EPA Waste Licence Proposed Decision
Fingal Landfill – Oral Hearing

Statement on Geology and Hydrogeology

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1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Shane Herlihy is a Professional Member of the Institute of Geologists of Ireland (PGeo) and has a Masters Degree in Hydrogeology and Groundwater Resources from the University of London and an Honours Bachelor Degree in Earth Sciences from Dublin University. He is also a member of the International Association of Hydrogeologists (IAH). Shane has been active in the field of hydrogeology and groundwater for over 15 years, 13 of which have been as a hydrogeological and environmental consultant. He has considerable experience in the assessment and investigation of hydrogeology and assessing the risks posed by contaminated land and proposed developments to groundwater.

Malcolm Doak is a professional Member of the Institute of Geologists of Ireland and has a Masters Degree in Hydrogeology Research from Sligo Institute of Technology and an Honours Bachelor Degree in Earth Sciences from Dublin University. Malcolm has over 14 years of professional experience in the field of hydrogeology including five years working in the EPA. While in the EPA as a Senior Inspector in the Office of Licensing and Guidance, Malcolm was responsible for the writing of numerous non-hazardous landfill licences.

Wyatt Orsmond is a Technical Director (Geotechnical) with RPS Consulting and Head of the Geotechnical Department. He has a National Higher Diploma (Civil), a Master of Science Degree in Engineering (geotechnical). He is a Chartered Engineer, a member of the IEI and Chairman of the Geotechnical Society of Ireland. Wyatt has worked in Ireland since February 2000. He has over 15 years experience in all aspects of Civil Engineering and is a specialist Geotechnical Engineer.

1.2 BACKGROUND

The likely significant impacts of the proposed landfill on the geological and hydrogeological environment in the vicinity of the site have been considered and assessed in the Environmental Impact Statement, submitted with the Waste Licence Application on 5 July 2006. Additional information was provided in response to three separate requests for further information, in December 2006, January 2007 and May 2007, under Article 14(2)(b)ii of the Waste Management Licensing Regulations. On the 22nd May 2007 the EPA acknowledged compliance with Article 14(2) of the licensing regulations. A proposed decision with respect to the Waste Licence has been issued by the Environmental Protection Agency (EPA) having considered the application and supporting documentation, all submissions received and the report of its inspector.

1.3 SITE SETTING

The geological and hydrogeological environment in the vicinity of the site has been described in detail within the Environmental Impact Statement and the response submissions to requests for further information under Article 14.

The bedrock geology has been classified by the Geological Survey of Ireland as **Locally Important**, Generally Moderately Productive Bedrock Aquifer **(Lm)**. Where present, sands and gravels that are in hydraulic contact with the bedrock provide additional storage for the bedrock aquifer. Beneath the landfill footprint groundwater within the bedrock and sand and gravel is confined by overlying clay.

A minimum thickness greater than 10m of clay will be retained below the landfill footprint following construction that will maintain **Low Vulnerability** status according to the guidelines given in Groundwater Protection Schemes published by the department of the Environment and Local Government, EPA and GSI in 1999. The combination of **Locally Important Aquifer** designation and

Low Groundwater Vulnerability classification results in an **R1** classification in the **Response Matrix for landfills (DoE, EPA, GSI 1999).** This is the lowest classification in the Response matrix and indicates that the site is acceptable for use as landfill subject to guidance in the EPA Landfill Design Manual and appropriate conditions of a waste licence.

The direction of groundwater flow within the locally important aquifer beneath the landfill footprint is towards the south-east away from the Bog of the Ring public water abstraction scheme.

Recharge to the aquifer beneath the landfill footprint is limited by the significant thickness of the clay.

2 PROPOSED DECISION

The proposed conditions impose specific measures with respect to the protection of the geological and hydrogeological environment in the form of engineered containment, leachate management and groundwater monitoring.

2.1 ENGINEERED CONTAINMENT

The landfill will be contained using an engineered lining system to meet in full Annex 1 of the Landfill Directive 1991/31/EC and Chapter 6 (lining systems) of the Landfill Manuals, "Landfill Site Design" (EPA, 2000). This will meet the requirements of the Landfill Directive.

In addition to the engineered lining system a minimum vertical thickness of 10 m of clay will be maintained below the footprint of the landfill after excavation.

2.2 LEACHATE MANAGEMENT

The landfill will be operated on a phased cell by cell basis. Leachate management infrastructure shall be provided and maintained at the facility **(Condition 3.14)** and leachate levels in the waste shall not exceed a level of 1.0m over the top of the liner at the base of the landfill **(Condition 6.2.1)**.

Following closure of the site, an engineered cap shall be constructed **(Condition 10.4)** in order to prevent water ingress and leachate generation.

2.3 GROUNDWATER MONITORING

The groundwater monitoring programme will include monitoring for both groundwater levels and groundwater quality as per Schedule C of the proposed decision.

Suitable monitoring equipment shall be installed at all monitoring boreholes and safe and permanent access shall be maintained to all onsite and offsite monitoring points **(Conditions 3.19 to 3.21)**. Groundwater monitoring well sampling equipment shall be available on-site and fit for purpose at all times **(Condition 6.21)**.

Trigger levels shall be established for groundwater monitoring wells, in accordance with the Landfill Directive, for the purpose of establishing when a significant change has occurred within groundwater **(Condition 6.15.1)**. A baseline environmental monitoring programme, in accordance with the requirements of the Landfill Manual, will be completed prior construction of the site and will be used to develop trigger levels. The baseline data will include all data collected to date **(Condition 6.17)**.

An annual review of hydrogeology will be produced, based on groundwater level monitoring and will include groundwater level contour plots **(Condition 6.15.4)**.

The EPA shall be informed immediately of the occurrence of any incident with the potential to cause environmental contamination of surface water or groundwater in order that prompt action can be taken to prevent the occurrence of environmental pollution with respect to groundwater **(Condition 11.5)**.

3 THIRD PARTY OBJECTIONS TO PROPOSED DECISION

A number of third party objections have been received with respect to the proposed decision. Specific concerns have been raised in relation to:

- The Water Framework Directive with respect to the proposed development;
- Protection of the locally important bedrock aquifer;
- The risk to the horticultural industry from deterioration in groundwater quality;
- Impact on Bog of the Ring; and
- The effect of the proposed landfill on the sustainability of the aquifer.

Many of these issues have previously been addressed in submissions to the EPA in December 2006, January 2007 and May 2007 in response to requests for further information under Article 14(2)(b)ii of the Waste Management Licensing Regulations.

3.1 WATER FRAMEWORK DIRECTIVE

The construction operation and decommissioning of Fingal Landfill will not breach the Water Framework Directive (2000/60/EC), as there will be no direct discharge of pollutants as defined in Article 2(32) of that directive. The proposed decision has taken account of the requirements of Articles 3, 4 and 5 of the Groundwater Directive (80/68/EEC) by imposing the specific measures to prevent the direct discharge of pollutants and limit indirect discharge.

3.2 PROTECTION OF THE LOCALLY IMPORTANT BEDROCK AQUIFER AND RISK TO HORTICULTURAL INDUSTRY

The proposed decision imposes a number of technical precautions to prevent egress of leachate from the proposed landfill in order to prevent direct discharge and limit indirect discharge of pollutants.

In addition, a minimum depth of 10 m of clay will be maintained below the footprint of the landfill. This requirement is to ensure that the site maintains the lowest risk response of "**R1**" in the DoEHLG/EPA/GSI (1991) response matrix for landfills. With regard to Borehole AGB4 where GRAVEL , to a depth of 4.5 m was encountered, a second borehole ASA3 was constructed adjacent to AGB4 and encountered CLAY to a depth of 19 m (Refer to Appendix I, Page 10, Paragraph 6 of the EIS)

The engineered containment and natural geological protection, inter alia, establishes that any impact on the aquifer will be unlikely and that any such impact will be imperceptible. Therefore, there will be no risk to the horticultural industry from the proposed facility, in relation to hydrogeology.

3.3 IMPACT ON BOG OF THE RING

The direction of groundwater flow within the locally important aquifer beneath the proposed site and the local surrounding area has been established from comprehensive time series groundwater level monitoring data. Water level monitoring data sets collected from June 2005 to November 2007 have consistently demonstrated that groundwater flow below the proposed landfill site is in a south-easterly direction towards Rogerstown Estuary and away from the Bog of the Ring through all seasons.

3.4 SUSTAINABILITY OF AQUIFER

The aquifer underlying the site is classified by the Geological Survey of Ireland as a **Locally Important**, Generally Moderately Productive Bedrock Aquifer (**Lm**). Thick deposits of clay in the area impede infiltration of rainwater and recharge of the aquifer. It is this low recharge which is the principle constraining factor to long term sustainable groundwater yield. For this reason a further public groundwater abstraction scheme in the area is not being considered by Fingal County Council.

The **R1** risk response classification for the landfill, coupled with specific mitigation measures with respect to the protection of the geological and hydrogeological environment provides adequate protection to the aquifer and does not prevent continued use of current groundwater abstractions nor the development of further groundwater abstractions in the area.