Sub (9)

Ann Kehoe

Subject: FW: Clarecastle Regatta 14 July 2012
Attachments: response to epa re history of landfill.docx; URS schematic of unlined H2 below water table 001.jpg

-----Original Message-----
From: omahonyroger@eircom.net [mailto:omahonyroger@eircom.net]
Sent: 12 July 2012 15:25
To: Ana Bolger
Cc: Laura Burke; Tom Coughlan; Betty Devanny
Subject: Fwd: Clarecastle Regatta 14 July 2012

Attn: Ms Ana Bolger - Environmental Protection Agency

cc: Ms Laura Burke Director General, Environmental Protection Agency
cc: Mr Tom Coughlan, Clare County Manager
cc: Ms Betty Devanny, Environment Directorate, Clare County Council

Dear Ms Bolger,
Please add the communication below to the licence review of Roche Ireland Ltd, p0012-05

Sincerely

Roger O'Mahony
Kilshannig House
Cratloe Wood
Cratloe
Co. Clare

t: 086-8597277
m: omahonyroger@eircom.net

----- Forwarded Message -----
From: omahonyroger@eircom.net
To: "Tom Coughlan" <tcoughlan@clarecoco.ie>
Cc: "l burke" <l.burke@epa.ie>, "Betty Devanny" <bdevanny@clarecoco.ie>
Sent: Monday, 9 July, 2012 6:44:19 PM
Subject: Clarecastle Regatta 14 July 2012

Attn: Mr Tom Coughlan, Clare County Manager

cc: Ms Laura Burke Director General, Environmental Protection Agency
cc: Ms Betty Devanny, Environment Directorate, Clare County Council

Dear Mr Coughlan,

In the light of the upcoming events , I wish to remind Clare County Council and the Environmental Protection Agency of the enclosed submission to the licence review of Roche Ireland Ltd, which your office and the Agency received in May.

In the interests of the health and safety of members of the public, competitors and safety crews who will be using the River Fergus on the day, it is prudent to draw your attention to the H2 unlined hazardous waste pit and specifically to sections as described by Roche Ireland Ltd own consultants :

Evidence of Groundwater Contamination around the landfill Cells - H2 Area

Waste Classification Roche landfill

Migration of Contamination

Schematic Hydrogeological Cross Section Through Landfill Cells H2,1,3 & 4.

I look forward to receiving an acknowledgement to this communication by return.

Sincerely

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Ms Ann Marie Donlon

Inspector,

Environmental Protection Agency

PO Box 3000

Johnstown Castle Estate

Co. Wexford

17 May 2012

Reference: Hazardous Waste Unlined Pits - Licence Review Roche Ireland Ltd - P0012-05

Dear Ms Donlon.

Hazardous buried waste in an unlined pit now identified as H2 and others, has been discovered within a Seveso protected zone which is shared by Roche Ireland Ltd and my property. The existence of such buried hazardous waste appears contrary to the applicant's public declarations relating to its landfill, the applicants Annual Environmental Report, the applicants IPPC licence conditions and the information supplied by the applicant to a public oral hearing for an on-site incinerator in 1996.

The existence of such hazardous waste directly affects the planning permission granted to my property in the Seveso protected zone and compromises European Seveso legislation.

On the 21 February 2012, the Agency requested of the applicant the following:

"Provide a summary table of activities carried out in relation to the landfill (including H2 area) in chronological order from the date when placement of waste in this area commenced"

The detail I believe the Agency should have received relating to the H2 area is as follows:

H2 Area

According to Roche own consultants URS (45078361, 2005)

"Waste was initially landfilled in to the H2 area between 1977 and 1980. Approximately 300 to 500 tonnes per annum were disposed of in this area during its operational period.

There was no control on filling processes, no lining, and no leachate control mechanisms in this area and waste disposal took place across a relatively wide area in numerous dispersed pits, including on land close to the artificially constructed Nature Area ponds, to the south of the area marked H2 landfill on Figure 2. There was also a deep (5m deep, 750m3 capacity) trench through the centre of the area, close to well H2, in which some drummed wastes were disposed of.

The H2 area is underlain by soft silty clay, underlain by peat in places, overlying the rock gravel (weathered limestone)"shallow aquifer". Based on limited trial pit and borehole information the clay liner is between 0.6 and 3.0 m thick in the H2 landfill area.

Wastes disposed of in the H2 landfill included metal and plastic drums of mauser, dimer,magnesium, suspected hydrochloric acid and spent carbon, undrummed carbon waste, rubber hoses, rubble, wire, polythene sacks (formally containing potassium hydride and dimer), undrummed white powders/pastes, cement bags, plastic sheeting, wooden pallets, timber, gloves, pipes, cables, paint tins, woven sacks, construction wastes, mesh/netting, centrifuge core mesh, aluminium cladding, fibre drums, glass sample bottles and secondary sludge (Marples, 1991, URS 2005)

Hydrogen sulphide 'Nerolin (beta-ethoxy-naphthalene) and toluene odours were reported during trial pit excavation in 1991 (Marples 1991). Groundwater/leachate within the pits was reported to have an oily or greasy film and to be actively gassing (bubbling) in places. Samples of waste material showed localised elevated methanol, toluene, THF, DCM, bromide and acetone.

In 1985 an initial set of leachate wells were installed in cell H2 (wells H1 and H2) and a geophysical ground conductivity survey was carried out in 1988 to determine the extent/location of the waste, though this remains poorly defined due to lack of contemporary filling records.

A soil sampling trial pit study was carried out in this cell in 1991 by Alan Marples Consultants (Marples, 1991) which led to remedial measures consisting of excavation the highest concentration of drummed waste from the deep trench area, undertaken in the H2 area in 1993. Drummed wastes were removed, stabilised with Portland cement and re-deposited into the southwestern corner of the double lined Cell 7.

Leachate was extracted from the two pumping wells within the H2 cell for several years, though this has ceased, as recommended by URS Dames and Moore and as agreed with the EPA.

A geomagnetic profiling survey was carried out by Zetica for Roche in the H2 area/contractors compound in two phases in December 2004 and June 2005 (Zetica, 2005). This survey provided extensive evidence for the widespread presence of buried ferrous waste within the survey area, although the explicit identification of individual drums was not possible due to the complexity of the measured magnetic (magnetometry) and time domain electromagnetic (TDEM) responses.

The trial pit study by URS in 2005 (URS, 2005a) targeted magnetic anomalies identified by Zetica and showed the chemical/process wastes to contain crushed steel drums and other ferrous wastes. The chemical/process wastes were generally between 1 and 3m below ground level and were concentrated in the central and southern portion of the H2 landfill/contractors compound area, with reworked fill material (also containing metals such as wire, pipes, and other construction related materials) being more dominant in the northern half of the contractors compound. In some areas the wastes are emplaced below the water table (measured at 0.85 to 2.59m below the well casing in monitoring wells in October 2004)

The distribution of chemical wastes identified by URS in 2005 is consistent with the 1991 Marples study.

The chemical/process wastes encountered in the trial pits were generally overlain by up to 1m of gravel fill and/or clay fill material. However significantly less overlying fill material was encountered in some trial pits, particularly close to the nature area and in the northeast of the contractors compound (URS, 2005a)."

Leachate Composition H2 Area

According to Roche own consultants URS (45078361, 2005)

"Groundwater / leachate within the pits was reported to have an oily or greasy film and to be actively gassing (bubbling) in places (Dames and Moore 1997c, URS 2005).

Trial pit grab samples of leachate/shallow groundwater in 2005 detected VOC compounds in the perched groundwater, including dichloromethane (0.01-110mg/L), chloroform (0.012-5.4mg/L) and toluene (0.098-857 mg/L)

Leachate was extracted from two pumping wells within the H2 cell for several years in the 1990's, though this has reportedly now ceased."

Evidence of Groundwater Contamination around the Landfill Cells – H2 Area

According to Roche own consultants URS (45078361, 2005)

"Contaminant concentrations in shallow aquifer groundwater samples close to the H2 area reflect the heterogeneous waste deposition pattern, with elevated levels historically identified in samples taken from piezometers lying both in the centre (well H2) and close to the southern periphery of the area (wells 21 and 216) whereas wells 2,3,6 and 23 were relatively lightly contaminated.

There appears to be leakage of contaminated leachate from this area to the shallow aquifer beneath (Dames and Moore, 1999a, b, URS, 2004b, URS, 2005, a)

Groundwater data suggests that a plume of THF- contaminated groundwater is migrating eastwards away from the central area beyond the general landfilling area to the north of landfill Cells 1 and 3A/B. This was shown by detection of THF and, to a much lesser extent, toluene in wells 517 (THF up

to 4.0 mg/l in 1996, toluene up to 0.06 in 2003) and 205 (THF up to 5.6 mg/l in 1996, toluene up to 0.05 in 1997)

Tetrahydrofuran was detected in wells 517 (2.8 mg/l) and 205 (3.5 mg/l) down gradient of Cell H2 in the October 2003 groundwater monitoring round. Toluene was only detected at trace concentration in well 205 and DCM and acetone were not detected.

In the south of the H2 area, well 216 has historically shown very elevated toluene (up to 38mg/l in 1996) and THF (up to 84 mg/l in 1997). Drummed wastes were reported intersected during drilling of well 216, which is screened in the shallow aquifer between 4.6 and 5.6 metres below ground, which is consistent with the 1991 trial pit investigation by Marples in this area 9Dames and Moore, 1997a). There is no historical groundwater data available for well 21, next to well 216.

In May 2001 well 216 recorded 7mg/l toluene and 10 mg/l THF and 9.5 mg/l acetone. Drilling of well 702 in mid 2001 appears to have disturbed a pocket of contamination around wells 21 and 216 on the southern edge of the H2 area. Concentrations of toluene, THF and acetone increased in both wells (210 mg/l toluene and 110 mg/l THF in 216 in October 2001) following drilling of well 702 and have remained elevated (THF 43 mg/l, DCM 40mg/l and toluene 310mg/l in well 216 in October 2003) Increases in THF concentrations have been noted in downgradient wells 514 and 712 in May 2004 (URS, 2004b) though not in wells 215 and 515. This is suspected to be due to migration of dissolved phase THF via groundwater from the known area of elevated toluene and THF concentrations in the vicinity of wells 21 and 216."

Waste Classification Roche Landfill

According to Roche own consultants URS (45078361, 2005)

"To be considered as hazardous waste Category 1 wastes or the hazardous constituents of Category 11 waste must exhibit hazardous properties above threshold values as specified in Schedule 11 Part 111 of SI 10 of 1996.

The wastes in the Roche landfill cells meet the criteria for consideration as hazardous wastes on the basis that they are capable of yielding substances with hazardous properties after being disposed of, such as leaching of hazardous materials and decomposition to form highly flammable gaseous substances (methane) or irritants (ammonia)."

Migration of Contamination

According to Roche own consultants URS (45078361, 2005)

"Most groundwater below the landfill flows within the shallow aquifer, eastwards towards the Fergus River at rates of approximately 0.3m/day. Thus this shallow aquifer (rock gravel and overlying alluvial sand, if present) will be the preferential pathway for contaminant migration, and the principal receptor will be the Fergus River."

Closure Options H2 Area

According to Roche own consultants URS (45078361, 2005)

"The trial pit studies in 1991 and 2005 show that the H2 area is distinctly different from the engineered cells in respect of both the method of emplacement of waste materials and the underlying geology

The waste in the H2 area was deposited in unlined pits (up to 3.4m deep), with no facilities for leachate interception and collection. In some areas the wastes are emplaced below the water table (the water table was 0.85 to 2.59m below the well casing in surrounding monitoring wells in October 2004).

The natural clay soils are thinner (0.6 to 3.0m thick) under the H2 area than under the engineered cells and excavation of pits has further thinned or removed the protective natural clay layer in parts of the H2 area (the 'deep trench was up to 5m deep and waste is present up to 3.4m below grade in TP27). Therefore leachate from this area may readily enter the main groundwater flow horizon in the shallow broken rock aquifer and migrate towards the river (as shown by recent events in well 216 following drilling in 2001).

The uncontrolled release of leachate from the H2 area to groundwater is not consistent with EPA guidance on leachate management at landfills during the operational or aftercare phases (EPA, 1997a)"

Options relating to H2 Area

In its conclusion, Roche consultant URS states

"Options for the long term management of the H2 area have been considered including Monitored Natural Attenuation, capping, hydraulic control and removal of contaminated waste. Monitoring data shows that a likely drum rupture occurred in 2001 and records show crushed and intact drums in the H2 area. Solutions involving leaving the waste in place will likely require undefined long term monitoring and operational costs for decades, while not eliminating the possibility of future incidents which may prompt a regulatory rethink. Only removal and treatment or off-site disposal/ destruction of the contaminated waste materials eliminates the potential future environmental liability associated with the buried drummed material but at considerable capital cost ("reasonable worst case" estimate for offsite disposal €9 to €18m)."

Included in the above options put forward by Roche consultants URS relating to H2 hazardous waste are

- Monitored Natural Attenuation
- Capping
- Removal of Waste Material

Monitored Natural Attenuation of H2 Area

According to Roche own consultants URS (45078361, 2005)

"Monitored Natural Attenuation (MNA) is essentially a continuation of the current monitoring program in wells around the H2 landfill. The aim of MNA would be to document stable or improving groundwater quality around the H2 area (as was the case up to 2001) to the satisfaction of the regulators, as an alternative to active intervention. However contaminant concentrations in leachate samples taken from the 2005 trial pits continue to show elevated concentrations of volatile organics (solvents), semi-volatile organics (phenolics) and heavy metals 25 years after the cessation of landfilling in the H2 area, despite extraction of contaminated groundwater from this area for several years.

It is therefore likely that MNA would have to be continued for decades in order to meet regulatory requirements, with no reduction of the risk of an unforeseen future incident, such as the drum rupture which occurred near well 216 in 2001, which could lead to future regulatory enforcement. Also, as previously mentioned, the release of leachate to groundwater is not consistent with EPA guidance on landfill operation and aftercare.

Annual cost for biannual monitoring around the landfill as part of an MNA strategy are estimated to be in the order of €5000 to €10,000.

MNA is likely to require extensive monitoring of the H2 area for a considerable timeframe and while attractive as a low cost option initially does not give Roche a long term reduction in the risk of a potential larger release and is not consistent with EPA guidance"

Capping of H2 Area

According to Roche own consultants URS (45078361, 2005)

"Capping of the H2 area to reduce rainfall infiltration is considered to be of limited benefit, as the chemical/process waste in some areas is emplaced below the water table and there is through- flow of shallow groundwater through the waste, driven by natural gradients due to the hillside to the west of the H2 area.

Capping would require considerable engineering works to profile the H2 area to promote runoff and manage the drainage, but would not eliminate the release of leachate to groundwater. In addition, the presence of a landfill cap would restrict the future use of the H2 area and, despite the capital investment, would not provide Roche with a reduction of liability in the event of an unforeseen future incident."

Removal of Waste Material

According to Roche own consultants URS (45078361, 2005)

"Removal of chemical/process waste material in the H2 area would require excavation to a depth generally of 2 to 3 metres below grade (possibly 4 to 5 metres locally) and either ex-situ treatment of the waste on site to reduce contaminant concentrations or the disposal of contaminated waste material to an appropriately licenced waste disposal facility overseas (none currently exists in Ireland) or to a future waste management facility in Ireland (i.e. the Indaver Ireland incinerator in Ringaskiddy, County Cork). Such a strategy would greatly reduce, or possibly eliminate the long term environmental liability due to the chemical/process wastes in the H2 area, albeit at a high cost for excavation, treatment (if feasible), transport and disposal.

Removing the wastes which are the source of groundwater contamination would reduce the time required for depletion of residual contamination in the shallow aquifer and eliminate the need for long term hydraulic control of leachate or groundwater, though some monitoring of groundwater may initially be required by the regulators.

The distribution of chemical/process- derived waste material (as opposed to purely construction related wastes) identified in the 1991 and 2005 trial pit studies in this area has been used to estimate an approximate volume of wastes material potentially requiring removal and treatment or disposal (60,275m3)

Location	Trial Pits Defining Area	Area	Average Depth to Base of Waste	Total Volume
1- From Nature Area Ponds to Contractors Yard	1991- TP16,TP18 2005 – TP1,TP2,TP5,TP7,TP8,TP39	110M X 80M	2M	17,600M3
2- Southern Contractors Yard	1991- TP14, TP15 2005, TP3,TP6,TP10,TP35	150M X 85M	2.5M	31,875M3
3- Northern Contractors Yard	1991 – none 2005 – TP23,TP27,TP28,TP30	60M X 60M	3.0M	10,800M3

Assuming a density of 1.5 tonnes/m3 for the relatively granular mixed waste (based on gravel, loose, dry 1.522 tonnes/m3) this equates to a waste mass of approximately 90,000 tonnes. This mass represents a reasonable "worst case" estimate and may be reduced if uncontaminated material (i.e. the gravel fill and clayey fill overlying the waste in varying thicknesses) can be segregated during excavation.

Given the substantial volumes involved, costs for excavation and overseas disposal of the waste material are likely to be between €100/tonne and €200/tonne which in the worst case would give an overall disposal cost of €9 million to €18 million.

Roche and URS are investigating whether on-site, ex situ soil treatment methods could be feasible and more cost effective to treat the solvent contaminated waste materials".

Proposed Remedial Approach for H2 area

According to Roche own consultants URS (45078361, 2005)

"In terms of reducing , or eliminating the long term environmental liability associated with material deposited in the unengineered H2 area, excavation and removal of the chemical/process wastes (involving segregation and re-use of uncontaminated fill material overlying the chemical/process waste) is proposed, as it

- removes the source of leachate generation and groundwater contamination in the H2 area
- does not require indefinite operation, maintenance and monitoring
- eliminates uncertainty relating to impacts of possible future incidents, or changes in regulatory approach, which affect options where the waste mass remains in-situ.
- Facilitates re-use of the H2 area for other purposes such as the expansion of the plant"

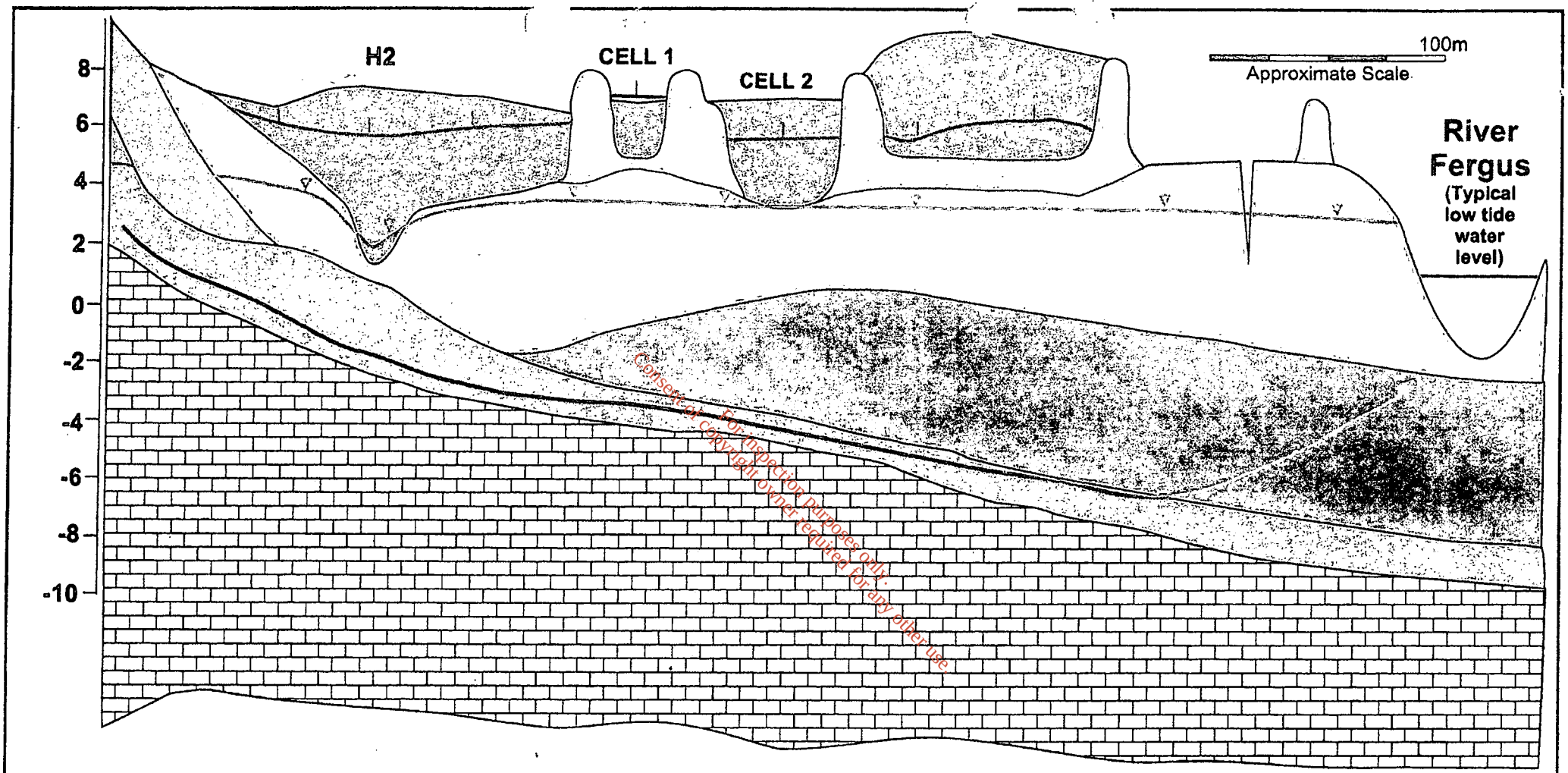
Do not hesitate to contact me should you require further clarification on any element of the above. Please note a copy of this letter has been forwarded to the European Commission.

Yours sincerely

Roger O'Mahony

encl:

URS Schematic Hydrogeological Cross Section Through Landfill Cells H2,1,3,4, Reference EO'H/COR, Job No. 33748-024-447, Figure 4, August 2004



Title	SCHEMATIC HYDROGEOLOGICAL CROSS SECTION THROUGH LANDFILL CELLS H2, 1, 3 &4
Location	CLARECASTLE, CO CLARE
Client	ROCHE IRELAND

App'd	Reference	Date	
	EO'H/COR	AUG 2004	
TI App'd	Job No.	Scale	
	33748-024-447	AS SHOWN	

URS

FIGURE 4

Key

- Landfill Material
- Made Ground
- Soft-firm grey blue silty Clay
- Loose grey brown silty Sand
- Stiff brown gravelly Clay (Boulder Clay)
- Very dense Gravel (Broken Rock)
- Hard, grey black, fine grained fossiliferous Limestone Bedrock
- Groundwater level in Landfill Waste
- Groundwater level in shallow aquifer
- Generalised direction of groundwater flow in shallow aquifer

NW-SE Location of cross section as identified in Figure 2