

Bantry Bay
Seaward side

Bantry Town
Landward side

31000 N.T.S.

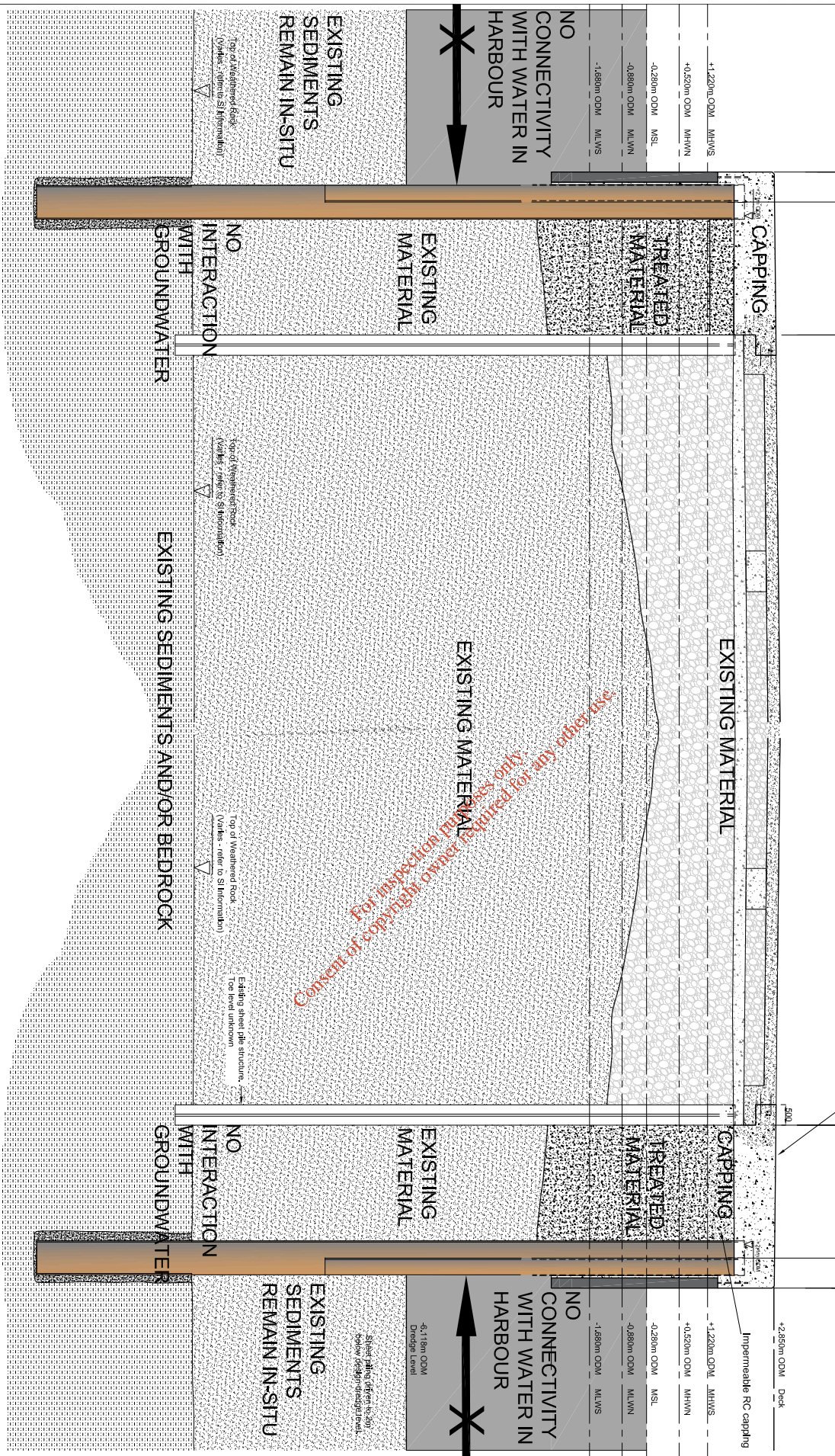
proposed widened Pier Head

Existing Pier
Pier Head

Pier Head symmetrical about C-C

New deck slab

Proposed quay edge



Transverse Section Through Pier Head (Looking Northwards)
SCALE: 1:50

Notes

1. All dimensions are in millimetres (MM),
2. All levels are in metres related to Ordnance Datum Mean,
3. Drawings are not to be scaled.

Legend

+1.220m ODL	MHWS
+0.520m ODM	MHWN
-0.280m ODM	MSL
-0.880m ODM	M/LWN
-1.680m ODM	M/LWS

Reference Drawings

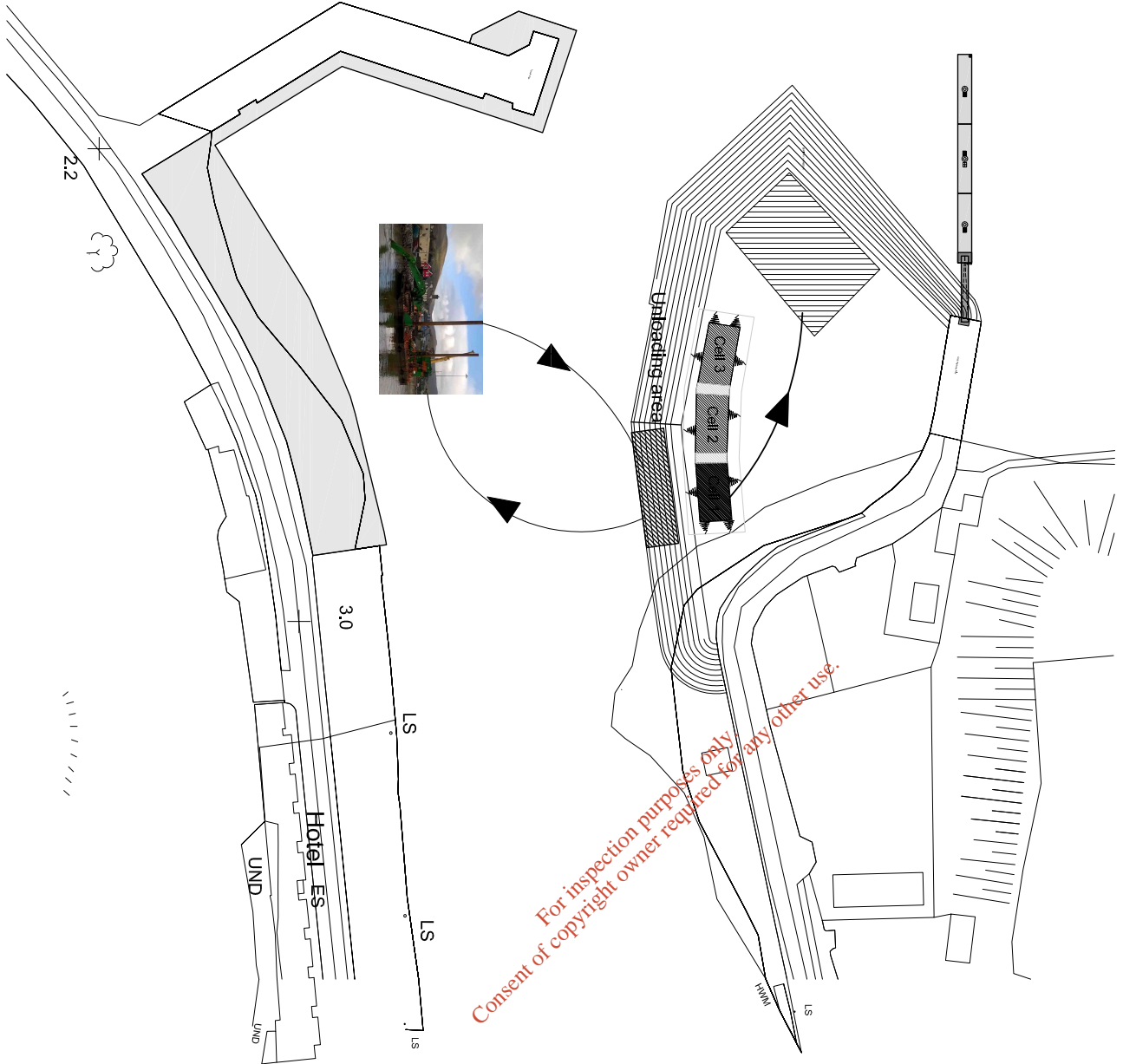
4.117m ODM
Design Level
Slab shall differ to 500
below design level.

Rev	Date	Description	By	Check
1	16/02/2015	ISSUED FOR BIA	SHF	MSS
2	16/02/2015	Revised	SHF	MSS

This
Conceptual Site Model
For Pathways From
Fishing Pier Head
Client
Port Of Cork



Author: AW	15/02/2015	Eng. No.	16341 - FIG.07	Scale	A
Drawn: SJ	16/02/2015				
Checked: AW	16/02/2015				
Approved: PC	16/02/2015				



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Phase 1 :
Cell 1 filled with dredged spoil

Phase 2 :
Commence placing dredged gravel material

Phase 3 :
Commence stabilising material in Cell 1 and loading dredged material into Cell 2

Phase 4 :
Commence unloading stabilised material from Cell 1 and placing over the gravel. The material in Cell 2 is being stabilised and newly dredged material is being unloaded into Cell 3.

Notes

1. All dimensions are in millimetres (UNO)
2. Drawings are not to be scaled.
3. All levels are to Ordnance Datum Mean High unless otherwise noted.
4. Conversion for Mean High to Chart Datum : 0.00m ODM = 2.18m CHD.
5. Schematic Drawing for Information Purposes Only.

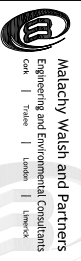
Legend

Reference Drawings

Ref. No.	Description	Rev.	Date
1	1:10 Scale	1	15/02/16
2	2:10 Scale	1	15/02/16
3	3:10 Scale	1	15/02/16
4	4:10 Scale	1	15/02/16
5	5:10 Scale	1	15/02/16
6	6:10 Scale	1	15/02/16
7	7:10 Scale	1	15/02/16
8	8:10 Scale	1	15/02/16
9	9:10 Scale	1	15/02/16
10	10:10 Scale	1	15/02/16

Site: Port of CA

This: Inner Harbour Development / Amenity Area Treatment/Piering



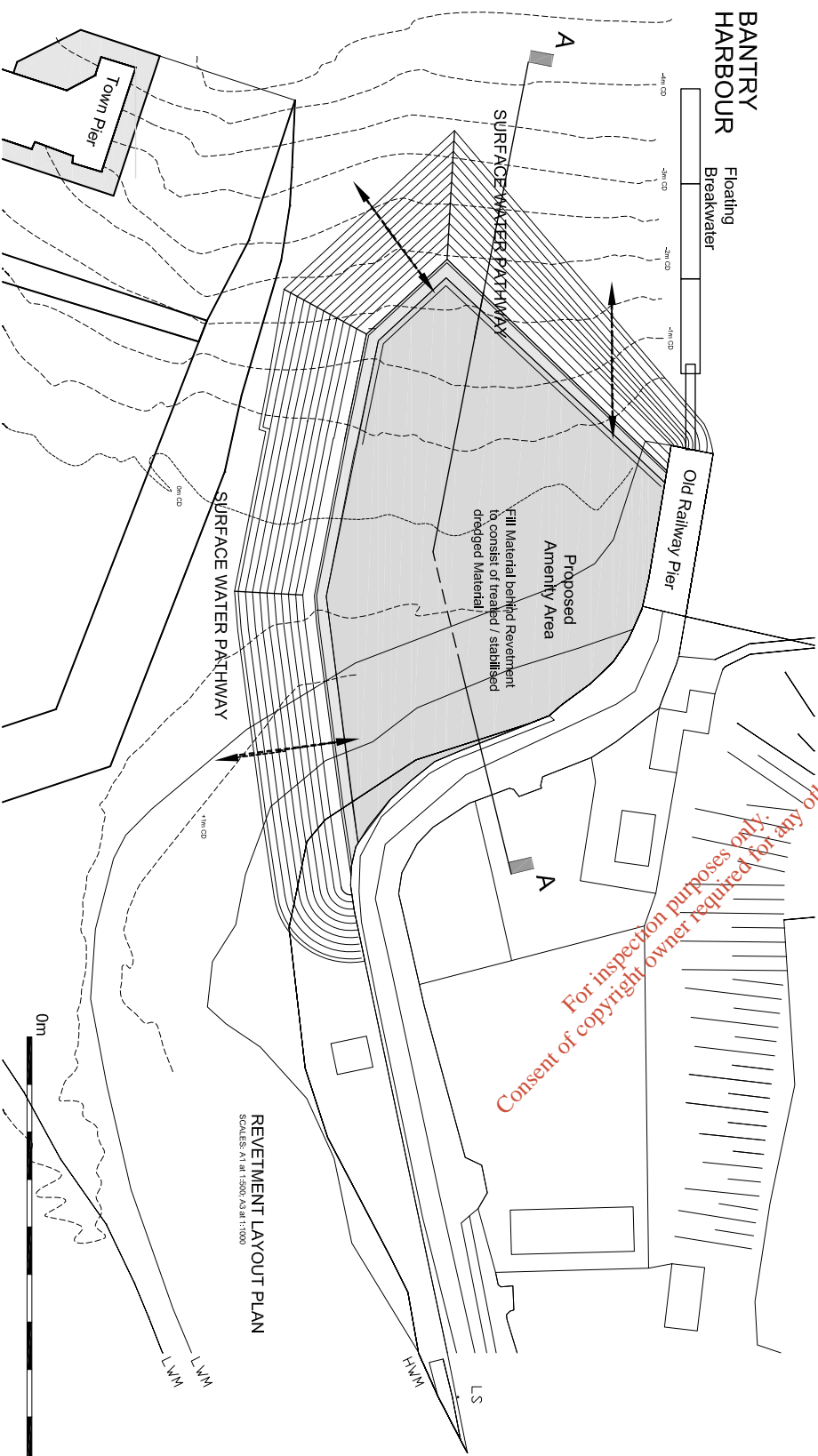
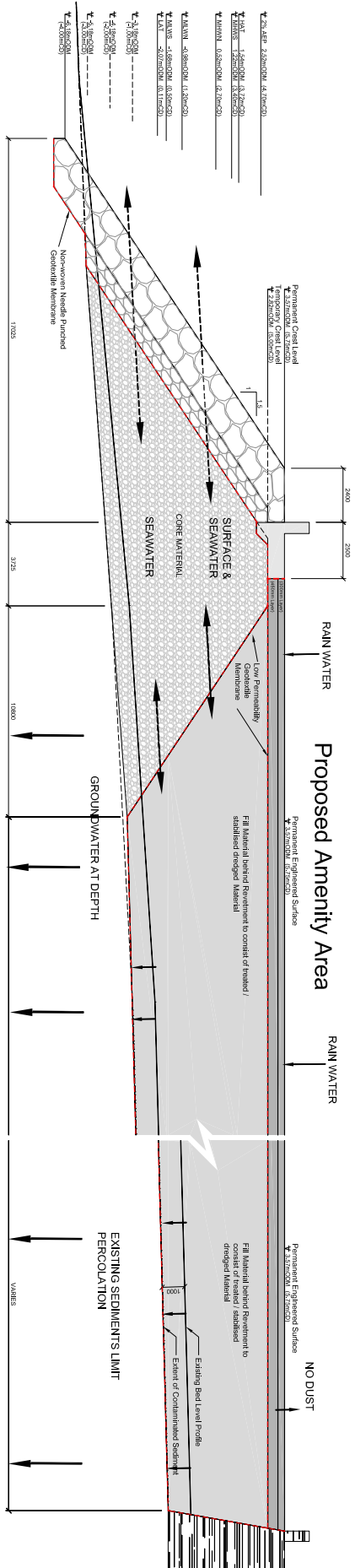
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Scale: A1	WB	15/02/16	16341-FIG.08	Rev: A
Drawn: JWS	15/02/16			
Checked: JWS	15/02/16			
Approved: JWS	15/02/16			

TYPICAL RETEWMENT CROSS-SECTION A-A

SCALES: As Shown



RETEWMENT LAYOUT PLAN

SCALES: As Shown

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Notes

- 1. All dimensions are in millimetres (UNO)
- 2. Drawings are not to be scaled.
- 3. All levels are to Ordinance Datum Mean High Water unless otherwise noted.
- 4. Conversion for Mean Head to Chart Datum: 0.00m ODM = 2.18m CD.

Legend

Reference Drawings

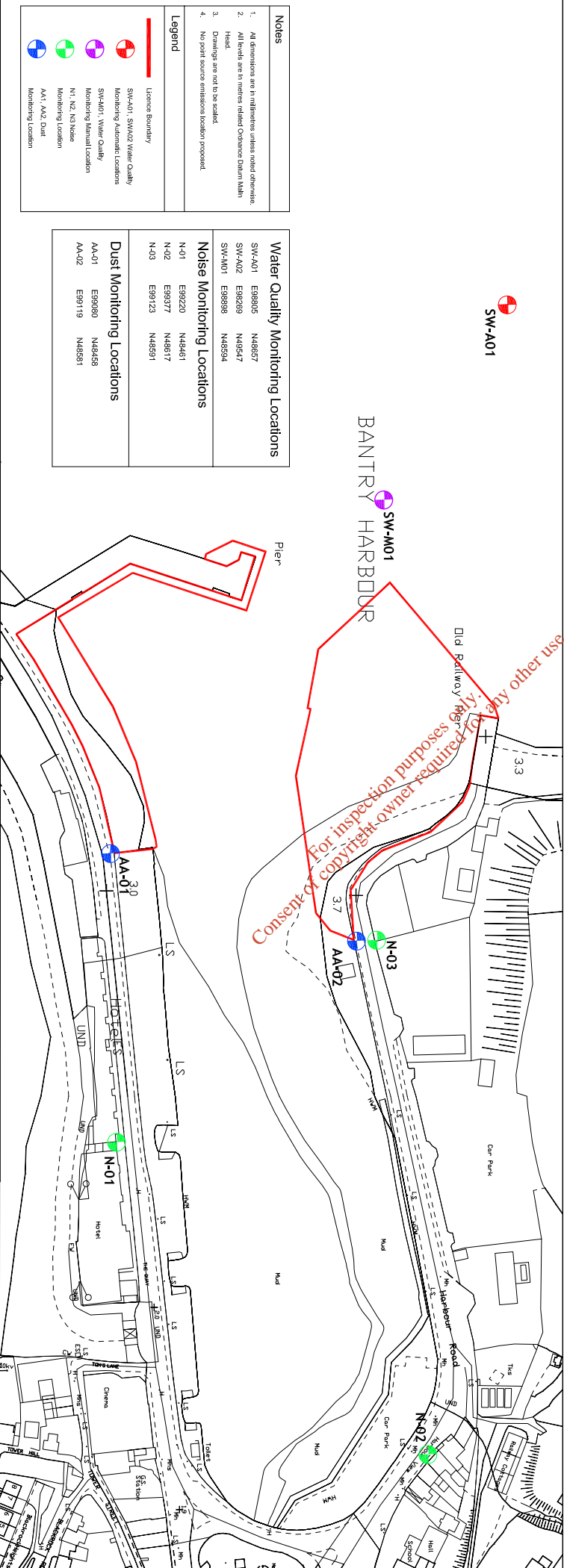
No.	Description	Rev.	Date	By
1	ISSUED FOR BIDDING			
2	FOR PERMITS			
3	FOR CONSTRUCTION			
Project: Bantry Pier Harbour Development				
Phase: Phase 1				
Title: Conceptual/Shellhead For Pathways from Amenity Area				
Date: Part of O&M				

Malachy Walsh and Partners Consulting Engineers
 Cork | Tralee | London | Liverpool

Mr. John Walsh
 Malachy Walsh and Partners
 16334-FIG.099 A



Baseline Water Quality Monitoring Outer Harbour (NTS)



Notes

1. All dimensions are in millimetres unless noted otherwise.
2. All levels are in metres unless stated otherwise.
3. Drawings are not to be scaled.
4. No point source emissions location proposed.

Legend

- SW-A01, SW-M02 Water Quality Monitoring Automatic Locations
- SW-M01, Water Quality Monitoring Manual Location
- N1, N2, N3 Noise Monitoring Location
- AA1, AA2 Dust Monitoring Location

Water Quality Monitoring Locations

SW-A01	E89806	N48857
SW-A02	E89209	N49547
SW-M01	E89898	N48594

Noise Monitoring Locations

N-01	E89220	N48461
N-02	E89377	N48517
N-03	E89123	N48591

Dust Monitoring Locations

AA-01	E89080	N48458
AA-02	E89119	N48591

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Rev.	Date	Description	by	chkd	app
A	04.03.16	ISSUED FOR ORA	BMP	MOS	PP

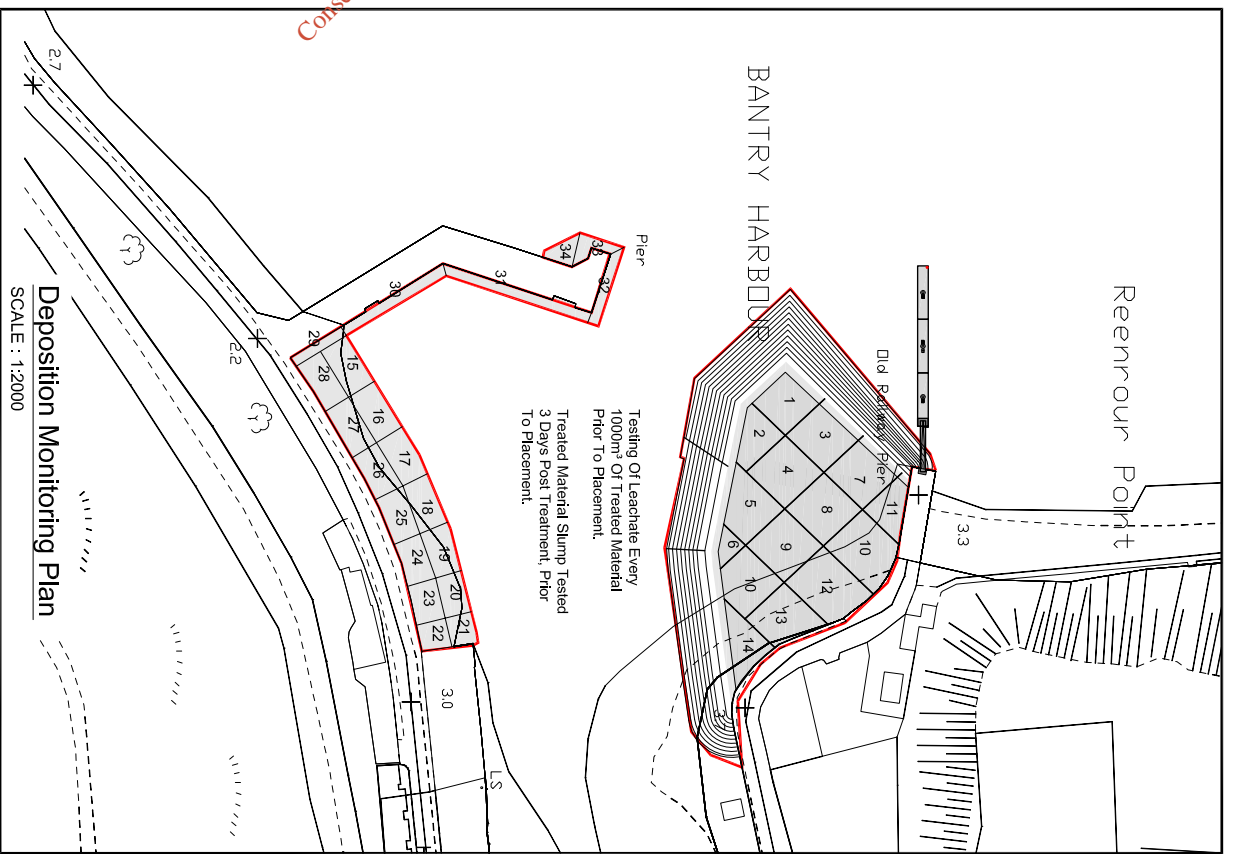
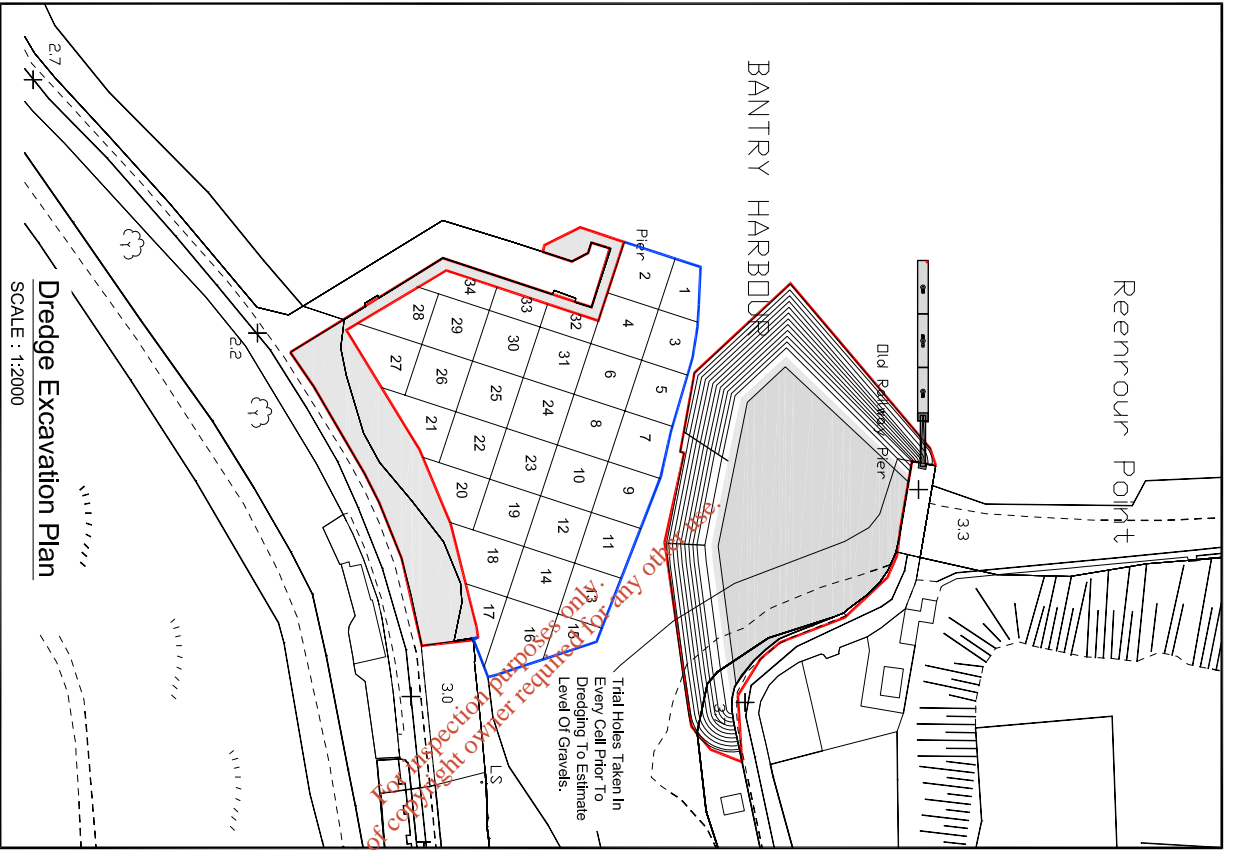
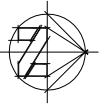
Client: PORT OF CORK
Project: BANTRY INNER HARBOUR DEVELOPMENT PHASE 1
Title: MONITORING PLAN

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

Scales (A3)	1:2000
Drawn	MOS
Checked	PP
Date	Jan. 2016

Dwg. No. **16341-FIG.10**

Rev.	A
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Notes

1. All dimensions are in millimetres unless noted otherwise.
2. All levels are in metres related Ordnance Datum Mean High.
3. Drawings are not to be scaled.

Legend


- Licence Boundary
- Dredge Footprint

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OSI Sheet No. 6654-45

Rev.	Date	Description	by	chk'd	app
A	04.03.16	ISSUED FOR ORA	BMP/MOSI	PP	

Client: PORT OF CORK

Project	BANTRY INNER HARBOUR DEVELOPMENT PHASE 1
Title	DREDGE EXCAVATION AND DEPOSITION MONITORING PLAN



Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

Scales (A3)	1:2000	Dwg. No.	16341 - FIG.11	Rev.	A
Drawn	MOS	Jan. 2016			
Checked	PP	Jan. 2016			



Bantry Inner Harbour - Phase 1 Development
Environmental Quantitative Risk Assessment
Report Tables 1 to 9

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**Table 1: Bantry Inner Harbour - Phase 1 Development Tier 2 QRA
Soil Data from SI 2009 compared to Marine Intitute Levels
(All samples from sea floor to 0.5m)**

MI Sediment Quality Guideline Limits		Borehole Samples										Grab Samples									
Lower Level	Upper Level	Parameter	BH01	BH03	BH4	BH5	BH6	BH16	GS10	GS11	GS12	GS13	GS14	GS15	GS16	GS17	GS18	GS20	GS21		
mg/kg	mg/kg		11600	19300	15600	16600	15700	5490	9200	8830	7110	8660	4580	5440	9170	10800	14600	8650	8800	18300	
9	70	Aluminium	8.42	10.4	13.3	10.3	8.41	4.08	11.4	9.28				4.42		9.07	14600	8650	8800	18300	
0.7	4.2	Arsenic	0.156	0.482	0.758	0.218	0.079	0.052	0.26	0.232				0.09		0.556		0.73		0.401	
120	370	Cadmium	14	32	24.9	19.3	21.5	8.87	13.3	12.6				8.49		20.2		21.6		30	
40	110	Chromium	14.1	71.6	91	20.3	14.6	4.06	33.9	21.4	14.8	27.1	4.04	6.94	46.7	52.1	70.2	68.8	25.1	40.2	
60	218	Copper	17.5	254	106	38.3	6.68	7.32	29.7	32				13.7		78.6		79.5		32.5	
		Lead	20.3	28.1	26.6	25.8	44.2	14.7	26.0	24.3				15.3		24.7		20.5		31.0	
0.2	0.7	Lithium	0.023	0.576	1.97	0.233	0.017	0.0245	0.324	0.197	0.01	0.268	0.017	0.035	0.429	0.434	1.13	1.18	0.374	0.119	
21	60	Mercury	23.3	28.3	21.8	25.5	53.5	12.2	21.7	20.3				13.3		21.9		18.9		25.4	
160	410	Nickel	69.6	259	238	72.2	63.3	33.1	101	86.9				55.3		235		256		90.8	
		Zinc																			
		Dibutyltin	0.004	0.006	0.005	0.004	0.00786	0.003	0.0105	0.00786	0.00786	0.0105	0.00786	0.0105	0.0105	0.0131	0.0157	0.262	0.0131	0.0131	
		Tributyltin	0.0131	0.183	0.236	0.004	0.003	0.003	0.2	0.003	0.003	0.02	0.003	0.004	0.004	0.05	0.2	0.3	0.005	0.005	
0.1	0.5	Σ TBT& DBT	0.0171	0.189	0.241	0.008	0.01086	0.006	0.2105	0.01086	0.01086	0.0305	0.01086	0.0145	0.0145	0.0631	0.2157	0.562	0.0181	0.0181	

**Table 2: Bantry Inner Harbour Phase 1 Development Tier 2 QRA
Soil Data from SI January 2015 Compared to Marine Institute Levels**

MI Sediment Quality Guideline Limits		Sample ID	SL02	SL03	SL05	SL06	SL07.1	SL07.2	SL07.3	SL07.4	SL08	SL09	SL10	SL11	SL12	SL13	SL14	SL15	
Lower Level	Upper Level	Depth (m)																	
mg/kg	mg/kg																		
9	70	aluminium	42400	36600	41000	45000	41200	38600	44000	42600	51300	40400	46500	40200	40600	50700	49800	78900	
0.7	4.2	Arsenic	14.4	7.77	8.72	15.8	11.7	11.1	8.94	14.5	13.3	14.3	8.77	15.3	13.7	20.7	11.1	14.8	
120	370	Cadmium	0.68	0.3	0.38	0.79	4.34	0.37	0.28	0.51	0.93	0.71	0.32	0.76	0.64	0.82	0.26	4.2	
40	110	Chromium	47.7	36.7	43.1	54.2	42.2	40.2	46.4	46.9	50	57.6	45.6	47	47.4	64.5	50.5	78.6	
60	218	Copper	43.2	11.8	25.4	50.6	12.8	16.5	15	18.6	42.1	63.8	26.7	49.5	35.4	36.1	10.1	22.8	
		Lead	58.7	35.9	39.4	66.4	39	27.4	26.2	37	34.2	65.6	27.6	65.7	50.3	54.9	17.5	16.1	
0.2	0.7	Lithium	29.6	30.2	30.8	32.6	32.3	28.9	33.3	25.8	41.2	26.8	33.4	25.9	25.7	35.6	32.3	37.7	
21	60	Mercury	2.37	0.14	4.61	0.63	0.65	0.34	0.08	0.06	0.44	0.39	0.3	0.49	0.4	0.36	0.09	0.04	
160	410	Nickel	23.5	23.6	24.4	26.9	24.4	26.8	30.5	34.1	30.1	29.8	27.1	24.6	23.9	31.2	28.6	37	
		Zinc	169	69	101	188	78.8	88	110	164	86.8	216	105	203	152	167	68.7	255	
ug/kg	ug/kg																		
1.7	180	PCBS	101	0.1	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
2.7	180	PCB 28	0.22	0.2	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
3.0	180	PCB 52	0.22	0.28	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
0.6	180	PCB 101	0.22	0.83	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
7.9	180	PCB 118	1.34	0.2	2.25	1.51	0.2	0.1	0.1	0.1	0.2	1.49	0.1	0.96	0.92	2.32	0.1	0.1	
40	180	PCB 138	2.68	0.2	3.65	3.45	0.39	0.1	0.1	0.1	0.41	2.73	0.2	2.3	2.02	3.86	0.1	0.1	
12	180	PCB 153	8.9	0.28	8.14	11	1.17	0.34	0.1	0.1	0.82	8.69	0.54	5.76	6.06	11.6	0.1	0.1	
68	1260	PCB 180	114.61	2.09	14.44	16.84	2.16	0.94	0.7	0.7	1.83	13.91	1.24	9.42	9.4	18.82	0.7	0.7	
mg/kg	mg/kg	Total 7 PCBs																	
		TBT & DBT																	
		Dibutyltin	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.17	0.01	
		Tributyltin	0.06	0.05	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	
0.1	0.5	Σ TBT& DBT	0.07	0.08	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.18	0.02	

Table 4: Bantry Inner Harbour Phase 1 Development Tier 2 QRA Sample Data from Sl Aug 2015 compared to Marine Institute EQS Levels.

Client: Malachy Walsh	Chemtest Job No.:	Marine Institute Lower Level	Marine Institute Upper Level	Date Sampled		15-18366		15-18366		15-18366		15-18366		15-19920				
				Ac cr	SOP	Units	LOD	mg/kg	mg/kg	1.2 l/kg	10.1 mg/kg	1.2 l/kg	10.1 mg/kg	1.2 l/kg	10.1 mg/kg	1.2 l/kg	10.1 mg/kg	1.2 l/kg
Quotation No.:	177408			12	0.008	9.6	0.02	46	0.015	46	0.015	44	0.022	46	0.006	29	0.027	0.091
Order No.:	177409			8.9		8.9		7.9		7.9		7.9		7.5		8.2		0.005
Client Sample ID:	Bantry																	0.04
Client Sample ID:	SST3																	0.032
Sample Type:	SOIL																	0.0005
Sea Depth (m)																		0.0007
Bottom Depth (m)																		0.02
Determinand																		0.04
Moisture	N 2030					9.6	0.02	46	0.015	46	0.015	44	0.022	46	0.006	29	0.027	0.091
pH	U 2010					8.9		7.9		7.9		7.9		7.5		8.2		0.005
Acid Neutralisation Capacity	N 2015	mol/kg	0.002															0.04
Aluminium (Total)	N 2430	mg/kg	100			6500		3800		3800		5300		4400		2900		0.032
Arsenic	U 2450	mg/kg	1	9	0.0044	0.050	0.0023	0.050	0.0023	0.050	0.0023	0.050	0.0023	0.050	0.0023	0.050	0.0023	0.032
Cadmium	U 2450	mg/kg	0.1	0.7	0.021	0.010	0.0001	0.010	0.0001	0.010	0.0001	0.010	0.0001	0.010	0.0001	0.010	0.0001	0.0005
Chromium	U 2450	mg/kg	1	120	370	12	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.032
Copper	U 2450	mg/kg	0.5	40	110	34	0.027	0.050	0.027	0.050	0.027	0.050	0.027	0.050	0.027	0.050	0.027	0.032
Mercury	U 2450	mg/kg	0.1	0.2	0.7	0.10	0.0005	0.050	0.0005	0.050	0.0005	0.050	0.0005	0.050	0.0005	0.050	0.0005	0.0007
Nickel	U 2450	mg/kg	0.5	21	60	48	0.026	0.050	0.026	0.050	0.026	0.050	0.026	0.050	0.026	0.050	0.026	0.005
Lead	U 2450	mg/kg	0.5	60	218	26	0.001	0.010	0.001	0.010	0.001	0.010	0.001	0.010	0.001	0.010	0.001	0.005
Selenium	U 2450	mg/kg	0.2			0.20	0.0054	0.022	0.0054	0.022	0.0054	0.022	0.0054	0.022	0.0054	0.022	0.0054	0.005
Inc	U 2450	mg/kg	0.5	160	410	75	0.001	0.050	0.001	0.050	0.001	0.050	0.001	0.050	0.001	0.050	0.001	0.005
LOI	U 2610					3.2		3.2		3.2		3.2		3.2		3.2		0.2
Total Organic Carbon	U 2625					1		0.75		0.75		0.75		0.75		0.75		0.2
Total TPH, C10-C40	U 2670	mg/kg	10			10		16		16		16		16		16		0.04
Total O17 PAHs	N 2700	mg/kg	2	4		5.1		12		12		12		12		12		0.04
TribuM, Th	N 2730	g/kg	10	100	500	10		10		10		10		10		10		0.04
Total BTX	U 2760	g/kg	10			10		10		10		10		10		10		0.04
Total PCBs (7 Congeners)	N 2815	mg/kg	0.1	7	1260	0.10		0.10		0.10		0.10		0.10		0.10		0.04

Surface Water Regs '0	mg/l	MAC EQS
AA EQS	0.02	0.04
0.0002		0.005
0.015		0.032
0.005		0.01
0.0005		0.0007
0.02		0.05
0.0072		0.02
0.04		0.2

> SW Regs Mac EQS
 > SW Regs AA EQS
 Lab LOD > the AA EQS
 Dissolved chromium AA EQS value used from the protection of saltwater life UK EA standard.

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Above the MI Upper Limit
 Above the MI Lower Limit
 Below the MI Lower Limit

**Table 5: Bantry Inner Harbour Development Phase 1 Tier 2 QRA
Sample SST2 Monolith Tank Test Results - 1, 2, 4 Day Water Data.**

Pro. ect: SST02 Bantry Pier		Client: Malachy Walsh and Partners		Chemtest Job No.:		15-24484		15-24494		15-24494		15-24494		15-24484		15-24484		15-24484		15-24484		15-24484	
Question No. 1	Order No. 1	Chemtest Sample ID:	Client Sample No:	Chemtest Date:	Client Date:	Sample Type:	Top Depth (m)	Bottom Depth (m)	Date Sampled:	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015	15-Oct-2015
		Acquired	SOP	Units	LOD																		
		U	1450	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1450	g/l	0.080	0.38	0.31	0.11	0.11	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
		U	1450	g/l	1.0	17	17	28	4.3	6.1	6.1	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
		U	1450	g/l	1.0	4.7	6.0	4.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
		U	1450	g/l	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
		U	1450	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1450	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1450	g/l	1.0	2.3	4.0	3.1	3.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		U	1450	g/l	1.0	7.0	4.0	2.0	2.8	3.6	3.6	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
		U	1670	g/l	10	□	10	□	10	□	10	□	10	□	10	□	10	□	10	□	10	□	10
		U	1760	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1760	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1760	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0
		U	1760	g/l	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0	□	1.0



Laboratory photos of the monolith samples made for the Tank Testing.

**Table 6: Bantry Inner Harbour Phase 1 Development Tier 2 QRA
Potential Sediment Concentrations During Dredging Compared to Average EQS Values.**

Determinand	Units	LOD	AA EQS (mg/l)	Number of samples	Minimum soil concentration (mg/kg)	Average soil concentration (mg/kg)	Maximum soil concentration (mg/kg)	Average dredged concentrations (mg/l)	Average dredged concentrations with soprtion (mg/l)
Moisture	%	0.02		6	9.60E+00	3.11E+01	4.60E+01	1.24E-03	1.24E-03
pH				6	7.50E+00	8.22E+00	8.90E+00	3.29E-04	3.29E-04
Acid Neutralisation Capacity	mol/kg	0.002		6	6.00E-03	1.63E-02	2.70E-02	6.53E-07	6.53E-07
Aluminium (Total)	mg/kg	100		40	2.90E+03	2.39E+04	7.89E+04	9.57E-01	9.57E-01
Arsenic	mg/kg	1	2.00E-02	34	4.08E+00	1.23E+01	2.40E+01	4.91E-04	4.89E-04
Cadmium	mg/kg	0.1	2.00E-04	34	5.20E-02	6.43E-01	4.34E+00	2.57E-05	2.50E-05
Chromium	mg/kg	1	1.50E-02	34	8.49E+00	3.26E+01	7.86E+01	1.30E-03	1.20E-03
Copper	mg/kg	0.5	5.00E-03	40	1.04E+00	3.78E+01	2.10E+02	1.51E-03	9.74E-04
Lead	mg/kg	0.5	7.20E-03	34	6.68E+00	4.56E+01	2.54E+02	1.82E-03	2.85E-04
lithium*	mg/kg			28	1.47E+01	2.87E+01	4.42E+01	1.15E-03	1.15E-03
Mercury	mg/kg	0.1	5.00E-05	40	1.00E-02	4.99E-01	4.61E+00	2.00E-05	1.84E-05
Nickel	mg/kg	0.5	2.00E-02	34	1.22E+01	2.58E+01	5.35E+01	1.03E-03	1.01E-03
Selenium	mg/kg	0.2	2.00E-01	22	2.00E-01	1.01E+02	2.55E+02	4.04E-03	4.03E-03
Zinc	mg/kg	0.5	4.00E-02	18	3.31E+01	6.17E+02	2.59E+02	4.67E-03	4.61E-03
LOI	%	0.1		6	3.00E+00	6.40E+00	8.80E+00	2.56E-04	2.56E-04
Total Organic Carbon	%	0.2		22	3.60E-01	1.96E+00	5.22E+00	7.82E-05	7.82E-05
Total TPH >C10-C40	mg/kg	10		22	1.00E+01	1.31E+00	3.62E+01	5.25E-04	5.25E-04
Total Of 17 PAH's	mg/kg	2	5.00E-03	22	4.29E-02	4.70E+00	1.30E+01	1.88E-04	1.88E-04
Tributyl Tin	mg/kg	0.01	2.00E-06	40	0.00E+00	5.75E-02	5.62E-01	2.30E-06	2.12E-06
Total BTEX	mg/kg	10		6	1.00E-02	1.35E-02	3.10E-02	5.40E-07	5.40E-07
Total PCBs (7 Congeners)	mg/kg	0.1	1e-6	16	7.00E-04	1.30E-02	1.15E-01	5.21E-07	4.32E-07

Note: Average concentration of TBT increased by highest sample result in GS19 (0.562mg/kg) which will not now be excavated.

**Table 7: Bantry Inner Harbour Phase 1 Development Tier 2 QRA.
Potential Leachate Concentrations from Untreated Contaminated Sediments.**

Surface Water Regs'0		Dilution factor				0.003		
Eluate mg/l	AA EQS (mg/l)	MAC EQS (mg/l)	No. of samples	Count above MAC EQS	Average leachate (mg/l)	Diluted average leachate	Maximum leachate (mg/l)	Diluted maximum leachate
Arsenic	0.02	0.04	58	0	9.07E-03	2.72E-05	3.10E-02	9.30E-05
Barium	100000	100000	52	0	1.49E-02	4.47E-05	4.30E-02	1.29E-04
Cadmium	0.0002	0.005	58	0	1.28E-04	3.83E-07	3.00E-04	9.00E-07
Chromium	0.015	0.032	58	14	2.54E-02	7.62E-05	1.20E-01	3.60E-04
Copper	0.005	0.01	58	13	7.36E-03	2.21E-05	3.70E-02	1.11E-04
Mercury	0.00005	0.00007	58	58	7.33E-04	2.20E-06	4.70E-03	1.41E-05
Molybdenum	100000	100000	52	0	4.54E-02	1.36E-04	2.10E-01	6.30E-04
Nickel	0.02	0.05	58	0	2.71E-03	8.13E-06	1.40E-02	4.20E-05
Lead	0.0072	0.02	58	0	1.10E-03	3.31E-06	5.00E-03	1.50E-05
Antimony	100000	100000	52	0	3.77E-03	1.13E-05	2.50E-02	7.50E-05
Selenium	100000	100000	58	0	1.26E-02	3.77E-05	5.10E-02	1.53E-04
Zinc	0.04	0.2	58	0	1.31E-02	3.92E-05	3.50E-02	1.05E-04
Chloride	100000	100000	52	0	8.98E+02	2.69E+00	3.80E+03	1.14E+01
Fluoride	100000	100000	52	0	4.71E-01	1.41E-03	1.10E+00	3.30E-03
Sulphate	100000	100000	52	0	1.56E+02	4.69E-01	4.60E+02	1.38E+00
Total Dissolved Solids	100000	100000	52	0	1.93E+03	5.80E+00	7.20E+03	2.16E+01
Phenol Index	100000	100000	52	0	3.33E-02	9.98E-05	1.20E-01	3.60E-04
Dissolved Organic Carbon	100000	100000	52	0	3.22E+00	9.66E-03	9.10E+00	2.73E-02

Notes:
This data summarises the eluate concentrations from WAC Test results shows that dilution is sufficient to reduce any elevated concentrations of Cr, Cu, and Hg to below EQS concentrations prior to any S/S treatment.

Mercury is reported as above the MAC EQS in all samples as the laboratory detection limit was above the required EQS value. Dilution Factor is based on MWP Tidal Prism Calculations (see Table 9) of sea ward edge of sediment in amenity area. Results are based on all WAC Data from 2015 sampling work including single and double stage laboratory testing.

Table 8: Bantry Inner Harbour Development Phase 1 Tier 2 QRA. Potential Leachate Concentrations in Treated Sediment Material.

Determinand	Units	LOD	AA EQS (mg/l)	MAC EQS (mg/l)	Average soil concentration (mg/kg)	Maximum soil concentration (mg/kg)	Average porewater concentrations (mg/l)				Diluted average porewater concentrations (mg/l)				Diluted maximum porewater concentrations (mg/l)				
							Using average Kd		Using max Kd		Using average Kd		Using max Kd			Using average Kd		Using max Kd	
							10	20	50	10	20	50	10	20		50	130		
Metastave pH	%	0.02			8.22E+00	8.90E+00													
Neutralisation Capacity	mol/kg	0.002			1.63E-02	2.70E-02													
Aluminium (Total)	mg/kg	100			2.39E+04	7.89E+04													
Arsenic	mg/kg	1	2.00E-02	4.00E-02	1.23E+01	2.40E+01	4.00E-01	8.12E-03	4.09E-03	1.62E-03	2.43E-04	1.59E-01	7.93E-03	3.17E-03	1.22E-03				
Cadmium	mg/kg	0.1	1.00E-02	2.00E-02	3.78E+01	7.89E+01	4.00E-01	1.35E-02	6.73E-03	2.69E-04	4.04E-05	1.92E-03	9.52E-04	3.75E-04	1.42E-04				
Chromium	mg/kg	0.5	5.00E-03	1.00E-02	3.78E+01	2.10E+02	2.10E+02	2.49E-04	1.25E-04	4.99E-05	7.48E-06	3.25E-03	1.62E-03	6.50E-04	2.50E-04				
Lead	mg/kg	0.5	7.20E-03	2.00E-02	4.59E+01	2.54E+01	4.42E+01	3.07E-05	1.53E-05	6.14E-06	9.21E-07	1.71E-03	8.95E-05	2.77E-04	1.07E-04				
Lithium*	mg/kg	0.1	5.00E-05	7.00E-05	2.87E+01	4.61E+01	4.61E+01	2.35E-02	2.39E-02	2.39E-02	7.04E-01	3.62E-02	3.62E-02	3.62E-02	1.32E-05				
Mercury	mg/kg	0.5	2.00E-02	5.00E-02	2.59E+02	5.35E+01	5.35E+01	5.71E-03	2.89E-03	1.14E-03	1.71E-04	1.19E-01	5.93E-03	3.91E-05	1.50E-05				
Nickel	mg/kg	0.2	1.72E-02	2.00E-02	1.17E+02	2.59E+02	2.59E+02	1.26E-01	6.29E-02	2.52E-02	3.77E-03	3.17E+00	7.84E-02	6.39E-01	2.44E-02				
Selenium	mg/kg	0.5	4.00E-02	2.00E-01	6.40E+00	8.80E+00	8.80E+00	5.24E-01	1.77E-02	7.08E-03	1.09E-03	7.83E-01	3.92E-01	1.57E-02	6.03E-03				
Zinc	mg/kg	0.1			1.98E+01	1.98E+01	1.98E+01	1.60E+01	5.24E+01	1.60E+01	1.57E-01	7.20E+01	7.20E+01	7.20E+01	7.20E+01				
Total Organic Carbon	%	0.2			1.98E+01	5.22E+00	5.22E+00	1.60E+01	1.60E+01	1.60E+01	4.80E-02	4.27E+01	4.27E+01	4.27E+01	4.27E+01				
Total Cd	mg/kg	10			1.31E+01	3.62E+01	3.62E+01	1.07E+02	1.07E+02	1.07E+02	3.22E-01	2.96E+02	2.96E+02	2.96E+02	2.96E+02				
Total Of 17 PAHs	mg/kg	2	5.00E-03	5.00E-03	4.70E+00	1.30E+01	1.30E+01	1.79E-01	1.79E-01	1.79E-01	5.36E-04	4.96E-01	4.96E-01	4.96E-01	4.96E-01				
Tributyl Tin	mg/kg	0.01	2.00E-06	2.00E-06	2.47E-05	5.62E-02	5.62E-02	2.47E-06	1.23E-06	4.93E-07	7.40E-08	2.41E-04	2.41E-04	2.41E-04	1.85E-06				
Total BTEX	mg/kg	10			9.08E-03	3.10E-02	3.10E-02	9.81E-04	4.93E-04	1.98E-04	2.73E-05	2.09E-02	2.09E-02	2.09E-02	1.79E-04				
Total PCBs (7 Congeners)	mg/kg	0.1	1e-6	1e-6	1.30E-02	1.19E-01	1.19E-01	2.29E-07	1.1E-07	4.57E-08	6.96E-09	2.01E-05	2.01E-05	2.01E-05	1.55E-07				

Notes:

This table exhibits a range of leachate concentrations that would be expected based on a range of achievable Partition Coefficients.

The data shows that the S/S treatment process can reduce the potential leachate concentration to values below the EQS prior to any dilution factor being applied. (Note that leachate concentrations using the average Kd values are generally of the order of the email eluate concentrations measured in the WAC testing indicating accuracy in the values used).

Partition Coefficient Data Used in Calculations:

Parameter	Average Koc (L/kg)	Kd (L/kg)	Justification
Arsenic	137.5	137.5	Average of values in LandSim 2.5
Cadmium	750	750	Average of values in LandSim 2.5
Chromium	2200	2200	Average of values in LandSim 2.5
Copper	13770	13770	Average of values in LandSim 2.5
Lead	135000	135000	Average of values in LandSim 2.5
Mercury	2142.5	2142.5	Average of values in LandSim 2.5
Nickel	410	410	Average of values in LandSim 2.5
Zinc	300.5	300.5	Average of values in LandSim 2.5
Total TPH >C10-C40	62	1.24	Koc for Benzene (USEPA 2009)
Total Of 17 PAHs	1190	23.8	Koc for Naphthalene (USEPA 2009)
Tributyl Tin	106000	2120	Average of values in LandSim 2.5
Total BTEX	62	1.24	Koc for Benzene (USEPA 2009)
all PCBs (7 Congeners)	259000	5180	Average of values in LandSim 2.5

**Table 9: Bantry Inner Harbour Development Phase 1 Tier 2 QRA
Tidal Prism Calculations for Seaward Edge of Amenity Area.**

Frontage	Height of fl Area of flow	Head	Length	k	m ³ /s	m ³ /hr	m ³ /flood tide	Max rate of tide rise
m	m						m ³ /flood tide	Sp Np
150	2.9	435	0.1	65	1	0.669230769	2409	3
150	2.9	435	0.1	65	0.1	0.066923077	241	1.5
150	2.9	435	0.1	65	0.01	0.006692308	24	0.000167
150	2.9	435	0.1	65	0.001	0.000669231	2	8.33333E-05
150	2.9	435	0.1	65	1.00E-05	6.69231E-06	0	Volume of flow to follow tide rise
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	m ³ /s
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	0.7
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	1260
150	2.9	435	1.5	65	1	10.03846154	36138	2520
150	2.9	435	1.5	65	0.1	1.003846154	3614	Conclusions
150	2.9	435	1.5	65	0.01	0.100384615	361	Tide level in rock armour will follow tide
150	2.9	435	1.5	65	0.001	0.010038462	36	Tide level in fine sands and silt will NOT follow tide rise and fall - very little flow.
150	2.9	435	1.5	65	1.00E-05	0.000100385	0	
150	2.9	435	1.5	65	1.00E-06	0.0000100385E-05	0	
150	2.9	435	1	65	1	6.692307692	24092.308	149613.2
150	2.9	435	1	65	0.1	0.669230769	2409.2308	14961.32
150	2.9	435	1	65	0.01	0.066923077	240.92308	1496.132
150	2.9	435	1	65	0.001	0.006692308	24.092308	149.6132
150	2.9	435	1	65	1.00E-08	6.69231E-08	0.0002409	0.0001496
150	2.9	435	1	65	1.00E-09	6.69231E-09	2.409E-05	0.000015
150	2.9	435	0.5	65	1	3.346153846	12046	74.807
150	2.9	435	0.5	65	0.1	0.334615385	1205	7.481
150	2.9	435	0.5	65	0.01	0.033461538	120	748
150	2.9	435	0.5	65	0.001	0.003346154	12	75
150	2.9	435	0.5	65	1.00E-05	3.34615E-05	0	1
150	2.9	435	0.5	65	1.00E-06	3.34615E-06	0	0
150	2.9	435	0.1	65	1	0.669230769	2409	14.961
150	2.9	435	0.1	65	0.1	0.066923077	241	1.496
150	2.9	435	0.1	65	0.01	0.006692308	24	150
150	2.9	435	0.1	65	0.001	0.000669231	2	15
150	2.9	435	0.1	65	1.00E-05	6.69231E-06	0	0
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	0
150	2.9	435	0.1	65	1.00E-08	4.35E-08	0.00	450
150	2.9	435	0.1	65	1.00E-09	4.35E-09	0.00	450
150	2.9	435	1.5	65	1.00E-06	2.84E-03	10.21	20.7
150	2.9	435	1.5	65	1.00E-09	2.84E-09	0.01	11.25

Volume of flow into Length m³/hr to match tide level

Sp	Np
m ³ /hr	m ³ /hr
900	900
900	450
20.7	10.35
22.5	11.25

Porosity

100.05 max volume of material

divided by 33750 estim tidal prism volume (np)

factor to reduce leachate when = 0.002964

diluted

For a Hyd Grad of 1.5m at neap tide the width of amenity area with 2.9m face to be saturated by incoming tide is a maximum of 0.23m

Volume of material saturated

this allows for a min dilution of 100.05 m³

Horizontal darcy - estimate of gradient based on head of 1.5m over 1m drop

Q	i	phi
6.53E-04 m ³ /s	1.5	0.05
3.00E-05 m/s		
6.48E-01 m		
1.41E+01 m ³		
1.41E+01		

Flow in 12 hours

Horizontal darcy - estimate of gradient based on head of 0.75m over 0.1m

Q	i	phi
3.26E-03 m ³ /s	7.5	0.05
1.50E-04 m/s		
3.24E+00 m		
7.05E+01 m ³		
7.05E+01		

Flow in 12 hours

Half of the tide head for average over 6 hours

Estimate of thickness of low K material at edge of cement



Bantry Inner Harbour - Phase 1 Development
Environmental Quantitative Risk Assessment
Appendix A – PGL SI Report 2009

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**BANTR INNER HARBOUR
SITE INVESTIGATION**

FACTUAL REPORT

NO. PC 030

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Client: Bantry Bay Harbour Commissioners

Engineer: RPS Consulting Engineers,
Elmwood House,
74 Boucher Road,
Belfast

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REPORT CONTROL SHEET

Client	Bantry Bay Harbour Commissioners					
Engineer	RPS Consulting Engineers					
Project Name	Bantry Inner Harbour Site Investigation					
Report Name	Bantry Inner Harbour Site Investigation Factual Report					
Project Number	PC9030					
This Report Comprises of	RCS	TOC	Text	No. of Appendices	Drawings	Electronic data
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