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DUBLIN NORTH CONSTITUENCY

**FOR YOUR INFORMATION
MAR EOLAS**

**Environmental
Protection Agency**

14 JUL 2006

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DAIL DEBATE; WASTE MANAGEMENT 20/6/2006

Mr. Sargent: I move:

"That Dáil Éireann,

- recognising the continued record levels of waste generated per head, as highlighted by the recent Forfás report and the low levels of recycling in Ireland;
 - condemning the Government's failure to bring forward regulations under the Waste Management Act 1996 to give effect to producer responsibility obligations to promote the placing on the market reusable, recyclable and biodegradable products;
 - acknowledging the civic mindedness of people, who are recycling;
 - condemning the practice of local authorities which charge for community level civic recycling facilities;
 - condemning the Government's failure to divert waste away from landfill as legally required under EU directives and the Government's plans to seek a derogation from the landfill directive requiring a reduction of biodegradable waste going to landfill by 2009;
 - recognising that an independent expert has stated that incineration costs are significantly higher than that estimated by the Government;
 - acknowledging that many local authorities have excluded incinerators from their waste management plans;
 - recognising specifically that Dublin City Council has excluded incineration from its development plan; and
 - recognising that the planning inspector's report on the hazardous waste facility in Ringaskiddy, which gave 14 reasons this development should not proceed, was overruled by An Bord Pleanála on the basis that incineration was "Government policy",
- calls on the Minister for the Environment, Heritage and Local Government to ensure:
- that the Canadian Guelph waste management model of separate collection of wet (organic) and dry (inorganic) wastes from all waste outlets including households, be instituted by a given date;
 - the provision of proper "civic amenity" infrastructure for both wet and dry waste at disposal depots in all local authorities, open to the public at no charge, and provide that collection services for all domestic recyclables are free of charge;
 - the introduction of waste production regulations under section 29(4) and 29(5) of the Waste Management Act 1996, setting down producer responsibility obligations and targets for the composition, design, use and placing on the market of recyclable, reusable and biodegradable packaging and setting down specified limits on the use of virgin material in primary production of packaging;
 - the establishment of a waste deposit regulations under section 29(4)(f) of the Waste Management Act 1996, to require producers, distributors or retailers to operate deposit refund schemes;
 - the establishment of a waste reuse research and development programme and enterprise supports under section 28(2) of the Waste Management Act 1996, for innovative projects and business start-ups, for the reuse of waste packaging, and in particular for projects for the curing of contaminated food waste containers;
 - that legislation is introduced to return powers to local authorities so that the making of a waste management plan is a reserved function by repealing sections 4 and 5 of the Waste Management (Amendment) Act 2001; and
 - that the Minister uses his powers under section 24(c) of the Waste Management Act 1996 to require local authorities in Dublin County to vary the replacement waste management plan for the Dublin region made by them on 11 November 2005, by the deletion of paragraph 18.8 to exclude the siting of an incinerator on the Poolbeg peninsula in south County Dublin."
- Tá mé ag roinnt mo chuid ama leis an Teachta Gormley agus an Teachta Boyle. Tá a fhios agam go bhfuil an Teachta Morgan agus na Teachtaí Neamhspleácha ag iarraidh labhairt chomh maith.

I acknowledge the presence of residents of many communities such as Ringsend and Sandymount in the Visitors Gallery. Waste management is a key issue in many areas and it will inform people in making their decision on who to vote for in the next general election. The Green Party has tabled the motion to outline a better way to manage waste and to highlight a blind spot in Government thinking which has made Ireland the dirty old man of Europe. The EU Environment Agency again this month found Ireland to be the worst state in the EU 25 for generating municipal waste, creating 735 kg *per capita* in 2003. The Government's amendment refers to its record as remarkable progress but people will have to judge that for themselves.

When debating the terrible death toll on our roads, no Minister would dare say that even one death is acceptable, yet the growing mountain of waste foisted on householders has resulted in no useful response from Government. Instead of adopting a strategy to reduce waste, Ireland has a policy of increasing waste. The growing amount of junk mail landing on our doormats every day without Government sanction is an example in this regard. I have witnessed in Canada how a strategy focused on reducing waste year by year to achieve zero waste in due course can work if political will and community empowerment are strong enough. People want to recycle and compost. The green schools programme is better supported by Irish schools than those of any other EU member state.

Under section 29(4) and 29(5) of the Waste Management Act 1996, producers can be required to generate less waste, segregation of materials and diversion from landfill can be mandatory and local communities can be empowered to play their part in a zero waste strategy. Such a strategy would not require incinerators and hiding waste in huge landfills would also not be necessary.

Lives are being ruined in my constituency by the Government's *laissez-faire* attitude to the growing waste crisis. In the Tooman-Nevitt area of Lusk where the current major dump for Dublin is located at Balleyally, eight more families will be evicted if the Government is permitted to build a new dump and further destroy lives, communities and the wider environment. The Minister for the Environment, Heritage and Local Government has said nobody wants to live near a landfill, yet he is prepared to sentence 13 families to live on the periphery of this new monument to Government failure to tackle the mounting waste crisis. However, a geological fault line has been discovered beneath the proposed 10 million tonne landfill site, which means groundwater from this part of Lusk feeds the Bog of the Ring underground reservoir on which many people in County Dublin depend for drinking water. This is also the Minister's responsibility.

No landfill liner membrane is guaranteed never to leak or to be punctured and, because of this, the EPA recommends that a minimum of 10 metres of clay be present on top of the bedrock to act as a filter for leakage from the dump. The Tooman-Nevitt site has as little as 4.5 metres of soil above bedrock in places and much less than 10 metres in others. Valuable archaeology on the site has also meant that, so far, 3 million tonnes, approximately one third of the dump's proposed capacity, has been forfeited by Fingal County Council. Unsurprisingly, 21 reports on this proposed landfill have been sent to the European Commission so far.

The Green Party will make a logical case to deal with post-consumer materials as a resource rather than as waste to be thrown away. There is no such place as away. The Government has the legislation to minimise the waste problem but it must be instrumental in minimising the crisis. However, as my colleagues, Deputy Gormley, Green Party health spokesperson, and Deputy Boyle, Green Party finance spokesperson, will make clear, there are proven ways to reduce and tackle this avoidable problem and they do not involve a false choice between incineration and landfill. Waste reduction is where the solution lies, and it is for this reason we seek support for our motion.

Environmental
Protection Agency

14 JUL 2006

Health Effects of Selected Drinking Water Contamination

CONTAMINANT HEALTH EFFECTS

- Arsenic** - Malignant tumors of skin and lungs, cramps, spasms, effects to nervous system
- Barium** - Prolonged stimulant action on muscles, nerve block
- Benzene** - Associated with cancer, leukemia, anemia
- Cadmium** - Bronchitis, anemia, gastrointestinal upsets, cancer in rats
- Carbon tetrachloride** - Central nervous system depression, gastrointestinal effects, liver and kidney damage, coma, death
- Chlordane*** - Carcinogen, liver and kidney damage
- Chlorobenzene** - Irritation to respiratory system, central nervous system depression
- Chloroform** - Possible liver, kidney and heart effects; carcinogenic in at least one animal species **Chromium**
- Kidney damage, cancer
- Copper** - Gastrointestinal tract irritant, possible infant fatality, Wilson's disease
- Dichlorobenzene(s)*** - Suspected carcinogen
- Dichloroethane** - Central nervous system depression, liver damage, suggested animal carcinogen
- 1,2-Dichloroethane** - Nausea, mental confusion, liver and kidney damage
- Dichloroethylene*** - Nausea, dizziness
- Ethylendibromide (EDS)** - Decreased fertility
- Fluoride** - Skeletal damage when present in high levels
- Heptachlor** - Possible tumor induction, carcinogenic in test animals
- Lead** - Damage to nervous system, kidneys, reproductive system; cancer in rats
- Lindane** - Chronic liver damage, anemia, leukemia
- Mercury** - Kidney impairment, possible death
- Methylene chloride*** - Toxic
- Nickel** - Signs of hyperglycemia and gastrointestinal and nervous disorders
- Pentachlorophenol (PCP)** - Loss of appetite, respiratory difficulties, anesthesia, coma, death
- PCBs** - Damage to skin and liver; nausea, loss of weight, jaundice, coma, death
- Selenium** - Carcinogen; irritation to mucous membranes, dermatitis Sulfate Laxative action
- Tetrachloroethylene** - Central nervous system effects; confirmed animal carcinogen, anesthesia, death
- Toluene** - Narcosis, irritation to eyes and respiratory system
- Toxaphene** - Possible liver damage Trichloroethane Narcosis, depression of central nervous system, unconsciousness, death
- 1 5 1 2-Trichloroethane** - Possible liver and kidney effects, possible carcinogen in animals Trichloroethylene
Central nervous system depression, loss of coordination, unconsciousness; strong irritant and carcinogen
- 2,4,6-Trichlorophenol** - Suspected carcinogen
- Trihalomethanes (THMS)** - Effects to nervous system and muscles, loss of consciousness
- Vinyl chloride** - Central nervous system depression, dulling of visual and auditory responses, possible death
- Xylene** - Mucous membrane irritant, lung congestion, impairment of kidney functions
- Zinc** - Muscular stiffness and pain, loss of appetite, nausea

The Assembly Office of Research, April 12, 1983, states that the health effects listed for these substances were compiled from the following sources: "Drinking Water and Health", National Academy of Sciences, Safe Drinking Water Committee, 1977, "Contamination of Ground Water by Toxic Organic Chemicals", U.S. Council on Environmental Quality, 1981 "Carcinogenic Hazards of Organic Chemicals in Drinking Water", R.H. Harris, T. Page, and N.A. Reiches, 1977

Risk of adverse birth outcomes in populations living near landfill sites

Paul Elliott, David Briggs, Sara Morris, Cornelis de Hoogh, Christopher Hurt, Tina Kold Jensen, Ian Maitland, Sylvia Richardson, Jon Wakefield, Lars Jarup



Abstract

Objective To investigate the risk of adverse birth outcomes associated with residence near landfill sites in Great Britain.

Design Geographical study of risks of adverse birth outcomes in populations living within 2 km of 9565 landfill sites operational at some time between 1982 and 1997 (from a total of 19 196 sites) compared with those living further away.

Setting Great Britain.

Subjects Over 8.2 million live births, 43 471 stillbirths, and 124 597 congenital anomalies (including terminations).

Main outcome measures All congenital anomalies combined, some specific anomalies, and prevalence of low and very low birth weight (<2500 g and <1500 g).

Results For all anomalies combined, relative risk of residence near landfill sites (all waste types) was 0.92 (99% confidence interval 0.907 to 0.923) unadjusted, and 1.01 (1.005 to 1.023) adjusted for confounders. Adjusted risks were 1.05 (1.01 to 1.10) for neural tube defects, 0.96 (0.93 to 0.99) for cardiovascular defects, 1.07 (1.04 to 1.10) for hypospadias and epispadias (with no excess of surgical correction), 1.08 (1.01 to 1.15) for abdominal wall defects, 1.19 (1.05 to 1.34) for surgical correction of gastroschisis and exomphalos, and 1.05 (1.047 to 1.055) and 1.04 (1.03 to 1.05) for low and very low birth weight respectively. There was no excess risk of stillbirth. Findings for special (hazardous) waste sites did not differ systematically from those for non-special sites. For some specific anomalies, higher risks were found in the period before opening compared with after opening of a landfill site, especially hospital admissions for abdominal wall defects.

Conclusions We found small excess risks of congenital anomalies and low and very low birth weight in populations living near landfill sites. No causal mechanisms are available to explain these findings, and alternative explanations include data artefacts and residual confounding. Further studies are needed to help differentiate between the various possibilities.

Introduction

Waste disposal by landfill accounts for over 80% of municipal waste in Britain.¹ Human exposure to toxic chemicals in landfill (which include volatile organic compounds, pesticides, solvents, and heavy metals²⁻⁴) may occur by dispersion of contaminated air or soil,² leaching or runoff,³ or by animals and birds, although evidence for any substantial exposures is largely lacking.⁶ Excess risks of congenital anomalies and low

birth weight near landfill have been reported,⁴⁻⁹ including from recent European and UK studies,^{10 11} although some have reported less significant¹² or negative findings.¹³ The aim of our present study was to examine risk of adverse birth outcomes associated with residence near landfill using data on all known sites in Great Britain.

Methods

Classification of populations near landfill sites

Data provided by the national regulatory agencies were merged in a geographical information system to give a database containing 19 196 sites. Data on boundaries were unavailable for most sites, so point locations had to be used. These comprised the site centroids for 70% of sites and, for the remainder, the location of the site gateway at the time of reporting. Data for site locations were of low accuracy (often rounded to 1000 metres), and data on area were inadequate to allow estimation of the extent of most sites. Landfill sites also change considerably over time as old areas are closed and new areas develop, while postcodes (used to define the location of cases and births) give only an approximation of place of residence, accurate to 10-100 metres in urban areas but > 1 km in some rural areas; also, landfill sites are highly clustered, so that individual postcodes may lie close to 30 or more sites. Therefore, distance from nearest landfill site was not regarded as a meaningful proxy for exposure. As a compromise between the need for spatial precision and the limited accuracy of the data, we constructed a 2 km zone around each site (figure), giving resolution similar to or higher than that of previous studies,^{10 11} and at the likely limit of dispersion for landfill emissions.¹⁴ Postcodes within the 2 km buffer zone were classified hierarchically by operational status, year on year, such that sites still operating took precedence over those closed earlier in the study period, which took precedence over sites opening later in the study period.¹⁵ People living more than 2 km from all known landfill sites during the study period comprised the reference population.

Because of concerns about the quality of landfill data for earlier years, and because health data were available only to 1998, we excluded 9631 sites (25% of the population) that closed before 1982 or opened after 1997 (to allow a one year lag period for the birth outcomes) or for which there were inadequate data. The remaining 9565 sites comprised 774 sites for special (hazardous) waste, 7803 for non-special waste, and 988 handling unknown wastes. The 2 km surrounding these sites included 55% of the national population; 20% were included in the reference area.

Health and denominator data

We used national postcoded registers held by the Small Area Health Statistics Unit. These comprised the National Congenital Anomaly System in England and

Editorial by
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BMJ 2001;323:363-8

1st Report

2nd Report (New knowledge AVAILABLE)

Environmental
Protection Agency

14 JUL 2006

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Dublin Landfill Siting

At

Tooman, Lusk, Co. Dublin.

On attached map are marked in Red the lay-out of the aquifers in the Tooman to Bog of The Ring area. In the Tooman area several aquifers run more or less parallel to each other. These tend to converge into one main source, as the system moves northwards. Before reaching The Bog of The Ring, however, the channel becomes semi-circular and approaches The Bog of The Ring from an easterly direction. Having circled the "Bog" area, it appears to move in a north-easterly direction, to finally discharge into the Irish Sea, at a point north-east of Skerries.

Before undertaking an examination of the hydro-geological conditions existing at the above site, I obtained the attached Ordnance Survey Map of the area concerned. The map covers the district from just south of Tooman to as far north as the Bog of The Ring.

The first information obtained from this map was the position of 6 No. "Rises". (These are shown Ringed Red on attached map). "Rises" are natural springs of water and indicate an aquifer in the strata beneath. They are, in fact, the overflow of aquifers. An investigation on site confirmed the existence of a complex system of aquifers in the Tooman - Nevitt area.

These aquifers are bearing their volume of water northwards and their contents eventually reach The Bog of The Ring. It is estimated that approximately 90% of the water delivered to The Bog of The Ring comes from the Tooman area. The remaining 10% appears to come from a westerly direction (X—Y on map).

It is noted from "Dublin Landfill Siting Study" (Sections 3 & 4, p.p.4,5 & 6,) that an elaborate design is envisaged to deal with the leachate problem. There is, however, no evidence of comprehensive percolation testing having been carried out at this site.

It appears to be the intention to instal a non-permeable layer, a flexible membrane and a system of pipes, to deal with the leachate.

This system would, no doubt, work very well on a site where aquifers were non-existent. At Tooman, however, we have a potentially destructive situation.

Here the loose material of the aquifer (e.g. sand, gravel, etc.) alternates with and runs parallel to the firm strata separating the aquifers. An enormous weight is proposed to be placed on this area. Twice each year, as the water table rises and falls, very great stress will be placed on the land surface immediately beneath the fill. The ground over the aquifer will have to contend with the hydraulic pressure from beneath and opposing the load from the landfill. On the ground between the aquifers, where hydraulic pressure is absent stresses will be very low by comparison.

This condition will give rise to Differential Settlement. This may result in damage to the pipes, the membrane and the compacted impermeable layer. Consequently the system has the potential to fail, with disasterous results.

Should this opinion not be accepted by the Local Authority, it may be necessary to verify the findings on the ground. In this regard, I suggest that 2 No. deep-well borings be made (approx. 65 Metres) at the points A and B on attached map . 4 No. shallow wells (approx. 8 Metres) should be made at C, D, E, and F.. By pumping and by monitoring the water levels in the wells, it will be confirmed that the water at Tooman Landfill Site and the water at the pumphouse (at F on map)are, in fact, one and the same.

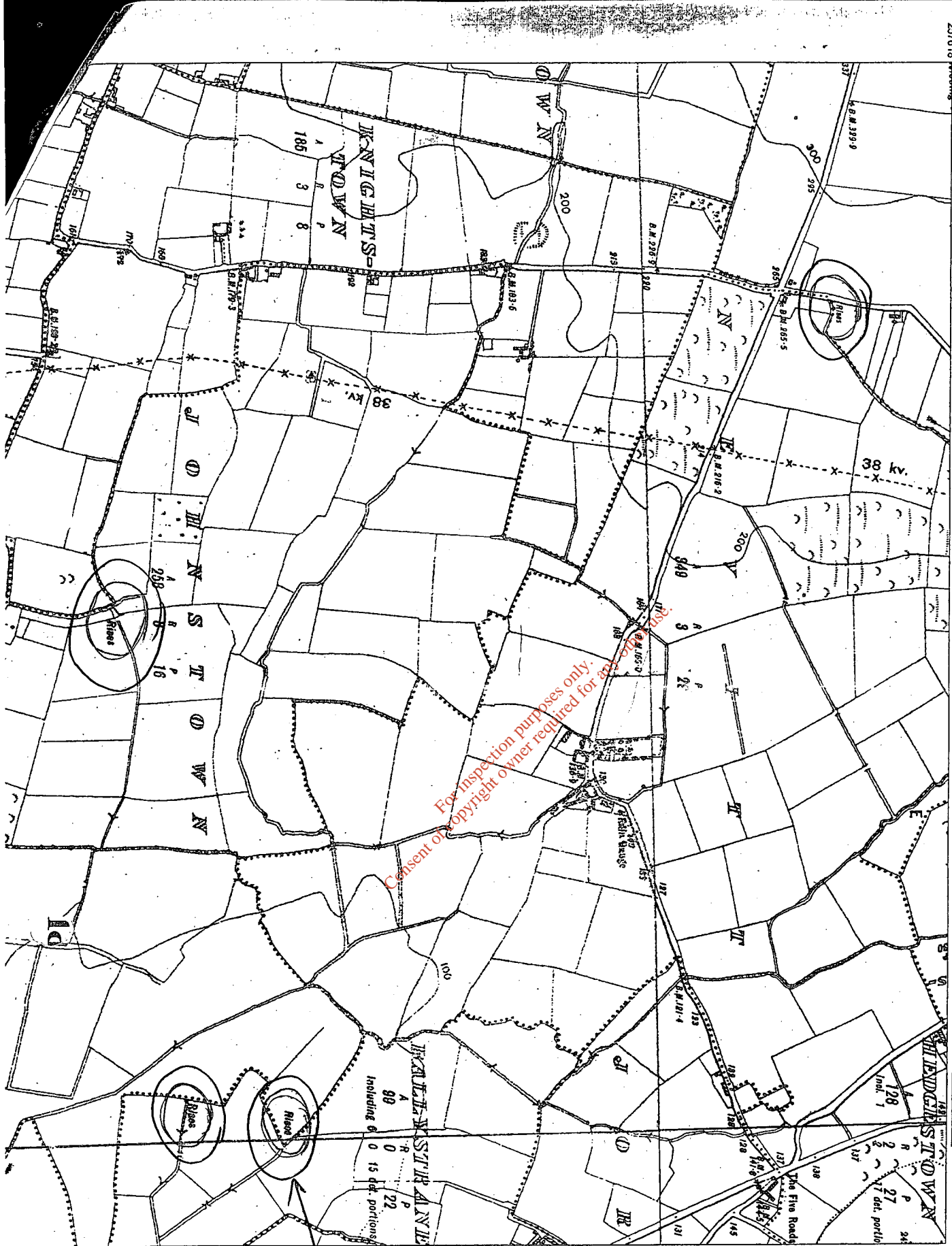
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Surveyed 1836-1837
 Revised 1937-1938
 Levelled 1938

5 RISEERS in NEVERT SITE
 5 RISEERS ON SO CALLED WATERPROOF
 (PLUS) + 5 RURAL PLACE MAP



WHILE THAT THESE
 IS PUMP BASED
 IT DOES NOT
 EXIST



257618
 CENTRE POINT COORDS
 717531, 756691

DESCRIPTION

MAP SHEETS

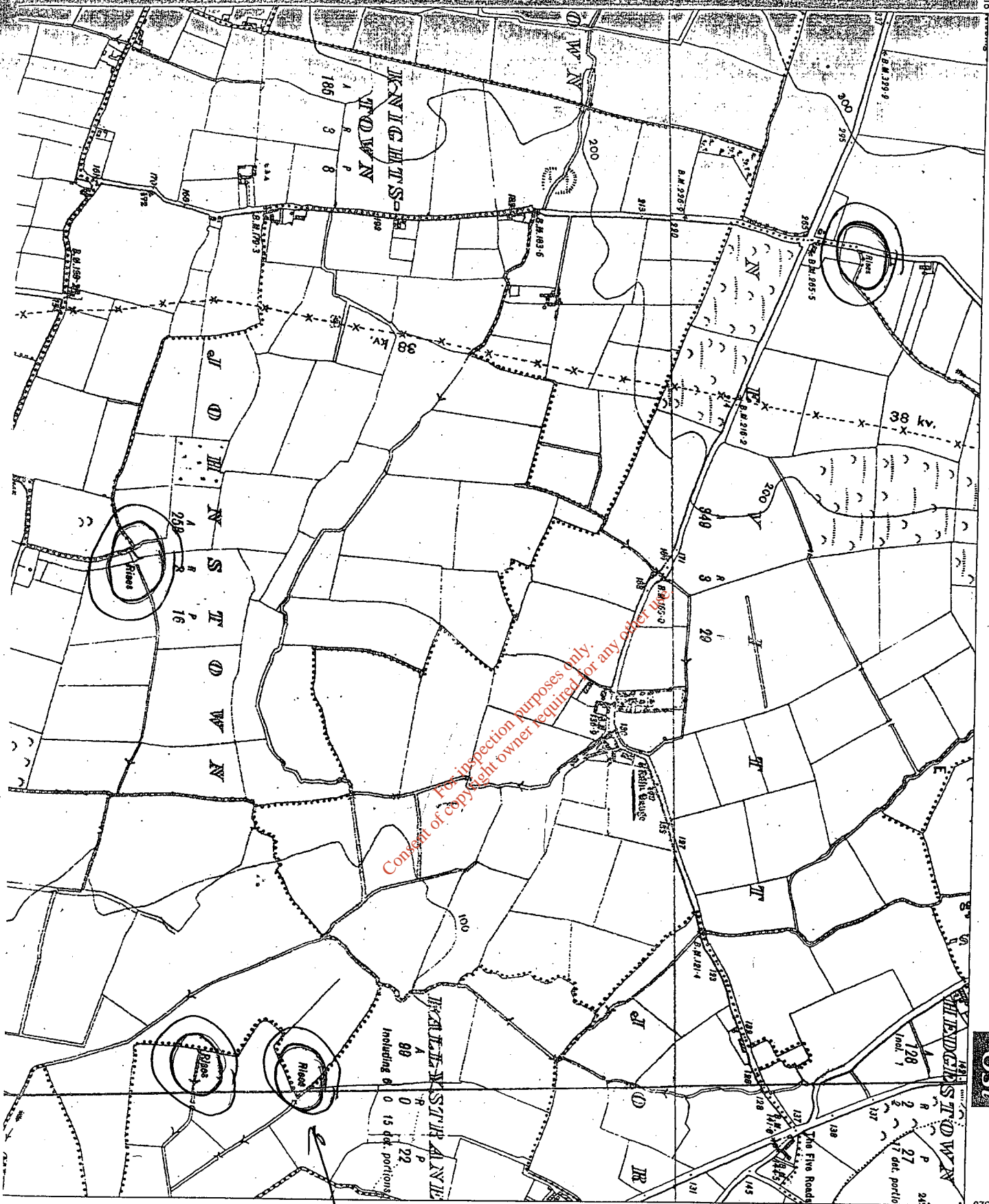
6 inch
 DN004 DN005+00
 DN007 DN008



RISEERS

Surveyed 1836-1837
 Revised 1937-1938
 Levelled 1938

RUR & PLACET Map



257618

JIM CENTRE PT COORDS
 717531.75691

DESCRIPTION

MAP SHEETS

6 inch
 DN004 DN005+00
 DN007 DN008



RISERS

DUNNES DRILLING

~~28~~ 28 MILLION
2800000 LITRES
PER WEEK

BOG
OF
RING

NEAR
SEE PUMP
TESTS RESULTS

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KERRIGANS

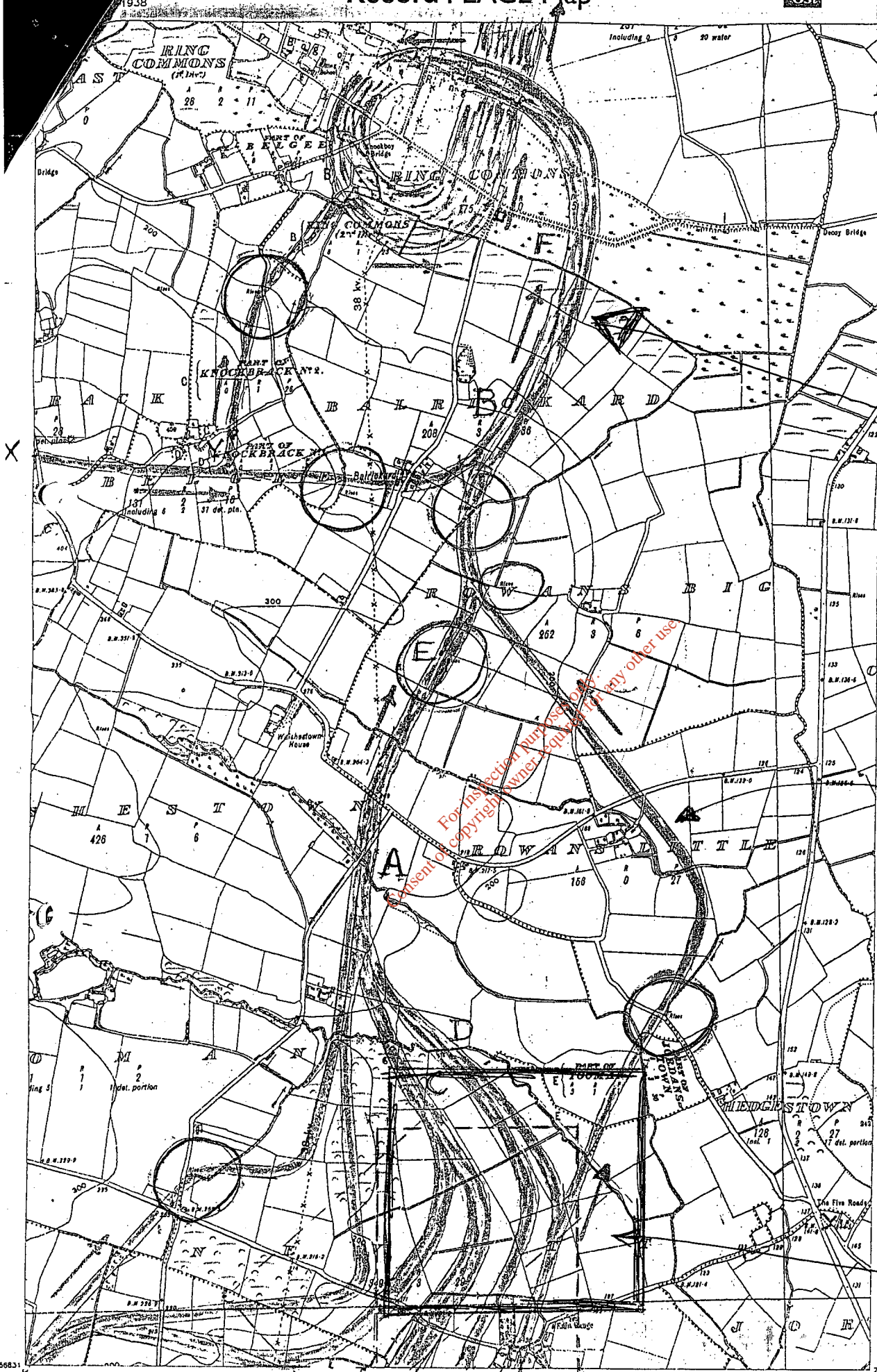
1 MILLION
PER DAY.
ANNSBROOK

COUNTRY
CREST
10000
G.P.H.
+
20000
G.P.H.

TIM
BERGIN
25000
G.P.H.

JIM BURKE

DRILLING IN 1961
APPROX



DESCRIPTION:

BOG OF THE RING

MAP SCALES:

6inch
DN004 DN007
DN005+005A DN008

THE
WATER
SUPPLY
FOR
20 000
PEOPLE
APPROX.

AQUIFERS



Area shown (eggs and holes) by Survey Ireland
Ordnance Survey, Planning and Information,
Barns Close, E. Sme, Colchester and published by Ordnance Survey
Ireland, Phoenix Park, Dublin 8, Ireland.

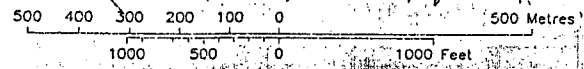
Survey Ireland acknowledges the assistance
of the Ordnance Survey, Eireann, and
the Ordnance Survey, Ireland, in the production
of this map.

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PROPOSED
DUMP
SITE

Scale: - 1:10560
Scala: - 1:10560



Plot Ref. No. 246541_1_1
Plot Date 18-OCT-2004

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Nevitt Lusk Action Group
Windfield
Nevitt
Lusk
County Dublin

Environmental
Protection Agency

14 JUL 2006

1st Reports

2nd Report Available
SHORTLY.

Fingal Landfill Project Review of proposals

April 2005

ENGLISH

CONSULTANT

N.B.

P. 5

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P. 7

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Fingal Landfill Project

Review of proposals

Issue and Revision Record

Rev	Date	Originator	Checker	Approver	Description
A	5 th April 2005	Paul Ashley	Anthony Feigl	Paul Ashley	First issue

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List of Contents

	Page
1 Introduction	1
2 Environmental setting	1
2.1 Topography and surface water systems	1
2.2 Geology and groundwater systems	2
2.3 Potential environmental receptors	3
3 Review of proposals for the landfill	4
3.1 Proposals	4
3.2 Regulatory issues in the selection of the Nevitt site	4
4 Preliminary assessment of potential impacts	5
5 Recommendations	5

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1 Introduction

Fingal County Council (FCC) has identified a site at Nevitt near Lusk, at which it proposes to construct a landfill to accept waste from the Dublin area, in the context of the Dublin Waste Management Strategy (2001). An "EIA - Preliminary Scoping Report For Consultation" has been prepared (it is not clear if there will be a "Final" version of the same report for consultation, or whether the "Preliminary" version will be used as the basis of the environmental impact assessment without further consultation).

A community group, Nevitt Lusk Action Group (NLAG), is objecting to the proposed location. One of the issues of concern is the risk posed to the local aquatic environment, groundwater in particular, by pollution from the landfill.

This report has been commissioned by the NLAG to provide:

- A review of the potential impact of the landfill on the local environment.
- Recommendations for studies and investigations that should be carried out as part of the EIA process.

The report is based on:

- A review of the following documents.
 - Dublin Landfill Siting Study, RPS/MCOS, September 2004.
 - Fingal Landfill Project, EIA - Preliminary Scoping Report for Consultation, RPS/MCOS, December 2004.
- Discussions with, and information provided by, the Geological Survey of Ireland (GSI) during a meeting on 21st March 2005.
- Observations made by Mott MacDonald during a visit to the site of the proposed landfill on 21st March 2005.

The report commences with a review of the environmental setting of the site. This is given simply to give the basis for conclusions and recommendations. Fuller details should be obtained from the source material.

2 Environmental setting

2.1 Topography and surface water systems

The proposed site is in an area of rolling hilly topography, draining from west to east in the Corduff catchment. It is, however, in the upper reaches of the catchment: the local catchment topographic "high" is 176 m above sea level, about three kilometres north-west of the proposed site. The northern edge of the site, though not the likely disposal area, appears to overlap a separate catchment that drains northwards.

2.2 Geology and groundwater systems

The site is underlain by Carboniferous sedimentary bedrock overlain by glacial deposits of variable thickness.

Bedrock

The site lies on the south-western edge of a geological syncline (a basin-shaped structure). In the centre of the syncline is the Walshestown Formation, which forms the hills to the north and west of the site. The Loughshinny Formation (which underlies the site itself) surrounds and underlies the Walshestown Formation, and is therefore also present in the catchment to the north.

The bedrock strata are characteristically high in limestone content, of poor intergranular permeability, and occasionally fractured, resulting in higher bulk permeability. Fracturing is often related to local or regional faults: the east-west North Dublin Fault system lies three to four kilometres east of the site; another major north-south fault system is traced by the route of the M1 just east of the site.

Superficial deposits

The bedrock is overlain mainly by glacial deposits of stiff clays of very low permeability, although permeable sands or gravels are occasionally present. In the valley followed by the route of the M1, there are known to be gravels underlying the clays which can store and transmit significant quantities of water.

The thickness of the glacial deposits has been investigated by the GSI using about 60 auger holes in the catchment of the Bog of the Ring wellfield, and by RPS/MCOS using 12 boreholes and electrical resistivity surveys at the Nevitt site.

At the Nevitt site, the glacial deposits have been measured as varying between less than 10 m and greater than 30 m thick, with the bulk of the site covered by 10-30 m thickness. There appears to be a lack of firm data from parts of the site where the thickness is likely to be least, that is, beneath the channels of the streams that cross the site.

Hydrogeology

The Loughshinny Formation is an aquifer, classified by the GSI as "Locally important" and "Generally moderately productive", although beneath the Walshestown Formation in the centre of the syncline it is probably of low permeability. It is exploited for public water supply by Fingal County Council at the Bog of the Ring wellfield, about three kilometres north of the site, on the northern side of the syncline. The wellfield is considered by the GSI to exploit groundwater flowing through fractures associated with the North Dublin Fault system.

The Walshestown Formation is classified as a "Poor aquifer"; the GSI considers it to have little fracturing and so transmits little groundwater.

The GSI has carried out a study of the hydrogeology of the Bog of the Ring wellfield to establish source protection zones. The GSI report to Fingal County Council has not been seen, although the information on which it is based has been provided by the GSI. The GSI study established the general characteristics of the regional and local hydrogeology, although it necessarily focused on the area closest to the Bog of the Ring wellfield. The key features are:

- The Bog of the Ring wellfield draws water from a groundwater system that is largely limited to the outcrop of the Loughshinny Formation: that is, the valley to the west of the wellfield, and to the south east of the wellfield (the route of the M1). An unknown, but probably lesser amount is contributed by the older geological strata to the north.
- Groundwater is unlikely to be drawn from beneath the Nevitt site in a *direct* line beneath the syncline to the Bog of the Ring wellfield.
- Groundwater is probably drawn *indirectly* to the Bog of the Ring wellfield from an area just to the north of the Nevitt site around the edge of the syncline. Groundwater movement may be facilitated by fracturing close to the nearby north-south fault system.

The GSI study was not designed to determine whether or not the Nevitt site falls within the "zone of contribution" of the Bog of the Ring wellfield, and few data are available on which such a conclusion could be based. The study included the development of a simple groundwater model of the wellfield and surrounding area; however, the structure of the model started with the assumption that Nevitt is outside the zone of contribution for the wellfield; it therefore could not be used to examine whether, and under what conditions, the zone of contribution could extend beneath the Nevitt area.

2.3 Potential environmental receptors

Potential environmental receptors that could be affected by pollution of water from the landfill include:

- The Bog of the Ring wellfield and consumers in Balbriggan which it supplies. To cause pollution of the wellfield, contaminants would have to leak through the landfill liner, seep through the glacial deposits and then be drawn through the Loughshinny Formation to the wellfield. This would occur only if part of the landfill fell within the zone of contribution for the Bog of the Ring wellfield.
- Private water supply wells in the area, including those closer to the Nevitt site than the Bog of the Ring wellfield. The mechanism for pollution would be the same as for the Bog of the Ring wellfield.
- Surface watercourses in the catchment downstream of Nevitt, which are understood to include fisheries. This would occur if contaminants leaked from the landfill liner and then seeped into watercourses after passing through the glacial deposits or bedrock.
- The local aquifer as a whole: under EU and national legislation, aquifers are to be protected from pollution independently of wellfields, and whether or not they are currently exploited by wells.

As noted in section 2.2, the GSI study was not designed to determine whether or not the Nevitt site falls within the zone of contribution of the Bog of the Ring wellfield. The GSI study provisionally placed the Nevitt site outside the zone. However, this may be incorrect because:

- There are insufficient field data to accurately delineate the edge of the zone of contribution.
- The zone is likely to change in size depending on seasonal rainfall.

- Future increases in the pumping rate from the Bog of the Ring wellfield (or variations in the amount of water drawn from each well) may change the size of the zone of contribution.

Additional field investigations are needed to clarify this situation.

3 Review of proposals for the landfill

3.1 Proposals

The site selection process delineated at Nevitt a total site area including a buffer zone. Within this total area it is proposed that an engineered disposal area will be placed, although the precise shape and orientation of the area has not yet been determined. Hypothetical outlines of the disposal area shown in the Dublin Landfill Siting Study in some cases cross watercourses, and it is assumed that a significant amount of land reprofiling would be carried out in order to create a practical site. It is not clear to what extent this reprofiling would reduce the thickness of glacial deposits above the bedrock.

A modern landfill would be constructed with a liner designed to minimise the loss of leachate (the highly contaminated liquid that accumulates in a landfill as the waste degrades). It is understood that a composite polymer and clay liner would be employed at the new landfill site. No liner can "guarantee" that leachate will not escape, and current best practice is to design the system such that any leachate that escapes will be in sufficiently small amounts and will be so attenuated during seepage that no impacts are detectable in local groundwater and surface watercourses.

The water table at the Nevitt site is understood to be at shallow depth. If the site has to be partially excavated or reprofiled, so that the liner has to be constructed below the water table, then there would be a risk that the liner could be damaged during construction as a result of upward groundwater.

3.2 Regulatory issues in the selection of the Nevitt site

The Dublin Landfill Siting Study selected the site at Nevitt on the grounds that, with regard to environmental issues, there was minimal risk of water pollution because of the thickness of low-permeability glacial deposits, and because of the perception that it was outside the zone of contribution of the nearest public water supply wellfield.

The importance of these criteria arises from the requirements laid down by the GSI for the siting of landfills on aquifers. RPS/MCOS properly described the risk assessment procedure and concluded that the site fell into a GSI risk rating between R1 and R2². R1 is the lowest risk rating, where landfill development is considered "Acceptable subject to guidance in the EPA Landfill Design Manual or conditions of a waste licence".

Rating R2² is a higher risk classification where, in addition:

- "Special attention should be given to checking for the presence of high permeability zones. If such zones are present then the landfill should only be allowed if it can be proven that the risk of leachate movement to these zones is insignificant. Special attention must be given to existing wells down-gradient of the site and to the projected future development of the aquifer" and

- "Groundwater control measures such as cut-off walls or interceptor drains may be necessary to control high water table or the head of leachate may be required to be maintained at a level lower than the water table depending on site conditions"

The factor that separates R1 from R2² rating is the thickness of subsoil: for clayey soils, the thickness must be greater than 10 m for R1, and 5 m for R2².

4 Preliminary assessment of potential impacts

The data that are available to make an assessment of the risks from the proposed landfill are insufficient at present to draw firm conclusions. However it is provisionally concluded that:

- There is a risk of pollution of groundwater beneath the site by leachate from the landfill, as a result of local thin zones of glacial deposits. (See the conditions attached to risk rating R2² in section 3.2). This risk can be assessed by more comprehensive investigation of the thickness of the deposits combined with a more detailed study of the need for ground reprofiling across the proposed area of waste deposition.
- Polluted groundwater beneath the site would have the potential to migrate to the Bog of the Ring wellfield. This potential can only be clarified by more detailed investigations and studies of the boundary of the zone of contribution for the wellfield.
- Polluted groundwater beneath the site would have the potential to impact other wells in the catchment to the south and east. No surveys have yet been carried out to identify such wells, although some wells are known to exist. (See the conditions attached to risk rating R2² in section 3.2)
- There is potential for the development of new groundwater resources from the Loughshinny Formation to the east and north-east of the site, along the line of the major north-south fault and close to the layer of gravels known to overlie the bedrock there. The proposed landfill site would certainly be in the zone of contribution to a new wellfield there. The development of a landfill at Nevitt has the potential therefore to sterilise the local groundwater resource: it would no longer be available for future development. (See the conditions attached to risk rating R2² in section 3.2).
- The high water table at the site may lead to an increased risk of damage to the landfill liner during construction, unless dewatering is carried out for the period of construction. (See the conditions attached to risk rating R2² in section 3.2)
- The downstream watercourses are at risk of pollution from the site, and will require diversion of water courses and construction of drainage systems to mitigate this risk. Hydrological studies will be required to assess the feasibility and environmental impact of these activities.

5 Recommendations

The "EIA - Preliminary Scoping Report for Consultation" is inadequate as a basis for consultation. It provides little detail regarding the proposed studies to be carried out as part of the wider EIA. In particular:

- Although it states that additional boreholes will be drilled, the purpose, numbers and locations are not given.
- It appears that only one pump test is to be carried out in a well, which is insufficient for characterising the hydrogeology of the area.

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- The risk to groundwater is to be assessed using Landsim. Landsim is only suitable for use where the water table is below the base of the landfill. The report does not state how the risk will be assessed if the water table is high and above the base of the landfill.
- Although modelling of the regional groundwater system is to be carried out, no information is given on the objectives of the modelling activity, the lateral and vertical extent of the model, the software to be used, whether contaminant transport modelling will be carried out as well as groundwater flow modelling, and the period of time for which the model will be run.

Mott MacDonald is therefore not in a position to comment on the proposals for studies as part of the EIA. The recommendations given below are, therefore, provisional.

It is recommended that:

- (a) The hydrogeological studies for the EIA should not commence until firm and detailed proposals have been put forward by Fingal County Council and RPS/MCOS. Once the field investigations have started, it will be difficult to ensure that they are modified.
- (b) Detailed field investigations should be carried out to confirm characteristics of the superficial deposits across the whole site, in order to determine the site risk rating according to the GSI requirements, including: thickness, geological character and permeability, groundwater levels, and seasonal groundwater level fluctuation. Figure 1 shows the locations of proposed boreholes for this investigation. Permeability tests should be carried out in each borehole, and automatic water level monitors installed in 50% of them.
- (c) Detailed field investigations should be carried out to determine regional groundwater flow, and to provide data for the groundwater model (see below), with the joint objectives of (i) determining whether the Nevitt site falls in the zone of contribution for the Bog of the Ring wellfield under any likely hydrological or seasonal conditions, and (ii) assessing whether the potential water resource in the Loughshinny Formation north-east of the site could potentially be affected. Figure 2 shows the locations of seven proposed boreholes for this investigation. Pumping tests should be carried out in each of these wells and automatic water level recorders should be installed in each one.
- (d) Water level monitoring in wells and boreholes should be carried out for a full 12 month cycle to assess the change in extent of the zone of contribution to the Bog of the Ring System.
- (e) A survey should be carried out to locate all private water supply wells in the area, particularly those potentially downstream of the proposed site. Details of depth, yield and usage should be recorded.
- (f) Details should be provided of the proposed land clearance, land surface excavation and reprofiling, including a contour map of the proposed land surface immediately below the liner, in relation to the water table level.
- (g) A groundwater flow and contaminant transport model should be constructed of the regional aquifer system. The model should cover the extent of the existing GSI model for the Bog of the Ring wellfield, east to the locality of Palmerstown (grid longitude 320) and be extended well to the south of Nevitt (the required southern extent cannot be determined from the data provided in the RPS/MCOS reports). The preferred model software is the industry-standard Modflow and MT3D. The model should be run in transient mode, both for monthly time-steps over a year, and for yearly time-steps over a period of, say, 30 years (a period related to the time of construction and development of the landfill).

- (h) Although Landsim may be a suitable model for assessing risks from the landfill to the groundwater immediately beneath the site, an alternative model will be needed in the event that the water table is found to be high enough to be above the base of the landfill.
- (i) Baseline hydrometric (including rainfall) and hydrological studies should be carried out to assess flows in water courses across the site under flood and baseflow conditions. Detailed proposals should be set out for water course diversions and local flood management.

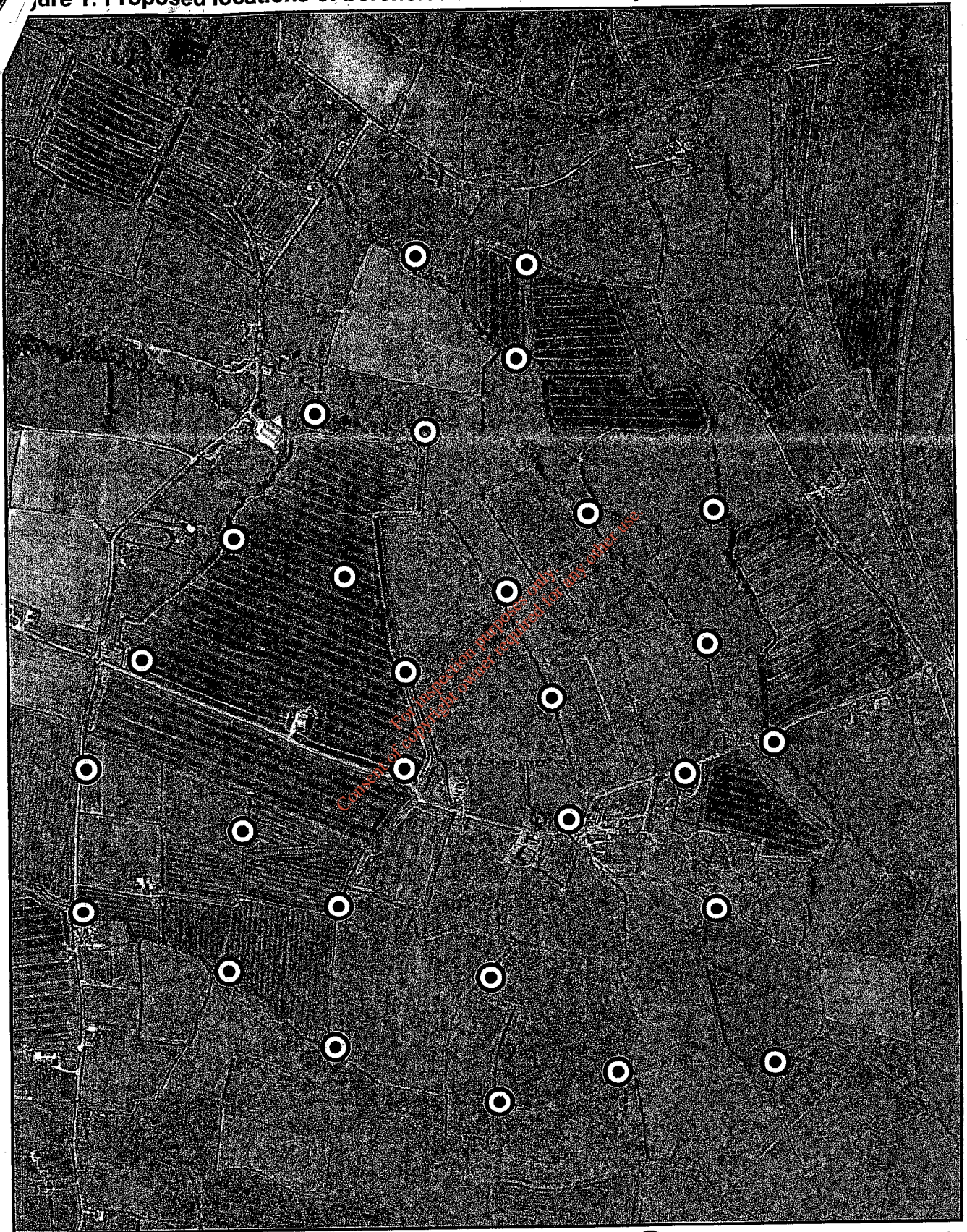
The final locations of proposed wells and boreholes would depend on confirmation by RPS/MCOS of the accurate locations of the existing boreholes which are to be monitored. There appear to be some errors in the current data on borehole locations: for example:

- Boreholes BGB2 and BGB3 are referred to as in the "mid-west" and "mid-east" of the site respectively, whereas on the report maps, the positions are reversed.
- Borehole BRC4 is shown as in an area of 10-20m overburden thickness, whereas only 8.25 m were actually encountered.
- Borehole BGB3 (or BGB2?) is shown in an area of 10-20m thickness, whereas only 6.7 m were encountered.
- Conversely, borehole BRC5 is shown in an area of 10-20 m thickness, whereas it actually encountered 23.2 m.

This number of errors on a issue of critical importance for the suitability of the site means that the data and its presentation should be fully reviewed and corrected by RPS/MCOS before the field investigations can be planned.

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Figure 1: Proposed locations of boreholes to assess site superficial deposits



Approximate scale: 1 km

○ Location of proposed new borehole