An Bord Pleanála Oral Hearing

Irish Water

Greater Dublin Drainage

Response to Inspector's Questions

Marine (Ecology) – Ian Wilson

Marine (Ecology) – Ian Wilson

Recolonisation of Benthos following Construction of the Marine Outfall Pipeline:

"Impact of the Proposed Project on Shellfish Waters"

Submission:

1 Two submissions[1] raised issues regarding the impact of the Proposed Project on designated shellfish waters (Section 10.3.5 of Irish Water's Response to An Bord Pleanála (dated 11 January 2019)).

Response:

2 The proposed outfall pipeline route (marine section) is located outside the Designated Shellfish Waters for Malahide although the route passes through areas recognised as active for shellfish fishery production. The impact from the Construction of the proposed outfall pipeline route (marine section) will be limited to a physical disturbance to the surface sediments and a localised impact along the pipeline itself as presented in Section 9.3.4 in Chapter 9 in Volume 3 Part A of the EIAR. Localised disturbance to the marine benthos and the sand-dwelling shellfish (such as the razor clam) is expected to be high from sediment removal or smothering of stored or plume-dispersed material but limited to a relatively small area of the trenched route (approximately 0.16km^2), and neighbouring sediments (approximately 1km^2). The benthos along the proposed outfall pipeline route (marine section) is based predominantly on sands, particularly in the western inshore section of the proposed route where the water depth is very shallow and subject to continuous reworking by wave induced currents. The central part of the proposed outfall pipeline route (marine section) is in silty sand, becoming increasingly coarser towards a muddy sandy gravel near the proposed marine diffuser location. There is an absence of any developed biogenic or geogenic features with any significant epifaunal component. The physical recovery of the surface sediments along the proposed outfall pipeline route (marine section) following construction is, therefore, expected to be rapid with a re-colonisation by the benthos in the dredged footprint localised areas occurring within six months for the majority of species, and one to two years for larger, slower-growing taxa.

3 The impact on water quality during the Operational Phase of the Proposed Project is covered under a separate brief of evidence. Section 9.5 in Chapter 9 in Volume 3 Part A of the EIAR summarises the expected high dispersion and significant near-field mixing zone of treated wastewater on discharge. The model confirms that an 'excellent' water quality status set out for 'coastal' waters will be maintained and will prevent impact to nearby bathing and shellfish waters. The modelled data for the discharge indicates that the impact plume has a limited spatial impact and will disperse significantly into the prevailing oceanography at the site. This fact, coupled with the discharge parameters will ensure there will be no ecological impact to shellfish waters.

4 **The following paragraphs provide further details on why rapid recolonization of benthos will occur following construction of the marine outfall pipeline:**

5 Paragraph 58 of the Marine Biodiversity brief of evidence, states that the physical recovery of the surface sediments along the proposed outfall pipeline route, following dredging and construction, is expected to be rapid with a re-colonisation by the benthos in the dredged footprint localised areas occurring within six months for the majority of species, and one to two years for larger, slower-growing taxa.

6 The details of the macroinvertebrate community along the proposed pipeline route is outlined in Section 9.3.4 of the EIAR. Surveys taken between 2012 and 2017 indicated that the benthic environment is naturally dynamic with the biological population constantly varying between years, due to the different success rates by some species during larval recruitment. This affects the relative dominance of key species between survey

[1] *Charles Heasman; Velvet Strand Sea Swimmers and Beach Users*

years and would be expected to continue to change constantly in the survey area. Changes in the biological community from 2012 to 2013 were attributed to higher abundances of the more dominant species recorded in 2012, whilst changes in 2017 showed that the population altered further with a change in the top five species. Stations within the sand classification found along the shallower part of the proposed outfall pipeline route also differed due to lower species dominance, but high numbers of the polychaete *Magelona mirabilis*. This species typically burrows in fine sand at low water and in the shallow sublittoral environments and is adapted for life in highly unstable sediments, characterised by surf, strong currents and sediment mobility. Furthermore, the shallow sands within the survey area are regularly dredged for razor clams on a 2 to 3 year cycle.

7 The impact to the benthos following construction dredging was detailed in section 9.4.3. of the EIAR. This concluded that the benthos may be impacted as a result of either physical removal of substratum from the seabed or a subsequent deposition of material through side casting or settlement of suspended sediment. A review of the impact of aggregate dredging in European coastal waters suggests that marine communities conform to well-established principles of ecological succession, and that these allow some realistic predictions on the likely recovery of benthic communities following cessation of dredging (Newell *et al.,* 1998)[a]. In general, communities living in fine mobile deposits, such as estuarine sediments, are characterised by large populations with a restricted variety of species that are well adapted to rapid recolonisation of deposits that are subject to frequent disturbance. Recolonisation of dredged deposits is initially by these 'opportunistic' species, and the community is subsequently supplemented by an increased species variety of long-lived and slow-growing 'equilibrium' species that characterise stable undisturbed deposits such as coarse gravels and reefs. Rates of recovery reported in the literature suggest that a recovery time of six to eight months is characteristic of many estuarine muds where frequent disturbance of the deposits precludes the establishment of long-lived components. In contrast, the community of sands and gravels may take two to three years to establish, depending on the proportion of sand and level of environmental disturbance by waves and currents, and may take even longer where rare slow-growing components were present in the community prior to dredging. As the deposits get coarser along a gradient of environmental stability, estimates of five to 10 years are probably realistic for development of the complex biological associations between the slow-growing components of equilibrium community characteristic of reef structures.

8 The benthos along approximately 75% of the proposed outfall pipeline route are based predominantly on sands, particularly in the western inshore section of the proposed outfall pipeline route. Here, the water depth is very shallow and subject to continuous reworking by wave induced currents. The central part of the proposed outfall pipeline route is a silty sand, becoming increasingly coarser towards a muddy sandy gravel near the proposed marine diffuser location. There is an absence of any developed biogenic or geogenic features with any significant epifaunal component.

9 Unlike most dredging related studies, which are based on aggregate recovery where the surface sediments are removed or altered significantly, material from the dredging works is not lost from the seabed but simply sidecast before being used to back-fill the trench on completion of the pipe lay. Consequently, a significant proportion of the marine benthos will survive the initial dredging operation and remain within the substrate post trenching, particularly in the sandy sediments west of the shelf break where backhoe dredging operations are envisaged. In these areas the physical recovery of the surface sediments along the proposed outfall pipeline route are expected to show recovery within a few months. The recruitment of a new larval cohort is expected to occur within the surviving fauna, as well as those of unaffected populations nearby, once or twice in the year during the spring to autumn months. Consequently, a recolonisation for the majority of species is expected to occur within six months, but possibly one to two years for some of the larger slower-growing taxa.

10 This prediction is generally supported by a study carried out by Collie *et al*., (2000)[b] who attempted to quantify recovery timescales within benthic communities from bottom towed fishing gear. The study concluded that sandy sediment communities were able to recover rapidly, although this was dependent upon the spatial scale of the impact. It was estimated that recovery from a small-scale impact, such as a fishing trawl (the impact width of which is similar to a pipeline trench) could occur within about 100 days. This assumed recolonisation through immigration into the disturbed area rather than from settlement or reproduction which

would accelerate the process but would be subject to the timing of the impact prior to a larval recruitment cycle.

11 Furthermore, a series of large-scale field experiments carried out by Dernie *et al*., (2003)[c] investigated the community response to physical disturbance of marine benthic communities within a variety of four sediment types ranging from (clean sand through to muds). Of the four sediment types investigated, the communities from clean sands (such as those prevalent along the pipeline route) had the most rapid recovery rate following disturbance.

12 In conclusion, the sediments and benthic community found along the majority of the proposed pipeline route is indicative of a mobile sand. The nature of the proposed dredging method will allow for the preservation of the existing sediment type as well as maintain some species within the re-instated sediments such that recolonisation of the benthic community will commence immediately on completion of the works. This benthic community should be well-established within six months for the majority of species, and one to two years for larger, slower-growing taxa.

References

a. Newell RC, Seiderer LJ & Hitchcock DR (1998). The impact of dredging works in coastal waters: A review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: An Annual Review 36: 127-178.

b. Collie JS, Hall SJ, Kaiser MJ, Pointer IR (2000). A quantitative analysis of fishing impacts on shelf-sea benthos. J AnimEcol 69:785–799

c. Dernie, Kaiser and Warwick (2003). Recovery rates of benthic communities following physical disturbance. J Animal Ecol. V72, p 1043-1056