HYDRO RISK ASS REPORT
SUB. NO. 5

Hand's Lane
Rush
Co Dublin
16/3/09

Licensing Unit
Office of Climate,
Licensing and Resource Use,
EPA
P.O. 3000
Johnstown Castle Estate
County Wexford

Ref.W0231-01 – Proposed Fingal Landfill

A Chara,

Please find attached submissions regarding the RPS Hydrogeological Risk Assessment Report of February 2009 -

a. Report of Dr. Paul Ashley, Mott MacDonald, to Mr. John Short of the NLAG dated 11 March 2000, and

b. The following additional points of objection submitted by the NLAG Committee.
   - The information and investigations used to compile this Risk Assessment were that which were contained in the original EIS, which has been shown by the GSI, Mr. Kevin Cullen, and others to be inaccurate and misleading in many important respects. No attempt to correct these inaccuracies has been made by the applicant prior to carrying out the Assessment.
   - The Risk Assessment process did not follow the tiered approach as recommended in "Hydrogeological Risk Assessment for Landfills" EA (England and Wales), with particular reference to hazard identification, identification of consequences, magnitude of consequences, probability of consequences and significance of risk. For example the risk to the nationally important horticultural industry centred in this area was not assessed. Neither was there any assessment of such hazards as fire and slope stability.
   - The recommendations of the GSI that further tests be carried out in order to eliminate any potential risk to the Bog of Ring public water supply was ignored.

- No investigations were carried out on the possible contribution of groundwater to the local streams and the consequential risks, even though the applicant was made fully aware at public hearings of the importance of these streams to the ecology, particularly the special area of conservation and bird sanctuary at Rogerstown Estuary and to the local farmers as a source of water for irrigation. In this regard may we direct the Agency's attention to the contents of the Scottish Environmental Protection Agency " Landfill Directive Regulatory Guidance Note 3", Dec2003 which states that the Agency will object to a landfill "below the water table in any strata where groundwater provides an important contribution to river flow or other sensitive surface waters". A risk assessment on these streams would have discovered that this surface water forms part of the most commercially sensitive body of water in Leinster, and supports a horticultural industry worth in excess of 500 million Euros.
- The proximity of these streams to the site boundaries, and one within the site itself is not indicated on the conceptual site model.
- Electrical conductivity measurements for all streams in the locality are remarkably consistent at circa 520 micro Siemens per centimetre.(EIS Vol 3 Aquatic Ecology Appendix 1).Conductivity figures for Groundwater within the landfill are also remarkably consistent at circa 720.(EIS Vol. 5, H&I, appx. A15) The consistency of figures would indicate that the water in the four streams involved when the measurements were taken was predominantly groundwater, and is unlikely to be attributable to pollution. **If this is the case then the site vulnerability at least in proximity to the streams may well be extreme.**
- The SEPA guidance document also confirms that the Agency would forbid landfills constructed below the water table where "active long term site management (of groundwater) is essential.". Is there likely to be such a requirement at Nevitt? There is ample evidence to indicate such a possibility, such as local artesian conditions, wells, and a stream which rises within the proposed footprint. No assessment has been made of this possible long-term site management risk.
- The Report consistently refers to the groundwater within the clays as "perched". This is obviously incorrect but more importantly it is misleading. There is no unsaturated layer of clay beneath the

groundwater table, therefore the clays either act as an aquitard with little significant water movement, or they act as a separate aquifer with totally differing and significant flow characteristics, including direction of flow, which may well be locally different to the underlying bedrock. Groundwater flow within the clay strata has not been assessed and neither is it included in the conceptual site model.

- We would particularly wish to draw the Agency's attention once again to the EA document "Hydrogeological Risk Assessments for Landfills" Para 2.2.4. Direct and Indirect Discharges. This section makes it quite clear that for a landfill below the water table the compliance point is

a. immediately below the engineered compacted soil liner, or
b. "the point at which water abstracted from the engineered layer is discharged back into the environment"

To suggest that for a below water level landfill the compliance point is located either below the 10 metre saturated soil strata or 100 meters down-gradient as the RPS Report seeks to do is erroneous, and, since the RPS report is entirely predicated on this erroneous concept it must be rejected.

- We would also like to draw the Agency's attention to the important Dublin Region Water Supply Project report in it's entirety. The report identifies the Loughshinny Formation as a resource with a potential of 40 million litres of potable water per day. This confirms the opinion of the GSI, Dr. Paul Ashley, Mr. Kevin Cullen and others as to the future potential of the aquifer. The Agency should also note the recommendation of the report that these water resources should be afforded immediate protection.
- In the absence of an assessment of the extent of the zones of contribution of the horticultural wells in the vicinity we reject the unsubstantiated assertion that they lie cross gradient to the landfill groundwater level contours.

Mise le meas,

Patrick Boyle, B.E.

For and on behalf of the Nevitt Lusk Action Group

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Mr John Shortt
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11 March 2009

Dear John

Ref.: Proposed Fingal Landfill

Thank you for the copy of the letter from Fingal County Council dated 20 February 2009, and RPS's Hydrogeological Risk Assessment Report of February 2009.

As you suggest, there should be opportunity to comment on the risk assessment in more detail later. However, there are several fundamental points that are worth raising at this stage.

I note that the EPA requested (17/10/08) a "detailed quantitative probabilistic risk assessment ..... to examine in detail the fate and transport of contaminants within the leachate and risk to groundwater.....". They have used two tools to carry out the risk assessment:

- LandSim Version 2.5 (Golder Associates, 2007)
- Contaminant fluxes from hydraulic containment landfills spreadsheet v1.0, (EA, 2004)

Landsim is designed explicitly for simulating the behaviour of landfills where the base is above the water table, with an unsaturated zone between the base and the water table. It has long been recognised as unsuitable for the case where the base is below the base of the water table and the leachate level in the landfill is also below the water table, which is the design for the proposed Fingal Landfill. This limitation has therefore led to the development by the Environment Agency (EA) of England & Wales of the second tool.

The **Contaminant fluxes from hydraulic containment landfills spreadsheet** is designed explicitly for the scenario proposed for the Fingal Landfill, where the base would be below the water table, and the level of leachate in the landfill would also be below the water table. However, the EA states in the user manual "*It should be noted that there are a number of limitations to the model that will generally make it a scoping tool rather than a detailed final risk assessment model. ..... If the appraisal of a risk assessment does not allow a clear decision to be made, more sophisticated modelling and/or well constrained site specific data will be required*". One of the limitations is the assumption that the only means for leachate contaminants to escape from the landfill is by diffusion across the liner i.e. it cannot

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assess the possibility of loss of leachate liquid if the water table drops locally or occasionally below the level of leachate in the landfill during construction or operation.

My preliminary comments on the Hydrogeological Risk Assessment are as follows:

- It uses two software tools which are designed for mutually exclusive scenarios (which is why the EA developed them separately).
- It has incorrectly used Landsim as a tool: it is not suitable for scenarios where the landfill base is above the water table.
- The Contaminant Fluxes Spreadsheet is an appropriate tool for the proposed scenario, but it is designed for scoping studies only, not for the "detailed quantitative probabilistic risk assessment" requested by the EPA. RPS has modified the spreadsheet by adding its own probabilistic tool (no validation of this modification has been provided) but this only partly addresses the concern.
- The time factor for the risk assessment is problematic: long term results are given for 20,000 years, which assumes that the site will be managed, if needed, to maintain low leachate levels for this period, which is unrealistic. Most accidental damage, leachate control problems and other high risk events are likely to occur during the construction phase. The risk assessment does not appear to model the construction programme in this period, other than providing results after 30 years of operation.

I have not reviewed the values of the various input parameters for the models.

It is pleasing to note that the risk assessment now acknowledges a number of concerns that were given low significance or ignored in the Environmental Impact Statement, although they now raise further concerns of their own:

- The potential for defects in the liner is acknowledged, and for their development over the life of the site.
- The complexity of groundwater movement in the low permeability strata is not reviewed, but is implied by the various scenarios. Groundwater in this layer can move vertically downwards and upwards, can move laterally and vertically across the landfill liner, and can move downwards from infiltrating rainfall. These processes are only partly modelled.

I trust that these comments are clear to you. Please do not hesitate to contact me if you require clarification.

Yours sincerely

Dr Paul Ashley