ABWP Phase I Decommissioning

Sediment Sampling Results

Volume 3, Appendix 4.4



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Statement of Authority

Author	Qualifications	Relevant Experience
Elena Henning	BSc(Hons) Geography, University of Edinburgh (UK)	4 years of experience in assessing risk associated with contamination to various offshore and terrestrial receptors. Experienced in authoring marine Environmental Impact Assessment chapters assessing water and sediment quality, including in offshore wind projects. Experienced in assessing projects against marine plans, policies and strategies.
Sara Méndez Roldán	BSc Environmental Sciences, University of Salamanca (Spain) MSc Coastal and Marine Resources Management, University of Portsmouth (UK)	Over 11 years' international experience in permitting and environmental impact assessment for a wide range of coastal and marine developments, including offshore wind farms and subsea cables across a number of geographies, including Spain, the UK, Ireland, Poland and Denmark, among others.

1 INTRODUCTION

1.1.1.1 Arklow Energy Limited (Arklow Energy) is seeking planning permission to decommission Arklow Bank Wind Park (ABWP) Phase I (referred to hereafter as 'the Proposed Works'). The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

1.1.1.2 The Proposed Works Offshore will be undertaken within the Offshore Site (see **Volume 2, Chapter 3: Proposed Works Description**), which includes:

- The Sub Lease Area, located on the long narrow Arklow Bank sand bank, situated approximately 10 km off the coast of Arklow, south-east Ireland, where seven wind turbine generators (WTGs) and foundations, associated scour protection, 7.4 km of inter-array cables and one met mast are located; and
- A 10 m wide cable corridor along the 15.6 km offshore export cable route connecting WTG T4 to the landfall point at High Water Mark (HWM).

1.1.1.3 This appendix presents the sediment sampling results from samples obtained from three surveys of relevance to Proposed Works Offshore:

- Ramboll Environ UK Ltd (2016) for Arklow Bank Dumping at Sea Permit Application. In May 2016, Arklow Energy commissioned sediment sampling and chemical and physico-chemical analysis of sediments from three locations in the Sub Lease Area in order to support a permit application to undertake seabed levelling works during ABWP Phase I operation and maintenance;
- AQUAFACT (2024) sediment sampling for ABWP Phase II - Environmental Impact Assessment Technical Reports. In October 2024, associated with the ABWP Phase II EIAR technical reporting, grab samples were collected across the ABWP Phase II array area (which surrounds to Sub Lease Area), cable corridor and working area. Nine of these sediment samples (St01, St02, St03, St06, St07, St09, St10, St11 and St13) were scheduled for chemical and physico-chemical testing; and
- Ramboll (2025) Monopile Sediment Sampling. Sediment sampling within one of the monopiles at ABWP Phase I (WTG T1) was completed in 2025. In total four sediment samples (S1, S2, S3 & S4) were collected by the Arklow Energy's appointed contractor and sent to an MCERT accredited laboratory.

1.1.1.4 This appendix informs **Volume 2, Chapter 4: Coastal Processes, Water and Sediment Quality** of the Environmental Impact Assessment Report (EIAR) prepared in support of the application for planning permission of Proposed Works.

2 SEDIMENT SAMPLING RESULTS SCREENING

2.1.1.1 In order to assess the significance of the concentrations recorded, the measured concentrations have been compared to sediment quality thresholds in accordance with current guidance. Sediment quality thresholds used are:

- Irish Action Levels 1 and 2 outlined in 'Guidelines for The Assessment of Dredge Material for Disposal In Irish Waters' (Cronin et al, 2006) and the 'Addendum to 2006 Guidelines for the Assessment of Dredged Material in Irish Waters' (Marine Institute, 2019);
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Environmental Assessment Criteria (EAC) (OSPAR, 2021);
- United Sates Environmental Protection Agency (USEPA) Effects Range Low (ERLs) (USEPA, 1996); and
- Background Assessment Concentrations (BAC) (OSPAR, 2021).

2.1.1.2 The sediment quality thresholds selected all represent concentrations at which there is considered to be low probability of effects to marine life. Exceedance of a threshold does not indicate unacceptable risk, just a potentially higher probability of measurable effects.

2.1.1.3 BAC values have only been included where they are higher than the sediment assessment criteria. OSPAR normalise hydrocarbon concentrations in sediment quality data to 2.5% Total Organic Carbon (TOC) to make results comparable between sites and over time, because organic carbon strongly controls how hydrocarbons behave in sediments.

2.1.1.4 The sediment sample results, along with the screening against the relevant threshold values, are presented in **Table 1**.

Table 1: Sediment Sampling Results Screening

Analytical Parameter		Units	Limit of Detection	Threshold Values					Sample details															
				Irish Action Levels (Marine Institute 2006 & 2019)		OSPAR Commission, 2021			Sample ID	S1	S2	S3	S4	Site 1	Site 2	Site 3	St01	St02	St03	St06	St07	St09	St10	St11	St13
				Lower Level	Upper Level	EAC	BAC (quoted where >EAC)	ERL	Sampled Date	Oct 2025	Oct 2025	Oct 2025	Oct 2025	May 2016	May 2016	May 2016	Oct 2024	Oct 2024	Oct 2024	Oct 2024	Oct 2024	Oct 2024	Oct 2024	Oct 2024	Oct 2024
Particle Size Analysis	Gravel (>2 mm)	%	N/A	N/A	N/A	N/A	N/A	N/A		-	-	-	-	0.8	0.5	7	0.7	26.7	3.59	0.02	0	0	0.94	1.82	0.01
	Sand (63 - 2000 um)	%	N/A	N/A	N/A	N/A	N/A	N/A		-	-	-	-	95.4	96.6	89.6	90.17	25.4	86.77	95.23	96.53	100	96.14	95.66	97.91
	Silt (<63 um)	%	N/A	N/A	N/A	N/A	N/A	N/A		-	-	-	-	3.7	2.9	3.4	9.14	47.9	9.64	4.75	3.47	0	2.92	2.52	2.08
Metals	Arsenic	mg/kg	0.5	20	70		25	8.2		6	6	6.9	7.5	7.38	6.29	9.47	15.1	22.5	22.4	20.9	21.8	18.3	20	19.8	20
	Cadmium	mg/kg	0.3	0.7	4.2			1.2		<0.3	<0.3	<0.3	<0.3	0.031	0.025	0.025	0.1	0.13	0.03	0.04	0.04	0.05	0.03	0.05	0.05
	Chromium	mg/kg	0.5	120	370		81	81		10.1	12.7	96.1	8.7	4.62	4.74	5.75	36.9	52.6	12.9	19.5	9.5	11.8	12.8	13	11.1
	Hexavalent Chromium	mg/kg	0.3	N.V	N.V	N.V	N.V	N.V		<0.3	<0.3	<0.3	NDP	-	-	-	-	-	-	-	-	-	-	-	-
	Copper	mg/kg	1	40	110			34		3	6	6	4	0.797	1.06	1.1	9.2	14.1	3.1	2.7	2.6	2.5	2.8	3.2	3.7
	Lead	mg/kg	5	60	218			47		6	6	6	<5	2.31	2.47	2.95	11.4	27	7.5	6.3	5	4.7	5.9	5	6.3
	Mercury	mg/kg	<0.1	0.2	0.7			0.15		<0.1	<0.1	<0.1	<0.1	0.0011	0.0012	0.0011	0.03	0.04	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Nickel	mg/kg	<0.7	40	60		36	21		10.3	16.4	17.7	11.6	3.73	3.75	4.92	7.8	23.4	7	6.6	6.5	6.4	7.5	8.1	7.6
	Zinc	mg/kg	<5	160	410			150		40	61	49	30	9.42	9.86	11.5	39	87.1	20.9	14.8	13.8	13.6	15.7	17.2	19
	Aluminium	mg/kg		N.V	N.V	N.V	N.V	N.V		-	-	-	-	1910	1750	2280	15700	31500	11400	8240	8310	8780	7940	8460	8140
	Lithium	mg/kg		N.V	N.V	N.V	N.V	N.V		-	-	-	-	3.06	2.56	4.3	19	43.2	13.3	11.4	11.4	11.8	11.8	12.7	11.8
Polyaromatic Hydrocarbons (PAH)	Naphthalene	mg/kg	<0.04	N.V	N.V			0.16		<0.04	<0.04	<0.04	<0.04	-	<0.005	-	<0.001	0.0102	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Acenaphthylene	mg/kg	<0.03	N.V	N.V	N.V	N.V	N.V		<0.03	<0.03	<0.03	<0.03	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Acenaphthene	mg/kg	<0.05	N.V	N.V	N.V	N.V	N.V		<0.05	<0.05	<0.05	<0.05	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluorene	mg/kg	<0.04	N.V	N.V	N.V	N.V	N.V		<0.04	<0.04	<0.04	<0.04	-	<0.005	-	<0.001	0.00528	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Phenanthrene	mg/kg	<0.03	N.V	N.V			0.24		<0.03	<0.03	<0.03	<0.03	-	<0.005	-	<0.001	0.0175	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Anthracene	mg/kg	<0.04	N.V	N.V			0.085		<0.04	<0.04	<0.04	<0.04	-	<0.001	-	<0.001	0.0022	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluoranthene	mg/kg	<0.03	N.V	N.V			0.6		<0.03	<0.03	<0.03	<0.03	-	<0.001	-	<0.001	0.0153	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Pyrene	mg/kg	<0.03	N.V	N.V			0.665		<0.03	<0.03	<0.03	<0.03	-	<0.001	-	<0.001	0.0105	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(a)anthracene	mg/kg	<0.06	N.V	N.V			0.261		<0.06	<0.06	<0.06	<0.06	-	<0.001	-	<0.001	0.00638	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Chrysene	mg/kg	<0.02	N.V	N.V			0.384		<0.02	<0.02	<0.02	<0.02	-	<0.003	-	<0.001	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(bk)fluoranthene	mg/kg	<0.07	N.V	N.V	N.V	N.V	N.V		<0.07	<0.07	<0.07	<0.07	-	<0.001	-	-	-	-	-	-	-	-	-	-
	Benzo(a)pyrene	mg/kg	<0.04	N.V	N.V			0.43		<0.04	<0.04	<0.04	<0.04	-	<0.001	-	<0.001	0.00778	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Indeno(123cd)pyrene	mg/kg	<0.04	N.V	N.V			0.24		<0.04	<0.04	<0.04	<0.04	-	<0.001	-	<0.001	0.0149	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Dibenzo(ah)anthracene	mg/kg	<0.04	N.V	N.V					<0.04	<0.04	<0.04	<0.04	-	<0.001	-	<0.001	0.0022	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(ghi)perylene	mg/kg	<0.04	N.V	N.V			0.085		<0.04	<0.04	<0.04	<0.04	-	-	-	<0.001	0.0117	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(b)fluoranthene	mg/kg	<0.05	N.V	N.V	N.V	N.V	N.V		<0.05	<0.05	<0.05	<0.05	-	-	-	<0.001	0.0179	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(k)fluoranthene	mg/kg	<0.02	N.V	N.V	N.V	N.V	N.V		<0.02	<0.02	<0.02	<0.02	-	-	-	<0.001	0.0151	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	PAH 16 Total	mg/kg	<0.6	4		N.V	N.V	N.V		<0.6	<0.6	<0.6	<0.6	-	0.034	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (TPH)	**Aliphatics**																								
	>C5-C6	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>C6-C8	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>C8-C10	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>C10-C12	mg/kg	<0.2	N.V	N.V	N.V	N.V	N.V		<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-	-	-	-
	>C12-C16	mg/kg	<4	N.V	N.V	N.V	N.V	N.V		22	41	<4	<4	-	-	-	-	-	-	-	-	-	-	-	-
	>C16-C21	mg/kg	<7	N.V	N.V	N.V	N.V	N.V		<7	<7	<7	<7	-	-	-	-	-	-	-	-	-	-	-	-
	>C21-C35	mg/kg	<7	N.V	N.V	N.V	N.V	N.V		<7	<7	<7	<7	-	-	-	-	-	-	-	-	-	-	-	-
	Total aliphatics C5-35 (EH_CU+HS_1D_AL)	mg/kg	<19	N.V	N.V	N.V	N.V	N.V		22	41	<19	<19	-	-	-	-	-	-	-	-	-	-	-	-
	Aromatics																								
	>C5-EC7	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>EC7-EC8	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>EC8-EC10	mg/kg	<0.1	N.V	N.V	N.V	N.V	N.V		<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-
	>EC10-EC12	mg/kg	<0.2	N.V	N.V	N.V	N.V	N.V		<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-	-	-	-
	>EC12-EC16	mg/kg	<4	N.V	N.V	N.V	N.V	N.V		15	14	<4	<4	-	-	-	-	-	-	-	-	-	-	-	-
	>EC16-EC21	mg/kg	<7	N.V	N.V	N.V	N.V	N.V		13	17	<7	<7	-	-	-	-	-	-	-	-	-	-	-	-
	>EC21-EC35	mg/kg	<7	N.V	N.V	N.V	N.V	N.V		<7	<7	<7	<7	-	-	-	-	-	-	-	-	-	-	-	-
	Total aromatics C5-35	mg/kg	<19	N.V	N.V	N.V	N.V	N.V		28	31	<19	<19	-	-	-	-	-	-	-	-	-	-	-	-
	Total aliphatics and aromatics(C5-35)	mg/kg	<38	1000	N.V	N.V	N.V	N.V		50	72	<38	<38	-	-	-	-	-	-	-	-	-	-	-	-
	Total extractable hydrocarbon	g/kg	<0.0001	1	N.V	N.V	N.V	N.V		-	-	-	-	-	0.00204	-	0.000795	0.0139	0.00054	0.00015	<0.0001	0.000168	0.000314	<0.0001	0.00027
	Total hydrocarbon Content	ug/kg	100	N.V	N.V	N.V	N.V	N.V		-	-	-	-	-	-	-	795	13900	540	150	<100	168	314	<100	270
MTBE	MTBE	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
	Benzene	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
	m/p-Xylene	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
	o-Xylene	ug/kg	<5	N.V	N.V	N.V	N.V	N.V		<5	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
Organotins	DBT	mg/kg		N.V	N.V	N.V	N.V	N.V		-	-	-	-	-	<0.004	-	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	TBT	mg/kg		N.V	N.V	0.8				-	-	-	-	-	<0.004	-	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	DBT and TBT	mg/kg		0.1	0.5	N.V	N.V	N.V		-	-	-	-	-	<0.008	-	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCBs	PCB 028	ug/kg	<0.08	1	180	1.7				-	-	-	-	-	<0.1	-	<0.08	0.13	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	PCB 052	ug/kg	<0.08	1	180	2.7				-	-	-	-	-	<0.1	-	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	PCB 101	ug/kg	<0.08	1	180	3				-	-	-	-	-	<0.1	-	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	PCB 138	ug/kg	<0.08	1	180	7.9				-	-	-	-	-	<0.1	-	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	PCB 153	ug/kg	<0.08	1	180	40				-	-	-	-	-	<0.1	-	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	PCB 180	ug/kg	<0.08	1	180	12				-	-	-	-	-	<0.1	-	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.15	<0.08	<0.08
	PCB 118	ug/kg	<0.08	1	180	0.6				-	-	-	-	-	<0.1	-	<0.08	0.09	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
	Sum of PCBs	ug/kg		7	1260	N.V	N.V	N.V		-	-	-	-	-	<0.7	-	-	-	-	-	-	-	-	-	-
Organochlorine Pesticides	g-HCH (Lindane)	ug/kg	<0.1	0.3	1			3		-	-	-	-	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	HCB	ug/kg	<0.0	0.3	1			20		-	-	-	-	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	AHCH	ug/kg	<0.1	N.V	N.V	N.V	N.V	N.V		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BHCH	ug/kg	<0.1	N.V	N.V	N.V	N.V	N.V		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Dieldrin	ug/kg	<0.2	N.V	N.V			0.02		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	DDE	ug/kg	<0.3	N.V	N.V			2.2		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	DDT	ug/kg	<0.4	N.V	N.V			1.58		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	DDD	ug/kg	<0.5	N.V	N.V	N.V	N.V	N.V		-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:
Data highlighted if threshold value exceeded
BAC, EAC, and ERL values available at: https://www.ospar.org/documents?v=46271
Irish Action Level Values available at: Addendum-to-2006-Guidelines-(Marine-Insitute-2019).pdf
N/V = no threshold value available

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