

Coastal & Marine Impacts of Particulate Emissions

*from an Energy Recovery Facility (waste incinerator) proposed by
Powerfuel Portland Limited for the Isle of Portland in Dorset,
Planning Appeal Reference APP/D1265/W/23/3327692*

Dr John Webb BSc FAETC DipA&CE MSc PhD FRGS

Presentation of Comments as an Interested Party on 14th Dec. 2023

My relevant background includes being a director of the United Kingdom Against Incineration Network (UKWIN).

In this Appeal Inquiry's sessions though I am presenting evidence on my own behalf as an Interested Party rather than representing UKWIN, which is making separate submissions to the inquiry.

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I am also a trustee of the Circularity Foundation (which is at a formative stage).

I am a long-standing Fellow of the Royal Geographical Society (FRGS, since 1987) and subject to the Member's Code of Conduct.

My academic qualifications include a science degree (BSc) in Mathematics and Physics with Chemistry and Geology, a master's degree (MSc) in Ecology and Society and a doctorate (PhD) in methods of textual analysis of official documents.

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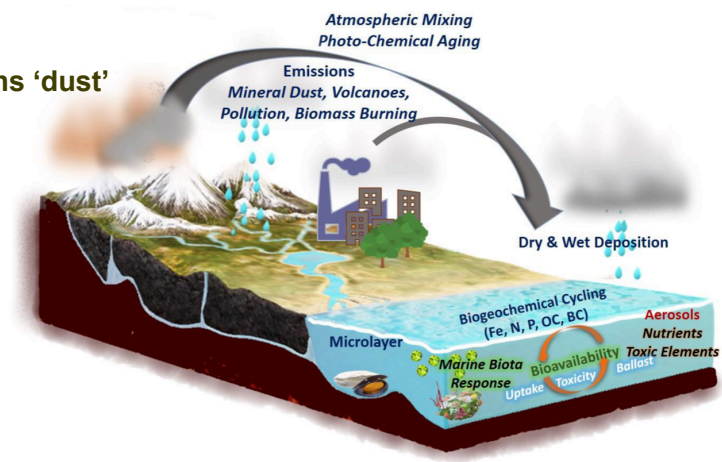
I am a keen member of the Town & Country Planning Association, the Green Alliance network and other environmental networks. My views and actions reflect a deep ecological (rather than just environmental) concern at the impacts of climate change toward 2030, 2050 and far longer periods of time.

Atmospheric & marine mixing & ageing of emissions

(Atmosphere journal: Ventura et al. 27 May 2021, 12(6))

Note:

Here 'particulates' means 'dust'



SUMMARY

This objection responds to heightened scientific and public alarm at the increasing damage to shores, seas and oceans from human, and especially industrial, activities.

In my Comments I address a vital yet under-examined aspect of the proposed siting of a waste incinerator on Portland: the potential for harms to coastal and marine habitats by particulate emissions from the proposed facility's chimney stack and - to a lesser extent - from freight vehicles' tyres and brakes.

Hence I shall mainly address the Appellant's Environmental Statement, in particular the Appendix 9.3, 'Potential marine impacts of the ERF' from 2021 and related assessments and the (updated) Shadow Habitats Regulation Assessment (sHRA) in CD2.05 (in 2 parts) and CD2.06 (in 2 parts).

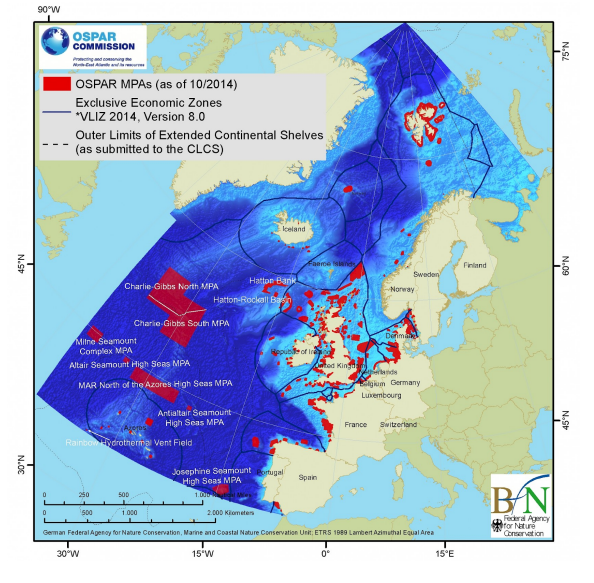
This slide illustrates how dust from natural and industrial sources is carried in the wind to settle on surfaces including seas, rivers and lagoons.

Marine Protected Areas

in the North-east Atlantic Ocean

(2 charts by the OSPAR Commission, using maps of German Federal Agency for Nature Conservation, Marine and Coastal Nature Conservation Unit)*

**Convention for the Protection of the Marine Environment of the North-East Atlantic*



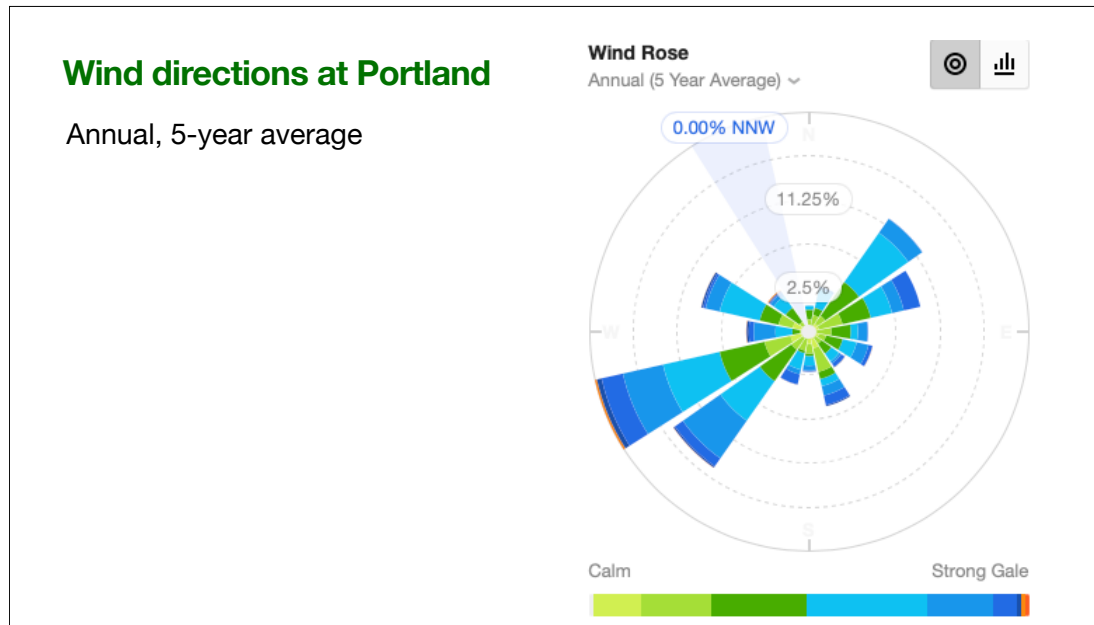
1st map

This slide shows in red the extent to which various coasts and seas/oceans are protected, or not, by their countries.

2nd map

This extract shows how much of the UK's waters are already protected; further protects are being sought.

That carries a risk of developers seeking to cram developments onto as yet unprotected stretches of coastline.

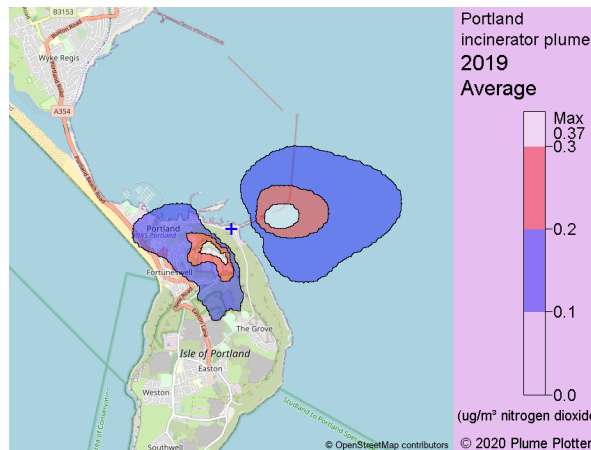


This 'wind rose' shows the incoming directions and intensity with which winds arrive at Portland. These are mainly and most strongly from the south-south-west.

The annual pattern of plume of emissions would thus mainly be directed east-north-eastwards from Portland.

Estimated plume from a proposed ERF/Waste Incinerator

by PlumePlotter, 2019 average



The area of highest intensity to seaward is entirely offshore, on either side of the southern Breakwater.

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The landward area of heightened average intensity includes a coastal stretch between the Cruise Ship Dock by the Harbour and the Yacht Club by the Marina.

That is close to where the tidal flow via the Smallmouth Passage under the Ferry Bridge flows into The Fleet lagoon.

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At any point in time, depending on weather conditions, different areas of land and sea will be affected.

Thus all areas around the Isle of Portland are liable sometimes to have the plume of emissions - visible or not - carried in their direction.

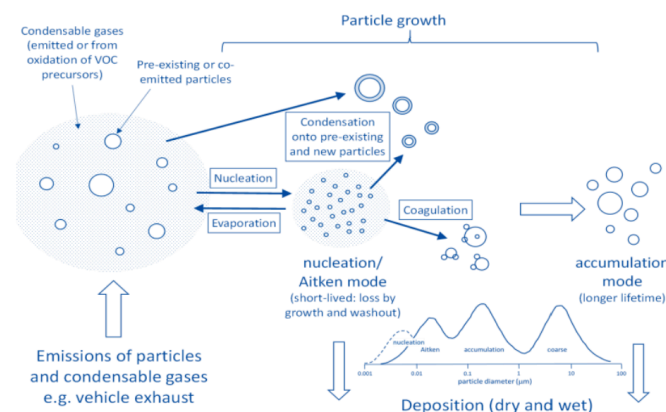
The residual particulate materials may be 'washed' out of the atmosphere prematurely by precipitation.

Estimated plume from a proposed ERF/Waste Incinerator

Defra, AQEG 2018, Ultrafine Particles (UFP) in the UK

Natural processes that concentrate toxic dust:

- physical
- chemical
- biological



A wide range of natural processes that may concentrate toxins from particulate emissions on the way to, and within, coastal & marine habitats.

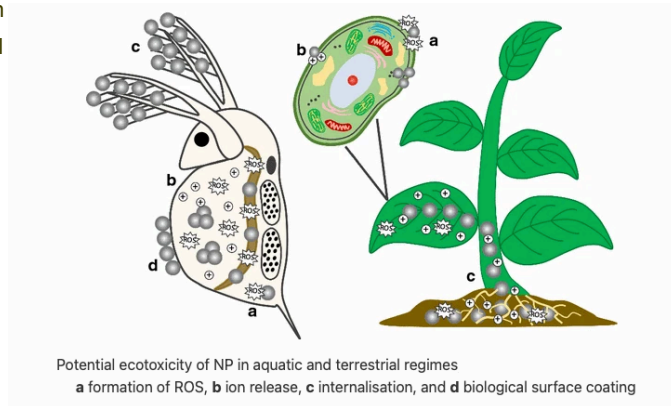
These include:

- a). **physical processes** including the movements of winds, currents and tides, solution and adsorption;
- b). **chemical processes** including aqueous reactions in the 'envelope' of water vapour around the plume, ionisation in the 'water column' and reactions with compounds in seawaters, sea-beds and coastal materials; and
- c). **biological processes** to do with 'food chains' and marine wildlife's needs for access to clean waters, light and protective 'homes'.

Potential ecotoxicity of nanoparticles

Bundschuh *et al.*, 'Nanoparticles in the environment...', Environmental Sciences Europe volume 30, Article number: 6 (2018)

('ROS' means reactive oxygen species, i.e. highly reactive chemicals formed from diatomic oxygen (O_2), water, and hydrogen peroxide)



Based on the Appellant's estimate from CD1.37e, PPL's ES Technical Appendix D: Air quality (part 2 of 3), Appendix 2: Process Emissions Modelling, p.17:

I reckon that in each year of operation up to 5.6 tonnes of particulate matter would be emitted from the facility's chimney stack.

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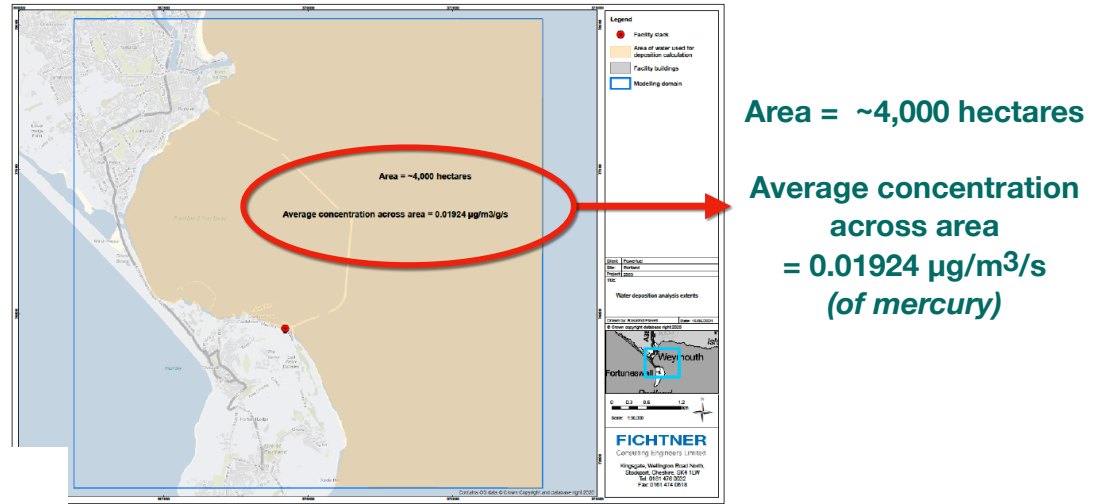
The finest, microscopic dust ('nanoparticles') can harm all forms of living matter, both externally and internally.

On the left we see a water flea (daphnia) and a plant (or sea-plant or 'seaweed' algae) to the right, each beset with particles.

Research findings show that the effects may even carry down generations.

PPL's method of modelling

Source: CD2.17p, PPL ES 9.3, page 5, 'Study Area showing model boundary'



The Appellant's simplistic approach to modelling is wholly inadequate for assessing harms to the living marine habitats all around the Isle of Portland.

That's because the tidal and marine areas include a wide range of processes that not only disperse particulate matter but also serve to sift, sort and concentrate that matter into, through and onto wildlife habitats.

As far as I know, there is no detailed modelling available to the Inquiry that takes account of processes of concentration, transformation and ageing of particulate emissions in the coastal and marine areas around the Isle of Portland.

Besides, the Appellant's Environmental Statement relied on a handy but misleading basis for assessing the potential for harms to marine receptors from emissions.

The Appellant's simple modelling used concentration of mass (micro-grammes per cubic metre) to indicate of potential for harm to organisms

- rather than a range of other factors including number of particles (and hence surface area), composition, reactivity, physical and chemical structures and coherence, transgenerational effects etc.

CAVEAT: *I am NOT claiming that the Appellant of submitted incomplete documentation to this Inquiry, insofar as my view is based on recent research and complex modelling might not exist or be feasible for the coasts and waters around Portland when the Appellant's documentation was compiled.*

On the shore and under the sea...

1). 150 spined stickleback and 2). spotted ray in Swanage Bay



(credit: Alamy photo archive, image IDs: DP6HF2 & DDK638, www.alamy.com)

In this final slide, I'd like to finish with two glimpses of peace and beauty below water:

- **Photo 1 - marine 150-Spined Stickleback**
- **Photo 2 - a Spotted Ray (a kind of skate)**

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The site proposed for an Energy Recovery Facility is quite unique in England since it is surrounded by inshore sea areas, bays and a lagoon.

It would be at the seashore's edge on a relatively small island which is in the English Channel off the south coast of England.

From a mainland perspective, the facility would in effect be a marine installation; so the site would be a uniquely unsuitable situation to choose for this proposal.

The areas that would be affected by particulate emissions partly include wildlife habitats that are protected in various respects and in any case should be treated as beneficial and potentially worth protecting in their own right.

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On this basis I urge the Inspector to take account of harms to coastal and marine habitats in arriving at the planning balance for

land usage on the proposed site.

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Now I would welcome questions from the Inspector and - *so long as I can ask questions in return* - questions of clarification from other parties including the representatives of the Appellant.