Addendum to 2006 Guidelines for the Assessment of Dredged material in Irish Waters (Cronin *et al*.)

Background: In 2006, upper and lower action levels for contaminants were set as part of guidelines for assessment of suitability of dredged material for disposal at sea. The guidelines were formulated as a transparent aid to the evaluation of dredged material for disposal at sea. The purpose of the lower action levels is to be able to categorise sediment as essentially "clean" and to allow the disposal at sea of such material considered not to pose a risk through contamination to the marine environment. The purpose of the upper actions is to identify material likely to cause biological or other effects and prevent such material from being disposed of at sea by conventional methods.

Data used in the calculations of lower and upper action levels in 2006 were provided by the Enterprise Ireland Laboratory at Shannon from their database. Lower action levels for metals were set using 95 percentiles of these data. Owing to a scarcity of relevant data for arsenic and nickel at the time from Irish sediments, the lower action levels were set for arsenic and nickel using the most conservative established ecotoxicological thresholds from other jurisdictions (Effects Range – Low, ERL), (Long, 1998).

Chemical analyses submitted with Dumping at Sea permit applications since 2006 indicate that our natural background geological values for both elements are generally higher than the ERL figures used, and as a result, these lower action levels are regularly exceeded, often in completely remote areas with no known sources of contamination. In many cases, it is likely that these concentrations also exist as background concentrations at the proposed dumpsites.

Methodology: There is now a considerable amount of data on arsenic and nickel concentrations in sediment from all around the coast. Those relating to Dumping at Sea applications are stored in the EPA database. The Marine Institute has also been gathering sediment data as part of the Water Framework Directive monitoring and other activities.

The data from both sources were merged and plotted. Samples showing obvious levels of contamination were removed from the review. Summary statistics following removal of outliers are displayed in Table 1. below.

Table 1: Summary statistics for Arsenic and Nickel background concentrations in sediment from around the Irish Coast(from Marine Institute and EPA database).

	Arsenic	**Nickel**
Max (mg/kg dry weight)	21	44
95%ile (mg/kg dry weight)	18	38
90%ile (mg/kg dry weight)	16	35
75%ile (mg/kg dry weight)	13	30
Min (mg/kg dry weight)	0.62	0.95
No. of samples	671	636

Table 2. Existing and proposed new lower action levels for dredged material

	Lower action level (from ERL) mg kg^{-1}	**95%ile of current Irish background data mg kg^{-1}**	**Proposed lower action levels mg kg^{-1}**
Arsenic	9	18	20
Nickel	21	38	40

Ninety-five percentile data with accompanying coordinates were mapped to check for relevance (Figures 1 and 2, below). The maps indicated that sediment from the larger ports, which would more likely be exposed to polluting sources, may still exceed the proposed new lower action level, as anticipated, and would be subject to further investigation.

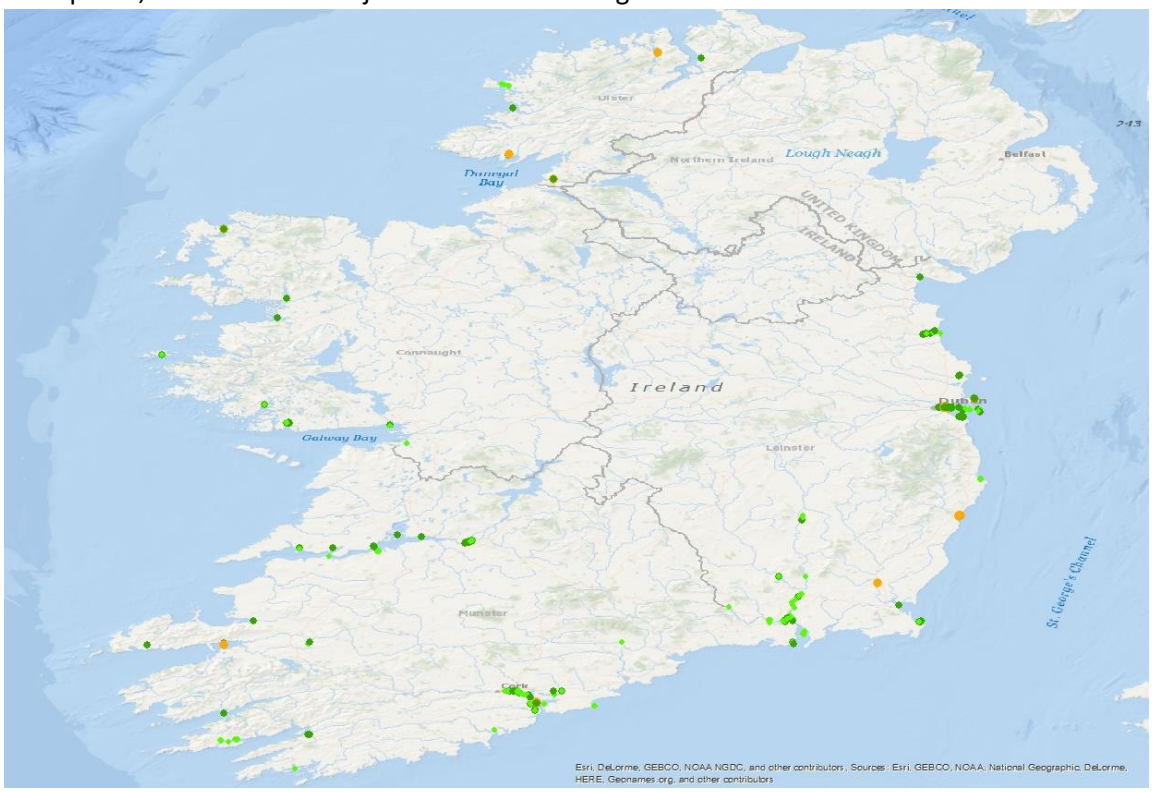

Figure 1. Map of arsenic concentrations: Light green = less than existing lower action level, dark green = less than proposed new action, orange = exceeding proposed new lower action level

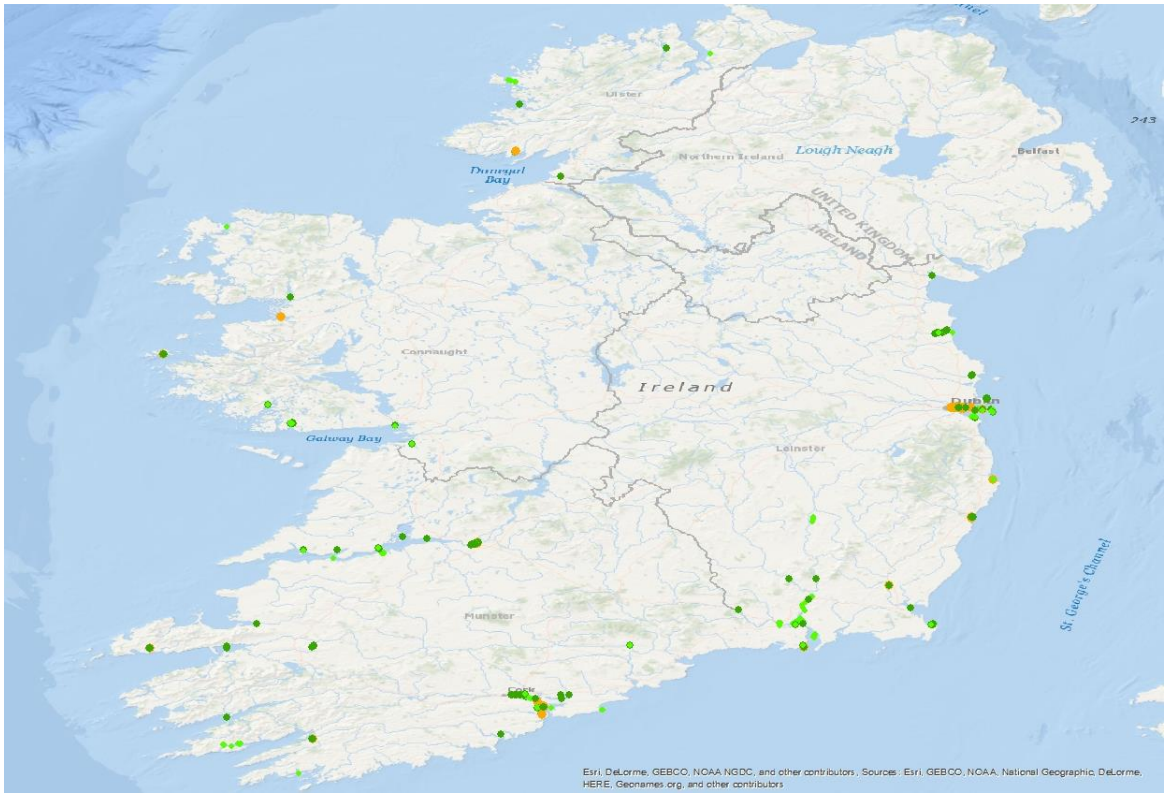

Figure 2. Map of nickel concentrations: Small green = less than existing lower action level, medium green = less than proposed new action, red = exceeding proposed new lower action level

Calculated figures have been rounded up to bring them more in line with lower action levels of other European countries. Comparisons of these proposed new lower action levels with other OSPAR Contracting Parties are shown in Table 3, below.

Table 3. Lower action levels for Arsenic and Nickel from OSPAR Contracting Parties

Country	**Arsenic (mg kg^{-1})**	**Nickel (mg kg^{-1})**	**Fraction tested**
Belgium	20	70	
Denmark	20	30	
Finland	15	45	10% OM, 25% clay
France	25	37	
Germany	30	50	<20um
Ireland (existing)	7	21	<2mm
Ireland (proposed)	20	40	<2mm
Netherlands	29	35	No correction
Norway	80	130	Whole sediment
Spain	80	100	<63 um
Sweden	10	15	
UK	20	30	

Summary: The revised lower action levels for arsenic and nickel have been calculated on the basis of background concentrations, in line with all other lower action levels for Ireland set in 2006. The concentrations calculated are more consistent with lower action levels from other OSPAR Contracting Parties. These revised lower action levels resolve the inconsistency between established background levels of arsenic and nickel and the previously used lower action levels. Use of these revised lower action level should now prevent the exclusion from conventional open water dumping, of sediment with equivalent of background concentrations.

The proposed new lower action levels were adopted by EPA in 2018, and have been used by MI in assessments since then

References:

Long, E.R., Field, L.J., and MacDonald, DD. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry, Vol. 17, No. 4, pp 714 – 727.

Cronin, M. et al. 2006. Guidelines for the Assessment of Dredged Material for Disposal in Irish Waters. Marine Institute MEFS Series, No.24.