product thicknesses after 24 hours.

Exploratory Hole	Thickness of product pre test (m)	Thickness of product 24 hours after (m)	Variation in product thickness (m)
DSB021S1	0.30	0.16	-0.14

DSB022S1	0.06	0.45	+0.39
DSB024S1	0.16	0.14	-0.02
DSB025S1	1.23	2.52	+1.29
DSB025S2	4.58	1.96	-2.62
DSB027S2	1.09	1.98	+0.89
MSMW069S1	0.40	0.01	-0.39
MSMW224S2	0.14	ND	-0.14

It was noted during the tests that the product and water removed from MSMW224S possessed a strong 'chemical' odour and black colouration, not noted in other wells.

4.3. Hardstanding Clearance and Shallow Drainage Removal

In order to remove surface hardstanding and facilitate the ongoing investigation and assessment of the sources of solvent impact upon the surrounding drainage, clearance works across the area of the former DiMe commenced in June 2010. The works comprised the removal of below ground structures, to a depth of 1m bgl and the removal of existing drainage from within the central part of the former DiMe Plant. Selected photographs, taken during the works, are presented in Appendix F.

An annotated plan showing areas of identified visual/olfactory contamination noted during the works, is presented as Drawing 5041216-ENG-DWG-820.

A total of approximately 200 litres of product was removed from this area as part of these works. All free product encountered during the works was recovered and removed from the DiMe for recycling off site. This included further recovery of product from existing wells, plus localised areas of free product encountered within excavations.

On completion of the works, the management of shallow groundwater was maintained by the use of shallow trenches which were installed along the northern and southern boundaries of the former Plant.

In order to try and delineate the location of and source(s) of solvent impact upon the existing drainage network, sampling of both the shallow (<1m depth) trenches and surrounding drainage system was carried out on two occasions (July and August 2010) at the locations shown on Drawing 5041216_REM_DWG 1014. Samples CCT1 to CCT4 were recovered from a shallow excavated trench which ran east to west within the northern part of the former DiMe Plant, parallel to the crest of the railway cutting. This trench was excavated by Cuddy to install a cable to provide an electrical supply to the North Site Reservoir pumps.

A summary of the results of the analysis is presented as Table 4.6

Table 4.6 - Solvent concentrations recorded from the existing drainage network and shallow trenches

Location	Recorded concentration of Dichloromethane (ug/l)	Recorded concentration of 1,2 Dichloroethane (ug/l)	Sample recovered from (Date Sampled):
DMW001	238	1060	Trench 16/06/2010
DMW002	16.4	99.8	Trench 28/06/2010
DMW003	ND	ND	Trench 06/07/2010
CCT 1	139	234	Trench 08/07/2010
CCT 2	3300	4670	Trench 08/07/2010
CCT 3	3070	4440	Trench 08/07/2010

Location	Recorded concentration of Dichloromethane (ug/l)	Recorded concentration of 1,2 Dichloroethane (ug/l)	Sample recovered from (Date Sampled):
DiMe A	34.2	259	Drain 16/07/2010
DiMe B	16.7	63.6	Drain 16/07/2010
DiMe C	14.6	67.7	Drain 16/07/2010
DiMe D	>3.7	>3.3	Drain 16/07/2010
DiMe E	>3.7	>3.3	Drain 16/07/2010
DiMe G	33	66.3	Drain 16/07/2010
DiMe H	3.75	12.8	Drain 16/07/2010
DiMe J	70.4	174	Drain 27/07/2010
DiMe K	67.1	167	Drain 27/07/2010
DiMe L	4.67	13	Drain 27/07/2010
DiMe M	53.6	137	Drain 27/07/2010
DiMe N	15.3	66.5	Drain 27/07/2010
HVD01	622	1070	Trench 27/07/2010
HVD02	1750	3710	Trench 27/07/2010
CCT 4	2930	5980	Trench 27/07/2010

Concentrations of solvents in samples taken from shallow excavated trenches were noticeably higher than those recovered from existing drains. These confirm the source of the solvents at shallow depth across this area.

Concentrations of solvents below laboratory detection limits were recorded within samples D and E, which represent discharge from areas upslope of the former DiMe and confirms the absence of and demonstrable solvent loading from this upslope area.

The highest solvent concentrations were recorded in samples CCT 2, 3 and 4, which were taken from a shallow cable trench in the northern part of the DiMe. Concentrations of solvents within H and L were consistently less than within samples J, K, G and M confirming a lack of connection between these two existing drains down the eastern part of the former DiMe Plant.

4.4. Ground Investigation (2011)

A total of 74 machine excavated trial pits were carried out across the former DiMe Plant by Atkins during 2011 (Drawing 5041216-REM-DWG-980) to a depth of between 0.1m and 4.0m bgl. Nine of these lie outside of the boundary of Monitor Phase 43.

Access to some areas in the western part of Monitor Phase 43 was restricted in some areas due to the presence of existing stockpiles and 'live' drainage.

The objective of these shallow investigative works by Atkins were as follows:

- Provide further detail on shallow ground and groundwater conditions across the area of the proposed sports pitches.
- Confirm the extent and location of any remaining free product
- Confirm the extent and location of solvent impacted shallow groundwater. All shallow seepages/groundwater encountered during the works were sampled for analysis.

Copies of exploratory hole logs for each of these locations are provided in Appendix G.

Consistent with previous investigation, Made Ground was encountered at all locations to a depth of between 0.1m and 3.0m bgl. DVP8, DVP9, DVP24, DVP27, DVP28, DVP63 and DVP70 were

terminated on concrete at depths of between 0.1m (DVP27&28) and 1.9m depth (DVP63). Rare pipework was also recorded at three locations (DVP26, DVP33 and DVP31).

Shallow Made Ground was generally recorded as comprising a loose brown clayey gravelly sand but with localised areas of more cohesive materials (ie DVP15, DVP24, DVP44 etc). Sandstone bedrock was recorded at two locations within the southern half of Monitor Phase 43 during the works:

- DVP46 at 1.2m depth
- DVP68 at 2.1m depth

Localised areas of shallow heavy staining (VO>4) were recorded and were generally found to be associated with the presence of coarse granular materials (tank base rubble or slag) as referred to on the exploratory hole logs (refer to Table 4.7). Localised areas of deeper, impacted natural soils were also recorded, as summarised in Table 4.8.

Table 4.7 Summary of heavily impacted Made Ground (MG) encountered during recent ground investigation (refer to Drawing 5041216/DIME/DWG/979)

Exploratory Hole Reference	Visual/Olfactory Rating (maximum recorded)	Depth (m bgl)	Relevant Strata
DVP6	4,2	1.2 to 1.4	Stained black sandy gravel of sandstone and ballast
DVP9	5,3	1.3 to 1.5	Grey sandy gravel. Coarse gravel of cement and clinker (tank base hardcore rubble). Lube oil on gravel
DVP10	4,3	0.8 to 1.3	Stained black/grey clayey gravelly sand with coarse gravel of brick and cement
DVP16	4,3	1.4 to 1.5	Green/grey/black stained sandy gravel. Coarse gravel of tank base rubble
DVP17	4,3	0.9 to 1.5	Green/grey/black stained sandy gravel. Coarse gravel of tank base rubble
DVP18	4,3	1.3 to 1.5	Green/grey stained black sandy gravel. Coarse gravel of tank base rubble
DVP41	4,2	0.5 to 0.7	Black stained gravel. Medium to coarse gravels of ash, clinker and slag
	5,3	1.6 to 2.0	Grey gravelly sandy clay. Coarse gravel of quartz. Product on gravel
DVP52	2,4	1.2 to 1.6	Stained green hardcore gravel. Fine to coarse gravel of slag and concrete
DVP53	2,4	1.3 to 1.7	Stained green hardcore gravel. Fine to coarse gravel of slag and concrete
	5,3	1.7 to 2.0	As above with viscous straw coloured lube oil
DVP55	2,4	1.3 to 1.6	Stained green hardcore gravel. Fine to coarse gravel of slag and concrete
DVP67	5,2	1.2 to 1.3	Stained black sandy gravel. Coarse gravel of sandstone and hardcore. Product on gravel (MG)
	5,4	1.3 to 2.0	Grey green hardcore gravel. Ingress of lube oil and rapid ingress of water with solvent.

DVP68	5,2	1.0 to 1.5	Stained black sandy gravel. Coarse gravel of sandstone and hardcore. Product on gravel
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Table 4.8 Summary of heavily impacted natural soils encountered during recent ground investigation (refer to Drawing 5041216/DIME/DWG/979)

Exploratory Hole Reference	Visual/Olfactory Rating (maximum recorded)	Depth (m bgl)	Relevant Strata
DVP2	4,3	1.0 to 1.2	Clayey sandy gravel – stained black with hydrocarbon odour.
DVP5	4,2	0.9 to 1.0	Stained black slightly sandy gravel. Coarse gravel of angular sandstone.
DVP7	4,2	1.4 to 1.6	Orange brown stained grey gravelly clayey sand.
DVP22	4,3	0.2 to 1.2	Stained black gravelly clayey sand. Frequent gravel of sandstone cobbles.
DVP36	4,3	1.0 to 3.2	Light grey stained gravelly clayey sand. Coarse gravel of sandstone and quartz. Sheen on gravel.
CATP044	5,4	1.9 to 2.1	Heavily stained peat. Product in water
CATP045	4,4	1.6 to 1.8	Heavily stained peat. Pockets of brown and cream mottled clay

Free product/oily water was recorded at 18 locations within Monitor Phase 43 during the 2011 ground investigation works by Atkins, as shown on Drawing 5041216-DiMe-DWG-980. Consistent with previous investigation, the majority of these lie within the northern and western parts of the former DiMe Plant within the northern part of Monitor Phase 43.

In response to the identification of free product during the trial pitting, a series of product recovery trenches were installed at the locations shown on Drawing 5041216/REM/DWG/1013. Selected photographs, taken during the installation and monitoring of these trenches are provided in Appendix G. Monitoring of the installed trenches confirmed free product to generally be confined to isolated pockets and seepages. The greatest amount of free product encountered was identified in DMT1 in the western part of the former DiMe Plant.

Laboratory analysis on water samples taken from trenches DMT1, 3A, 4A and 5A March 2011, indicate no exceedences of the adopted thresholds.

A summary of the result of chemical analysis on 224 samples is presented in Appendix H, of which 20 lie outside of Monitor Phase 43 but have been included for reference as they lie within the former DiMe Plant to the east. A total of 111 samples were tested for Volatile Organic Compounds (VOCs). The only exceedance of the Atkins RTCs was a single exceedance of 1,2 Dichloroethane (90.5mg/kg) in DVP67@2.1m depth. This represents natural soils and coincides with an area of heavily impacted soils within the central part of Monitor Phase 43, as indicated in Table 4.7.

In order to try and confirm the extent of solvent impacted shallow groundwater within Monitor Phase 43, samples of groundwater recovered during the trial pits were also analysed for solvent concentrations (namely 1,2 dichloroethane and dichloromethane). The results of the analysis are summarised in Table 4.9. and shown in Appendix H.

Comparison with the adopted groundwater thresholds presented in Appendix A suggests exceedences in DVPW1, DVPW9 and DVPW16 (ie trial pits DVP1, DVP9 and DVP16 respectively). Reference to the exploratory hole location plan indicates DVP1 lies outside of Monitor Phase 43 within the area to the east. Details of remedial and validation works across this area are detailed within Atkins report 5041216/REM/RPT/1016. Reference to historic maps (refer to Drawing 5041216/REM/DWG/983) indicates both DVP9 and DVP16 to lie within the vicinity of the former solvent storage tanks. This is consistent with previous assessment by URS which

suggested the highest concentrations of contamination downgradient of the chiller and filter units (refer to Section 3.3).

Asbestos testing on 92 samples, comprising both Made Ground and natural soils, indicates no asbestos in any of the samples tested.

Testing for polychlorinated biphenyls (PCBs), from within the vicinity of the former electricity substation shown on historical maps, records no concentrations about detection limits.

Table 4.9: Summary of solvent concentrations recorded during trial pitting

Sample Ref	Concentrations of 1,2 Dichloroethane (ug/l)	Concentrations of Dichloromethane (ug/l)	Depth (m bgl)
DVPW1	19700	5830	1.4
DVPW2	<3.3	<3.7	1.0
DVPW4	<3.3	<3.7	2.5
DVPW5	96.5	<3.7	0.9
DVPW6	64.1	<3.7	1.2
DVPW7	<3.3	<3.7	1.4
DVPW9	6440	113	1.3
DVPW10	125	10.7	0.8
DVPW11	105	4.83	0.5
DVPW13	<3.3	<3.7	1.0
DVPW16	13000	18.7	1.4
DVPW17	462	<3.7	1.3
DVPW18	6.3	<3.7	1.0
DVPW19	540	4.84	1.2
DVPW21	<3.3	<3.7	1.0
DVPW22	<3.3	<3.7	0.8
DVPW25	21.7	<3.7	0.5
DVPW26	21.6	<3.7	1.6
DVPW29	<3.3	<3.7	0.4
DVPW39	<3.3	<3.7	1.0
DVPW41	<3.3	<3.7	1.5

5. Requirements of the Section 106

5.1. Remedial Action Plan (RAP) Works

The RAP works for the site, are defined in the S106 as “a programme of ongoing voluntary Remedial Action in relation to Pre Transfer Date Environmental Matters at or in the vicinity of the Property”.

The general purpose and objectives of the RAP Works are the “carrying out of appropriate Remedial Action necessary and sufficient in the context of both the current use of the Property and the intended use, or such other use as may be determined from time to time” (Schedule 7, Part 1, Paragraph 1.3 of the S106).

Paragraphs 1.3.1 and 1.3.2 of the S106 state the following specific objectives for the defined RAP works;

- To prevent (or where that is not possible, minimise, remedy or mitigate as far as is reasonably practicable the effects of) migration from the Property of Pre-Transfer Date Contamination and any Developer Contamination; and
- To assess with a frequency agreed as sufficient by the relevant Environmental Authorities and keep under review;
 - a) The condition of the Environment at and in the vicinity of the Property, including any controlled waters that are or may be affected by such condition, and. any land adjoining or adjacent to the property; and
 - b) The progress and effectiveness of natural attenuation processes

It is noted that URS Report DR1144 (refer to Table 3.2) states that the defined RAP works for the DiMe “*focussed solely on the mitigation of risks to controlled waters and not human health receptors*”.

Three RAP Items (19, 24 and 25 as referred to in Table 1, Schedule 7) are shown to relate to the area of the former DiMe (refer to Drawing 5041216-RAP-DWG-538A).

The original RAP program was designed on the assumption that North Site Reservoir was to be removed and restored to an existing valley. Discussions are ongoing between St. Modwen and the landowner relating to the potential retention of this feature, thus a number of existing RAP Items are considered no longer achievable and require variation (refer to Appendix I). This includes RAP Item 19 which requires isolation of the ‘reservoir from the site drainage system’ and is considered to have been associated with the historical release of solvent impacted surface water from the former DiMe Plant. Agreement of this proposed variation has been obtained from the relevant Environmental Authorities (refer to Appendix J).

A report relating to RAP Feature 24 is currently under preparation by Atkins.

Table 5.1 – Extract from Table 1 from Schedule 7 of the S106 (Dewey & LeBoeuf report GNP/NJR/13773-2_refer to Section 1.4)

Site Area/Potential Receptor.	Key Issues	Scope of Currently Envisaged Remedial Action	Performance Criteria	Works to Date
Eastern Process Area/Neath Valley and River (RAP Feature 25)	Known and or suspected presence of free phase hydrocarbon and chlorinated hydrocarbons Dissolved hydrocarbon and chlorinated hydrocarbon migration away from areas of product	Either containment of hydrocarbon and chlorinated hydrocarbon product, vapour and dissolved phase or; source- reduction solution (of area 30,000m ²) to render containment permanently unnecessary with the following programme elements; 1) Design Level investigations 2) Feasibility Tests 3) System implementation and installation 4) Groundwater and air and soil vapour monitoring programme.	Permanent maintenance of acceptable risk to controlled waters receptors (River Neath and Crymlyn Bog) to the satisfaction of EA and NPT.	Limited work may be required for the RA subject to the result of long term monitoring. Substantial additional (containment) work likely to be required in the event of development.

Eastern process area / Neath valley and river (RAP Feature 24)	Potential cross boundary free product migration into railway cutting	Monitor 30 sentinel wells for free phase product on six monthly basis. Install permanent product interception trench system along boundary of North Site, if sentinel well data suggests a risk of down gradient product migration occurring and in any event install such a trench to, at a minimum, replace the current sentinel wells prior to redevelopment (500 x 3 metres minimum). Any interception trench must prevent further down gradient migration of free product and allow recovery of intercepted product.	Install permanent interception feature to prevent free product migration down gradient and permit recovery of intercepted product.	Sentinel well installation complete*. Groundwater monitoring only.
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*The sentinel wells comprise a series of wells placed at regular intervals, for monitoring, approximately 15m from boundaries considered potentially vulnerable from product migration (URS Report DR869r3). Depending on monitoring results from the sentinel wells the RAP requires the installation of a product interception trench.

5.2. Redevelopment Remediation Works

In the absence of any guidance relating specifically to proposed sports pitches, the general requirements for an open space/recreational end use have been adopted for the purpose of the following assessment.

The S106 for the redevelopment of the former refinery states that:

The Developer shall remediate areas of the Property which will not be developed for residential or commercial end uses based on these areas falling into one of the following in three broad categories of land-use:

- *Well managed parks and public gardens*
- *More lightly managed areas where public access is encouraged.*
- *Areas to which access is discouraged but occasional access and/or trespassing is possible.*

The degree of protection that will need to be afforded to people will be largely dependent upon how 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 RBSLsto an appropriate depth and (iii) include an appropriate scheme of validation testing.

Schedule 10, Paragraph 6 of the S106 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'

In addition to the requirements outlined above, Schedule 10, Section 8 of the S106 also requires the placement of a cover of clean materials within proposed landscaping areas in the final development as detailed below:

To provide them with 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 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 a residential end use and type 1 or better for a commercial end use.

Due to ongoing uncertainty relating to proposed development levels across this area, the following assessment assumes that current ground levels across Monitor Phase 43 represent 1m below FFL.

It is anticipated that outstanding fill materials, including the clean cover materials required by the S106, will be placed by others as part of the development of this area and the construction of the proposed pitches.

6. Remedial and Plot Preparatory Works

6.1. Scope of Works

In order to comply with the requirements of the S106, the following scope of works have been undertaken across Monitor Phase 43.

- *The removal of existing structural remnants, including in situ concrete, brickwork and other identified 'obstructions'.*
- *The removal of identified free product.*
- *The removal and treatment of heavily impacted shallow groundwater,*
- *The removal of heavily impacted in situ soils,*
- *Further investigation and the removal of identified 'hotspots' of contamination.*
- *Reprofiling and validation of in situ soils*

In line with the access restrictions posed by existing hardstanding, ongoing use and the presence of identified solvent contamination in shallow groundwater. These works within Monitor Phase 43 have been carried out in a number of phases as described below:

- Hardstanding removal and clearance works (December 2009 - October 2010) as previously discussed in Section 4.2.
- Investigation followed by subsequent turnover and removal of grossly impacted soils, including the removal and treatment of solvent impacted shallow groundwater (October 2011 – March 2012 'Phase 1')
- Backfill of excavations with suitable site won materials and reprofiling of shallow soils (January to April 2012)
- Additional turnover, including removal of relict infrastructure and heavily impacted soils (April – June 2013 'Phase 2')
- Outstanding turnover, including removal of relict infrastructure and heavily impacted soils (September – November 2014 'Phase 3')

For ease of reference, works in each of the phases are discussed separately below. As the initial hardstanding removal was carried out solely to facilitate access to this area for subsequent investigation and remediation then these works are not discussed further.

It should be noted that, due to the presence of a number of 'live' services running east-west through the northern part of Monitor Phase 43, remedial works within this area have not been possible. It is noted that a 10m corridor in this area is to be retained as a Utilities Corridor within the final development (refer to Drawing 5041216/ENG/DWG/906).

The approximate extent of these three phases of works is shown on drawing 5041216-DWG-REM-1862).

6.2. Phase 1 (2011-12)

Hotspot removal

The initial phase of remedial works within Monitor Phase 43 comprised a turnover of existing Made Ground and shallow soils and the removal of heavily impacted soils, identified either by visual/olfactory classification and/or previously identified by laboratory testing during ground investigation (refer to Section 4). The extent of these works covered an area of approximately 53,844m², as shown on Drawing 5041216/REM/DWG/1845.

Selected photographs taken during the remedial works are presented in Appendix K.

Excavated materials were removed from Monitor Phase 43 and taken elsewhere within the refinery for treatment. The base of the excavations, as indicated on Drawing 5014126-DWG-1845, comprised a layer of low permeability clay soil which possessed no obvious indication of hydrocarbon or solvent impact. Previous ground investigation by Atkins (see Section 4) has generally confirmed the natural soils below the former DiMe to be generally suitable for retention in situ. Exceedences of the reported thresholds have been identified at depth, locally, but given the depth of these exceedences (>5m bgl) these are not considered to pose a significant risk to the redevelopment of this area as proposed.

The volume of material removed during this phase the works was approximately 38,000m³. As anticipated, based on the findings of the previous ground investigation, the majority of the excavated soils comprised a coarse granular materials, previously referred to as 'slag' or 'tank base rubble' during previous ground investigation (see Section 4).

All solvent and hydrocarbon impacted soils from across this area were taken to a pre-prepared treatment pad within the southern part of the former refinery. On disturbance some of the grossly contaminated soil released small quantiles of suspected Dense Non Aqueous Phase Liquid (DNAPL). Given the generally low volumes encountered and the mixed nature of the contaminants it was not considered practical to try a phase separation operation relating to the identified DNAPL. Impacted materials were excavated en-masse and removed to a segregated area of the treatment pad in the south of the site. To mitigate against the uncontrolled migration of DiMe related solvents, two control lagoons were constructed adjacent the treatment pad to allow for the collection of run-off from these pads and enable analysis of the water prior to discharge into the Containment Area Lagoons.

Identified free product was recovered from Monitor Phase 43 as part of the remedial works.

Structures and obstructions

Additional concrete and pipe work, identified during these works, were removed from this area as part of the works.

Groundwater Management and treatment of solvent impacted shallow groundwater.

Groundwater has been previously shown to lie at depths of around 1m bgl beneath the former DiMe Plant.

In order to manage shallow groundwater during the remedial excavations, a trench was excavated along the northern edge of the excavation and a 600mm HDPE lined sump was installed in the north west corner of the excavations.

Water was pumped from this sump during the remedial works. Due to the presence of known solvent contamination and localised free product, the water was passed through an oil water separator, a carbon filter and a sand filter prior to discharge into the existing site drainage network.

In order to confirm the successful treatment of this water prior to discharge, weekly water samples were taken from the influent and effluent of the water treatment unit throughout the works. These results are discussed further in section 7

6.3. Phase 2 (2013)

Hotspot removal

In line with ongoing monitoring and sampling of remaining monitoring wells within the north eastern part of the former DiMe, remediation/reclamation of this area was carried out as part of a second phase of works. The extent of this second phase of works covered an area of approximately 9,430m² the extent of which is shown on Drawing 5041216-DWG-REM 1962.

Previous monitoring of wells within this area (DSB025, 027, 030 and MSMW222) suggested the presence of free product up to a thickness of 2.8m within the natural soils. Free product recovery was carried out from these wells between February 2012 and July 2012 and recovered approximately 20 litres of product. In line with a significant reduction in the volume of free product within this area (as shown on the trend graph in Appendix L), a series of machine excavated trial

pits were subsequently carried out around each installation in order to further assess the source/volume of the free product in terms of the ground conditions present. The investigation recorded only localised pockets of free product within the vicinity of DVM016 confirming that the identified thicknesses of product were related to 'trapped' product within borehole installations rather than indicative of more widespread free product in the natural soils in this area.

Selected photographs taken during the remedial works are presented in Appendix K.

Further to the confirmation of the absence of widespread free product remaining in this area, a turnover was carried out to and remove any remaining heavily impacted soils and relict infrastructure. As per the previous works, the base of these excavations comprised natural soils (predominantly silts and silty clays) possessing minimal evidence of any hydrocarbon or solvent impact.

The volume of material removed from Monitor Phase 43 as part of this phase of works was approximately 14,000m³. The majority of excavated soils removed comprised heavily impacted Made Ground and very soft glacial sands.

Excavated shallow soils from this area, considered suitable for proposed re-use, were stockpiled locally for proposed re-use.

Structures and obstructions

Additional concrete foundations and pipe work were identified and removed from this area as part of the works.

Groundwater Management

Due to the presence of shallow groundwater and surface water from upgradient areas, a trench was excavated along the northern edge of the Phase 2 excavation area.

Water within this channel was visually inspected daily and was tested weekly to confirm the concentrations of contamination present prior to discharge to the existing site drainage network. In addition, weekly water samples were taken from the influent to the North site reservoir throughout the works. These results are discussed further in section 7.

6.4. Phase 3 (2014)

In line with access restrictions posed by the use of this area by Hydrock for storage during works associated with the stabilisation of sludges from North Site Reservoir, the final phase of remedial/reclamation works within Monitor Phase 43 was undertaken in January 2014. The extent of this last phase of works covered an area of approximately 11,780m², as shown on Drawing 5041216-DWG-1845.

It is noted that remedial works within the southern part of this area were undertaken in conjunction with the remediation of the area to the east, as detailed in Atkins report 5041216/REM/RPT/1016.

Selected photographs taken during the remedial works are presented in Appendix G.

Consistent with wider remedial works, materials were removed based on visual/olfactory inspection down to underlying 'clean' natural soils. The base of the excavations within this area is shown on Drawing 5041216-DWG-1845.

The volume of material removed from this area as part of these works was approximately 11000m³. A heavily impacted soft grey alluvial silt was identified in this area during the works and was removed for treatment (bioremediation) elsewhere in the refinery. This is consistent with the presence of localised peat and peaty soils noted by previous investigation across the former DiMe (refer to Section 3) and in the north eastern part of Monitor Phase 43 (Atkins report 5041216/PLOTS/RPT/1016, May 2015).

Impacted soils, excavated as part of these works were removed from this area for treatment (bioremediation) elsewhere within the former refinery.

Structures and obstructions

During the works, additional concrete foundations and pipe work were identified, these were removed.

6.5. Utilities Corridor

As previously highlighted, the extent of excavations within the northern part of the former refinery was restricted by the presence of a number of live services as shown on drawing 5041216-DWG-1844.

It is noted that a 10m strip of land within the northern part of Monitor Phase 43 is proposed for retention as a utilities corridor as part of the proposed redevelopment of this area (refer to drawing 5041216/ENG/DWG/906).

6.6. Plot Reprofilling Works and Earthworks Volumes

6.6.1. Phase 1 (2011-12)

Following removal of identified contamination hot spots, plot re-profiling was undertaken across this part of Monitor Phase 43 between October 2011 and April 2012.

Final ground levels across this area are shown on drawing 5041216/REM/DWG/1844.

The works within this area entailed the removal of the following materials:

- Approximately 38,000m³ of impacted soils/identified hotspots
- Approximately 6,000m³ of residual soils (non contaminated Made Ground and natural soil)

In order to restore ground levels across this area to the desired levels, approximately 34,0000 m³ of fill material were required within this part of Monitor Phase 43.

Fill materials comprised approximately 24,000m³ of suitable site won materials from elsewhere within the former refinery, approximately 6000m³ of selected materials recovered from within Monitor Phase 43 and approximately 4000m³ of treated material that was returned to the DiMe after bio-remediation. Further discussion of these materials is provided as section 7.

6.6.2. Phase 2 (2013)

Following removal of identified contamination hot spots, plot re-profiling was undertaken across this part of Monitor Phase 43 between April 2013 and June 2013.

Final ground levels across this area are shown on drawing 5041216/REM/DWG/1844.

The works in this area comprised the removal of the following materials:

- Approximately 8000m³ of impacted soils/identified hot spots
- Approximately 6000m³ of residual soils (non contaminated Made Ground and natural soil)

A total of approximately 12,000 m³ of fill material was placed across this area as part of the works.

Fill materials in this part of Monitor Phase 43 comprised approximately 10,500m³ of site won material and approximately 1500m³ of treated material that was returned to the DiMe after bio-remediation. Further discussion relating to these materials is provided in section 5.

6.6.3. Phase 3 (2014)

Filling and re-profiling works were undertaken across this part of Monitor Phase 43 between February and March 2014.

Final ground levels across this area are shown on drawing 5041216/REM/DWG/1844.

The works in this area comprised the removal of the following materials:

- Approximately 8000m³ of contamination hot spot material
- Approximately 3000m³ of residual soils (non contaminated Made Ground and natural soil)

A total of approximately 10,000m³ of material was required to bring the Phase 3 area to the desired ground levels. This included approximately 9,500m³ of site won material and 500m³ of treated material that was returned to the DiMe after bio-remediation processes. Further discussion of these materials is provided in Section 7.

7. Validation/Verification

7.1. General

Specific validation frequencies for proposed areas of Public Open Spaces are not specified in the S106.

Ground investigation across Monitor Phase 43 has generally shown ground conditions to comprise the following:

- **Made Ground** generally comprising concrete and coarse grained fill material predominantly of ash clinker and brick.
- **Granular Drift Deposits** which are patchy in extent, comprising slightly silty sands and gravels.
- **Cohesive Drift Deposits** comprising more cohesive stiff grey brown clays and silts with varying proportions of gravel, cobbles and boulders.
- **Coal Measures Strata** underlie the Drift deposits and comprise inter bedded sandstones, siltstones and mudstones with occasional traces of coal. The top of the coal measures strata are weathered.

Laboratory analysis on natural soils (refer to Section 4) has confirmed these to be acceptable for retention in situ based on the adopted thresholds for this area (refer to Appendix A).

In line with the frequency of previous investigation, validation of the remedial works across Monitor Phase 43 has been carried out in a number of phases, comprising the following works:

- Samples taken from the base of remedial excavations
- Stockpile sampling prior to re-use
- Post remedial trial pitting

Further discussion of each of the above is given in the following sections:

7.1.1. Visual and Olfactory Inspection and Basal Sampling

Remedial excavations across Monitor Phase 43 were generally terminated in natural soils displaying minimal visual and/or olfactory evidence of contamination. Based on previous laboratory analysis by Atkins, natural soils underlying this area have been shown to be suitable for retention at depths >1m beneath the proposed sports pitches.

The extent of the remedial excavations within Monitor Phase 43, as shown on Drawing 5041216/REM/DWG/1845, is approximately 40,600m².

During the remedial works, a total of 89 samples were taken from the base of the remedial excavations, including samples taken from depth within trial pits into the underlying natural soils. A summary of the results, including copies of laboratory certificates are provided in Appendix M. With the exception of a single base sample (DIME BASE 8) which was subject to a 300mm scrape and then resampled (DIME BASE 8b) laboratory analysis confirm concentrations of contamination below the adopted thresholds in Appendix A. Excluding DIME BASE 8b, which lies only marginally in exceedance of the RBSL for 1,2 Dichloroethane (6050ug/kg cf 6000ug/kg), the reported concentrations also lie below the RBSLs for a recreational end use at depths >1m below FFL.

Based on an area of 40,600m², this equates to a sampling frequency of 1 per 456m². As this testing supplements the sampling of natural soils, taken during previous ground investigation across Monitor Phase 43 (refer to Appendix H) then this is considered acceptable to demonstrate the removal of impacted soils from across this area.

As previously indicated, remedial works within the southern part of Phase 3 were carried out in conjunction with the remediation of the adjacent area to the east. Reference to Atkins report 5041216/PLOTS/RPT/1016 indicates a total of 13 samples from this area, as shown on Drawing

5041216/DIME/DWG/1199. Comparison of these results with the adopted thresholds in Appendix A confirm thresholds suitable for retention beneath the proposed sports pitches (refer to Appendix M).

7.1.2. Sampling of stockpiled Materials prior to use

Site Won Soils-Untreated Materials

Approximately 50,000m³ of sitewon materials were used as backfill during remedial works across Monitor Phase 43.

These comprised the following stockpiles.

- SP12 (approximately 4820m³ of 'gravelly clayey sand')
- SP23 (approximately 2450m³ of 'medium and coarse sand')
- SP24 (approximately 800m³ of 'gravelly sandy clay')
- SP25 (approximately 780m³ of 'gravelly sandy clay')
- SP31 (approximately 1980m³ of 'gravelly sandy clay')
- SP32 (approximately 790m³ of 'gravelly sandy clay')
- SP33 (approximately 380m³ of 'sandy gravel')
- SP34 (approximately 6400m³ of 'gravelly sand')
- SP35 (approximately 8000m³ of 'gravelly sand')
- SP38 (approximately 8800m³ of 'gravelly clayey sand')
- SP39 (approximately 5200m³ of 'gravelly clayey sand')
- SP40 (approximately 8010m³ of 'sandy gravelly clay')
- SP49 (approximately 1600m³ of 'sandy gravelly clay')

In order to confirm the suitability of these soils for use as backfill materials, all stockpiled materials were tested at a frequency of 1 per 400m³ prior to use. This adopted frequency is in line with the specific frequency in the S106 (Table 4, Part 3, Schedule 8) for stockpiled soils proposed for use within an area of proposed commercial end use. As this was to be supplemented by post remediation trial pitting and further sampling across Monitor Phase 43 then this was considered acceptable. As many of these stockpiles represent soils won from works outside of Monitor Phase 43, and solvents are reported to have been previously utilised within limited areas of the former refinery, only those materials originating from within the former DiMe plant were tested for Volatile Organic Compounds (VOCs) as part of this initial screening.

Copies of laboratory certificates and a summary of laboratory analysis on these soils are provided as Appendix N. A total of 124 samples were tested and confirm concentrations of contamination below the adopted thresholds in Appendix A.

Asbestos testing was carried out on 59 of the samples and confirmed the presence of 'loose fibres' in 5 samples. Possible asbestos containing materials were reported in one sample. Given the proposed use of these materials at depth beneath an area of proposed sports pitches then the risk of exposure of these materials in the final development is considered to be low and no further testing relating to asbestos was carried out.

Site Won Soils-Treated Materials

As outlined in Section 6, backfill materials within Monitor Phase 43 comprised approximately 6,000m³ of site won materials that had undergone bioremediation.

A total of 79 samples were taken in order to confirm the suitability of these materials prior to use, details of which are provided in Appendix N. Review of the reported data indicates concentrations acceptable for use beneath the proposed sports fields.

The above sampling represents a frequency of 1 test per 75m³ and this lies below the required validation frequency defined in the S106 for 'soils treated ex situ and homogenised' for soils proposed at depth (>1m) beneath areas of both a proposed residential and commercial end use.

7.1.3. Post Remediation Trial Pitting

A total of 31 machine excavated trial pits (DMV001 to DMV031) were carried out by Atkins in May 2012 across Monitor Phase 43 on completion of the remedial works. The locations of the pits are shown on Drawing 5041216/DIME/RPT/1199 and copies of relevant exploratory hole logs are provided in Appendix O. Due to a setting out error, trial pits DMV2, 3 and 4 lie outside of the boundary of Monitor Phase 43 and have therefore been excluded from any further assessment relating to this area.

Reference to the exploratory hole logs indicates ground conditions across this area to comprise Made Ground, generally described as a brown sandy gravelly clay or brown gravelly sand, to depths of between 1m (DMV005) and 4m bgl (DMV030).

Consistent with previous investigation, natural soils are described as a sandy gravelly clay or gravelly clayey sand. Occasional pockets of product were noted in DMV001, at depths of between 0.7m and 1.2m bgl and the underlying sands are described as having displayed a 'heavy sheen' (VO=3/3).

Heavy sheens were also recorded in natural soils in DMV16 and a solvent odour was noted at 2.2m to 3.2m depth in DMV23. No evidence of any free product or oily seepages were noted at any location during the works.

Laboratory analysis on 56 samples taken from these pits confirm concentrations below the adopted thresholds in Appendix A. Copies of laboratory certificates, including a summary of relevant analysis is provided in Appendix P.

Samples of water taken from seven of the trial pits (DMV007,11,16,19,26,27 and 30) indicates concentrations below the adopted thresholds in Appendix A.

7.1.4. Groundwater Monitoring and Analysis

Weekly water samples were taken during the remedial works on Monitor Phase 43 in order to confirm the absence of significantly increased concentrations of solvent contamination within the existing refinery drainage network.

Graphs, presented in Appendix Q, record the concentrations for 1,2 Dichloroethene and Dichloromethane for samples taken between November 2011 and February 2012 from the Water treatment unit. This unit was in place throughout the preliminary phase of works across Monitor Phase 43. Recorded concentrations of 1,2 Dichloroethane vary between <1ug/l and 78,800ug/l, consistent with recorded concentrations noted during sampling from trial pits undertaken during previous investigation by Atkins (refer to Section 4).

Concentrations exiting the water treatment unit are reported to be higher than the influent on a number of occasions at the end of 2011, however this is considered potentially to be as a result of mislabelling during the works. Albeit there is a clear reduction in recorded concentrations for both sample locations during the monitoring period.

Monitoring of water quality at the influent of the NSR is also ongoing as part of the redevelopment of the former refinery. This predominantly comprises shallow water and surface water from across the former DiMe. Trends in the reported concentrations for 1,2 Dichloroethene and Dichloromethane for chemical samples taken between 2010 and 2015 show a consistent and marked reduced in the concentrations of such solvents since 2012 (refer to Appendix Q).

8. Summary and Conclusions

A summary of the status of Monitor Phase 43, in line with the requirements of the S106 is presented in Table 8.1 below:

Table 8.1 – Validation Summary

Requirement	Status	Comment
Chemical quality of soils in situ	Complete	Trial pitting and sampling has been undertaken across Monitor Phase 43. Further trial pitting is proposed to investigate localised areas of heavy sheens noted during validation trial pitting and to investigate previously inaccessible areas in the north western part of Monitor Phase 43.
VO quality of soils in situ	Complete	With the exception of localised pockets of free product in DMV001 which are to be further investigated, a maximum recorded VO of 3 has been recorded for retained soils within Monitor Phase 43.
Observations of groundwater for the presence of free phase product	Complete	See above
Chemical and VO quality of imported material	N/A	No imported soils were utilised as part of the works. Details of testing on all site won soils are provided.
Compliance with adopted thresholds	Complete	Remaining soils within Monitor Phase 43 have been shown to be suitable for retention based on the adopted thresholds for this area.
Removal of oil saturated soils	Complete	Existing oil saturated soils have been removed from across Monitor Phase 43 down to 'clean' underlying natural soils.
Asbestos Assessment	Complete	Visible ACM was not identified during the works in Monitor Phase 43. Testing confirms localised asbestos fibres, however, as this area is proposed for use as an area of sports pitches and the current levels have been assumed to represent 1m below FFL then the risks associated with the proposed retention of these soils is considered to be low.
Control of seeps, sheens and iron staining from bedrock	N/A	No evidence of any oily seepages or iron precipitates were noted during recent validation trial pitting across Monitor Phase 43.

Atkins has been commissioned by St. Modwen Developments Ltd to undertake an assessment of an area of the former refinery with a view to enabling Monitor sign-off for this area in terms of a proposed commercial end use. For the purpose of Monitor Sign off, this area shall be referred to as Monitor Phase 43.

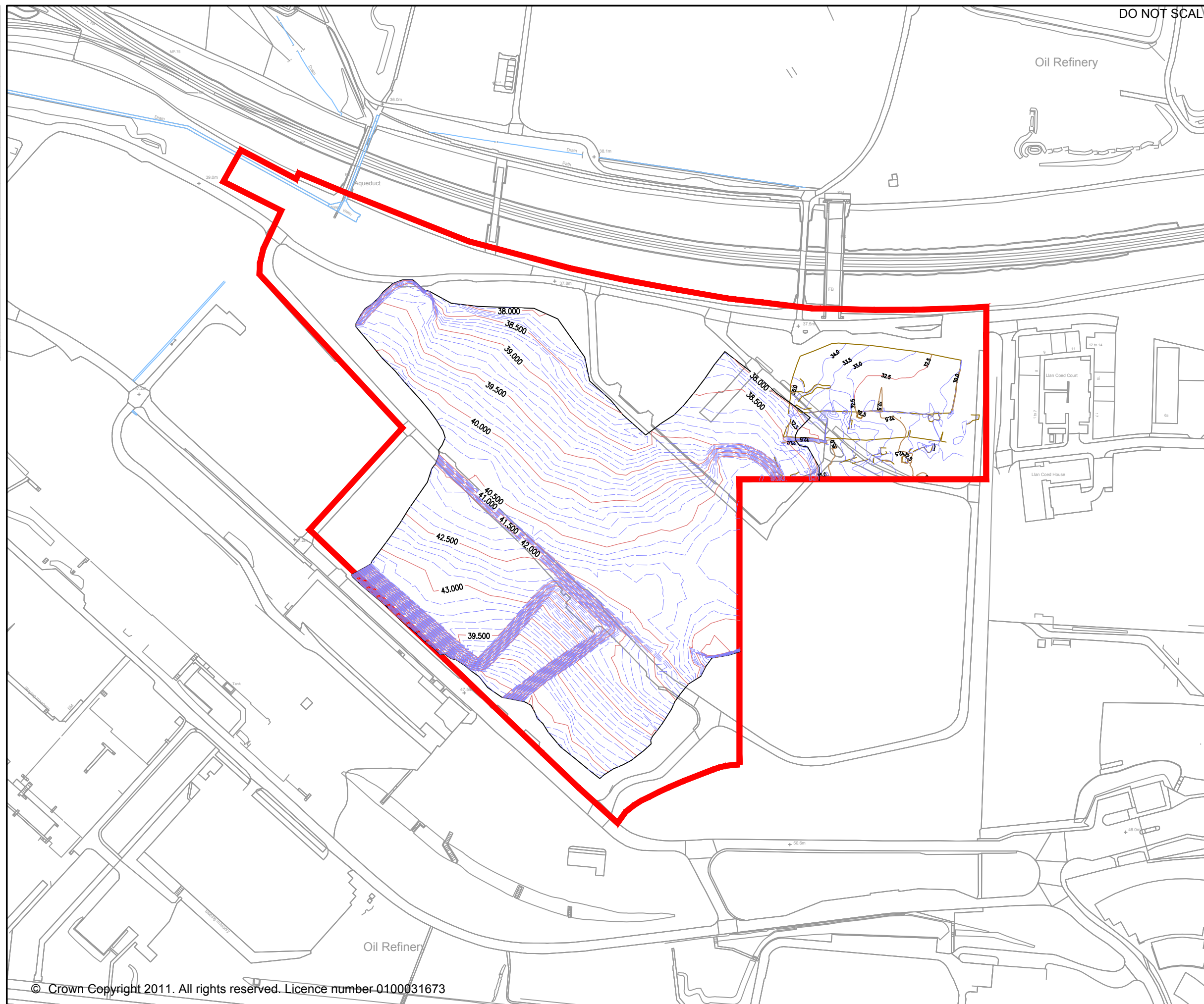
Based upon the findings of recent investigation and in line with the use of this area for sports pitches, Monitor Phase 43 area has been validated and has been deemed to be suitable. Further

investigation of localised areas of 'heavy sheens' and pockets of free product are, however, proposed.

It should be noted that recent ground investigation works focussed predominantly on contamination across this area and further assessment to assess potential geotechnical constraints within this Phase should be carried out prior to any proposed development.

Where a change in proposed end use is proposed for this area, reassessment of the data will be required in order to confirm the need for additional investigation and/or further remediation across this area.

Drawings

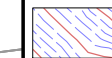


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1. THIS DRAWING WAS BASED ON SURVEY INFORMATION PRODUCED AND PROVIDED BY HAWK 2015.

KEY:



BOE CONTOURS

— DIME AREA PHASE BOUNDARY

P1	00/00/15	FIRST ISSUE			
Rev	Date	Description	By	Chkd	A

Drawing Status	FOR INFORMATION	Suitability	S2
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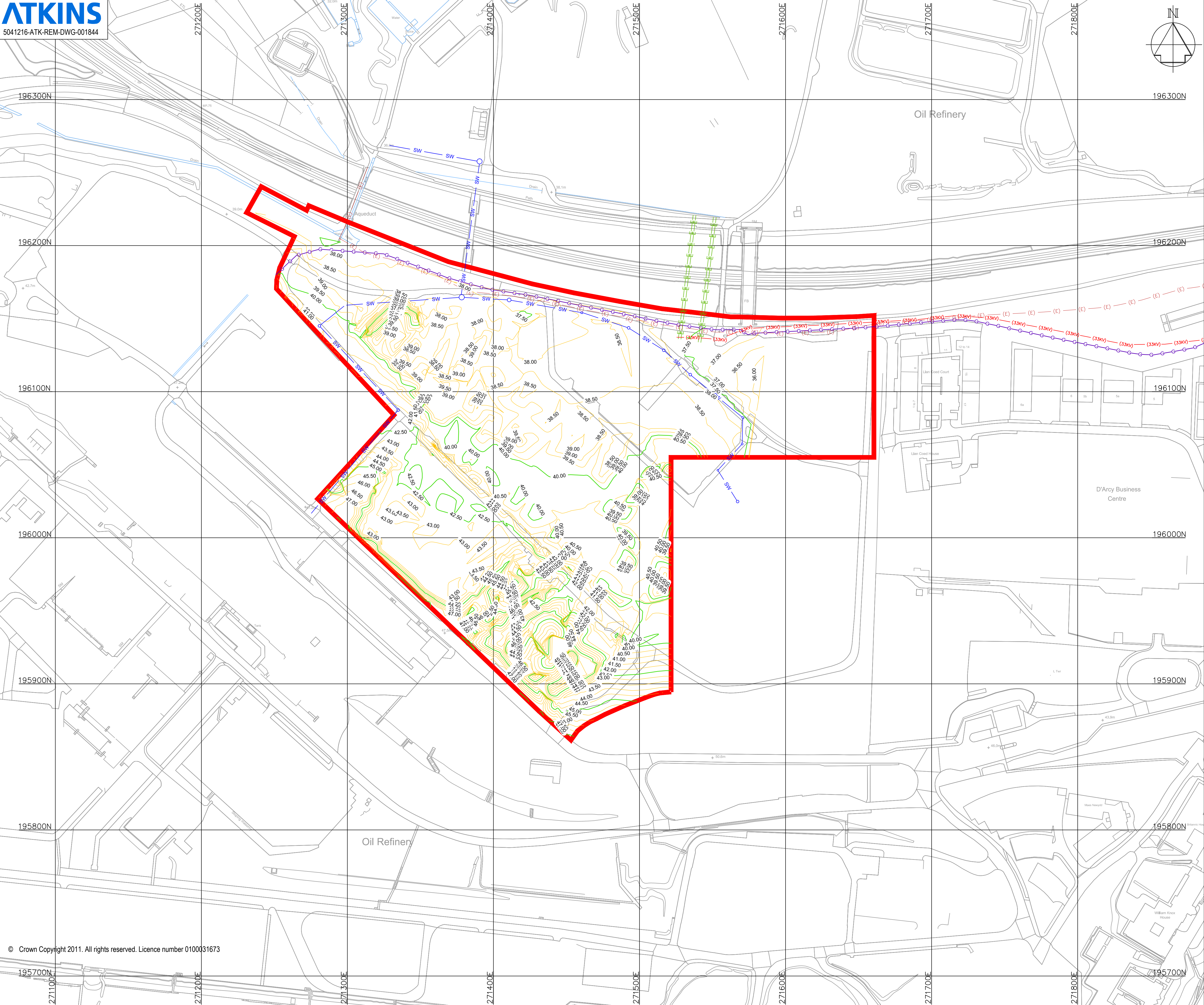
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Drawing Title

COMMERCIAL AND DIME AREAS
BASE OF EXCAVATION

Scale 1:2000	Designed AM	Drawn MJ	Checked AM	Authorised ML
Original Size A3	Date 07/04/15	Date 07/04/15	Date 07/04/15	Date 07/04/15

Drawing Number		Revision	
5041216-ATK-REM-DWG-1845		P 1	



- NOTE
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 - AS BUILT LEVELS AS OF MARCH 2015. PRIOR TO CONSTRUCTION OF THE EMBANKMENT AND UPFILLING WORKS.
- KEY:
- PRE REMEDIATION CONTOURS
 - DIME AREA PHASE BOUNDARY
 - SURFACE WATER DRAINAGE
 - LOW VOLTAGE UNDERGROUND CABLE
 - 33kV UNDERGROUND CABLE
 - LOW VOLTAGE OVERHEAD CABLE
 - GAS MAIN

REVISIONS	Drawn By	Checked By	Date
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PURPOSE OF ISSUE	Rev.	Authorised for issue	Date
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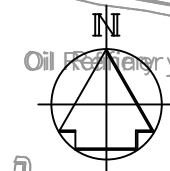
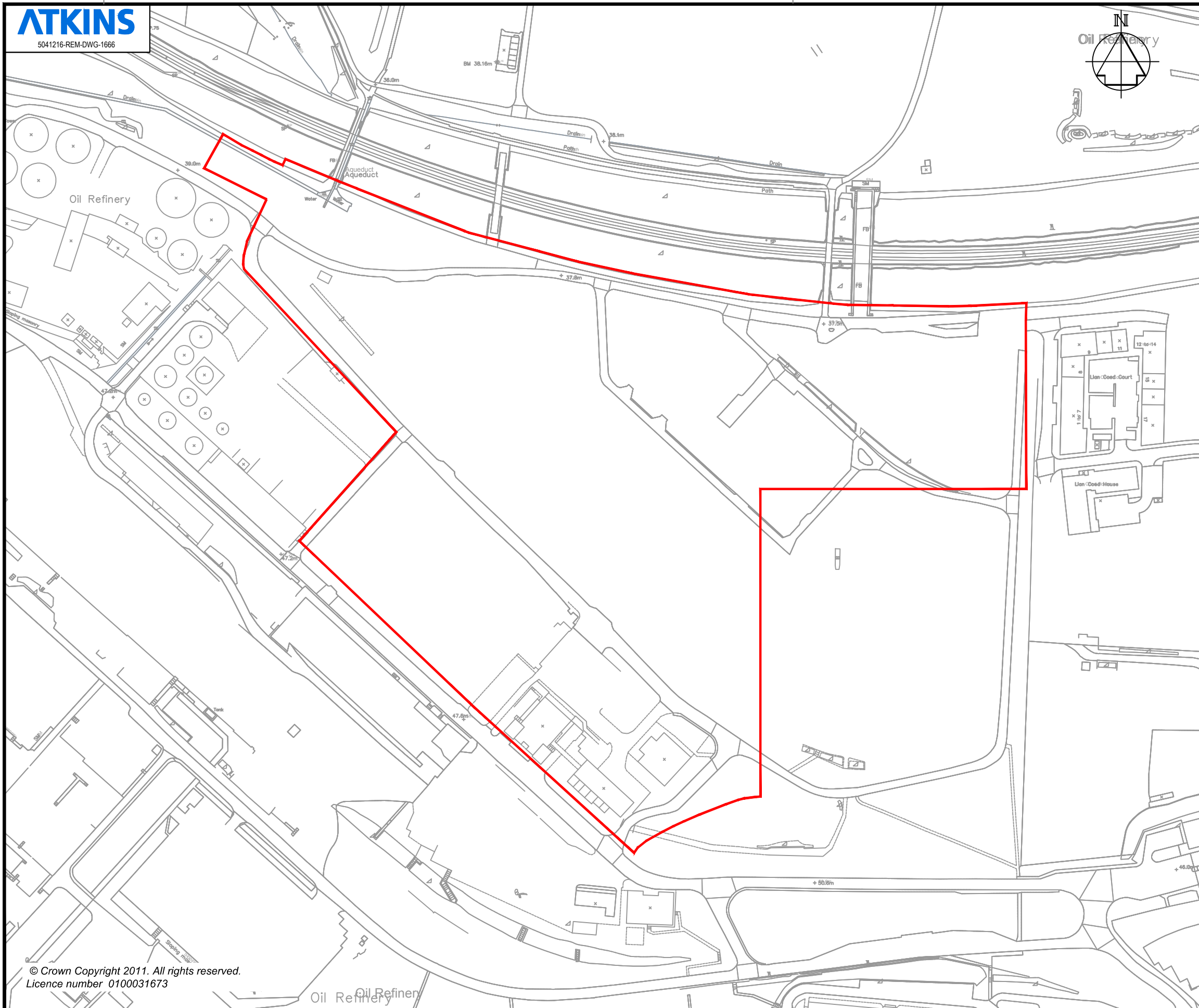
PROJECT

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DRAWING TITLE

MONITOR PHASE 38
POST REMEDIATION GROUND LEVELS

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KEY

Monitor Phase 43 Boundary

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PURPOSE OF ISSUE	Rev.	Authorised for issue	Date
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Proposed Phase Boundary
(Monitor Phase 43)

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