Archive

ATLAS

Administration,
Waste Management Licensing,
Environmental Protection Agency,
Headquarters,
P.O. Box 3000
Johnstown Castle Estate,
Co. Wexford.

ENVIRONMENTAL PROTECTION AGENCY WASTE LICENSING RECEIVED
- 1 MAY 2003
INITIALS.....

Date: 30/04/03

Ref: 184 -1

Dear Sir/Madam,
In response to the correspondance relating to a notice in accordance with Article 14 (2)(b)(ii) of the Waste Management (Licensing) Regulations. Please find enclosed a response in relation to queries raised with regard to Article 12 compliance.

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Statutory Requirements

- Please find attached the outstanding fee of €6,348.75 (£5,000) for fees relating to the recovery of waste as per the Third Schedule of the Waste Management (Licensing) Regulations 2000, (S.I. No. 185 of 2000)

Sludge Drying Plant – Innodry 2E (Please refer to correspondence for relevant points)

1. Please see attached booklet and attached Schematic for further detailed information on the Innoplanna sludge drying plant. The Schematic includes a plan for 4 engines however the need for these has since been reviewed. (See Point No.2).
2. The original application included a provision for four 1.2 MW power units. Due to the prevailing electricity supply/market the need for these 4 engines has since been reviewed. It is proposed now to use two 1.2 MW power units to power the sludge drying plant. This will reduce the thermal input to less than 3 MW and will therefore comply with Article 8 of the EU Council Directive 87/101/EEC. It should be noted also that Recycled fuel oil will be used as the source of fuel and not waste oil.
3. It is proposed that there will be one stack arising from the unit. This stack will act as an emission point for both the process itself and exhausts emissions from the engines. Dimensions of the proposed stack will be furnished to the Agency prior to commencement of operations for Agency approval.

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4. Air emissions from the sludge drying plant include the air exhaust vent. Air discharged from this vent is generated within the belt dryer. Exhaust air from the underground storage tank will be discharged through the same discharge point as the air exhaust vent from the belt dryer. Apart from odour generation it is not envisaged that there will be a significant impact on air quality as a result of the additional discharge point. Dust generation from the belt dryer will be minimal due to a number of contributory facts which are (a) the moisture content of the sludge, will be up to 10% when sludge is discharged from the plant (b) The method utilised allows for the encapsulation of the sludge upon initial drying there by minimising dust generation. Due to the reduction in the number of engines used to power the plant it is envisaged that the emissions from the power unit will be diverted to the one emission point (the air exhaust on the sludge drying plant).
   Atlas Ireland hope to develop a sludge drying unit at its sister company SES. Data that becomes available from this development will be used as baseline data for the Portlaoise project. Further information with regard to waste characterisations and the impact on the local air quality will be made available to the Agency at the relevant time.
5. It is proposed to acoustically clad the sludge drying facility in order to reduce noise emissions from the unit. The two engines used to power the unit will also be acoustically clad to reduce noise emissions during operation. Noise emission will comply with the 55dB A daytime and 45 dB A nightime requirement
6. Primary abatement will include the afore mentioned biofilter which will treat any odours and VOCs arising from the operation. It is proposed to put an inline PID monitor to volatiles in the air stream. Further trials will be conducted to determine potential emissions from wastes and provide emission abatement technologies where necessary. In line monitoring will also raise an alarm of significant changes to air quality being discharged.
7. Initially there were two options available for the treatment of air being discharged from the exhaust vent. These included
   (i) A bio filter or
   (ii) A chemical scrubbing system.

   Chemical scrubbers are often used in end of pipe treatment of odour streams. Chemical scrubbers can achieve the same efficiency as biofilters with regard to its effectiveness for the treatment of odours. A chemical scrubbing system operates in either of two ways by means of mist scrubbing or in a packed bed mode. The packed bed mode being

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the more utilised method. There is a variety of different chemicals which can be used in the chemical scrubbers including sodium hydroxide, hydrochloric acid, sodium hypochloride and hydrogen peroxide. Biofilters were chosen as a preferable option of treating the emissions for a number of reasons including its ease of handling in that there are no chemicals involved only a biological filter and therefore reducing waste effluent generated from the treatment process. Biofilters are more cost effective for both running and maintenance and have an advantage over other technologies in that it has no secondary environmental hazards, and also due to the simplicity of the treatment it also less likely to have any significant environmental impacts in the event of an emergency.

8. As detailed in information supplied in point No.1 a weekly washing will be planned depending on the level of activity of the sludge dryer. Washings arising from the sludge dryer will be placed back into the sludge acceptance area allowing waste to be recycled back through the drying plant.
9. It is proposed that the best available option of the disposal of sludge is currently through landfill. Further details of sites of disposal will be furnished to the Agency when available
10. Soil remediation which is already under the jurisdiction of the Atlas Ireland IPC licence involves the treatment of soil contaminated with petroleum hydrocarbons. Due to their inherent properties a certain fraction of the compounds are volatilised before the contaminated soil reaches the Atlas site. Odour complaints have been received on site, however the source of this odour is deemed unlikely to emanate from the soil treatment area. Investigations are still ongoing with regard to this matter.

    A Photo Ionisation Survey (PID) was carried out on the soil treatment area. This allowed us to determine the Volatile Organic Carbon levels using a broadband VOC gas monitor. Volatile fractions were not detected on the soil pads or in the vicinity of the soil treatment area. Please see attached Site plan and table 1 detailing levels of VOCs recorded. All readings were found to be 0ppm. As a result of this survey we deduce that the air emission impacts of soil remediation activities do not have a significant impact on the local environment.

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Groundwater

- See attached letter from URS Dames and Moore with regard to the impact or risk to the underlying regional bedrock aquifer from the Atlas facility and the groundwater flow direction in the bedrock aquifer.

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ATLAS

Monitoring – Dust

- As per attached programme

If you require any further information, please do not hesitate to contact us at the number below.

Yours Sincerely

Anne Phelan

Anne Phelan
Environmental Officer
Atlas Ireland

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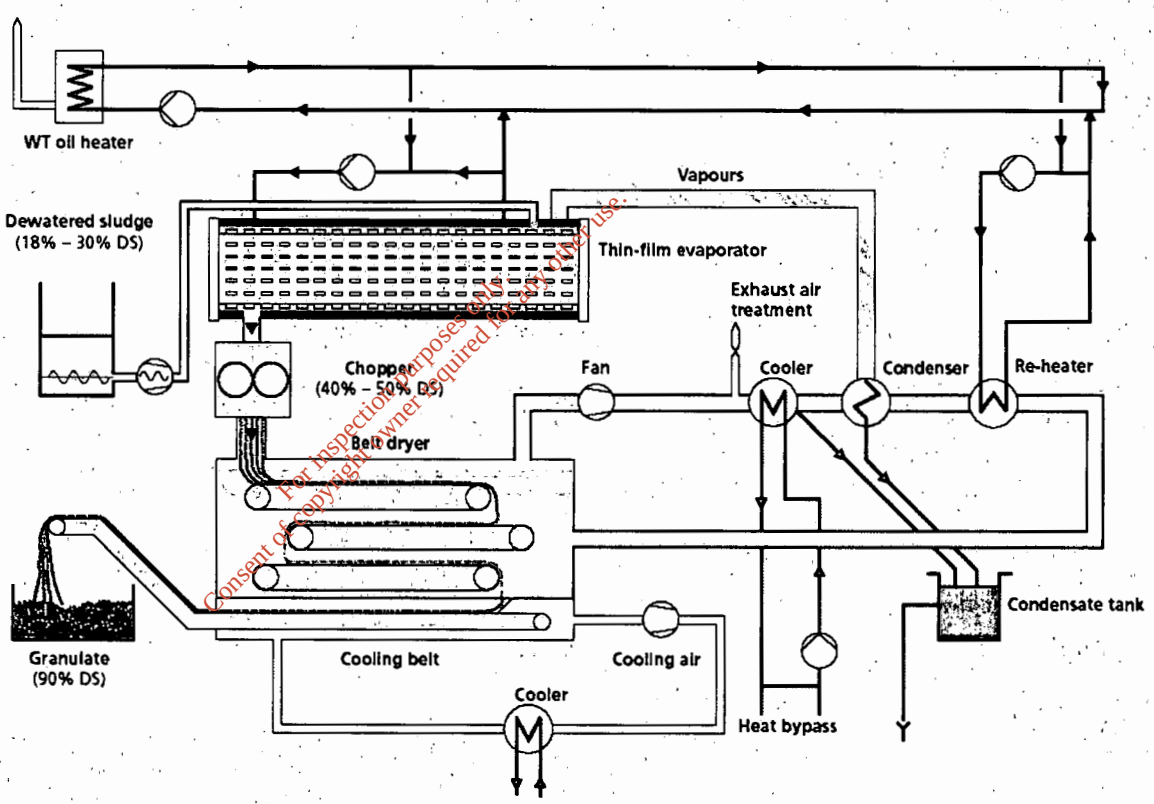
General information

INNOPLANA has analysed the drying of industrial and communal sludge and developed a 2 stage drying solution; INNODRY 2E with a process integrated energy recovery and a mechanical extrusion of the sludge in the plastic stage.

The INNODRY 2E system reduces significantly the production cost of the drying. Thin-film evaporators ideally function in the range 18% - 50% dry substance (DS), belt dryers in the range 50% - 90% DS. Molding - i.e. granulation – of the sludge is easiest if the sludge remains plastic., i. e. containing between 40% and 50% DS. This know-how has been incorporated into the patented INNOPLANA process.

The dewatered sludge (18% - 30% DS) is first pre-concentrated in the thin-film



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evaporator to 40% - 50% DS. A chopper shapes the product into granulate of the chosen type and form.

Various different granulate sizes can be selected to suit the intended use. From the chopper the granulate passes to the belt dryer, where it is dried to the required level of dry substance, i. e. between 65% - 90%. Absolutely unique and noteworthy is the fact that the belt dryer requires hardly any additional energy thanks to the heat recovered from the vapours in the thin film evaporator. This efficiency affords INNODRY 2E with a remarquable economy. Additionally, INNODRY 2E offers a high level of dryness as well as sludge consistency.

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Major features of the INNOPLANA plant

Low heat consumption 650 – 750 kWh per t of evaporated Water

Process integrated heat recovery system

The plant is designed with a process integrated heat recovery system. The vapours produced in the first stage of evaporation, representing about half of the water to be evaporated, are used once more to preheat the circulation air for the second stage. Thus, for evaporating the second half of water, in the belt dryer only a small amount of additional heat is required. The amount of heat that can be recovered is optimised by choosing the parameters and reaches is maximum effectiveness when feeding dehydrated sludge with 28% or higher TS. This multiple effect heating reduces the consumption of primary energy and normally represents a reduced use of non renewable energy. Heat is also recovered from the cooling of the vapours of the second stage and from condensation of excess vapour from the first stage and is available from a hot water circuit at a temperature level of 50°C. For moments, when not all of this heating energy has enough users, a separate standby cooler is provided.

Dust free operation, dust free granulate

Drum dryer, fluidised bed dryer and belt dryer systems require a recirculation of ground dry sludge powder when the feedstock of dehydrated sludge contains only 24% TS or less. This is to overcome the pasty phase or to be able to form a firm granule, required to prevent baking together and sticking on the belt-surface of belt dryers. INNOPLANA has as first stage a thin film evaporator, which can be fed with 18% TS or even lower, which can happen through out the year several times. In addition, no manual change of the plant is required in such case, as the control system will take care and automatically set the parameters accordingly.

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At the discharge of the thin film evaporator, first stage of drying, the sludge with 40 to 60% TS is still wet and can't build up any dust. In the belt dryer, second stage of drying, the granules lay motionless on the belt, thus no friction occurs, as it does in other two – stage processes such as fluidised bed coolers, disk dryers, linear dryers, through dryers etc. Further the granules are leaving the belt finished, cooled and in accordance with update quality requirements for the granulate. There is no need of any further treatment such as cooling, sieving, dust separating, dust recycling, dust air filtering and storing, metering, mixing etc. Such dust handling equipment represents a source of wear and tear and is an always lasting danger of fire and explosion, which an INNOPLANA Plant is exempted of. For certain applications reduction of granule size is requested. INNOPLANA has systems available, tailor made to the demand of crushing to a smaller size without building up of large amounts of dust.

Low contamination of vapour condensate

This feature is typical for a band dryer process. INNOPLANA does in addition operate at moderate air temperatures, below 120°C with granulate temperatures reaching 90 – 100 °C. At these temperatures only very few ammonium is extracted from the sludge. The main reason for this very low contamination however the fact

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that there is nearly no withdrawal of dust from the two drying stages. The condensate is a transparent, low odour liquid.

Low cost solution

Although the plant consists of two stages, the process is very simple and does not need many items of equipment, resulting also in a economic price. The heat transfer efficiency of the two stages process is twice as high as for a single stage resulting in lower equipment cost.

Further, as the equipment is smaller, also the space requirement becomes smaller and it is possible to achieve a more compact arrangement of the plant.

Technical data

Feedstock quality

Origin:	Industrial digested 1)	
Ash content:	50	%
Dry substance content:	20	%

Capacity of the plant

Total dry substance capacity per year:	1'000	tons / year
Operating hours per year:	5'280	hours
Water evaporation capacity:	737	kg / h

Dried sludge quality

Dried substance content:	90	%
Temperature:	< 50	°C
Bulk density:	650	kg / m^3

Hourly consumption

Fuel / Biogas / Natural gas:	50	kg / h
Electricity:	92	kW

Condensate

Quantity:	583	kg / h
Temperature :	82	°C

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Vent air

Quantity to gas cleaning:	950	m^3 / h
Temperature:	88	°C
Hydrometry:	20	%

Space Required (excluding Heating system)

LxWxH	16 x 9 x 7.5	m

1) The listed values are based on digested municipal sludge this must be adapted after the test results.

Process description

Sludge reception (section 1000)
The sludge of the centrifuges is transferred from two short screw conveyors (by client) to a long screw conveyor, which transports the dewatered sludge into a buffer vessel 10 m^3. From the buffer feed vessel (10 m^3) the sludge is transported over an excenter pump to the thin film evaporator. The metering pumps have a variable speed drives to preset the desired feed amount to the thin film evaporator.

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Drying (section 2000)
First stage drying is concentrating the sludge from the feedstock siccity to approx. 50% TS in a thin film evaporator. The sludge entering the evaporator is spread by a rotating set of blades to the inner surface of a tube heated from outside and is transported along the tube. By means of the rotating rotor and the small clearance of the baffles to the tube a thin film is formed, steadily agitated and kept in turbulency, while forced to the outlet side of the evaporator. The blades are adjusted to meet the individual characteristic properties of the sludge to optimise performance.

At the outlet of the evaporator the sludge is still a humid paste and is transported into a chopper mounted below. The chopper presses the sludge paste through a perforated plate, forming strings of approx. 8 mm diameter. At this position already 50% of the water is evaporated.

The sludge paste strings are, at proper conditions, immediately after contact with air, forming a thin skin, preventing them to bake together. The strings are led down on the upper belt of a belt dryer consisting of several belts transporting the strings from one belt down to the next until completely dried. The belt dryer is heated with warm air, sweeping through the belts and taking the water out of the strings by differential partial pressure. Mechanically the strings lay absolutely quiet and when dry are breaking normally down into granules with 5 to 30 mm length. The drying temperature is around 90 - 100 °C, and overall residence time is minimum 40 minutes. Final concentration can be adjusted from 60 up to 95% TS by setting different parameters, such as belt velocity and air temperature. The belt dryer also provides cooling of the granules down below 50°C by means of a separate cooling

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zone built in into the dryer housing. Cooled air from a closed air circuit is blown over the granules to cool them down.

Discharge and handling of the Granules (section 3000)

The granules are discharged through a crusher on to a bucket conveyor. The crusher, consisting of two rotating drums has an adjustable clearance between the drums in order to preset the required size of granules. The sludge properties are varying considerably and if a certain granulate quality is requested, it is advisable to carry out testing in the pilot plant in Switzerland, or to provide for modifications during the start-up period.
The granules have at the place of discharge of the belt dryer a final form, are cooled to below 50°C, have low dust content and can be used for all of the state of the art applications. The granules density is between 500 - 550 kg/m3. If precrushed for conveying, the granules density is increased to 650 to 720 kg/ m3 without producing much more dust.
The granulate is conveyed to the storage silo (by client). We recommend to size a silo, which can be drain once a day to allow the granulate to cool completely. Also insulation has to be foreseen to avoid condensation on the inside wall. A temperature measurement is also recommended.

Heat-supply (section 4000)

The heat is provided by heater, fired with fuel (natural gas or 11LS in engines). The heaters are designed in accordance with the DIN 4754 regulations and local regulations regarding flue-gas emission. We suggest to install the heater in a separate room with ventilation. The heat radiation in the heating room amounts to approx. 80 kW . The flue-gas is collected in one chimney 15m high that penetrates through the roof and is guided at level of approx.10 m.

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Economiser, Heat recovery

To optimise the heat balance additional heat recovery heat exchangers are provided.

Process integrated heat recovery system

The vapours from the thin film evaporator, first stage drying, are condensed in an air cooled condenser by heating up the air for the belt dryer, optimised to a maximum by adjustment of the intermediate water content of the sludge at the thin film evaporator discharge and the drying air inlet temperature of the belt dryer. Approx. 30 to 40% of the total heat normally required for evaporation of water can be recovered in a process integrated way with this patented system of the INNOPLANA. This means that the consumption of combustible needed for the drying is only 600 – 750 kWh per ton of evaporated water.

Control System,

The operation is controlled from an SPS controller with an operator working station located in a control room near to the dryer. A separate room is containing the MCC panel with the required frequency converters, electrical control- and power –

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switchboard. The operation is continuous, fully automatic and can be supervised by an operator, who simultaneously can operate further sections of the purification plant. The plant does not need permanent operator presence. Both lines have separate hard- and software and are operated independent from each other.

All needed measures to ensure a safe operation are provided in respect of:

Personnel protection
Plant safety and damage prevention
High availability
Fire

Vent air

All odour emissions from closed systems are collected and shall be connected to a locally provided central vent air collecting pipe. The total amount of air is approx. 950 Nm3/ h at max. 90°C with a humidity of 20% relative and with 500 Pa. discharge pressure. The air is going into biofilter. The vent air is containing only very little dust, as the circulation air is passing a layer of wet granules on a belt. The granules are not moving and are not subject to friction. The circulating air is passing in cross – counter - current to the belt move and the vent air is leaving from the wet end, which causes any dry particle to be hold back on the surface of the wet granules.

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Condensate

Maximum total 583 l / h of condensate are produced and are pumped from the condensate collection vessels back into the centrate water. Condensate temperature is max. 80°C.

The typical analysis is:

pH	8
Ammonium	500 mg/l
COD	500 mgO2/ l
BOD5	300 mgO2/ l

Flushing water

When a line is shut down it has to be flushed with water from the outlet of the station. The thin film evaporator is running until the evaporator and chopper are empty and is then flushed with water. Water from the outlet of the station can be utilized unfiltered. The flushing water is collected in the flush vessel. During this flushing, sludge lumps are flushed out and accumulate in the flush vessel. When finished the flush vessel must be emptied into the sewer system by adding water to dilute and prevent blockage of the sewer. The amount of water used for flushing and diluting is approx 2 - 3 m3 for each shut down. Sufficient large sewers have to be provided for discharging the flushing water. (DN 300 would be appropriate)
Weekly flushing stops should be planned, each requiring 2-3 h to complete.

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CW20 cooling water return

CW20 is the water (18°C) from the outlet of the station and is used for cooling by means of a plate heat exchanger. The return water could be drained to the centrate water at the dewatering section.

Plant operating and control

The plant shall be started up manually, which takes approx. 1-2 hours per line. After achieving equilibrium conditions, the automatic control is switched on and the plant is running fully automatic, without any personnel. If any parameter is running out of its limitation, or if a motor blocks, an automatic shutdown programme is initiated conducting the plant safely to a still-stand. The same programme is used if the plant has to be shutdown at a pre - programmable set time. Total time used for observing, operating, establishing the operator protocol etc. is 3 hours per 24h of operating, per line. At average, to achieve the requested throughput, the plant is designed to normally operate non - stop 120 h / week, 44 weeks per year. Increasing the throughput correspondingly can make up for short maintenance interruptions. At least one short regular shutdown for a duration of approx. 3 hours per week for each line, for cleaning and flushing shall be planned.

Weekly maintenance

From time to time mechanical adjustments, inspections and cleaning, or general minor debugging work may have to be done by the operators, or a mechanic which could take approx. 4 h per week.

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Yearly maintenance

We suggest 1 maintenance period of 2 weeks once in a year, where all equipment is inspected, standard wear parts are exchanged and such wear parts that usually wear in more than one year are inspected and replaced if required. This service is offered in the pricing section of this quotation.
A daily, weekly and monthly programme will be established with detailed routines for the operators, covering cleaning, flushing, greasing and inspecting, etc.

Granulate crushing and conveying

The granules are leaving the dryer at max 50°C and 90% DS with only little dust. The size of the silo should be kept relatively small so as it will be emptied nearly weekly, and there will be sufficient cooling time to prevent build up of high temperature spots neither by auto-oxidation nor biologically as the silo is also insulated to minimise condensation.
A separate temperature monitoring is provided which controls the temperature of the dried sludge entering the silo.

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FLOOR PLAN
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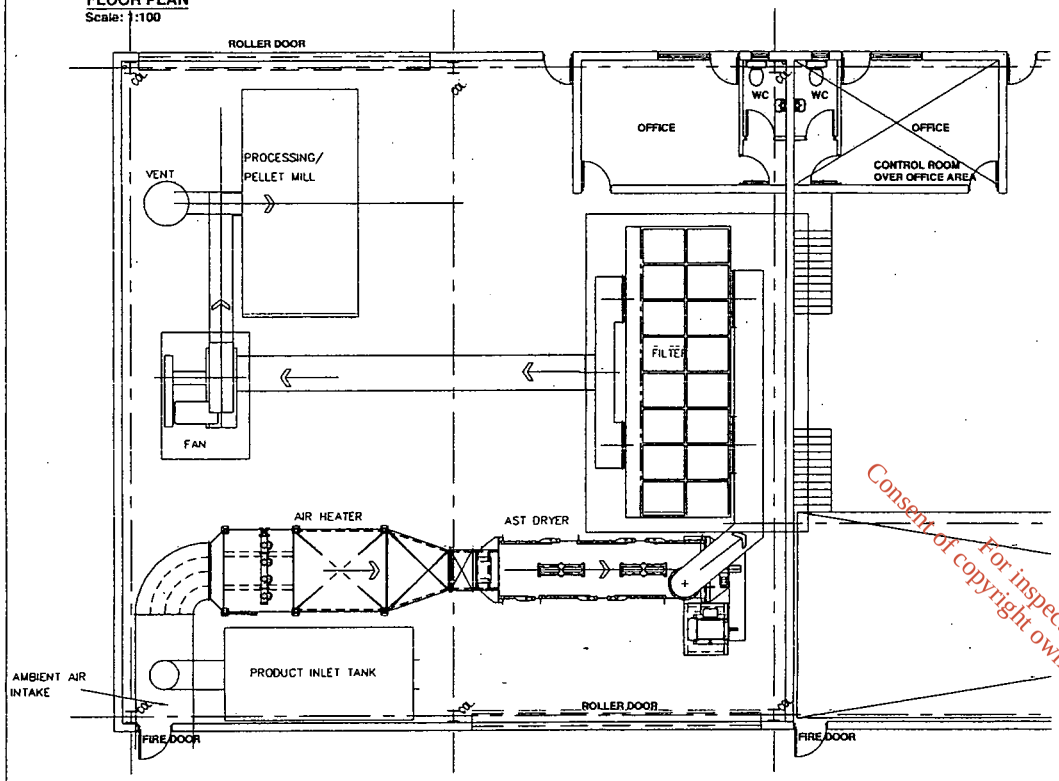

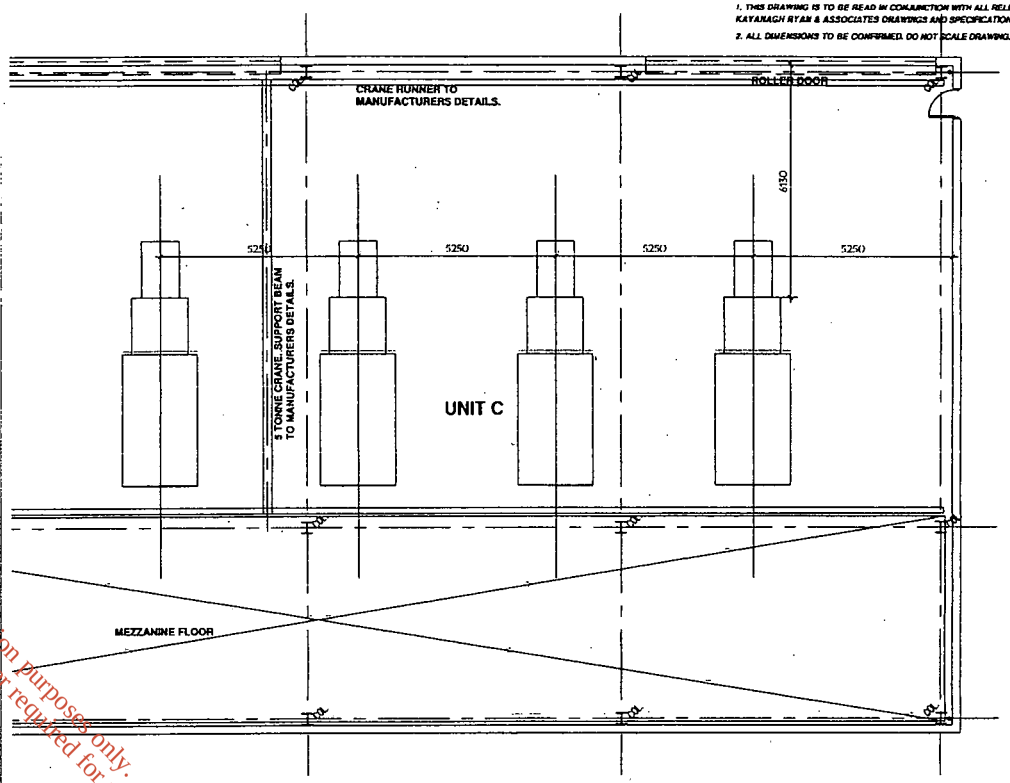

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT KAVANAGH RYAN & ASSOCIATES DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS TO BE CONFIRMED. DO NOT SCALE DRAWING.

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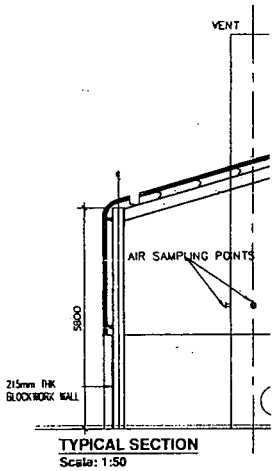

TYPICAL SECTION
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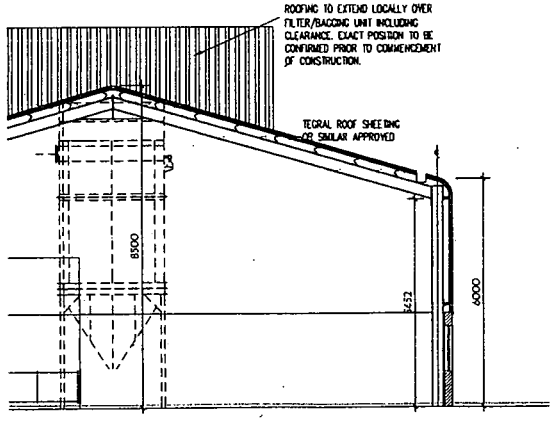

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- 1 MAY 2003
INITIALS.....

no.	revision	date

Kavanagh Ryan & Associates. DESIGN AND CONSTRUCTION CONSULTANTS
Unit 34, The Egon Centre,
Dargle Road, Bray, Co. Wicklow.
Tel. 2765661/662, Fax. 2765664
E-mail. kmryan@eircom.net

CLIENT: Warehouse Facility
Atlas Enviromental Ireland Ltd.
Clonminam Industrial Estate,
Portlaoise, Co. Laois.

TITLE: **Floor Plan/Section**
Sludge Drying Plant

ATLAS ENVIRONMENTAL IRELAND LIMITED. CLONMINAM IND. EST., PORTLAOISE, Co. LAOIS.

DRAWN	SCALE	DRAWING NO.
KR	1:100	Load-2
JOB NO. C01110	DATE Dec 01	

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Photo Ionisation Survey (PID)

A PID survey was carried out of the soil piles and the areas adjacent to the treatment pads. Volatile Organic Carbon (VOC) emissions were determined using a broadband VOC gas monitor. The table below lists the locations and the levels of VOCs recorded. Please see attached site plan to refer to monitoring locations.

Table 1.

Monitoring location	VOC (ppm)
Pad A	0
Pad B	0
Pad C	0
Pad D	0
Pad H	0
Pad I	0
Pad J	0
Pad K	0
Pad L	0
Point 1	0
Point 2	0
Point 3	0
Point 4	0
Point 5	0
Point 6	0
Point 7	0
Point 8	0
Point 9	0
Point 10	0
Point 11	0
Point 12	0
Point 13	0
Point 14	0

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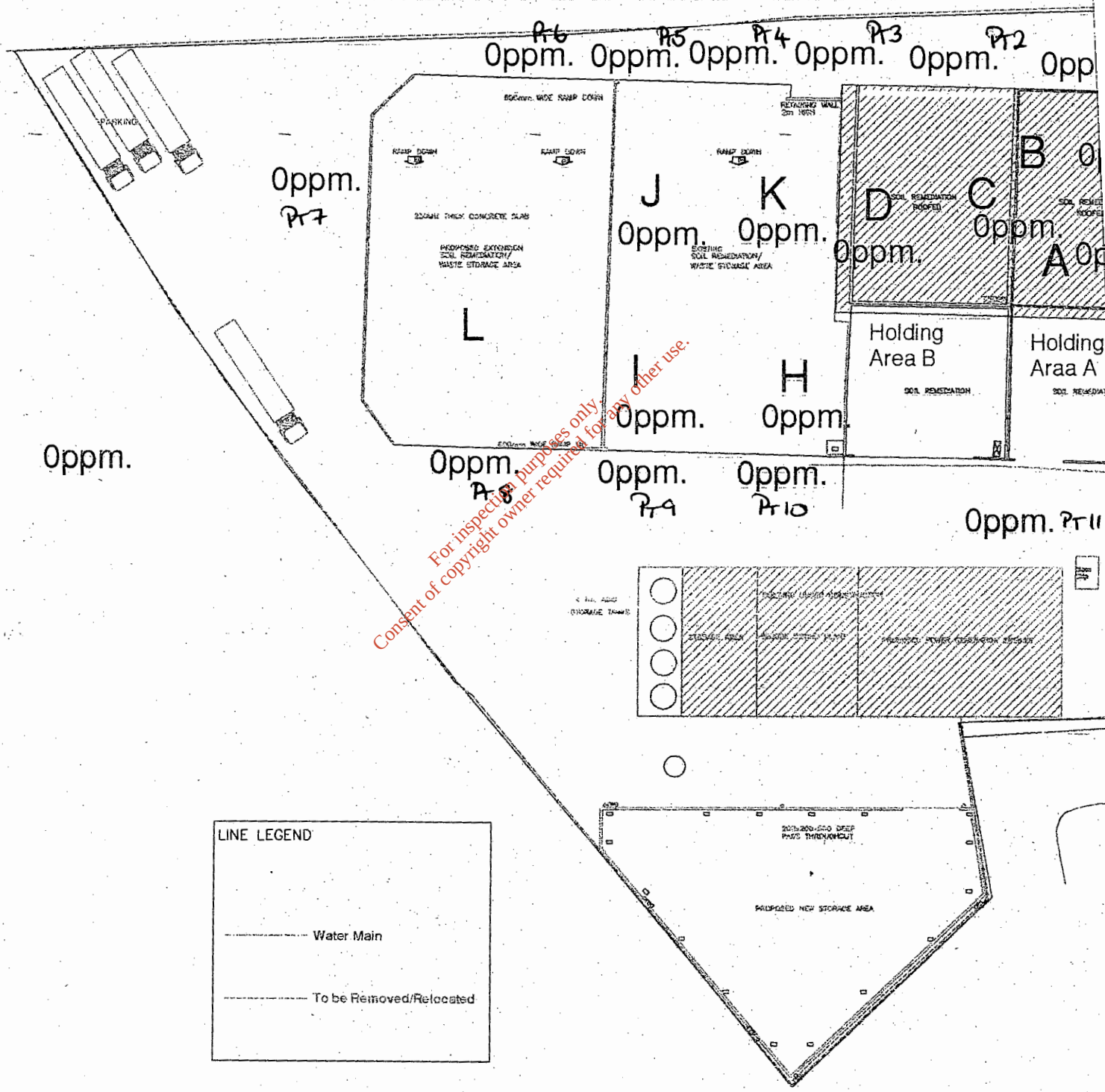
Waste Management License Application

Photo Ionisation Detector Levels



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URS

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INITIALS.....

17 April 2003

Ref: 46605-002-447/ghw

Atlas Ireland Limited
Clonminam Industrial Estate
Portlaoise
Co. Laois

Attention: Anne Phelan

Re: Vulnerability of Bedrock Aquifer at Atlas Portlaoise Facility

Dear Anne:

Further to your recent request, we are pleased to provide an assessment of the vulnerability of the bedrock aquifer at the Atlas facility in Portlaoise.

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Geology

The underlying bedrock in the region is dark grey argillaceous bioclastic limestone from the Lower Carboniferous. This type of limestone is usually thinly bedded.

The Geological Survey of Ireland's 1860's 6" to 1 mile drift geology sheet indicates that the overburden in this part of Portlaoise is limestone gravel. During site investigations performed by URS in 2001, the Atlas facility was found to be underlain by made ground, overlying gravely clays and clayey gravels (gravely sand was encountered in one borehole). The depth to bedrock was not proven; however, there were indications that bedrock may have been encountered in two boreholes at 6 – 7 metres below ground level.

Hydrogeology

Static water levels at the site have been observed between 1.4 m and 3.8 m below ground level.

Groundwater flow in both the fractured bedrock and overlying sediments is expected to mirror the topography and flow to the northeast towards Portlaoise. Groundwater flow in the bedrock is expected to discharge to the Triogue River, which flows north through Portlaoise to the River Barrow.

The bedrock is classified as a major aquifer in which the groundwater flow is via fractures, some of which may be solutionally enlarged ('karstified').

As relatively coarse-grained subsoils overlie the bedrock aquifer, the aquifer is classified as being 'extremely vulnerable' (GSI terminology) to contamination. The subsoils themselves may also constitute a local aquifer and would also be classified as extremely vulnerable.

URS Ireland Ltd
Iveagh Court,
6-8 Harcourt Road
Dublin 2
Ireland
Tel: +353 (0) 1 415 5100
Fax: +353 (0) 1 415 5101

Registered in Ireland No. 107912

nsai
I.S. EN ISO 9001

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The public water supply for Portlaoise is derived from groundwater. The main groundwater source is at Ballydavis to the north-east of Porlaoise town, with an additional source, which is used occasionally, to the south-east of the town on the R426 road. Groundwater may be used for potable supply in the vicinity of the site, however no wells are noted within a 1 km radius of the site in the well record database of the Geological Survey of Ireland.

ooOOoo

I trust this brief summary is sufficient for your current requirements. Please do not hesitate to contact me should you have any questions.

Yours Sincerely,
for URS Ireland Ltd.

Graham Webb
Manager, Soil & Groundwater Services

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Dust Monitoring Programme

1. Aim.

To provide a programme for the monitoring of Dust deposition arising from activities carried out by Atlas Ireland.

2. Responsibilty

It is the responsibility of the Environmental Officer to ensure that monitoring is carried out as per guidelines detailed below.

3. Procedure

(a) Monitoring Locations

There are three proposed monitoring locations around the site as follows:

DP1 : To the North of the inside boundary of the site
DP2 : To the North West inside boundary of the site
DP3 : To the South of the inside boundary of the site.

There are two monitoring locations proposed to the North end of the site due to the activities being carried out in these areas. Dust generation to the south of the site will be minimal and therefore it was decided to place one monitoring location to the south of the site. Please see attached map for locations of dust monitoring points.

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(b) Monitoring Intervals

Monitoring of the dust location will be carried out three times per year at one month intervals

(c) Sampling and Procedures

Dust deposition monitoring will be carried out in accordance Guideline VDI 2119 Sheet 2 by the Constitution of German engineers (Verien Deutscher Ingenieure) as the recommended standard method meeting the TA Luft requirements. This monitoring method determines Total dust deposition, including wet deposition by gravimetric weight analysis.
Dust will be expressed in mg/m^2 /day and then calculated over the month.

(d) Equipment

Bergerhoff dust deposit gauges will be used to determine dust deposition.

(f) Reporting

Report will be furnished to the Agency as soon as practiceable.

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Surveyed 1994 – 1997
Revised 1997 – 2000
Levelled 1984

Rural PLA

245648
198098

KNOCKMAY

2.58
2.73
1.29
0.25
0.77
3.20
0.23
0.56
0.22
0.28
0.46
0.35
1.11
1.38
0.26
0.52
0.82
2.62
0.28
0.73
0.37
1.50

110Kv
10Kv
DP2
Tanks (c)
Rowan Park
Oak Park

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197488
245648

Scale:– 1:2500 200 150 100 50 0

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MEMO

TO:	Accounts	**FROM:**	Karen Vaughey
CC:	Office File	**DATE:**	1 May, 2003

SUBJECT : Outstanding Fee - Waste Licence Application 184-1, Atlas Environmental Ireland Ltd.

Please find attached cheque number 005676 from Atlas Environmental Ireland for €6348.75 in respect of application fee outstanding.

Regards,
Karen

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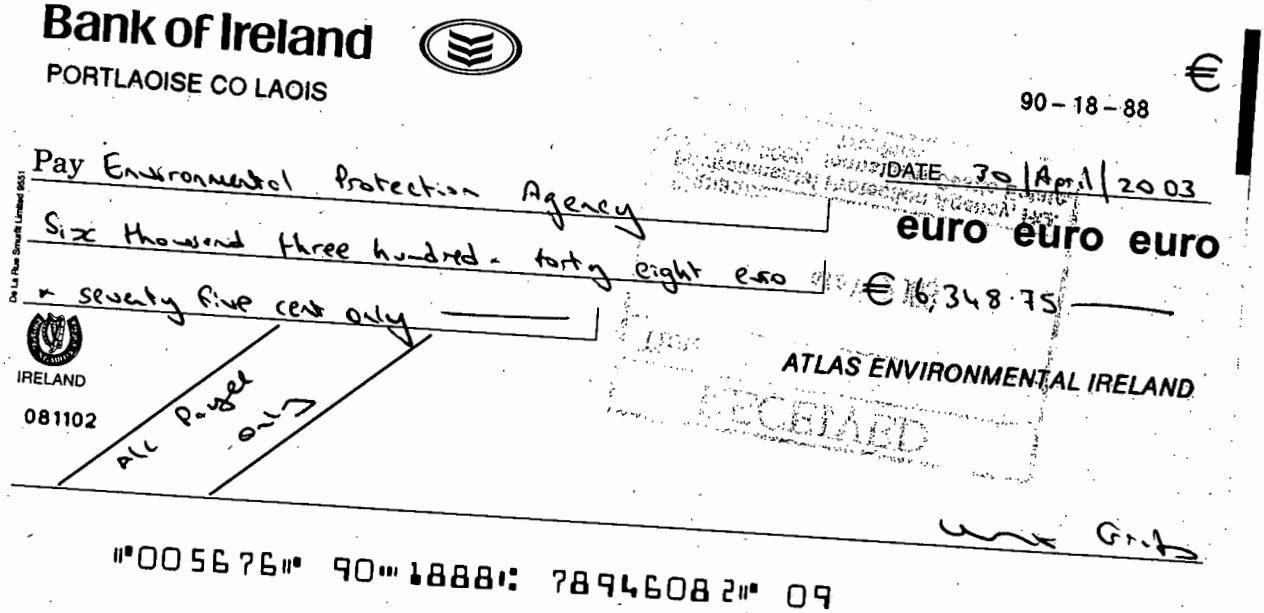

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ATTACHMENT J3

02 July 2001

46605\002\Report

URS

FINAL REPORT

SOIL AND GROUNDWATER INVESTIGATION
ATLAS IRELAND FACILITY,
PORTLAOISE

PREPARED FOR ATLAS IRELAND LTD

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URS Dames & Moore
Iveagh Court
6-8 Harcourt Road
Dublin 2
Ireland

ph: + 353 1 475 4422
fax: +353 1 475 4878

Final

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SOIL AND GROUNDWATER INVESTIGATION
ATLAS IRELAND FACILITY, PORTLAOISE

1.0 INTRODUCTION AND SCOPE OF WORK

1.1 INTRODUCTION

URS Dames & Moore are pleased to present this report, which summarises the findings of a soil and groundwater investigation at the Atlas Ireland facility in Portlaoise, Co. Laois. The field work was carried out between the 01st March 2001 and the 14th March 2001. All work completed was in accordance with our proposal of the 28th July 2000 (reference PRP672/09447/GHW) and as amended on the 11th September 2000.

1.2 PROJECT OBJECTIVES

Section 9.3 of the IPC licence for the facility (No. 472) requires Atlas Ireland to carry out a comprehensive soil and groundwater contamination investigation of the site. Details of the investigation were agreed with the EPA prior to implementation. The objectives of the investigation, in line with EPA requirements, were:

- To assess the extent and severity of shallow soil and groundwater contamination (if any) caused by historic and current use of the site for oil recovery and soil treatment.
- To gain an understanding of the shallow groundwater flow system beneath the site.
- To provide Atlas Ireland with a permanent monitoring network that can be used for on-going monitoring of shallow groundwater quality beneath the site.

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1.3 SCOPE OF INVESTIGATIVE WORKS

The following scope of work was completed in order to meet the project objectives:

- Four shell and auger boreholes were drilled, at locations agreed in advance with the EPA (BH101-BH104; see attached figure). The boreholes were drilled to depths ranging between 5.7and 6.8 m.
- The vertical profile of contamination through the soil was assessed by detailed logging in the field of the soil returns from the borehole. This included field headspace tests on selected soil samples from the drilling returns. Laboratory analysis of selected soil samples was also undertaken. Two soil samples per borehole were taken for laboratory analysis for diesel range organics (DRO); one sample per borehole was analysed for gasoline range organics (GRO), BTEX compounds (benzene, toluene, ethylbenzene and xylene), polyaromatic hydrocarbons (PAH) and metals. The soil samples were taken where field evidence

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(visual/olfactory/headspace results) of hydrocarbon contamination existed. In the absence of such evidence a shallow sample was taken and one near the water table.

- Monitoring wells, comprising 50mm diameter HDPE standpipe piezometers, were installed in each of the completed boreholes. The screened section of each well was placed across the zone of observed groundwater entry to allow ingress of groundwater for sampling, and was surrounded by a coarse silica sand filter pack. A bentonite seal was placed above each filter zone and at surface to isolate the screened section of each well, and to minimise the potential for surface and shallow groundwater entry into each well. Following completion, each of the monitoring wells was developed using the air-lifting technique to enhance the well's ability to exclude fine-grained material and prolong the productive lifespan of the monitoring well. The top of each of the well casings was subsequently surveyed relative to a local datum to allow assessment of groundwater flow direction and hydraulic gradient under the site.

- Groundwater samples were collected from the monitoring wells and analysed for the same parameters as the soil. Samples were collected via inertial-lift type polyethylene tubing, which was dedicated to each well to avoid cross contamination between samples. Before the samples were collected the monitoring wells were purged of at least three volumes of standing water to ensure a water sample representative of that in an aquifer was taken.

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The drilling work and well installation was supervised on a full-time basis by a URS Dames & Moore field engineer, who also logged the drilling returns, and collected soil and groundwater samples for both field and laboratory testing. All soil and groundwater samples were taken using clean latex gloves, which were changed between sampling events to avoid cross contamination between samples. Samples were placed in laboratory supplied sample bottles and stored in a chilled cool box during the site investigation. Prior to shipment to the chosen laboratory of the Alcontrol Geochem Group in Chester, UK, the samples were stored in a fridge in URS Dames & Moore's offices. The samples were conveyed to the laboratory in a chilled cool box by overnight courier, together with chain-of-custody documentation.

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2.0 SITE ENVIRONMENTAL SETTING

2.1 GEOLOGY

2.1.1 Regional Geology

The underlying bedrock in the region is dark grey argillaceous bioclastic limestone from the Lower Carboniferous. This type of limestone is usually thinly bedded.

The Geological Survey of Ireland's 1860's 6" to 1 mile drift geology sheet indicates that the overburden in this part of Portlaoise is limestone gravel. The map does not give any indication of the thickness of this overburden; however, within 1 km of the site is noted an area of bedrock outcrop, so the overburden cover is likely to be thin.

2.1.2 Site Geology

Detailed geological logs from each of the four boreholes are presented in Appendix A, complete with construction details of the monitoring wells installed at each location.

Below is a brief summary of the geological sequence encountered.

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Concrete: Concrete 0.2-0.9 m deep was encountered at each drilling location. In BH102 the concrete was present to a depth of 0.9 m and was reinforced with steel bars.

Fill: Consisting of subangular, angular and subrounded gravel, sand, cobbles and boulders ('hardcore'). Hardcore was encountered in BH104 to a depth of 3.6 m; a water seepage was noted in this borehole at 0.9 m depth. Fill was also encountered in BH103 to a depth of 1.0 m.

Gravelly Clay: Natural gravelly clay was encountered at locations BH101, BH102 and BH103, with a thickness ranging from 3.0 to 4.5 m. The clays were gravelly and varied in colour from brown to grey with an increasing sand content with depth. The gravelly clay was generally damp and soft to firm.

Sand: In BH104, sand was encountered from the base of the fill layer to the base of the hole at 6.8m depth. The sand was gravelly in nature with some cobbles.

Cobbles/Boulders: BH101, BH102 and BH103 were completed within dense cobbles or boulders with a clay matrix. Monitoring wells BH101 and BH 103 were completed on refusal indicating that bedrock may be present at 6.8m and 5.7 m below ground level respectively.

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2.2 HYDROGEOLOGY

2.2.1 Regional Hydrogeology

Groundwater flow in both the fractured bedrock and overlying sediments is expected to mirror the topography and flow to the northeast towards Portlaoise. Groundwater flow in the bedrock is thought to be karstic and is believed to discharge to the Triogue River, which flows north through Portlaoise to the River Barrow.

The bedrock is considered to be a major aquifer in which the groundwater flow is via fractures, some of which may be solutionally enlarged ('karstified'). As the bedrock is overlain by coarse-grained subsoils it is considered to be extremely vulnerable. The subsoils themselves may also constitute a local aquifer and would also be classified as extremely vulnerable to pollution.

The public water supply for Portlaoise is derived from groundwater. The main groundwater source is at Ballydavis to the north-east of Porlaoise town; with an additional source, which is used occasionally, to the south-east of the town on the R426 road. Groundwater may be used for potable supply in the vicinity of the site, however no wells are noted within a 1 km radius of the site in the well record database of the Geological Survey of Ireland.

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2.2.2 Site Hydrogeology

Groundwater was encountered in all four boreholes. Groundwater entry was first observed in each borehole at depths ranging from 2.0 to 5.2 m below ground level. A rapid inflow of water was observed in all boreholes implying relatively high permeability soils. Static water levels in the completed monitoring wells ranged between 1.4 m and 3.8 m below ground level, or between 7.8 and 8.3 m above site datum.

The topographic gradient at the site dips down slightly to the west, however the site has been built up particularly to the rear (east) where up to 1m of concrete and 3.5 m of fill were encountered. The general regional gradient is to the east-north-east. Based on water table elevations measured in the four monitoring wells the groundwater flow direction is to the east, towards a small tributary of the Triogue River.

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3.0 FIELD EVIDENCE OF CONTAMINATION

During drilling no visual or olfactory evidence of contamination was observed at locations BH101 and BH102. Slight hydrocarbon odours were observed during the drilling of monitoring well BH103 to a depth of 1.0-1.5 m; below this no odours were detected and PID readings were below 10 ppm.

During the drilling of monitoring well BH104 a hydrocarbon odour and sheen were detected in the shallow fill material to a depth of 1.0 m, below which there was no evidence of contamination.

During groundwater sampling no hydrocarbon sheen or odour was detected from the groundwater recovered from any of the four monitoring wells.

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4.0 ANALYTICAL RESULTS

The results of the soil and groundwater sampling are compared to Dutch Intervention values where relevant. The Dutch standards have no legal standing in Ireland but are a commonly used tool in the initial screening of analytical results.

4.1 SOIL RESULTS

A total of eight soil samples were analysed for diesel range organics (DRO) and four for gasoline range organics (GRO), the BTEX compounds (benzene, toluene, ethylbenzene and xylene), polyaromatic hydrocarbons (PAH) and the Dutch list of metals. Full details are given in the sample inventory (Table 1).

4.1.1 DRO in Soil

DRO was detected at low levels in all of the eight soil samples analysed, as shown in Table 3. However, it should be noted that the analytical technique for measuring DRO also picks up a range of natural organic compounds, and results of the order of 50 - 60 mg/kg for 'clean' soil are not uncommon. The levels of DRO detected in the soil samples ranged from 18 mg/kg to 69 mg/kg. The highest DRO result of 69 mg/kg was detected from BH101 at a depth of 0.5 m below ground level; this decreased to 21 mg/kg at 5.2 m.

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4.1.2 GRO/BTEX in Soil

With regard to GRO and BTEX (both indicators of petrol contamination), trace levels were detected in two of the four soil samples. Full results are given in Table 4.

The highest level of GRO detected was 0.408 mg/kg from BH104 at a depth of 0.6m. Toluene levels from the same sample were 0.063 mg/kg, which is below the Dutch Intervention Value of 130 mg/kg. Toluene was also detected in BH102 at a depth of 1.5 m at a concentration of 0.022 mg/kg. No other BTEX compounds were detected from this sample. GRO and BTEX levels were below detection limits from those samples analysed from BH101 and BH103.

There is no Dutch Intervention Value for GRO, however, in our experience, concentrations in excess of 50 mg/kg could have significant migration potential, and the risk to sensitive environmental receptors should be assessed in such cases. The threshold of 50 mg/kg was not exceeded any of the four samples analysed.

4.1.3 PAH in Soil

Table 5 outlines PAH results for the soil samples. The Dutch Intervention Value for PAH's in soil is 40 mg/kg calculated as the sum of 10 individual PAH compounds. The respective total PAH concentrations for the four soil samples analysed from the subject site were all well below this. The highest sum of the ten PAH compounds was

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6.16 mg/kg from BH102 at a depth of 1.5 m. This value can be mostly attributed to naphthalene, which was detected at 5.78 mg/kg. In the other three samples naphthalene concentrations ranged from 2.35 to 3.0 mg/kg.

4.1.4 Metals in Soil

The metal results are reported in Table 6. No results above typical background concentrations were reported. All the results from all four soil samples analysed were below the Dutch Intervention Values.

4.1.5 QA/QC – Soil Results

A laboratory duplicate of the soil sample from BH102 at a depth of 1.5m was analysed for all analytical suites. The primary sample results together with the lab duplicate and RPD values are given in Table 11.

For the DRO analysis the RPD values were consistently higher than the expected value of 30%. This may be due to the inherent heterogeneity of the soil.

With regard to volatile results, toluene was detected in the primary sample at 0.022 mg/kg and the total GRO was 0.023 mg/kg. No GRO or BTEX compounds were detected in the laboratory duplicate. This again may be due to sample heterogeneity.

With the exception of the anthracene result the RPD values for the PAH analyses were between 8 % and 25% and acceptable (i.e. below 30%). The RPD value for anthracene was 36%. However, both results for anthracene were low 0.036 and 0.015 mg/kg; the RPD value represents a large difference in two small numbers and is not of concern.

The metals results again had acceptable RPD values being less than 30% with the exception of the results for antimony. Antimony was detected in the primary sample at 3 mg/kg and was not detected above the method detection limit in the lab duplicate. As the level at which was detected is low it is not considered cause for concern. As above, the difference may be due to sample heterogeneity.

The sets of results for the primary sample were consistently above those of the laboratory duplicate and were therefore reported in the tables.

4.2 GROUNDWATER RESULTS

Water samples were taken from each of the four monitoring wells and were analysed for DRO, GRO, BTEX, PAH and Metals. Full details are given in the sample inventory (Table 1).

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4.2.1 DRO in Water

DRO concentrations in the four water samples ranged from 0.23 mg/L in BH101 to 0.13 mg/L in BH104, (see Table 7). Mineral oil concentrations ranged from 0.047 mg/L to 0.081 mg/L. The mineral oil results were all below the Dutch Intervention Value for mineral oil of 0.6 mg/L.

4.2.2 GRO/BTEX in Water

The GRO and BTEX concentrations in the four water samples were all below the method detection limit of 0.01 mg/L.

4.2.3 PAH in Water

The PAH results are tabulated in Table 9. Total PAH concentrations (sum of 10 compounds on the Dutch list) ranged from 0.3 to 3.3 µg/L.

Four PAH compounds were detected in excess of their respective Dutch Intervention Values in some or all of the monitoring well samples. Specifically these compounds were:

- Benzo(k)fluoranthene was detected in all four monitoring wells above the Dutch Intervention Value of 0.05 µg/L, at a highest concentration of 0.084 µg/L in monitoring well BH101.
- Benzo(a)pyrene was detected in all four monitoring wells at, or in excess, of the Dutch Intervention Value of 0.05 µg/L; the highest concentration was 0.085 µg/L in monitoring well BH101.
- Indeno(1,2,3-cd)pyrene was detected in two samples above the Dutch Intervention Value of 0.05 µg/L, the highest value being 0.058 µg/L.
- Benzo(ghi)perylene was detected in all four monitoring wells above the Dutch Intervention Value of 0.05 µg/L. The highest concentration detected was 0.077 µg/L from monitoring well BH103.

The monitoring well with the highest total PAH concentration was BH103; this well is located up-gradient of the main areas of potential impact on site, namely the tank farm and soil treatment stockpile. The monitoring well with the lowest total PAH concentration was BH104, which is located in the south eastern corner of the site, across-gradient from the main potential source areas on site. This suggests that there may be an up-gradient source of PAH impact.

Monitoring well BH101 is located immediately down-gradient of the tank farm. Several PAH compounds were detected in this monitoring well at higher concentrations than in BH102 and BH103, specifically benzo(k)fluoranthene, benzo(a)pyrene and indeno(1,2,3-

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cd)pyrene. This indicates that the site may be contributing to the observed groundwater impact by PAHs.

As there are no known potable supply wells down-gradient of the site this is not considered a major cause of concern. However, groundwater is a regional resource, and the possiblity of future potable supplies or unknown potable supplies being located down-gradient of the site can not be discounted.

4.2.4 Metals in Water

Of the eleven metals included in the analytical suite eight were not detected above the method detection limit in any of the four samples analysed.

Barium was detected in all four samples but was below the Dutch Intervention Value of 0.625 µg/L. The highest concentration of barium detected was 0.26 mg/L from monitoring well BH104.

Zinc was detected in monitoring well BH102 at a concentration of 0.12 mg/L, which is below the Dutch Intervention Value of 0.8 mg/L.

Nickel was detected in three of the four monitoring wells. Monitoring well BH103 yielded a result of 0.077 mg/L of nickel, which is marginally above the Dutch Intervention Level of 0.075 mg/L. In monitoring wells BH102 and BH104 the concentrations were below the Dutch Intervention value. Nickel was not detected in monitoring well BH101.

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All the results of the metals analyses in groundwater are given in Table 10.

4.2.5 QA/QC – Water Results

A field duplicate from BH104 for GRO and BTEX was taken and sent for analysis with the other groundwater samples. No GRO or BTEX compounds were detected in either the primary or duplicate sample. The QA/QC data are given in Table 12.

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5.0 SUMMARY AND CONCLUSIONS

A total of four groundwater monitoring wells were installed at the Atlas Ireland facility in Clonminam Industrial Estate, Portlaoise, Co. Laois. The monitoring wells were installed to enable the assessment of soil and groundwater quality beneath the site and to allow for continued groundwater monitoring at the site in line with the requirements of the site's IPC licence.

During drilling, evidence of minor hydrocarbon contamination in the shallow material was observed in the field. No PID reading was recorded above 10 ppm, indicating a general absence of volatile organic compounds. Laboratory analysis of the soil samples taken confirmed the field observations and did not highlight any zones of contamination with regard to volatile hydrocarbons, diesel range hydrocarbons, polyaromatic hydrocarbons or metals.

During groundwater sampling no field evidence of hydrocarbon contamination was observed. Laboratory analysis of the groundwater samples did not highlight any significant diesel range or volatile hydrocarbon contamination. The detected levels of four PAH compounds were above Dutch Intervention Values in some wells. The results indicated the possibility of an up-gradient source, however they also indicated that the site may be contributing to the observed impact of groundwater by PAHs. Most of the metal results were below the method reporting limit and all results were below the respective Dutch Intervention Values, except for nickel in one well which marginally exceeded the Dutch Intervention Value.

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ooOOoo

URS Dames & Moore is pleased to have had the opportunity to prepare this proposal. Should you wish to discuss any aspect of the proposal please do not hesitate to contact the undersigned.

Yours sincerely
for URS DAMES & MOORE

Edel O'Hannelly
Staff Hydrogeologist

Graham Webb
Senior Engineer

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TABLE 1
Sample Inventory
Atlas Ireland, Portlaoise

Field I.D.	BH101.1	BH101.2	BH101	BH102.1	BH102.2	BH102	BH103.1	BH103.2	BH103	BH104.1	BH104.2	BH104
Depth (m bgl)	0.5	5.2		1.5	4.8		2.3	4		0.6	4.6	
Sample Type	Soil	Soil	Groundwater	Soil	Soil	Groundwater	Soil	Soil	Groundwater	Soil	Soil	Groundwater
Data Source	Atlas Oil Investigation											

Analysis	07/03/01	08/03/01	14/03/01	02/03/01	03/03/01	14/03/01	01/03/01	01/03/01	14/03/01	05/03/01	06/03/01	14/03/01
DRO and Mineral Oil	x	x	x	x	x	x	x	x	x	x	x	x
GRO & BTEX	x		x	x		x	x		x	x		x
PAH Compounds	x		x	x		x	x		x	x		x
Metals	x		x	x		x	x		x	x		x

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TABLE 2
Groundwater Field Measurements
Atlas Ireland, Portlaoise

Field I.D.	BH101	BH102	BH103	BH104
Sample Type	Groundwater	Groundwater	Groundwater	Groundwater
Data Source	Atlas Oil Investigation			

Measurement				
SWL (m bct*)	3.83	3.02	1.4	2.23
SWL (m SD**)	7.8	8.13	8.3	7.77
Purged Volume (L)	30	30	75	75
pH	7.52	6.44	6.8	6.39
Temperature (°C)	10.9	11.6	9.5	9.2
Electrical Conductivity (µS/cm)	389	926	585	545
Observations	Brown very silty water, no sheen, no odour.	Brown, murky turbid water, very silty, no sheen, no odour.	Initially sandy in colour becoming clearer, some silt, no sheen, no odour.	Initially brown and silty, becoming clearer, no sheen, no odour.

m bct* Metres below casing top
m SD** Metres above site datum.

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TABLE 3
Soil Analytical Results - Diesel Range Organics
Atlas Ireland, Portlaoise

Field I.D.	BH101.1	BH101.2	BH102.1	BH102.2	BH103.1	BH103.2	BH104.1	BH104.2
Depth (m bgl)	0.5	5.2	1.5	4.8	2.3	4	0.6	4.6
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Data Source	Atlas Oil Investigation							
Chemical	Dutch I Values	MRL[1]	Units									
Hydrocarbon Compounds												
Diesel Range Hydrocarbons		1	mg/kg	69	21	68	29	40	25	28	18
Mineral Oil	5,000	1	mg/kg	45	9	31	13	18	11	13	8
C_{10} - C_{20} Compounds		1	mg/kg	34	13	34	18	24	15	17	11
C_{21} - C_{30} Compounds		1	mg/kg	27	6	27	9	12	7	8	6
C_{31} - C_{40} Compounds		1	mg/kg	7	2	7	3	4	2	3	2

MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value

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TABLE 4
Soil Analytical Results - Gasoline Range Organics
Atlas Ireland, Portlaoise

Field I.D.	BH101.1	BH102.1	BH103.1	BH104.1
Depth (m bgl)	0.5	1.5	2.3	0.6
Sample Type	Soil	Soil	Soil	Soil
Data Source	Atlas Oil Investigation			

Chemical	Dutch I Values	MRL[1]	Units				
Hydrocarbon Compounds							
GRO (C_4-C_{13})		0.01	mg/kg	-	0.023	-	0.408
Benzene	1	0.01	mg/kg	-	-	-	0.022
Toluene	130	0.01	mg/kg	-	0.022	-	0.063
Ethyl Benzene	50	0.01	mg/kg	-	-	-	-
Total Xylene	25	0.01	mg/kg		-	-	0.045

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MRL[1] Method Reporting Limit

Indicates result in excess of Dutch Intervention (I) Value

- Indicates results below MRL

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TABLE 5
Soil Analytical Results - PAH Compounds
Atlas Ireland, Portlaoise

Field I.D.	BH101.1	BH102.1	BH103.1	BH104.1
Depth (m bgl)	0.5	1.5	2.3	0.6
Sample Type	Soil	Soil	Soil	Soil
Data Source	Atlas Oil Investigation			

Chemical	Dutch I Values	MRL[1]	Units				
PAH Compounds							
Naphthalene		0.001	mg/kg	2.35	5.78	3.00	2.97
Acenaphthylene		0.001	mg/kg	0.034	0.15	0.061	0.036
Phenanthrene		0.001	mg/kg	0.35	0.12	0.12	0.066
Fluoranthene		0.001	mg/kg	0.23	0.038	0.05	0.031
Benz(a)anthracene		0.001	mg/kg	0.082	0.024	0.018	0.012
Chrysene		0.001	mg/kg	0.083	0.022	0.02	0.016
Benzo(a)pyrene		0.001	mg/kg	0.037	0.011	0.006	0.005
Benzo(g.h.i)perylene		0.001	mg/kg	0.022	0.007	0.003	0.003
Benzo(k)fluoranthene		0.001	mg/kg	0.044	0.009	0.006	0.006
Indeno(1.2.3-cd)pyrene		0.001	mg/kg	0.024	0.008	0.003	0.002
PAH's 10 (sum)	40		mg/kg	3.25	6.16	3.29	3.15
Acenaphthene		0.001	mg/kg	0.26	0.57	0.32	0.24
Fluorene		0.001	mg/kg	0.16	0.26	0.13	0.085
Anthracene		0.001	mg/kg	0.069	0.032	0.026	0.017
Pyrene		0.001	mg/kg	0.19	0.033	0.041	0.025
Benzo(b)fluoranthene		0.001	mg/kg	0.11	0.025	0.015	0.015
Dibenz(a.h)anthracene		0.001	mg/kg	0.005	0.005	0.001	0.001

MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value

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TABLE 6
Soil Analytical Results - Metals
Atlas Ireland, Portlaoise

Field I.D.	BH101.1	BH102.1	BH103.1	BH104.1
Depth (m bgl)	0.5	1.5	2.3	0.6
Sample Type	Soil	Soil	Soil	Soil
Data Source	Atlas Oil Investigation			

Chemical	Dutch I Values	MRL[1]	Units				
Metals							
Arsenic	55	1	mg/kg	2	4	1	-
Barium	625	1	mg/kg	69	117	113	18
Cobalt	240	1	mg/kg	3	4	3	3
Chromium	380	1	mg/kg	10	18	18	8
Copper	190	1	mg/kg	9	16	11	7
Molybdenum	200	1	mg/kg	-	2	2	-
Nickel	210	1	mg/kg	10	11	12	11
Lead	530	1	mg/kg	7	45	6	2
Antimony	15	1	mg/kg	3	3	2	1
Zinc	720	1	mg/kg	29	28	23	16
Cadmium	12	0.5	mg/kg	-	-	-	-
Mercury	10	0.3	mg/kg	-	-	-	-

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MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value
- Indicates result below MRL

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TABLE 7
Groundwater Analytical Results - Diesel Range Organics
Atlas Ireland, Portlaoise

Field I.D.	BH101	BH102	BH103	BH104
Sample Type	Groundwater	Groundwater	Groundwater	Groundwater
Data Source	Atlas Oil Investigation			

Chemical	Dutch I Values	MRL[1]	Units				
Hydrocarbon Compounds							
Diesel Range Hydrocarbons		1	mg/L	0.23	0.17	0.15	0.13
Mineral Oil	0.6	1	mg/L	0.081	0.059	0.054	0.047
C_{10} - C_{20} Compounds		1	mg/L	0.093	0.067	0.061	0.053
C_{21} - C_{30} Compounds		1	mg/L	0.12	0.084	0.077	0.067
C_{31} - C_{40} Compounds		1	mg/L	0.023	0.017	0.015	0.013

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MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value

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TABLE 8
Groundwater Analytical Results - Gasoline Range Organics
Atlas Ireland, Portlaoise

Field I.D.	BH101	BH102	BH103	BH104
Sample Type	Groundwater	Groundwater	Groundwater	Groundwater
Data Source	Atlas Oil Investigation			

Chemical	Dutch I Values	MRL[1]	Units				
Hydrocarbon Compounds							
GRO (C_4-C_{13})		0.01	mg/L	-	-	-	-
Benzene	0.03	0.01	mg/L	-	-	-	-
Toluene	1	0.01	mg/L	-	-	-	-
Ethyl Benzene	0.15	0.01	mg/L	-	-	-	-
Total Xylene	0.07	0.01	mg/L	-	-	-	-

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MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value
- Indicates result below MRL

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TABLE 9
Groundwater Analytical Results - PAH Compounds
Atlas Ireland, Portlaoise

Field I.D.				BH101	BH102	BH103	BH104
Sample Type				Groundwater	Groundwater	Groundwater	Groundwater
Data source				Atlas Oil Investigation			
Chemical	Dutch I Values	MRL[1]	Units				
PAH Compounds							
Naphthalene	70	0.01	µg/L	0.13	0.16	2.69	0.11
Acenaphthylene	5	0.01	µg/L	0.011	-	0.09	-
Acenaphthene		0.01	µg/L	0.022	0.015	0.89	0.017
Fluorene		0.01	µg/L	0.022	0.01	0.38	0.011
Phenanthrene	5	0.01	µg/L	0.041	0.028	0.17	0.015
Anthracene		0.01	µg/L	0.015	0.012	0.035	-
Fluoranthene	1	0.01	µg/L	0.037	0.035	0.04	0.025
Pyrene		0.01	µg/L	0.038	0.035	0.041	0.024
Benzo(a)anthracene	0.5	0.01	µg/L	0.023	0.037	0.03	0.011
Chrysene	0.2	0.01	µg/L	0.06	0.05	0.049	0.033
Benzo(b)fluoranthene		0.01	µg/L	0.048	0.04	0.038	0.031
Benzo(k)fluoranthene	0.05	0.01	µg/L	0.084	0.074	0.069	0.051
Benzo(a)pyrene	0.05	0.01	µg/L	0.085	0.072	0.066	0.05
Indeno(1.2.3-cd)pyrene	0.05	0.01	µg/L	0.058	0.053	0.046	0.035
Dibenz(a.h)anthracene		0.01	µg/L	0.025	0.021	0.021	0.017
Benzo(g.h.i)perylene	0.05	0.01	µg/L	0.073	0.07	0.077	0.063

MRL[1] Method Reporting limit
Indicates result in excess of Dutch Intervention (I) Value
- Indicates result below MRL

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TABLE 10
Groundwater Analytical Results - Metals
Atlas Ireland, Portlaoise

Field I.D.				BH101	BH102	BH103	BH104
Sample Type				Groundwater	Groundwater	Groundwater	Groundwater
Data Source				Atlas Oil Investigation			
Chemical	Dutch I Values	MRL[1]	Units				
Metals							
Barium	0.625	0.05	mg/L	0.06	0.11	0.11	0.26
Cobalt	0.1	0.05	mg/L	-	-	-	-
Molybdenum	0.3	0.05	mg/L	-	-	-	-
Zinc	0.8	0.05	mg/L	0.12	-	-	0.05
Mercury	0.0003	0.00005	mg/L	-	-	-	-
Arsenic	0.06	0.002	mg/L	-	-	-	-
Cadmium	0.006	0.0004	mg/L	-	-	-	-
Chromium	0.03	0.001	mg/L	-	-	-	-
Copper	0.075	0.005	mg/L	-	-	-	-
Nickel	0.075	0.01	mg/L	-	0.038	0.077	0.032
Lead	0.075	0.005	mg/L	-	-	-	-

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MRL[1] Method Reporting Limit
Indicates result in excess of Dutch Intervention (I) Value
- Indicates result below MRL

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TABLE 11
Soil QA/QC Data
Atlas Ireland, Portlaoise

Field ID	BH102.1	BH102 DUP	RPD %
Depth (m bgl)	1.5	1.5	
Sample Type	Soil	Soil	
Hydrocarbon Compound	mg/kg	mg/kg	%
Diesel Range Hydrocarbons	68	25	46
Mineral Oil	31	11	48
C_{10} - C_{20} Compounds	34	13	45
C_{21} - C_{30} Compounds	27	10	46
C_{31} - C_{40} Compounds	7	3	40
Hydrocarbon Compound	mg/kg	mg/kg	%
GRO C_4-C_{13}	0.023	-	100
Benzene	-	-	0
Toluene	0.022	-	100
Ethyl Benzene	-	-	0
Total Xylene	-	-	0
PAH Compound	mg/kg	mg/kg	%
Naphthalene	5.78	4.098	17
Acenaphthylene	0.15	0.1	18
Phenanthrene	0.12	0.084	16
Fluoranthene	0.038	0.025	21
Benz(a)anthracene	0.024	0.016	20
Chrysene	0.022	0.015	19
Benzo(a)pyrene	0.011	0.007	22
Benzo(g.h.i)perylene	0.007	0.006	8
Benzo(k)fluoranthene	0.009	0.007	12.5
Indeno(1.2.3-cd)pyrene	0.008	0.005	23
Acenaphthene	0.57	0.397	18
Fluorene	0.26	0.186	17
Anthracene	0.032	0.015	36
Pyrene	0.033	0.022	20
Benzo(b)fluoranthene	0.025	0.017	19
Dibenz(a.h)anthracene	0.005	0.003	25
Metal	mg/kg	mg/kg	%
Arsenic	4	4	0
Barium	117	113	2
Cobalt	4	4	0
Chromium	18	17	3
Copper	16	17	3
Molybdenum	2	1	33
Nickel	11	11	0
Lead	45	49	4
Antimony	3	-	100
Zinc	28	25	6
Cadmium	-	-	0
Mercury	-	-	0

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TABLE 12
Groundwater QA/QC Data
Atlas Ireland, Portlaoise

Field ID	BH104	QA/QC100	RPD %
Hydrocarbon Compound	mg/L	mg/L	
GRO C_4-C_{13}	-	-	0
Benzene	-	-	0
Toluene	-	-	0
Ethyl Benzene	-	-	0
Xylene	-	-	0

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Dublin 2
Ireland

BOREHOLE LOG

BOREHOLE NO.: BH 101

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATION

CLIENT:	Atlas Oil
SITE NAME:	Portlaois
SITE LOCATION:	Portlaois, Co Laois
JOB NO.:	46605-002
LOGGED BY:	Nicola O'Hara
CHECKED BY:	
DATES DRILLED:	05/03/01-08/03/01

DRILLING INFORMATION

DRILLING CO.:	Glovers
DRILLER:	John Sheppard
DRILLING METHOD/DIAMETER:	Shell and Auger
SCREEN TYPE/DIAMETER:	HDPE/ 50mm
SCREEN SLOT SIZE:	1mm
SAMPLING METHODS:	Grab

NOTES:

▽ Water level during drilling

▼ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
				0		CONCRETE		0
	BH101.1					CLAY: light-medium brown/grey, sandy, gravelly, significant cobbles and boulders,	no odour	
				-1		CLAY: light brown, dry, sandy gravelly, significant angular and subangular cobbles,		-1
				-2		CLAY: very stiff, light brown, boulder clay, gravelly, sandy,	no odour	-2
				-3			moist, no sheen, no odour	-3
				-4		CLAY: very stiff, compacted, sandy, dry, some subangular, medium-coarse gravel,		-4
				-5				-5
	BH101.2		▽			CLAY: very stiff, compacted, sandy, dry, some subangular, medium-coarse gravel,		
						GRAVEL: subangular and subrounded, cobbles and boulders, some sand,	no sheen, no odour	
				-6				-6

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BOREHOLE LOG

Page 1 of 1

BOREHOLE NO.: BH 102

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATION

CLIENT:	Atlas Oil
SITE NAME:	Portlaois
SITE LOCATION:	Portlaois, Co Laois
JOB NO.:	46605-002
LOGGED BY:	Caroline Enright
CHECKED BY:	
DATES DRILLED:	01/03/01-03/03/01

DRILLING INFORMATION

DRILLING CO.:	Glovers
DRILLER:	John Sheppard
DRILLING METHOD/DIAMETER:	Shell and Auger
SCREEN TYPE/DIAMETER:	HDPE/ 50mm
SCREEN SLOT SIZE:	1mm
SAMPLING METHODS:	Grab

NOTES:

▽ Water level during drilling

▼ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
				0		CONCRETE		0
				-1		CLAY: soft-firm, mid-brown, friable, some peat, some small-medium subangular gravel,	slightly damp	-1
	BH102.1	1		-2		CLAY: soft-firm, mid-brown with grey/green mottling, friable, some peat, some small-medium subangular and subrounded gravel,		-2
						CLAY: soft, green grey, slightly plastic, some large cobbles,	slightly damp, no odour	
			▼	-3		CLAY: firm to stiff, light grey with green mottling, plastic, large gravel and cobbles	slightly damp, no odour	-3
						CLAY: soft, brown, plastic, marley, large gravel and cobbles		
				-4		CLAY: soft, light brown, plastic, marley, fine-coarse gravel, some cobbles	slightly damp, no odour	-4
						CLAY: soft, light brown, plastic, marley, fine-coarse gravel, some cobbles		
	BH102.2	1	▽	-5		BOULDERS: very hard ground		-5
						BOULDERS: large cobles gravel and boulders, some clay		
				-6				-6
						BOULDERS: some firm clay with fine-coarse gravel, large cobbles		

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BOREHOLE LOG

BOREHOLE NO.: BH 103

TOTAL DEPTH: 5.7m bgl

PROJECT INFORMATION

CLIENT:	Atlas Oil
SITE NAME:	Portlaois
SITE LOCATION:	Portlaois, Co Laois
JOB NO.:	46605-002
LOGGED BY:	Caroline Enright
CHECKED BY:	
DATES DRILLED:	01/03/01-03/03/01

NOTES:

DRILLING INFORMATION

DRILLING CO.:	Glovers
DRILLER:	John Sheppard
DRILLING METHOD/DIAMETER:	Shell and Auger
SCREEN TYPE/DIAMETER:	HDPE/ 50mm
SCREEN SLOT SIZE:	1mm
SAMPLING METHODS:	Grab

▽ Water level during drilling

▼ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
				0		CONCRETE		0
						GRAVEL: dense, grey, clayey, some sand, fine-medium subangular gravel,	slightly damp, slight HC odour	
						GRAVEL: firm, light grey, sandy, clayey, cobbles,	damp, slight HC odour	
				-1		CLAY: firm, light-medium grey, some brown and yellow mottling, sandy gravelly, fine-medium gravel, sub angular and sub rounded, large cobbles	slightly damp, slight HC odour	-1
						CLAY: soft, medium grey, plastic, some gravel fine-coarse, some sand, cobbles	damp, no odour	
				-2				-2
	BH103.1	4				CLAY: firm, brown/grey, slightly plastic, some sand, some gravel fine-coarse, cobbles	damp, no odour	
				-3				-3
	BH103.2	1	▽	-4		CLAY: soft-firm, brown-grey, gravelly fine-coarse, slightly plastic	damp, no odour	-4
				-5		CLAY: soft, brown-grey, gravelly fine-coarse, slightly plastic, some cobbles		-5
						BOULDERS: black/grey, very hard ground		

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Ireland

BOREHOLE LOG

BOREHOLE NO.: BH 104

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATION

CLIENT:	Atlas Oil
SITE NAME:	Portlaois
SITE LOCATION:	Portlaois, Co Laois
JOB NO.:	46605-002
LOGGED BY:	Nicola O'Hara
CHECKED BY:	
DATES DRILLED:	05/03/01-08/03/01

NOTES:

DRILLING INFORMATION

DRILLING CO.:	Glovers
DRILLER:	John Sheppard
DRILLING METHOD/DIAMETER:	Shell and Auger
SCREEN TYPE/DIAMETER:	HDPE/ 50mm
SCREEN SLOT SIZE:	1mm
SAMPLING METHODS:	Grab

▽ Water level during drilling

▼ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
				0		CONCRETE		0
	BH104.1			-1		FILL: dense, hardcore some clay,	HC odour, sheen	-1
			▼	-2				-2
			▽	-3			no odour, no sheen	-3
				-4		GRAVEL & SAND: medium grained gravel,	no odour, wet	-4
	BH104.2			-5		SAND: medium-coarse grained, medium to coarse gravel angular and subangular, angular and subangular cobbles,	no odour	-5
				-6		SAND: as above, except more gravel content		-6

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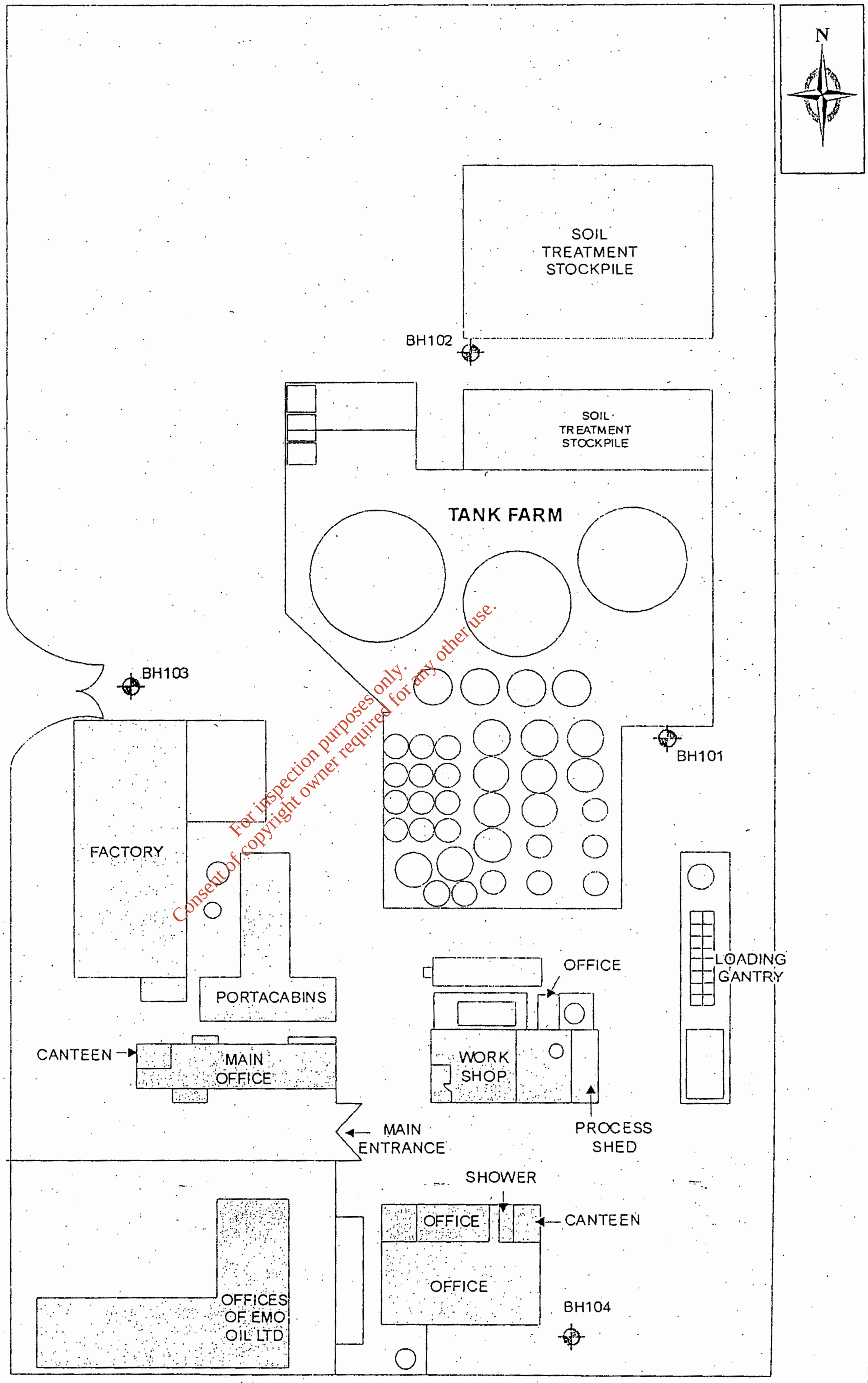

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Title	BOREHOLE LOCATION PLAN	App'd	Reference EOH/DB/DUB	Date APRIL 2000
Project	PHASE II SITE INVESTIGATION	TI App'd DB	Job No. 46605-002-447	Scale NTS
Location	CLONMINAM INDUSTRIAL ESTATE	URS	Dames & Moore, Iveagh Court, 4th Floor, 6-8 Harcourt Road, Dublin 2, Ireland. Tel: + 353 (0) 1 475 4422 Fax: + 353 (0) 1 475 4578 www.urscorp.com	FIGURE 1
Client	ATLAS IRELAND			

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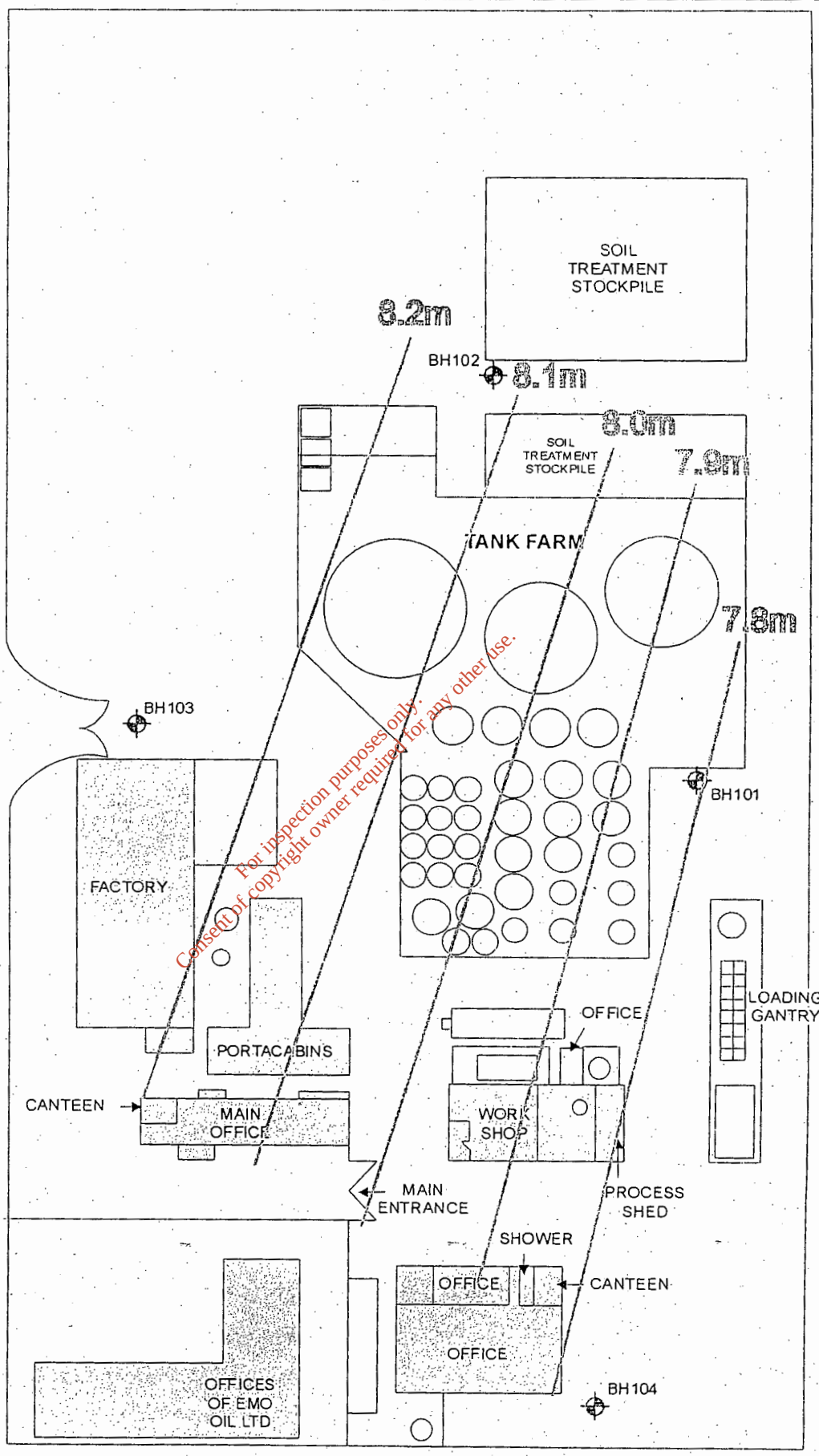

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Title	INFERRED PIEZOMETRIC CONTOURS
Project	PHASE II SITE INVESTIGATION
Location	CLONMINAM INDUSTRIAL ESTATE
Client	ATLAS IRELAND

App'd	Reference	Date
	EOH/DB/DUB	APRIL 2000
TI App'd	Job No.	Scale
DB	46605-002-447	NTS

URS
Dames & Moore
O'Brien Reidberg
Hamilton Colquhoun

Dames & Moore
Iveagh Court, 4th Floor
6-8 Harcourt Road
Dublin 2
Ireland
Tel: + 353 (0) 1 475 4427
Fax: + 353 (0) 1 475 4878
www.urscorp.com

FIGURE 2

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