

SYSAC Marina

Water Framework Directive Assessment



June 2024

Swansea Council
Pollution Control
Housing and Public Health
The Guildhall
Swansea
SA1 4PE

tel: +1792 635600
e-mail: pollution@swansea.gov.uk

Final Document

Date: 19th June 2024

Name: Tom Price

Signature:

A handwritten signature in black ink, featuring a large, stylized capital 'P' that loops around the first part of the name. Below the 'P', the words 'Tom Price' are written in a cursive, lowercase script.



Table of Contents

1. Introduction	1
1.1. Legislative Background	1
1.2. Location	3
2. River Tawe Barrage Act	4
3. Historical Dredging - Frequency, Timing and Extent.....	5
3.1. Marina Dredging.....	5
3.2. Adjacent Port Dredging	7
4. Proposed Dredging Activity	7
4.1. Proposed Dredge Area.....	7
4.2. Dredge Design	8
4.3. Proposed Timing and Duration.....	9
4.4. Dredging Methodology	9
5. Sediment Quality Data	11
5.1. Sediment Procedure.....	11
5.2. 2020 Sampling	11
5.3. Chemical Characteristics.....	11
6. Relevant River Basin Management Plan	12
7. Local Protected Areas	24
7.1. SSSI – Crymlyn Bog.....	25
7.2. SSSI – Crymlyn Burrows.....	25
7.3. SSSI – Blackpill Beach.....	26
8. Potential Impact on Water Body	26
9. Alternative Dredging & Disposal Methods	27
10. Conclusions.....	27
Appendix A – Seabed Surface Sediment Sample Analysis 2024.....	29



1. Introduction

The Swansea SYSAC moorings are accessed from the western edge of the River Tawe and situated north of the River Tawe Barrage. The marina provides direct access to Swansea Bay and the West Glamorgan coastline. In recent times maintenance dredging has been carried out at two-yearly intervals, which has been necessary to maintain navigable depths in the area.

Swansea Council, the owners of Swansea Marina occupied by the Swansea Yacht & Sub Aqua Club (SYSAC) moorings, propose to undertake maintenance dredging campaigns in the winter months of 2024/2025 and 2026/27 (and every other year, ending March 2033) to restore the required navigational depths. The application for a Marine Licence to dredge and/or dispose of dredge material is administered by the Marine Licensing Team (MLT) on behalf of Natural Resources Wales (NRW). A requirement of the Marine Licence Application is to undertake a Water Framework Directive (WFD) Assessment. This document outlines whether this individual pre-existing maintenance dredging activity needs further assessment to establish if it complies with the Water Framework Directive.

1.1. Legislative Background

The purpose of the WFD is to establish a framework for protecting inland surface waters, transitional waters, coastal waters and groundwaters. The EU Water Framework Directive was transposed into Welsh law as the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The requirements of the Directive need to be considered at all stages of the river and coastal planning and development process. The framework for delivering this Directive is through the River Basin Management Plans (RBMPs). Each RBMP has been characterised into smaller management units known as 'Water Bodies'.

A default Objective in all Water Bodies is to prevent deterioration in either the Ecological Status or, for Heavily Modified Water Bodies (HMWBs) or Artificial Water Bodies (AWBs), the Ecological Potential of the water body. Any activity which has the potential to have an impact on ecology (as defined by the Biological, physicochemical and hydromorphological Quality Elements (BQE) listed in Annex V of the Directive) will need consideration in terms of whether it could cause deterioration in the Ecological Status or Potential of a water body.



Where there are sites designated under EU legislation (e.g. the Birds or Habitats Directives, Shellfish Waters Directive), the Directive aims for compliance with any relevant standards or objectives for these sites. Therefore, where a site which is water-dependent in some way is protected by designation under another EU Directive, and the Good Ecological Status (GES) or Good Ecological Potential (GEP) targets set under the Water Framework Directive would be insufficient to meet the objectives of the other Directive, the more stringent targets would apply.

Ecological Status is expressed in terms of five status classes – high, good, moderate, poor or bad. These classes are established on the basis of specific criteria and boundaries defined against biological, physicochemical and hydromorphological elements (which are set out in Annex V of the WFD); these are shown in table 1 below.

Type	Description
Biological assessment	Uses numeric measures of communities of plants and animals (e.g. fish, macrophytes).
Physico-chemical assessment	Looks at elements such as temperature and the level of nutrients, which support the biology.
Hydromorphological quality	Looks at water flow, sediment composition and movement, continuity (rivers) and the structure of physical habitat.

Table 1: Definition of Quality Elements

The overall ecological status of a 'Water Body' is determined by whichever of these assessments is the poorer. A Water Body might achieve 'Good Status' for chemical and physicochemical assessments, but only achieve 'Moderate Status' for the biological assessment; in this case, it would be classed overall as having 'Moderate Ecological Status'. To achieve the overall aim of good surface water status, the WFD requires that surface waters be of at least GES and Good Chemical Status (GCS).

The WFD recognises that physical alterations may have been undertaken to support the use of a Water Body for a particular purpose (e.g. water storage, coast or flood defence, navigation, etc). If this reason is still valid the Water Body may be designated as an HMWB, with the requirement to achieve GEP rather than GES.



1.2. Location

The dredging site is located between the River Tawe Barrage and the new Sail Bridge walkway, on the River Tawe in Swansea, South Wales. The River Tawe Barrage was the first of its kind built in Wales and resulted in a half-tide basin being created along the lower tidal section of the River Tawe in Swansea (see figures 1 and 2).

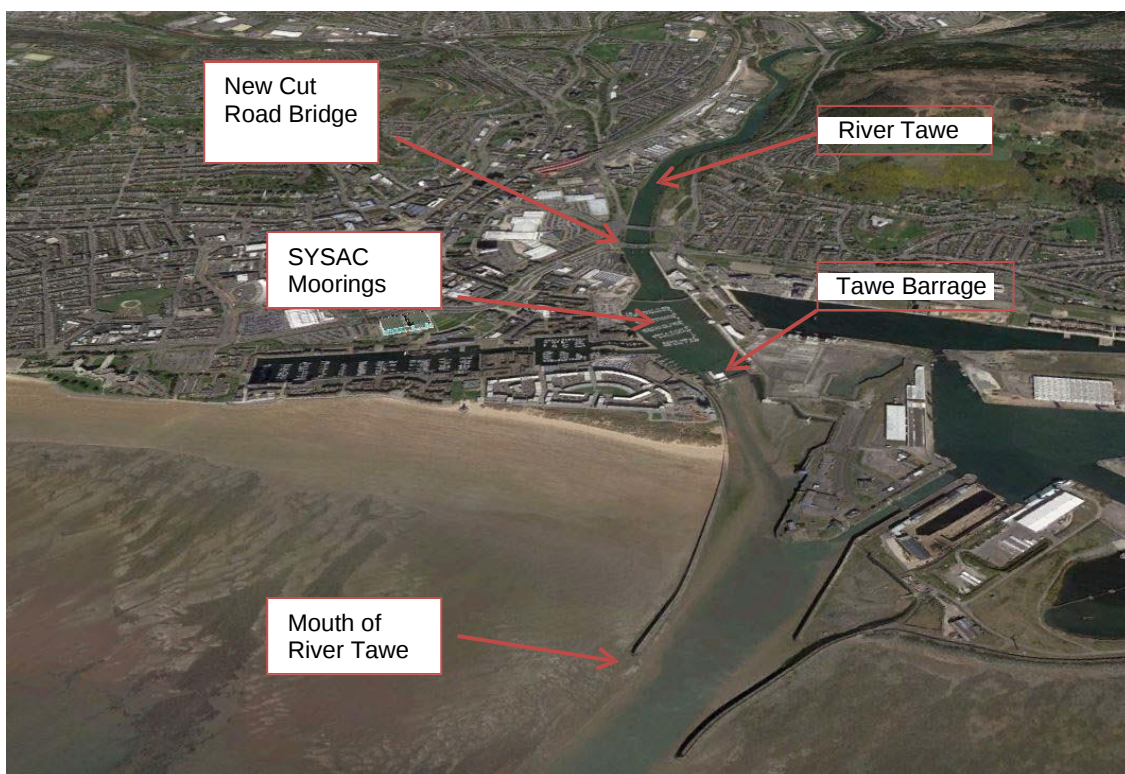


Figure 1: River Tawe, Swansea, southern aspect (source – Google Earth)

With the continual steady sedimentation in the area of the SYSAC marina, vessels moored on the pontoons have been touching bottom during the impounded phase of the tidal cycle. The yacht club generally manages this problem in the short term by moving deeper drafted vessels to areas where the natural water depth is greatest.

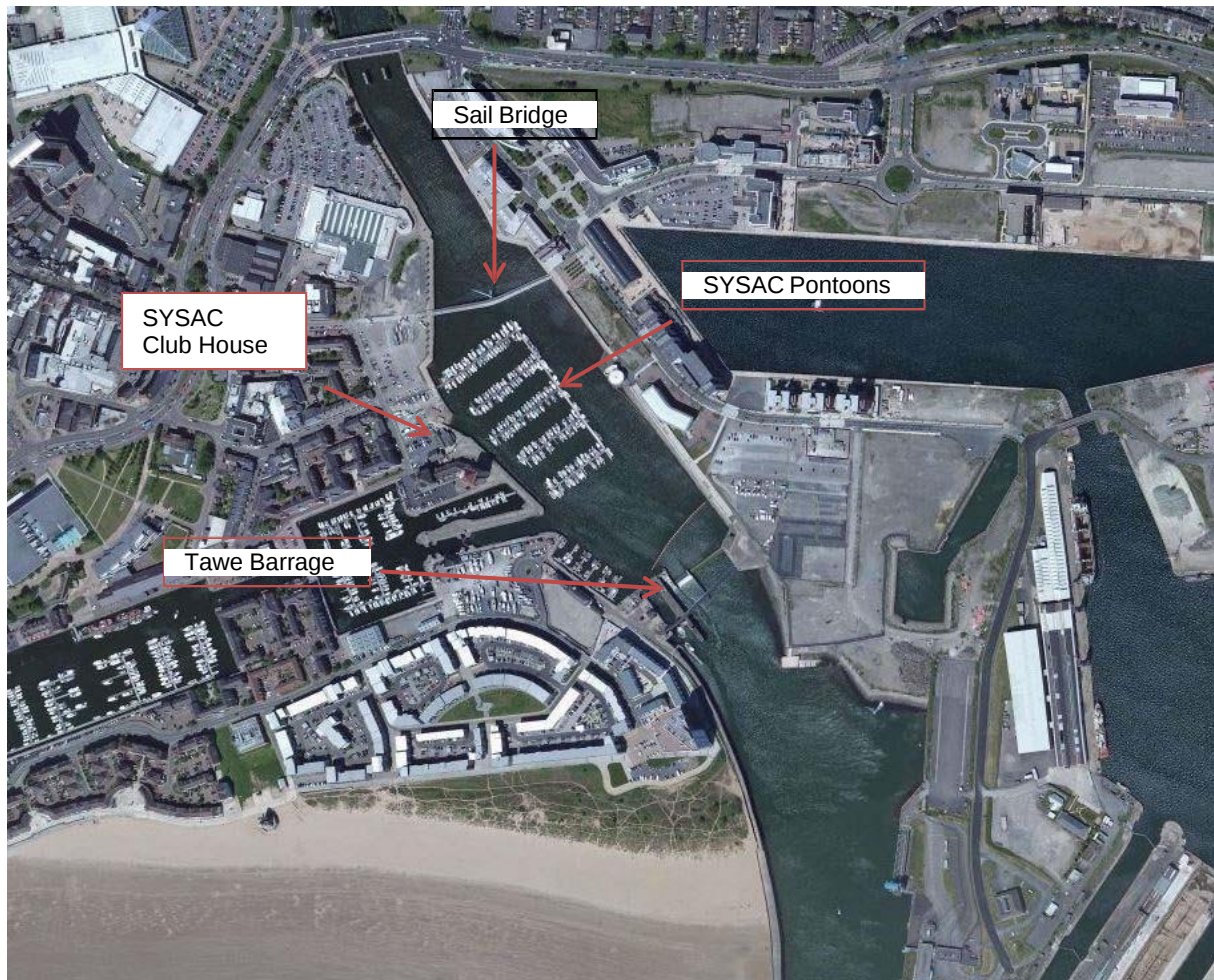


Figure 2: SYSAC Marina (Source Google Earth)

2. Swansea City Council (Tawe Barrage) Act 1986

For the barrage to be constructed an Act of Parliament was required to permit interruption to the flow of the river. This Act is known as the Swansea City Council (Tawe Barrage) Act 1986. Within this Act there is a provision concerning the maintenance of navigation within the river upstream of the barrage, once completed. The specific wording of this provision is as follows:

Following construction and bringing into operation of the barrage (Work No.1) the council shall take such steps as are possible at reasonable cost to maintain at all times but without prejudice to the powers of Clause 22 (Operation of sluices and lock gates) of the Bill an adequate depth of water in the main navigation channel of the upstream river inland of the works sufficient to allow passage along the river by yachts drawing not more than 5 feet to an extent similar to that possible before construction of the works.



The above clause requires there to be a maintained depth sufficient to allow the safe navigation of vessels with a draft of 5ft (1.52m), at all times, within that part of the river that was navigable before the construction of the barrage. For safe navigation to be achieved it is normal practice to include an additional depth for under keel clearance. This extra depth is to allow for such items as squat of the vessel, seabed undulations, wash effects, drawdown, drought plus an overall safety margin.

3. Historical Dredging - Frequency, Timing and Extent

3.1. Marina Dredging

Dredging using water injection (WID) has been undertaken eight times since 2007/08 and been successful in its aims each time. The first campaign commenced in December 2007 as a limited short term remedial measure to improve navigable depth to a minimum depth of 1.5m below the level of the Primary Weir Crest (PWC). The second was completed in February/March 2009 and was aimed at increasing depths beyond those attained in 2007/08, to a minimum water depth of 2.5m. The additional depth was required to provide some additional capacity for sedimentation between dredge campaigns. The subsequent campaigns are presented in Table 2 below and as with the 2009 campaign, have all aimed to restore the available depth in the Marina area of -2.5PWC to provide capacity for natural sedimentation. The scheduling of each campaign is recommended by the CCS's dredging consultants, Anthony D Bates Partnership (ADBP), based on data from bathymetric surveys.

The volumes of material displaced/relocated during the last eight maintenance dredging campaigns are summarised below in table 2. It must be noted that not all of this material exits the dredge area, a proportion is relocated within the marina area.

Occasion	Date		Area	Method	Volume (m ³)
	Start	End			
1	18-Dec-07	20-Dec-07	As above	WID	3,164
	04-Jan-08	10-Jan-08			
2	16-Feb-09	22-Feb-09	As above	WID	14,124
3	10-Jan-11	17-Jan-11	As above	WID	14,975
4	04-Jan-13	17-Jan-13	As above	WID	15,011
5	30-Jan-15	14-Feb-15	As above	WID	15,988
6	28-Jan-17	11-Feb-17	As above	WID	14,317
7	3-Feb-19	19-Feb-19	As above	WID	18,382
8	1-Feb-22	26-Feb-22	As above	WID	19,041

Table 2: Total quantities of material displaced/relocated/dredged within the marina area.



The volume displaced in per campaign has been approximately 15,000m³. However, not all of this material exits the dredge area via the lock gate pen stocks, a proportion of the dredged material re-settles within the dredge area. The 2019 campaign (occasion 7), resulted in an overall increase in volume displaced compared to previous years due to the WID working in the marina lock barrel - an area included under the previous licence but not previously dredged. As table 3 presents, a significant portion of the material displaced by WID is retained within the dredge area with the remainder being transferred downriver south of the barrage, via the lock gate penstocks, on its natural course.

Occasion	Volume Eroded (m ³)	Volume Remaining North of Barrage (m ³)	Volume Relocated South of Barrage (m ³)
1	3,164	861	2,303
2	14,124	11,195	2,929
3	14,975	7,099	7,876
4	16,947	7,154	9,793
5	18,834	7,395	11,439
6	16,860	7,367	9,493
7	18,382	7,136	11,246

Table 3: Historic dispersion characteristics of material eroded by WID dredging

Figure 3 below provides a visual representation of the areas eroded by the WID dredging process and the adjacent areas that accumulate material. The largest area that accumulates material is just north of the barrage. However, this is a very deep area (8m of water depth) and the material that settles here is re-eroded naturally over time.

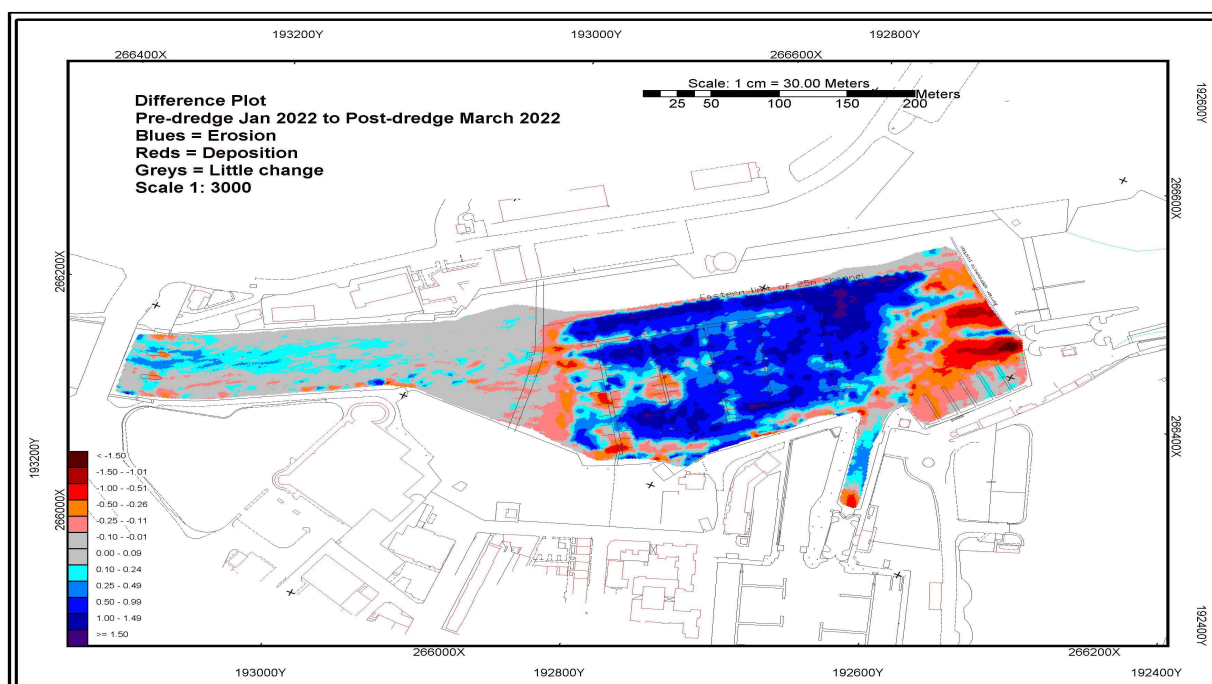


Figure 3: Areas of erosion (blue) and deposition (red) upstream of the barrage as a result of WID dredging

3.2. Adjacent Port Dredging

Dredging also takes place periodically seaward of the proposed dredging site for the Port of Swansea and its approaches. A significant quantity of sediment used to be dredged regularly and in some years has totalled over 817,000 tonnes. The volume dredged by the Port of Swansea has diminished over time as the trade vessels using the port have reduced in both number and size. The majority of the dredging presently carried out is to provide safe navigation of tugs used in nearby Port Talbot. In the last 3 years the volume of material deposited by the Port of Swansea at the Swansea Bay offshore disposal site has been:

Year	Tonnage deposited
2017	159,670
2018	206,336
2019	231,647

It can be seen that the dredging activity that is carried out by the Port of Swansea is an order of magnitude larger than the dredging that is carried out in association with the SYSAC marina maintenance dredging activity.

4. Proposed Dredging Activity

4.1. Proposed Dredge Area

The proposed dredge area is the same as that defined for previous campaigns, as approximately outlined in figure 4. This area is in the immediate vicinity of the vessel mooring



locations and the approach to/from the lock gates on the upstream side of the Tawe Barrage. The area also extends up to the lock gates to Swansea Marina as the lock barrel is prone to slow but steady sediment accumulation. The lock barrel does not need to be dredged on each campaign as the sedimentation rate is low. The defined area incorporates the fishing vessel pontoons located on the west side of the impounded area just upstream of the Tawe Lock gates.



Figure 4: Approximate area dredged every two years (*Image source: Google Earth*)

4.2. Dredge Design

The volume to be dredged during any dredging campaign will be affected by the siltation rate and the period since the preceding campaign. This has a direct effect on the depth of dredging required and hence volume. The most recent calculated sedimentation rate represents an average sedimentation rate of approximately $23\text{m}^3/\text{day}$ or $8,500\text{m}^3/\text{year}$. Applying this to the planned two-year cycle between campaigns it is estimated that a quantity of approximately $17,000\text{m}^3$ may need to be relocated biennially. This equates to removing approximately 0.39m from the entire area outlined above. However, as natural siltation is not



equal over the site, accumulating more rapidly under pontoons, the dredge depth may vary between 0.1m to 0.9m.

4.3. Proposed Timing and Duration

The timing and duration of the proposed dredging activity will be similar to historical campaigns, undertaken during the winter months when boating activity in the marina and Tawe Lock use are low. This application is to cover planned campaigns in the winter months of 2024/2025 and 2026/27 (and every other year, ending March 2033) . Each campaign is expected to last for approximately 14 days, excluding delays.

4.4. Dredging Methodology

The WID plant proposed consists of a small floating pontoon with a high volume water pump and injection arm attached. The pontoon is then manoeuvred by its own propulsion system or attached tug. The injection arm is hence passed over the area to be dredged as the pontoon is manoeuvred, the height of the injection arm is also controlled during this process (see figures 5 & 6). The system involves low-pressure water being injected into the sediments on the seabed. The low-pressure injection fluidises the sediments which will then flow as a dense fluid via natural seabed gradients towards lower bed levels. The majority of density flow is retained within the lower portion of the water column.

For this method of dredging to be successful, there has to be somewhere for the mobilised sediment to flow to. In the case of the SYSAC marina channels, approximately 0.5m deep, are dredged between the area to be dredged and the deeper water in front of the Tawe Lock. Arrangements are made for the penstocks of the lock to be left open to create a constant bed flow, during ebb tides, in the vicinity of the lock. The purpose being for the hydraulic flow through the penstocks discharge to create a continuous flow at seabed level, which will draw the fluid mud out of the upstream depression and discharge it into the downstream river flow, and hence away from the site.

Where a significant accumulation of saturated leaf mold matrix is encountered this can reduce the efficiency of the hydraulic flow. Where this is encountered the water injection nozzles will be altered to increase the flow in focused areas in order to loosen and move the organic material along the seabed in order to keep the flow channels clear. This method of more focused water injection is sometimes referred to as the mass flow technique, and is commonly used to fluidise and move more granular material.



One of two working methods will be used depending on the tidal state. On spring tides, dredging may start up to 1 hour before high water and end at low water, for a maximum duration of 5 hours, hence maximising the use of the natural flows over the two daily ebb tides. Alternatively, during neap tide periods, when tide levels do not overtop the weir, greater productivity can be achieved by working for a straight 12hr shift as opposed to two shifts over high tides. This is based on the fact that when the neap tide does not overtop the barrage there is no real advantage to only dredging on the ebb tides as the river's flow will remain constant throughout the tidal cycle.

Under the most recent marina licence (DML2042v2) the working method has followed the Project Specific Condition (cl. 8.8) where, *'The Licence Holder must ensure that on spring tides, dredging is only undertaken for a duration of five hours between 1 hour before high water and low water. During neap tide periods there are no tidal state restrictions on dredging.'*



Figure 5: Self-propelled water injection dredger working in SYCAC Marina

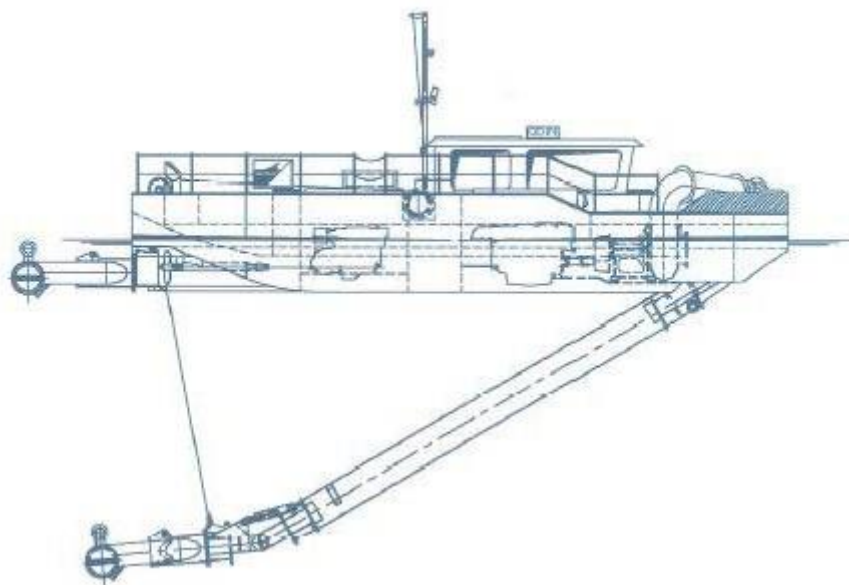


Figure 6: Water injection system schematic

5. Sediment Quality Data

5.1. Sediment Procedure

Sediment analysis has been undertaken by Swansea Council previously to facilitate past maintenance dredging activities at the location stated in Section 4. The most recent samples, for this 2024 application, were undertaken in April 2024.

5.2. 2024 Sampling

In line with previous sediment sampling, samples have been collected and tested at different locations within the marina dredge area at the seabed surface. Results have been provided for physical parameters, trace metals, organotins, polycyclic aromatic hydrocarbons (PAH), Polychlorinated biphenyls (PCB), Organochlorine and Brominated flame retardant (BDE) tests.

5.3. Chemical Characteristics

Action levels are used as part of a 'weight of evidence' approach to assessing dredged material and its suitability for disposal at sea. In general, contaminant levels in dredged material below Action Level 1 are of no concern and are unlikely to influence the licensing decision. However, dredged material with contaminant levels above Action Level 2 is generally considered unsuitable for sea disposal. Dredged material with contaminant levels between Action Levels 1 and 2 requires further consideration of the natural and historical information before making any recommendations.



Detailed chemical analyses and results of the bed materials are provided in Appendix A. The results are generally in line with historical sampling results from the Marina Area.

6. Relevant River Basin Management Plan

The proposed dredging site is located on the River Tawe just north of the Tawe barrage. The area north of the Barrage has now been included within the Water Framework Directive Cycle 2 waterbody classification, extending from the Barrage upstream to Beaufort Weir. This area has been designated as a Heavily Modified Water Body (HMWB).

South of the barrage is also a River Tawe designated HMWB. The current ecological quality status of these areas are shown in figure 7. Some of the dispersed material from the planned WID will relocate within these areas. Table 4 highlights all of the relevant, available, ecological quality status data for the two potentially affected water bodies, River Tawe (Beaufort Weir to Barrage) and River Tawe Estuary (below barrage including docks), from National Resources Wales, Water Watch Wales data portal.



Figure 7: River Basin Management Plan with proposed dredge site location

Table 4: River Tawe and Estuary - Cycle 3 2021 Transitional Water Body Information
(Data sourced from NRW Water Watch Wales, <https://waterwatchwales.naturalresourceswales.gov.uk/en/>)

OBJECTID	19	25
WBID	GB541005900901	GB541005900900
WB_Name	Tawe - Beaufort Weir To Barrage	Tawe Estuary Below Barrage Incl Docks
WB_Type	Transitional	Transitional
HM_Desig	Heavily Modified	Heavily Modified
RBD	Western Wales	Western Wales
Man_Catch	Tawe to Cadoxton TraC	Tawe to Cadoxton TraC
Op_Catch	Tawe Estuary below Barrage including Docks	Tawe Estuary below Barrage including Docks
NRW_Area	South West Wales;Marine	South West Wales;Marine
OverallWB	Moderate	Moderate
Ecological	Moderate	Moderate
Chem	Moder	High
Driving_Element	Cadmium;Nickel;Zinc;Mit_Assmnt	DIN;Zinc;Mit_Assmnt
Mit_Assmnt	Moderate	Moderate
Eco_Bio	Not Assessed	High
Fish		
Fish_Conf		
Fish_Roll		
Inverts		
Inverts_Conf		
Inverts_Roll		
IQI		
IQI_Conf		
IQI_Roll		
Imposex		
Imposex_Conf		
Imposex_Roll		
Phytoplank		
Phytoplank_Conf		
Phytoplank_Roll		
Angiosperm		
Angiosperm_Conf		
Angiosperm_Roll		
SalMar_Sub		
SalMar_Sub_Conf		
SalMar_Sub_Roll		
SeaGrs_Sub		
SeaGrs_Sub_Conf		
SeaGrs_Sub_Roll		
Macroalgae		High
Macroalgae_Conf		
Macroalgae_Roll		
OppMac_Sub		High
OppMac_Sub_Conf		No Information
OppMac_Sub_Roll		2015
FucExt_Sub		
FucExt_Sub_Conf		
FucExt_Sub_Roll		

Eco_Gen	Good	Moderate
DIN	Good	Moderate
DIN_Conf	Uncertain	Very Certain
DIN_Roll		
DO	High	
DO_Conf	Quite Certain	
DO_Roll		
Eco_HM	Not Assessed	Not High
Hydro		Not High
Hydro_Conf		No Information
Hydro_Roll		2014
Morph		
Morph_Conf		
Morph_Roll		
Spec_Poll	Moderate	Moderate
Arsenic		High
Arsenic_Conf		Very Certain
Arsenic_Roll		2015
Chrom_VI		
Chrom_VI_Conf		
Chrom_VI_Roll		
Copper	High	High
Copper_Conf	Very Certain	Very Certain
Copper_Roll		2015
Dimethoate		
Dimethoate_Roll		
Dimethoate_Conf		
Iron		
Iron_Conf		
Iron_Roll		
Linuron		
Linuron_Conf		
Linuron_Roll		
Manganese		
Manganese_Conf		
Manganese_Roll		
Permethrin		
Permethrin_Conf		
Permethrin_Roll		
Phenol		
Phenol_Conf		
Phenol_Roll		
Phenol_2_4		
Phenol_2_4_Conf		
Phenol_2_4_Roll		
Toluene		
Toluene_Conf		
Toluene_Roll		
Triclosan		
Triclosan_Conf		
Triclosan_Roll		
UI_NH3		
UI_NH3_Conf		
UI_NH3_Roll		
Zinc	Moderate	Moderate
Zinc_Conf	Very Certain	Very Certain

Zinc_Roll		2015
Chem_PHZ	Moderate	High
Anthracene		
Anthracene_Conf		
Anthracene_Roll		
BDPE_Calc		
BDPE_Calc_Conf		
BDPE_Calc_Roll		
Cadmium	Moderate	High
Cadmium_Conf	Uncertain	Very Certain
Cadmium_Roll		2015
Dioxins		
Dioxins_Conf		
Dioxins_Roll		
Endosulfan		
Endosulfan_Conf		
Endosulfan_Roll		
HBCDD		
HBCDD_Conf		
HBCDD_Roll		
Heptchl		
Heptchl_Conf		
Heptchl_Roll		
Hex_chl_bu		
Hex_chl_bu_Conf		
Hex_chl_bu_Roll		
Hex_chl_bz		
Hex_chl_bz_Conf		
Hex_chl_bz_Roll		
Hex_chl_cx		High
Hex_chl_cx_Conf		Very Certain
Hex_chl_cx_Roll		2015
Mercury		
Mercury_Conf		
Mercury_Roll		
Noyphenol		
Noyphenol_Conf		
Noyphenol_Roll		
PAH		
PAH_Conf		
PAH_Roll		
Pen_chl_bz		
Pen_chl_bz_Conf		
Pen_chl_bz_Roll		
PerfluSulp		
PerfluSulp_Conf		
PerfluSulp_Roll		
TBT_annx10		
TBT_annx10_Conf		
TBT_annx10_Roll		
Chem_PR	Moderate	High
Alachlor		
Alachlor_Conf		
Alachlor_Roll		
Atrazine		
Atrazine_Conf		

Atrazine_Roll		
Benzene		
Benzene_Conf		
Benzene_Roll		
Cypermeth		
Cypermeth_Conf		
Cypermeth_Roll		
Dichlo_1_2		
Dichlo_1_2_Conf		
Dichlo_1_2_Roll		
Dichlometh		
Dichlometh_Conf		
Dichlometh_Roll		
Dichlorvos		
Dichlorvos_Conf		
Dichlorvos_Roll		
Diuron		
Diuron_Conf		
Diuron_Roll		
Flourthene		
Flourthene_Conf		
Flourthene_Roll		
Isoprotron		
Isoprotron_Conf		
Isoprotron_Roll		
Lead		
Lead_Conf		
Lead_Roll		
Napthalene		
Napthalene_Conf		
Napthalene_Roll		
Nickel	Moder	
Nickel_Conf	Very Certain	
Nickel_Roll		
Octylphen		
Octylphen_Conf		
Octylphen_Roll		
Pen_chl_ph		
Pen_chl_ph_Conf		
Pen_chl_ph_Roll		
Simazine		
Simazine_Conf		
Simazine_Roll		
Tri_chl_bz		
Tri_chl_bz_Conf		
Tri_chl_bz_Roll		
Tri_chl_mh		
Tri_chl_mh_Conf		
Tri_chl_mh_Roll		
Chem_Other	Not Assessed	
Carb_tetra		
Carb_tetra_Conf		
Carb_tetra_Roll		
DDT_total		
DDT_total_Conf		
DDT_total_Roll		

Swansea Bay is also a designated HMWB. The current ecological quality status of this area is shown in figure 8. Table 5 highlights all of the relevant, available, ecological quality status data for the Swansea Bay Water Body, River Tawe from National Resources Wales, Water Watch Wales data portal.

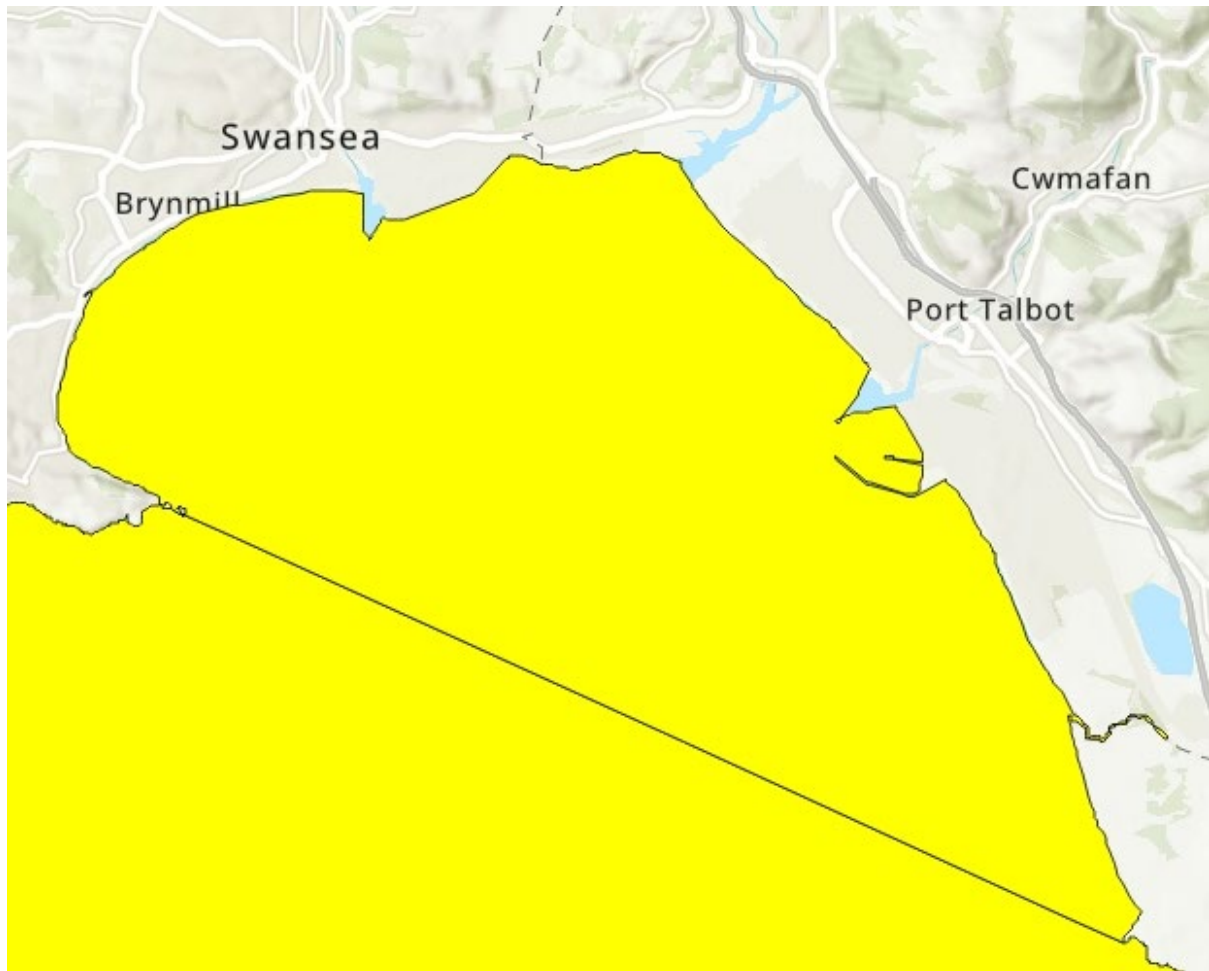


Figure 8 : Swansea Bay – Water Body

Table 5: River Tawe and Estuary - Cycle 3 2021 Rivers and Waterbodies Map
(Coastal Cycle 3 2021)

(Data sourced from NRW Water Watch Wales

<https://waterwatchwales.naturalresourceswales.gov.uk/en/>)

OBJECTID	2
WBID	GB641008260000
WB_Name	Swansea Bay
WB_Type	Coastal
HM_Desig	Heavily Modified
RBD	Western Wales
Man_Catch	Tawe to Cadoxton TraC
Op_Catch	Swansea Bay
NRW_Area	South West Wales;Marine
OverallWB	Moderate
Ecological	Moderate
Chem	Moderate
Driving_Element	Mercury;DIN;Mit_Assmnt
Mit_Assmnt	Moderate
Eco_Bio	Good
Fish	
Fish_Conf	
Fish_Roll	
Inverts	Good
Inverts_Conf	Uncertain
Inverts_Roll	
IQI	Good
IQI_Conf	Uncertain
IQI_Roll	
Imposex	
Imposex_Conf	
Imposex_Roll	
Phytoplank	Good
Phytoplank_Conf	Quite Certain
Phytoplank_Roll	
Angiosperm	
Angiosperm_Conf	
Angiosperm_Roll	
SalMar_Sub	
SalMar_Sub_Conf	
SalMar_Sub_Roll	
SeaGrs_Sub	
SeaGrs_Sub_Conf	
SeaGrs_Sub_Roll	
Macroalgae	High
Macroalgae_Conf	
Macroalgae_Roll	
OppMac_Sub	High

OppMac_Sub_Conf	No information
OppMac_Sub_Roll	2015
RSMac_Sub	
RSMac_Sub_Conf	
RSMac_Sub_Roll	
Eco_Gen	Moderate
DIN	Moderate
DIN_Conf	Uncertain
DIN_Roll	
DO	High
DO_Conf	Very Certain
DO_Roll	
Eco_HM	Not Assessed
Morph	
Morph_Conf	
Morph_Roll	
Spec_Poll	High
Arsenic	High
Arsenic_Conf	Very Certain
Arsenic_Roll	
Chrom_VI	High
Chrom_VI_Conf	Very Certain
Chrom_VI_Roll	
Copper	High
Copper_Conf	Very Certain
Copper_Roll	
Iron	High
Iron_Conf	Very Certain
Iron_Roll	2018
Manganese	
Manganese_Conf	
Manganese_Roll	
Permethrin	
Permethrin_Conf	
Permethrin_Roll	
Phenol	
Phenol_Conf	
Phenol_Roll	
Toluene	
Toluene_Conf	
Toluene_Roll	
UI_NH3	
UI_NH3_Conf	
UI_NH3_Roll	
Zinc	High
Zinc_Conf	Very Certain
Zinc_Roll	
Chem_PHZ	Moderate

Anthracene	
Anthracene_Conf	
Anthracene_Roll	
BDPE_Calc	
BDPE_Calc_Conf	
BDPE_Calc_Roll	
Cadmium	High
Cadmium_Conf	Very Certain
Cadmium_Roll	
Dioxins	
Dioxins_Conf	
Dioxins_Roll	
Endosulfan	
Endosulfan_Conf	
Endosulfan_Roll	
HBCDD	
HBCDD_Conf	
HBCDD_Roll	
Hex_chl_bu	
Hex_chl_bu_Conf	
Hex_chl_bu_Roll	
Hex_chl_bz	
Hex_chl_bz_Conf	
Hex_chl_bz_Roll	
Hex_chl_cx	
Hex_chl_cx_Conf	
Hex_chl_cx_Roll	
Mercury	Moderate
Mercury_Conf	Very Certain
Mercury_Roll	
Noyphenol	High
Noyphenol_Conf	Very Certain
Noyphenol_Roll	2018
PAH	
PAH_Conf	
PAH_Roll	
Pen_chl_bz	
Pen_chl_bz_Conf	
Pen_chl_bz_Roll	
PerfluSulp	
PerfluSulp_Conf	
PerfluSulp_Roll	
TBT_annx10	
TBT_annx10_Conf	
TBT_annx10_Roll	
Chem_PR	High
Benzene	High
Benzene_Conf	Very Certain

Benzene_Roll	2018
Cypermeth	
Cypermeth_Conf	
Cypermeth_Roll	
Dichlo_1_2	High
Dichlo_1_2_Conf	Very Certain
Dichlo_1_2_Roll	2018
Dichlometh	High
Dichlometh_Conf	Very Certain
Dichlometh_Roll	2018
Dichlorvos	
Dichlorvos_Conf	
Dichlorvos_Roll	
Flourthene	
Flourthene_Conf	
Flourthene_Roll	
Lead	High
Lead_Conf	Very Certain
Lead_Roll	
Napthalene	
Napthalene_Conf	
Napthalene_Roll	
Nickel	High
Nickel_Conf	Very Certain
Nickel_Roll	
Octylphen	
Octylphen_Conf	
Octylphen_Roll	
Tri_chl_bz	
Tri_chl_bz_Conf	
Tri_chl_bz_Roll	
Tri_chl_mh	High
Tri_chl_mh_Conf	Very Certain
Tri_chl_mh_Roll	2018
Chem_Other	High
Carb_tetra	High
Carb_tetra_Conf	Very Certain
Carb_tetra_Roll	2018
DDT_total	High
DDT_total_Conf	Very Certain
DDT_total_Roll	2018
Drins	
Drins_Conf	
Drins_Roll	
Pa_pa_DDT	High
Pa_pa_DDT_Conf	Very Certain
Pa_pa_DDT_Roll	2018
Tet_chl_ee	

Tet_chl_ee_Conf	
Tet_chl_ee_Roll	
Tri_chl_ee	
Tri_chl_ee_Conf	
Tri_chl_ee_Roll	
Shape_Area	284938584.063477
Shape_Length	96833.913803



7. Local Protected Areas

The planned dredging area does not lie within any protected aquatic area, nor does it have any protected areas adjacent to the dredging site. There are two protected aquatic areas located within 5km of the dredging site as highlighted by the orange hatching in figure 8 below. These are both Sites of Special Scientific Interest (SSSI) and their details and anticipated impacts of the planned dredging activity are discussed below.

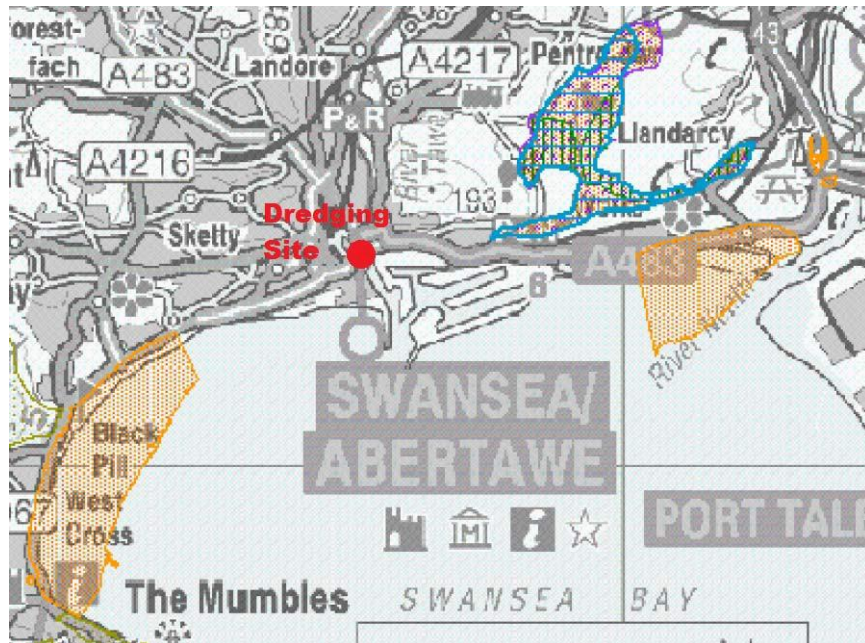


Figure 8: Location of dredging and SSSI sites

7.1. SSSI – Crymlyn Bog

Crymlyn Bog, located onshore to the North East of the dredging site (bordered by blue and hatched green in figure 8), is covered by several protection statuses such as Special Area of Conservation (SAC), National Nature Reserve (NNR), SSSI and by the RAMSAR Convention. However, as this site is over 2km from the proposed dredging site and onshore, no potential impacts are identified.

7.2. SSSI – Crymlyn Burrows

Crymlyn Burrows covers a total area of 234.52 hectares and is located to the east of the dredging site. Crymlyn Burrows is the only part of the eastern Swansea Bay coastline that has remained substantially unmodified by industrial development. The site includes examples of habitat transitions between sand-dune and saltmarsh habitats.

The impact on this site is anticipated to be zero. The direct distance between the dredging site and this SSSI is approximately 4km. However, for the sediment to be transported by local currents the distance is increased to a minimum of 5km. The general anticlockwise rotation of the marine currents within Swansea Bay means that and sediment discharged from the marina via the River Tawe is very unlikely to migrate towards this protected site.



7.3. SSSI – Blackpill Beach

Blackpill Beach covers a total area of 453.56 hectares and is located to the west of the dredging site. Blackpill beach was designated as an SSSI in 1986 in recognition of its importance for local and migratory birds. The mud and sand provide the perfect habitat for many marine invertebrates, the rich source of food on which the 150 or so species of birds, recorded there, depend.

The impact on this site is anticipated to be zero. The direct distance between the dredging site and this SSSI is approximately 3km. However, for the sediment to be transported by local currents the distance is increased to a minimum of 4.2km.

8. Potential Impact on Water Bodies

As discussed in Section 1 the WFD recognises that some water bodies have been physically altered, for example for navigation or flood defence, and allows for these water bodies to be designated as Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB) and need to achieve good ecological potential rather than ecological status. Ecological potential means that the water body is managed to sustain the biology that can be achieved given its modified condition.

The potential effects of the proposed water injection dredging campaign are negligible. The River Tawe already contains a high suspended sediment load and the increases in suspended solids associated with the dredging activity will be temporary and within the envelope of normal background levels. The dredging activity itself only takes place over certain periods of the day, as highlighted in Section 4.5, and over a maximum period of approximately fourteen days every 2 years. Also, as previously highlighted this dredging technique has been utilised on eight occasions since 2007/08 with no negative effects noted. Low volumes of the dredged material will be introduced to the River Tawe South of the barrage, with a proportion of this reaching Swansea Bay but in low dilutions.

As detailed in the dredging methodology the sediment is re-fluidised and uses the local currents to continue its natural pathway should the Tawe barrage not been constructed. This practice is widely regarded internationally as a beneficial use of the material, known as sediment cell maintenance, as it retains the naturally occurring sediments in the local environment rather than removing it to a foreign environment,



potentially impacting on offshore disposal areas. This method of dredging has been previously used at this site on eight occasions with no negative impacts reported.

No groundwater bodies are likely to be impacted by the proposed works.

9. Alternative Dredging & Disposal Methods

Due to the proposed method of dredging no material is removed from the aquatic environment, therefore no disposal operation takes place. By using the WID dredging method the required depths can be maintained by regular small scale WID campaigns. Should other, more intrusive, dredging methods be employed it would make economic sense to dredge much higher volumes but probably less frequently.

The recovery of the material from the aquatic environment would also have very substantial cost implications. Substantially larger dredging plant would be required to excavate the sediment. Ancillary plant would also be required for transportation of the dredged material to a remote disposal site, the nearest of which is 10km out into Swansea Bay. The cost of implementing such a process could increase the dredging costs considerably. Alternatively, beach nourishment or land reclamation is not feasible due to the very fine nature of the sediment.

Alternative disposal to land has been considered, but the spoil would have to be dewatered or dried and transferred by truck via busy roads through a densely populated area. If spoil was not dewatered then trucks would be needlessly transferring seawater along with the spoil to a land-based waste facility. The high potential for spills during the transfer from the vessel to the truck and from truck spillages on roads will have a consequential additional environmental impact. An alternative site for dewatering operations and recovery would also be required as the required space is not available on-site; such a site has not been identified.

10. Conclusions

The proposed pre-existing method of maintaining the marina navigational channels and berths is considered to be the most economic and environmentally sustainable option available.

The volumes being dredged and relocated within the dynamic environment are considered to be minor. The frequency and duration of operations are also minimal. The restricted dredging



hours each day also ensures that the volume of material relocated daily is limited, promoting a trickle charge regime of the local coastal areas.

The proposed dredging processes are established pre-existing techniques with no reported impacts on the local environment, including local river basins, coastal waters or third parties. It is concluded that the proposed dredging will not cause a non-temporary deterioration in status at water body level or otherwise affect the ability of the water body to achieve either its WFD objectives or relevant water-related protected area objectives.



Appendix A – Seabed Surface Soil Sample Analysis 2024

Including sample locations and diagram

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295

Issue Version: 2

Customer: Swansea Council, Pollution Control, Room 401, The Guildhall, Swansea, SA1 4PE

Customer Reference: NRW MMO Sediment Analysis

Date Sampled: 30-Apr-24

Date Samples Received: 02-May-24

Test Report Date: 11-Jun-24

Condition of samples: Cold Satisfactory

Opinions and Interpretations expressed herein are outside the scope of our UKAS accreditation

The results reported relate only to the sample tested

The results apply to the sample as received

JM Colbourne

Authorised by: Jane Colbourne

Position: Customer Service Specialist



1252

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			45mm	31.5mm	22.4mm	16mm	11.2mm	8mm	5.6mm
Client Reference:	SOCOTEC Ref:	Matrix	-5.5	-5.0	-4.5	-4.0	-3.5	-3.0	-2.5
SC1 - Pontoon 1	MAR02295.001	Sediment	0.00	0.00	0.00	0.00	1.31	1.34	0.70
SC2 - Pontoon 2	MAR02295.002	Sediment	0.00	0.00	0.00	0.00	0.69	0.15	0.36
SC3 - Pontoon 3	MAR02295.003	Sediment	0.00	2.26	2.15	0.85	2.04	0.52	0.57

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			4mm	2.8mm	2mm	1.4mm	1mm	707µm	500µm
Client Reference:	SOCOTEC Ref:	Matrix	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
SC1 - Pontoon 1	MAR02295.001	Sediment	0.74	0.82	0.59	0.52	0.44	2.11	2.21
SC2 - Pontoon 2	MAR02295.002	Sediment	0.34	0.54	0.54	0.56	0.44	1.93	0.59
SC3 - Pontoon 3	MAR02295.003	Sediment	0.48	0.54	0.27	0.38	0.70	1.94	2.77

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			353.6µm	250µm	176.8µm	125µm	88.39µm	63µm	44.2µm
Client Reference:	SOCOTEC Ref:	Matrix	1.5	2.0	2.5	3.0	3.5	4.0	4.5
SC1 - Pontoon 1	MAR02295.001	Sediment	3.06	2.28	4.02	7.79	6.07	6.94	7.71
SC2 - Pontoon 2	MAR02295.002	Sediment	2.05	2.96	5.75	8.66	7.40	7.32	6.94
SC3 - Pontoon 3	MAR02295.003	Sediment	3.40	2.22	3.42	7.62	5.39	6.00	7.34

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			31.3µm	22.1µm	15.6µm	11µm	7.8µm	5.5µm	3.9µm
Client Reference:	SOCOTEC Ref:	Matrix	5.0	5.5	6.0	6.5	7.0	7.5	8.0
SC1 - Pontoon 1	MAR02295.001	Sediment	7.59	7.49	7.07	6.86	6.22	5.20	3.73
SC2 - Pontoon 2	MAR02295.002	Sediment	6.90	6.89	7.10	6.94	6.24	5.56	4.32
SC3 - Pontoon 3	MAR02295.003	Sediment	7.47	7.27	6.56	6.40	5.82	4.83	3.46

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			2.75µm	1.95µm	1.38µm	0.98µm	0.69µm	0.49µm	0.34µm
Client Reference:	SOCOTEC Ref:	Matrix	8.5	9.0	9.5	10.0	10.5	11.0	11.5
SC1 - Pontoon 1	MAR02295.001	Sediment	2.30	1.26	0.74	0.56	0.51	0.47	0.42
SC2 - Pontoon 2	MAR02295.002	Sediment	2.80	1.52	0.85	0.64	0.60	0.59	0.54
SC3 - Pontoon 3	MAR02295.003	Sediment	2.18	1.24	0.78	0.61	0.55	0.51	0.45

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)	% (at 0.5phi intervals)
		Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
		Accreditation	MMO	MMO	MMO	MMO	MMO	MMO	MMO
			0.24µm	0.17µm	0.12µm	0.09µm	0.06µm	0.04µm	<0.04µm
Client Reference:	SOCOTEC Ref:	Matrix	12.0	12.5	13.0	13.5	14.0	14.5	>14.5
SC1 - Pontoon 1	MAR02295.001	Sediment	0.34	0.26	0.18	0.11	0.05	0.01	0.00
SC2 - Pontoon 2	MAR02295.002	Sediment	0.46	0.35	0.26	0.16	0.06	0.01	0.00
SC3 - Pontoon 3	MAR02295.003	Sediment	0.37	0.27	0.20	0.12	0.05	0.01	0.00

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)							
		Method No	ICPMSS*							
		Limit of Detection	0.5	0.04	0.5	0.5	0.01	0.5	0.5	2
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Mercury (Hg)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)
SC1 - Pontoon 1	MAR02295.001	Sediment	22.9	1.90	15.5	36.6	0.09	46.3	51.1	301
SC2 - Pontoon 2	MAR02295.002	Sediment	16.8	1.38	13.9	33.0	0.08	40.6	42.9	268
SC3 - Pontoon 3	MAR02295.003	Sediment	26.2	1.97	18.4	43.0	0.12	49.7	57.7	346
Certified Reference Material SETOC 768 (% Recovery)			92	92	93	100	95	91	91	92
QC Blank			<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2

* See Report Notes

MAR02295 V2
 This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	0.001	0.001
		Accreditation	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	Dibutyltin (DBT)	Tributyltin (TBT)
SC1 - Pontoon 1	MAR02295.001	Sediment	<0.005	<0.005
SC2 - Pontoon 2	MAR02295.002	Sediment	<0.005	<0.005
SC3 - Pontoon 3	MAR02295.003	Sediment	<0.005	<0.005
Certified Reference Material BCR-646 (% Recovery)			108	94
QC Blank			<0.001	<0.001

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1	1	1
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	ACENAPTH	ACENAPHY	ANTHRACN	BAA	BAP	BBF	BENZGHIP	BEP
SC1 - Pontoon 1	MAR02295.001	Sediment	57.4	23.6	65.3	248	312	355	231	235
SC2 - Pontoon 2	MAR02295.002	Sediment	277	45.4	244	740	806	849	492	527
SC3 - Pontoon 3	MAR02295.003	Sediment	113	72.5	229	602	661	697	452	452
Certified Reference Material Nist 1941b (% Recovery)			71	120	68	71	68	86	63	81
QC Blank			<1	<1	<1	<1	<1	<1	<1	<1

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

For full analyte name see method summaries.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1	1	1
		Accreditation	UKAS/MMO	MMO	MMO	MMO	MMO	MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	BKF*	C1N	C1PHEN	C2N	C3N	CHRYSENE*	DBENZAH	FLUORANT
SC1 - Pontoon 1	MAR02295.001	Sediment	288	93.6	168	123	70.8	356	47.3	512
SC2 - Pontoon 2	MAR02295.002	Sediment	662	136	352	152	111	842	117	1460
SC3 - Pontoon 3	MAR02295.003	Sediment	587	227	454	236	165	757	93.0	1380
Certified Reference Material Nist 1941b (% Recovery)			83	76	82	112	119	91	100	81
QC Blank			<1	<1	<1	<1	<1	<1	<1	<1

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

For full analyte name see method summaries.

*See report notes

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	mg/Kg
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/305
		Limit of Detection	1	1	1	1	1	1	1
		Accreditation	MMO*	UKAS/MMO	UKAS/MMO	MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	FLUORENE	INDPYR	NAPTH	PERYLENE	PHENANT	PYRENE	THC
SC1 - Pontoon 1	MAR02295.001	Sediment	56.3	229	63.9	80.6	295	392	169
SC2 - Pontoon 2	MAR02295.002	Sediment	234	560	68.3	215	1030	1060	419
SC3 - Pontoon 3	MAR02295.003	Sediment	127	480	232	169	852	1080	255
Certified Reference Material Nist 1941b (% Recovery)			53	79	60	57	75	71	87~
QC Blank			<1	<1	<1	<1	<1	<1	<1

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

For full analyte name see method summaries.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
		Accreditation	UKAS/MMO	UKAS/MMO	MMO*	MMO*	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	PCB 101	PCB 105	PCB 110	PCB 118	PCB 128	PCB 138	PCB 141
SC1 - Pontoon 1	MAR02295.001	Sediment	0.00033	0.00014	0.00049	0.00050	<0.00008	0.00049	<0.00008
SC2 - Pontoon 2	MAR02295.002	Sediment	0.00037	0.00009	0.00054	0.00036	<0.00008	0.00036	<0.00008
SC3 - Pontoon 3	MAR02295.003	Sediment	0.00047	0.00019	0.00072	0.00059	<0.00008	0.00071	0.00013
Certified Reference Material Nist 1941b (% Recovery)			98	99	139	122	108	93	122~
QC Blank			<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	PCB 149	PCB 151	PCB 153	PCB 156	PCB 158	PCB 170	PCB 18
SC1 - Pontoon 1	MAR02295.001	Sediment	0.00045	<0.00008	0.00044	<0.00008	<0.00008	0.00023	0.00027
SC2 - Pontoon 2	MAR02295.002	Sediment	0.00040	<0.00008	0.00034	<0.00008	<0.00008	0.00015	0.00015
SC3 - Pontoon 3	MAR02295.003	Sediment	0.00042	0.00018	0.00052	0.00009	<0.00008	0.00018	0.00051
Certified Reference Material Nist 1941b (% Recovery)			102	110~	85	82	89	105	96
QC Blank			<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	MMO*	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	PCB 180	PCB 183	PCB 187	PCB 194	PCB 28	PCB 31	PCB 44
SC1 - Pontoon 1	MAR02295.001	Sediment	0.00038	0.00012	0.00022	0.00011	0.00065	0.00054	0.00024
SC2 - Pontoon 2	MAR02295.002	Sediment	0.00019	<0.00008	<0.00008	<0.00008	0.00036	0.00032	0.00016
SC3 - Pontoon 3	MAR02295.003	Sediment	0.00043	<0.00008	0.00026	0.00014	0.00083	0.00080	0.00035
Certified Reference Material Nist 1941b (% Recovery)			101	84	99	100	81	108	99
QC Blank			<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.00008	0.00008	0.00008	0.00008
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	MMO*
Client Reference:	SOCOTEC Ref:	Matrix	PCB 47	PCB 49	PCB 52	PCB 66
SC1 - Pontoon 1	MAR02295.001	Sediment	0.00013	0.00025	0.00026	0.00054
SC2 - Pontoon 2	MAR02295.002	Sediment	<0.00008	0.00014	0.00024	0.00030
SC3 - Pontoon 3	MAR02295.003	Sediment	0.00014	0.00035	0.00040	0.00071
Certified Reference Material Nist 1941b (% Recovery)			111~	102	104	104
QC Blank			<0.00008	<0.00008	<0.00008	<0.00008

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
 Issue Version 2
 Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)							
		Method No	ASC/SOP/302							
		Limit of Detection	0.0001							
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	MMO*	UKAS/MMO	UKAS/MMO	MMO*
Client Reference:	SOCOTEC Ref:	Matrix	AHCH	BHCH	GHCH	DIELDRIN	HCB	PPTDE	PPDDE	PPDDT
SC1 - Pontoon 1	MAR02295.001	Sediment	<0.0001	<0.0001	<0.0001	0.0007	0.0002	0.0006	0.0004	0.0007
SC2 - Pontoon 2	MAR02295.002	Sediment	<0.0001	<0.0001	<0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
SC3 - Pontoon 3	MAR02295.003	Sediment	<0.0001	<0.0001	<0.0001	0.0005	0.0003	0.0005	0.0004	0.0003
Certified Reference Material Nist 1941b (% Recovery)			114~	84~	85~	142~	144	88	94	41~
QC Blank			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are available.

For full analyte name see method summaries.

*See report notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308
		Limit of Detection	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	BDE17	BDE28	BDE47	BDE66	BDE85	BDE99	BDE100	BDE138
SC1 - Pontoon 1	MAR02295.001	Sediment	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
SC2 - Pontoon 2	MAR02295.002	Sediment	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
SC3 - Pontoon 3	MAR02295.003	Sediment	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	0.00027	<0.00025	<0.00025
Certified Reference Material Quasimeme SED56 (% Recovery)			129~	101	99	101~	119~	119	149	97~
QC Blank			<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005

* See Report Notes

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308
		Limit of Detection	0.00005	0.00005	0.00005	0.0001
		Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Client Reference:	SOCOTEC Ref:	Matrix	BDE153	BDE154	BDE183	BDE209
SC1 - Pontoon 1	MAR02295.001	Sediment	<0.00025	<0.00025	<0.00025	0.038
SC2 - Pontoon 2	MAR02295.002	Sediment	<0.00025	<0.00025	<0.00025	0.013
SC3 - Pontoon 3	MAR02295.003	Sediment	<0.00025	<0.00025	<0.00025	0.042
Certified Reference Material Quasimeme SED56 (% Recovery)			114	93~	129	79
QC Blank			<0.00005	<0.00005	<0.00005	<0.0001

* See Report Notes

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis



Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
*SUB_01	MAR02295.001-003	Analysis was conducted by an approved subcontracted laboratory.
ICPMSS*	MAR02295.001-003	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ASC/SOP/301	MAR02295.001-003	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/302	MAR02295.001-003	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (PCB110, 118, 194, 66, HCB, PPDDT) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02295.001-003	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (FLUORENE) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02295.001-003	Benzo[k]fluoranthene is known to coelute with Benzo[j]fluoranthene and these peaks can not be resolved. It is believed Benzo[j]fluoranthene is present in these samples therefore it is suggested that the Benzo[k]fluoranthene results should be taken as a Benzo[k]fluoranthene (inc. Benzo[j]fluoranthene). Benzo[j]fluoranthene is not UKAS accredited. This should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR02295.001-003	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved in the PAHSED UKAS accredited method. Chrysene and Triphenylene are resolved for MMO but this is currently not UKAS accredited therefore Chrysene is reported without this accreditation.
ASC/SOP/308	MAR02295.001-003	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.

DEVIATING SAMPLE STATEMENT

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ



Test Report ID MAR02295
Issue Version 2
Customer Reference NRW MMO Sediment Analysis

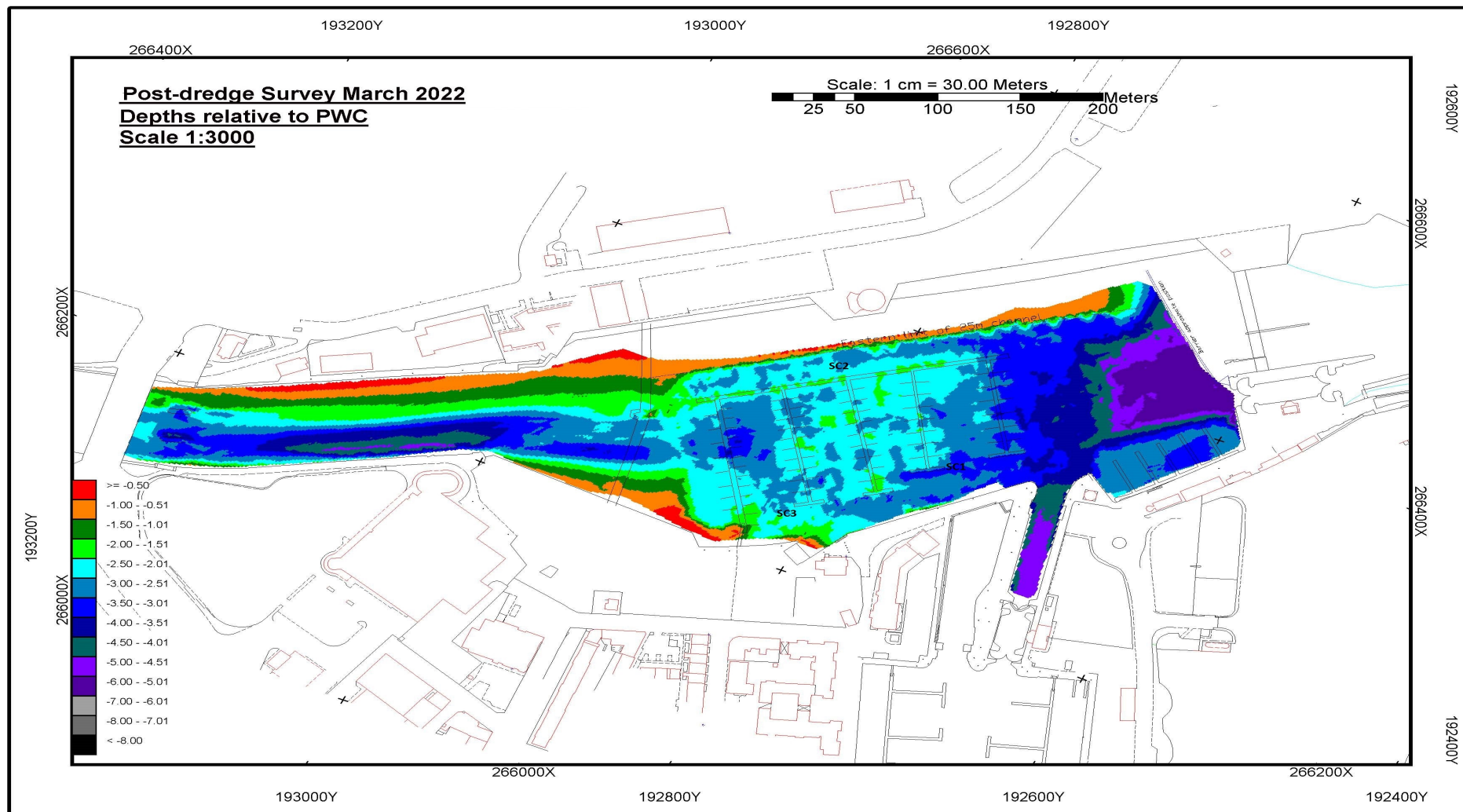
Method	Sample and Fraction Size	Method Summary
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Metals	Air dried	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Ultra-violet fluorescence spectroscopy
Polychlorinated Biphenyls (PCBs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Brominated Flame Retardants (PBDEs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions					
Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorocyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorocyclohexane
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorocyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	PPDDE	p,p'-Dichlorodiphenyldichloroethylene
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	PPDDT	p,p'-Dichlorodiphenyltrichloroethane
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	PPTDE	p,p'-Dichlorodiphenyldichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		

MAR02295 V2

This test report shall not be reproduced except in full, without written approval of the laboratory

Name	OS East	OS North	WGS84 Lat	WGS84 Long
SC1	266311	192741	51.6176	-3.9324
SC2	266346	192828	51.6184	-3.9319
SC3	266244	192815	51.6182	-3.9334



Depth colours shown are relative to the Primary Weir Crest of the barrage.