

## **P-05-1003 Demand an EIA now on the dumping of radioactively contaminated mud in Welsh waters, Correspondence – Petitioner to Committee, 10.03.21**

### ***To Petitions Committee secretariat***

#### **GeigerBay response to NRW letter to the Committee chair**

*P-05-1003 Demand an EIA now on the dumping of radioactively contaminated mud in Welsh waters.*

#### **Direct comments on the letter**

1. The NRW acceptance of EDF's sampling plan had deficits – a) no transparency; b) no answer on refusal to detect nuclear microparticles via CR-39 (TASTRAK) process; c) omission of bio-toxicity tests (OSPAR/IMO procedure)
2. NRW decision (12 Oct.) that EIA is required was on the basis that the company withdrew the screening application. Our lawyers detailed that the Marine Works EIA legislation does not allow withdrawal, but does require NRW to make a reasoned decision. NRW was unable to answer why they did not follow the EIA Regs.
3. NRW write *the scope of the EIA is restricted to the requirements of the Marine Works (EIA) Regulations (2017)*. While EDF has not sought a Scoping Opinion, that does not remove the need to face issues of deciding which issues are in scope (by Schedule 2)
4. NRW do not suggest that any of the 11 issues in our 21 October briefing (Annex on Scope of the EIA) are not in-scope. We ask the Petitions Committee to ask NRW to scrutinise EDF's submission to ensure it cover these 11 issues and others, in deciding if the necessary EIA information is included. They should consult the EIA consultation bodies on this insofar as they lack in-house expertise (CEFAS to be excluded due to conflicting interest).

#### **The EIA Regulations specify very wide scope (Marine Works EIA 2017 Schedule 2)**

In the 2020 sampling consultation, NRW declared various issues “out of scope” when that was wrong or at least contestable. The Committee should ask for an open and transparent process for deciding arguments on scope within the EIA Regs.

The EIA requirements are very widely drawn. We find NRW interpreted them only narrowly for the *screening* application. Our lawyers found this by FoI requests; NRW's response just “noted” their criticisms of the inadequacies, saying the application was withdrawn. That was no reason for their accepting too narrow a screening application. The *screening request* had to describe the nuclear power station 'project' - it didn't – nor did it describe the particular purpose of installing a cooling water system for extracting seawater (which kills much of the marine life) and returning contaminated water to the Marine Protection Area (MPA). The EIA screening application covered only the dumping scheme itself.

The two responses to NRW from Cardiff and from the VoG Councils on the screening request raised the basic planning-law issue, that EDF's proposal is an amendment to the 2012/13 nuclear power station planning consent. They suggested this defines the ‘project’

to which the EIA screening and scoping regulations apply, implying EDF's screening application was inadequate. While MLT's case officer had accepted it, NRW were unable to supply our lawyers LeighDay with a "completeness check" record. NRW replied their Marine Advisory Service provides the advice to ensure compliance on scope. The Advisory Service reply (appended Memo, ██████████ to MLT, 17 Sept 2020) did not mention the issue.

### **EDF's parallel application to the MMO**

As EDF submitted an EIA for dumping at the Portishead dump-site a month ago. This covers only the dumping scheme for that site, so we expect they will submit a similarly narrow-scope application for Cardiff. It talks only of the dumping 'scheme' and fails to describe the nuclear power station 'project'. The Committee should emphasise to NRW that to be acceptable for the EIA Regs, the application has to describe the nuclear power station 'project' with its cooling water system and alternatives to it that avoid the fish-kill and harm to the MPA (designated in 2018 by the Welsh and English governments), giving environmental reasons for the choice.

### **Screening assessment of NRW Marine Advisory Service** (appended 17 Sept Memo)

This document had to be obtained via FoI, after NRW refused it on the grounds that EDF's screening application was withdrawn. The Memo questions particular assertions of EDF and details several areas requiring specific information to assess possible impacts. One issue is the claim that the Cardiff site is 'dispersive', in view of the mounds of sediment visible on the seabed in April 2019, months after being dumped (Titan survey). The Marine Licensing Team (MLT) and CEFAS previously insisted the site is dispersive, with the MLT approving CEFAS's 2020 amended version of the Titan Environmental report to include a 'residual survey offset' that made the total amount remaining on the seabed appear very small. The Memo did not accept that, seeing that the mounds were quite prominent and grab samples showed some to be a different 'sediment matrix'.

The *Marine Advisory Service* report shows firmly on several grounds that EIA is needed. It implies there should have been EIA in 2017 when NRW and the Minister misled the Petitions Committee and Senedd in saying EIA was not needed.

### **Expanded number of issues in-scope**

On the above arguments, we urge the Petitions Cttee to reject NRW's implication that the EIA Regs are "restrictive" of the scope. We are able to argue that all of the 11 issues we proposed in October (see Annex) can be justified as "in scope".

We have found further evidence that expands the scope:

- a) In 2012 the EA suggested dumping outside the SAC/MPA in the *Holm Deep*. EDF need to disclose why they rejected this in favour of Cardiff.
- b) In 2010 the EA published Cooling Water Options for the New Generation of Nuclear Power Stations in the UK SC070015/SR3). This advised land-based cooling systems for nuclear

- plants where the adjacent sea is sensitive for conservation, fish hatching/breeding or at-risk species (EPS, eels, etc.). EDF need to disclose how they considered this.
- c) Most of the dumped mud does not disperse to sea, but deposits on existing mud or blows onto land; EDF must address this rather than claim standards applying to dumping at sea.
  - d) The Cdf dump-site has never been reviewed re. the Habitats and EIA legislation so the fate of the dumped mud, its dispersal around the estuary and transfer of pollutants (nuclides and chemicals) to land and foodstuffs as well as marine life has to be fully described.
  - e) Wales National Marine Plan, section on dredging and dumping, does not including capital dredging for non-port facilities; EDF must supply evidence that their dumping is covered.
  - f) Welsh waste policy (Towards Zero Waste) virtually excludes dumping waste from English projects in Wales; what exceptional reasons do EDF give?

### **Further evidence on Nuclear Discharges**

Prof Keith Barnham of Imperial College has written a memo for the Petitions Committee on suspicions that emitted nuclear fuel microparticles are buried in the sediments. The plutonium-containing microparticles (PMPs) were produced and discharged from Hinkley-A. He shows errors in NRW's dismissal of such 'hot' fuel particles. The memo points out there were accidents with unloading magnox fuel elements in 1968 and 1969, which would have released many fragments into the cooling pond; "*extensive surface corrosion of the uranium itself*" was reported due to accidental acid spill. Prof Barnham then shows data of the strong excess of alpha emissions compared with gamma-emissions in the discharges. The records he reports (graph in the memo) show an alpha excess in 1978 and a bigger one in 1982 and '83.

NRW wrote that "*would have been detected by gamma spectrometry in the first instance*"; they are wrong as the alpha-emitting isotope is dominant in Hinkley-A fuel, while the commonly dominant Pu-241 inferred from Am-241 emissions is only 3% (not the normal 90%). NRW write too that "*no hot particles have been identified in the previous... sediment samples*", yet they were tested only for gamma emission and the PMPs have very little. Also CR-39 detectors (next section) have to be used to detect concentrated micron-sized emitters, which spectrometry misses. The strong alpha excess in 1982-3 indicates that not just liquid but unusual amounts of sludge were discharged from the cooling pond at that time. PMPs are largely very dense metal which normally stays within the pond; they drop into the sediments not far from the discharge point, depending on the tidal conditions. Prof. Barnham in his memo has formulated 4 questions that we'd like NRW to address.

EDF try to confuse the public and avoid the issue of PMPs by talking of 'alpha particles'. These atomic particles are far, far smaller – 10 trillion times less massive than a plutonium micro-particle PMP. This huge factor explains why a single PMP can be detected via an exposure time of days or weeks (gamma exposures are limited to 1-3 days due to cost).

The huge factor also explains why a single PMP is dangerous to health if inside a human organ.

### **Testing for alpha emitters from 'hot' fuel particles**

*Children with Cancer UK (CwC)* pointed out NRW had been misled by CEFAS in dismissing the CR-39 tests for alpha emissions. We append their letter to NRW (CwCUK toMLT 17Jun'20)

In appendices to their letter, CwC supplied the scientific evidence that CR-39 detectors are well-used and practical - TASL (Track Analysis Systems Ltd, Bristol). Alpha radiation makes tracks a few tens of micrometres into TASTRAK (name for their propriety material). It provides a cheap method to detect microfragments of fuel containing Pu, U etc. from a multiplicity of tracks concentrated around a point focus (Picture below).

These are the big danger to humans if they get into the body via inhalation or food. Alpha spectroscopy was likely to miss them since the range of alphas in matter is under 0.01mm. NRW did not disclose in writing why they rejected the CwC information:

- a) The MLT asked CEFAS as EDF contracted agents to consider including CR-39 detection.
- b) Apparently CEFAS refused and the MLT caved in, letting them continue with their alpha spectroscopy that was likely
- c) NRW declined to retain sediment samples for further testing via CR39 etc. (saying they trusted CEFAS, notwithstanding their acting as EDF contractors)
- d) CRIIRAD are comparable professionals and criticised CEFAS's previous gamma spectroscopy; the MLT could commission them to audit the CEFAS result as NRW's advisors on this topic are CEFAS
- e) NRW must now be prepared to commission CR-39 testing. Bristol University's Prof. Denis Henshaw has informed us he could take this on. His unit uses TASTRAK for the UK's radon programme and he is a world expert in the field.

Would the Petitions Cttee therefore tell NRW that the scope of tests for alpha-radioactive particles is too narrow, that they need to include CR-39 testing, and suggest they contract with Prof Henshaw to investigate portions of the core samples extracted by EDF?

----- 9<sup>th</sup> March 2021



Figure: Microscopic round and oval pits in the surface of a plastic sheet of CR-39 (TASTRAK) burned by alpha rays from a micron-sized PMP some 10 micron above the sheet. Background counts are show by

## Geiger Bay campaign: Annex on Scope of the Hinkley EIA in briefing for the Senedd Debate 21 October 2020

EDF have conceded to pressure for an EIA, but perhaps not asked for advice on what it should cover – that is a formal “scoping opinion” [1]. Remember that Geiger Bay went to the High Court in Sept 2018 as EDF claimed to have carried out an EIA of the dumping operations. We showed they had not, and they had to concede in Court.

At this stage the ‘scope’ of the EIA is all important. Let the Senedd have a say - the Petitions Committee should collect views and evidence, including on the aspects outlined in the Petition. When the EIA results come through, Senedd can help to secure independent expert reviews of its many facets.

1. The London (anti-dumping) Convention implemented in UK law forbids sea dumping unless strict and detailed assessments have been carried out. The IMO (*international Maritime Organisation*) issues updates - the latest Dredged Material Assessment Guidelines in 2014 tightens pressure to avoid sea dumping where possible. The EIA must therefore address all the issues in that guidance and in particular detail the alternative re-use or disposal routes.

2. Welsh policy in the *Public Health Wales Act* prescribes participative *Health Impact Assessment* for major projects of high public concern. NRW says it’s ‘best practice’ in developing projects [2]. NRW should have foreseen the need for HIA from the high public concern experienced in 2018. It normally forms part of a planning EIA for addressing impacts on humans, so should be in the scope this time.

3. Baseline data on the Severn Estuary: the current Environmental Management Scheme (EMS) is very incomplete. NRW say several designated features, including the fish assemblage, are in an *unfavourable state*. This needs detailing before dumping any more Hinkley mud, as this is quite different from port dredgings. Knowledge on the fate of dumped sediments – where they land up on mudbanks and saltmarsh including in river estuaries - is essential for dumping in any Special Area of Conservation and particularly one containing European Protected Species. The EIA needs baseline data on artificial nuclide levels in the south Wales coastal environment, focussing on ones likely to be released. Tests in Somerset’s tidal river Parrett revealed nuclides far up-river, but none have been done in the Welsh Rhymney, Wye and Usk.

4. Microparticles of plutonium etc. as predicted from the Hinkley nuclear discharges: radon-type detectors (tracks in CR39 plastic) are best to detect alpha-emitters in micro-particles, which are the most dangerous when inhaled into the human body. EDF’s consultants CEFAS refused it and NRW omitted it from the testing spec. The EIA should provide information from the alternative testing methods, try them out on the samples, and compare results. EDF should share portions of their samples for independent testing; as was done by the Environment Agency with samples from the river Parrett, where the independent CRIIRAD testing proved superior to CEFAS’s tests for EDF.

5. Assessment of several alpha and beta emitting radio-nuclides ignored by EDF and NRW (Sr-90, Tc-99, S-35, C-14, H-3) was recommended by the independent CRIIRAD (report 18-32, May 2018, *Radiological analysis... close to the Hinkley Point power stations*) which found radio-toxic americium (Am-241) from nuclear discharges. These alpha and beta emitters are relevant because they and not the gamma emitters are relevant for assessing harm to wildlife and humans from ingestion. Only Am-241 and H-3 of CRIIRAD’s list are in NRW’s testing advice, while EIA’s have to be comprehensive.

6. modelling of potential impacts on the human population, to beach users, seafood eaters and others inhaling microspray and mud particles contaminated by Hinkley nuclides. A model was developed for Cumbria by AEA Harwell, which can be adapted with local data and a local habits survey for the South Wales coast population. It includes nuclide transfer to land, such as Hinkley microparticles carried ashore by winds. This model requires collecting much local baseline data.

7. Processes that bioconcentrate and magnify nuclear and chemical pollutants in the Estuary waters and the food chain need assessing under IMO dredged material guidelines (2014). Several chemical pollutants in the Hinkley mud exceed UK Action Level-1. The IMO in this case requires 'detailed assessment', where testing of the bio-mechanisms and biosensitivity takes months and gives uncertain results. An EIA has to use the best available science and describe uncertainties. The alternative of managing chemical and nuclide-contaminated wastes on land is normally preferred and must be assessed too.

8. Dredged material intended for disposal is subject to waste management law. The proximity and self-sufficiency principles in Wales's Waste Strategy (*Towards Zero Waste* 2010) say options for managing Hinkley wastes in England must be covered - dumping or reuse options (eg. in bunds on the power station site) and any reasons given against be critically assessed in the EIA (cf. 'geographical circumstances' of TZW).

9. The OSPAR treaty requires us to return nuclides in the sea to historical levels (pre-nuclear power) by the 2020s and artificial nuclides to near zero. Uranium emissions last century with plutonium discharges from Hinkley continuing till 2014 gave fall-out and drop-out over Bridgwater Bay. The potential breach of OSPAR through releasing plutonium etc. buried in the mud, needs addressing in the EIA.

10. The EIA has to describe the central purpose of the project, to construct a system for extracting cooling water from the estuary, returning it 10°C warmer, and the consequential effects. These include mass fish-kill, the discharge of dead and maimed fish into the Severn Estuary, discharged biocide chemicals used to clear Hinkley pipework, and killing or harming any individuals of European protected species (EPS) of fish, as well as the critically-endangered European eel. If any EPS would be harmed, the EIA has to show there is no practicable alternative [3].

11. The EIA has to face the possibility that the Environment Agency might cancel the 2013 licence for water abstraction, because (as the EA say re. the recently announced public inquiry[4]) it's not compatible with the Conservation of Habitats & Species Regs. Also face the possibility that NRW will reject the dumping application. The EIA should therefore describe what alternative cooling systems they could fall back on (as in countries which ban the use of seawater that's poorer in ecology than Bridgwater Bay).

----- Cardiff 16 October 2020

[1] The Minister writes (12 Oct.) that scoping discussions are underway, but this would contravene the EIA rules on the scoping process. She also wrote that scoping is *a technical and regulatory matter for NRW*, which is at best misleading as NRW has to consult quite widely.

[2] *HIA should be considered as best practice in the development of all programmes and projects.*

<https://naturalresources.wales/about-us/area-statements/natural-resources-wales-approach-to-impact-assessments-of-area-statements>

[3] The Conservation of Habitats and Species Regulations 2017

[4] <https://consult.environment-agency.gov.uk/psc/ta5-1ud-nnb-generation-company-hpc-limited-2>

To: [REDACTED] – Marine Licensing Team  
From: [REDACTED] – Senior Advisor, Marine Area Management and Advice Team  
Date: 17 September 2020

## **Marine Licence consultation: REQUEST FOR SCREENING OPINION Hinkley Point C Disposal Licence**

**Reference number: SC2005**

**Applicant: Wood Environment & Infrastructure Solutions UK Ltd, on behalf of NNB  
Generation Company**

**Response to email from [REDACTED] dated 21 August 2020**

### **Summary**

NRW Marine Licence Team has received a request for a screening opinion to ascertain whether the above proposal, will require an Environmental Impact Assessment (EIA) and the submission of an Environmental Statement (ES), to support an application for a Marine Licence for the disposal of sediment comprising dredged arisings from capital and maintenance dredging associated with offshore marine infrastructure preparation and construction at Hinkley Point C, to Cardiff Grounds Disposal Site.

A previously granted Marine Licence (12/45/MLv1) for disposal of such material to the Disposal Site was valid from 22 March 2018 to 04 March 2019. With this licence having expired, the Applicant intends to submit a new licence application for use of the Disposal Site and extend the scope of the licence, to cover the disposal of a greater volume of dredged sediment.

### **Documents Submitted**

Wood Environment & Infrastructure Solutions UK Ltd (May 2020) EIA screening report



## NRW Advisors Consultation Record

NRW Advisor	Role/Team	Comments
██████████	Marine Specialist Advisor (All Wales Marine Advice Team)	Coastal Physical Processes
██████████	Marine Specialist Advisor (All Wales Marine Advice Team)	Marine Water & Sediment Quality
██████████	Marine Specialist Advisor (All Wales Marine Advice Team)	WFD
██████████	Marine Specialist Advisor (All Wales Marine Advice Team)	Benthic Ecology
██████████	Marine Specialist Advisor (All Wales Marine Advice Team)	Marine & Diadromous Fish Species

## NRW Advisory Comments:

NRW Advisory have considered the information provided in the EIA screening report.

It is the view of NRW Advisory that the proposal should be subject to EIA given the sensitivity of the location and the potential for likely significant effects, including cumulative effects. As we are still awaiting the results from the 2020 sediment surveys, we do not believe that at this stage we can agree with the proposed outcomes of “*no likely significant effect*” which is stated for all parameters considered in the EIA screening report provided by the Applicant.

It is also the view of NRW Advisory that, on the basis of the information provided, we cannot conclude that the proposal will have no likely significant effect, either alone or in combination with any other plans or projects, with respect to the Conservation of Habitats and Species Regulations 2017. We therefore recommend that an Appropriate Assessment is undertaken.

Further reasoning and justification is provided in the comments below:

### Physical Processes

From a marine physical process perspective, we believe an EIA is required to ensure no significant environmental effects. Justification is provided in the comments below.

### 2. Site Description and Proposed Scheme

Under section 2.1.2. the Applicant states that the 10 years maximum annual input to Cardiff Grounds has been 786,826m<sup>3</sup>. The Applicant is proposing to add an additional 600,000m<sup>3</sup> of sediment, which is almost double the site’s annual deposition, therefore the extra pressure to the disposal site will need assessing.

Whilst NRW agree that the site is acting as a dispersive disposal ground, the current sediment that is disposed here constitutes recently accumulated fines from ports and harbour entrances and therefore very different to what is being proposed in section 2.3.4. which is a mix of clay, silt, sand and gravel.

In section 2.3.1., the proponent states that they previously had a licence for 300,000m<sup>3</sup>; however, NRW Advisory believe this to be misleading as the final monitoring report (Cefas Report TR492) under licence 1245MLv1, states that a smaller proportion was disposed, 57,958m<sup>3</sup>. On the returned monitoring although we agreed, as stated previously, that the site was acting as a dispersive site, in the difference bathymetric plots; 'individual disposal events can be used to clearly identify changes in bed elevation (i.e., erosion or accretion) associated with "real" events and those attributed primarily to the offset. For example, Figure 6 (2D) and Figure 7 (3D) illustrate a series of four discrete disposal events along a transect ("Transect 01"), with each disposal identified as two parallel lines of deposited material (i.e., accretion), consistent with material being released through the hopper doors of a dredging vessel.' The dredge release was therefore still very much apparent at the time of monitoring and had not dispersed. As the nature of the site overall had not changed and was still dispersing, concerns were not raised, however with the new application we would advise this is assessed within the EIA process.

In section 2.3.4. there is an indication that the sediment that will enter the disposal site will be a matrix of clay, silt, sand and gravel. Although the receiving site may be of this composition, the dispersive nature and behaviour may be changed and will unlikely be able to move large aggregated clumps of clay or the gravel fraction and therefore this could be a permanent addition. We relate to the above point in which mounds were evidently recorded through previous monitoring. No indication has been presented of the amounts of each sediment type likely to be deposited.

In section 2.3.7. it is stated likely that post-disposal bathymetric surveys and grab sample analyses of the disposal site will be conducted; further information would need to be presented here under EIA for consideration.

### 3. EIA Screening Assessment

In section 3.3.16, the Applicant suggests any benthic communities will have readily adapted to disposal material at the site, however the sediment that is being proposed to be deposited will be a different nature to that primarily disposed of in the past and therefore we disagree with the assessment of 'unlikely to be significant'.

In 3.3.17 it is proposed that an effect on the benthic fauna is 'unlikely to be significant', however no assessment of fractions of the sediment matrix is included, to understand how the sediment will behave.

Paragraph 3.3.30 embodies the two main concerns from a physical perspective, firstly the amount the Applicant wants to dispose of is almost double that which is already going into the site on an annual basis. The sediment that has proved the site to be dispersive is of a different nature to that the Applicant wishes to dispose of, and no quantitative assessment has been presented on what the sediment composition is and how it will behave. We are therefore unable to agree that any effect is 'unlikely to be significant'.

### Cumulative Effects

The cumulative section of the EIA screening currently fails to acknowledge the different nature of the sediment to be deposited and the fact that all licences could dispose concurrently, no assessment is made at present. There is also no sediment deposition plan provided. In a previous licence, we believe the Applicant agreed to 'spread out the deposits over the entire grounds'. However, in the recent bathymetric reporting, if the

artefacts that have been captured are from NNB GenCo previous deposits, this shows a large proportion of sediment deposited in the southern section.

### **Marine Water Quality**

From a marine water quality perspective, we believe an EIA is required. Justification is provided in the comments below.

The comments provided herein relate to the marine water quality specialism, where we are typically interested in suspended sediment (typically of fines for long time periods), nutrients, oxygen, bacterial concentrations, temperature and salinity, and contaminants such as heavy metals and other substances.

Under biodiversity (pg 15), we agree that likely significant effects could include contaminated sediment and suspended sediment (via change to sediment regime). However, we note that the risk of spills has not been included here although is included elsewhere in the screening report. The impact of spills on biodiversity should be considered.

With reference to the Coastal Management (pg 17) and Cumulative Effects (pg 26-27) sections, we note that volumes of sediment to be released via combined licences are over twice as much as the historic average and Hinkley C alone would produce nearly as much as the historic average. Even though the current licensed amount is > 1,000,000 m<sup>3</sup> (3.3.83), we do not believe that necessarily means that much has been deposited. Furthermore, the total of all combined licences for 2021 (3.3.82) would total > 1,600,000 m<sup>3</sup> and we do not believe there is evidence to say this will not have an impact on water quality. While it is temporary (3.3.84) on geological timescales, there has been no assessment of what the impacts would be over the year when all discharges will be in operation. Furthermore, we have not been provided sufficient evidence to say all discharges will not occur at the same time. Therefore, we disagree that an assessment under EIA is not needed.

While potential for spills has been included in the document, there is no assessment of its significance with either the Marine Geology and Contamination section (pg 18) or the Major Accidents and Disasters section (pg 20-21). We note that the documentation states that regulations and codes will be followed, but there is no specific mention of a management plan to be drawn up for this specific piece of work. We recommend that a contingency plan be drawn up for potential spills. While HRA does not allow mitigation to be included at screening stage, EIA does and so if the Applicant can evidence mitigation, it can be screened out of the EIA.

In terms of contaminated sediment, we are led to read reference 19, the Hinkley C ES which was completed in 2011. Contaminant concentrations have been averaged over the whole depth of the core (18.5.43 of the ES). We are concerned that we are not able to examine the depth profile of the sediment where it may be expected that surface samples will be more contaminated. Depending on how dredging is carried out, it is possible to suppose that contaminated sediment could all be discharged at one time and deeper, non-contaminated sediments at a later date. We do not, therefore, believe it appropriate to depth-average the contaminant results. Furthermore, there were PAH exceedances of CEFAS action level (AL) 1 and the Canadian TEL (Threshold Effects Level) and PEL (Probable Effects Level), plus exceedances of PCBs above CEFAS AL 2; very little

information is provided on metals. We would advise the Applicant to provide the raw data in order for us to make an assessment and compare to the CEFAS action levels. In this case, as we do not have sight of the full dataset, we would advise that we do not agree with the conclusion that there will not be significant impacts. However, as we are expecting results of a 2020 survey (3.3.18 pg 15) to be submitted a further, up-to-date assessment can be made then.

### **Water Framework Directive**

NRW Advisory believe it pertinent to take this opportunity to advise the Applicant that the disposal site they propose to use lies within the Severn Lower WFD water body and as such, the project will need to consider any potential effects on the WFD status and objectives of this and any other hydrologically connected water bodies where there is a pathway for effect.

### **Benthic Ecology**

Based on the information presented it has not been possible to rule out adverse effect on habitat features of conservation importance (SAC, Section 7 Environment Act) in relation to the current proposal. Therefore, we advise a full EIA should be undertaken.

## 2. Site Description and Proposed Scheme

Section 2.1.3 – As well as being Annex 1 SAC biogenic reef feature (EC Habitats Directive 1992), the Honeycomb worm reef (*Sabellaria alveolata* reef) is also recognised under the Environment (Wales) Act 2016 as a habitat of principal importance to Wales. This habitat feature has previously been identified at the Cardiff Grounds disposal site.

### The Proposed Scheme

Section 2.3.4. - The predicted volumes of sediment disposal totalling a maximum of 600,000m<sup>3</sup> are significantly greater than those previously licenced for the site, taking the total well over previous maximum annual permitted volumes. Therefore a full assessment of all potential environment impacts on habitats of conservation importance, including biogenic reef - *Sabellaria alveolata* should be undertaken.

The significant proportion of capital dredge material – up to 380,000 m<sup>3</sup> could potentially lead to a significantly higher proportion of larger fraction material being deposited on the site which may affect the potential fate and dispersive nature of these sediments. Further assessment is needed to avoid negatively impacting (through smothering) the habitat features present. The relatively shallow nature of the disposal site also compounds active dispersal (depending on a number of factors i.e. sediment fraction, tidal flows, dredge vessel behaviour etc....) all of which need to be assessed in more detail.

Section 2.3.5 - The deposition of material described in this section may cause a detrimental effect (through smothering) of the biogenic *Sabellaria alveolata* reef feature present at this location. No information has been presented to demonstrate how impacts will be avoided.

## 3.3 EIA Screening Assessment

### Biodiversity

Section 3.3.15 - *Deposition of material directly onto the seabed will inevitably have the effect of smothering any habitats present, as well as any species present in the area. However, it is noted that the receiving environment is a site which has already been*

*approved for the disposal of dredged material from a number of projects; therefore, any communities present will have developed a tolerance to frequent activity and changes in the seabed present. This, combined with the generally impoverished nature of seabed communities, means that effects are unlikely to be significant.* – We consider that due to the proposed increase in sediment volumes (above anything previously licenced), likelihood of increased sediment fractions and uncertainty regarding the dispersive potential of any material deposited – adverse effects on site features cannot be ruled out.

Therefore, we are unable to agree with the Applicant's assessment of '*effects are unlikely to be significant*', and request that a full EIA be undertaken to fully understand the potential impacts on benthic ecology and habitat features of conservation importance.

We also note that no assessment of the potential impacts related to the spread of marine invasive non-native species has been undertaken. This should be incorporated into the EIA.

### Cumulative Effects



Section 3.3.79 - The Applicant has failed to identify the cumulative effect of other users disposing at the Cardiff Grounds disposal site which would potentially result in total annual volumes well over previous amounts. This, as well as the variation and uncertainty over the type of sediment (sediment fractions) to be deposited, related to the predominantly 'capital' nature of dredging activities, means that any cumulative effects have been poorly assessed. Further assessment is therefore required.

### **Marine & Diadromous Fish Species**

If there will be changes to the habitats within the Severn Estuary from the disposal of the sediment, then this has the potential to result in significant effects upon designated fish species of the Severn Estuary, and upstream SACs, that use the habitats as foraging, nursery or spawning grounds.

We are also awaiting the results of the 2020 sediment testing. If there are issues with contamination of the sediment to be disposed of and this cannot be mitigated by other actions (i.e. avoiding dredging particular areas or disposing the sediment by other means), then disposal of the sediment has the potential to result in significant effects upon designated fish species of the Severn Estuary, and upstream SACs.

Both of these impact pathways will need to be assessed as part of the HRA, conducted for the activity due to its location and presence of impact pathways to features of the Severn Estuary SAC/SPA/Ramsar site and upstream SACs. These impact pathways could also be considered to be likely significant effects under the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) for which an EIA should be conducted.

  
  
Senior Marine Advisor  
Marine Area Advice and Management Team



We feel it essential to include alpha-emitters as part of your monitoring exercise. In this regard, CR-39 Track Etch plastic detectors offer specific information as follows:

- Activity, size and shape of “Hot” alpha-radioactive particles in an unconcentrated sample.
- Detectors can be exposed in air, in the ground or in water *in situ* or in samples taken to the laboratory.
- Ability to separate natural background from anthropogenic/discharge sources.
- Ability to detect very low levels/fluxes of such particles.
- Automated image analysis can allow initial scanning of large areas of the plastic detector, prior to more detailed analysis of candidate “hot” particles.
- Relatively inexpensive when seen alongside radiochemical assay.
- Ability to demonstrate the specific absence of or limits to the presence of discharge sources. This would be re-assuring to all concerned.

I will illustrate the above with reference to the following attached papers.

1. Barnham KWJ, Hart D, Nelson J, Stevens RA. 1985. Production and destination of British civil plutonium. *Nature* 317:213–217 – as described above.

2. Fews AP, Henshaw DL. 1982 High resolution alpha-particle spectroscopy using CR-39 plastic track detector. *Nuclear Instruments & Methods*, **197**:517-529. – see **limiting 20 keV resolution in fig 14**.

This paper illustrates the alpha-particle energy resolution that can be obtained.

3. Fews AP, Henshaw DL. 1982. Analysis of uranium fragments found in the human lung. In: *Solid State Nuclear Track Detectors* pages 717–720 (Eds P H Fowler and V M Clapham) Pergamon Press, (1982) – see **figs 1, 2 and 3**.

Note that these naturally occurring uranium- and thorium-bearing minerals were found at autopsy retained in the lung airways. Note from figure 3, the unique signature compared with discharge particles.

4. Henshaw DL, Allen JE, Keitch PA, Close JJ. 1997. Elevated levels of  $^{210}\text{Po}$  in human fetal tissues from mothers living near the Severn Estuary. 12th Symposium on Microdosimetry, Oxford, 29th September - 4th October 1996. In: *Microdosimetry an Interdisciplinary Approach*, (Eds D T Goodhead, P O'Neill and H G Menzel), Royal Society of Chemistry, ISBN 0-85404-737-9, (1997).

I do not have a hard copy of this paper to hand, but as part of an autopsy investigation into still-birth's, we found an association between levels of naturally-occurring Pb-210 supported Po-210 in the fetal skeleton and proximity of mother's residence to the Severn Estuary. This is indicative of natural pollution being made airborne in the turbulent estuary and being carried over Avonmouth and Bristol in the prevailing south-westerly wind.

5. Henshaw DL, Allen JE, Keitch PA, Randle PH, 1994, The spatial distribution of naturally occurring  $^{210}\text{Po}$  and  $^{226}\text{Ra}$  in children's teeth. International Journal of Radiation Biology, **66**:815-826 – see all figures, especially fig 3.

This is an example of a micro-distribution of alpha-activity in the body, in this case in the teeth of children.

6. Henshaw DL, Keitch PA, James PR. 1995. Lead-210, polonium-210 and vehicle exhaust pollution. The Lancet, **345**, 324-325 – see table.

This papers illustrates some features of retention of alpha-emitters in children's teeth in relation to air pollution sources.

7. Zorri V, Remetti R, Capogni M, Cotellessa G, Falcone R. 2017. Feasibility study on the application of solid state tracks detectors for fast surveys of residual alpha contamination in decommissioning activities. Radiation Measurements **107**:111–114. – see figs 3 & 4.

Figures 3 & 4 show specific examples of alpha-particle clusters from plutonium hot particles.

8. Bondarenko OA, Salmon PL, Henshaw DL, Ross AN. 1995. Alpha-particle spectroscopy with TASTRAK (CR-39 type) plastic, and its application to the measurement of hot particles. Nuclear Instruments and Methods in Physics Research, **A369**:582-587. – see figs 1 & 2.

Figures 1 & 2 show examples of an automated analysis procedure for hot particles in CR-39.

9. Bondarenko OA, Korneev AA, Onishchuk YN, Berezhnoy AV, Aryasov PB, Antonyuk D, Dmitrienko AV. 1999. Application of SSNTD for maintenance of radiation and nuclear safety of the Sarcophagus. Radiation Measurements **30**:709–714. – see fig 5 and sect 4.

Fig 5 is an example of size and activity hot particle determination with respect to the situation at the Chernobyl Sarcophagus.

10. Calderón-Garcidueñas et al 2008. Long-term Air Pollution Exposure Is Associated with Neuroinflammation, an Altered Innate Immune Response, Disruption of the Blood-Brain Barrier, Ultrafine Particulate Deposition, and Accumulation of Amyloid  $\beta$ -42 and  $\alpha$ -Synuclein in Children and Young Adults. Toxicologic Pathology, **36**:289-310 – see figs 4 & 5.

This paper is included in response to your comment above: “*It is the chemical form of a radioactive material that dictates how it is metabolised by the body*”. This is correct but please bear in mind that there are many examples [as in 3 above] of the retention of insoluble particles in the body,. Figs 4 & 5 in Calderón-Garcidueñas et al 2008 provide examples of ultrafine air pollution particles mapped in the brain of children and young adults at autopsy.



**2020 Hinkley Dredging Consultation  
NRW SP1914**



I am retired now, but it would be possible to train others to use this technology, possibly at Bristol University.

May I please ask you and your advisors to consider what I have said here so that we can open a dialogue of how best to proceed? Children with Cancer UK could consider a pilot study in the Severn Estuary which we could start immediately to test the feasibility of our proposals.

I look forward to hearing from you soon.

Best regards

[Redacted]

Signed

[Redacted]

Professor [Redacted], B.Sc., Ph.D, Fellow Collegium Ramazzini  
CwC UK Honorary Scientific Director and Emeritus Professor of Human Radiation Effects  
University of Bristol. 17/06/2020

Countersigned for the charity:

[Redacted]

Signed

[Redacted], CwC UK Trustee 17/06/2020

Further affiliation of Professor [Redacted]:

Emeritus Professor of Human Radiation Effects  
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Cantocks Close,  
Bristol, BS8 1TS

**Short CV.**

My early training and research was in Nuclear, Particle and Astrophysics, but later changed direction. I am now Emeritus Research Professor in Human Radiation Effects at Bristol University, with over 40 years' experience, 24 years with Medical Research Council (MRC) grant support. I have over 260 scientific publications, including expert evidence to the MoD, the Committee on Medical Aspects of Radiation in the Environment (COMARE), the Advisory Group on Non-ionising Radiation (AGNIR) and other committees in the UK and abroad. I was for 10 years Associate Editor of the International Journal of Radiation Biology, IJRB.

**Encl.**

Nine attachments accompany this letter sent by email: papers 1–3 and 5–10 [there is no attachment 4 – paper not available]