OH Doc No. 6 A

Recd From:
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Date Recd:
17/04/07

Proposed Bellanaboy Gas Terminal Produced Water Discharge – Monitoring Needs

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Irish EPA oral hearing, Belmullet, Tuesday 17 April 2007

Background

- Prof. Matthiessen is an independent consultant in ecotoxicology, with experience in the impacts of oil and gas discharges, and in marine environmental monitoring

- He has advised the Co. Mayo Lobster Re-Stocking Group on the likely environmental risks of the proposed Bellanaboy discharge*, which on the basis of documents published by Shell, are considered by him to be acceptably small

- He has also advised the Group on the environmental monitoring regime considered necessary to check that impacts are minimal or non-existent

- The purpose of this presentation is to propose a revised monitoring regime, and the reasons for it.

*Matthiessen, P. (2007). Predicted effects on local fisheries of the proposed produced water discharge from the Corrib gas field, Republic of Ireland

Purposes of Monitoring

- To provide reassurance to local fishermen that their livelihoods are not endangered
- To provide reassurance to consumers of fish and shellfish that these products will remain safe to eat
- To provide reassurance to marine conservation interests that the marine ecosystem is not being damaged
- In the event of a breakdown in the Bellanaboy treatment plant, to monitor the rate of recovery of the marine ecosystem
- To provide this information in a way which has the confidence of all stakeholders

Assumptions

- To fulfil these purposes, a monitoring programme should study both chemical and biological variables
- Chemical monitoring can help confirm causation by a limited number of substances, while biological monitoring can help detect effects of un-analysed substances and mixtures
- A monitoring programme will only have the confidence of all stakeholders if it is delivered by an independent body
- There should be a commitment to publish all validated monitoring data within a generally acceptable timeframe

Existing Monitoring Proposals*

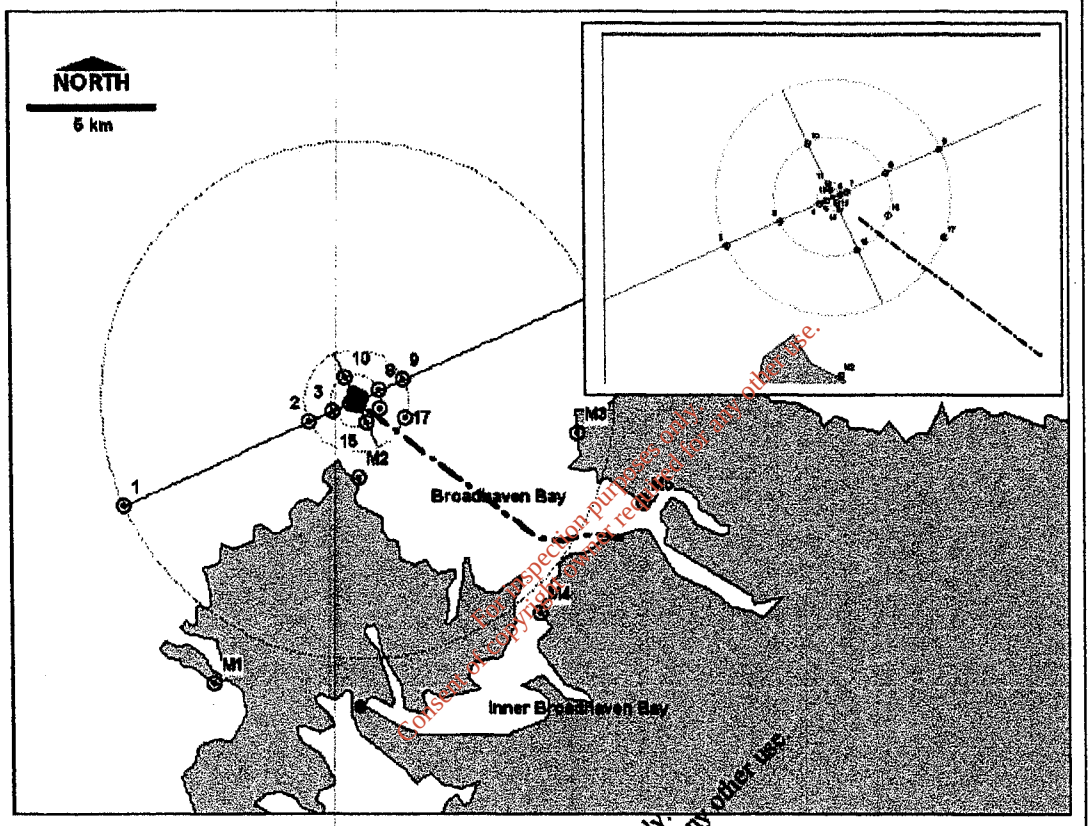

Figure 1 Proposed sampling locations for intertidal mussels Mytilus edulis (⊙ M1-M5) and subtidal sediment and water samples (⊙ 1-17) Stations M1. Approximate location of the outfall pipe is marked in red. Inset picture show details around outfall. It is proposed that benthic analysis would be undertaken at stations 1, 3, 8, 11, 12, 13, 14 and either station 16 or 17).

* Ecological Consultancy Services Ltd (2005). Proposal to monitor the potential impacts of the Bellanaboy gas terminal outfall at the point of discharge and within Broadhaven Bay, Co. Mayo. Prepared for Shell E&P Ireland Ltd., 16 pp + annex.

Existing Monitoring Proposals*

Table 3 Sample media and parameters

Medium	Physico-chemical parameters	Inorganic parameters	Organic parameters	Biological parameters
Water	• Temperature • Salinity • DO • TSS • pH	• Trace metals (Hg, Cd, Pb, Ba, Cu, Zn, Ni, Cr) • Ammonia	• Aromatic hydrocarbons (BTEX) (Fluorescence as a screening tool?) • Light polycyclic aromatic hydrocarbons (PAHs) e.g. naphthalene, alkyl naphthalene's. • Phenols	
Sediment (< 2mm fraction)	• Granulometry • Organic carbon • Organic matter • Sulphides	• Trace metals (Hg, Cd, Pb, Mn, Ba, Cu, Ag, Al, Li)	• Total petroleum hydrocarbons by GC • Aromatic hydrocarbons • Other hydrocarbons • Total organic carbon	• Benthic analysis – selected stations around outfall (1, 3, 8, 11,12, 13, 14 and 16 or 17 see Figure 1) • (no. species, abundance, metrics for select species, e.g. Bivalves)
Mussels		• Trace metals (Hg, Cd, Pb, Ba)	• Total lipid • PAHs, alkyl PAHs.	• Length • Weight • Biological effects 3 yearly?
Dab (or other common demersal resident fish)		• Muscle / Liver - Trace metals (Hg, Cd, Pb, Ba)	• Bile metabolites of PAHs • Total lipid • Metallothionein?	• Length • Weight • Age • Obvious disease and / or • Biological effects 3 yearly?

* Ecological Consultancy Services Ltd (2005). Proposal to monitor the potential impacts of the Bellanaboy gas terminal outfall at the point of discharge and within Broadhaven Bay, Co. Mayo. Prepared for Shell E&P Ireland Ltd., 16 pp + annex.

Comments on existing proposals

- Adequate as far as they go (esp. for chemicals), but inclusion and details of biological effects monitoring are unclear
- Mussels and dab are good monitoring targets, but the main fishery (crab and lobster) is ignored
- Unclear if benthic community biodiversity assessment (in-fauna and epi-fauna of sediment) is included
- Unclear which, if any, biological effects in mussels are to be measured
- Mussel monitoring restricted to wild inter-tidal individuals
- Unclear which biological effects in dab are to be measured
- Frequency of biol. effects monitoring (3 yearly) insufficient

Additional suggested monitoring (1)

- Organoleptic (i.e. human taste panel) monitoring of lobster and crab, caught in and around Broadhaven Bay, is needed to provide reassurance that hydrocarbon-tainting of the shellfishery is not occurring

- Chemical monitoring of lobster and crab is only needed if contaminant levels in mussel or dab increase

- Inter-tidal mussel monitoring should be supplemented with caged mussels deployed at buoys around the discharge site – collection of wild dab is insufficient to cover an adequate range of contaminants/effects

- Sediment samples should be analysed for biodiversity of all macro-invertebrates (in-fauna and epi-fauna)

Additional suggested monitoring (2)

- Biological effects in mussels (wild and caged) should be measured, and should include a broad-spectrum measure of pollution impact such as lysosomal stability or (better still) scope-for-growth, as well as length/weight

- Biological effects in dab should also be measured (although bearing in mind that some exposure may be gained remotely during annual migrations) – a good measure of hydrocarbon exposure would be cytochrome P450 1A1 induction (EROD), in addition to liver disease recording and length/weight measurement.

- If metal contamination is detected in sediments, mussels or fish, metallothionein induction in dab should also be measured

Additional suggested monitoring (3)

- Biological effects should be measured at least annually, at the same time(s) of year. Every 3 years is insufficient to act as an early-warning of longer-term damage.

- In the event of a failure of the treatment plant, or a release of firewater, monitoring frequency should be increased so that recovery of the ecosystem can be followed. Comprehensive sampling should take place immediately after any spill, and then at suitable intervals (e.g. monthly/quarterly) until contamination and/or effects return to baseline.

- If released firewater is likely to contain fire-control agents such as perfluoro-octane sulphonates (PFOS), these should be included in the list of monitored chemicals after a spill

Need for independent monitoring

- To ensure that all stakeholders accept the results of the monitoring programme, the work should be conducted and reported by an independent organisation, with recognised accreditation to perform such studies

- The monitoring data should be reported in a timely manner (with adverse data made public as soon as they are validated) so that any significant impacts can be rapidly remediated, and to protect human consumers

- If the EPA or Marine Institute do not conduct the monitoring programme itself, it would be essential for the monitoring data to be assessed by Irish Government/EPA experts or independent appointees

Suggested monitoring model

- At Sullom Voe, the Shetland Oil Terminal Environmental Advisory Group (SOTEAG), an independent group of experts advising both government and industry, conducts monitoring of the wider area around the terminal

- The terminal operator (BP) contracts a specialist company to monitor the discharge itself using agreed protocols, but SOTEAG sees and comments on the BP monitoring data, which are reported several times per year.

- In addition to SOTEAG, the Scottish EPA also reviews all monitoring data

- We recommend a model of this type for the Bellanaboy terminal, possibly with the Marine Institute as the independent monitoring/advisory group

Summary

- The monitoring programme proposed by Ecological Consulting Services Ltd is adequate, as far as it goes.
- However, it does not give sufficient detail on the biological effects measures to be deployed, or their frequency
- Furthermore, there are no proposals for monitoring possible impacts on the local shell fishery, or for ensuring independence of the monitoring programme
- This presentation has made proposals for filling these gaps, and it is accordingly suggested that the notifiers should be invited to submit ideas for a revised monitoring programme