Figure 5.3 Aerial View of the Proposed Amendments (March 2012)

5.4.6 AMMONIA AND FUEL OIL STORAGE TANKS – FUTURE ADDITIONAL CAPACITY

It is anticipated that at some future date, additional storage capacity on site for Ammonia and Fuel Oil would be beneficial to operational efficiency. This would enable the frequency of deliveries to be optimised. Currently, the storage capacity for Fuel Oil is 44m^3 and Ammonia is 62m^3. If determined that additional capacity is necessary, it is proposed to install duplicate storage tanks beside the existing storage tanks, in effect doubling the capacity of each. The layout of the possible additional tanks are shown on Figure 5.4 The addition of an extra oil tank would also allow for the possibility to burn waste oil to balance with the burning of low CV wastes but only when the temperature in the furnace is above 850°C.

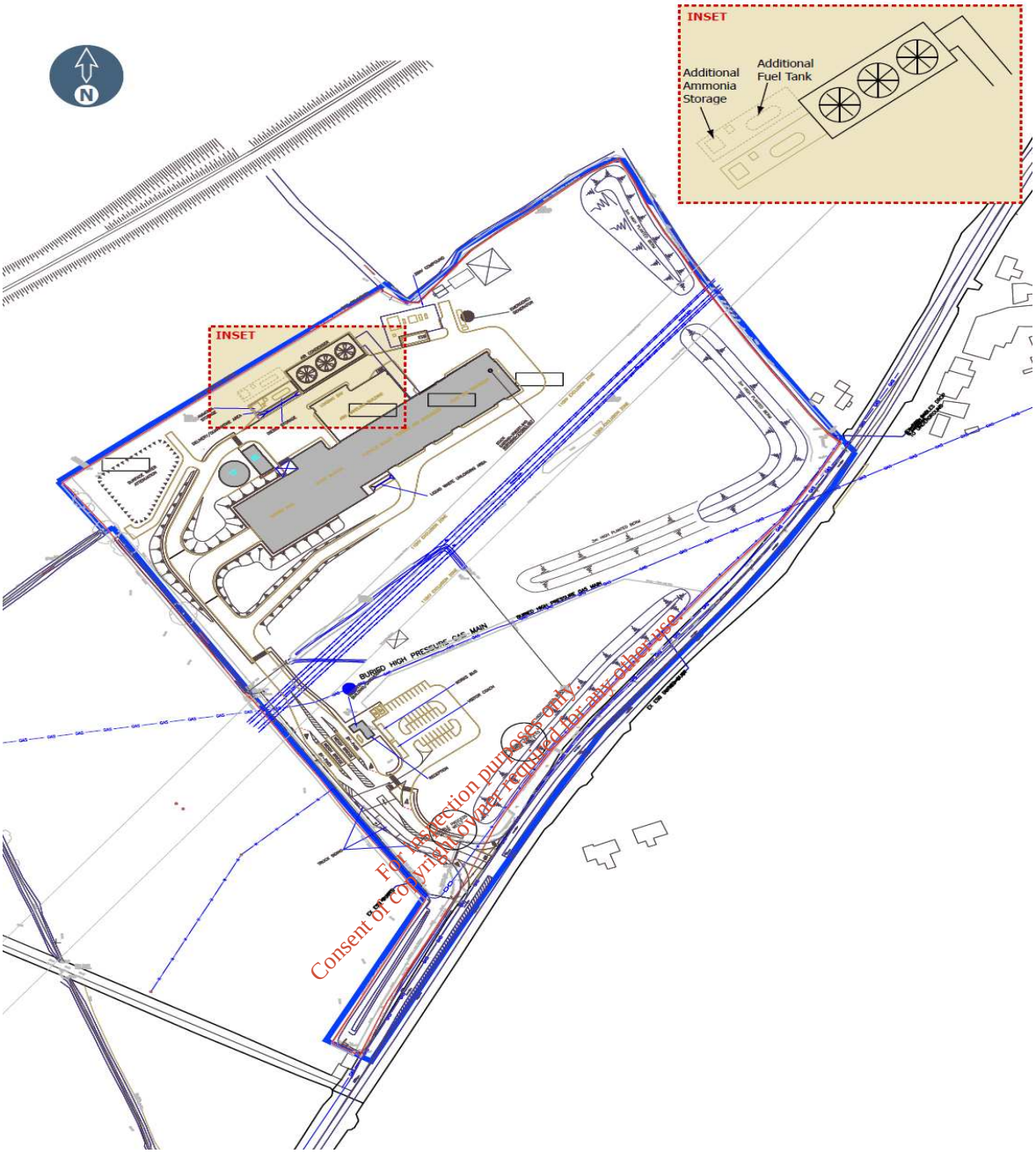

Figure 5.4 Proposed Additional Ammonia and Fuel storage

5.5 GENERAL OPERATION

As described in Section 5.4, the main impact on general operations would be the extension of the hours of waste acceptance and the removal of the restriction on the dispatch of residues from the site. An examination of delivery and dispatch patterns of the now operational facility reveal that 12% of the daily movements occurred between the hours of 08:00 and 08:30. A similar peak between 13:00 and 13:30 of 10% has been recorded. The half hour periods between 08:30 and 13:00 reflect an average of 5%, and the afternoon half hour blocks between 13:30 and 18:30 reflect an average of 3%. The

change of the hours of waste acceptance will allow for a more measured distribution of waste deliveries to the site which will also reduce the impact on the peak hour traffic flows on the local road network.

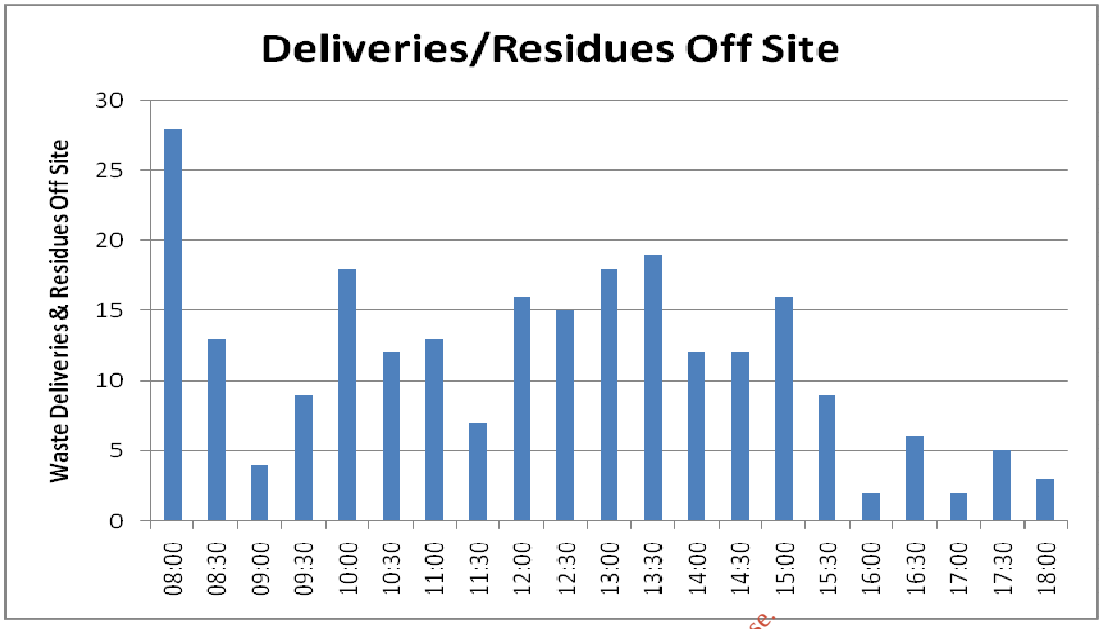

Figure 5.5 Data from MCC Traffic Survey 21-26 November 2011

It is foreseen that only minor adjustments will have to be made to the existing Waste Acceptance Procedure and Waste Handling Procedure (ENV 01.00 and ENV 02.00 respectively) to reflect the acceptance of the proposed additional waste codes. These procedures are included in Appendix 5.2 and 5.3 and this topic is discussed in detail in Section 5.6.1 below.

The location of the Central Maintenance Depot on the site will facilitate business continuity for the plant, as well as Indaver's facilities in Dublin Port and (proposed) Cork WTE. As discussed in Section 5.4 there will be an additional 2-3 persons on site to manage this storage and warehouse facility. The impact of the additional personnel is discussed in section 5.8.

5.6 PROCESSES

An assessment of the impacts of the additional tonnage and waste types is outlined in the following sections. The incineration process and associated flue gas cleaning and energy recovery systems are unchanged from that outlined in the EIS of 2009. A schematic of the process is shown below in Figure 5.5

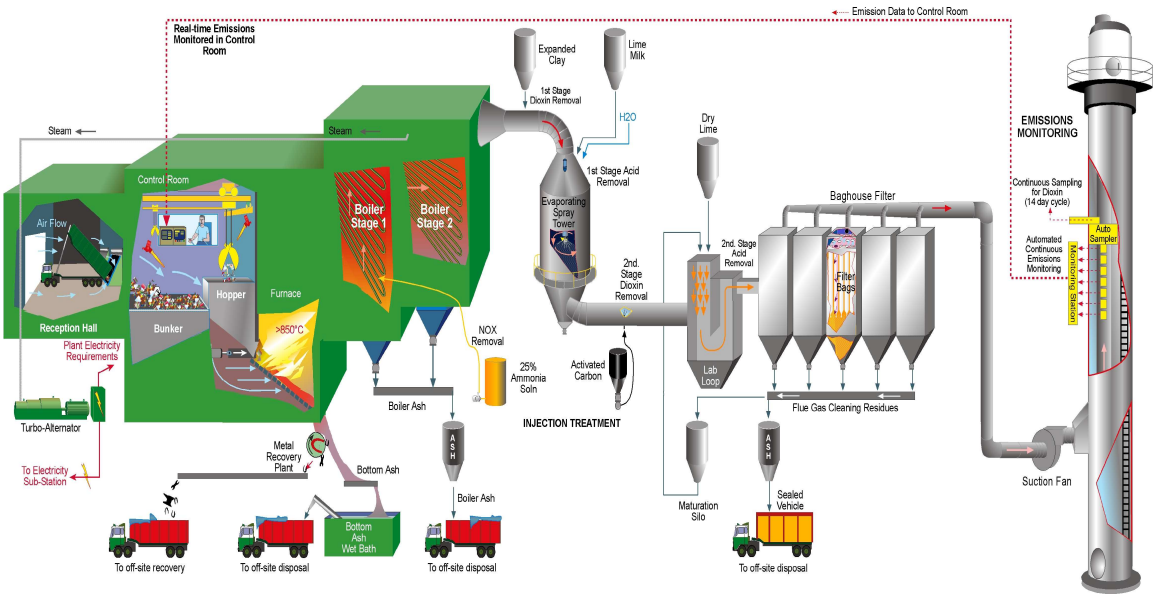

Figure 5.6 Process Schematic

5.6.1 Waste Characterisation and Classification

Specific BAT (Best Available Techniques) for hazardous waste incineration Section 5.4 (69) states that "knowledge of the process or origin of the waste is important as certain hazardous characteristics are difficult to determine analytically". This would apply to some types of material proposed for the Meath WTE which are mainly made up of mixed types of solids, and thus standard laboratory analysis is not possible. For example, one such stream which has been specifically identified is bales of PPE (Personal Protective Equipment), empty plastic bottles, bags and liners contaminated with pharmaceutical residues. Where each bale may vary in proportional composition, the components and contaminants will remain constant. The production process, its location on site, and all possible feed streams were explored with the waste producer before it's suitability for the Meath WTE was determined.

The above process will be applied to all waste streams that are identified as being suitable for the Meath WTE. Liquid wastes (hazardous & non-hazardous) will be sampled and analysed to ensure that the composition is well known and is suitable for treatment.

A complete screening of any proposed waste streams will be done, to ensure that the waste streams will;

- Have a known calorific value range
- Have a known flashpoint range > 55°C
- Not contain elevated levels of PCBs, Halogens, heavy metals or radioactive material.
- Comply with the requirements of IED (Industrial Emissions Directive 2010/75 EU); Art. 45.2 (a) and Art. 52.3

Competence, Procedures and Traceability

Indaver Ireland Ltd. has a Technical Team (part of the Quality, Environmental, Safety & Health (QESH) Dept) whose responsibility is waste classification. The Technical Team consists of highly qualified personnel known as Technical Advisors.

As many of the proposed waste streams are currently being exported, they have been classified by the Technical Team of Indaver Ireland Limited, to comply with the very strict transport regulations of ADR & IMDG, EC1013/2006, as well to ensure they meet the acceptance criteria of the Waste Outlet to which they are being sent. This is in accordance with Indaver Ireland Procedure Operations 4.2 "Classification and Identification of waste". This procedure is included in Appendix 5.2

The Technical Advisor will consult all the necessary regulations/legislation to determine the waste classification.

Currently waste is classified under the following criteria:

- UN Number(s)
- PSN (Proper Shipping Name):
- Class/Subrisk(s)
- PG (Packing Group)
- Limited Quantities if applicable
- Marine Pollutant if applicable
- Segregation rules (from IMDG)
- EWC Code
- Hazard Characteristics (Waste Mgmt. Act 1996)
- Ozone depleting substance or not
- Controlled drug or not

Waste Handling

It is foreseen that only minor adjustments will have to be made to the existing Waste Acceptance Procedure (Env 01.00) and Waste Handling Procedure (ENV 02.00) to reflect the proposed additional waste codes, as the wastes will still ultimately be tipped into the waste bunker and fed to the furnace using the grab cranes. Extra precautions may also have to be taken for inspecting waste loads, but this will relate mainly to additional PPE requirements for the operators. The only exception to this would be if infectious waste (EWC Code 180103*) was to be accepted at the plant and in this case a direct feeding method of this waste to the furnace would have to be provided. This is a requirement of the BAT Guidelines (Section 5.6) and the Industrial Emissions Directive (Article 50.6) which state that infectious clinical waste must be placed straight into the furnace without being mixed and without direct handling. This waste is typically delivered in closed wheeled bins and will be placed on a mechanical bin lift system to avoid any direct handling of the waste. The direct feeding system will be located in the

reception hall, and will consist of a closed conveyor system which will feed the waste directly into the furnace. Hence, this waste would not be introduced to the bunker and mixed with the other wastes. Prior to acceptance of any infectious clinical waste, the Meath WTE will ensure full compliance with these criteria.

As is currently the case, new customers or new waste streams from existing customers for MSW are assessed both in advance of their arrival at the site also upon arrival. This will also be the case for the separately collected fractions of waste carrying a hazardous EWC code. The screening of these wastes will ensure for example that no wastes with a low flash point are accepted at the facility.

Wastes carrying a hazardous EWC code will be tipped into the bunker directly from the reception hall and hence no extra handling procedures are proposed for the acceptance of such solid wastes. Liquid wastes with non-hazardous EWC codes are currently permitted to discharge directly into the furnace. These liquid wastes are typically water with various contaminants that make them unsuitable for treatment at waste water treatment plants or physico-chemical treatment plants and hence must be incinerated. It is proposed that the same types of wastes (high water content) which, due to the nature of the contaminants contained within, require them to have a hazardous EWC code can be treated at the facility. The same method of direct injection would be used and hence no changes are proposed to the waste acceptance and handling techniques at the plant. It is not proposed to accept solvents or highly chlorinated wastes (>1% Chlorine) for direct injection at the plant.

5.6.2 Moving Grate Incinerator

The new waste streams proposed have been selected based on the successful treatment of such wastes in similar grate furnace technology throughout Europe. Hence, the waste streams proposed do not pose a difficulty for the grate furnace which is a proven robust technology. Grate furnace installations such as the one owned by AVR in Rotterdam and the Ekokem plant in Finland are taking similar waste types successfully.

5.6.3 De-NO_x - Ammonia Solution Injection

The production of NO_x during the incineration process is primarily a result of the air supplied to support the combustion process. NO_x production and hence the efficiency of removal of NO_x will not be affected by the additional tonnage or new waste streams proposed as the addition primary air (supplied to support combustion on the furnace itself) and secondary air (provided in the space above the furnace to ensure complete combustion of the off-gases) is balanced depending on the CV value of the incoming waste. Hence, with more low CV value waste, more primary air is required to support combustion on the grate but less secondary air is needed to ensure complete combustion of the off-gases. Likewise, with higher CV value waste, less air is required on the furnace to support combustion but more secondary air is required to ensure complete combustion of the off-gases. To adopt a

conservative approach on the use of raw materials and the traffic movements to the site however, a 10% increase in ammonia and water solution is used.

5.6.4 Waste Heat Boiler

There will be no impact on the waste heat boiler as the boiler is designed based on thermal capacity and as stated previously will allow for a more stable steam production by running the plant at full capacity at all times.

5.6.5 Steam/Turbine Generator

Again, there will be no impact on the turbo-generator as it is designed to run at full plant load.

5.6.6 Expanded Clay Injection (1st Stage Dioxin Removal System)

It is likely that the rate of clay injection will not change as a result of the new wastes proposed. The clay is injected at a fixed rate and this rate has been previously defined based on a very conservative assessment of the potential dioxin & furan concentrations in the raw flue gases. This is borne out by the analysis results for dioxins in the flue gases which as seen in Appendix 5.1 are on average 100 times below the limit value. The clay injection is also backed up by the injection of activated carbon further downstream in the process. Adopting a conservative approach in the usage of raw materials (and associated traffic movements), an estimated increase of 10% has been projected.

5.6.7 Evaporating Spray Reactor (1st Stage Acid Removal)

As is currently the case, the evaporating spray reactor is controlled by monitoring of the concentration of HCl, HF & SO2 in the stack in conjunction with the concentration of these pollutants measured at the exit of the boiler in the untreated flue gases. The rate of lime addition is adjusted to control the above parameters to set levels. This will not change with the addition of the new wastes or capacity but the use of lime may increase if there are elevated levels of chlorine or sulphur in the raw flue gases and to ensure levels in the stack are kept well below the emission limit value set in the licence. The plant is currently operating well below the limits set for HCl, HF & SO_2 which can be seen in Appendix 5.1.

5.6.8 Activated Carbon Injection (2nd Stage Dioxin Removal System)

It is likely that the rate of activated carbon injection will not change as a result of the new wastes proposed. The activated carbon is injected at a fixed rate and this rate has been previously defined based on a very conservative assessment of the potential dioxin & furan concentrations in the raw flue gases. However as with the case of expanded clay above, an estimated increase in usage of 10% has been projected. Again, results for dioxins in the flue gases as shown in Appendix 5.1 are on average 100 times below the limit value.

5.6.9 Dry Lime Injection (2nd Stage Acid Removal System)

As is currently the case, the rate of addition of dry lime into the flue gases is controlled by monitoring of the concentration of HCl, HF & SO2 in the stack and in the raw flue gases. The rate of lime addition is adjusted to control the above parameters to set levels. This will not alter with the proposed changes but the use of dry lime may increase if there are elevated levels of chlorine or sulphur in the raw flue gases and to ensure levels in the stack are kept well below the emission limit value set in the licence. The plant is currently operating well below the limits set for HCl, HF & SO_2 as can be seen in the results in Appendix 5.1

5.6.10 Baghouse Filter (Dust Removal System)

The operation of the baghouse filter will not be impacted by the proposed changes. If there is an increase in the addition of lime as a result of the proposed changes, the modules of the baghouse filter and the surface area of the bags themselves are designed to cope with this increase. There is also one module of the six modules within the baghouse filter that is fully redundant to allow for the changing of bags whilst the facility is still in operation.

5.6.11 Induced Draft Fan & Stack

The operation of the ID fan and the maintaining of underpressure in the furnace will not be impacted by the proposed changes as the fan has been designed based on the maximum flue gas flowrates associated with the operation of a furnace and boiler of 70MW capacity. The stack diameter and height has been determined by the air emission modelling exercise carried out as part of the 2006 & 2009 EIS's. As explained in Section 5.7 below, the modelling exercise was robust and does not need to be reviewed on the basis of the proposed changes.

5.6.12 Ash Handling

There are no changes proposed to the handling of the ash residues as a result of the proposed changes. A conservative 10% increase in residue production is assumed in order to ensure that a robust assessment of changes to traffic flows to and from the site is done. The additional EWC codes applied for will not impact the composition of these residues. The increases are outlined in the following table.

RESIDUE TYPE	ESTIMATED TONNAGE 2009	PROJECTED TONNAGE 2012[1]	ESTIMATED TONNAGE[2]
Bottom Ash	50,000	54,000	59,400
Boiler Ash	3,000	1,360	1,500
Flue Gas Cleaning Residues	10,000	7,500	8,200
TOTALS	63,000	62,860	69,100

[1] Based on actual operational plant data from 2012
[2] Assuming a 10% increase in residue production

The Bottom Ash is non hazardous and is currently sent to landfill locally. The Flue Gas Residues and Boiler ash are currently sent for re-use in the remediation of salt mines in Germany. The increase in residues produced will result in a small increase in traffic movements to dispose/re-use of the residues. The impact of this is discussed in detail in Chapter 13. Based on experience from other grate furnaces in Europe burning additional wastes of the type proposed, the classification of the bottom ash will remain unchanged. The classification of the other residues produced will also remain unchanged.

5.7 DESCRIPTION OF PROCESS INPUT AND OUTPUT REQUIREMENTS

The EIS of 2009 assessed the impact of the inputs and outputs from a facility with a "nominal" capacity of 200,000 tonnes per annum. The capacity of an incineration plant is based on the thermal design capacity and the calorific value of the incoming waste combined with the amount of available operating hours per annum (plant availability). The plant, because of its thermal design capacity (70 MW) and the fact that the incoming waste is of a lower calorific value than expected, can therefore process more tonnage per annum than originally anticipated.

As conservative estimates were used in the 2009 assessment, the request for an additional 20,000 tonnes per annum (10% tonnage increase) does not correlate directly to a 10% increase in raw materials used or in residue production. However, in order to ensure a robust assessment of the extra traffic movements to and from the facility, the worst case scenario has been taken and the 10% increase has been applied to raw materials usage and residue production in addition to the increase in waste input.

The main inputs are waste, water, raw materials and light fuel oil. The main outputs are ash, electricity and emissions from the stack. The additional water requirement will be approximately 3.52% (about 300 litres per hour). There will be no additional fuel oil requirement as a result of the proposed change, indeed the use of fuel oil may decrease if the addition of waste oil (EWC 13 07 01*) is granted.

Raw Materials Use

The use of raw materials may increase as described above and these changes are outlined in the table below.

Use	Raw Material	Estimated 2009 (kg/hr)	Actual 2012 (kg/hr)	Proposed (kg/hr)
Flue gas cleaning	Hydrated Lime	13.4	140[3]	154
Flue gas cleaning	Quicklime	307.2	320[3]	352

[3] Consumption of hydrated lime and quicklime are on average higher than expected due to commissioning phase and prior to fine tuning of the installation

Flue gas cleaning	Activated Carbon	13.4	16.5	18
Flue gas cleaning	Expanded Clay	26.7	27.5	30.25
Flue gas cleaning	Ammonia Solution	130	75	82.5
De-mineralisation	Ammonia Solution	3.8	5	5
De-mineralisation	Hydrochloric Acid*	3.8	Not Used	Not Used
De-mineralisation	Nitric Acid*	-	0.5	0.5
De-mineralisation	Sodium Hydroxide	3.5	5.8	5.8

*Nitric acid was substituted for hydrochloric acid in the demineralization process

Ash

The proposed changes to the ash quantities are outlined in section 5.6.12 above.

Electricity

The amount of electricity produced is limited by the thermal capacity of the boiler; the electrical design output is 18MW, with 2MW required for running the plant, giving a net export of 16MW to the national grid. The current output is averaging at 16.56MW due to lower calorific value of waste and the plant being in a start-up phase and not operating at 100% capacity.

As the plant moves out of the start-up phase and with the proposed new waste types assisting in raising the average Calorific Value of the waste, this will reach the 16MW net export to the grid predicted.

There will be a small increase in electrical demand associated with the office accommodation and warehouse, but the load in these areas is required only for space heating and lighting.

Stack Emissions

In the 2006 EIS and subsequently in the 2009 EIS Amendment application, the emissions from the plant were assessed based on the maximum allowable limits in the Waste Incineration Directive (which will be replaced by the Industrial Emissions Directive 2010/75/EU) and 110% of the estimated flue gas flow rate at the plant nominal capacity. Recent measurements of the short term average nominal flue gas flowrate have shown that the flue gas flowrate is higher than was anticipated and in order to ensure that assessment from 2009 was still valid, the model was re-run and shows (as explained in Section 7.4) that the variation in flowrate does not materially alter the original conclusions and that the

assessment is still valid. This, combined with the fact that the actual emissions from the plant are well below the limits modeled, ensures that the assessment of the impact on air quality is robust.

The lower average calorific values of the waste as currently recorded can be caused by either higher water content or the inclusion of inert material (stones, ceramics, metals etc) which do not combust. The water, when converted to water vapour in the process is not calculated as part of the overall flue gas flowrate for the purposes of reporting and modeling, as the reference condition is dry and hence the additional weight of the water does not add to the flue gas flowrate. If inert waste is causing the lower CV of the waste, then this waste does not contribute to the incineration process and hence acts as ballast in the system and the weight of this material in the waste does not contribute to the flue gas flow either. The requested additional tonnage of 20,000 tonnes per annum is to guarantee that the plant can operate at full thermal capacity and an increase in the annual average flowrate is not anticipated as result of the additional tonnage.

The next point to consider is the effect of the proposed additional waste types on the measured levels of pollutants in the stack. Again, it is important to stress that the types of new waste proposed in this application are of similar characteristics as material already being treated successfully on site and will not impact on the emission limit values currently in place. This combined with the two stage dioxin removal and acid gas removal system provides a buffer in the capacity to treat elevated levels of pollutants in the raw flue gases if they do occur. The upstream measurement of pollutants in the raw flue gases also ensures that correct amounts of lime are added to the flue gases at each step to keep the emission values measured in the stack well below the limits specified in the waste licence. The addition of activated carbon and expanded clay at the two stages in the system is set to a fixed rate that is conservative to ensure that the measured levels of dioxins are well below the limits set. Additional ammonia solution can also be added to manage NO_x levels in the stack, but as explained in Section 5.6.3 above, the production of NO_x is more related to the total amount air introduced into the furnace and overall does not change relative to the type or quantity of waste input. Hence, Indaver is confident that the addition of the proposed new waste types will not materially alter the emission values in the stack and that the measured values will continue to be well below the limits set in the waste licence, The current measured emission values have been presented in Appendix 5.1

5.8 OCCUPANTS/STAFFING

Currently, there are 20 shift workers who work in teams of 4 to run and control the plant on a 24 hour basis. There are another 22 employees split between the following functions:

- Management and Administration
- Operations
- Quality Control and Assessment
- Maintenance

Other persons who may be on site intermittently would include:

- Visiting Staff from other Indaver Sites (both in Ireland and Europe)
- Contractors employed for servicing or repairs
- Educational visits/Site Inspections from a broad range of companies and institutions.

The proposed establishment of a Centralised Maintenance Department in one of the structures will result in an increase of staffing levels by 2-3 persons.

The conversion from temporary to permanent of the single storey modular office block is proposed in order to accommodate visiting staff, contractors and so on, away from the main working areas and offices of the facility. Additional meeting rooms and general office storage and filing space are proposed for this structure also.

5.9 DESCRIPTION OF NATURAL RESOURCES USED

Requirements for natural resources are discussed under Section 17 – Material Assets

5.10 DESCRIPTION OF SECONDARY PROCESS/ACTIVITIES

Off Site Traffic Movements

As stated in Section 5.12, there will be a small increase in traffic to take waste residues off site. This is discussed in Chapter 13. The upgrade of the R152 road outside the plant has been completed to the satisfaction of Meath County Council as required under permission PL.17.219721. There are no further upgrades required to accommodate the proposed amendments. This has been outlined in Chapter 13 Traffic.

On Site Waste/Personnel Movements

The proposed amendments will involve no change to the manner in which on-site traffic is managed. The waste material transported to the facility is directed to the waste reception and processing building for unloading into the waste bunker. Staff are provided with parking facilities located to the east of the gatehouse and weighbridges. No unauthorised personnel are permitted access beyond the gatehouse.
The conversion of the single storey modular office building is designed to keep pedestrian traffic away from the office area of the main facility.

Electricity Generation & Substation

The waste-to-energy plant exports electricity to the local electrical distribution system via a 38 kV line to Rathmullan Substation about 2.5km north of the site. The line is installed as an underground cable and hence does not have any visual impact.

Water

The mains water supply piped along the R152 road supplies many of the residential dwellings in the area. The development uses a small quantity of mains water as a potable supply for the facility. On site water well(s) were installed at the site in June 2011. These are used to supply process water within the facility as detailed in Section 5.7 above.

Sanitary Services

Domestic sewage from toilets, changing and kitchen areas discharge via the foul drainage system into the on site effluent treatment system which pass through a percolation area to ground as detailed in Chapter 9 and 10. There are currently two such percolation areas, one for the main process building facilities and one for the gatehouse. An additional effluent system is proposed for the modular office block as described in Chapter 1.

Telecom

A telecommunications network is in place to the main process building and to all areas of the site where telemetry or remote monitoring is required. All cables are underground and ducted. The proposed amendments do not entail any changes to the existing network.

Monitoring

It is not anticipated that any additional environmental monitoring will be required as a result of the proposed changes. The review of the existing waste licence with the EPA will identify any such requirements.

Security

The proposed amendments do not entail any change to Site Security procedures. All traffic (both vehicular and pedestrian) to the main site must route through the Gatehouse. This is manned by Security Personnel who ensure the procedure for access to site are followed.

A record is kept of all visitors to the site, as well as deliveries and dispatches of waste. All visitors to the site are monitored and supervised at all times.

There is 2.4m high palisade fencing along the frontage to the R152 and the remaining site perimeter boundaries consist of a 2.4m chain link fence.

There are also CCTV cameras at strategic locations around the site which are displayed in the control room.

5.11 REGULATORY CONTROL

In order to operate the waste management facility, Indaver require a licence from the EPA. Indaver currently have a waste licence (ref. W0167-02), and this EIS has also been prepared for a licence review application to the EPA to increase the annual tonnage and to add the new waste types proposed.

5.12 DESCRIPTION OF DECOMMISSIONING

A detailed Closure, Residuals and Aftercare Management Plan (CRAMP) and Environmental Liabilities Risk Assessment (ELRA) have been prepared and submitted to the EPA as part of compliance with Condition 10 of the Waste Licence. As part of this exercise, the costs associated with closing the facility were identified and a bond has also been put in place to the satisfaction of the EPA to cover these costs.

Indaver is currently in discussion with Meath Co. Co. to ascertain if there are additional bonding requirements to meet the planning conditions set out in Conditions 27 & 28 of PL.17.219721.

5.13 DESCRIPTION OF OTHER DEVELOPMENTS

5.13.1 Design & Construction Health and Safety

The facility has been built in accordance with the Safety Health and Welfare at Work Act, 2005, Health, Safety and Welfare at Work (General Application) Regulations, S.I. No. 299 of 2007 and associated Regulations.

The plant was designed and built by skilled personnel according to internationally recognised standards, design codes, legislation, good practice and experience.

Disabled access certificates will be applied for to cover the modular office building and the Central Maintenance Depot.

5.13.2 General Operational Safety

No changes are proposed to the systems and general approach to operational safety. Design Review Risk Assessments including Hazard and operability studies (HAZOPs) were carried out at the detailed design stage of the project. These studies were a systematic method of identifying design hazards and determining necessary mitigation measures.

As outlined in Section 5.6 wastes that will pose a danger to Indaver Personnel or the facility will not be accepted on site, and the screening procedures will ensure that wastes accepted will not require any additional safety aspects to be implemented (other than direct feed for potentially infectious wastes). The transport, acceptance and handling of all materials will be in accordance with all the existing procedures.

Indaver operates a combined Quality, Environmental, Safety & Health (QESH) Management System. It is proposed to apply all of the internationally recognised quality, environmental and health and safety standards/assessment series of our existing hazardous waste business (which operates to ISO 9001:2000, ISO 14001 and OHSAS 18001) to the Meath Facility also.

The QESH policy are the top-level documents of each of these management systems. It defines Indaver's overall aims and objectives with respect to the provision of a quality service to customers, the provision of a quality workplace to employees and the control over the environmental and health & safety impacts of its activities respectively.

Indaver carries out Health & Safety Risk Assessments to identify the health & safety hazards associated with Indaver's activities, assess the level of risk presented by those hazards and determine appropriate safety controls to prevent/minimize risk. The Risk Assessments will be updated to incorporate the proposed new activities at the facility.

Prior to start up a comprehensive set of operational procedures covering all aspects of the different activities were drawn up. The purpose of these procedures is to ensure that Indaver:

- Maintains control over the environmental, quality and safety aspects of its activities;
- Meets the aims laid down in the Environmental, Quality and Health & Safety Policies; and
- Remains compliant with all relevant operating licences, permits and legislative requirements.

In compliance with the Safety, Health and Welfare at Work Act, 2005, Indaver Ireland drew up a safety statement covering the operation of the plant.

The Employees of Indaver represent the Company's greatest asset. By providing opportunities, facilities and financial resources, the Company aims to ensure that all members of staff are in possession of the knowledge, skills and experience necessary to perform their jobs to a satisfactory standard.

The incineration process is controlled manually and automatically by employees and a computerised control system in the control room. Through recruitment, training, performance management, employee development and succession planning, Indaver provides employees with sufficient training, experience & knowledge for their roles and ensures that they are competent to perform them.

In the unlikely event of a failure of the plant, and a simultaneous failure of the supply from the electrical distribution system, the plant's un-interruptible power supply (UPS) will supply electricity to the critical systems, such as the gas cleaning and computer systems. The UPS will be designed to maintain a power supply to the control systems for 15 to 30 minutes.

The emergency generator will come on line at the same time as the UPS and will supply electricity to motors, pumps and fans until the plant is safely shut down.

The plant has an Emergency Response Procedure (SAF 01.00) and dedicated Emergency Response Team (ERT) to respond to any emergency situations that may arise. Please refer to Appendix 5.4

5.13.3 Fire Safety

Due to the waste screening measures proposed and the exclusion of certain waste types, it is not proposed to change the approach to the existing fire safety and systems which have been agreed in detail with the local fire officer.

Indaver now have in place fire safety certificates for the main building, the gatehouse, pumphouse and the 38KVa substation.

Fire safety certificates will be required for the office accommodation and the maintenance warehouse.

5.13.4 Potential Operating Hazards

There is no change to the operating hazards identified or the safety measures proposed in the application of 2006 or as detailed in amendment to existing permission in the EIS in 2009.

5.14 SITE STATUS IN RELATION TO THE EU CONTROL OF MAJOR ACCIDENTS HAZARDS INVOLVING DANGEROUS SUBSTANCES DIRECTIVE

The site is not a Seveso site. During the course of the previous applications, the HSA has assessed the site and formed the view that the Regulations of SI No. 74 of 2006 do not apply. The proposed amendments will not result in any change in status. This is because the wastes, with a hazardous designation, proposed to be accepted in this application will not be listed substances under the directive nor will they qualify under any of the generic hazard criteria. There is no proposed change to any storage capacities for any substances that are in scope of the Directive and hence there can be no further contribution to the maximum inventory calculations on the site. In addition, part of the screening assessment for new waste streams will include exclusion criteria for such materials.

Appendix 5.1

Month overview validated day-averages (incl. confidence interval)

Month **Sep-11**

ME1

Day/Month	CO	Dust	HCl	HF	NOx	SO_2	TOC	Temp oven 1
	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	°C
Limit	**50**	**10**	**10**	**1**	**200**	**50**	**10**	**850**
Average	3.9	0.1	0.4	0.0	102.5	3.8	0.9	899

N.A. : Not Available
S.D. : Shut Down

Measurements standardised at normal conditions (licence condition 4.2)
Confidence interval taken in account (licence condition 4.1.1.2)
Start-up and shut down excluded (licence condition 4.1.1.1)

Month overview validated day-averages (incl. confidence interval)

Month **Oct-11**

ME1

Day/Month	CO	Dust	HCl	HF	NOx	SO_2	TOC	Temp oven 1
	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	°C
Limit	**50**	**10**	**10**	**1**	**200**	**50**	**10**	**850**
Average	2.6	0.0	0.8	0.0	102.1	2.5	0.9	917

N.A. : Not Available
S.D. : Shut Down

Measurements standardised at normal conditions (licence condition 4.2)
Confidence interval taken in account (licence condition 4.1.1.2)
Start-up and shut down excluded (licence condition 4.1.1.1)

Month overview validated day-averages (incl. confidence interval)

Month **Nov-11**

ME1

Day/Month	CO	Dust	HCl	HF	NOx	SO_2	TOC	Temp oven 1
	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	°C
Limit	**50**	**10**	**10**	**1**	**200**	**50**	**10**	**850**
Average	2.1	0.1	0.6	0.0	121.3	8.0	0.4	915

N.A. : Not Available
S.D. : Shut Down

Measurements standardised at normal conditions (licence condition 4.2)
Confidence interval taken in account (licence condition 4.1.1.2)
Start-up and shut down excluded (licence condition 4.1.1.1)

Month overview validated day-averages (incl. confidence interval)

Month **Dec-11**

ME1

Day/Month	CO	Dust	HCl	HF	NOx	SO_2	TOC	Temp oven 1
	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	mg/Nm3 dr, by 11% O2	°C
Limit	**50**	**10**	**10**	**1**	**200**	**50**	**10**	**850**
Average	2.8	0.1	1.2	0.1	124.4	21.2	0.2	929

N.A. : Not Available
S.D. : Shut Down

Measurements standardised at normal conditions (licence condition 4.2)
Confidence interval taken in account (licence condition 4.1.1.2)
Start-up and shut down excluded (licence condition 4.1.1.1)

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ANALYTICAL REPORT : IAC12-00431

Your reference:	Dioxin Cartridge - 05/01 - 19/01/2012
Number of samples:	1
Date of receipt:	24/01/2012

Identification of the samples:

Cartridge LAB INDAVER-Measurement 1 - 5/1/12 u 19/1/12-AMESA 2

Analytical results:

B Determination of 2,3,7,8 substituted PCDF's and PCDD's
(HRGC/HRMS; ECO/AV/IAC/001 (EN1948-2 & 3))

The analyses marked with B are Belac ISO17025 accredited (N.005-TEST)

ANTWERP, 14/02/2012

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ISO17025 (N.005-TEST)

Marc Van Ryckeghem
Division Manager

ANALYTICAL REPORT : IAC12-00431

Determination of 2,3,7,8 substituted PCDF's and PCDD's

Sample identification : IAC12-00431.001

Your reference: Cartridge LAB INDAVER-Measurement 1 - 5/1/12 u 19/1/12-AMESA 2

Start date: 05/01/2012

End date: 19/01/2012

Sampled volume (Nm³): 136,395

Oxygen concentration(vol%): 8,1133

Component	Concentration (ng/Nm³)	I-TEF	I-TEQ (ng/Nm³)
2,3,7,8-TCDF	0,00025	0,1	0,000025
2,3,7,8-TCDD	0,000063	1	0,000063
1,2,3,7,8-PeCDF	0,00035	0,05	0,000017
2,3,4,7,8-PeCDF	0,00093	0,5	0,00046
1,2,3,7,8-PeCDD	0,00053	0,5	0,00026
1,2,3,4,7,8-HxCDF	0,00070	0,1	0,000070
1,2,3,6,7,8-HxCDF	0,00086	0,1	0,000086
2,3,4,6,7,8-HxCDF	0,0014	0,1	0,00014
1,2,3,7,8,9-HxCDF	<0,000073	0,1	< 0,0000073
1,2,3,4,7,8-HxCDD	0,00054	0,1	0,000054
1,2,3,6,7,8-HxCDD	0,0015	0,1	0,00015
1,2,3,7,8,9-HxCDD	0,0010	0,1	0,00010
1,2,3,4,6,7,8-HpCDF	0,0035	0,01	0,000035
1,2,3,4,7,8,9-HpCDF	<0,00092	0,01	< 0,0000092
1,2,3,4,6,7,8-HpCDD	0,0050	0,01	0,000050
OCDF	<0,0018	0,001	< 0,0000018
OCDD	0,0064	0,001	0,0000064
Total			0,0015 - 0,0016
Total 11% O2			0,00119 - 0,00120

The TEQ values have been calculated using the toxicity equivalence factors according to J.A. van Zorge et al. (Chemosphere 19 (1989), 1881-1895).

The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.
The RSD of the control sample is less than 10%.

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Recovery standards - 2,3,7,8 substituted PCDF's and PCDD's	
Sample identification : IAC12-00431.001 Your reference: Cartridge LAB INDAVER-Measurement 1 - 5/1/12 u 19/1/12-AMESA 2 Start date: 05/01/2012 End date: 19/01/2012 Sampled volume (Nm³): 136,395 Oxygen concentration(vol%): 8,1133	
Recovery sampling standards	
Component	Recovery 13C-sampling standards (%)
13C-1,2,3,7,8-PeCDF	108
13C-1,2,3,7,8,9-HxCDF	113
13C-1,2,3,4,7,8,9-HpCDF	86,2
Recovery extraction standards	
Component	Recovery 13C-extraction standards (%)
13C-2,3,7,8-TCDF	97,7
13C-2,3,4,7,8-PeCDF	105
13C-1,2,3,4,7,8-HxCDF	82,1
13C-1,2,3,6,7,8-HxCDF	78,8
13C-2,3,4,6,7,8-HxCDF	83,1
13C-1,2,3,4,6,7,8-HpCDF	72,9
13C-OCDF	47,0
13C-2,3,7,8-TCDD	80,9
13C-1,2,3,7,8-PeCDD	103
13C-1,2,3,4,7,8-HxCDD	82,3
13C-1,2,3,6,7,8-HxCDD	82,9
13C-1,2,3,4,6,7,8-HpCDD	70,4
13C-OCDD	56,7

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ADDENDUM ANALYTICAL REPORT : IAC12-00431

- **Precision of the method :**

The precision of the method is expressed in the intra-laboratory reproducibility and the repeatability, based on the results of the control sample and the results of the validation of the method.

Intra-laboratory reproducibility
Control sample: RSD = 5,6 % (amount sum 17 toxic congeners = 5000 ng TEQ / kg ; n = 33).
(RSD = Relative Standard Deviation).

Repeatability
Emission: RSD = 3,3 % (amount sum 17 toxic congeners = 0,02 ng TEQ ; n = 7).
Emission: RSD = 1,0 % (amount sum 17 toxic congeners = 0,5 ng TEQ ; n = 7).
(RSD = Relative Standard Deviation).

Measurement uncertainty
The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.

- **Sample storage:**

Temperature of the sample storage: below 4 °C.
Date and time that the sample was stored in the sample storage, see column 2.

- **Extraction :**

The part of the sample (filter, condensate or XAD-2) to which the extraction standard was added: XAD-2
The part of the extraction standard which was added to the XAD-2: 100 %.
Date and time that the extraction standard was added to the XAD-2, see column 3.
Weight condensate, see column 6 (whenever applicable).

- **Evaporation :**

Volume of the extract after evaporation: 0,25 ml.

- **Addition of the injection standard :**

Date and time that the injection standard was added, see column 4.
Date and time of the injection, see column 5.

Volume of the extract at injection: 25 µl.

Sample number	Storage date - time	Extraction std date - time	Injection std date - time	Injection date - time
IAC12-00431.001	24/1/2012 - 12:47	01/2/2012 - 14:20	03/2/2012 - 12:55	12/2/2012 - 19:26

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ANALYTICAL REPORT : IAC12-00674

Your reference:	Dioxin Cartridge - 19/01 - 02/02/2012
Number of samples:	1
Date of receipt:	6/02/2012
Identification of the samples:	

Cartridge LAB INDAVER-Measurement 2 - 19/1/12 u 2/2/12-AMESA 1

Analytical results:

B Determination of 2,3,7,8 substituted PCDF's and PCDD's
(HRGC/HRMS; ECO/AV/IAC/001 (EN1948-2 & 3))

The analyses marked with B are Belac ISO17025 accredited (N.005-TEST)

ANTWERP, 16/02/2012

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A division of SGS Belgium NV

ISO17025 (N.005-TEST)

Marc Van Ryckeghem
Division Manager

ANALYTICAL REPORT : IAC12-00674

Determination of 2,3,7,8 substituted PCDF's and PCDD's

Sample identification : IAC12-00674.001

Your reference: Cartridge LAB INDAVER-Measurement 2 - 19/1/12 u 2/2/12-AMESA 1

Start date: 19/01/2012

End date: 02/02/2012

Sampled volume (Nm³): 152,932

Oxygen concentration(vol%): 8,3

Component	Concentration (ng/Nm³)	I-TEF	I-TEQ (ng/Nm³)
2,3,7,8-TCDF	0,00037	0,1	0,000037
2,3,7,8-TCDD	0,000095	1	0,000095
1,2,3,7,8-PeCDF	0,00053	0,05	0,000026
2,3,4,7,8-PeCDF	0,0011	0,5	0,00057
1,2,3,7,8-PeCDD	0,00059	0,5	0,00029
1,2,3,4,7,8-HxCDF	0,00077	0,1	0,000077
1,2,3,6,7,8-HxCDF	0,00094	0,1	0,000094
2,3,4,6,7,8-HxCDF	0,0011	0,1	0,00011
1,2,3,7,8,9-HxCDF	<0,000065	0,1	< 0,0000065
1,2,3,4,7,8-HxCDD	0,00045	0,1	0,000045
1,2,3,6,7,8-HxCDD	0,0012	0,1	0,00012
1,2,3,7,8,9-HxCDD	0,00077	0,1	0,000077
1,2,3,4,6,7,8-HpCDF	0,0056	0,01	0,000056
1,2,3,4,7,8,9-HpCDF	<0,00082	0,01	< 0,0000082
1,2,3,4,6,7,8-HpCDD	0,0031	0,01	0,000031
OCDF	0,0030	0,001	0,0000030
OCDD	0,0031	0,001	0,0000031
Total			0,00163 - 0,00164
Total 11% O2			0,00128 - 0,00130

The TEQ values have been calculated using the toxicity equivalence factors according to J.A. van Zorge et al. (Chemosphere 19 (1989), 1881-1895).

The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.
The RSD of the control sample is less than 10%.

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Recovery standards - 2,3,7,8 substituted PCDF's and PCDD's	
Sample identification : IAC12-00674.001 Your reference: Cartridge LAB INDAVER-Measurement 2 - 19/1/12 u 2/2/12-AMESA 1 Start date: 19/01/2012 End date: 02/02/2012 Sampled volume (Nm³): 152,932 Oxygen concentration(vol%): 8,3	
Recovery sampling standards	
Component	Recovery 13C-sampling standards (%)
13C-1,2,3,7,8-PeCDF	109
13C-1,2,3,7,8,9-HxCDF	126
13C-1,2,3,4,7,8,9-HpCDF	109
Recovery extraction standards	
Component	Recovery 13C-extraction standards (%)
13C-2,3,7,8-TCDF	84,4
13C-2,3,4,7,8-PeCDF	84,0
13C-1,2,3,4,7,8-HxCDF	68,5
13C-1,2,3,6,7,8-HxCDF	66,3
13C-2,3,4,6,7,8-HxCDF	72,1
13C-1,2,3,4,6,7,8-HpCDF	75,6
13C-OCDF	78,8
13C-2,3,7,8-TCDD	75,0
13C-1,2,3,7,8-PeCDD	87,7
13C-1,2,3,4,7,8-HxCDD	79,4
13C-1,2,3,6,7,8-HxCDD	81,6
13C-1,2,3,4,6,7,8-HpCDD	83,8
13C-OCDD	91,7

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ADDENDUM ANALYTICAL REPORT : IAC12-00674

- **Precision of the method :**

The precision of the method is expressed in the intra-laboratory reproducibility and the repeatability, based on the results of the control sample and the results of the validation of the method.

Intra-laboratory reproducibility
Control sample: RSD = 5,6 % (amount sum 17 toxic congeners = 5000 ng TEQ / kg ; n = 33).
(RSD = Relative Standard Deviation).

Repeatability
Emission: RSD = 3,3 % (amount sum 17 toxic congeners = 0,02 ng TEQ ; n = 7).
Emission: RSD = 1,0 % (amount sum 17 toxic congeners = 0,5 ng TEQ ; n = 7).
(RSD = Relative Standard Deviation).

Measurement uncertainty
The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.

- **Sample storage:**

Temperature of the sample storage: below 4 °C.
Date and time that the sample was stored in the sample storage, see column 2.

- **Extraction :**

The part of the sample (filter, condensate or XAD-2) to which the extraction standard was added: XAD-2
The part of the extraction standard which was added to the XAD-2: 100 %.
Date and time that the extraction standard was added to the XAD-2, see column 3.
Weight condensate, see column 6 (whenever applicable).

- **Evaporation :**

Volume of the extract after evaporation: 0,25 ml.

- **Addition of the injection standard :**

Date and time that the injection standard was added, see column 4.
Date and time of the injection, see column 5.

Volume of the extract at injection: 25 µl.

Sample number	Storage date - time	Extraction std date - time	Injection std date - time	Injection date - time
IAC12-00674.001	07/2/2012 - 09:40	13/2/2012 - 15:15	15/2/2012 - 14:00	15/2/2012 - 22:19

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ANALYTICAL REPORT : IAC12-00953

Your reference:	Dioxin Cartridge - 02/02 - 16/02/2012
Number of samples:	1
Date of receipt:	20/02/2012

Identification of the samples:

Cartridge LAB INDAVER-Measurement 2 - 2/2 u 16/2/12

Analytical results:

B Determination of 2,3,7,8 substituted PCDF's and PCDD's
(HRGC/HRMS; ECO/AV/IAC/001 (EN1948-2 & 3))

The analyses marked with B are Belac ISO17025 accredited (N.005-TEST)

ANTWERP, 06/03/2012

I.A.C.
A division of SGS Belgium NV

ISO17025 (N.005-TEST)

Marc Van Ryckeghem
Division Manager

ANALYTICAL REPORT : IAC12-00953

Determination of 2,3,7,8 substituted PCDF's and PCDD's

Sample identification : IAC12-00953.001

Your reference: Cartridge LAB INDAVER-Measurement 2 - 2/2 u 16/2/12

Start date: 02/02/2012

End date: 16/02/2012

Sampled volume (Nm³): 199,723

Oxygen concentration (vol%): 9,3019

Component	Concentration (ng/Nm³)	I-TEF	I-TEQ (ng/Nm³)
2,3,7,8-TCDF	0,00021	0,1	0,000021
2,3,7,8-TCDD	0,000058	1	0,000058
1,2,3,7,8-PeCDF	0,00039	0,05	0,000020
2,3,4,7,8-PeCDF	0,00057	0,5	0,00029
1,2,3,7,8-PeCDD	0,00028	0,5	0,00014
1,2,3,4,7,8-HxCDF	0,00028	0,1	0,000028
1,2,3,6,7,8-HxCDF	0,00054	0,1	0,000054
2,3,4,6,7,8-HxCDF	0,0013	0,1	0,00013
1,2,3,7,8,9-HxCDF	<0,00012	0,1	< 0,000012
1,2,3,4,7,8-HxCDD	0,00035	0,1	0,000035
1,2,3,6,7,8-HxCDD	0,0010	0,1	0,00010
1,2,3,7,8,9-HxCDD	0,00059	0,1	0,000059
1,2,3,4,6,7,8-HpCDF	0,0020	0,01	0,000020
1,2,3,4,7,8,9-HpCDF	<0,0014	0,01	< 0,000014
1,2,3,4,6,7,8-HpCDD	0,0026	0,01	0,000026
OCDF	<0,0029	0,001	< 0,0000029
OCDD	<0,0029	0,001	< 0,0000029
Total			0,00098 - 0,0010
Total 11% O2			0,00084 - 0,00087

The TEQ values have been calculated using the toxicity equivalence factors according to J.A. van Zorge et al. (Chemosphere 19 (1989), 1881-1895).

The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.
The RSD of the control sample is less than 10%.

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Recovery standards - 2,3,7,8 substituted PCDF's and PCDD's	
Sample identification : IAC12-00953.001 Your reference: Cartridge LAB INDAVER-Measurement 2 - 2/2 u 16/2/12 Start date: 02/02/2012 End date: 16/02/2012 Sampled volume (Nm³): 199,723 Oxygen concentration (vol%): 9,3019	
Recovery sampling standards	
Component	Recovery 13C-sampling standards (%)
13C-1,2,3,7,8-PeCDF	157
13C-1,2,3,7,8,9-HxCDF	125
13C-1,2,3,4,7,8,9-HpCDF	67,7
Recovery extraction standards	
Component	Recovery 13C-extraction standards (%)
13C-2,3,7,8-TCDF	113
13C-2,3,4,7,8-PeCDF	78,9
13C-1,2,3,4,7,8-HxCDF	130
13C-1,2,3,6,7,8-HxCDF	94,6
13C-2,3,4,6,7,8-HxCDF	95,0
13C-1,2,3,4,6,7,8-HpCDF	90,6
13C-OCDF	57,5
13C-2,3,7,8-TCDD	91,0
13C-1,2,3,7,8-PeCDD	89,8
13C-1,2,3,4,7,8-HxCDD	102
13C-1,2,3,6,7,8-HxCDD	87,4
13C-1,2,3,4,6,7,8-HpCDD	63,5
13C-OCDD	53,9

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ANALYTICAL REPORT : IAC12-00953

ADDENDUM ANALYTICAL REPORT : IAC12-00953

- **Precision of the method :**

The precision of the method is expressed in the intra-laboratory reproducibility and the repeatability, based on the results of the control sample and the results of the validation of the method.

Intra-laboratory reproducibility
Control sample: RSD = 5,6 % (amount sum 17 toxic congeners = 5000 ng TEQ / kg ; n = 33).
(RSD = Relative Standard Deviation).

Repeatability
Emission: RSD = 3,3 % (amount sum 17 toxic congeners = 0,02 ng TEQ ; n = 7).
Emission: RSD = 1,0 % (amount sum 17 toxic congeners = 0,5 ng TEQ ; n = 7).
(RSD = Relative Standard Deviation).

Measurement uncertainty
The measurement uncertainty has been determined and is available in the laboratory. On request, the data will be transmitted.

- **Sample storage:**

Temperature of the sample storage: below 4 °C.
Date and time that the sample was stored in the sample storage, see column 2.

- **Extraction :**

The part of the sample (filter, condensate or XAD-2) to which the extraction standard was added: XAD-2
The part of the extraction standard which was added to the XAD-2: 100 %.
Date and time that the extraction standard was added to the XAD-2, see column 3.
Weight condensate, see column 6 (whenever applicable).

- **Evaporation :**

Volume of the extract after evaporation: 0,25 ml.

- **Addition of the injection standard :**

Date and time that the injection standard was added, see column 4.
Date and time of the injection, see column 5.

Volume of the extract at injection: 25 µl.

Sample number	Storage date - time	Extraction std date - time	Injection std date - time	Injection date - time
IAC12-00953.001	21/2/2012 - 09:49	01/3/2012 - 13:50	05/3/2012 - 13:30	06/3/2012 - 07:37

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Appendix 5.2

	Procedure Title:	**Waste Acceptance Criteria**		
	Procedure Ref.	ENV 01.00		
	Version:	0	**Pages:**	8
	Issue Date:		**Last Modified:**	18.07.2011
	Owner:	Aidan Kennedy Process Engineer		

1. Purpose

This document has been prepared to give clear guidelines on the type of waste that can be accepted at Meath Waste-to-Energy.

2. Definition

EWC - European Waste Catalogue
LIMS - Laboratory Information Management System
MSW - Municipal Solid Waste
WAC – Waste Acceptance Criteria
QESH – Quality, Environmental Safety and Health
SAP – Management Software System

3. Responsibilities

The process engineer has responsibility to approve waste based on criteria listed below before it arrives on site.

4. References

Waste handling procedure ENV 02.00
Waste Licence W0167-02

5. Procedure

<u>Details on the methodology for waste profiling for new and existing customers:</u>

Pre-Acceptance

Information requested from potential customer:

- A meeting takes place between the Account Manager and customer contact.
- Licence conditions are made known to the customer such as waste acceptance criteria, source segregation, facility opening hours.
- Potential waste type(s) for acceptance are discussed and may be viewed in certain cases by the Process Engineer.
- Information is gathered from the customer and this information, such as waste type, source of waste including the process producing the waste, composition, physical state and appearance,

packaging type is sent to the technical department for classification (see classification procedure Operations 4.2). Should there be insufficient information to classify the waste a chemical analysis may be required.

- Waste is then put into any of the following categories:
    - MSW or equivalent
    - Sludge
    - Liquids
    - Non MSW

- The EWC code is checked versus the licence to ensure that the waste type can be accepted under the licence.
- If the customer is the haulier for the waste, a letter of acceptance is created from Indaver (or this may have been completed in advance of the signing of the contract) and sent to the customer to ensure that their waste collection permit is updated with our facility. Then a copy of the updated waste collection permit is sent to our QESH department for filing.
- The contract is then put in place with the customer.
- The contract is valid for the period stated in the contract.
- Based on the contract deliveries are planned in advance. All loads and sales orders are stored on our SAP system. The classification is stored in the Laboratory Information Management System (LIMS) and reports can be produced at any time which show the classification of the waste type.

Sampling and Analysis

Number of analyses required:

- Number of analyses required will be decided upon on the basis of information received on the waste stream. In many cases one analysis is sufficient to accept the waste stream.
- In the case of municipal waste or where reliable and complete composition and information on the waste is received, analysis will not be required.

Who completes the sampling and analysis:

- The sampling can be completed by either the customer or an Indaver representative.
- The analysis of the samples are to be completed by an approved contracted laboratory.

Approach to verification sampling and analysis by Indaver, during initial profiling and on an ongoing basis, including frequency of testing:

- After the results of the sample have shown compliance with the Indaver WAC a trial load can be organised. This is agreed with the planner and the Process Engineer.
- Should there be any changes to the process or composition then a new sample may be requested. It is the customers responsibility to inform Indaver of these updates/changes to process.
- When the contract for this waste stream gets renewed, the quotation is reviewed and updated as necessary on the SAP system.
- During the contract should there be any anomalies with the waste stream this will be raised and preventative and corrective measures would be investigated. This could include a reclassification of the waste stream or update on the composition of the waste or analysis.

Non-conforming Waste

Actions in the event of a non-conformance with waste acceptance criteria:

- Should a waste stream be inspected and found to be in non compliance with the original composition of the waste then the Planner/ Account Manager is informed. An investigation will then occur. Here the received waste type will be investigated as to whether it is possible to treat the waste under the licence and operationally. Should the waste stream not be treatable under our licence or operationally then the waste is moved to quarantine and is quarantined as per ENV 02.00.
- Should the waste be outside tolerable limits and not be feasible to be treated within the process then the waste will not be accepted.

Specific Waste Acceptance Criteria:

Waste acceptance criteria are designed to fulfil the requirements of:

- Licence and planning conditions
- Operational conditions such as size
- Safety procedures
- Chemical restrictions
- Practical experience of operating a waste to energy plant

Licence and planning conditions

- Waste will only be accepted from known customers or new customers subject to initial profiling and characterisation.
- Deliveries of waste will only be accepted from authorised or exempted carriers under national or European legislation.
- Deliveries must be booked in advance.
- Waste collectors must hold a valid waste collection permit and Indaver will hold copies of this in their internal system.
- Delivery of waste is allowed between 08.00 and 18.30 from Monday to Friday and 08.00 and 14.00 on Saturdays.
- All waste accepted at the plant will be characterised prior to planning the acceptance of the load.
- Loads must be covered when they arrive on site.

The full list of acceptable waste streams, by EWC code, is provided in Schedule A of the current waste licence. Only EWC codes listed on our current waste licence are acceptable.

The following categories will not be accepted;

- EWC codes not on the current waste licence
- Source segregated recyclable material, unless by agreement with the EPA (i.e. due to contamination or a failure in the recycling market)

Procedure: Classification & Identification of Waste

Reference	Status	Version	Owner
Operations_4.2	Authorised	13	Denise Cunningham

Type Operations Manual **Sub-Type** Classification & Identification of Waste

1. Purpose

The purpose of this procedure is to define the steps to be taken when an item or list of items, requiring identification & classification, is received by the technical department from the Commercial Department, Waste Treatment Department, Logistics Department, TWM Department, Customer Support/Sales Support department or from a customer or any other route and how the identification & classification is recorded.

All waste material must be identified & classified as follows under all relevant regulations prior to collection:

1. Categorise waste as Green or Amber under the Waste Movement Regulations - Council Regulation EC No 1013 of 2006 on shipments of waste and S.I. 419 of 2007 Waste Management (Shipments of Waste) Regulations 2007
2. Identify the most appropriate EWC number for a waste stream from the European Waste Catalogue/Hazardous Waste List
3. Identify the most appropriate TFS code for the waste stream, either BASEL Code, OECD code or EWC code
4. Select appropriate hazard numbers if any from Part III of the Second Schedule of the Waste Management Act 1996
5. Classify the waste in accordance with the ADR & IMDG Code regulations governing the transport of dangerous goods by road and sea
6. If the waste is going for Landfill then classify in accordance with 2003/33/EC (establishing criteria and procedures for the acceptance of waste at landfills)

2. Definition

TFS - Transfrontier Shipment Form - A TFS is a document consisting of a Notification Form and a Movement/Tracking Form and associated annexes,contracts and financial guarantee. It is the legal documentation required for shipping material under EC No. 1013 of 2006 enacted in Ireland under Waste Management (Shipments of Waste) Regulations S.I. 419 of 2007. Essentially it is an export licence
EWC - European Waste Catalogue
HWL - Hazardous Waste List (The European Waste Catalogue and the Hazardous Waste List have been

amalgamated into a single list by indicating on the EWC if a waste is on the hazardous waste list by means of an asterisk)
ADR - Regulations governing the transport of dangerous good by road
IMDG - Regulations governing the transport of dangerous good by sea
RID - Regulations governing the transport of dangerous good by rail
Basel Code - Code consisting of a letter followed by 4 numbers. Originates from Basel Convention
OECD Code - Code consisting of 2 letters followed by 3 numbers. Originates from the OECD
ODS - Ozone Depleting Substance
WCP – Waste Collection Permit

3. Responsibilities

It is the responsibility of the Technical Department to ensure that all materials prepared for shipment are correctly identified & classified in accordance with all relevant waste and transport regulations.

Only a member of the Technical Department can perform classifications. It is the responsibility of each member of staff involved in the shipment of waste material to ensure the material being shipped has been classified by an appropriate person.

It is the responsibility of the Quality & Environmental Manager to ensure that the most up to date versions of the EWC/HWL, ADR & IMDG are available to members of the technical team and that the most up to date versions of the EWC/HWL, Consolidated Basel & OECD list are available to all members of the logistics team.

4. References

Raising a TFS (Operations 3.6)
Obtaining Licenses for the shipment of Controlled Drugs (Operations 2.4)
Safety Data Sheets (Operations 4.8)
Meath Waste to Energy Facility Licence (W0167-02)
SAP TS Catalogue

Waste Regulations:

Waste Management (Shipments of Waste) Regulations 2007 - S.I. No. 419 of 2007
Council Regulation (EC) No. 1013 of 2006 on shipments of waste
Waste Management Act 1996
Waste Management (Amendment of Waste Management Act, 1996) Regulations 1998
Waste Management (Amendment) Act, 2001
2003/33/EC (establishing criteria and procedures for the acceptance of waste at landfills) - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:011:0027:0049:EN:PDF
European Communities (Shipments of Hazardous Waste Exclusively Within Ireland) Regulations 2011 (S.I. 324 of 2011)

Transport Regulations:

International Maritime Dangerous Goods Code - current edition
ADR Regulations - current edition
RID Regulations - current edition
S.I. 616 of 2010 European Communities (Carriage of Dangerous Goods by Road Act 1998)(Amendment) Regulations 2010
S.I. 349 of 2011 European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment) Regulations 2011

Note: For waste to be transported by Rail again the Technical team must be consulted so that an outside

contractor can be contacted to approve this. Finbarr O' Mahony of Environmental Health & Safety is our consultant for RID

Other Transport Regulations
IATA (International Air Transport Authority) Dangerous Goods Regulations
ICAO (International Civil Aviation Organisations) Technical Instructions for the Safe Transport of Dangerous Goods by Air
CFR 49 (Code of Federal Regulations)

Note: Indaver's Technical Team do not classify waste for Air Transport or for transport in the United States

EWC Commission Decisions:

The current European Waste Catalogue and hazardous waste list is based on current EU legislation, i.e. Commission Decision 2000/532/EC on 3rd May 2000. This introduced a replacement waste list and hazardous waste list and came into force on 1st January 2002. This replacement list was amended a further three times as detailed below.

As amended by:

Commission Decision 2001/118/EC

Commission Decision 2001/119/EC

Commission Decision 2001/573/EC

Therefore all four documents are needed to have a complete list. The current consolidated document 'European Waste Catalogue and Hazardous Waste List' is a consolidated version of all four commission directives.

EPA Publication - European Waste Catalogue and Hazardous Waste List.

European Waste Catalogue & Hazardous Waste Lis

Other sources of information:

"Procedure for the Identification of the Hazardous Components of Waste" developed for the EPA by the Clean Technology Centre

Procedure for the Identification of the Hazardous Components of Waste - Main Re

Paper Tool.pdf Hazardous Waste Classification Worksheet

Appropriate Chemical Dictionaries e.g. SAX's Dangerous Properties of Industrial Materials, Hawley's Condensed Chemical Dictionary.
Customer Material Safety Data Sheet Folders in Adest
Sigma Aldrich Online Material Safety Data Sheet Database
Internet MSDS Libraries
Consolidated Basel Code & OECD Code list
Regulation (EC) No 2037/2000 on substances that deplete the ozone layer
S.I. No. 281 of 2006 Control of Substances that Deplete the Ozone Layer Regulations 2006

CHIP Regulations (Approved Supply List published by HSC - Chemicals (Hazard Identification and Packaging for Supply) Regulations
S.I. No 62 of 2004 European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004
S.I. No 116 of 2003 European Communities (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations 2003
BAM List Requirements for Tanks for the Transport of Dangerous Goods
AVG Repacking Spreadsheet

Offer_Irland_new.xls

5. Procedure

Requesting Classification

Upon receipt of a list of materials to be classified from a customer the sales support/customer support must enter the details on the mastertable for that customer. The mastertable must then be sent to Technical for the initial classification of the materials (Level 1 classification).

If the customer is a key account or 'Top 60' customer then the dedicated Technical person, as per the customer focus group should be emailed directly with the request and approximate timeframe for completion given.
If the customer is a 'small' customer then the request should be emailed to 'to be classified'.

On receipt of a classification request the Technical Advisor must then go to the relevant mastertable for the customer and populate the following cells on the spreadsheet:

1. Waste Description
2. EWC Code
3. State of Matter
4. UN Code
5. Packaging Group
6. Remarks (if any)

The customer waste descriptions should also be reviewed and changed if necessary so that as many waste types as possible can be moved on the same waste material number.
Waste can fit under the same Material Number if they have the same UN number, EWC Code, Segregation Details and Organic/Inorganic.

When choosing a waste description, the SAP TS Catalogue must first be checked and wherever possible and existing waste description should be chosen from this list so that waste descriptions are consistent.

If this is not possible and a new material needs to be set up for the waste, then a request should be sent to Waste Treatment department (WT) to get the new waste description and EWC code added to the catalogue.

Wherever possible a pre-categorised MM number should be chosen so that as many wastes as possible can be moved on that description. Customer specific materials should only be set up for waste streams that move in high tonnages or for very dangerous substances that would move often.

Identification of Appropriate EWC Number

European Waste Catalogue / Hazardous Waste List:

All waste moved by Indaver must be assigned a European Waste Code. These codes are listed in the European Waste Catalogue / Hazardous Waste List.

A consolidated version of this list and the associated amendments was published by the EPA and hard copies of this publication is provided to all logistics personnel as part of their TFS training. (Amended versions and details of amendments to this list are circulated to members of staff by the Quality & Environmental Manager).

The EWC list is broken down into 20 chapters (detailed below). Each chapter deals with a different process or industry of generation of the waste

01 Waste resulting from exploration, mining, quarrying, physical and chemical treatment of minerals
02 Waste from agricultural, horticultural, aquaculture, forestry, hunting and fishing, food preparation and processing
03 Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard
04 Wastes from leather, fur and textile industries
05 Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal
06 Wastes from inorganic chemical processes
07 Wastes from organic chemical processes
08 Wastes from the manufacture, formulation, supply and use (MFSU) of coatings, (paints, varnishes and vitreous enamels), sealants and printing inks
09 Wastes from the photographic industry
10 Wastes from thermal processes
11 Waste from chemical surface treatment and coating of metals and other materials; non-ferrous hydro-metallurgy
12 Wastes from shaping and physical and mechanical surface treatment of metals and plastics
13 Oil wastes and wastes of liquid fuels (except edible oils, 05 and 12)
14 Wastes organic solvents, refrigerants and propellants (except 07 and 08)
15 Waste packaging, absorbents, wiping cloths, filter materials and protective clothing not otherwise specified
16 Waste not otherwise specified in the list
17 Construction and demolition wastes (including excavated soil form contaminated sites)
18 Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care)
19 Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
20 Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions.

See the European Waste Catalogue/Hazardous Waste List for the complete listing of codes in each chapter

Identifying the Appropriate EWC Numbers:

From the full European Waste Catalogue listing the following steps should be followed:

- Identify if the process that generated the waste is described by any of the chapters **01 to 12 or 17 to 20**.

  If yes then identify if there is an appropriate six-digit code within the chosen chapter (excluding the codes ending in 99) that describes the waste (The codes ending in 99 should be chosen only as a last option after all 20 chapters have been reviewed)

  Note :

  A specific industry/process of generation may need to classify its wastes in several chapters. For

instance, a car manufacturer may find its wastes listed in any of the following, Chapter 12 (Wastes from shaping and physical and mechanical surface treatment of metals and plastics), Chapter 11 (Waste from chemical surface treatment and coating of metals and other materials; non-ferrous hydro-metallurgy), or Chapter 08 (Wastes from the manufacture, formulation, supply and use (MFSU) of coatings, (paints, varnishes and vitreous enamels), sealants and printing inks)

- If no appropriate waste code can be found in chapters 01 to 12 or 17 to 20 **then the chapters 13, 14 and 15** must be examined to identify the waste. If none of these waste codes apply, then the waste must be identified according to **chapter 16**.

- Finally if the waste is not described in chapter 16 then the 99 code (waste not otherwise specified) within the chapter describing the process that generated the waste must be used e.g. 070599

Note: Currently due to Waste collection Permit (WCP) restrictions the following 99 codes can only be selected. If we have a waste stream that is classified as another '99' code then we must contact the QESH Department to ensure that this code is added to the relevant WCP can be updated and this list must then be also updated.

02 07 99
06 01 99
06 08 99
07 01 99
07 05 99
07 06 99
08 01 99
08 03 99
08 04 99
10 01 99
10 10 99
12 01 99
13 08 99*
19 09 99
20 01 99

EWC codes with mirror entries:

If the EWC number chosen is one with a mirror entry then the EPA Procedure for the Identification of the Hazardous Components of Waste must be followed in order to determine which of the mirror entries should be used to describe the waste if there is a doubt over the choice of the mirror entry i.e. hazardous or non hazardous.
This procedure has been developed in order to interpret current and anticipated Irish and EU legislation with regard to the classification of waste as hazardous or non hazardous. A worksheet has been provided to record the decision path and substantiate any conclusions. The detailed instructions to follow are outlined in the Paper Tool.

To determine if a material is hazardous or non hazardous then the paper tool should be completed. To do this both the CHIP regulations and S.I. No 62 of 2004 European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 may be consulted to determine the Risk Phrases of the constituents of the waste.

Once the paper tool has been completed then it should be submitted to the EPA for approval.
If the waste is originating from an IPC/IPPC licensed customer then it should be sent to the customer to forward to their inspector.
If the waste is destined to go or from to the Meath Waste to Energy Facility then it should be sent to our inspector.
If the customer is not an IPC/IPPC Licensed customer then we should keep all records on file to prove our

classifications should there be any questions relating to it from the waste outlet.

Note:

If an EWC code is followed by an asterisk then the EWC code describes waste which is hazardous. The list of codes, which have an asterisk originates from the Hazardous Waste List (HWL). However this does not mean that a waste assigned an EWC code which does not have an asterisk (therefore not on the HWL) is non-hazardous waste.
Hazardous Waste is defined in section 4(2) of the Waste Management Act 1996 and 2001 as waste which appears on the Hazardous Waste List or waste which displays any of the properties specified in Part III of the Second Schedule of the Waste Management Act 1996 i.e. explosive, oxidising, flammable, irritant, harmful, toxic or corrosive etc. (see section on Classification of Waste as Hazardous under the Waste Management Act 1996)
Hence if there is no appropriate EWC code on the Hazardous Waste List then an EWC code that does not have asterisk may be used.

EWC codes with aqueous/halogenated:

Certain EWC codes use the terms aqueous, halogenated solvents and other solvents. After seeking advice from the authorities in Europe on what is the definition of halogenated and aqueous etc in waste mixtures we have decided on the following rules and have notified the EPA on these in 2005.

1. If you have >95% water in a mixture then the stream should be classified as aqueous for the purpose of EWC codes
2. If you have <95% water and any amount of halogenated solvents or salts (e.g. chlorides) then the stream should be classified as halogenated for the purpose of EWC codes
3. If you have <95% water and no halogenated compounds then the stream should be classified as non-halogenated (i.e. 'Other') for the purpose of EWC codes

Note:

Some customers are only allowed to use certain pre-determined EWC codes as specified in Table 17 of their IPC/IPPC licence. These customers are identified on the Technical consultation document.
It is the responsibility of each Technical Advisor to update the consultation document as required and to check it when classifying waste to ensure that we classify the waste in accordance with the customer's IPC/IPPC licence.

Also some customers use their own interpretation of when waste is considered Halogenated or not. In this case and if they have always reported their figures to the Agency as such we will continue to operate on their interpretations once they are in accordance with the procedure for assigning EWC Codes as outlined above.

Once you have determined the most appropriate EWC Number the SAP TS Catalogue should be searched for that EWC code and the most appropriate description chosen that fits the waste should be chosen and inputted onto the mastertable.

Classification of Waste in accordance with Transport Regulations

The material must be classified in accordance with the IMDG and ADR regulations governing the transport of dangerous goods by road and sea. For material which is to be transported by rail or air the RID, IATA and ICAO regulations must also be referred to. If this is the case then a qualified consultant must be contacted as no member of the Technical team has qualifications in these regulations.

Classification is the process by which a UN number is assigned to a material. The UN number is an internationally recognised 4-digit number. Their purpose is to uniquely identify a substance, overcoming

language barriers and the fact that many substances have many synonyms.

- Each item must be searched for in accordance with the following hierarchy of reference;

    a) By chemical name in the IMDG and ADR regulations
    b) By customer/manufacturer MSDS (if available)
    c) By chemical name or product code in the Online Sigma Aldrich MSDS database
    d) By chemical name in a variety of Internet MSDS libraries, manufacturer's website etc
    e) By chemical name in a variety of chemical dictionaries

- Transport Regulations: If the item is listed in the transport regulations for the relevant mode of transport then the UN Number, Packing Group and technical information for that particular item is assigned automatically.

  Other sources: If the item is not listed in the transport regulations then other sources (MSDS, chemical dictionaries or sample analysis results) are used to determine the items hazard class(es) as per chapter 2 of ADR/IMDG

- If there is more than one hazard class, the table of precedence must be employed to determine the primary hazard. Once the primary hazard class has been determined the UN number, packing group and relevant technical name (required for the DGN) can be assigned.

- If there is insufficient information to perform a classification then further information must be obtained from the customer. This information can be provided in the form of an MSDS from the customer or details of the chemical composition of the material (analysis).

- When the classification is complete the UN Number and packing group must be are entered on the customer Mastertable

NOTE: Generic Classifications:

As per ADR 2011, Chapter 2.1.3.5.5, waste may classified when the precise composition is unknown based on consignor's knowledge. This is done based on the information the customer provides in relation to possible contents and using a worst case principle to assign the UN number and Packing Group. This procedure may only be used when transporting Bulk tanks to the transfer station or elsewhere for sampling as this provision is not available in IMDG. The tank is then sampled and analysed and the exact composition is used to then classify the waste for its onward IMDG and TFS movement.

If using this provision, then the following must be inputted into the hazard inducers box in LIMS so when logistics are moving the waste they can copy it onto SAP and it will print on the transport documentation as required by ADR 2011.

'WASTE IN ACCORDANCE WITH 2.1.3.5.5'

NOTE: Segregation

When you have assigned the UN number to the waste stream, if the UN number is for a specific substance, e.g. Sodium Cyanide then the segregation box will be automatically populated with the segregation for that substance when entered onto LIMS.

If a generic UN number is assigned then the specific segregation instructions for that substance must be typed into this box in LIMS, e.g. UN1759, Waste Corrosive Solid, N.O.S. for lab smalls containing Sodium Cyanide.

It is very important when classifying a material to check the limited quantity provisions of both the ADR and IMDG codes. The maximum quantities can be different in the ADR and IMDG so it is vital to check

both codes and go with the stricter option. Classifying something as a limited quantity, especially items that have difficult segregation requirements, e.g. Class 5.1, 5.1, 4.2, 4.3 makes it much easier to ship from our transfer station and should be used whenever possible.

If the UN number you have assigned is not in the dropdown box on the classification technical screen then it needs to be added to the IMDG database on LIMS. To do this all the relevant information must be added to the DG Key spreadsheet and then the request emailed to BIS Support.
S:\3_Projecten\SAP\Project\waste rollout IRL\1_Preparation\Waste optim project\dbo_IMDG screened by tech.xls

NOTE:

If typing in segregation notes it is vital that the segregation is filled in on LIMS so that this prints on the Dangerous Goods note (DGN).

Note: If at any stage the classification of any material needs to be changed then it is very important that the Transfer Station operations team is aware of this so that they can ensure the package(s) get relabelled prior to shipment. To do this once classified the Technical Advisor must email the Facility Manager and Deputy Facility Manager, who will then ensure the package gets re-labelled and once this is complete the item can be removed from quarantine to allow the item to be consigned and shipped.

Note:

UN2907 ISOSORBIDE DINITRATE MIXTURE, Class 4.1, PGII - This material cannot be transported to Belgium (Antwerp port)

Categorisation of Waste as Green or Amber under the Movement Regulations

For all waste destined to be exported by Indaver must be categorised as Green or Amber under the Waste Movement Regulations - Council Regulation EC No 1013 of 2006 on the shipments of waste.

Movements of waste from Ireland for recovery, treatment or disposal must comply with the Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No 419 of 2007). These Regulations are for the purposes of giving effect to EC No 1013/2006 on the shipments of waste within, into and out of the European Community.

The essence of the regulations is to develop a supervision and control system for shipments of waste, normally by means of a tracking system. The system must record, supervise and control all waste shipments whether hazardous or non-hazardous.

Control System:

The control system established is that of Transfrontier Shipment Forms (TFS's). A TFS is a document consisting of a Notification Form, Movement/Tracking Form, associated annexes, contracts and financial guarantee. It is the legal documentation required for shipping of material under EC No. 1013/2006

The Notification form is intended to provide the competent authorities of dispatch, transit and destination with all the information they need to make a decision as to whether they shall consent to a proposed waste movement. Once authorised the Notification form covers the shipment of a specified number of loads/tonnes of a defined waste stream.

A Movement/Tracking Form travels with each waste load at all times from its departure from the waste producers' site to its arrival at the recovery/disposal site in another country. Space is provided on the form for entering details of the first and any subsequent carriers and to record the passage of the consignment through Customs Posts. Finally the form is used by the disposal/recovery facility to certify that the consignment has been received and also as a disposal/recovery certificate.

For the purpose of this control system regulation EC No. 1013/2006 categorises waste into two categories (Green and Amber) based on their potential to present a risk to the environment. Annexes III, IIIA, IIIB and IV of 1013/2006 gives the two lists; Green and Amber. The controls applied to waste shipments is dependent on which category the waste falls into, as follows:

Green List Waste destined for recovery - Green List waste destined for recovery is generally excluded from the control procedure (i.e. does not require a TFS) of this regulation since such waste should not normally present a risk if properly recovered in the country of destination. (See section on Control System for Green Waste destined for recovery

Green List Waste destined for disposal - Green List wastes destined for disposal must be a controlled movement under these regulations and must have a Transfrontier Shipment Form raised for their shipment.

Amber Waste - Amber wastes destined for either recovery or disposal must be a controlled movement under these regulations and must have a Transfrontier Shipment Form raised for their shipment.

Therefore in order to ship waste Indaver must first decide which category of waste the material falls under.

Categorisation of waste as Green or Amber:

Annexes III, IIIA, IIIB and IV of 1013/2006 lists wastes by type e.g. Nickel waste and scrap, Wood waste and scrap etc. and also by process of generation e.g. Wastes from the production and preparation of pharmaceutical products. When categorising the waste you must refer to annex III, IIIA, IIIB and IV and identify if either the waste type or process by which waste was generated is listed in either of the annexes.

When determining if material is Green or Amber *all annexes must be consulted* as it is possible for a waste to be covered by entries in two different annexes e.g. both the Green and Amber.

Example: Spent Nickel catalyst is given on the Green list. However all waste from the production and preparation of pharmaceutical products is listed on the Amber list. Hence if you have Spent Nickel Catalyst waste generated from the preparation of pharmaceuticals then this is covered by both the Green and Amber lists.

If this happens then the more controlled annex must be selected (i.e. in the example above the waste would be categorised as amber list waste).

The selected category must then be entered on the info card in LIMS. LIMS is automatically defaulted to Amber as the vast majority of waste Indaver Ireland moves is classified as Amber so if you are changing this to Green then you need to select the button on the info card.

Control System for Green Waste:

For all Green list waste destined for recovery approval to ship as Green waste and confirmation that waste is Green list must be received from the National TFS office (NTFSO). If you want advice from the NTFSO then all information, MSDS etc should be sent to nationaltfs@dublincity.ie. The correspondence relating to this must be saved in the customer info file.

Should any waste be classified as green list for recovery and is waste generated at the Indaver Waste to Energy Facility W0167-02 then this needs to agreed with the EPA prior to shipment.

Identifying Appropriate TFS Code:

The underlying principle of the new TFS regulations state that each TFS should have one defining code. This code should be either a Basel Code, an OECD code or an EWC code in that order of precedence.

So when assigning a code the most appropriate TFS code must be selected, whenever possible this should be a Basel Code and if none available then an OECD code and if none available then an EWC code.

To select the most appropriate Basel/OECD code please consult the Consolidated Basel Code & OECD Code list. In conjunction with this list you should also consult the TFS listing report so that you only choose a TFS code that Indaver has a TFS in place for.

The TFS Code must then be entered on the info card in LIMS.

Classification of Waste as hazardous under the Waste Management Act 1996

Hazardous Waste is defined in section 4(2)(a) of the Waste Management Act 1996 as waste which appears on the Hazardous Waste List (see section on Identifying the Appropriate EWC Numbers) or waste which displays any of the properties specified in Part III of the Second Schedule of the Waste Management Act 1996 i.e. explosive, oxidising, flammable, irritant, harmful, toxic or corrosive etc.

The appropriate hazard properties and hence hazard numbers for the material must be identified from Part III of the Second Schedule of the Waste Management Act 1996.

The hazard numbers must be entered on the linked document in LIMS.

To determine the hazard number you must consult the SDS for the material. In section 15 of the SDS the Risk phrases and EC classification is listed. This will be listed in section 2 in the new REACH format SDS' s.

Classification of Waste Leaving Meath Waste to Energy Facility

In accordance with our Facility Licence W0167-02 and Waste Regulations all waste that Indaver moves offsite must be classified.

All Indaver's waste is classified in accordance with all the waste regulations as described and detailed above. All classifications are recorded in our LIMS system and then subsequently moved in our SAP system which tracks all waste movements in accordance with the licence.

For Flue Gas, Bottom Ash and Boiler residues these wastes will be tested in accordance with Schedule C.4 of W0167-02.

These results will be reviewed and Waste Classification will then be carried out. EWC codes will be assigned and results and findings will be forwarded to the Agency in the case of a non-hazardous mirror image being selected.

All hazardous waste will then be exported as Amber waste under TFS to suitable outlets.

All classifications are recorded on the LIMS system which has an audit trail to allow for the checking of who classified the waste, when and if the classification was changed at any stage also.

Last Change :
Added in a note on UN2907 ISOSORBIDE DINITRATE MIXTURE, Class 4.1, PGII - This material cannot be transported to Belgium (Antwerp port). Denise Cunningham (24/08/2011)
Mary Miller 24/08/2011 09:43:52 Version: 13

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Change History :
Previously Word Operations 10.5 New Document
Patricia McGrath 02/07/2001 12:06:28 PM Version: 0

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Previously Word Operations 10.5, Issue no 1; 01/12/00
Patricia McGrath 24/04/2001 17:39:39 Version: 1

_____
Sigma Aldrich now appears before Chemical dictionaries in order of hierarchy when performing classification
Patricia McGrath 24/01/2002 17:28:29 Version: 2

_____
Procedure amended to incorporate signing of on classification and filing Classification Record Forms and classified lists of materials in Customer MSDS files.
Patricia McGrath 23/07/2002 17:06:17 Version: 3

_____
Procedure reviewed to reference RID, IATA and ICAO regulations. Completed classifications to be saved on separate files not on MSDS files. Overall responsibility changed from that of Site Operations Manager to that of Tech Manager.
Patricia McGrath 30/10/2002 09:57:24 Version: 3.02

_____
Laura and Ger passed procedure for issue verbally
Patricia McGrath 31/10/2002 10:00:37 Version: 4

_____
Procedure has been amended to include the recording of TREMCARD details and Suitable UN Packaging on the Classification Record Form.
Patricia McGrath 13/01/2003 15:46:17 Version: 5

_____
Amalgamtion of Ops4.2, Ops 4.9 and Ops 4.20. Addition of selection of appropriate hazard numbers from the Waste Management Act 1996 (second schedule).
Patricia McGrath 09/07/2003 15:24:05 Version: 6

_____
Addition of a section detailing what happens when a review of the classification of a waste stream is conducted
Patricia McGrath 25/07/2003 11:38:23 Version: 7

_____
Packaging Types must now also be specified on part A of classification request form.
Patricia McGrath 20/08/2003 15:34:16 Version: 8

_____
Procedure reviewed by Ger Gallagher. Classification Record Form no longer used, information now entered on Tracker and locked down by technical team.
Patricia McGrath 31/08/2004 13:02:35 Version: 9

_____
Procedure reviewed by Denise Cunningham and the Technical team on 8th December 2008. Changes made include updating all references to EU 259/93 to the new TFS regulations (EC) No 1013/2006. Changes were made to the responsibilities section and to the references section taking out the specific editions of the transport regulations and updating waste legislation Also added new references on ODS and Basel/OECD code, CPL and CHIPS. Changes were made in relation to the TFS code and the new regulations. Screen shots were added of the classification technical screens. A section was added on how to add a new UN number to tracker.
Mary Miller 22/01/2009 16:23:07 Version: 10

_____
The Technical Manager, Denise Cunningham reviewed this procedure and made the following changes
1. Removed TWM from the responsibilities as no one in TWM classifies currently
2. Removed all references to Tremcards as per ADR 2009
3. Add the list of approved 99 EWC codes we are allowed to use
4. Changed the section on Green list waste as Competent authorities on TFS's will no longer approve classifications

5. Added a note on hiding classifications on tracker
6. Removed older reference to 'to be classified Cork and Dublin' folders and added line on customer focus groups
7. Added section on generic classifications for Bulk tanks as per ADR 2009 (Denise Cunningham 22/12/2009)
8. Added note in relation to changing classification and getting it re-labelled (Denise Cunningham 07.01.2010)
Mary Miller 07/01/2010 14:36:17 Version: 11

Procedure was reviewed and amended to incorporate the changes to LIMS and SAP and also to include the classifications of waste leaving Meath. Added reference to Waste Treatment Department under the purpose section. Added WCP to the definitions list. Reviewed list of 99 codes. Changed reference to Technical Manager to Quality & Environmental Manager. The regulations were updated and new hyperlinks were added for the SAP related links. Screenshots from tracker were also removed. Added reference to European Communities (Shipments of Hazardous Waste Exclusively Within Ireland) Regulations 2011 (S.I. 324 of 2011). Removed references to S.I. 617 of 2010, S.I. 618 of 2010, S.I. 619 of 2010 & S.I. 620 of 2010 and replaced with European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment) Regulations 2011 (S.I. 349 of 2011) (DC 16.08.2011)

Mary Miller 22/08/2011 14:20:47 Version: 12

Added in a note on UN2907 ISOSORBIDE DINITRATE MIXTURE, Class 4.1, PGII - This material cannot be transported to Belgium (Antwerp port). Denise Cunningham (24/08/2011)
Mary Miller 24/08/2011 09:43:52 Version: 13

- End of Document -

Appendix 5.3

	Procedure Title:	**Waste Handling**		
	Procedure Ref.	ENV 02.00		
	Version:	1	**Pages:**	5
	Issue Date:	18.7.2011	**Last Modified:**	18.7.2011
	Owner:	Aidan Kennedy		

1. Purpose

This procedure covers waste handling in the Meath Waste to Energy facility. It covers all movements of waste from the security gate to the feeding hopper.

2. Definition

EPA - Environmental Protection Agency
WAC - waste acceptance criteria

3. Responsibilities

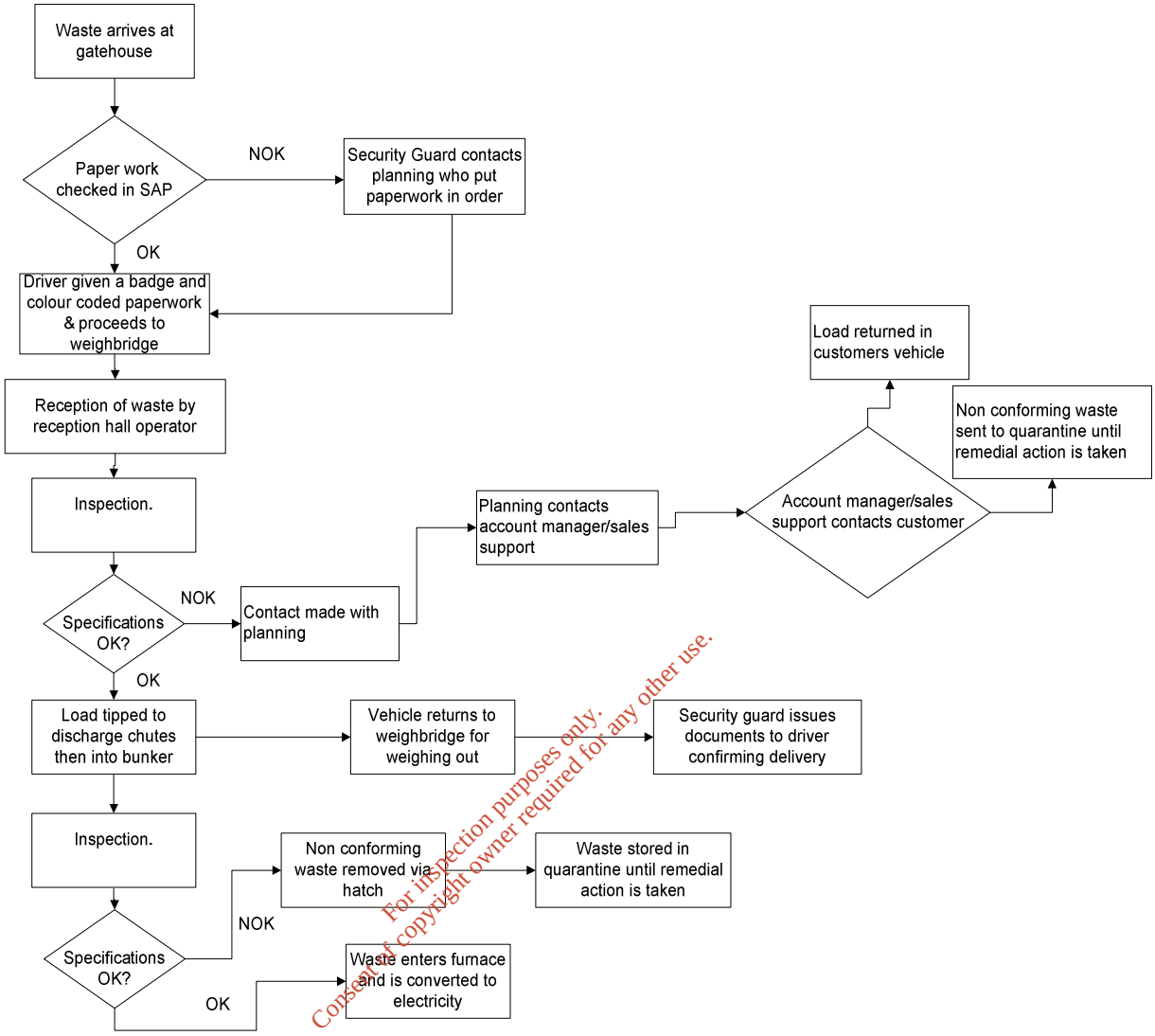
Indaver's customers have a responsibility to deliver waste in compliance with the waste acceptance criteria. The Tipping Hall Operator is responsible for conducting visual checks of the waste to ensure compliance with the waste acceptance criteria. The crane driver is responsible for performing visual checks as they clear the discharge chutes and mix the waste. They are also responsible for checking the closed circuit TV screen on the hopper as a final check. The security guard is responsible for enforcing the opening hours.

4. References

Waste acceptance criteria ENV 01.00
Waste Licence W0167-02
Waste inspection checklist ENV 02.01
Waste acceptance daily report ENV 02.02

5. Procedure

Overall work flow



1 Reception of waste truck.

Waste is only accepted if it is planned and scheduled in the SAP system and in accordance with the requirements of the licence. All waste supplied must be in conformance with Indaver's waste acceptance criteria (WAC).The criteria for acceptance are outlined in the WAC procedure.

The vehicle parks in a designated bay and the driver walks to the reception/security hut via a designated walkway. When a driver arrives on site for the first time they must complete an induction before entering the site. The opening hours of the facility in accordance with the licence W0167-02 will be adhered to unless in extreme cases where to do so would pose a significant threat to the environment or public safety.

1.1 Document check

The security personnel checks that the paperwork supplied with the vehicle matches what is available on the SAP system. The following information is recorded by the security guard:

a) the date and time
b) the name of carrier (and waste collection permit details if appropriate)
c) the vehicle registration number
d) the trailer, skip, or other unique identification (where relevant)
e) the name of producer/ collector of waste as appropriate
f) the name of waste facility from which the load originated, including the waste licence or waste permit register number
g) description of the type of waste including EWC codes
h) quantity of waste in tonnes
i) details of the treatment(s) to which the waste has been subjected, if any.
j) the classification or coding of the waste, including whether MSW or otherwise.
k) name of person checking the load
l) if a load is rejected/ removed detail the date, type of waste and facility to which they were removed
m) if applicable a consignment note number (CMR number)
n) Badge number (which is handed to the driver).

Once everything is confirmed as acceptable, the security guard hands the driver details of the waste, to inform the Tipping Hall Operator where to direct the load and grants the driver access to the reception hall and a badge to activate the weighbridge. The paper work is coded for each waste type with a colour as per the table below.

MSW or equivalent	No mark on paper
Sludge	Blue mark
Non MSW	Yellow mark
Liquids	Green mark

If an unscheduled load arrives at the gate, the security guard makes contact with the planning department. The planning department then ensures the SAP system is updated as required.

Should an anomaly arise the planning department will ensure the matter is dealt with appropriately. All anomalies will be recorded by the planning department.

The records of waste accepted are submitted to the planning authority on a monthly basis as agreed in line with Condition 4 of planning permission PL 17.219721 and will be summarised in the annual environmental report. The records of waste accepted will be maintained at the facility and reported as part of annual environmental report.

1.2 Weighing in

The vehicle drives to the 'in' weighbridge where they use the badge to activate the weighing of the load. There is no requirement to leave the cab during weighing. This weight is automatically recorded on the SAP system. On receiving a green light the driver moves the vehicle towards the reception hall.

The security guard will look out for anomalies on the weighing scales (too heavy/light may indicate waste is out of specification). If the security guard notices any anomalies the Tipping Hall Operator is notified via the hand held radio system.

1.3 Reception hall

Entry to the reception hall is controlled by the Tipping Hall Operator. The tipping hall operator gives a signal to the driver and then the driver may enter the reception hall. The relevant paper work is handed to the acceptance Tipping Hall Operator. If materials meet the acceptance criteria, the vehicle driver is directed to the appropriate discharge chute. Liquids loads will be sent for direct injection. More detailed inspections may be carried out periodically as outlined below.

2 Inspections

There are various options for waste inspections. For every load received checklist ENV 02.02 is completed by the person inspecting the waste. At least one of the following must be performed on every load received.

Should any anomalies be noted the Tipping Hall Operator makes contact with the planning department. They in turn contact the relevant account manager, who contacts the customer to discuss return of the load or additional costs for Indaver to dispose of the load on their behalf. Depending on the wishes of the customer, the waste in question is returned to the suppliers or moved to the quarantine area to await removal from site at the customers expense. Photographs may be taken by the Tipping Hall Operator as evidence. Should anomalies be noticed inside the bunker the waste is removed via the hatch to await correct disposal offsite.

2.1 Visual on discharge

This inspection is carried out in the waste inspection area of the reception hall. As the load is being tipped into the reception chutes the Tipping Hall Operator watches for any non conformance to the waste acceptance criteria. If a non conformance is spotted the Tipping Hall Operator immediately radios the crane driver who will remove the waste in question via the bunker hatch to await correct disposal offsite. The tipping hall operator will also notify the planning department who contacts the relevant account manager.

2.2 Visual in truck

This may be carried out if the Tipping Hall Operator suspects non compliance and it is possible to inspect vehicle before load is discharged. CCTV cameras are in place at the weighbridge and waste can be inspected using this e.g. tipper trucks where the cover has been pulled back. Another possible method would involve the Tipping Hall Operator using a ladder or mobile platform to look into the truck. Should any waste not be in conformance with the WAC a detailed inspection will follow.

2.3 Detailed inspections

These will be carried out periodically as required to ensure that customers do not supply waste outside the WAC. As a minimum one random inspection per week will be carried out. During such inspections the contents of the load are tipped onto the reception hall floor and the tipping hall operator completes a check of the contents to ensure compliance with the WAC. Once it is shown that the waste is in accordance with the WAC/licence, the waste is loaded into the bunker using a front loader. The front

loader will only be used by trained personnel. Should anomalies be noticed the non conforming waste is segregated to await correct disposal offsite.

For a new customer the frequency of inspection will be increased to ensure that the waste has been characterised correctly and that it meets the WAC.

Records of the detailed inspections will be completed by the Tipping Hall Operator and maintained on site. These records will contain as a minimum, the name of the person carrying out the inspection, the customers details, the trucks licence plate number and whether any non conformities were spotted.

2.4 Camera inspection

There is a camera in the bunker/hopper area of the plant. This camera is a moveable camera and can be directed to inspect waste in the bunker or in the hopper. The monitor for this camera is in the control room where a crane operator can ensure that only acceptable waste loaded into the hopper.

2.5 Inspection by crane operator

As the crane operator mixes and transfers the waste they must always be vigilant for any waste that does not conform to the waste acceptance criteria. Should any non conforming waste be found it is removed via the hatch to be disposed of in a correct manner.

3 Weighing out

The Vehicle follows the one way route, observing the speed limit, and exits via the 'out' weighbridge. A tare weight is then recorded on SAP. The security guard stamps/signs the paper work for the driver. The security guard then gives the driver the relevant paperwork. A recovery certificate will be provided to the customer in due course to prove that Indaver accepted and treated their waste.

4 Waste to energy

The waste is mixed in the bunker and fed to the hopper where it enters the furnace and is converted into energy.

Appendix 5.4

	Procedure Title:	Meath Emergency Response Procedure		
	Procedure Ref.	Operations XX.X		
	Version:	Draft	Pages:	20
	Issue Date:	30.05.11	**Last Modified:**	30.05.11
	Owner:	Colum Smith, Health & Safety Manager		

Contents

1 Purpose

This procedure describes the emergency response process in place at Indaver Ireland's Meath Waste to Energy facility. The purpose of the procedure is to:

- Describe the emergency response process including roles & responsibilities, resources, facilities & equipment to identify, respond to, and address emergency situations
- Contain and control emergency situations so as prevent/minimise the effects of emergency situations on personnel, property and the environment

2 Definitions

The following types of emergency situation are defined:

2.1 Local Emergency

These are smaller incidents that can be handled at a local level by the operational team and/ or plant Emergency Response Team (ERT) without impacting on others part of the plant, personnel or environment e.g. first aid injury, minor spill etc.

2.2 Plant Emergency

These are incidents that could have a significant adverse impact on on-site personnel and/or the Indaver plant and site environment e.g. serious injury, major fire.

2.3 External Emergency

These are incidents that could have an adverse off-site impact e.g. major bunker fire with release of smoke-plume off-site, significant damage to off-site environment etc.

With respect to the above emergency situations, three different types of alarm signal may be generated:

2.4 Local Alarm

Individual local areas of the plant (Flue Gas Cleaning, Bottom Ash Hall, Steam/Condensate Area & Turbine, Furnace Boiler, Tipping Hall & Bunker, and Administration Building) are equipped with local Sounders (different sound to Plant Alarm) and Strobes which are activated by smoke / heat / flame detectors and break glass units in the local area.

These detectors and break glass units are not linked to the Plant Alarm which requires manual activation from the Control Room. Local sounders in noisy areas (Shredder Area, ID Fan, Compressor Room, and Turbine) are set at a higher decibel level. A direct communication (via radio) will be sent from the Control Room to the Emergency Response Team (ERT) Members to respond to any local alarms.

2.5 Plant Alarm - Start:

Description: Slow waving klaxon siren (approx. 5 times / min.)
Meaning: Plant wide alarm (e.g. for large fire). Activated by key switch in Control Room.
In the event of a malfunction of the plant alarm siren, the Control Room will issue an alarm message over the radio system to individual personnel and a Manual Plant Horn will be activated by both the Shift Supervisor in the building and by the Security Guard outside the security hut.

2.6 Plant Alarm - End:

Description: Continuous non-waving flat sound of klaxon siren (approx. 1 minute)
Meaning: End of Alarm. Activated from the Control Room.

3 Roles & Responsibilities

3.1 Incident Controller (Plant Manager)

- Overall responsibility for ensuring there are adequate resources, training, facilities and equipment in place to address any emergency situations that may arise at the Meath plant
- Establishes Emergency Control Centre (ECC) in Plant Managers Office or alternative location if emergency situation/safety considerations dictate
- Proceeds to ECC in order to ascertain as much detail (i.e. number of injured persons, location, nature and extent of incident etc.) of the emergency as possible from the ERT Leader or from the person discovering the incident
- Briefs other ECC Members and co-ordinates activities in the Emergency Control Centre
- Communicates with ERT Leader for duration of emergency situation
- Communicates with the Site Evacuation Co-Coordinator to ensure all persons are accounted for in the event of an evacuation at Assembly Point
- Communicates with Process Controller in Plant Control Room on any process control required during the emergency situation
- Communicates with External Emergency Services before they arrive on site.
- Manages all other external communication required during emergency: relatives of employees, regulatory authorities (HSA, EPA, CER, ESB etc), press/media (through Indaver Managing Director and Communications Manager), neighbouring establishments
- Notifies Indaver senior management and organisation of incident as required
- Decides on End of Emergency following consultation with ERT Leader and Emergency Services (if present on site) and instructs Panel Operator to sound Plant Alarm End
- Follows (as appropriate) Incident Controller Prompt Sheet attached to this procedure.

3.2 Communications Officer (Process Engineer)

- Proceed to Emergency Control Centre (ECC) if directed by Incident Controller
- Establishes contacts with external agencies and personnel (Emergency Services, Employee Relatives, Regulatory Authorities, Neighbouring Establishments) as directed by the Incident Controller
- Alerts Indaver Ireland Managing Director and Indaver organisation (flash mail) as directed by Incident Controller

- Answers all incoming telephone calls
- Meets external officials arriving on-site as directed by the Incident Controller

3.3 Incident Recorder (HR & Admin Officer)

- Proceeds to the ECC if directed by Incident Controller
- Records and documents the timing and sequence of events during the emergency situation
- Assists the Communication Officer as required

3.4 QESH Advisor (Q &E Manager)

- Proceed to Emergency Control Centre (ECC) if directed by Incident Controller
- Advises Incident Controller on any actions required to mitigate EHS consequences of incident
- Assists Incident Controller in communication with relevant authorities (EPA, HSA)

3.5 Emergency Response Team (ERT) Leader (Production Manager)

- Proceeds to ERT Room
- Contacts Control Room and ECC in order to ascertain as much detail of the emergency as possible from the person discovering the incident.
- Briefs the ERT Members on the situation in the ERT Room, designates role to each ERT member giving them specific instructions, assigns PPE for each role, and ensures they are adequately equipped
- Completes roll-call of ERT members and informs ECC of same
- Proceeds to incident scene with the ERT and co-ordinates and leads the actions of the ERT
- Directs Indaver occupational first aiders to treat any injured personnel as required
- Assesses the incident scene and decides on additional actions and resources required
- Contacts the ECC ASAP with the request for External Emergency Services support
- Briefs the External Emergency Services and acts as the Indaver point of contact after their arrival on site. Takes lead from and provides assistance to Emergency Services Commander who takes control of incident after arrival on site.
- Stays in contact with the control room shift supervisor with regards to any required process actions (e.g. stop production equipment)
- Informs the ECC about the status and progress of the emergency response
- Determines when the site is safe to return to normal operations with Emergency Services Commander and communicates to Incident Controller to declare End of Emergency

3.6 ERT Members (Mechanical and E&I Technicians)

- Proceed to ERT Room
- Immediately don emergency PPE and undergo briefing by ERT Leader
- Executes the ERT role and tasks assigned by the ERT Leader in accordance with their training
- Check their equipment and PPE including SCBA is in good working order prior to use
- Always consider their own safety and that of their fellow team members before undertaking any hazardous tasks as part of emergency response

3.7 Occupational First Aiders

- If notified of personnel injury, proceed to location of injured personnel (provided it is safe to do so) with First Aid Kit. If injured person is located in hazardous area, proceed to safe location to administer first aid in agreement with ERT Leader

- In event of plant alarm, proceed to Assembly Point with First Aid Kit in event of Plant Alarm and await instruction from ERT Leader
- Provide first aid to injured personnel in accordance with training given
- Remain with injured personnel until the arrival of the Emergency Services

3.8 Site Evacuation Co-Coordinator (Maintenance Manager)

- Manages activities of personnel (Roll Caller, Traffic Entry Controller, Visitors Guide), evacuees, and vehicles at the designated Assembly Point (Security Guardhouse or alternative)
- Obtains list of persons present on site from Security Guard and organizes roll-call
- If any persons are missing, asks assembled personnel where missing persons were last seen
- Informs the Emergency Control Centre (ECC) about roll-call status and any missing persons
- Maintains contact with the ECC and changes Assembly Point location if situation dictates
- Co-ordinates access control to site during emergency
- Informs the ECC about arrival of external authorities and others (e.g. media)) at Security Guardhouse

3.9 Roll Caller (Warehouse Supervisor)

- Conducts roll-call of personnel at assembly point using list obtained from Security Guard and informs Site Evacuation Co-Coordinator of any missing persons
- Manages evacuees present at Assembly Point to ensure they act appropriately during emergency situation (i.e. no smoking, no photographs, no standing in way of traffic, vehicles parked at side of road and engines switched off, access for emergency services)
- Assists the Traffic/Entry Controller to control access and egress from site as required
- Assist the Visitors Guide manage visitors if required

3.10 Traffic/Entry Controller (Security Guard)

- Prints out list of persons present on site and hand to Site Evacuation Co-Coordinator at Assembly Point
- Stops all incoming and outgoing traffic and manages traffic at entrance to ensure Emergency Services vehicles have free access
- Directs Emergency Services to ERT Leader/incident location on arrival on site
- Controls entry of all persons to site. Prohibits entry of unauthorized persons unless specifically directed by Site Evacuation Co-Coordinator. Keeps all external persons (e.g. journalists) outside security entrance.

3.11 Visitors Guide

- Ensures public visitors are briefed on emergency procedures prior to commencing site visit
- Guides the public visitors back to the Visitors Room (standard procedure) in event of Local Alarm
- Guides the public visitors to designated Assembly Point in event of Plant Alarm
- Completes a roll-call of visitors and informs Site Evacuation Co-Coordinator of roll-call and any missing persons
- Organizes a debriefing of Visitors after end of emergency situation

3.12 Process Controller (Shift Supervisor)

- Proceeds to Control Room in emergency situation
- Coordinates the production activities during the Emergency Situation

- Completes roll-call of personnel present in Control Room and informs ECC of same
- Decides on activation of Local and Plant Alarms based on consultation with Panel Operator and ERT Leader
- Maintains contact with ERT Leader and ECC during emergency and makes any process changes (e.g. start/stop equipment) on request of ERT Leader
- Co-ordinates activities of the Panel Operator and Production Operators during emergency situation
- Directs the Panel Operator to activate End of Alarm Signal upon request of Incident Controller
- Outside normal business hours:
    - Initiates the emergency response, co-ordinates activities of Panel Operator and Process Operator, and activates the Local and/or Plant Alarm as deemed necessary.
    - Contacts the Emergency Services
    - Contacts the Plant Manager and Manager on Duty to inform them of the situation.

3.13 Process Operators (1 x Shift Operator, 1 x Day Operator)

- Proceeds to Control Room in emergency situation as directed by Process Controller
- Undertakes tasks as directed by the Process Controller
- Outside normal business hours, if instructed by Process Controller, meet the Emergency Services at security gate and direct them to incident scene.

3.14 Panel Operator (Control Room Panel Operator)

- Acts as collecting point for initial alarm messages
- Activates the Local and Plant Alarm Signals on direction of Process Controller or ERT Leader or based on own assessment of severity of situation
- Alerts the ERT of emergency situations using radio system
- Executes the process related actions as directed by the Process Controller

3.15 Persons without Specific Responsibilities in Emergency Situation

On discovering fire, spill, or other emergency situation:

- In case of fire, activate the local area fire alarm by using the nearest Break Glass Unit
- Contact Control Room on Extension 4017 or by radio and follow their instructions
- Make your job safe where possible e.g. stop machinery etc.
- Evacuate area as appropriate
- Only tackle hazard (e.g. small fire or small spill) if safe to do so and if you have received appropriate training

On hearing Local Alarm

- Make your job safe where possible
- Evacuate the local area following emergency exit signage and proceed to the Control Room (unless unsafe to do so)
- Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
- Await further instruction from the Control Room.

On hearing Plant Alarm:

- Make your job safe
- Proceed to the designated external Assembly Point following emergency exit signage and lighting.
- Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
- Report to the Site Evacuation Co-Coordinator at the Assembly Point for Roll-Call.

Visitors or contractors should follow the instructions of their Indaver host/contact .

4 References (Attachments to Procedure)

4.1 Meath Emergency Telephone Contact List
4.2 Incident Controller Prompt Sheet
4.3 Specific Emergency Scenarios & Response Spreadsheet
4.4 Principal Chemicals & Materials List
4.5 Drawings
- 4.5.1 Site Layout
- 4.5.2 Location of principal chemicals/materials storage areas
- 4.5.3 Site Services
- 4.5.4 External Firemain and Hydrants
- 4.5.5 Internal firefighting systems schematic
- 4.5.6 Line Electrical Drawing

5 Procedure

5.1 Emergency Response Facilities and Equipment

5.1.1 Plant Design

The Meath plant buildings, facilities and equipment have been designed in accordance with regulatory requirements and best practice including:

- Building Regulations Technical Guidance Note B-Fire Safety (Fire Certificate received from local authority)
- Relevant Irish/European Standards (IS EN)
- Insurance Company Standards (FM Global)
- Indaver Corporate guidelines which are based on operational experience of similar plants
- Consultation with Fire Brigade

5.1.2 Means of Escape

Escape routes, fire protection and ventilation of escape routes, travel distances to exits, emergency exits, and normal and emergency lighting, have been designed and provided in accordance with the requirements of the Building Regulations and relevant Irish & European standards. A fire safety certificate was received from the local authority approving the building and facilities design with respect to the above. A drawing showing the location of exits and designated assembly point is included as an attachment to this procedure.

5.1.3 Fire Detection & Alarm System

The fire alarm system is the primary means of alerting people to an emergency situation and the need to evacuate. The devices on the system include:

- Optical Smoke Detectors, Heat detectors, and UV/IR Flame Detectors located throughout plant
- VESDA Aspirating Smoke Detectors in MCC Room cabinets, VSD room, Technical Galleries and Turbine Hall
- CCTV monitoring of key process operations (i.e. shredder, hopper, bunker, turbine etc.)
- Fire Alarm Break Glass Units located throughout plant
- Local alarms (sounders and strobes) in individual areas and sitewide klaxon evacuation alarm
- Master fire alarm panel located in MCC Room Boiler Area a Repeater Panel (fully functional) located in Control Room

- Mimic Panel (Synoptic Board) located in Control Room showing Building Layout, Individual Zones and LED Display showing location of alarm activation

Inspection and testing of the fire detection and alarm system is carried out in accordance with relevant Irish standards (IS EN series) and regulatory requirements.

5.1.4 Firefighting Systems

Firewater is supplied in an external 250mm fire main to external fire hydrants and an internal 250mm fire main to fixed hose-reels, landing valves, water canons, sprinkler heads, and foam deluge systems on site.

The ring main is supplied by a combined firewater and process water tank. The tank has a total capacity of 2185m^3 with a minimum firewater reserve capacity of 1855m^3 which is sufficient to provide firewater for up to two hours under maximum flow conditions. The tank is supplied with water from the on-site well.

The firewater pump house is equipped with 3 No. diesel pumps (2 Duty/1 Standby) and an electrical jockey pump which are designed to maintain the pressure in the fire main between 10 -12 bar. Pressure regulating valves at the fire-hydrants reduce the pressure to 4 - 6 bar for use with fire hoses. This arrangement ensures the availability of firewater for emergency response even if certain essential services such as electricity are unavailable during an emergency.

The firemain provides firewater to the following systems:

- External Fire hydrants located throughout the site
- Internal fixed hose reels and landing valves
- Automatic/Manual Dry and Wet Sprinkler Systems in the following areas: Tipping Hall Shredder Unit & Lay-down Area, Bunker Crane Lay-down Areas, Feeding Hopper, Auxiliary Burners, Firewater Pumphouse, and Turbine Bearings (water droplet)
- Automatic/Manual Foam Deluge Systems in the following area: Turbine Lube Oil Tank and Pipework, Turbine Cellar and Turbine Control Oil Pack
- 4 No. Water Cannons in Bunker Area.

The deluge systems on the Hopper (High Level), Shredder, and Turbine Building can also be activated manually using the Manual Pull Station in the local area.

A.F.F.F foam is stored in a 1.3 m^3 foam tank which provides foam to the foam deluge system.

An automatic/manual Inergen gas suppression system is provided in the Variable Speed Drive (VSD) room. Stage 1 and Stage 2 alarms together with sounders and strobes located inside and outside room will warn personnel to evacuate/not to enter room in event of Inergen activation.

Fire cabinets located close to external fire hydrants contain sections of fire hose, branchpipe hose nozzles, hydrant keys, bars and standpipes. Fire cabinet(s) located close to oil tanks (i.e. diesel tank) have sections of fire hose, containers of foam concentrate, foam branchpipes, and foam uniductors.

Different types of portable fire extinguisher (water, foam, carbon dioxide, dry powder) are mounted in prominent positions throughout the site.

Drawings showing the location of the external firemain and hydrants and an schematic of the internal fire-fighting system are included as attachments to this procedure.

5.1.5 Fire Blankets

Fire blankets are mounted in prominent positions throughout the site which are suitable for small fires and wrapping individuals in.

5.1.6 Smoke Ventilation

Automatic smoke vents linked to the fire detection system are located in the Tipping Hall, the Bunker, Bottom Ash Hall, and Administration Building Stairwells. With respect to the smoke vents in the Bunker these will activate once sufficient temperature has built up to activate the dry sprinkler heads above the cranes in the bunker. Heat vents (permanently open air louvres) located on the building roof will also dissipate smoke from the building in the event of a fire situation.

5.1.7 Control of Plant and Equipment in Fire Situations

In the event of certain fire situations the DCS will automatically bring to a safe state and/or shutdown specified plant and equipment including:

- Burner Gas Supply Slam Shut Valves Activated
- Shutdown Fuel Oil Pumps
- Shutdown Shredder
- Close Primary Air Intake Damper at Bunker
- Shutdown Flue Gas Residue Unloading
- Cranes in bunker return to home position
- Turbine shutdown

In addition, lifts will automatically return to ground floor in event of fire detection/plant alarm.

5.1.8 Explosion Mitigation & Protection

An Explosion Protection Document (EPD) has been prepared for the site which details the measures taken to prevent the formation of flammable/explosive atmospheres, prevent ignition sources (e.g. EX-rated equipment) occurring, and mitigate the effects of an explosion. Areas with potential flammable atmospheres (EX-rated areas) identified on site are the Activated Carbon Silo & System, Ammonia Storage Tank & Unloading Area, Pilot Fuel Propane Gas Cylinders, Hydrogen Cell and Cylinder at CEMS Room, and Flammable Chemical Storage Cabinets. Equipment in these areas is appropriately EX-rated. The activated carbon silo also incorporates a nitrogen inertion system and explosion pressure relief venting to a safe location.

5.1.9 On-Site Locations for Management of Emergency Response

The on-site emergency response will be co-ordinated from the following locations:

- Emergency Control Centre (ECC): Plant Managers Office on Level 4 of Administration Building or Control Room if Office is unsafe to use in emergency situation
- Control Room: Level 5 of Administration Building
- Assembly Point : Outside Entrance at Security Guard-House or alternative location if unsafe to use in emergency situation
- Emergency Response Team (ERT) Room: Located adjacent to Control Room on Level 5 of Administration Building

The ECC, Control Room and Security Guard-House contain the following equipment and documentation for use in an emergency situation:

- Radio, Landline & Mobile Phone
- Access to MSDSs for all chemicals used on site
- Emergency Response Procedure
- Indaver Emergency Contact Telephone List
- Site Plan Drawings showing building layouts and location of emergency equipment

The relevant documentation described above will also be stored in the Indaver Head Office and a copy provided to the Navan and Drogheda Fire Brigades.

5.1.10 Communications

All ERT, production and maintenance personnel can communicate using radios in an emergency situation.

The Administration Building, Control Room and Security building will also be equipped landline phones.

The Control Room/ERT can be contacted on the radio system or by dialing Extension 4017 in an emergency situation. The Control Room will then notify the ERT using radios provided to the individual ERT members.

An Emergency Contact List (included as Attachment X to this procedure and link on the intranet homepage) contacts names of relevant Indaver personnel and external emergency services and agencies to be contacted in an emergency situation.

5.1.11 First Aid

There will be a minimum of one occupational first aider on site at any one time. In addition, all members of the Emergency Response Team (ERT) are trained in emergency first aid. The names and contact numbers for the site occupational first aiders are displayed on prominent signage throughout the site. First aiders can also be contacted by dialing the control room on Extension 4017. First aid boxes are located throughout the site. If necessary individual offices in the administration block can be used to administer first aid in an emergency situation.

5.1.12 Safety Showers and Eyewash Stations

Safety showers and/or eyewash stations are located in areas of the site where there is a potential for exposure to hazardous materials. External safety showers and eyewash stations are fitted with trace-heating to prevent freezing during the winter months. A drawing showing the location of safety showers and eyewash stations is included as an attachment to this procedure.

5.1.13 PPE

Appropriate Personal Protective Equipment (PPE) is provided for use by the site Emergency Response Team (ERT) and other site personnel in emergency situations. The exact PPE to be worn will depend on the emergency situation, but may include some or all of the following:

- Safety Glasses & Goggles
- Chemical Resistant Boots
- Chemical Resistant Gloves: Inner Nitrile and Outer Gauntlet (Nitrile) Gloves
- Heat Resistant Gloves
- High Visibility Clothing
- Hard Hats
- Tyvek F Chemical Resistant Suits
- 3M Full Face Masks with ABEK2P3 Filters
- Portable self contained breathing apparatus (SCBA)
- Protective Clothing for Firefighting (Helmet, Flash Hood, Jacket, Leggings, Gloves, Boots)

The PPE for use by the ERT is stored in a dedicated ERT room located adjacent to the Control Room.

5.1.14 Containment of Liquid Releases (Spills/Leaks)

5.1.14.1 Process Building

All waters produced from wash down etc. and any leaks/spills within the process building are directed to a underground spill containment tank with a capacity of 100m^3. Water from this spill tank will be used to supplement process water requirements or will be transported off-site for treatment or disposal to an appropriately permitted or licensed facility. There is no process effluent discharged from the facility.

5.1.14.2 Storage of Hazardous Materials

Bulk tanks containing hazardous materials (ammonia, diesel fuel oil) are double skinned and equipped with interstitial leak detection. The tanks are also fitted with level monitoring and overfill protection. Crash barriers are located around the bulk tanks to prevent potential vehicle collision and spills. Pipework from the bulk tanks is located over-ground over paved areas and undergoes regular visual inspection.

There is a designated bulk tanker unloading area for diesel and ammonia which is graded towards an ACO channel. Prior to unloading a diversion valve on the surface water drainage system is activated which diverts the drainage from the ACO channel to an underground Full Retention Forecourt Separator. This ensures that during tanker unloading any spills/leaks are contained within the unloading area and underground separator. Any contained spills of hazardous materials will be treated appropriately.

All other hazardous materials on site are stored in smaller quantities (e.g. 200L drums, IBCs etc.) in individual bunded areas (e.g. spill pallets, trays, chemical storage cabinets) to contain any spills/leaks.

5.1.14.3 Surface Water Drainage System

The site surface water drainage system has been designed in general accordance with Sustainable Drainage Systems (SuDS) principles and collects rainwater from all roofs, hardstanding areas, roads on site and which fall naturally towards these areas. A site services drawing showing the layout of the surface water drainage system is included as an attachment this procedure.

The surface water drainage system routes the surface water (rainfall) from roads, hardstanding areas and building roofs to:

- a Class 1 Bypass Separator
- a continuous online monitoring chamber (TOC, pH, Conductivity)
- a surface water attention pond with a capacity of 1600m^3
- a continuous online monitoring chamber (TOC, pH, Conductivity) on the outfall from the attention pond
- local surface water drainage network and River Nanny

The Class 1 Bypass Separator is designed to retain any oil/hydrocarbons present in the surface water runoff.

The pre-attenuation pond monitoring chamber diverts any contaminated runoff to an underground diverted water tank with a capacity of 300m^3. This water is re-used in the process where possible while the remainder is stored within the tank for off site treatment or disposal to a suitably licensed facility. Should this storage tank be filled the pre-attenuation pond t monitoring chamber will go into overflow mode and allow water to pass into the attenuation pond.

The surface water attenuation pond and outfall pump is designed to provide a controlled pumped discharge from the site to the local surface water drainage network to prevent any downstream flash

flooding. The discharge rate of 59.8 litres/second has been agreed with the local authority. The attenuation pond has been designed to cater for 1 in 30 year and 1 in 100 year storm events.

A second continuous online monitoring chamber on the outfall from the attenuation pond shuts-off the discharge pumps from the attenuation pond if any contamination in the discharge and retains the contaminated runoff in the attenuation pond.

The surface water attenuation system described above will prevent the discharge of any contaminated runoff from the site in the event of accidental leaks/spills or emergency situations.

5.1.14.4 Contaminated Firewater Retention

Fire suppression is provided by an on site firewater storage tank with an effective fire-fighting storage volume of 2185 m^3 as described in Section 5.1.4. Of the total tank capacity 330 m^3 is provided for process water requirements with 1855 m^3 fully reserved for fire fighting. However in the event of a fire, the process water requirement will not be needed and potentially all 2185 m^3 will be available for fire fighting.

The greatest potential for fire at the facility arises within the waste bunker (water-tight) where localised heating can occur due to decomposition of organic material. Up to the level of the tipping hall, the bunker has a capacity of ca. 5670 m^3 approximately. If a 50% voidage ratio is assumed for the waste, then there would be a retention capacity of 2835 m^3 within the waste bunker. With 2185 m^3 of water available for fire fighting, this demonstrates that all of the water would be retained within the bunker even in the most extreme fire event.

With respect to a fire occurring elsewhere in the process building or other buildings on site the firewater run-off will drain either to the process building 100m^3 capacity spilled water tank or be contained by collection in the surface water drainage system as described in Section X.X. which incorporates a 300m^3 diverted water tank and a 1600 m^3 surface water attenuation pond.

A firewater retention study has been carried out for the facility to demonstrate that the above containment facilities are adequate to contain the maximum projected volumes of firewater runoff in an emergency situation.

5.1.14.5 Spill Response Materials

Spill response materials such as spill mats, absorbent materials, brushes, non-sparking shovels, drum putty, drain blockers, litmus paper are located in designated locations in the plant.

5.1.15 Monitoring Equipment

Monitoring equipment used on site to detect potential emergency situations and/or process upsets include:

- Smoke, heat and flame detectors
- Closed Circuit Television Monitoring (CCTV) of key process operations
- Process monitoring (Pressure, Temperature, Level etc.) as part of the DCS control system
- Continuous emissions monitoring of atmospheric and surface water discharges
- Interstitial leak detection on double-skinned chemical storage tanks
- Level monitoring on bulk chemical tanks
- Portable Gas Detectors (LEL, O_2, CO, H_2S) used by the ERT and for specified types of work (e.g. confined space entry) on site
- Ammonia detector at bulk ammonia tank
- Oxygen Depletion and Hydrogen Detectors in Central Emissions Monitoring Room (CEMS)
- Litmus paper used for checking spills/leaks

5.1.16 Weather Monitoring

A windsock is located on the top of the main process building which can be used for monitoring wind direction during an emergency.

5.1.17 Other Rescue Equipment

A variety of other equipment may also be used on site in emergency situations such as rescue equipment for confined spaces and work at height (e.g. Tripods & Winches, Harnesses & Lanyards, Escape Sets etc.).

5.1.18 Inspection and Checking

All emergency equipment and facilities are inspected and maintained in accordance with regulatory requirements, relevant standards, and corporate requirements and is managed as part of the site maintenance management system using SAP.

5.2 Emergency Response Organisation

5.2.1 Structure

The roles and responsibilities of individual personnel in an emergency situation are described in Section 3 and actions to be undertaken by individuals in an emergency situation are described in Section 5.3 and 5.4.

The full emergency response organisation including ERT is only present on-site during normal business hours (Monday to Friday 08:00 – 16:30) during which time full production (i.e. waste deliveries etc.) and maintenance activities take place. However, the plant incineration process operates on a 24-hour seven day per week basis, but with a reduced manning level outside normal business hours. Therefore due to the difference in manning levels, the emergency actions taken on-site will differ between normal business hours and outside normal business hours.

The management structure for dealing with emergencies is shown during normal business hours and outside normal business hours in shown in Figures 1 and 2 respectively.

5.2.2 Backup Personnel

In the event of absence (holidays, sick-leave, off-site business) of key personnel in the Emergency Response Organisation, the following personnel are nominated as backup.

Emergency Response Role	Nominated Backup Personnel
Emergency Control Centre	
Incident Controller	Process Engineer
Communications Officer	HR and Admin Officer
Incident Recorder	Q&E Manager or H&S Manager
QESH Advisor	Health & Safety Manager
Emergency Response Team (ERT)	
ERT Leader	Maintenance Manager
ERT Members	Mechanical Technician 4 and E&I Technician 4
Evacuation and Headcount (Assembly Point)	
Site Evacuation Co-Coordinator	Mechanical Technician 3 or E&I Technician 3
Roll Caller	Mechanical Technician 3 or E&I Technician 3

Control Room Process Operator	Day Shift Operator 2 or Day Shift Supervisor

5.2.3 Training and Emergency Drills

Appropriate training is delivered to members of the Emergency Response Organisation which is backed up by periodic drills and training exercises. The behaviour of personnel is monitored during all drills and exercises with to continuously improve both the instructions for emergency responses and the personnel's implementation of these responses.

Training is provided for all personnel who have key roles in emergency management, encompassing all levels of the emergency response organisation. This includes a comprehensive programme for the Emergency Response Team (ERT) including:

- Fire Fighting
- Chemical Spill Response
- Use of PPE and Self-Contained Breathing Apparatus
- Search and Rescue
- Emergency First Aid
- Confined Space Entry & Rescue

ERT personnel participate in quarterly drills that simulate specific emergency scenarios that could potentially arise on site. Any lessons learned from these exercises are incorporated as necessary into the emergency response procedure and addressed in subsequent drills.

Evacuation drills are conducted every six months to test the adequacy of alert systems, evacuation arrangements and the response of employees, and visitors. A record is maintained of the details of each drill.

The Navan and Drogheda Fire Brigades will be given periodic tours of the site to ensure they are familiar with site layout and emergency equipment.

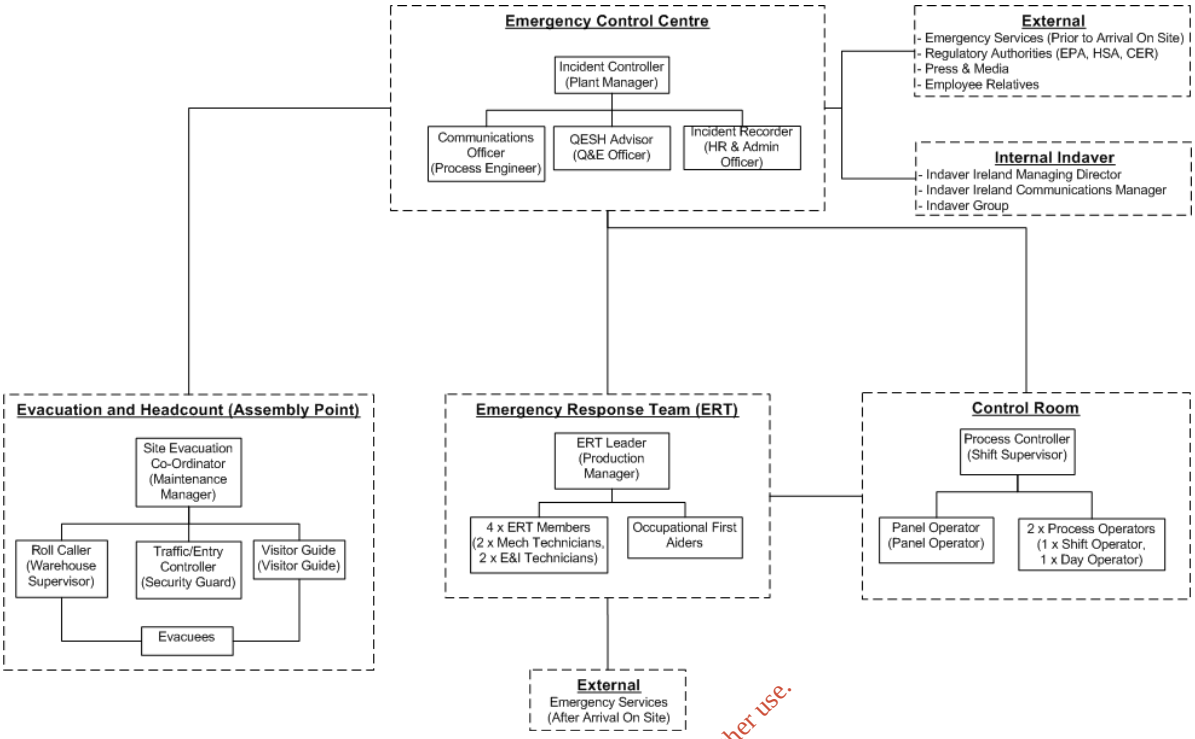


Figure 1: Structure of Emergency Response Organisation (During Normal Business Hours)

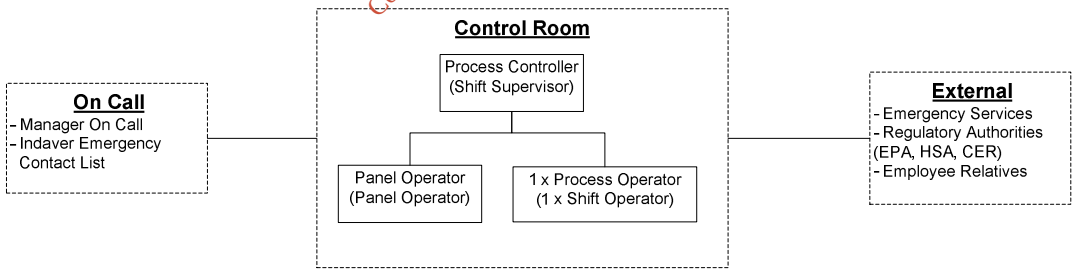


Figure 2: Structure of Emergency Response Organisation (Outside Normal Business Hours)

5.3 Activation of Alarms

Local Alarms (area sounders and strobes) are activated automatically by the local heat/smoke/flame detectors in the area. Local alarms can also be activated by personnel using the Break glass Units located in the specific area if personnel notice a fire or other situation requiring emergency action. Alternatively personnel can contact the Control Room on Extension 4017 or by radio to inform them of the situation and the Control Room can then activate the Local Alarm as required.

The Plant Alarm can only be activated from the Control Room using a designated key switch. The Control Room can be notified of an emergency situation by activation of a Local Alarm as described above or by contacting the Control Room on Extension 4017 or by radio.

After being informed or otherwise notified of an emergency situation, the Panel Operator in the Control Room shall consult with the Process Controller (Shift Supervisor) who shall assess the need for the activation of the Plant Alarm based on the severity of the situation and if deemed necessary shall instruct the Panel Operator to activate the Plant Alarm using the key switch in the Control Room.

The Panel Operator may also activate the Plant Alarm without consulting with the Shift Supervisor if the severity of the emergency situation so requires and/or if instructed to do so by the ERT Leader (Production Manager) or Incident Controller (Plant Manager).

If the Plant Alarm malfunctions/does not operate the Panel Operator shall contact the Shift Supervisor and the Security Guard who will operate the Manual Mobile Alarm in the building and outside the Security Gatehouse respectively. The Panel Operator will inform all personnel of the Plant Alarm over the radio system.

At the end of the Emergency situation, the Panel Operator shall generate the End of Plant Alarm signal after being instructed to so do by the Incident Controller (during normal business hours) or the Shift Supervisor (outside normal business hours).

5.4 Actions to be taken in event of Alarm / Emergency Situation

The full emergency response organisation including ERT (as shown in Figure 1) is only present on-site during normal business hours (Monday to Friday 08:00 – 16:30), during which time full production (i.e. waste deliveries etc.) and maintenance activities take place. However, the plant incineration process operates on a 24-hour seven day per week basis, but with a reduced manning level outside normal business hours. Therefore due to the difference in manning levels, the emergency actions taken on-site will differ between normal business hours and outside normal business hours.

5.4.1 During normal business hours

5.4.1.1 Personnel Discovering the Incident/Hearing Alarm

Fire

- Activate the local area fire alarm by using the nearest Break Glass Unit
- Contact Control Room on Extension 4017 or by radio and follow their instructions
- For small fires, having regard for personal safety and the safety of others, undertake 'reasonable action' to extinguish small fires or prevent escalation e.g. shut off source of ignition and attack fire with appropriate extinguisher if trained to do so.
- If this is not possible, do the following:
    - Make your job safe – stop machinery, hot work etc
    - Evacuate local area

Spill of Hazardous Material

- Contact the Control Room on Extension 4017 or by radio to report the spill giving them as much information as possible about the nature of the spill (material names, size of spill, location etc.) and follow their instructions (e.g. evacuate area)
- Make your job safe - stop machinery, hot work etc
- For small spills/leaks, having regard for personal safety and the safety of others, undertake 'reasonable action' to contain/clean up small spill using local spill kit if trained and properly equipped (e.g. correct PPE) to do so

Injury to Person(s)

- Contact the Control Room on Extension 4017 or by radio to report the injury and request them to send first aider
- Remain with the injured person until the arrival of the First Aider
- Follow the instructions of the First Aider

All other accident/incident/emergency situations

- Contact the Control Room on Extension 4017 or by radio and follow their instructions

Personnel Hearing Local or Plant Alarm

- On hearing plant or local alarm, personnel who are part of the Emergency Organisation shall carry out their specific duties as defined in Section 3 and in accordance with their training
- Personnel without specific responsibilities in an emergency should do the following:
    - On hearing Local Alarm
        - Make your job safe where possible
        - Evacuate the local area following emergency exit signage and lighting and proceed to Control Room
        - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
        - Await further instruction from the Control Room.
    - On hearing Plant Alarm:
        - Make your job safe where possible
        - Proceed to the designated external Assembly Point following emergency exit signage and lighting
        - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
        - Report to the Site Evacuation Co-Coordinator at the Assembly Point for Roll-Call.
    - Plant visitors or contractors should also follow the instructions of their Indaver host/contact

5.4.1.2 Local Alarm

- Control Room is notified of emergency situation in local area (e.g. fire, chemical spill, personnel injury etc.)
- Production and/or Maintenance personnel discovering incident in local area take first action to address situation if safe to do so (e.g. extinguish small fire, contain small spill)
- The Control Room decides whether or not to activate Local Alarm (sounders and strobes) in area if not already activated by smoke/heat/flame detectors in area or Break Glass Unit
- If the Local Alarm Sounders and Strobes are activated, the local area will be evacuated and evacuees will proceed to Control Room and await further instruction from the Control Room. Normal operation will continue in other areas of the plant.
- If there are any public visitors on site, the Control Room Panel Operator shall inform the Public Visitor Guide by radio about the restricted area and if necessary not to leave the visitors room.
- The Control Room Panel Operator shall alert the ERT by radio
- Members of the ERT will report to ERT Leader, don the appropriate PPE and equipment and execute the necessary mitigation actions to address the emergency in the local area
- The ERT Leader will inform the Control Room Panel Operator when the emergency situation has been contained or the requirement to upgrade the Local Alarm to Plant Alarm

- The Panel Operator shall inform the Incident Controller (Plant Manager) of the situation if appropriate (e.g. serious incident/severe personal injury/potential for escalation)

5.4.1.3 Plant Alarm

After being informed or otherwise notified of an emergency situation, the Panel Operator in the Control Room shall consult with the Process Controller (Shift Supervisor) who shall assess the need for the activation of the Plant Alarm based on the severity of the situation and if deemed necessary shall instruct the Panel Operator to activate the Plant Alarm using the key switch in the Control Room.

The Panel Operator may also activate the Plant Alarm without consulting with the Shift Supervisor if the severity of the emergency situation so requires and/or if instructed to do so by the ERT Leader (Production Manager) or Incident Controller (Plant Manager).

On activation of the Plant Alarm the following actions will take place:

- Persons with a specific role in the Emergency Organisation shall carry out their duties as defined in Section 3 and in accordance with their training
- All other persons should:
  - Make their job safe
  - Proceed to the designated external Assembly Point following emergency exit signage and lighting.
  - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
  - Report to the Site Evacuation Co-Coordinator at the Assembly Point for Roll-Call.
- All radios shall be turned to the Emergency Radio Channel. Personnel responsible for control of operational equipment shall remain on separate operational radio channel if instructed to do so by Control Room.
- All non-emergency radio and telephone calls will be stopped.
- All vehicles shall be moved to the side of the road/designated parking area and shut down to allow access by Emergency Services.
- The Emergency Control Centre shall contact the Site Evacuation Co-Coordinator to confirm all personnel present and accounted for at Assembly Point.
- The ERT Leader reports to the Emergency Control Centre on the scale and nature of the emergency situation and requirement for Emergency Services support
- The Emergency Control Centre contacts the Emergency Services and other external organizations as required. Note: Fire Brigade will always be contacted in event of any fires which cannot be immediately contained by Indaver.
- If deemed necessary the Incident Controller shall inform Indaver Ireland Managing Director of the situation who in turn will inform Indaver Group management if necessary.
- After the Emergency situation, the Head of the Coordination Centre inform personally the eventual present Public Visitors.
- During the Emergency situation, nobody except the Emergency Services will be allowed to enter the plant. All other external personnel will be kept outside the entrance at the Security Gate House unless specific authorization to enter is given by the Incident Controller.

5.4.2 Outside Normal Business Hours

Outside of normal business hours, a minimum of three personnel (1 x Shift Supervisor, 2 x Production Operators) may be on site at any one time. At least one person shall be a trained occupational first aider.

The Shift Supervisor shall be responsible for initiating the emergency response and activating the Local and/or Plant Alarm as deemed necessary.

The Shift Supervisor shall initiate any appropriate actions (e.g. process control) to contain/ mitigate/ prevent escalation of the emergency situation if safe to do so.

In the event of a Local and/or Plant Alarm all personnel shall evacuate the area and proceed to the Control Room or other safe Assembly Point as instructed by the Shift Supervisor (or pre-defined assembly point during planned maintenance

The Shift Supervisor shall contact the Emergency Services to respond to:

- any fire situation
- any significant spill of hazardous materials
- personal injury requiring medical attention
- other emergency situation requiring the intervention of the Emergency Services

The Shift Supervisor shall send one of the Production Operators to meet the Emergency Services at the entrance gate (if safe to do so) and direct the Emergency Services to the emergency location on site.

The Shift Supervisor shall contact the Plant Manager and Manager on Duty to inform them of the situation. The Manager on Duty are required to proceed to the site and liaise with Shift Supervisor in the Control Room if the Emergency Services attend site.

5.4.3 End of Emergency Situation

The end of a Local Alarm is decided by the Control Room (Shift Supervisor and Panel Operator) after consultation with the ERT Leader. The Control Panel Operator will switch of the Local Alarm sounders and beacons in the local area.

The end of a Plant Alarm is decided by the Incident Controller after consultation with the ERT Leader and Emergency Services (if present on site). The Incident Controller will inform the Control Room Panel Operator to activate the End of Alarm Signal.

Following an emergency situation, the incident scene should remain undisturbed until the necessary information (e.g. photographs etc.) has been gathered as part of the incident investigation or until as instructed by the Plant Manager.

Following the end of the emergency situation, the ERT Leader shall ensure that any equipment (e.g. spill kits, BA cylinders, PPE, fire extinguishers etc.) used during the emergency situation is checked and cleaned/re-stocked/re-filled as required so that it is available for future use.

The Incident Controller shall:

- Ensure the Health & Safety Manager and Quality & Environmental Manager are informed of any accident and emergency situations so that an investigation is carried out and regulatory authorities (EPA, HSA etc.) are notified as appropriate.
- Liaise with the Guide for any public visitors so they receive the necessary information about the incident
- Consult with Indaver Ireland Managing Director regarding requirement to issue company wide update and/or media release on incident

Outside normal business hours, similar actions to the above are taken at the end of the emergency with the following exceptions:

- The end of a Local Alarm is decided by the Shift Supervisor. The Control Panel Operator will switch of the Local Alarm sounders and beacons in the local area.
- The end of a Plant Alarm is decided by the Shift Supervisor after consultation with the Plant Manager/Manager on Duty and Emergency Services (if present on site). The Shift Supervisor shall inform the Control Room Panel Operator to activate the End of Alarm Signal.

5.5 Controls and Actions to be Taken for Specific Emergency Situations

The plant controls in place and actions to be taken to address specific emergency scenarios are summarised in the spreadsheet attached to this procedure.

5.6 Notification of Emergency Situations to Regulatory Authorities

If the nature or scale or the emergency situation / incident requires regulatory authorities (e.g. HSA, EPA, RPII etc.) to be notified, the relevant authorities will be contacted in accordance with site licence(s) and/or regulatory requirements. An Emergency Contact List with contact numbers for relevant authorities is included as an attachment to this procedure. *Operations 6.4 Environmental Incident Investigation and Reporting* details the procedure to be followed for notifying the EPA and other authorities of environmental incidents.

6. HUMAN BEINGS

6.1 INTRODUCTION

This chapter evaluates the impacts, if any, which the proposed changes to the existing Indaver facility will have on Human Beings as defined in the Environmental Protection Agency (EPA) 'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements'), 2003.

This chapter has been prepared based on a review of the previous Human Beings assessment completed as part of the 2009 EIS and planning application. The 2009 assessment has been revised to assess the potential impact on human beings as a result of the proposed amendments to the existing planning permission as outlined in Chapter 1 Introduction.

In accordance with the above guidance this chapter has considered the 'existence, activities and well being of people' with respect to 'topics which are manifested in the environment such as new land-uses, more buildings or greater emissions'. Issues examined in this section include:

- Health and Safety
- Social Consideration
- Land Use
- Economic Activity

These issues are discussed below in further detail. Consideration of other issues as recommended by the EPA 'such as employment, commercial competition, zoning and social and economic activity are also dealt with in this section.

6.1.2 Human Beings Baseline Study

6.1.2.1 Introduction

This portion of the human beings assessment is conducted by reviewing the current socio economic status in the areas close to the proposed development. In the case of this facility, this is the District Electoral Division (DED) of Duleek in Co. Meath.

Identification of principal potential receptors and an analysis of recent trends in population, employment economic performance and land use including local amenities was completed and the impact of the development was assessed against this background. Reference is made to the most recent census data available from the Central Statistics Office (CSO), 'Census of Population 2006, Small Area Population

Statistics'. Although the 2011 census has been completed the Small Area Population Statistics will not be available from the CSO until later during 2012. The only statistics available from the 2011 census is the population for the state and province. The DED of Duleek includes 15 townland areas including:

- Carranstown*
- Abbeyland
- Caulstown*
- Commons*
- Cruicerath*
- Downestown
- Drumman
- Gillinstown
- Longford*
- Lougher
- Newtown*
- Prioryland
- Reask
- Roughgrange
- Stalleen*

The proposed development is located in the townland of Carranstown. Townlands accompanied with an asterix (*) are those within 3km of the proposed development.

6.1.2.2 Principal Potential Receptors

An assessment of principal potential receptors within the environs of the facility including homes, hotels, holiday accommodation, schools and rehabilitation workshops and commercial premises was conducted and is detailed below.

Housing development in the Duleek area intensified considerably between 2002 and 2006, as it did across much of the state. This was most evident in the village of Donore and Duleek town. An updated housing survey was conducted in November 2011 in the vicinity (3Km radius) of the proposed development and is illustrated in Figure 6.1. Since the previous housing survey completed in 2009, there has been no major change in population density/development around the facility. Only a small number of additional one off houses have been completed in the area since 2009.

Cognisance of the facilities in the villages of Duleek and Donore are also referenced as the facility is located approximately 2.7 km north east of Duleek and 2.6 km south east of Donore in Co. Meath.

Homes

Residential development in Carranstown is predominantly ribbon development along the main roads. These vary from one off housing to garages and two-storey farmhouses with associated sheds. A number of small commercial/industrial units including a petrol station and forecourt shop have been constructed approximately half way between the facility and Duleek village. The closest residential dwellings to the facility are;

- Two dwellings adjacent to the eastern boundary of the facility,
- Two dwellings located across the R152 to the south of the facility,
- A group of five residential dwellings and a garage located across the R152 road from the eastern corner of the facility,
- One unoccupied house and a newly built house adjacent to the southern boundary
- A further group of dwellings including two farm houses about 400 metres to the west of the facility across the railway line.

CSO information for 2002 and 2006 was used in assessing the number of households and the number of people in private households within the study area. The household size i.e. the number of people residing permanently at a household was evaluated on a national, county and DED level. The findings are illustrated in Table 6.1 and 6.2 respectively.

Table 6.1 Numbers of Households in the Study Area, 2002 and 2006

	2002	2006	Increase/ Decrease
Persons in private households (Duleek DED)	2922	3236	+314
Number of households (Duleek DED)	941	1107	+166

The findings illustrate that within the study area the number of households increased significantly between 2002 and 2006. Table 6.2 below demonstrates and that the number of people residing permanently at a household has decreased between 2002 and 2006 as it also did between 1996 and 2002. This follows the general national trend.

Table 6.2 Households Sizes on National, County and DED Level, 2002 and 2006

	2002 (Units/people per household)	2006 (Units/people per household)	% Increase/Decrease
State	2.94	2.81	- 0.13%
County Meath	3.2	3.00	- 0.2%
Duleek DED	3.1	2.92	- 0.05%

Health, Social and Community Facilities

Health, social and community facilities located in the study area are limited but include:

- Local Football Club, Opposite Carranstown Lodge
- Duleek Pitch 'n' Putt Club

Schools

Details are provided below on the four primary schools located in the study area, including their address.

Table 6.3 Educational Facilities in the Area

School Type	Name	Address	Approximate Distance from Facility (km)
Primary	Scoil Colm Cille	Mt Hanover, Duleek Co. Meath	1
Primary	Donore Primary	Donore, Duleek, Co. Meath	2
Primary	Duleek Girls NS	Duleek, Co. Meath	2.5
Primary	Duleek Boys NS	Duleek Co., Meath	2.5

Heritage and Amenity

The Area is classified under the County Development Plan as 'Rural and Agricultural'. The closest 'Areas of Visual Quality' to the facility are the 'Lower Boyne Valley' located about 2km to the north and the 'River Valleys' located about 2km to the South (See figure 6.2). The area immediately surrounding the facility is not a significant tourist attraction however Duleek is identified as a settlement with potential to be a tourist base and is considered a secondary tourist attraction in the County Development Plan.

Duleek is located within Central Lowlands Landscape Character Area which is identified by the County Development Plan as being of regional importance, having high landscape value, and as having medium landscape sensitivity. The core area of Duleek town is designated as an Area of Archaeological Interest and there are 32 no. recorded facilities and monuments within the Duleek Local Area Plan. The Duleek Heritage Trail has been established because of the high quality built heritage and historic buildings within Duleek and includes monastic facilities and facilities linked to the Battle of the Boyne. The buildings/ structures included within the Duleek Heritage Trail include the following:

- Duleek Courthouse
- Connells House
- Duleek Parochial House
- The Lime Tree
- St. Cianans R.C
- Larrix Street and Kingsgate
- St. Mary's Abbey
- Duleek Wayside Cross
- Duleek House
- Duleek Commons
- The Beford Cross
- The Nanny Bridges
- Coach House or 'The Buildings'

Duleek, amongst a number of other towns and areas are included within The Boyne Valley which holds significant archaeological value that attracts tourists. In addition it has the tourism potential for fishing holidays in the River Boyne. Duleek village does have heritage connections to the events of the Battle of the Boyne and there is signage at the River Nanny Bridge explaining the town's role during the Battle of

the Boyne. The village boasts a number of religious crosses, churches and Abbeys as well as the oldest Lime tree in Ireland. Heritage protected structures and amenities in the area include:

- Bellewstown Race Course
- Bru Na Boinne visitor centre incorporating Newgrange, Knowth and Dowth Megalithic tombs
- The Boyne River Valley
- The Battle of the Boyne historic area
- Duleek village churches and crosses

Proposed Natural Heritage Areas (pNHA) in the locality includes (see Chapter 13 for more information on these):

- pNHA. Duleek Commons (No. 01578)
- pNHA Thomastown Bog (No. 01593)
- cSAC Boyne River Islands (No. 01862)
- pNHA Dowth Wetland (No. 01861)

The above proposed natural heritage areas (pNHAs) are located between 2km and 5km from the proposed facility. Therefore there was no requirement to assess the potential impact of the facility on these sites.

Commercial and Industrial premises

The development is situated to the southwest of the existing Irish Cement Ltd. cement manufacturing plant at Platin, Duleek, Co. Meath. Annual output here is about 2.8 million tonnes of cement annually. The cement works is one of three significant employment locations within or close to Duleek. The remaining two are the Duleek Business Park and the quarry to the north of the town. The Duleek Business Park provides employment space for light industrial and service based businesses and a Framework Plan Area for Extension to Duleek Business Park is developed. This area relates to lands located north-east of the existing Duleek Business Park.

As mentioned previously there is a garage and tyre shop located across the R152 to the eastern boundary of the facility. In addition there are industrial units in the townsland of Gaffney approximately 1.5km to the southwest of the facility. As much of the study area is farmland the majority of the non-residential buildings in the area are farm sheds and related agri-business. These small businesses are scattered around the study area.

Areas in Duleek have been targeted for mixed residential and commercial development. There are many commercial units in the centre of Duleek village including convenience stores, comparison outlet and service businesses. The service units include hairdressers, betting offices, pubs, restaurants, post office and credit union.

6.1.2.3 Recent Trends in Population

The closest population centres to the facility are Duleek village to the south west and Drogheda town to the north east. Carranstown is located within Duleek DED. Although the SAPS are not available for the 2011 census, the population statistics are available for the state and county but not the DED level. CSO data provides an ability to review recent trends in population within the wider area over a four year period i.e. from 2006 to 2011 as illustrated in Table 6.4. The growth rates in the county at 13% exceeded the state growth rates of 8.1%. Although the 2011 figures are not available for Duleek it is likely that the population has increased.

Table 6.4 2006 and 2011 Population of the Study Area

	2006	2011	% Increase
State	4,239,848	4,581,269	8.1
County Meath	162,831	184,034	13.0
Duleek DED	3,236	-	-

The demographic profile i.e. the age structure, of the population in the study area is illustrated in Table 6.5. The table shows a notable increase in overall population with notable increases particularly in the 25-44 age group. An increase of 36% was noted in this age group.

Table 6.5 Demographic Profile within the Study Area

	2002		2006	
	Actual	**%**	**Actual**	**%**
0 - 14	651	22.13	765	23.64
15 - 24	512	17.40	464	14.33
25 - 44	951	32.33	1297	40.1
45 - 64	603	20.50	539	16.65
65+	224	7.61	171	5.28
Total	2941	100.0	3236	100.0

6.1.2.4 Recent Trends in Employment

Recent trends in employment were evaluated using CSO information and information generated from the Small Area population Statistics (2006). The information was complied on the basis that:

- The labour force is defined as the sum of people aged 15+ who are at work or who are unemployed

- The participation rate is the proportion of persons in the workforce aged 15 and over expressed as a percentage of all persons in that age group
- The unemployment rate is the proportion of all people unemployed expressed as a percentage of all persons in the labour force

The findings illustrate that the unemployment rate within the study area is 3.69%, which is a slight increase on the 2002 statistics of 3.58%.

Upon evaluation of the principal employment profiles as illustrated in Table 6.7, it is evident that employment rates in agriculture, manufacturing and building/construction are decreasing while employment rates in commerce, clerical and professional services are increasing. Clearly as this data relates to an employment profile based on 2006 census data, the employment profile is likely to have changed significantly in the area between 2006 and 2011, particularly in light of the changed economic circumstances. The County Development Plan states that unemployment in the town is still relatively high despite the success of Duleek Business Park.

Table 6.6 Employment Figures

	Persons aged 15+		At Work		Unemployed		Labourforce		Participation Rate		Unemployment Rate of Workforce	
	2002	2006	2002	2006	2002	2006	2002	2006	2002	2006	2002	2006
DED	2290	3358	1277	2149	82	124	1359	2273	59.3%	67.6%	3.58%	3.69%

Table 6.7 Distribution of Employment Sectors within the Study Area

	DED	
	2002 %	2006 %
Agriculture (including fishing,forestry)	5.71	3.07
Manufacturing/ Industry	21.45	14.65
Building/ Construction	18.48	13.77
Commerce (including service)	20.83	22.25
Transport	6.73	8.8
Clerical/ Public Admin	4.15	18.24
Prof Workers	9.47	10.42
Other	13.16	8.8
Totals	100	100

6.2 HEALTH AND SAFETY

6.2.1 Human Health

As part of the 2006 EIS, Dr. Martin Hogan AFOM, FFOMI, a Medical Doctor specialising in Occupational Medicine was asked to assess the potential effect on human health of the Municipal Waste Incinerator at Carranstown Co Meath. It is considered that the proposed amendments, which do not result in a change to the primary process or significant changes to the nature or characteristics of the emissions, will not result in an impact on human health. This is demonstrated in the findings of the air quality study (as presented in Chapter 7). It is therefore not considered necessary to reassess the potential impacts of the facility on human health. Other potential health impacts regarding the delivery, handling and processing of the proposed new waste types are outlined below.

6.2.1.1 Proposed New Waste Streams

Part of this application includes the request to accept additional waste types at the Meath WTE facility, including some that have been designated as hazardous waste by the assignment of the most appropriate EWC (European Waste Catalogue) Code.

For clarity, this does not mean that these new waste types are dangerous wastes, most would be very similar in physical and chemical characteristics to the wastes accepted at the Meath WTE facility today as non hazardous waste, but due to them being collected directly from particular producers, or as segregated streams from existing waste collectors or Civic Amenity Sites, the classification process designates the material to be hazardous.

Waste that would pose a danger to Indaver personnel, or indeed, Indaver's extensive investment in the Meath WTE will not be accepted at the facility. Health and Safety assessments of all Indaver Operations are ongoing as part of the companys commitment to guaranteeing a safe working environment and protection of the Environment.

6.2.1.2 Transport to the site

Wastes will be transported to the site in sealed packages in closed trailers/shipping containers or in bulk in covered vehicles. This waste is currently being transported further afield and poses no threat to public health.

6.2.1.3 Handling and storage on site

Wastes will be tipped directly into the bunker which is designed as a large water retaining structure and hence there is no threat to groundwater – discussed further in Chapter 9. The bunker is kept under a negative air pressure by the primary air fans and this means that any airborne particles in the bunker associated with this waste will be introduced to the furnace. The only exception to this would be if infectious waste (EWC Code 18 01 03*) was to be accepted at the site. If this waste type was

acceptable, then a direct feeding mechanism in the form of a closed conveyor system would have to be constructed so that this waste would not be introduced to the bunker.

6.2.1.4 Processing & Emissions Control

These wastes will be mixed with other wastes in the bunker by mechanical cranes remotely operated from the control room and fed directly into the furnace via the hopper. The waste will burn out on the grate and the bottom ash will exit via the wet de-slagger and then be sent by conveyor to the bottom ash hall. Based on experience from other grate furnaces in Europe treating similar waste types, the classification of the bottom ash will remain non-hazardous. This will be verified in accordance with the sampling and analysis regime required under the existing waste licence. As mentioned previously in Section 5.7 of Chapter 5, the emissions will not be compromised due to the robust design of the flue gas cleaning systems and the upstream measurement of pollutants in the untreated flue gases. This measurement allows a quick response from the control system if it sees an increasing trend in HCl or SO_2 concentrations to increase the addition of lime milk or dry lime at the two stages in the flue gas cleaning process to keep the concentrations of these pollutants low in the stack. Heavy metals and dioxins are controlled by overdosing at both stages in the process with expanded clay and activated carbon at fixed rates. Experience from other plants in Europe burning these waste types is that emissions control is not a difficulty. For example; the Ekokem facility in Finland or the AVR facility at Rosendahl, Rotterdam in The Netherlands.

6.3 SOCIAL CONSIDERATIONS

6.3.1 Introduction

Planning permission was granted for the construction of a 70 MW waste-to-energy facility with a capacity of 200,000 tonnes per annum. The plant has been built and is operational. It is intended to apply for planning permission to increase the tonnage to 220,000 tonnes per annum and accept suitable hazardous waste streams. This plant remains Ireland's first commercial waste-to-energy plants and while waste-to-energy is not the definitive solution to the waste issue in this country; its necessity is paramount to the success of a fully integrated sustainable waste management system in Ireland.

While being an end of cycle process for waste, the re-use of the waste as energy is in line with the principles of the waste hierarchy and sustainable development as detailed in Chapter 2 the Background to the Project. Simple hazardous waste streams, for instance paint tins or empty contaminated packaging are exported abroad for treatment however the technology is now available within the plant to treat these waste streams providing cost savings. Furthermore the permitted development will have a significant role in the following:

- It is a recommended objective of the Environmental Protection Agency's (EPA) Second National Hazardous Waste Management Plan 2008-12 to reduce export and increase indigenous (including on-site) treatment of hazardous waste. For example, the hazardous waste category of paint, ink, varnish waste amounts to approximately 3,977 tonnes annually of which approximately, 3,045 tonnes of waste was exported abroad. The hazardous waste stream of packaging (contaminated or containing residues) generated approximately 1,115 tonnes, of which 881 tonnes is exported abroad

- It will contribute to Ireland's renewable energy targets as required under EU Directive 2001/77/EC. Renewable energy will be generated from the biodegradable fraction, which is, on average over 50% of the waste treated. The proposed increase in tonnage at the facility can provide enough electricity for 20,000 homes annually. It will also contribute to the production of electricity to reduce both the reliance on energy imports and exposure to international markets.

- Ireland has committed, under the Kyoto Protocol, to maintaining its green-house gas emissions to some 13% above its 1990 levels in the period 2008-2012. The reduction from the fossil fuel energy sector will make a significant contribution to achieving Ireland's Kyoto obligations.

- Reduce landfill emissions of methane due to diversion of the waste stream from landfill to incineration.

- The Landfill Directive 1999/31/EC set national targets for the diversion of biodegradable waste from landfill (based on the 1995 waste figures). The quantity of biodegradable waste going to landfill in 2009 was approximately 1,059,582 million tones and the target for 2013 is 610,000 tonnes. There remains an ever more urgent requirement to establish necessary treatment facilities in order to achieve the National targets as set out by the landfill directive and the National Strategy for Biodegradable Waste (2006).

6.3.2 Impacts and Mitigation Measures

Impacts upon society as a result of this development have been considered in detail in this EIS. Detailed descriptions of the effects, residues and emissions associated with the facility and the proposed amendments are presented in Chapters 6-17 under the following headings:

Chapter 6: Human Beings	Chapter 12: Ecology
Chapter 7: Air	Chapter13: Traffic
Chapter 8: Noise	Chapter 14: Landscape- Visual Impact
Chapter 9: Geology and Soils	Chapter 15: Climate
Chapter 10: Groundwater and Hydrogeology	Chapter 16: Cultural Heritage
Chapter 11: Surface Water	Chapter 17: Material Assets

6.4 TOURISM , LAND USE & ECONOMIC ACTIVITY

As outlined above the proposed amendments will not impact on the local population from a health perspective i.e. medical, dioxins or odour. The following sections describe the potential indirect impact of the proposed facility on human beings via tourism, landuse and employment. Impacts on a number of other related economic assets are described in Chapter 17 Material Assets. The proposed amendments within the same facility will have no impact on tourism or land use. There will be a positive impact for economic activity in terms of the proposed acceptance of suitable hazardous waste as it will provide a cost saving for companies and local Authorities in comparison to exporting abroad. The proposed centralisation of the Indaver Maintenance and Spare Parts at the facility will provide additional employment opportunities. A summary of the findings of the assessments is presented below.

Incinerator in Vienna

Incinerator in Portugal

6.4.1 Tourism

In general the facility and environs are predominantly agricultural and therefore tourism is not a major industry in the immediate area of the facility. Duleek is identified as a settlement with potential to be a tourist base and is considered a secondary tourist attraction in the County Development Plan. The primary attractions in Duleek and the surrounding areas are listed above under 'Heritage and Amenity'. There is some tourist accommodation in the form of B+Bs within a 3km radius of the facility though there are no hotels, caravan facilities or self-catering accommodation in the study area. These facilities are available at the nearby towns of Drogheda, Ardee and Navan.

6.4.1.1 Impacts and Mitigation Measures

Many of the 450-500 European municipal waste-to-energy facilities are located in the vicinity of major tourist attractions. Incinerators are currently operating in European cities such as Paris, Monaco, Vienna and Lisbon and on islands such as Madeira and Majorca, all popular holiday destinations and where tourism makes a significant contribution to the national economy. From research to date there is no evidence to suggest that a waste-to-energy plant has a significant impact on tourism in the vicinity. As the plant has now been constructed the proposed amendments to the plant will have no impact on tourism in the immediate area and therefore no mitigation is proposed in relation to potential impact for tourism.

Incinerator in Madeira

Incinerator in Majorca

6.4.2 Land Use

The facility is located on an area of approximately 10 hectares (25 acres in the townland of Carranstown, County Meath (Figure 6.1). The proposed amendments will not involve any additional land take and there will be no severance of land. There will also be no loss of rights of ways, amenities or rezoning of land required. A number of the proposed additional structures within the facility are already present as temporary structures. The operation of the development is not predicted to have any significant impact on the land-use of the surrounding areas and is not predicted to have any significant impact on the housing in the surrounding areas. (See Chapter 17– Material Assets for further information.)

6.4.2.1 Impacts and Mitigation Measures

Cognisance of the impact that this development will have on the environment as a whole has been evaluated in Chapter 6-17.

6.5 ECONOMIC ACTIVITY

6.5.1 Introduction

On the basis of the most recent Census data, the total labour force within the study area in 2006 was 2,273. The largest employment sector is in the commerce sector accounting for 22.25% of the employment rate. This is followed closely by the clerical/public admin sectors comprising 18.24% of the workforce respectively.

6.5.2 Impacts

Direct Impacts

As outlined in Chapter 18, it is expected that construction works related to the conversion of the temporary office and maintenance building will require up to 10 staff. The staff will comprise managerial, technical, skilled and unskilled workers. It is anticipated that this proposed development will have a small increase on the numbers of employees in this sector.

Now that the facility is fully operational 44 personnel are employed in a full time capacity (the majority of whom are from the immediate area). Based on the proposed amendments the employment will increase to 46-47. It is considered that the revenue generated from the additional employment of 2-3 persons within the study area will result in additional money being spent in the locality. This will have effects on local service demand, accommodation etc over a long term basis resulting in continued expenditure within the locality.

Community Gain

As a condition of the original planning permission granted to Indaver Ireland an annual financial contribution of €200,000 is made to Meath County Council for the provision of environmental improvement and recreational/community facility projects in the vicinity of the facility. The identification of environmental/recreational/community facility projects are decided by Meath County Council and the Community Liaison Committee.

Since the start of construction in 2009, the Community Fund has been used to fund a number of projects including building a footpath along the R152, resurfacing a play area at Duleek Girls School, repair and restoration of old headstones and maintain cemetery at Donore Cemetery –, new railings on the Duleek GFC sports field, provision of meeting rooms for Duleek AFC-, replacement of netting at St Marys GFC, extension of an indoor training area at Cushinstown Athletic Club and planting of mature trees in association with the Duleek Tidy Towns committee.

The additional tonnage proposed will provide an additional €25,000 per annum to the fund if granted.

6.5.3 Mitigation Measures

Following completion of the proposed amendments to the development a small increase in employment within the DED will occur and introduce related expenditure into the economy as detailed above. The additional minor construction works for the proposed amendments to the development will take place over approximately 1 month, as outlined in Chapter 18. It is estimated that an additional maximum of 10 people will be employed in the construction activities for the proposed amendments. Therefore no mitigation measures are suggested as the proposed development will have a slight positive impact on the economic activity of the study area.

6.6 RESIDUAL IMPACTS

Strict adherence to the mitigation measures recommended in Chapters 6 to 18 will ensure that there will be no negative environmental impacts or effects on Human beings as a result of the proposed amendments to the development.

N

DROGHEDA

Donore

DONORE

M1

Approximate 1Km Buffer from Site

Platin

Cement Factory

Platin

Carranstown

Cruicerath

Carranstown

Platin

Carranstown

Caulstown

R152

Commons

Shop &
Office

Indutrial
Unit

Commons

Industrial Estate

Housing Estate

R150

River Nanny

DULEEK

Bellewstown

Bellewstown

BlackDitch

KnockIsland

KnockIsland

LEGEND

- House
- Farm Building
- Derelict House
- School
- Indaver Buildings
- Site Boundary

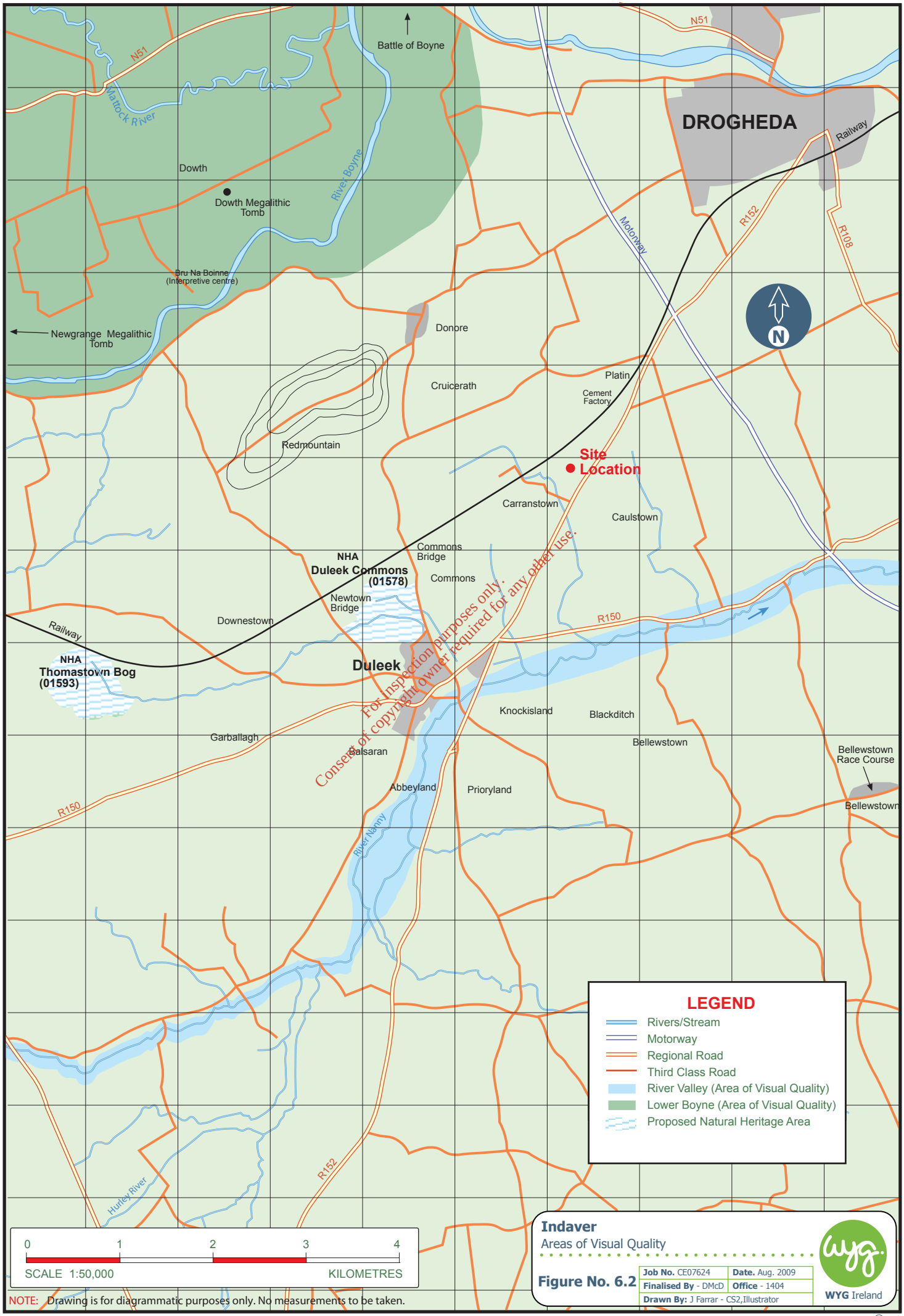
NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.

Indaver
Housing Survey

Figure No. 6.1

Job No. CE08650	**Date.** March 2012
Finalised By - DMcD	**Office** - 1404
Drawn By: J Farrar - CS2,Illustrator	

WYG Ireland



NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.

Indaver

Areas of Visual Quality

Figure No. 6.2

Job No. CE07624	**Date.** Aug. 2009
Finalised By - DMcD	**Office** - 1404
Drawn By: J Farrar - CS2,Illustrator	

WYG Ireland

7 AIR QUALITY

7.1 INTRODUCTION

The air quality assessment undertaken in 2009 comprehensively addressed the potential impacts of the emissions from the existing development on the air quality of the site and its environs. The 2009 study has been updated to allow for an increase in traffic associated with the proposed increase in waste accepted from 200,000 tonnes to a maximum of 220,000 tonnes (including a possible maximum of between 10,000 – 15,000 tpa of suitable hazardous waste streams).

The 2009 assessment was modelled on the maximum emission concentrations outlined in the Waste Incineration Directive (2000/76/EC), and assumed 110% of the nominal flue gas flow rate and also assumed 100% availability of the plant of 8760 hours per year. This found that the impact on air quality would not be significant. As outlined in Section 5.7 Stack Emissions, recent spot measurements of the volume flow at the facility have shown that the volume flow is slightly higher than was anticipated. The air modelling study has been updated to assess the impact of variations to the volume flow.

A summary of the key findings of the updated air quality assessment is presented below.

7.1.1 Study Methodology

The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model[9] (Version 1.03c, July 2007) and the NO_x to NO_2 Conversion Spreadsheet[10] and following guidance issued by the NRA[11], UK DEFRA[6-9] and the EPA[12,13]. The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. The worst-case predicted ambient concentration is then compared with the relevant ambient air quality standards.

7.2 EXISTING ENVIRONMENT

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality Monitoring Annual Report 2010"[1] details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes[1,2]. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 21 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all

towns with a population of less than 15,000, is defined as Zone D. In terms of air quality management, the facility is defined as Zone D[1,2].

Long-term NO_2 monitoring is carried out at two rural Zone D locations, Glashaboy and Kilkitt[1,2]. The NO_2 annual average in 2010 for both sites was 10 and 3 µg/m^3, respectively. The results of NO_2 monitoring carried out at the urban Zone D location in Castlebar in 2010 indicated an average NO_2 concentration of 10 µg/m^3 with no exceedances of the 1-hour limit value[1,2]. Hence, the long-term average concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3. Based on the above information and previous baseline monitoring data carried out at the site as reported in the 2009 EIS, a conservative estimate of the background NO_2 concentration is 20 µg/m^3

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar and Longford in 2010[1]. The average concentrations measured at both sites were 15 and 21 µg/m^3, respectively. Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2010 gave an average level of 10 µg/m^3[1]. Data from the Phoenix Park in Dublin also provides a good indication of urban background levels, with an annual average in 2010 of 11 µg/m^3[1]. Based on the above information and previous baseline monitoring data carried out at the site as reported in the 2009 EIS, a conservative estimate of the background PM_{10} concentration is 20 µg/m^3.

The results of $PM_{2.5}$ monitoring at Rathmines (Zone A) in 2010[1] indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.67. Based on this information, a conservative ratio of 0.70 was used to generate a rural background $PM_{2.5}$ concentration of 14 µg/m^3.

A summary of the background concentrations used for the air dispersion model is detailed in Table 7.4.

7.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

7.3.1 Forecasting Methods

The air quality assessment has been carried out following procedures described in the publications by the EPA[1,2] and using the methodology outlined in the guidance documents published by the UK DEFRA[3-9].

7.3.2 Construction

There will be some minor construction activities associated with this application. Two existing buildings will be converted from temporary to permanent structures but there are no construction activities associated with this. The construction activity is centred on an access road to the modular office building, additional parking spaces and the installation of a Puraflo® effluent treatment system.

7.3.3 Incineration

Incineration would be expected to be the dominant source of air emissions associated with the proposed development. For the purposes of this assessment, the "Do Nothing" scenario is based on the facility in operation treating 200,000 tonnes of residual household and commercial waste whilst the "Do Something" scenario is based on the facility in operation treating 200,000 tonnes of residual household and commercial waste and 20,000 tonnes additional throughput (with a maximum of 10,000 – 15,000 of select hazardous waste streams). A detailed air modelling assessment was previously undertaken in the air quality chapter of the 2009 EIS which represents the current "Do Nothing" scenario. The assessment, based on the proposed maximum volume flow and based on the maximum emission concentrations outlined in the Waste Incineration Directive (2000/76/EC), found that the impact on air quality would not be significant (based on continuous operations for 8760 hours per year). In relation to the "Do Something" scenario, as mentioned in Section 5.7 Stack Emissions, recent spot measurements of the volume flow at the facility have shown that the volume flow is slightly higher than was anticipated. The current air modelling study has been undertaken to assess the impact of variations to the volume flow. The assessment includes the maximum spot volume flow, the minimum spot volume flow and the 110% maximum volume flow as shown in Table 7.5. This assessment has been undertaken in order to ascertain whether any signficant variation in ambient ground level concentrations of the regulated pollutants occurs due to the variation in volume flows.

7.3.4 Road Traffic

Additional road traffic related to the additional tonnage of waste to the plant will result in additional air emissions. Waste will be transported from the source of the waste to the site for disposal whilst the residues will subsequently be removed from the facility to be treated appropriately.

The current assessment focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ (pollutants which are most associated with road traffic) in the region of the proposed road development, both currently (by analysis of suitable EPA monitoring data), and with the proposed development in place (through modelling). Thereafter, the impact of the development on air quality at the neighbouring sensitive receptors was determined relative to the existing baseline for the design year (Year 2023).

Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the NRA guidelines[(11)] detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the development. The NRA significance criteria have been adopted for the current development and are detailed in Tables 7.1 – 7.3. The significance criteria are based on PM_{10}, $PM_{2.5}$ and NO_2 as these pollutants, derived from traffic sources, are most likely to exceed the limit values.

7.4 PREDICTED IMPACT OF DEVELOPMENT ON AIR QUALITY

7.4.1 Construction

The construction activities associated with this development will be minor and temporary in nature. Dust emissions associated with the construction phase of the project will be negligible.

7.4.2 Incineration

Full details of the air dispersion modelling input parameters and modelling methodology are as per the Carranstown WTE Facility EIS which was undertaken in 2009 with the exception that the USEPA air dispersion model, AERMOD, has been updated from version 07026 to version 12060. This would be expected to have only a minor effect on the ambient ground level concentrations.

As shown in Tables 7.6 – 7.9, a comparison between the ambient ground level process contributions of the regulated pollutants shows only a very minor variation as the volume flow changes.

At the maximum spot value volume flow, ambient ground level concentrations are similar compared to results derived using the EIS maximum volume flow with variations ranging from between +<0.01% to +2% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the maximum flow scenario.

At the 110% maximum volume flow, ambient ground level concentrations are similar compared to results derived using the EIS maximum volume flow with variations ranging from between +<0.01% to +2% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the maximum flow scenario.

At the average volume flow, ambient ground level concentrations are similar compared to results derived using the EIS average volume flow with variations ranging from between +<0.01% to +1.9% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the average flow scenario.

At the minimum spot value volume flow, ambient ground level concentrations are similar compared to results derived using the EIS average volume flow with variations ranging from between +0.01% to +0.5% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the minimum spot value volume flow scenario.

Results indicate that the changes to volume flow do not result in a significant change in the ambient ground level concentration with results increased by no more than 2% of any ambient air quality standard.

7.4.3 Road Traffic

Two receptor locations were modelled in the region of the facility. R1 was located adjacent to the R152 / M1 junction whilst R2 was located along the R152, 400m west of the R150 junction with the R152. The receptors modelled represent the worst-case locations in the vicinity of the facility. Annual average traffic speeds are required as an input to the DMRB screening model[9]. Results are reported for a typical traffic speed of 80 kph on all roads with a worst-case speed of 10 kph.

The discussion below provides modelling results for PM_{10}, $PM_{2.5}$ and NO_2 based on typical speeds.

"Do Minimum" Modelling Assessment

PM_{10}

The results of the "Do Minimum" modelling assessment for PM_{10} in the design year are shown in Table 7.10. Concentrations are well within the annual limit value at both worst-case receptors. In addition, the 24-hour PM_{10} concentration of 50 µg/m^3 is in compliance with the limit value at each of the receptors modelled. Annual average PM_{10} concentrations range from 51 - 52% of the limit value in 2023.

$PM_{2.5}$

The results of the "Do Minimum" modelling assessment for $PM_{2.5}$ in the design year are shown in Table 7.10. The predicted concentrations at both worst-case receptors are well below the $PM_{2.5}$ limit value of 25 µg/m^3. The annual average $PM_{2.5}$ concentration peaks at 58% of the limit value in 2023.

NO_2

The results of the "Do Minimum" assessment of annual average NO_2 concentrations in the design year are shown in Table 7.10. Concentrations are well below the limit value at both locations, with levels ranging from 59-60% of the limit value in 2023.

The hourly limit value for NO_2 is 200 µg/m^3 are expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). Maximum 1-hour NO_2 concentrations for the "Do Minimum" scenario are given in Table 7.10. Predicted levels in 2023 are below the limit value, with levels at the worst-case receptor 60% of the limit.

Modelled Impact of the Development Once Operational ("Do Something")

PM_{10}

The results of the modelled impact of the proposal for PM_{10} in the design year are shown in Table 7.10. Predicted annual average concentrations in the region of the proposal are well below the ambient standards at both worst-case receptors, ranging from 51-52% of the limit value in 2023. In addition, compliance will be achieved with the 24-hour limit value at both locations in 2023.

The impact of the proposal can be assessed relative to "Do Nothing" levels in 2023 (see Table 7.10). Relative to baseline levels, a negligible increase in PM_{10} levels at both worst-case receptors is predicted as a result of the proposal. The greatest impact on PM_{10} concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal with regard to PM_{10} is negligible at both receptors assessed.

$PM_{2.5}$

The results of the modelled impact of the proposal for $PM_{2.5}$ in the design year are shown in Table 7.10. Predicted annual average concentrations in the region of the proposal are well below the ambient standards at both worst-case receptors, ranging from 57.9 – 58.4% of the limit value in 2023.

The impact of the proposal can be assessed relative to "Do Nothing" levels in 2023 (see Table 7.10). Relative to baseline levels, a negligible increase in $PM_{2.5}$ levels at both worst-case receptors is predicted as a result of the proposal. The greatest impact on $PM_{2.5}$ concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal with regard to $PM_{2.5}$ is negligible at both receptors assessed.

NO_2

The results of the assessment of the impact of the proposal for NO_2 in the design year are shown in Table 7.10. The annual average concentration is well within the limit value at both worst-case receptors. Levels of NO_2 range from 59 - 60% of the annual limit value in 2023.

Maximum one-hour NO_2 levels with the proposal in place will be significantly below the limit value, with levels at the worst-case receptor reaching 60% of the limit value in 2023.

The impact of the proposal on maximum one-hour NO_2 levels can be assessed relative to "Do Nothing" levels in 2023 (see Tables 7.10). Relative to baseline levels, a negligible increase in pollutant levels is predicted as a result of the proposal. The greatest impact on NO_2 concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual or maximum 1-hour limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal in terms of NO_2 is negligible at both receptors assessed.

Worst-case Traffic Speed Scenario

An assessment of the effect of changing the traffic speed (for the entire assessment year) from an average speed of 80 km/hr to a worst case peak hour speed of 10 km/hr has also been carried out for all pollutants (see Table 7.11). The results indicate that pollutant levels are increased at the worst-case traffic speed. Nevertheless, pollutant levels are still significantly below the relevant limit values for PM_{10}, NO_2, and $PM_{2.5}$.

7.5 DESCRIPTION OF MITIGATION MEASURES

7.5.1 Construction

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.5.2 Incineration

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.5.3 Road Traffic

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.6 REFERENCES

(1) Environmental Protection Agency (2011) Air Quality Monitoring Report 2010 (& previous annual reports 1997-2009)
(2) EPA Website (2011) http://www.epa.ie/whatwedo/monitoring/air/
(3) UK DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(09)
(4) UK DETR (1998) Preparation of Environmental Statements for Planning Projects That Require Environmental Assessment - A Good Practice Guide, Appendix 8 - Air & Climate
(5) UK DEFRA (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)
(6) UK DEFRA (2000) Air Quality & Transport, LAQM.G3(00)
(7) UK DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. PG(09)
(8) UK DEFRA (2001) DMRB Model Validation for the Purposes of Review and Assessment
(9) UK DEFRA (2009) Guidance on Running the DMRB Screening Model
(10) UK DEFRA (2010) NO_x to NO_2 Conversion Spreadsheet (Version 2.1)
(11) National Roads Authority (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes
(12) EPA (2002) Guidelines On Information To Be Contained in Environmental Impact Statements
(13) EPA (2003) Advice Notes On Current Practice (In The Preparation Of Environmental Impact Statements)

Table 7.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m^3
Medium	Increase / decrease 2 - <4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - <2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease <0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease <0.25 µg/m^3

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2011)

Table 7.2 Air Quality Impact Significance Criteria

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration[Note 1]		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2011)

Table 7.3 Air Quality Impact Significance Criteria For Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration[Note 1]		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is imperceptible, then the Impact Description is Negligible

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2011)

Table 7.4 Summary of background concentrations used in the air dispersion model.

Background Values	Nitrogen Dioxide (µg/m^3)	Particulates (PM_{10}) (µg/m^3)	Particulates ($PM_{2.5}$) (µg/m^3)[Note 1]
Zone D (Rural)	20.0	20.0	14.0

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Table 7.5 Process Emission Design Details – EIS & Actual Measurements

Scenario	Stack Height (m) OD	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp. (K)	Volume Flow (Nm^3/hr)(1)	Exit Velocity (m/sec actual)
EIS – Maximum Operation	95.8	2.2	3.80	413	147,000	16.40(2)
EIS – Average Operation	95.8	2.2	3.80	413	134,000	14.95(2)
Maximum Spot Value	95.8	2.2	3.80	422	192,086	19.63(3)
110% Maximum	95.8	2.2	3.80	422	183,700	18.77(3)
Average	95.8	2.2	3.80	422	167,000	17.06(3)
Minimum Spot Value	95.8	2.2	3.80	422	134,641	13.76(3)

Note 1 Normalised to 273K, 11% Oxygen, dry gas.

Note 2 Actual - 413K, 6.6% Oxygen, 21.4% H_2O

Note 3 Actual - 422K, 5.6% Oxygen, 20.7% H_2O

Table 7.6 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Maximum Volume Flow In The EIS & The Maximum Spot Volume Flow.

Compound	Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Note 1 Maximum Volume Flow In EIS	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Maximum Spot Volume Flow	Variation ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	27.19	31.48	4.29	200	2.1%
NO2 (Ann)	**20**	0.85	0.942	0.09	40	0.23%
NOX (Ann)	**25**	1.13	1.256	0.12	30	0.40%
SO2 (1-Hr)	**8**	26.47	30.09	3.62	350	1.03%
SO2 (24-Hr)	**4**	2.36	2.710	0.35	125	0.28%
PM10 (24-Hr)	**20**	0.19	0.202	0.01	50	0.03%
PM10 (Ann)	**20**	0.057	0.062	0.01	40	0.01%
PM2.5 (Ann)	**12**	0.057	0.062	0.01	25	0.02%
CO (8-hr)	**400**	20.88	23.79	2.91	10000	0.03%
Benzene (Ann)	**0.7**	0.057	0.062	0.01	5	0.11%
HCl (1-hr)	**0.01**	4.90	5.31	0.41	100	0.41%
HF (1-hr)	**0.005**	0.326	0.354	0.03	3	0.92%
Hg (Ann)	**0.001**	0.00028	0.00032	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00032	0.00	0.005	0.80%
As (Ann)	**0.001**	0.00031	0.00034	0.00	0.006	0.60%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.7 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Maximum Volume Flow In The EIS & The 110% Maximum Volume Flow.

Compound	Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Note 1 Maximum Volume Flow In EIS	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. 110% Maximum Volume Flow	Variation ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	27.19	31.13	3.94	200	1.97%
NO2 (Ann)	**20**	0.85	0.93	0.08	40	0.21%
NOX (Ann)	**25**	1.13	1.25	0.11	30	0.37%
SO2 (1-Hr)	**8**	26.47	29.71	3.24	350	0.93%
SO2 (24-Hr)	**4**	2.36	2.68	0.32	125	0.25%
PM10 (24-Hr)	**20**	0.19	0.20	0.01	50	0.03%
PM10 (Ann)	**20**	0.057	0.062	0.01	40	0.01%
PM2.5 (Ann)	**12**	0.057	0.062	0.01	25	0.02%
CO (8-hr)	**400**	20.88	23.48	2.60	10000	0.03%
Benzene (Ann)	**0.7**	0.057	0.062	0.01	5	0.11%
HCl (1-hr)	**0.01**	4.900	5.294	0.39	100	0.39%
HF (1-hr)	**0.005**	0.326	0.353	0.03	3	0.90%
Hg (Ann)	**0.001**	0.00028	0.00032	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00032	0.00	0.005	0.79%
As (Ann)	**0.001**	0.00031	0.00034	0.00	0.006	0.60%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.8 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Average Volume Flow In The EIS & The Actual Average Volume Flow.

Compound	Background (µg/m^3)	Process Contribution (µg/m^3) Stack 95.8 O.D. Note 1 Average Volume Flow In EIS	Process Contribution (µg/m^3) Stack 95.8 O.D. Average Volume Flow	Variation (µg/m^3)	Limit Value (µg/m^3)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	26.13	29.90	3.77	200	1.88%
NO2 (Ann)	**20**	0.81	0.91	0.10	40	0.24%
NOX (Ann)	**25**	1.09	1.22	0.13	30	0.43%
SO2 (1-Hr)	**8**	25.59	28.81	3.22	350	0.92%
SO2 (24-Hr)	**4**	2.27	2.59	0.32	125	0.26%
PM10 (24-Hr)	**20**	0.19	0.20	0.01	50	0.03%
PM10 (Ann)	**20**	0.054	0.060	0.01	40	0.02%
PM2.5 (Ann)	**12**	0.054	0.060	0.01	25	0.02%
CO (8-hr)	**400**	20.16	22.83	2.67	10000	0.03%
Benzene (Ann)	**0.7**	0.0540	0.060	0.01	5	0.12%
HCl (1-hr)	**0.01**	4.8168	5.176	0.36	100	0.36%
HF (1-hr)	**0.005**	0.3218	0.346	0.02	3	0.82%
Hg (Ann)	**0.001**	0.00028	0.00030	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00030	0.00	0.005	0.48%
As (Ann)	**0.001**	0.00029	0.00033	0.00	0.006	0.59%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.9 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Average Volume Flow In The EIS & The Minimum Spot Volume Flow.

Compound	Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Note 1 Average Volume Flow In EIS	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Spot Minimum Volume Flow	Variation ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	26.13	27.08	0.95	200	0.47%
NO2 (Ann)	**20**	0.81	0.88	0.06	40	0.15%
NOX (Ann)	**25**	1.09	1.17	0.08	30	0.27%
SO2 (1-Hr)	**8**	25.59	26.40	0.81	350	0.23%
SO2 (24-Hr)	**4**	2.27	2.36	0.09	125	0.07%
PM10 (24-Hr)	**20**	0.19	0.19	0.01	50	0.01%
PM10 (Ann)	**20**	0.054	0.06	0.00	40	0.01%
PM2.5 (Ann)	**12**	0.054	0.06	0.00	25	0.01%
CO (8-hr)	**400**	20.16	20.94	0.78	10000	0.01%
Benzene (Ann)	**0.7**	0.0540	0.058	0.00	5	0.07%
HCl (1-hr)	**0.01**	4.8168	5.018	0.20	100	0.20%
HF (1-hr)	**0.005**	0.3218	0.336	0.01	3	0.47%
Hg (Ann)	**0.001**	0.00028	0.00030	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00030	0.00	0.005	0.38%
As (Ann)	**0.001**	0.00029	0.00031	0.00	0.006	0.33%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.10 Summary of air quality impact assessment (Typical Speed 80kph)

Background Values	Nitrogen Dioxide (µg/m^3)		Particulates (PM_{10}) (µg/m^3)		Particulates ($PM_{2.5}$) (µg/m^3)[Note 1]
	Annual	Max 1-Hr (as 99.8th%ile)	Annual	Days > 50 µg/m^3	
Do Nothing – Receptor 1	24.0	120	20.6	4	14.6
Do Nothing – Receptor 2	23.7	118	20.5	4	14.5
Do Something – Receptor 1	24.0	120	20.6	4	14.6
Do Something – Receptor 2	23.7	118	20.5	4	14.5
Limit Values[Note 2]	40	200	40	35	25

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Note 2 Council Directive 2008/50/EC

Table 7.11 Summary of air quality impact assessment (Worst-case Speed 10kph)

Background Values	Nitrogen Dioxide (µg/m^3)		Particulates (PM_{10}) (µg/m^3)		Particulates ($PM_{2.5}$) (µg/m^3)[Note 1]
	Annual	Max 1-Hr (as 99.8th%ile)	Annual	Days > 50 µg/m^3	
Do Nothing – Receptor 1	27.0	135	21.3	5	15.3
Do Nothing – Receptor 2	26.8	134	21.2	5	15.2
Do Something – Receptor 1	27.0	135	21.3	5	15.3
Do Something – Receptor 2	26.8	134	21.2	5	15.2
Limit Values[Note 2]	40	200	40	35	25

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Note 2 Council Directive 2008/50/EC

8. NOISE AND VIBRATION

8.1 INTRODUCTION

This chapter assesses the impact of the anticipated noise and vibration associated with the proposed amendments contained within this application at nearby sensitive locations.

The noise sources associated with the proposed amendments are identical to those originally assessed in the application of 2009. In terms of the current application the main potential for a change in the previously assessed noise impact relates to additional traffic on the local road network. This issue will be commented upon in detail.

The main plant has been in operation (through the commissioning phase) since October 2011. Therefore in order to determine the actual noise impact of the installation, noise monitoring data obtained from on-site noise monitors has been reviewed. This data has been supplemented with a brief attended noise survey with a view to identifying the noise levels associated with waste deliveries to the site.

In relation to construction noise and vibration it is understood that the no works of significance are associated with this application.

8.2 STUDY METHODOLOGY

The methodology adopted for this noise and vibration assessment is as follows:

- Characterisation of the receiving environment;
- Characterisation of the proposed development;
- Prediction of the noise and vibration impact associated with the proposed development;
- Evaluation of noise and vibration impacts.

In all cases, we have undertaken predictions and the impact assessment at the nearest noise sensitive residential locations surrounding the facility. Due to the nature of noise propagation, there is significant attenuation of noise as it travels away from the source, hence noise levels at more remote noise sensitive locations will be lower than noise levels predicted at the nearest residential locations. Therefore, noise impacts predicted at the nearest residential locations can be considered the "worst-case" scenario.

8.2.1 Environmental Noise Survey

As part on on-going works, two continuous noise monitors have been maintained on the site for the duration of the construction phase. The data obtained from these units prior to the commencement of construction activities and during a period when the site was commissioned and through the testing process has been reviewed. It is considered that this data presents a robust picture of the actual noise impact of the operational facility.

The noise monitoring was conducted in accordance with ISO 1996: *Acoustics – Description, measurement and assessment of environmental noise*: 2007. Specific details are set out in the following sections.

8.2.2 Choice of Measurement Locations

Measurement locations are indicated in Figure 8.1 and are summarised below.

Location N1 is located at the site boundary in the eastern corner of the site and is considered representative of the noise levels at the dwelling adjacent to the east of the site on the R152.

Location N2 is located at the site boundary in the western corner of the site, approximately 400m away from the nearest dwellings to the west of the site.

Location N3 is located at the eastern site boundary and at a similar distance from the Indaver site buildings as Location N1. This location is however set-back from the R152 road approximately 200 metres. It is considered that measurements at this location offer a better indication as to site noise emissions with a reduced contribution from road traffic noise not associated with the site.

8.2.3 Survey Periods

Baseline

Attended daytime and night-time noise surveys were carried out at properties in the vicinity of the site in October and November 2005.

Additional baseline monitoring was conducted in order to establish the noise environment prior to the commencement of the construction phase in 2008. Noise data obtained from the two unattended noise monitors at Locations N1 and N2 between the period 6 to 19 August 2008 has been reviewed and is summarised in this document.

Commissioning

The commissioning period commenced in August 2011, and the plant has been accepting and treating waste volumes in line with full operation since end October 2011. and for the purposes of this study noise data from the Locations N1 and N2 obtained between the period of 11 November and 23 December 2011 has been reviewed.

An additional attended daytime survey has been carried out to identify noise levels associated with truck movements to and from the facility and from delivery activities once on site. This survey was completed on the afternoon of 12 January 2012.

While the facility is, at the time of writing, still in a commissioning phase the plant itself is fully operational and accepting waste volumes in line with its normal day to day activities. The facility operates continuously (i.e. 24 hours per day, seven days a week) with the exception of waste deliveries to site, which are restricted to daytime hours.

The weather for attended surveys was dry and mild with light winds (not exceeding 1m/s).

8.2.4 Instrumentation

The attended noise measurements were performed using a Brüel & Kjær Type 2260 Sound Level Analyser. The measurement apparatus was check calibrated before and after the surveys using a Brüel & Kjær type 4231 Sound Level Calibrator. No significant deviation was observed.

The unattended measurements and long term construction noise measurements were performed using Brüel & Kjær Type 2238 Sound Level Meters. Check calibrations using Brüel & Kjær Type 4231 Sound Level Calibrators are carried out at appropriate intervals.

8.2.5 Procedure

The short-term attended measurements were conducted at the two locations. Sample periods were 15-minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

The long term monitoring is conducted at two fixed boundary locations. The meters are set to automatically log noise levels every 1-hour period.

8.2.6 Measurement Parameters

The attended noise survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. This parameter is representative of the specific noise from plant when plant is the dominant noise source, i.e. there is no extraneous noise from sources such as traffic.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{Amin} is the instantaneous minimum sound level measured during the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise. This parameter is representative of the specific noise from plant when there is extraneous noise from intermittent noise sources such as intermittent traffic.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa. The unattended noise survey results are presented in terms of the L_{Aeq}, L_{A10} and L_{A90} parameters.

8.3 RECEIVING ENVIRONMENT

8.3.1 General Description

Lands surrounding the site are a mix of agricultural farmland and residential housing. The majority of private residences are located to the south and east along the R152 regional road with the density of housing increasing on the approach to the township of Duleek. Lands to the west of the site are predominantly agricultural farmland with isolated private residences. Lands to the north of the site are a mixture of agricultural farmland and commercial (Platin Cement works and quarry).

8.3.2 Baseline Noise Monitoring Results and Discussion

Location N1

The attended baseline noise monitoring results for Location N1 are summarised in Table 8.1 below.

Table 8.1 Summary of attended baseline results for Location N1

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime 4 Oct 2005	12:21 – 12:36	75	90	43	80	50
	13:15 – 13:30	76	88	40	80	50
	14:10 – 14:25	76	89	42	81	51
Daytime 6 Nov 2005	10:35 – 10:50	72	85	46	78	52
	11:34 – 11:49	72	87	38	77	51
	12:40 – 12:55	72	84	45	77	51
Night-time 3-4 Oct 2005	23:51 – 00:06	63	83	23	61	31
	00:44 – 00:59	60	85	21	54	25
	01:40 – 01:55	59	85	21	47	25
Night-time 5-6 Nov 2005	00:15 – 00:30	71	89	34	73	41
	01:09 – 01:24	68	87	29	65	33
	02:05 – 02:20	66	87	26	61	30

Traffic movements on the R152 regional road dominated daytime noise levels at this monitoring location. Plant and process noise from the nearby cement factory facility was also audible at this location during lulls in the traffic. Noise levels during daytime periods were in the range 72 to 76dB L_{Aeq} and 50 to 52dB L_{A90}. These noise levels are typical of what would be expected adjacent to a moderately busy regional road.

Occasional traffic movements on the R152 regional road dominated night-time noise levels at this monitoring location. Noise levels during this period were in the range 59 to 71dB L_{Aeq} and 25 to 33 L_{A90}. No significant sources of vibration were observed.

In addition to the above attended site surveys, unattended noise monitors were installed at location N1 in August 2008. These monitors have been installed on site in order to log noise levels continually through the construction phase of the project. The 2-week period from 6 to 19 August 2008 has been used in order to define the baseline environment prior to the commencement of the construction phase. The results of this baseline monitoring are summarised below and are presented in full in Appendix 8.1. Results are presented for daytime (i.e. 08:00 to 22:00) and night-time (i.e. 22:00 to 08:00) in terms of the arithmetic average of the hourly measured values. The noted reduction in noise from the continuous monitoring when compared to the manned survey results is due to the position of the sound level meter, whereby the monitoring station for the unattended survey was moved slightly further away from the road and positioned in line with the rear façade of the dwelling.

Table 8.2 Summary of unattended baseline results for Location N1

Date	Period	Average Baseline Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
06/08/08	Daytime (08:00 to 22:00)	64	68	51
07/08/08		64	68	52
08/08/08		64	67	49
09/08/08		63	67	50
10/08/08		62	66	50
11/08/08		64	68	52
12/08/08		64	68	53
13/08/08		64	67	52
14/08/08		64	68	51
15/08/08		64	68	53
16/08/08		64	67	51
17/08/08		62	66	48
18/08/08		64	68	50
06-07/08/08	Night-time (22:00 to 08:00)	58	59	35
07-08/08/08		58	60	43
08-09/08/08		58	62	39
09-10/08/08		58	62	37
10-11/08/08		58	61	41
11-12/08/08		58	60	40
12-13/08/08		58	60	39
13-14/08/08		59	61	40
14-15/08/08		59	62	39
15-16/08/08		59	62	42
16-17/08/08		60	56	36
17-18/08/08		58	61	39
18-19/08/08		58	59	43

During daytime periods, the average ambient noise level for the period 6 to 18 August 2008 is 64dB $L_{Aeq.}$ The average background noise level is 51dB L_{A90}.

During night-time periods, the average ambient noise level for the period 6 to 19 August 2008 is 58dB $L_{Aeq.}$ The average background noise level is 39dB L_{A90}.

Location N2

The attended baseline noise monitoring results for Location N2 are summarised in Table 8.3 below.

Table 8.3 Summary of attended baseline results for Location N2

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime 4 Oct 2005	11:45 – 12:00	49	59	41	51	45
	12:39 – 12:54	47	63	41	49	43
	13:32 – 13:47	49	61	40	50	44
Daytime 6 Nov 2005	09:55 – 10:10	44	64	31	47	35
	09:53 – 11:08	47	63	33	51	36
	11:57 – 12:12	57	77	32	49	36
Daytime 17 Nov 2005	15:15 – 15:30	56	74	39	56	43
	15:30 – 15:45	50	68	42	52	45
	15:45 – 16:00	50	70	42	52	45
	16:00 – 16:15	50	64	43	51	46
	16:15 – 16:30	48	59	45	50	46
Night-time 3-4 Oct 2005	23:15 – 23:30	39	60	23	43	27
	00:08 – 00:23	38	53	23	42	28
	01:01 – 01:16	39	54	22	43	26
Night-time 5-6 Nov 2005	23:30 – 23:45	45	55	33	47	38
	00:35 – 00:50	47	75	38	49	42
	01:28 – 01:43	45	68	35	48	40

Daytime noise levels at this monitoring location were dominated by distant traffic noise from the M1 motorway and R152 regional road. During the weekday survey periods, there was also noise from equipment operating at the Platin Cement site with quarry equipment the dominant noise source from this site. We note that the higher measured noise level during the surveys on 6 and 17 November 2005 (57dB and 56dB L_{Aeq}) were dominated by farm machinery operating in the vicinity of the measurement location. Excluding these samples, noise levels during the weekday daytime periods were in the range 47 to 50dB L_{Aeq} and 43 to 46dB L_{A90} Noise levels during the weekend daytime periods were in the range 44 to 47dB L_{Aeq} and 35 to 36dB L_{A90}. These surveys give an indication of the contribution due to noise from the Platin Cement works.

Night-time noise levels at this monitoring location were dominated by distant traffic noise from the M1 motorway and R152 regional road. Noise levels during this period were in the range 38 to 47dB L_{Aeq} and 26 to 42dB L_{A90}. We note that noise levels measured during the second night survey period (i.e. 5 – 6 November 2005) were higher than the first survey period due to increased wind generated noise in trees and foliage adjacent to the survey position.

These noise levels are typical of what would be expected in the type of environment under consideration. No significant sources of vibration were observed.

In addition to the above attended site surveys, unattended noise monitors were installed on the site in August 2008. These monitors have been installed on site in order to log noise levels continually through the construction phase of the project. The 2-week period from 6 to 19 August 2008 has been used in order to define the baseline environment prior to the construction phase. The results of this baseline monitoring are summarised below and are presented in Appendix 8.1. Results are presented for daytime (i.e. 08:00 to 22:00) and night-time (i.e. 22:00 to 08:00) in terms of the arithmetic average of the hourly measured values.

Table 8.4 Summary of unattended baseline results for Location N2

Date	Period	Average Baseline Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
06/08/08	Daytime (08:00 to 22:00)	50	52	45
07/08/08		48	50	44
08/08/08		49	49	40
09/08/08		47	50	43
10/08/08		49	51	44
11/08/08		52	54	47
12/08/08		49	50	43
13/08/08		49	50	42
14/08/08		49	50	43
15/08/08		51	53	46
16/08/08		54	57	50
17/08/08		50	52	43
18/08/08		55	57	51
06-07/08/08	Night-time (22:00 to 08:00)	42	44	32
07-08/08/08		44	46	41
08-09/08/08		48	51	38

Date	Period	Average Baseline Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
09-10/08/08		44	48	36
10-11/08/08		46	49	39
11-12/08/08		45	48	39
12-13/08/08		43	46	36
13-14/08/08		44	47	37
14-15/08/08		47	50	35
15-16/08/08		50	53	43
16-17/08/08		45	48	37
17-18/08/08		48	51	39
18-19/08/08		47	49	43

During daytime periods, the average ambient noise level for the period 6 to 18 August 2008 is 50dB $L_{Aeq.}$ The average background noise level is 45dB L_{A90}.

During night-time periods, the average ambient noise level for the period 6 to 19 August 2008 is 46dB $L_{Aeq.}$ The average background noise level is 38dB L_{A90}.

8.3.3 Commissioning Noise Monitoring Results and Discussion

It is understood that construction of the Indaver project was completed in October 2011. The following sections present the noise monitoring results for the Locations N1 and N2 for the period 11 November to 23 December 2011. It is considered that this period gives an indication of the site noise emissions following the commencement of the operation phase of the development.

Location N1

The noise monitoring results for Location N1 are summarised in Table 8.5 below. The results of this monitoring are presented in Appendix 8.2. Results are presented for daytime (i.e. 08:00 to 22:00) and night-time (i.e. 22:00 to 08:00) in terms of the arithmetic average of the hourly measured values.

Table 8.5 Summary of commissioning results for Location N1

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
11/11/2011	Daytime (08:00 to 22:00)	64	68	52
12/11/2011		62	66	48
13/11/2011		61	65	48
14/11/2011		63	67	51
15/11/2011		62	66	50
16/11/2011		63	67	49
17/11/2011		65	68	54
18/11/2011		63	67	51
19/11/2011		61	65	47
20/11/2011		61	65	46
21/11/2011		62	66	48
22/11/2011		63	67	51
23/11/2011		63	66	52
24/11/2011		64	67	54
25/11/2011		63	67	54
26/11/2011		62	66	52
27/11/2011		61	65	50
28/11/2011		64	67	52
29/11/2011		64	67	53
30/11/2011		63	66	51
01/12/2011		64	68	54

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
02/12/2011		63	67	52
03/12/2011		61	66	48
04/12/2011		61	65	47
05/12/2011		63	66	51
06/12/2011		63	67	51
07/12/2011		63	67	51
08/12/2011		64	67	54
09/12/2011		63	66	53
10/12/2011		62	66	49
11/12/2011		61	65	48
12/12/2011		64	68	53
13/12/2011		65	68	55
14/12/2011		63	66	52
15/12/2011		63	67	53
16/12/2011	Daytime (08:00 to 22:00)	62	66	52
17/12/2011		61	65	51
18/12/2011		60	64	48
19/12/2011		63	67	52
20/12/2011		64	67	52
21/12/2011		63	67	53
22/12/2011		63	67	53
23/12/2011		62	66	52
11-12/11/2011	Night-time (22:00 to 08:00)	56	59	38
12-13/11/2011		55	57	42
13-14/11/2011		55	56	41
14-15/11/2011		55	55	42
15-16/11/2011		55	56	42
16-17/11/2011		56	57	41
17-18/11/2011		57	59	45
18-19/11/2011		56	58	40
19-20/11/2011		55	57	43
20-21/11/2011		55	56	42
21-22/11/2011		55	56	44

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
22-23/11/2011		56	57	43
23-24/11/2011		56	58	42
24-25/11/2011		57	59	44
25-26/11/2011		56	59	45
26-27/11/2011		58	62	50
27-28/11/2011		55	57	43
28-29/11/2011		59	62	48
29-30/11/2011		56	57	43
30/11-1/12/2011		56	57	43
1-2/12/2011		56	58	44
2-3/12/2011		56	58	41
3-4/12/2011		55	57	43
4-5/12/2011		55	57	40
5-6/12/2011		55	56	42
6-7/12/2011		56	57	42
7-8/12/2011		56	58	44
8-9/12/2011		56	58	44
9-10/12/2011		55	57	43
10-11/12/2011		55	58	42
11-12/12/2011		55	57	43
12-13/12/2011		56	59	44
13-14/12/2011		57	59	45
14-15/12/2011		56	58	44
15-16/12/2011		55	57	44
16-17/12/2011		56	58	45
17-18/12/2011		55	57	45
18-19/12/2011		56	58	38
19-20/12/2011		56	57	39
20-21/12/2011		57	59	42
21-22/12/2011		56	58	45
22-23/12/2011		58	61	46

During daytime periods, the average ambient noise level for the period 11 November to 23 December 2011 is 63dB $L_{Aeq.}$ The average background noise level is 51dB L_{A90}.

During night-time periods, the average ambient noise level for the period 11 November to 23 December 2011 is 56dB $L_{Aeq.}$ The average background noise level is 43dB L_{A90}.

Location N2

The commissioning noise monitoring results for Location N2 are summarised in Table 8.6 below. The results of this monitoring are presented in Appendix 8.2. Results are presented for daytime (i.e. 08:00 to 22:00) and night-time (i.e. 22:00 to 08:00) in terms of the arithmetic average of the hourly measured values.

Table 8.6 Summary of commissioning results for Location N2

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
11/11/2011	Daytime (08:00 to 22:00)	55	57	52
12/11/2011		52	54	46
13/11/2011		51	53	47
14/11/2011		53	55	49
15/11/2011		53	55	48
16/11/2011		53	55	48
17/11/2011		58	59	54
18/11/2011		58	60	54
19/11/2011		56	58	52
20/11/2011		55	56	52
21/11/2011		54	56	51
22/11/2011		55	57	51
23/11/2011		55	56	52
24/11/2011		56	58	52
25/11/2011		54	56	51
26/11/2011		55	58	50
27/11/2011		49	51	46
28/11/2011		54	57	50
29/11/2011		54	56	49
30/11/2011		54	55	50

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
01/12/2011		56	58	52
02/12/2011		55	58	51
03/12/2011		53	55	48
04/12/2011		51	53	48
05/12/2011		54	56	49
06/12/2011		53	55	49
07/12/2011		54	55	50
08/12/2011		55	58	51
09/12/2011		52	54	48
10/12/2011		50	52	46
11/12/2011		49	51	46
12/12/2011		55	58	51
13/12/2011		58	60	54
14/12/2011		55	57	50
15/12/2011		55	58	50
16/12/2011		53	55	48
17/12/2011		50	52	47
18/12/2011	Daytime (08:00 to 22:00)	48	49	45
19/12/2011		54	56	48
20/12/2011		52	54	48
21/12/2011		53	55	49
22/12/2011		54	56	50
23/12/2011		51	54	47
11-12/11/2011	Night-time (22:00 to 08:00)	46	49	40
12-13/11/2011		45	47	42
13-14/11/2011		44	46	41
14-15/11/2011		44	46	42
15-16/11/2011		44	46	41
16-17/11/2011		46	48	43
17-18/11/2011		55	57	52
18-19/11/2011		55	58	52
19-20/11/2011		53	54	51
20-21/11/2011		53	55	51

Date	Period	Average Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
21-22/11/2011		47	49	45
22-23/11/2011		47	48	44
23-24/11/2011		48	49	44
24-25/11/2011		47	48	44
25-26/11/2011		48	50	45
26-27/11/2011		55	58	50
27-28/11/2011		47	48	45
28-29/11/2011		53	55	49
29-30/11/2011		47	48	44
30/11-1/12/2011		46	48	44
1-2/12/2011		51	52	48
2-3/12/2011		50	52	45
3-4/12/2011		48	49	46
4-5/12/2011		47	49	45
5-6/12/2011		45	47	43
6-7/12/2011		46	48	43
7-8/12/2011		48	50	45
8-9/12/2011		47	49	44
9-10/12/2011		46	47	43
10-11/12/2011		46	48	44
11-12/12/2011		46	48	44
12-13/12/2011		50	52	46
13-14/12/2011		51	54	47
14-15/12/2011		47	48	45
15-16/12/2011		46	47	44
16-17/12/2011		48	50	44
17-18/12/2011		46	47	44
18-19/12/2011		45	47	41
19-20/12/2011		44	46	42
20-21/12/2011		47	49	43
21-22/12/2011		49	51	45
22-23/12/2011		48	50	46

During daytime periods, the average ambient noise level for the period 11 November to 23 December 2011 is 54dB $L_{Aeq.}$ The average background noise level is 49dB L_{A90}.

During night-time periods, the average ambient noise level for the period 11 November to 23 December 2011 is 48dB $L_{Aeq.}$ The average background noise level is 45dB L_{A90}.

Noise Survey of Waste Deliveries to Site

The results of the attended noise survey of waste delivery and unloading at the site are summarised in Table 8.7 below. Measurement locations are indicated in Figure 8.1.

Table 8.7 Summary of Waste Delivery Survey

Location	Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)					Notes
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
N2	12:16 - 12:34	51	65	45	52	46	No deliveries during this period.
	12:34 - 12:49	53	66	45	55	48	Waste delivery of the largest type truck with hydraulic ram. Slight audible increase in noise from previous measurement however the main unloading activities are internal.
N3	10:40 - 10:55	52	74	48	52	50	Distant plant from Indaver and Platin Cement sites both audible. Distant traffic also audible. Waste deliveries not audible at this location.
	10:55 - 11:10	51	57	58	52	49	
	11:10 - 11:25	51	65	45	52	49	

At the site boundary Location N2, the measured delivery noise level was 53dB L_{Aeq}. It should be noted that there is an additional approximate 400 metres from this boundary location to the nearest residential property. Delivery noise levels would therefore be expected to further reduce when consideration is given to the increased distances involved. Waste deliveries were not audible at the eastern boundary location N3.

8.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposal under consideration includes for an increase in the volume of waste that is handled at the existing facility. The potential noise elements of the facility are process machinery and plant located internally and externally. The major noise sources include condensers, turbines furnaces, boilers and discharge stack.

8.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

8.5.1 Construction Noise Criteria

There are no significant construction activities proposed in relation to this application. Minor construction in terms of paving and formation of hardstanding, the addition of 22 additional car park spaces and the installation of a Puraflo effluent treatment system to the existing facility are planned.

While no significant construction activities are related to this application it is considered prudent to restate the relevant construction noise limits that apply to the site. As part of the planning permission the following condition was attached relating to noise during the construction phase of the project.

Condition No. 18:

> *"During the construction phase of the proposed development, noise level at the site when measured at noise sensitive locations shall not exceed 65dBA between the hours of 0700 hours and 1900 hours, Monday to Saturday inclusive, excluding bank and public holidays and Sundays and 45dBA at any other time.*
>
> *Noise monitoring locations for the purposes of the construction phase shall be agreed in writing with the Planning Authority prior to commencement of any development on site. The locations shall be situated proximate to the nearest residential buildings."*

Although the assessment parameter and reference time period has not been referenced specifically in the above condition, it is assumed that the limits are set in $L_{Aeq,1hour}$, which would be one typically used for the assessment and monitoring of construction noise impacts.

8.5.2 Operational Noise Criteria

Due consideration must be given to the nature of the primary noise sources when setting criteria. Criteria for noise from process and building services plant will be set in terms of L_{Aeq} the equivalent continuous sound level.

The Environmental Protection Agency Waste Licence that is applicable to the facility (Ref:W0167-02) specifies the following noise limits at the façades of residential properties closest to the development:

Daytime (08:00hrs to 22:00hrs)	55dB $L_{Aeq,30min}$
Night-time (22:00hrs to 08:00hrs)	45dB $L_{Aeq,30min}$

Whilst the application of absolute noise limits to a development ensures that overall impact is kept within acceptable margins, it does not assist with the assignation of relative impacts. In order to do this, it is appropriate to consider the likely change in ambient noise level as a result of the scheme under consideration. Table 8.8 offers guidance as to the likely impact on the surrounding environment associated with a change in ambient noise level.

Table 8.8 Significance criteria associated with change in noise level

Change in Ambient Noise Level (dB L_{Aeq})	Subjective Reaction	Impact
< 3	Imperceptible	Negligible
3 – 5	Perceptible	Slight
6 – 10	Up to a doubling of loudness	Moderate
11 – 15	Over a doubling of loudness	Significant
> 15		Profound

8.5.3 Vibration Guidelines

Construction Phase

No significant construction activities are proposed in relation to this application. The associated vibration impact of the minor construction works proposed is not considered significant in terms of the potential for vibration at nearby sensitive locations.

Operational Phase

British Standard BS 6472 (2008) '*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting'* contains recommendations that continuous vibration in residential buildings should not exceed nominally 0.3mm/s by daytime and 0.2mm/s by night-time.

8.5.4 Construction Phase Assessment

It is predicted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

Due to the nature of the activities undertaken on a construction site of this nature, there is potential for generation of levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to potential site access points, the more significant of these is likely to be uneven road surfaces. However, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

Due to the fact that the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, Table 8.9 indicates typical noise levels that would be expected from the proposed construction site during the various phases of the construction project.

For the purposes of the assessment we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this report.

Table 8.9 Typical Noise Levels Associated with Construction Plant Items

Description (BS 5228 Ref)	A-weighted Sound Pressure Level re 10^{-5} Pa Octave Band Centre Frequency (Hz)								dB(A) 10m
	63	125	250	500	1k	2k	4k	8k	
Excavator (C2 03)	80	83	76	73	72	70	69	69	78
Dozer (C2 11)	75	79	77	77	74	71	65	57	79
Dump Truck Tipping (C2 22)	80	76	73	70	69	66	63	58	74
Tracked Mobile Crane (C3 28)	81	77	66	62	59	57	51	46	67

These noise spectra have been converted to equivalent sound power levels and sound pressure levels associated with the construction sources have been predicted to the nearest noise sensitive locations. Table 8.10 outlines the noise levels associated with these construction noise sources at these locations.

Table 8.10 Predicted Levels of Construction Noise at Sensitive Locations

Description (BS 5228 Ref)	A-weighted Sound Pressure Level re 10^{-5} Pa (dB)				
	NSL1	NSL2	NSL3	NSL4	NSL5
Excavator (C2 03)	33	44	53	42	37
Dozer (C2 11)	34	45	54	43	38
Dump Truck Tipping (C2 22)	29	40	49	38	33
Tracked Mobile Crane (C3 28)	22	33	42	31	26
Total	37	48	57	46	42

The predicted noise levels from construction activities are in the range of 37 to 57dB $L_{Aeq,1hr}$ at these locations. These levels would be comparable to prevailing ambient noise levels in these areas.

In all instances the total predicted noise levels are predicted to be below the appropriate daytime noise limit (i.e. 65dB $L_{Aeq,1hr}$) and therefore a significant effect is not predicted in relation to the nearest noise sensitive locations in terms of construction noise.

Note that the predicted noise levels referred to in this section are indicative only and are intended to demonstrate that it will be possible for the contractor to comply with current best practice guidance. It should also be noted that the predicted "worst case" levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will be lower than these levels for the majority of the time at the majority of properties in the vicinity of the proposed development.

8.5.5 Operational Phase Assessment

Each primary noise source that has been identified as part of the development operational phase is addressed in turn below.

Assessment of Building Services Plant

Table 8.11 presents the commissioning noise survey results, when compared to the baseline study and the EPA IPPC noise limits relevant to the site.

Table 8.11 Assessment of Site Noise Emissions

Location	Period	Average Baseline 2008		Average Commissioning 2011		EPA IPPC Criteria dB $L_{Aeq,30min}$	Satisfies ?
		dB L_{Aeq}	dB L_{A90}	dB L_{Aeq}	dB L_{A90}		
N1	Daytime 08:00 - 22:00	64	51	63	51	55	Yes*
N2		50	45	54	49		Yes
N1	Night-time 22:00 - 08:00	58	39	56	43	45	Yes*
N2		46	38	48	45		Yes*

* See Notes Below

It is noted that the L_{Aeq} noise measurements conducted at location N1 include a significant contribution from road traffic from the nearby R152. In these instances the L_{A90} parameter offers a better reflection as to the magnitude of plant noise emissions. It is noted that, following the opening of the facility, there has been no significant increase in L_{A90} noise levels at Location N1. The average L_{A90} values at Location N1 are also within the relevant daytime and night-time noise limits appropriate to the site.

The average daytime L_{Aeq} and L_{A90} values at Location N2 are within the relevant daytime noise limits appropriate to the site. The average night-time L_{Aeq} value marginally exceeds the EPA IPPC Criteria, when measured at the site boundary. However this was also the case during the baseline study and it should be noted that the site licence specifies the noise limits *'at the façades of residential properties closest to the development'*. The nearest residential property to the boundary measurement Location N2 is approximately 400 metres to the west of the site. It is therefore calculated that night-time plant noise emissions at the façade of the nearest residential property to the boundary Location N2 will be well within the noise limits appropriate to the site.

Review of the commissioning noise monitoring results presented above confirms that the site is operating within the relevant EPA IPPC noise limits that are outlined in the licence.

The proposed increase in volume of waste that is to be handled by the facility is not envisaged to result in a significant change of this situation and therefore the associated noise impact from building services plant is negligible.

Assessment of Deliveries to Site

It is understood that the hours of operation for waste deliveries to site are currently Monday to Friday 08:00 to 18:30hrs and Saturdays 08:00 to 14:00hrs. The relevant noise limit for deliveries to site is therefore 55dB $L_{Aeq,30min}$ at the façade of the nearest residential dwellings to the site.
Upon review of the noise measurements conducted of waste deliveries to site (as summarised in Table 8.7) it is concluded that the site is operating within the relevant EPA IPPC noise limits that are outlined in the licence.

The proposed increase in volume of waste that is to be handled by the facility is not envisaged to result in a significant change of this situation and therefore the associated noise impact is negligible.

Additional Vehicular Traffic on Public Roads

In terms of traffic, the increase in volume being processed at the site will result in a slight increase in traffic volumes on the local road network. Roughan & O'Donovan Consulting Engineers have provided predicted traffic flows associated with the expansion of the site operation. The supplied traffic flow values relate to two scenarios, as outlined below:

- Scenario 1 – AADT Flows for the Year 2023, Do Minimum (i.e. the development does not take place), and;
- Scenario 2 – AADT Flows for the Year 2023, Do Something.

In order to provide an assessment of any future potential increase in traffic noise, these traffic flow values have been used to determine the predicted change in noise levels adjacent to various roads in the vicinity of the site. The method for calculating the increase in noise is based upon the procedures within the UK Department of Transport, Welsh Office, *Calculation of Road Traffic Noise* (CRTN), 1988. Table 8.12 indicates resultant traffic flows and changes in noise levels associated with the site.

Table 8.12 Changes in Road Traffic Noise Levels

Road	AADT Flows		Change in Noise Level (dB(A))
	Do Minimum (2023)	Do Something (2023)	
M1 Slip off ramp	1,219	1,220	0.0
R152 West of M1 Slip off ramp	14,759	14,793	0.0
R152 East of M1 Slip off ramp	15,194	15,227	0.0
R152 West of R150	11,059	11,076	0.0
R152 East of R150	16,581	16,608	0.0
R150 North of R152	9,340	9,350	0.0
R150 South of R152	3,472	3,472	0.0

The increase in traffic noise levels along the roads assessed is less than 3dB(A) in all instances. Reference to Tables 8.8 confirms that this increase is negligible and the magnitude of change imperceptible. Resultant impacts can be considered not significant.

8.6 MITIGATION MEASURES

8.6.1 Construction Phase

With regard to construction activities, reference will be made to *BS5228: Noise control on construction and open sites*, which offers detailed guidance on the control of noise & vibration from demolition and construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring typical levels of noise and vibration during critical periods and at sensitive locations;
- keeping site access roads even so as to mitigate the potential for vibration from lorries.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of barriers as necessary around noisy processes and items such as generators heavy mechanical plant or high duty compressors;
- placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

8.6.2 Operational Phase

No additional noise or vibration mitigation measures are considered necessary in relation to the operation phase of the proposed development.

8.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

8.7.1 Construction Phase

During the construction phase of the project there will be some impact on nearby noise sensitive properties due to noise emissions from site traffic and other activities. However, given that the construction phase of the development is temporary in nature and the distances between the main construction works and nearby noise sensitive properties, it is expected that the various noise sources will not be excessively intrusive. Furthermore, the application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

8.7.2 Operational Phase

It is expected that that activities on site will be controlled so as not to exceed typical EPA Waste Licence daytime and night-time criteria of 55dB and 45dB L_{Aeq} respectively at the façade of nearby residential properties. The resultant noise impact from the proposed development on the local community is therefore not deemed to be significant.

Appendix 8.1

Unattended Baseline Noise Monitoring Results

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
06/08/2008 17:00	64	68	51	51	53	48
06/08/2008 18:00	63	67	50	48	51	42
06/08/2008 19:00	62	66	48	48	50	44
06/08/2008 20:00	61	66	48	49	53	43
06/08/2008 21:00	59	64	42	48	52	39
06/08/2008 22:00	58	63	39	46	46	36
06/08/2008 23:00	57	60	29	43	46	29
07/08/2008 00:00	54	56	26	39	43	27
07/08/2008 01:00	52	51	25	36	40	26
07/08/2008 02:00	52	46	25	34	38	24
07/08/2008 03:00	53	49	26	34	39	25
07/08/2008 04:00	56	56	28	34	38	25
07/08/2008 05:00	62	67	40	40	43	33
07/08/2008 06:00	64	69	49	46	45	39
07/08/2008 07:00	66	69	55	46	48	43
07/08/2008 08:00	65	69	52	49	49	45
07/08/2008 09:00	64	68	52	46	48	43
07/08/2008 10:00	64	68	50	49	48	43
07/08/2008 11:00	64	67	51	47	48	45
07/08/2008 12:00	64	68	51	49	49	44
07/08/2008 13:00	64	68	51	47	48	44
07/08/2008 14:00	63	67	52	49	51	45
07/08/2008 15:00	64	67	53	53	52	46
07/08/2008 16:00	65	68	56	50	52	47
07/08/2008 17:00	65	68	54	50	52	45
07/08/2008 18:00	64	67	53	49	52	45
07/08/2008 19:00	63	67	51	51	53	47
07/08/2008 20:00	62	66	48	49	51	45
07/08/2008 21:00	59	64	47	47	48	44
07/08/2008 22:00	58	62	45	45	48	42
07/08/2008 23:00	56	58	41	44	46	41
08/08/2008 00:00	55	54	40	43	46	40

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
08/08/2008 01:00	55	54	40	40	42	38
08/08/2008 02:00	55	54	40	41	43	38
08/08/2008 03:00	54	51	38	40	42	38
08/08/2008 04:00	57	57	39	39	41	37
08/08/2008 05:00	62	67	45	44	45	40
08/08/2008 06:00	65	69	50	48	49	43
08/08/2008 07:00	65	69	53	55	59	44
08/08/2008 08:00	64	68	48	56	60	42
08/08/2008 09:00	63	67	45	46	44	38
08/08/2008 10:00	63	67	47	42	44	38
08/08/2008 11:00	63	67	48	50	47	40
08/08/2008 12:00	64	68	49	57	49	40
08/08/2008 13:00	64	67	49	53	47	39
08/08/2008 14:00	64	68	51	45	45	39
08/08/2008 15:00	65	68	51	41	43	39
08/08/2008 16:00	64	68	51	42	43	39
08/08/2008 17:00	64	68	51	53	54	39
08/08/2008 18:00	63	67	48	52	55	40
08/08/2008 19:00	62	67	48	56	61	42
08/08/2008 20:00	62	67	50	55	58	45
08/08/2008 21:00	61	66	45	50	52	45
08/08/2008 22:00	59	64	42	47	50	42
08/08/2008 23:00	57	62	39	51	52	42
09/08/2008 00:00	56	60	33	45	48	34
09/08/2008 01:00	56	59	33	45	48	35
09/08/2008 02:00	56	59	29	42	46	32
09/08/2008 03:00	55	58	32	43	47	31
09/08/2008 04:00	54	55	30	44	48	33
09/08/2008 05:00	58	62	46	52	54	41
09/08/2008 06:00	61	65	40	49	52	42
09/08/2008 07:00	62	67	48	51	54	46
09/08/2008 08:00	63	67	48	49	52	45
09/08/2008 09:00	63	67	49	49	51	45

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
09/08/2008 10:00	63	67	52	48	51	45
09/08/2008 11:00	63	67	51	47	49	43
09/08/2008 12:00	63	67	50	45	48	40
09/08/2008 13:00	64	67	53	47	49	43
09/08/2008 14:00	63	67	52	46	49	42
09/08/2008 15:00	63	67	51	46	47	42
09/08/2008 16:00	63	67	49	45	47	41
09/08/2008 17:00	63	67	51	46	48	42
09/08/2008 18:00	62	67	47	49	52	43
09/08/2008 19:00	62	66	48	50	53	43
09/08/2008 20:00	61	65	47	50	54	44
09/08/2008 21:00	60	64	43	46	47	38
09/08/2008 22:00	59	64	42	43	46	38
09/08/2008 23:00	59	64	39	43	46	37
10/08/2008 00:00	58	62	36	42	45	34
10/08/2008 01:00	57	62	33	42	46	35
10/08/2008 02:00	56	61	31	42	46	31
10/08/2008 03:00	58	62	33	43	47	34
10/08/2008 04:00	54	55	29	42	47	31
10/08/2008 05:00	55	57	33	43	48	33
10/08/2008 06:00	57	61	37	46	50	39
10/08/2008 07:00	59	64	43	48	51	42
10/08/2008 08:00	59	63	46	50	53	45
10/08/2008 09:00	60	64	46	48	51	43
10/08/2008 10:00	61	65	49	51	54	45
10/08/2008 11:00	62	66	51	50	53	45
10/08/2008 12:00	62	66	52	49	52	45
10/08/2008 13:00	63	66	52	49	51	45
10/08/2008 14:00	63	67	53	50	53	47
10/08/2008 15:00	63	67	52	47	50	42
10/08/2008 16:00	63	67	53	49	50	44
10/08/2008 17:00	63	67	51	49	51	43
10/08/2008 18:00	63	67	52	47	50	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
10/08/2008 19:00	63	67	50	48	49	44
10/08/2008 20:00	61	66	46	48	50	42
10/08/2008 21:00	60	65	42	58	63	41
10/08/2008 22:00	58	63	43	47	50	42
10/08/2008 23:00	56	60	37	44	47	39
11/08/2008 00:00	54	57	36	41	45	36
11/08/2008 01:00	53	55	35	41	45	36
11/08/2008 02:00	53	50	33	39	43	34
11/08/2008 03:00	55	55	38	45	48	37
11/08/2008 04:00	56	58	37	42	45	36
11/08/2008 05:00	63	67	45	47	50	40
11/08/2008 06:00	66	69	52	50	52	44
11/08/2008 07:00	66	69	53	52	54	49
11/08/2008 08:00	65	69	54	52	54	49
11/08/2008 09:00	64	68	50	50	52	47
11/08/2008 10:00	64	68	52	51	53	46
11/08/2008 11:00	64	68	52	53	55	48
11/08/2008 12:00	64	68	51	52	54	48
11/08/2008 13:00	64	68	53	53	54	47
11/08/2008 14:00	65	69	55	52	54	48
11/08/2008 15:00	65	68	53	52	55	47
11/08/2008 16:00	66	69	56	53	55	49
11/08/2008 17:00	65	68	56	53	54	49
11/08/2008 18:00	64	68	51	50	52	46
11/08/2008 19:00	62	67	48	51	53	45
11/08/2008 20:00	60	65	45	47	50	42
11/08/2008 21:00	59	64	43	50	52	45
11/08/2008 22:00	57	61	43	49	52	45
11/08/2008 23:00	55	58	41	51	54	47
12/08/2008 00:00	55	56	38	48	51	42
12/08/2008 01:00	53	53	37	49	51	46
12/08/2008 02:00	52	47	30	41	44	32
12/08/2008 03:00	54	51	27	37	41	29

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
12/08/2008 04:00	57	59	27	38	42	27
12/08/2008 05:00	62	67	42	42	44	35
12/08/2008 06:00	65	69	50	47	48	41
12/08/2008 07:00	66	69	55	47	49	43
12/08/2008 08:00	65	69	53	47	46	41
12/08/2008 09:00	64	68	52	46	47	41
12/08/2008 10:00	64	68	52	57	60	42
12/08/2008 11:00	63	67	49	45	47	41
12/08/2008 12:00	63	67	50	44	45	39
12/08/2008 13:00	64	67	53	45	47	40
12/08/2008 14:00	64	68	54	55	51	44
12/08/2008 15:00	65	69	57	52	54	47
12/08/2008 16:00	66	69	59	52	54	50
12/08/2008 17:00	66	69	59	51	52	48
12/08/2008 18:00	64	68	52	51	50	45
12/08/2008 19:00	63	67	49	47	49	44
12/08/2008 20:00	61	66	47	49	51	45
12/08/2008 21:00	60	65	43	46	49	40
12/08/2008 22:00	59	63	40	43	46	37
12/08/2008 23:00	56	59	32	42	46	33
13/08/2008 00:00	56	57	30	41	45	30
13/08/2008 01:00	52	50	27	40	44	26
13/08/2008 02:00	52	48	31	36	40	27
13/08/2008 03:00	54	54	34	38	42	31
13/08/2008 04:00	58	59	35	41	45	32
13/08/2008 05:00	63	68	47	48	51	37
13/08/2008 06:00	65	70	52	50	52	45
13/08/2008 07:00	66	69	53	47	48	45
13/08/2008 08:00	64	68	51	47	47	43
13/08/2008 09:00	64	68	52	49	50	41
13/08/2008 10:00	63	68	50	56	60	42
13/08/2008 11:00	63	67	48	55	56	40
13/08/2008 12:00	63	67	49	43	44	40

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
13/08/2008 13:00	64	68	52	45	45	39
13/08/2008 14:00	64	67	52	44	46	41
13/08/2008 15:00	64	67	52	45	46	41
13/08/2008 16:00	65	68	54	49	51	45
13/08/2008 17:00	65	68	56	55	55	46
13/08/2008 18:00	64	68	55	53	54	49
13/08/2008 19:00	63	67	50	51	54	46
13/08/2008 20:00	61	66	49	49	52	46
13/08/2008 21:00	60	65	45	47	49	42
13/08/2008 22:00	59	63	39	43	46	38
13/08/2008 23:00	57	61	33	42	45	34
14/08/2008 00:00	56	58	33	41	44	33
14/08/2008 01:00	54	56	32	39	42	32
14/08/2008 02:00	54	53	32	40	43	32
14/08/2008 03:00	54	52	30	39	43	30
14/08/2008 04:00	57	60	31	39	43	30
14/08/2008 05:00	63	68	43	46	49	35
14/08/2008 06:00	66	70	53	52	54	45
14/08/2008 07:00	66	70	57	52	53	48
14/08/2008 08:00	65	69	54	50	52	46
14/08/2008 09:00	64	68	51	54	57	45
14/08/2008 10:00	64	68	52	47	49	43
14/08/2008 11:00	64	68	51	47	49	44
14/08/2008 12:00	64	68	51	46	48	43
14/08/2008 13:00	64	67	52			
14/08/2008 14:00	63	67	50			
14/08/2008 15:00	64	68	52			
14/08/2008 16:00	64	68	52			
14/08/2008 17:00	64	68	53			
14/08/2008 18:00	63	67	51	46	47	41
14/08/2008 19:00	63	67	48	53	53	42
14/08/2008 20:00	62	67	49	56	60	41
14/08/2008 21:00	60	65	46	56	60	45

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
14/08/2008 22:00	59	63	40	56	59	44
14/08/2008 23:00	57	60	32	47	49	40
15/08/2008 00:00	57	59	30	45	49	34
15/08/2008 01:00	53	53	26	43	47	30
15/08/2008 02:00	55	56	27	42	46	27
15/08/2008 03:00	55	55	26	38	43	26
15/08/2008 04:00	59	62	34	39	43	26
15/08/2008 05:00	64	68	46	43	45	28
15/08/2008 06:00	66	70	56	47	49	37
15/08/2008 07:00	66	69	56	50	52	45
15/08/2008 08:00	65	68	51	50	52	47
15/08/2008 09:00	64	68	51	50	52	46
15/08/2008 10:00	64	68	52	53	54	45
15/08/2008 11:00	64	68	51	49	51	45
15/08/2008 12:00	65	68	53	50	52	45
15/08/2008 13:00	65	68	53	49	51	46
15/08/2008 14:00	65	68	55	58	54	47
15/08/2008 15:00	65	69	56	50	52	46
15/08/2008 16:00	65	69	56	51	53	47
15/08/2008 17:00	65	68	55	51	53	48
15/08/2008 18:00	64	67	51	52	54	49
15/08/2008 19:00	63	67	49	51	54	47
15/08/2008 20:00	61	66	45	51	54	46
15/08/2008 21:00	60	65	42	51	54	47
15/08/2008 22:00	59	64	40	52	55	44
15/08/2008 23:00	57	60	35	47	50	39
16/08/2008 00:00	57	61	33	46	49	37
16/08/2008 01:00	56	59	36	46	50	36
16/08/2008 02:00	56	60	40	46	49	37
16/08/2008 03:00	56	59	41	48	51	40
16/08/2008 04:00	56	59	44	49	52	43
16/08/2008 05:00	60	65	46	52	55	46
16/08/2008 06:00	62	67	49	53	56	48

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
16/08/2008 07:00	63	67	50	55	58	50
16/08/2008 08:00	63	67	51	55	58	50
16/08/2008 09:00	64	68	53	55	58	50
16/08/2008 10:00	65	68	54	57	59	53
16/08/2008 11:00	65	68	57	58	60	53
16/08/2008 12:00	66	69	57	58	60	54
16/08/2008 13:00	65	68	56	59	61	56
16/08/2008 14:00	64	68	53	59	61	56
16/08/2008 15:00	63	67	47	58	61	55
16/08/2008 16:00	63	67	44	50	52	45
16/08/2008 17:00	63	68	45	48	51	41
16/08/2008 18:00	62	67	49	46	48	40
16/08/2008 19:00	62	67	48	52	53	43
16/08/2008 20:00	61	66	44	48	50	44
16/08/2008 21:00	60	65	43	48	51	43
16/08/2008 22:00	59	64	39	54	57	42
16/08/2008 23:00	57	61	36	48	51	40
17/08/2008 00:00	73	36	36	47	50	37
17/08/2008 01:00	56	60	33	46	50	37
17/08/2008 02:00	56	60	33	46	49	39
17/08/2008 03:00	73	33	33	44	47	37
17/08/2008 04:00	54	54	34	41	44	36
17/08/2008 05:00	55	58	34	36	38	31
17/08/2008 06:00	57	61	36	43	43	34
17/08/2008 07:00	58	61	36	44	46	34
17/08/2008 08:00	58	62	37	52	55	36
17/08/2008 09:00	60	65	41	56	60	38
17/08/2008 10:00	62	66	47	45	46	35
17/08/2008 11:00	62	66	48	46	48	39
17/08/2008 12:00	63	67	50	47	49	42
17/08/2008 13:00	64	67	51	49	51	43
17/08/2008 14:00	63	67	50	49	52	46
17/08/2008 15:00	64	68	52	50	53	46

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
17/08/2008 16:00	63	67	51	51	53	47
17/08/2008 17:00	64	68	53	52	53	47
17/08/2008 18:00	62	67	47	52	55	49
17/08/2008 19:00	62	67	48	53	55	49
17/08/2008 20:00	61	65	45	53	56	49
17/08/2008 21:00	58	63	40	52	55	48
17/08/2008 22:00	58	62	44	51	54	45
17/08/2008 23:00	56	60	39	50	53	43
18/08/2008 00:00	54	56	33	53	55	46
18/08/2008 01:00	52	51	26	47	51	39
18/08/2008 02:00	54	54	25	45	49	34
18/08/2008 03:00	53	53	25	41	45	28
18/08/2008 04:00	59	62	33	39	44	25
18/08/2008 05:00	63	68	45	41	46	25
18/08/2008 06:00	66	69	55	49	52	38
18/08/2008 07:00	66	69	55	54	57	49
18/08/2008 08:00	65	69	52	55	57	53
18/08/2008 09:00	64	68	49	55	57	52
18/08/2008 10:00	65	69	51	56	58	52
18/08/2008 11:00	64	68	52	56	58	52
18/08/2008 12:00	64	68	50	58	59	53
18/08/2008 13:00	63	67	51	56	57	51
18/08/2008 14:00	64	67	52	55	57	52
18/08/2008 15:00	64	68	51	55	57	51
18/08/2008 16:00	65	68	53	55	57	52
18/08/2008 17:00	64	68	51	55	57	51
18/08/2008 18:00	63	67	47	57	59	53
18/08/2008 19:00	62	66	48	54	56	49
18/08/2008 20:00	60	65	47	51	53	47
18/08/2008 21:00	59	63	45	49	51	46
18/08/2008 22:00	57	60	44	49	50	46
18/08/2008 23:00	55	57	40	49	51	45
19/08/2008 00:00	53	49	38	46	49	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
19/08/2008 01:00	53	49	37	43	46	40
19/08/2008 02:00	52	49	37	41	43	38
19/08/2008 03:00	53	52	36			
19/08/2008 04:00	59	62	39			
19/08/2008 05:00	63	68	46			
19/08/2008 06:00	66	69	54			
19/08/2008 07:00	65	69	54			

Appendix 8.2

Unattended Commissioning Noise Monitoring Results

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
11/11/2011 10:00	63	67	50	56	58	52
11/11/2011 11:00	64	68	53	56	58	53
11/11/2011 12:00	65	69	53	58	60	54
11/11/2011 13:00	65	68	53	57	59	54
11/11/2011 14:00	65	69	55	57	59	54
11/11/2011 15:00	65	69	53	55	57	53
11/11/2011 16:00	65	69	55	54	56	51
11/11/2011 17:00	64	67	54	55	57	52
11/11/2011 18:00	63	68	51	53	55	51
11/11/2011 19:00	62	67	49	51	54	48
11/11/2011 20:00	60	65	46	50	53	45
11/11/2011 21:00	59	64	43	49	51	43
11/11/2011 22:00	58	62	41	48	51	42
11/11/2011 23:00	57	61	38	46	50	41
11/11/2011 00:00	54	56	34	44	47	38
12/11/2011 01:00	54	56	34	43	46	38
12/11/2011 02:00	54	55	35	44	47	39
12/11/2011 03:00	54	55	34	43	46	40
12/11/2011 04:00	53	54	33	44	47	39
12/11/2011 05:00	54	54	35	44	47	38
12/11/2011 06:00	57	60	38	45	49	39
12/11/2011 07:00	59	63	43	49	52	42
12/11/2011 08:00	61	65	47	52	55	48
12/11/2011 09:00	61	65	48	53	55	47
12/11/2011 10:00	61	66	47	52	54	47
12/11/2011 11:00	62	67	49	52	56	46
12/11/2011 12:00	62	67	49	53	53	48
12/11/2011 13:00	62	67	46	51	53	45
12/11/2011 14:00	62	67	48	51	53	45
12/11/2011 15:00	62	67	47	53	54	44
12/11/2011 16:00	62	67	50	54	56	48
12/11/2011 17:00	62	66	50	55	55	48

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
12/11/2011 18:00	62	66	50	51	52	46
12/11/2011 19:00	60	65	46	48	50	45
12/11/2011 20:00	59	64	45	48	50	44
12/11/2011 21:00	58	63	44	46	48	43
12/11/2011 22:00	57	61	43	45	48	42
12/11/2011 23:00	56	60	43	44	46	42
12/11/2011 00:00	55	58	43	45	47	43
13/11/2011 01:00	54	58	42	45	47	43
13/11/2011 02:00	54	56	42	44	46	43
13/11/2011 03:00	54	56	41	44	46	42
13/11/2011 04:00	52	51	40	44	45	42
13/11/2011 05:00	54	53	40	46	48	42
13/11/2011 06:00	54	54	41	46	48	43
13/11/2011 07:00	57	59	43	46	48	43
13/11/2011 08:00	57	60	43	49	52	44
13/11/2011 09:00	58	63	44	48	51	44
13/11/2011 10:00	61	65	46	49	51	45
13/11/2011 11:00	61	65	47	50	53	47
13/11/2011 12:00	62	67	50	52	55	49
13/11/2011 13:00	63	67	52	53	55	49
13/11/2011 14:00	63	67	51	52	54	50
13/11/2011 15:00	63	67	51	52	54	49
13/11/2011 16:00	63	67	51	52	55	49
13/11/2011 17:00	62	66	50	50	52	48
13/11/2011 18:00	61	66	49	50	52	47
13/11/2011 19:00	60	65	48	49	52	46
13/11/2011 20:00	59	64	46	48	51	45
13/11/2011 21:00	57	62	45	46	48	43
13/11/2011 22:00	56	60	44	46	47	43
13/11/2011 23:00	54	55	39	44	46	42
13/11/2011 00:00	52	53	38	42	44	40
14/11/2011 01:00	49	48	35	40	42	38
14/11/2011 02:00	46	40	35	40	41	38

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
14/11/2011 03:00	51	47	38	40	42	39
14/11/2011 04:00	53	51	40	43	45	40
14/11/2011 05:00	57	59	42	44	46	42
14/11/2011 06:00	60	65	45	47	49	43
14/11/2011 07:00	64	68	51	50	53	46
14/11/2011 08:00	65	69	55	54	57	48
14/11/2011 09:00	64	68	53	54	56	50
14/11/2011 10:00	63	67	50	52	54	48
14/11/2011 11:00	62	66	48	51	53	48
14/11/2011 12:00	63	67	50	54	57	50
14/11/2011 13:00	63	67	51	55	57	51
14/11/2011 14:00	62	66	51	54	56	50
14/11/2011 15:00	63	67	53	53	55	50
14/11/2011 16:00	63	67	53	55	57	51
14/11/2011 17:00	63	67	54	52	54	49
14/11/2011 18:00	63	66	52	52	55	49
14/11/2011 19:00	60	65	48	50	52	47
14/11/2011 20:00	59	64	45	48	50	45
14/11/2011 21:00	58	63	43	46	48	42
14/11/2011 22:00	56	59	41	44	47	42
14/11/2011 23:00	54	56	42	43	45	41
14/11/2011 00:00	51	51	42	43	44	41
15/11/2011 01:00	50	47	41	42	44	41
15/11/2011 02:00	49	44	40	41	43	40
15/11/2011 03:00	51	46	41	41	42	40
15/11/2011 04:00	52	49	41	43	44	40
15/11/2011 05:00	55	56	42	43	45	41
15/11/2011 06:00	60	64	45	46	47	42
15/11/2011 07:00	63	67	50	48	50	45
15/11/2011 08:00	64	67	53	54	57	48
15/11/2011 09:00	63	67	51	52	54	49
15/11/2011 10:00	61	66	47	51	53	49
15/11/2011 11:00	61	66	46	53	55	49

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
15/11/2011 12:00	61	66	46	51	54	48
15/11/2011 13:00	62	66	51	53	56	49
15/11/2011 14:00	62	66	51	56	59	50
15/11/2011 15:00	63	67	52	56	60	49
15/11/2011 16:00	63	67	53	55	58	49
15/11/2011 17:00	63	66	54	51	51	48
15/11/2011 18:00	62	66	51	50	51	48
15/11/2011 19:00	61	65	48	48	50	46
15/11/2011 20:00	59	64	45	47	49	44
15/11/2011 21:00	58	63	43	45	47	43
15/11/2011 22:00	57	61	42	46	48	42
15/11/2011 23:00	55	58	42	44	46	41
15/11/2011 00:00	54	55	40	44	47	40
16/11/2011 01:00	51	47	40	42	44	40
16/11/2011 02:00	47	43	39	41	43	39
16/11/2011 03:00	50	44	40	41	43	39
16/11/2011 04:00	53	50	40	42	44	40
16/11/2011 05:00	56	58	42	44	47	40
16/11/2011 06:00	60	64	44	47	49	42
16/11/2011 07:00	63	67	49	49	51	46
16/11/2011 08:00	65	69	53	54	57	49
16/11/2011 09:00	63	68	49	55	58	51
16/11/2011 10:00	63	67	48	56	60	49
16/11/2011 11:00	63	67	47	57	59	49
16/11/2011 12:00	62	67	48	53	55	49
16/11/2011 13:00	62	67	48	52	54	49
16/11/2011 14:00	62	67	48	52	54	47
16/11/2011 15:00	63	67	50	53	55	50
16/11/2011 16:00	64	67	53	53	55	50
16/11/2011 17:00	64	67	53	53	54	50
16/11/2011 18:00	63	66	50	50	52	46
16/11/2011 19:00	62	66	47	48	50	44
16/11/2011 20:00	60	65	45	47	50	44

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
16/11/2011 21:00	59	63	44	46	48	43
16/11/2011 22:00	58	63	44	46	49	44
16/11/2011 23:00	56	59	43	48	49	46
16/11/2011 00:00	53	52	40	47	47	42
17/11/2011 01:00	49	48	38	42	43	40
17/11/2011 02:00	49	43	36	42	43	40
17/11/2011 03:00	49	45	36	43	45	41
17/11/2011 04:00	54	52	36	45	48	42
17/11/2011 05:00	58	60	37	47	50	44
17/11/2011 06:00	62	66	44	50	53	45
17/11/2011 07:00	65	69	53	53	55	49
17/11/2011 08:00	66	69	56	56	58	53
17/11/2011 09:00	64	68	53	57	58	53
17/11/2011 10:00	63	67	49	56	59	52
17/11/2011 11:00	64	68	51	55	57	52
17/11/2011 12:00	65	68	52	57	60	52
17/11/2011 13:00	66	70	55	58	60	54
17/11/2011 14:00	67	70	57	59	61	56
17/11/2011 15:00	66	70	57	60	62	57
17/11/2011 16:00	66	69	57	59	61	56
17/11/2011 17:00	65	68	57	58	61	55
17/11/2011 18:00	65	68	55	58	60	55
17/11/2011 19:00	63	67	53	58	60	55
17/11/2011 20:00	62	66	52	57	59	54
17/11/2011 21:00	61	65	50	57	59	54
17/11/2011 22:00	60	64	49	57	59	53
17/11/2011 23:00	58	62	46	55	58	52
17/11/2011 00:00	55	58	43	55	57	51
18/11/2011 01:00	52	53	42	54	56	51
18/11/2011 02:00	53	53	41	55	57	51
18/11/2011 03:00	51	50	40	54	56	51
18/11/2011 04:00	53	52	39	54	56	51
18/11/2011 05:00	56	59	41	54	57	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
18/11/2011 06:00	60	65	45	55	57	52
18/11/2011 07:00	63	67	50	56	58	53
18/11/2011 08:00	65	69	55	58	60	55
18/11/2011 09:00	63	67	53	58	60	54
18/11/2011 10:00	62	67	50	57	59	54
18/11/2011 11:00	63	67	52	59	62	54
18/11/2011 12:00	63	67	52	58	61	55
18/11/2011 13:00	63	67	51	59	61	55
18/11/2011 14:00	64	67	53	58	60	55
18/11/2011 15:00	63	67	52	57	59	54
18/11/2011 16:00	63	66	53	57	59	54
18/11/2011 17:00	62	66	51	58	60	55
18/11/2011 18:00	62	66	48	56	59	54
18/11/2011 19:00	62	66	49	56	59	53
18/11/2011 20:00	61	65	46	57	59	53
18/11/2011 21:00	59	64	44	56	59	52
18/11/2011 22:00	58	62	42	56	58	53
18/11/2011 23:00	56	60	40	56	59	51
18/11/2011 00:00	55	59	39	56	59	51
19/11/2011 01:00	55	58	39	55	58	52
19/11/2011 02:00	52	53	38	55	58	52
19/11/2011 03:00	54	56	39	55	58	52
19/11/2011 04:00	51	51	38	55	57	52
19/11/2011 05:00	54	53	38	55	57	51
19/11/2011 06:00	57	60	40	55	57	51
19/11/2011 07:00	58	63	42	56	58	51
19/11/2011 08:00	60	64	44	57	59	53
19/11/2011 09:00	61	66	46	54	56	49
19/11/2011 10:00	61	66	46	53	56	49
19/11/2011 11:00	62	66	48	54	55	50
19/11/2011 12:00	63	67	49	57	59	52
19/11/2011 13:00	62	66	48	56	59	53
19/11/2011 14:00	62	66	48	61	64	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
19/11/2011 15:00	62	66	48	55	57	51
19/11/2011 16:00	62	66	49	56	57	54
19/11/2011 17:00	61	65	47	56	57	54
19/11/2011 18:00	60	65	46	55	57	53
19/11/2011 19:00	59	64	43	57	59	54
19/11/2011 20:00	58	63	43	55	57	53
19/11/2011 21:00	57	61	42	53	55	51
19/11/2011 22:00	56	60	41	54	56	52
19/11/2011 23:00	55	59	41	52	54	51
19/11/2011 00:00	55	58	42	52	54	50
20/11/2011 01:00	53	55	43	52	53	50
20/11/2011 02:00	54	56	44	51	52	50
20/11/2011 03:00	55	57	44	52	53	51
20/11/2011 04:00	53	53	43	53	54	51
20/11/2011 05:00	53	51	45	54	54	52
20/11/2011 06:00	54	54	45	53	54	52
20/11/2011 07:00	55	57	43	53	54	52
20/11/2011 08:00	56	59	44	54	55	52
20/11/2011 09:00	59	63	45	54	55	52
20/11/2011 10:00	59	64	43	55	56	53
20/11/2011 11:00	61	66	46	54	56	52
20/11/2011 12:00	62	67	46	55	57	53
20/11/2011 13:00	62	67	47	56	58	53
20/11/2011 14:00	62	67	48	56	58	53
20/11/2011 15:00	62	67	48	55	57	53
20/11/2011 16:00	62	66	47	55	56	53
20/11/2011 17:00	61	65	46	54	55	52
20/11/2011 18:00	61	65	46	54	56	53
20/11/2011 19:00	59	64	44	55	57	52
20/11/2011 20:00	59	64	43	55	58	53
20/11/2011 21:00	57	61	42	55	57	52
20/11/2011 22:00	56	60	41	54	57	51
20/11/2011 23:00	54	57	39	55	57	52

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
20/11/2011 00:00	52	53	40	53	55	51
21/11/2011 01:00	51	50	39	53	55	51
21/11/2011 02:00	48	46	40	52	54	50
21/11/2011 03:00	51	48	40	52	54	50
21/11/2011 04:00	53	52	41	52	54	50
21/11/2011 05:00	55	55	42	52	53	51
21/11/2011 06:00	60	65	46	53	55	51
21/11/2011 07:00	63	67	51	53	54	52
21/11/2011 08:00	64	68	53	56	57	53
21/11/2011 09:00	63	67	50	54	56	52
21/11/2011 10:00	62	66	47	55	57	52
21/11/2011 11:00	62	67	47	59	62	54
21/11/2011 12:00	62	67	46	58	61	52
21/11/2011 13:00	61	66	46	57	60	52
21/11/2011 14:00	62	66	49	59	60	56
21/11/2011 15:00	62	66	47	57	58	56
21/11/2011 16:00	62	66	48	55	57	48
21/11/2011 17:00	62	66	51	49	50	47
21/11/2011 18:00	61	65	47	49	52	46
21/11/2011 19:00	60	65	47	46	47	45
21/11/2011 20:00	59	63	46	46	47	45
21/11/2011 21:00	58	62	46	47	48	46
21/11/2011 22:00	55	59	44	47	48	46
21/11/2011 23:00	54	56	43	46	47	45
21/11/2011 00:00	52	53	43	46	47	46
22/11/2011 01:00	49	48	42	47	46	44
22/11/2011 02:00	49	47	42	45	46	44
22/11/2011 03:00	51	48	43	47	50	44
22/11/2011 04:00	52	50	44	46	47	45
22/11/2011 05:00	56	58	43	52	58	45
22/11/2011 06:00	59	64	45	48	50	46
22/11/2011 07:00	63	67	52	50	52	48
22/11/2011 08:00	65	68	55	54	57	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
22/11/2011 09:00	63	67	50	56	57	54
22/11/2011 10:00	61	66	46	53	57	47
22/11/2011 11:00	62	66	48	56	58	51
22/11/2011 12:00	62	67	50	57	60	54
22/11/2011 13:00	62	67	50	58	60	54
22/11/2011 14:00	63	67	50	58	61	54
22/11/2011 15:00	63	67	51	57	59	55
22/11/2011 16:00	64	67	53	56	57	52
22/11/2011 17:00	64	67	54	57	59	51
22/11/2011 18:00	63	67	53	51	52	49
22/11/2011 19:00	62	66	50	50	51	48
22/11/2011 20:00	60	65	47	49	50	46
22/11/2011 21:00	59	64	46	48	50	45
22/11/2011 22:00	57	61	43	46	48	44
22/11/2011 23:00	54	57	42	46	48	44
22/11/2011 00:00	52	54	41	45	47	44
23/11/2011 01:00	51	50	40	45	46	44
23/11/2011 02:00	51	49	40	49	47	44
23/11/2011 03:00	52	49	40	45	47	44
23/11/2011 04:00	53	53	41	46	48	43
23/11/2011 05:00	56	58	42	46	48	43
23/11/2011 06:00	61	65	46	48	51	45
23/11/2011 07:00	63	67	52	51	53	47
23/11/2011 08:00	65	68	56	56	58	51
23/11/2011 09:00	63	67	53	57	59	55
23/11/2011 10:00	62	67	52	55	56	54
23/11/2011 11:00	63	67	51	55	57	54
23/11/2011 12:00	63	67	51	55	56	53
23/11/2011 13:00	63	67	52	56	57	54
23/11/2011 14:00	62	66	51	56	58	54
23/11/2011 15:00	62	66	52	56	58	54
23/11/2011 16:00	62	66	52	55	57	51
23/11/2011 17:00	63	66	54	52	54	50

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
23/11/2011 18:00	63	67	53	52	54	50
23/11/2011 19:00	62	66	50	49	51	47
23/11/2011 20:00	60	65	47	48	50	46
23/11/2011 21:00	58	63	45	48	50	45
23/11/2011 22:00	58	61	43	47	49	45
23/11/2011 23:00	55	59	42	46	48	44
23/11/2011 00:00	52	54	40	48	48	44
24/11/2011 01:00	51	51	40	46	48	44
24/11/2011 02:00	50	49	40	46	48	44
24/11/2011 03:00	51	50	40	46	49	44
24/11/2011 04:00	53	53	40	47	50	44
24/11/2011 05:00	56	58	41	47	49	44
24/11/2011 06:00	60	65	45	50	51	46
24/11/2011 07:00	63	67	51	51	53	48
24/11/2011 08:00	64	68	56	55	58	51
24/11/2011 09:00	64	67	54	56	58	53
24/11/2011 10:00	63	67	53	56	58	52
24/11/2011 11:00	64	68	54	58	60	54
24/11/2011 12:00	64	68	54	59	61	55
24/11/2011 13:00	65	69	56	59	61	56
24/11/2011 14:00	65	68	56	59	62	55
24/11/2011 15:00	64	67	57	58	60	54
24/11/2011 16:00	64	67	55	55	57	53
24/11/2011 17:00	64	67	56	53	55	51
24/11/2011 18:00	63	67	53	52	54	49
24/11/2011 19:00	62	66	50	50	52	48
24/11/2011 20:00	61	66	50	52	54	48
24/11/2011 21:00	59	64	48	47	48	45
24/11/2011 22:00	58	62	45	47	47	44
24/11/2011 23:00	56	60	43	45	47	43
24/11/2011 00:00	54	57	42	45	47	43
25/11/2011 01:00	52	53	42	46	47	43
25/11/2011 02:00	52	51	42	46	49	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
25/11/2011 03:00	52	50	41	45	46	43
25/11/2011 04:00	54	53	41	45	46	43
25/11/2011 05:00	57	59	41	46	48	43
25/11/2011 06:00	61	65	45	48	51	45
25/11/2011 07:00	63	67	52	52	54	49
25/11/2011 08:00	65	69	56	56	58	52
25/11/2011 09:00	64	68	54	57	59	54
25/11/2011 10:00	63	67	53	56	58	54
25/11/2011 11:00	63	67	54	56	58	53
25/11/2011 12:00	64	67	55	57	59	54
25/11/2011 13:00	63	67	55	54	57	50
25/11/2011 14:00	63	67	54	55	58	50
25/11/2011 15:00	63	67	53	54	57	49
25/11/2011 16:00	64	67	55	55	58	49
25/11/2011 17:00	63	67	55	50	52	48
25/11/2011 18:00	63	67	53	51	53	49
25/11/2011 19:00	62	66	52	50	52	48
25/11/2011 20:00	61	65	50	49	51	47
25/11/2011 21:00	59	64	47	48	50	46
25/11/2011 22:00	58	62	46	48	50	46
25/11/2011 23:00	56	60	45	47	49	45
25/11/2011 00:00	55	58	44	47	49	45
26/11/2011 01:00	55	57	45	47	49	45
26/11/2011 02:00	54	54	43	47	49	45
26/11/2011 03:00	55	55	44	47	49	45
26/11/2011 04:00	54	54	44	50	52	47
26/11/2011 05:00	55	56	45	49	51	46
26/11/2011 06:00	57	60	45	48	51	46
26/11/2011 07:00	59	63	46	49	50	45
26/11/2011 08:00	61	65	47	52	55	47
26/11/2011 09:00	62	66	50	54	56	49
26/11/2011 10:00	62	66	51	60	64	52
26/11/2011 11:00	63	67	53	59	63	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
26/11/2011 12:00	64	67	54	56	59	52
26/11/2011 13:00	64	68	55	55	57	51
26/11/2011 14:00	64	67	55	56	58	51
26/11/2011 15:00	63	67	53	54	57	50
26/11/2011 16:00	62	66	52	53	55	50
26/11/2011 17:00	61	65	50	53	55	49
26/11/2011 18:00	61	65	51	55	57	50
26/11/2011 19:00	61	65	51	54	56	50
26/11/2011 20:00	60	64	49	53	56	50
26/11/2011 21:00	60	64	51	58	61	53
26/11/2011 22:00	59	63	50	57	60	52
26/11/2011 23:00	59	63	50	56	59	52
26/11/2011 00:00	59	63	51	57	60	52
27/11/2011 01:00	59	62	49	56	59	50
27/11/2011 02:00	60	64	51	58	62	51
27/11/2011 03:00	59	63	51	57	61	51
27/11/2011 04:00	55	58	49	52	55	47
27/11/2011 05:00	56	59	49	52	55	47
27/11/2011 06:00	56	58	49	51	54	46
27/11/2011 07:00	57	60	50	50	53	46
27/11/2011 08:00	58	61	49	51	53	47
27/11/2011 09:00	59	63	50	50	53	46
27/11/2011 10:00	59	63	50	48	50	45
27/11/2011 11:00	60	65	50	48	50	45
27/11/2011 12:00	61	66	50	47	49	45
27/11/2011 13:00	62	66	51	50	52	46
27/11/2011 14:00	62	66	51	49	50	46
27/11/2011 15:00	63	66	52	50	52	47
27/11/2011 16:00	62	66	52	49	51	47
27/11/2011 17:00	61	66	51	49	51	47
27/11/2011 18:00	61	65	51	49	51	47
27/11/2011 19:00	60	65	49	48	50	46
27/11/2011 20:00	59	63	47	48	49	46

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
27/11/2011 21:00	58	62	46	48	49	46
27/11/2011 22:00	56	60	45	47	48	45
27/11/2011 23:00	55	57	43	46	48	45
27/11/2011 00:00	52	54	40	46	47	45
28/11/2011 01:00	52	51	40	46	47	44
28/11/2011 02:00	51	50	40	46	47	44
28/11/2011 03:00	51	50	40	46	47	45
28/11/2011 04:00	53	50	40	46	48	45
28/11/2011 05:00	57	58	41	47	49	45
28/11/2011 06:00	60	65	44	49	51	46
28/11/2011 07:00	63	68	50	51	53	47
28/11/2011 08:00	66	69	56	55	58	51
28/11/2011 09:00	64	68	52	58	62	51
28/11/2011 10:00	63	68	51	54	58	50
28/11/2011 11:00	63	67	51	54	55	51
28/11/2011 12:00	63	67	52	55	59	50
28/11/2011 13:00	63	67	52	54	57	51
28/11/2011 14:00	64	68	53	54	56	51
28/11/2011 15:00	64	68	54	53	55	50
28/11/2011 16:00	64	68	54	55	57	51
28/11/2011 17:00	64	67	54	57	62	50
28/11/2011 18:00	63	67	52	52	53	49
28/11/2011 19:00	62	66	50	51	53	48
28/11/2011 20:00	61	65	48	50	52	47
28/11/2011 21:00	60	64	48	50	52	47
28/11/2011 22:00	58	62	46	51	53	47
28/11/2011 23:00	57	61	46	51	53	47
28/11/2011 00:00	57	60	47	52	55	49
29/11/2011 01:00	57	60	47	53	56	49
29/11/2011 02:00	57	60	48	54	57	50
29/11/2011 03:00	57	60	47	54	57	49
29/11/2011 04:00	57	59	46	53	55	48
29/11/2011 05:00	59	63	48	54	57	50

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
29/11/2011 06:00	62	66	50	54	57	50
29/11/2011 07:00	65	68	55	56	58	52
29/11/2011 08:00	66	69	57	56	58	53
29/11/2011 09:00	66	70	56	55	57	51
29/11/2011 10:00	64	68	54	52	54	49
29/11/2011 11:00	63	67	54	57	57	48
29/11/2011 12:00	64	68	53	56	57	50
29/11/2011 13:00	64	68	53	55	58	49
29/11/2011 14:00	64	68	53	53	59	49
29/11/2011 15:00	64	67	54	54	58	50
29/11/2011 16:00	63	67	54	56	59	49
29/11/2011 17:00	63	67	54	52	52	48
29/11/2011 18:00	63	67	54	50	51	47
29/11/2011 19:00	62	66	49	48	50	46
29/11/2011 20:00	60	65	47	47	49	45
29/11/2011 21:00	59	63	46	47	48	44
29/11/2011 22:00	57	61	44	46	48	44
29/11/2011 23:00	57	61	44	45	46	44
29/11/2011 00:00	53	53	41	45	46	43
30/11/2011 01:00	51	48	41	45	46	44
30/11/2011 02:00	49	47	41	47	45	44
30/11/2011 03:00	51	53	40	45	46	44
30/11/2011 04:00	53	54	40	46	46	44
30/11/2011 05:00	56	58	41	46	49	44
30/11/2011 06:00	60	63	45	51	51	45
30/11/2011 07:00	63	65	50	52	54	46
30/11/2011 08:00	65	66	55	56	58	49
30/11/2011 09:00	64	66	51	56	57	51
30/11/2011 10:00	63	65	50	56	58	50
30/11/2011 11:00	63	66	49	55	57	51
30/11/2011 12:00	63	66	50	56	56	51
30/11/2011 13:00	63	66	51	56	56	51
30/11/2011 14:00	63	66	51	56	56	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
30/11/2011 15:00	63	66	52	55	56	52
30/11/2011 16:00	63	66	53	54	54	50
30/11/2011 17:00	63	66	53	52	54	49
30/11/2011 18:00	63	65	52	51	52	48
30/11/2011 19:00	62	65	49	49	50	46
30/11/2011 20:00	60	64	46	48	50	45
30/11/2011 21:00	59	63	46	47	49	44
30/11/2011 22:00	58	61	44	46	48	44
30/11/2011 23:00	56	58	43	45	49	43
01/12/2011 00:00	53	53	41	47	46	43
01/12/2011 01:00	51	50	40	43	44	42
01/12/2011 02:00	50	47	39	43	44	42
01/12/2011 03:00	50	48	39	44	45	42
01/12/2011 04:00	54	52	38	45	47	42
01/12/2011 05:00	57	59	39	47	48	44
01/12/2011 06:00	61	66	46	49	51	45
01/12/2011 07:00	64	68	53	52	55	49
01/12/2011 08:00	65	68	56	56	59	52
01/12/2011 09:00	64	68	53	57	59	51
01/12/2011 10:00	63	67	51	56	59	51
01/12/2011 11:00	64	67	51	56	58	51
01/12/2011 12:00	64	68	52	56	58	51
01/12/2011 13:00	65	68	54	56	59	52
01/12/2011 14:00	65	69	55	57	60	53
01/12/2011 15:00	65	68	55	58	61	54
01/12/2011 16:00	65	68	56	57	60	54
01/12/2011 17:00	64	67	56	58	60	53
01/12/2011 18:00	64	67	54	55	56	52
01/12/2011 19:00	62	66	52	54	56	51
01/12/2011 20:00	61	66	50	53	55	50
01/12/2011 21:00	60	64	48	52	54	49
01/12/2011 22:00	59	63	47	51	53	49
01/12/2011 23:00	57	60	45	50	52	48

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
02/12/2011 00:00	54	55	42	50	51	47
02/12/2011 01:00	51	51	41	50	51	47
02/12/2011 02:00	51	50	40	50	51	47
02/12/2011 03:00	51	50	40	50	51	47
02/12/2011 04:00	52	51	41	49	51	47
02/12/2011 05:00	56	58	42	50	51	47
02/12/2011 06:00	59	63	46	51	52	48
02/12/2011 07:00	62	66	50	53	55	49
02/12/2011 08:00	64	67	54	57	60	52
02/12/2011 09:00	63	66	53	57	59	51
02/12/2011 10:00	62	66	51	56	57	51
02/12/2011 11:00	63	67	52	56	58	52
02/12/2011 12:00	64	67	52	56	59	52
02/12/2011 13:00	63	67	52	57	59	52
02/12/2011 14:00	64	67	53	56	58	52
02/12/2011 15:00	64	67	52	55	56	52
02/12/2011 16:00	64	67	53	54	56	51
02/12/2011 17:00	63	66	52	55	57	51
02/12/2011 18:00	62	66	50	54	55	51
02/12/2011 19:00	62	66	49	53	55	50
02/12/2011 20:00	60	65	47	51	54	48
02/12/2011 21:00	59	64	45	51	53	47
02/12/2011 22:00	58	62	43	50	52	46
02/12/2011 23:00	56	60	41	49	53	45
03/12/2011 00:00	55	57	40	53	56	44
03/12/2011 01:00	55	57	40	52	54	45
03/12/2011 02:00	54	55	39	48	50	44
03/12/2011 03:00	54	55	38	49	51	45
03/12/2011 04:00	53	53	39	48	50	45
03/12/2011 05:00	54	54	39	48	51	44
03/12/2011 06:00	56	59	40	48	50	44
03/12/2011 07:00	58	62	43	51	54	46
03/12/2011 08:00	60	64	46	54	57	49

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
03/12/2011 09:00	61	65	48	53	56	48
03/12/2011 10:00	61	66	47	52	54	47
03/12/2011 11:00	62	66	49	52	55	48
03/12/2011 12:00	62	66	50	53	54	49
03/12/2011 13:00	62	66	48	53	55	48
03/12/2011 14:00	62	66	49	55	57	47
03/12/2011 15:00	62	66	49	53	55	47
03/12/2011 16:00	62	66	51	53	54	49
03/12/2011 17:00	61	65	49	53	53	49
03/12/2011 18:00	61	65	49	51	52	48
03/12/2011 19:00	60	64	46	50	52	48
03/12/2011 20:00	59	63	46	50	52	48
03/12/2011 21:00	58	62	45	49	50	46
03/12/2011 22:00	56	60	43	49	50	46
03/12/2011 23:00	55	59	42	47	48	46
04/12/2011 00:00	55	57	43	48	50	45
04/12/2011 01:00	54	57	43	47	49	45
04/12/2011 02:00	54	56	43	47	48	45
04/12/2011 03:00	55	57	43	47	48	45
04/12/2011 04:00	53	53	42	47	48	45
04/12/2011 05:00	53	52	43	48	49	45
04/12/2011 06:00	53	54	42	47	49	45
04/12/2011 07:00	55	57	42	48	50	46
04/12/2011 08:00	56	59	44	50	52	47
04/12/2011 09:00	58	61	44	50	51	47
04/12/2011 10:00	59	64	45	50	52	47
04/12/2011 11:00	61	65	47	51	52	48
04/12/2011 12:00	62	66	49	52	54	49
04/12/2011 13:00	62	66	49	52	54	49
04/12/2011 14:00	62	66	50	52	54	49
04/12/2011 15:00	63	67	50	52	53	49
04/12/2011 16:00	62	66	50	51	53	49
04/12/2011 17:00	61	65	49	50	52	48

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
04/12/2011 18:00	61	65	48	51	53	49
04/12/2011 19:00	60	65	46	50	52	48
04/12/2011 20:00	59	64	45	50	52	47
04/12/2011 21:00	57	62	43	48	50	46
04/12/2011 22:00	56	59	41	48	50	45
04/12/2011 23:00	54	56	37	47	49	44
05/12/2011 00:00	52	53	36	45	47	43
05/12/2011 01:00	51	49	34	45	47	43
05/12/2011 02:00	49	45	34	45	47	42
05/12/2011 03:00	52	49	37	45	47	43
05/12/2011 04:00	53	52	38	46	48	44
05/12/2011 05:00	56	58	41	47	49	45
05/12/2011 06:00	60	65	45	50	51	46
05/12/2011 07:00	63	67	51	52	54	49
05/12/2011 08:00	65	68	54	54	56	51
05/12/2011 09:00	64	68	52	54	56	50
05/12/2011 10:00	63	67	49	54	56	50
05/12/2011 11:00	63	67	49	54	57	50
05/12/2011 12:00	63	67	49	55	58	49
05/12/2011 13:00	62	66	50	55	58	50
05/12/2011 14:00	62	66	50	56	58	53
05/12/2011 15:00	63	66	51	55	57	53
05/12/2011 16:00	63	66	51	55	57	48
05/12/2011 17:00	63	66	53	51	53	47
05/12/2011 18:00	62	66	50	52	54	46
05/12/2011 19:00	61	65	48	49	51	45
05/12/2011 20:00	59	64	46	49	50	47
05/12/2011 21:00	58	62	44	49	50	47
05/12/2011 22:00	56	60	42	48	50	45
05/12/2011 23:00	54	56	41	43	45	42
06/12/2011 00:00	52	53	40	43	44	41
06/12/2011 01:00	51	48	39	42	43	41
06/12/2011 02:00	49	46	39	42	43	40

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
06/12/2011 03:00	51	47	39	42	44	40
06/12/2011 04:00	53	50	39	42	44	40
06/12/2011 05:00	56	57	40	46	49	41
06/12/2011 06:00	60	64	45	46	48	43
06/12/2011 07:00	63	67	51	49	51	46
06/12/2011 08:00	64	68	54	54	56	49
06/12/2011 09:00	63	67	51	54	55	50
06/12/2011 10:00	62	66	48	53	55	48
06/12/2011 11:00	62	66	49	53	55	49
06/12/2011 12:00	62	67	49	54	56	50
06/12/2011 13:00	63	67	51	55	57	50
06/12/2011 14:00	63	67	51	57	60	51
06/12/2011 15:00	63	67	51	56	59	51
06/12/2011 16:00	64	67	53	54	56	50
06/12/2011 17:00	64	67	54	53	54	49
06/12/2011 18:00	63	67	52	50	52	48
06/12/2011 19:00	62	66	49	49	51	46
06/12/2011 20:00	60	64	46	47	49	44
06/12/2011 21:00	59	63	44	46	48	43
06/12/2011 22:00	57	61	42	45	47	42
06/12/2011 23:00	55	58	41	45	47	42
07/12/2011 00:00	54	55	40	45	47	41
07/12/2011 01:00	52	50	40	44	46	41
07/12/2011 02:00	50	49	41	46	47	42
07/12/2011 03:00	51	48	39	44	45	41
07/12/2011 04:00	54	52	40	45	47	42
07/12/2011 05:00	56	58	41	45	48	42
07/12/2011 06:00	60	65	45	50	53	46
07/12/2011 07:00	63	67	51	52	54	48
07/12/2011 08:00	65	68	55	54	57	49
07/12/2011 09:00	63	67	52	56	58	52
07/12/2011 10:00	63	67	51	54	57	49
07/12/2011 11:00	63	67	50	56	57	50

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
07/12/2011 12:00	63	67	50	55	56	52
07/12/2011 13:00	63	67	51	55	57	52
07/12/2011 14:00	62	66	51	54	56	50
07/12/2011 15:00	63	66	51	53	55	50
07/12/2011 16:00	63	66	53	53	55	50
07/12/2011 17:00	63	66	54	52	54	50
07/12/2011 18:00	63	66	51	51	53	48
07/12/2011 19:00	62	66	49	48	50	45
07/12/2011 20:00	60	65	47	48	50	45
07/12/2011 21:00	59	63	46	48	49	44
07/12/2011 22:00	58	62	45	48	50	45
07/12/2011 23:00	56	59	43	48	50	45
08/12/2011 00:00	54	55	42	48	48	44
08/12/2011 01:00	51	51	40	45	47	44
08/12/2011 02:00	51	49	40	46	48	44
08/12/2011 03:00	52	51	41	51	54	44
08/12/2011 04:00	53	53	41	49	53	44
08/12/2011 05:00	56	57	42	48	50	45
08/12/2011 06:00	60	64	46	49	50	46
08/12/2011 07:00	63	67	50	51	53	48
08/12/2011 08:00	64	68	55	54	56	50
08/12/2011 09:00	64	67	54	56	58	51
08/12/2011 10:00	63	67	52	54	57	50
08/12/2011 11:00	64	67	53	58	60	54
08/12/2011 12:00	64	67	53	58	61	53
08/12/2011 13:00	64	68	54	57	60	53
08/12/2011 14:00	64	67	54	57	60	52
08/12/2011 15:00	63	67	55	55	57	52
08/12/2011 16:00	65	68	57	55	57	51
08/12/2011 17:00	64	67	58	53	56	50
08/12/2011 18:00	64	67	56	54	57	49
08/12/2011 19:00	62	66	53	51	53	47
08/12/2011 20:00	61	65	50	49	52	46

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
08/12/2011 21:00	60	64	50	51	54	47
08/12/2011 22:00	59	62	47	50	53	45
08/12/2011 23:00	56	59	43	46	49	44
08/12/2011 00:00	53	55	42	45	47	43
09/12/2011 01:00	51	51	42	45	47	43
09/12/2011 02:00	51	47	40	45	46	43
09/12/2011 03:00	53	51	41	46	48	43
09/12/2011 04:00	52	52	42	45	47	43
09/12/2011 05:00	56	59	42	46	47	43
09/12/2011 06:00	59	63	45	47	48	44
09/12/2011 07:00	62	66	50	50	52	47
09/12/2011 08:00	64	67	54	55	59	50
09/12/2011 09:00	63	67	53	53	56	48
09/12/2011 10:00	62	66	51	53	55	48
09/12/2011 11:00	62	66	51	52	54	48
09/12/2011 12:00	63	67	52	52	54	48
09/12/2011 13:00	63	67	53	54	57	49
09/12/2011 14:00	64	67	54	53	55	48
09/12/2011 15:00	63	67	54	54	56	48
09/12/2011 16:00	64	67	55	50	52	47
09/12/2011 17:00	63	67	55	50	51	47
09/12/2011 18:00	62	66	54	49	50	47
09/12/2011 19:00	61	65	50	47	49	46
09/12/2011 20:00	60	64	48	47	49	45
09/12/2011 21:00	58	63	47	46	47	45
09/12/2011 22:00	57	61	46	47	47	44
09/12/2011 23:00	55	59	44	45	46	44
09/12/2011 00:00	55	59	42	45	46	43
10/12/2011 01:00	54	57	41	44	46	43
10/12/2011 02:00	54	55	41	44	45	43
10/12/2011 03:00	53	54	40	45	46	43
10/12/2011 04:00	52	51	40	45	46	43
10/12/2011 05:00	53	53	40	45	46	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
10/12/2011 06:00	55	57	42	46	48	44
10/12/2011 07:00	56	60	43	51	55	44
10/12/2011 08:00	59	63	45	54	58	45
10/12/2011 09:00	61	65	49	50	52	46
10/12/2011 10:00	62	66	50	50	51	47
10/12/2011 11:00	63	67	52	50	52	48
10/12/2011 12:00	62	66	52	49	51	47
10/12/2011 13:00	62	66	52	51	54	48
10/12/2011 14:00	63	67	50	51	52	48
10/12/2011 15:00	63	67	51	50	52	47
10/12/2011 16:00	62	66	50	49	51	47
10/12/2011 17:00	62	66	50	49	51	46
10/12/2011 18:00	61	66	49	49	51	46
10/12/2011 19:00	61	65	47	49	50	45
10/12/2011 20:00	60	64	46	48	49	45
10/12/2011 21:00	58	63	43	47	49	45
10/12/2011 22:00	57	61	42	49	52	45
10/12/2011 23:00	57	60	44	47	49	45
10/12/2011 00:00	55	58	43	46	48	44
11/12/2011 01:00	56	59	45	47	48	45
11/12/2011 02:00	56	59	46	46	48	44
11/12/2011 03:00	55	56	43	45	47	43
11/12/2011 04:00	52	52	39	45	45	42
11/12/2011 05:00	51	50	38	44	46	42
11/12/2011 06:00	54	55	39	45	47	43
11/12/2011 07:00	55	57	42	46	48	44
11/12/2011 08:00	56	58	41	48	51	44
11/12/2011 09:00	59	63	44	48	50	45
11/12/2011 10:00	60	65	46	48	50	46
11/12/2011 11:00	61	66	47	51	52	47
11/12/2011 12:00	62	67	50	49	51	45
11/12/2011 13:00	62	66	51	48	49	45
11/12/2011 14:00	63	68	48	48	50	46

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
11/12/2011 15:00	63	67	51	51	52	47
11/12/2011 16:00	63	67	53	50	52	47
11/12/2011 17:00	62	66	52	49	51	47
11/12/2011 18:00	62	66	50	48	50	46
11/12/2011 19:00	61	65	48	48	50	45
11/12/2011 20:00	59	64	45	47	49	44
11/12/2011 21:00	58	62	44	47	49	44
11/12/2011 22:00	56	60	42	45	47	43
11/12/2011 23:00	54	57	40	45	47	43
11/12/2011 00:00	53	55	41	45	48	43
12/12/2011 01:00	50	50	40	45	46	43
12/12/2011 02:00	48	48	40	46	48	43
12/12/2011 03:00	52	52	41	45	47	43
12/12/2011 04:00	53	53	41	45	47	43
12/12/2011 05:00	57	59	42	46	48	43
12/12/2011 06:00	60	65	46	48	50	45
12/12/2011 07:00	63	67	53	50	52	47
12/12/2011 08:00	64	68	55	55	58	51
12/12/2011 09:00	64	67	53	54	58	49
12/12/2011 10:00	62	67	50	54	57	50
12/12/2011 11:00	63	67	51	57	60	51
12/12/2011 12:00	63	68	50	58	61	51
12/12/2011 13:00	64	68	51	57	60	52
12/12/2011 14:00	65	69	52	57	61	53
12/12/2011 15:00	66	69	54	55	57	53
12/12/2011 16:00	66	69	56	56	57	52
12/12/2011 17:00	65	69	56	56	58	51
12/12/2011 18:00	64	67	54	51	53	48
12/12/2011 19:00	62	67	51	52	55	49
12/12/2011 20:00	61	66	50	52	55	48
12/12/2011 21:00	59	63	48	49	52	45
12/12/2011 22:00	58	62	44	47	49	44
12/12/2011 23:00	56	59	42	46	48	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
12/12/2011 00:00	52	53	40	47	49	44
13/12/2011 01:00	51	52	40	46	48	44
13/12/2011 02:00	48	49	41	46	47	43
13/12/2011 03:00	53	51	42	49	52	45
13/12/2011 04:00	54	56	42	56	60	47
13/12/2011 05:00	59	63	46	53	56	48
13/12/2011 06:00	61	66	47	52	54	49
13/12/2011 07:00	64	68	53	55	58	51
13/12/2011 08:00	66	69	57	57	59	53
13/12/2011 09:00	65	69	55	56	59	53
13/12/2011 10:00	65	68	55	57	59	53
13/12/2011 11:00	64	68	54	59	62	54
13/12/2011 12:00	65	69	56	59	62	54
13/12/2011 13:00	66	69	58	61	63	56
13/12/2011 14:00	65	68	55	61	63	58
13/12/2011 15:00	65	69	57	60	63	55
13/12/2011 16:00	65	68	57	58	60	54
13/12/2011 17:00	65	68	56	58	60	54
13/12/2011 18:00	64	68	55	57	59	53
13/12/2011 19:00	62	66	52	56	58	52
13/12/2011 20:00	61	65	50	54	57	50
13/12/2011 21:00	59	63	48	53	55	49
13/12/2011 22:00	58	62	47	54	57	49
13/12/2011 23:00	58	60	45	51	54	47
13/12/2011 00:00	54	56	45	51	54	47
14/12/2011 01:00	53	54	44	55	58	49
14/12/2011 02:00	54	56	45	50	53	45
14/12/2011 03:00	51	49	41	48	51	45
14/12/2011 04:00	52	52	42	47	49	44
14/12/2011 05:00	56	59	42	49	51	46
14/12/2011 06:00	60	64	47	49	51	47
14/12/2011 07:00	63	67	51	52	55	49
14/12/2011 08:00	64	67	55	55	58	52

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
14/12/2011 09:00	63	67	54	57	59	52
14/12/2011 10:00	62	66	52	54	56	50
14/12/2011 11:00	62	67	52	59	63	50
14/12/2011 12:00	62	67	51	54	57	49
14/12/2011 13:00	62	67	51	57	59	50
14/12/2011 14:00	63	67	52	57	59	50
14/12/2011 15:00	63	67	53	53	55	50
14/12/2011 16:00	63	67	55	56	58	51
14/12/2011 17:00	63	67	54	54	58	50
14/12/2011 18:00	63	67	52	51	52	49
14/12/2011 19:00	61	66	50	51	53	49
14/12/2011 20:00	60	65	47	49	51	47
14/12/2011 21:00	59	64	44	48	49	46
14/12/2011 22:00	57	61	44	47	48	46
14/12/2011 23:00	56	60	43	45	46	44
14/12/2011 00:00	53	53	42	46	46	44
15/12/2011 01:00	53	53	42	44	45	43
15/12/2011 02:00	51	52	43	44	46	43
15/12/2011 03:00	52	52	42	45	46	43
15/12/2011 04:00	53	52	41	46	47	43
15/12/2011 05:00	56	58	42	46	47	44
15/12/2011 06:00	60	65	48	49	50	46
15/12/2011 07:00	62	66	52	51	54	48
15/12/2011 08:00	64	67	55	56	60	51
15/12/2011 09:00	64	68	54	56	60	50
15/12/2011 10:00	63	68	53	56	59	50
15/12/2011 11:00	63	67	52	57	60	51
15/12/2011 12:00	63	67	53	54	56	50
15/12/2011 13:00	63	67	53	55	58	50
15/12/2011 14:00	63	67	52	56	59	50
15/12/2011 15:00	63	67	53	57	60	52
15/12/2011 16:00	64	67	55	56	59	52
15/12/2011 17:00	63	67	54	57	59	51

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
15/12/2011 18:00	63	67	53	51	53	49
15/12/2011 19:00	61	66	51	50	52	48
15/12/2011 20:00	61	65	49	49	51	46
15/12/2011 21:00	59	64	46	47	48	45
15/12/2011 22:00	57	62	45	46	48	44
15/12/2011 23:00	55	59	44	45	47	44
15/12/2011 00:00	52	53	42	45	46	43
16/12/2011 01:00	49	49	41	45	46	43
16/12/2011 02:00	49	47	40	45	46	43
16/12/2011 03:00	50	50	41	45	46	43
16/12/2011 04:00	51	51	42	45	46	43
16/12/2011 05:00	55	57	43	45	46	43
16/12/2011 06:00	58	62	46	46	47	44
16/12/2011 07:00	61	65	50	50	53	46
16/12/2011 08:00	62	66	54	57	61	49
16/12/2011 09:00	63	66	53	56	59	49
16/12/2011 10:00	62	66	53	54	55	48
16/12/2011 11:00	62	66	53	52	54	48
16/12/2011 12:00	62	66	52	53	58	48
16/12/2011 13:00	62	66	53	54	58	48
16/12/2011 14:00	63	66	52	53	57	48
16/12/2011 15:00	63	67	52	52	53	48
16/12/2011 16:00	63	66	53	52	54	49
16/12/2011 17:00	62	66	52	53	55	48
16/12/2011 18:00	62	66	50	51	52	49
16/12/2011 19:00	61	65	51	51	52	48
16/12/2011 20:00	60	65	49	48	50	45
16/12/2011 21:00	59	64	49	48	50	45
16/12/2011 22:00	58	62	47	45	47	44
16/12/2011 23:00	56	59	47	46	50	43
16/12/2011 00:00	56	58	47	59	62	44
17/12/2011 01:00	56	58	46	56	58	45
17/12/2011 02:00	55	57	43	45	46	43

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
17/12/2011 03:00	53	54	42	47	50	44
17/12/2011 04:00	54	55	46	45	46	44
17/12/2011 05:00	53	54	44	47	50	43
17/12/2011 06:00	55	57	43	45	46	43
17/12/2011 07:00	57	61	44	50	53	44
17/12/2011 08:00	59	63	47	53	57	47
17/12/2011 09:00	60	65	49	53	56	49
17/12/2011 10:00	61	65	50	50	52	46
17/12/2011 11:00	62	66	52	51	53	47
17/12/2011 12:00	62	66	52	49	51	47
17/12/2011 13:00	63	67	52	52	55	47
17/12/2011 14:00	63	67	52	52	55	46
17/12/2011 15:00	63	67	53	52	56	47
17/12/2011 16:00	63	67	53	49	50	46
17/12/2011 17:00	61	66	52	47	49	46
17/12/2011 18:00	61	65	51	47	49	46
17/12/2011 19:00	60	64	50	47	48	46
17/12/2011 20:00	59	63	49	47	48	46
17/12/2011 21:00	58	62	49	47	48	45
17/12/2011 22:00	56	60	46	46	47	45
17/12/2011 23:00	55	58	44	45	46	44
17/12/2011 00:00	55	57	45	47	49	44
18/12/2011 01:00	55	58	46	45	46	44
18/12/2011 02:00	54	56	45	46	47	44
18/12/2011 03:00	55	57	45	45	47	44
18/12/2011 04:00	54	56	43	45	46	43
18/12/2011 05:00	52	52	43	45	46	43
18/12/2011 06:00	52	53	40	44	45	42
18/12/2011 07:00	52	54	41	46	47	43
18/12/2011 08:00	56	57	45	48	50	44
18/12/2011 09:00	55	58	44	47	48	44
18/12/2011 10:00	58	63	45	47	48	45
18/12/2011 11:00	60	65	48	48	49	46

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
18/12/2011 12:00	61	66	50	49	50	47
18/12/2011 13:00	62	66	49	49	50	46
18/12/2011 14:00	62	66	51	48	50	45
18/12/2011 15:00	63	67	52	48	49	45
18/12/2011 16:00	62	66	51	47	48	45
18/12/2011 17:00	61	66	50	47	48	45
18/12/2011 18:00	61	66	49	48	50	46
18/12/2011 19:00	60	65	47	47	49	45
18/12/2011 20:00	59	64	46	47	49	44
18/12/2011 21:00	58	63	43	45	47	42
18/12/2011 22:00	56	59	37	43	45	41
18/12/2011 23:00	55	57	33	42	45	39
18/12/2011 00:00	53	55	32	41	43	39
19/12/2011 01:00	51	51	29	42	45	39
19/12/2011 02:00	52	50	29	42	45	39
19/12/2011 03:00	54	54	34	43	46	40
19/12/2011 04:00	53	52	35	44	46	41
19/12/2011 05:00	57	60	39	46	49	42
19/12/2011 06:00	61	65	44	49	51	45
19/12/2011 07:00	64	68	52	53	55	49
19/12/2011 08:00	65	69	56	54	56	51
19/12/2011 09:00	64	68	54	53	56	49
19/12/2011 10:00	64	68	52	55	58	50
19/12/2011 11:00	63	68	52	52	55	48
19/12/2011 12:00	64	68	52	53	57	47
19/12/2011 13:00	63	67	52	53	58	48
19/12/2011 14:00	63	67	52	56	59	54
19/12/2011 15:00	63	67	53	56	57	54
19/12/2011 16:00	63	67	53	55	57	46
19/12/2011 17:00	63	66	53	51	54	44
19/12/2011 18:00	63	67	52	54	56	44
19/12/2011 19:00	61	65	49	52	55	42
19/12/2011 20:00	60	65	46	53	54	52

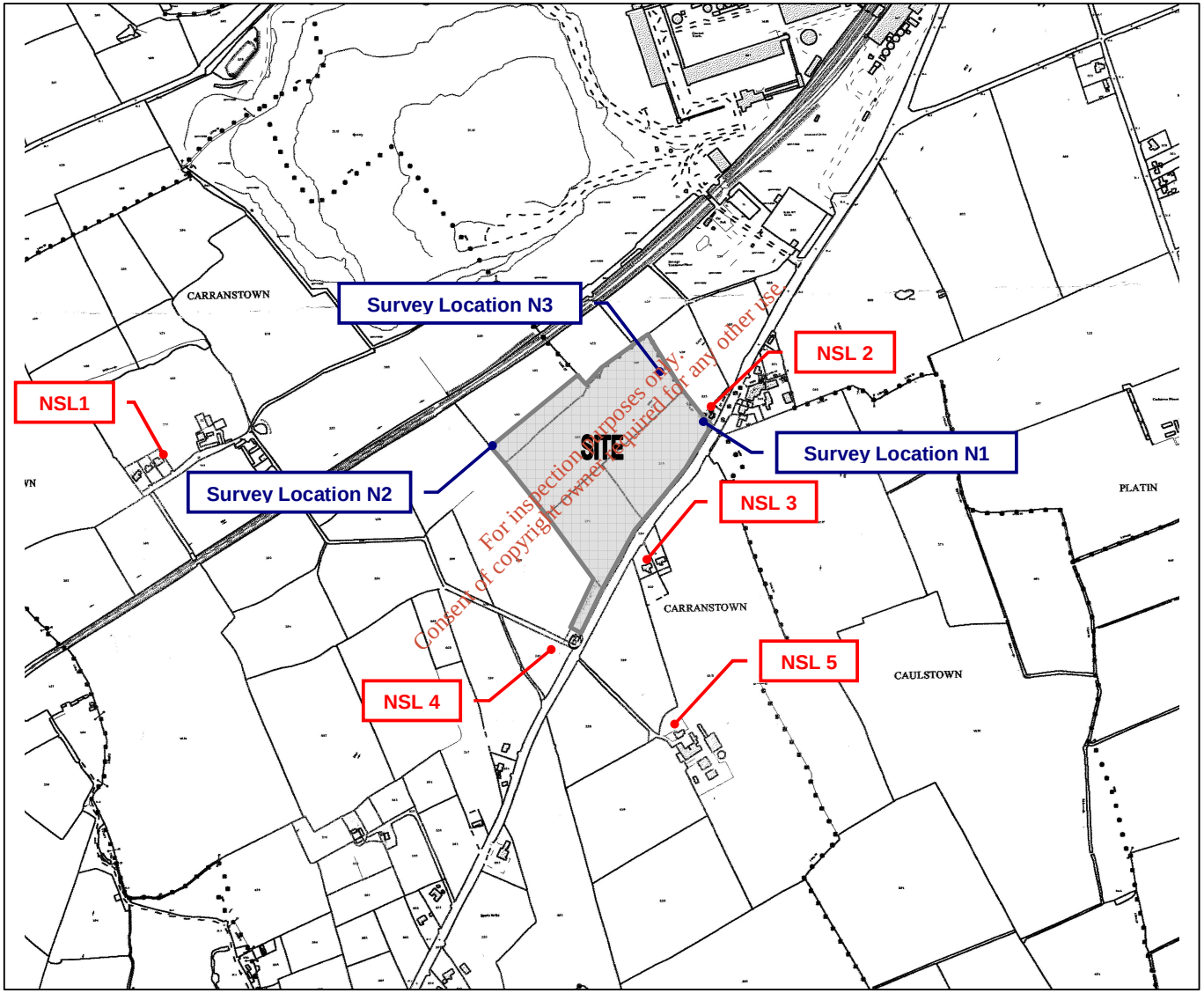
Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
19/12/2011 21:00	58	63	43	54	55	53
19/12/2011 22:00	57	61	42	53	55	49
19/12/2011 23:00	55	58	39	41	43	39
19/12/2011 00:00	54	55	36	41	42	37
20/12/2011 01:00	53	51	35	38	40	37
20/12/2011 02:00	50	48	36	39	41	37
20/12/2011 03:00	50	47	33	39	40	36
20/12/2011 04:00	54	51	34	39	41	37
20/12/2011 05:00	56	58	35	44	44	39
20/12/2011 06:00	60	64	45	45	47	42
20/12/2011 07:00	63	67	51	49	51	46
20/12/2011 08:00	64	68	54	52	55	49
20/12/2011 09:00	64	68	54	53	55	47
20/12/2011 10:00	63	67	52	53	56	48
20/12/2011 11:00	64	68	53	51	52	47
20/12/2011 12:00	64	68	52	52	54	48
20/12/2011 13:00	63	68	51	53	56	47
20/12/2011 14:00	63	67	51	55	59	49
20/12/2011 15:00	64	68	51	55	58	49
20/12/2011 16:00	64	67	53	51	52	49
20/12/2011 17:00	64	67	54	51	53	49
20/12/2011 18:00	64	68	52	50	52	47
20/12/2011 19:00	62	67	49	49	51	46
20/12/2011 20:00	61	65	47	47	49	44
20/12/2011 21:00	60	64	45	45	48	42
20/12/2011 22:00	58	62	41	44	46	41
20/12/2011 23:00	57	60	40	45	47	41
20/12/2011 00:00	56	57	40	45	48	41
21/12/2011 01:00	53	54	39	46	48	41
21/12/2011 02:00	53	54	43	48	51	42
21/12/2011 03:00	51	51	39	45	47	41
21/12/2011 04:00	55	54	40	46	49	43
21/12/2011 05:00	57	58	40	46	49	42

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
21/12/2011 06:00	61	65	46	56	58	51
21/12/2011 07:00	63	67	53	56	58	50
21/12/2011 08:00	64	68	55	53	55	48
21/12/2011 09:00	64	67	54	55	57	52
21/12/2011 10:00	63	67	52	53	55	46
21/12/2011 11:00	63	67	52	55	57	49
21/12/2011 12:00	63	67	52	56	58	54
21/12/2011 13:00	63	67	52	57	59	54
21/12/2011 14:00	63	67	53	55	57	49
21/12/2011 15:00	63	67	53	51	53	48
21/12/2011 16:00	63	67	54	52	54	49
21/12/2011 17:00	63	66	55	53	55	49
21/12/2011 18:00	62	66	52	51	53	47
21/12/2011 19:00	61	66	50	48	50	46
21/12/2011 20:00	61	65	49	48	50	45
21/12/2011 21:00	60	64	48	49	51	46
21/12/2011 22:00	58	62	48	50	52	47
21/12/2011 23:00	56	60	45	50	52	46
21/12/2011 00:00	55	57	44	47	49	44
22/12/2011 01:00	52	52	41	45	46	44
22/12/2011 02:00	51	50	41	45	47	44
22/12/2011 03:00	53	52	43	55	60	44
22/12/2011 04:00	53	53	43	51	57	45
22/12/2011 05:00	56	57	44	49	50	46
22/12/2011 06:00	60	64	48	48	50	46
22/12/2011 07:00	62	67	50	52	53	49
22/12/2011 08:00	64	68	55	53	55	50
22/12/2011 09:00	64	67	54	55	59	50
22/12/2011 10:00	63	67	51	53	55	49
22/12/2011 11:00	63	67	53	58	60	54
22/12/2011 12:00	63	67	52	58	60	52
22/12/2011 13:00	63	67	52	55	58	50
22/12/2011 14:00	63	67	53	54	58	50

Date and Start Time	Location N1			Location N2		
	L_{Aeq}	L_{A10}	L_{A90}	L_{Aeq}	L_{A10}	L_{A90}
22/12/2011 15:00	63	67	53	53	55	50
22/12/2011 16:00	64	67	54	53	55	50
22/12/2011 17:00	63	66	53	51	53	49
22/12/2011 18:00	63	67	53	51	53	49
22/12/2011 19:00	62	66	52	51	52	48
22/12/2011 20:00	61	66	49	49	51	47
22/12/2011 21:00	60	65	47	49	50	46
22/12/2011 22:00	59	63	45	49	51	46
22/12/2011 23:00	57	61	45	49	51	46
22/12/2011 00:00	56	60	46	49	51	46
23/12/2011 01:00	56	59	45	47	49	45
23/12/2011 02:00	55	58	44	47	49	45
23/12/2011 03:00	55	55	44	47	48	45
23/12/2011 04:00	56	56	46	47	48	46
23/12/2011 05:00	57	59	44	47	48	45
23/12/2011 06:00	59	62	46	48	49	45
23/12/2011 07:00	61	66	49	49	52	46
23/12/2011 08:00	63	68	52	53	56	48
23/12/2011 09:00	63	67	52	53	56	48
23/12/2011 10:00	63	67	53	52	55	47
23/12/2011 11:00	63	67	52	49	51	46
23/12/2011 12:00	63	67	52	50	53	47
23/12/2011 13:00	63	67	53			
23/12/2011 14:00	63	66	53			
23/12/2011 15:00	63	67	55			
23/12/2011 16:00	63	67	54			
23/12/2011 17:00	62	66	53			
23/12/2011 18:00	62	66	52			
23/12/2011 19:00	61	65	50			

FIGURE 8.1

Site Layout Showing Noise Survey Locations and nearby Noise Sensitive Locations (NSL)



9 SOILS AND GEOLOGY

This chapter evaluates the impacts, if any, which the development will have on Soils and Geology. The methodology used for this assessment is as defined in the Environmental Protection Agency (EPA) 'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements'), 2003 and the Institute of Geologists of Ireland (IGI) Geology in Environmental Impact Statements – A Guide (2002).

This chapter has drawn upon information from previous assessments of the site, the most recent of which was completed as part of an EIS and planning application submitted in 2009. A full assessment including intrusive investigations was undertaken at the site in 2005 which addressed the primary impacts potentially affecting the soils and geology aspect. This chapter will assess the impact of proposed amendments to the existing planning permission as described in Chapter 1, on the soils and geology of the site and environs. The amendments will entail some additional construction in the form of conversion of temporary office and maintenance structures respectively to permanent structures, the installation of an additional foul water treatment plant system, additional ammonia and fuel storage tanks and associated hardstanding surfaces and parking.

As the facility has now been constructed, a number of mitigation measures recommended in previous EIS's have now been implemented. This chapter therefore represents an update of the 2009 assessment to include the results of mitigation measures as implemented and identifying any further mitigation measures now required.

9.1 INTRODUCTION

The information regarding the existing geological environment is based on a desk study of the site and intrusive investigations completed at the site in 2000 and 2001, review of geotechnical reports based on assessments completed in 2007 and 2008, information from construction records and information from the Geological Survey of Ireland database. A copy of the most recent ground investigation report is provided in Appendix 9.1.

9.2 EXISTING GEOLOGY AND SOILS

The existing geology and soils environment is described under the two distinct units of solid bedrock geology and unconsolidated overburden deposits. The units are discussed below on both a regional and local basis.

9.2.1 Regional Geology

The site is located in a relatively narrow expanse of Carboniferous limestones that outcrops between the Lower Palaeozoic sandstones and shales of the Longford Down Massif to the north and the block of similarly aged meta-sedimentary rocks that extend between Julianstown and Balbriggan to the south (Figure 9.1). The Platin limestones extend westwards to connect with the Carboniferous rocks that underlie much of Meath. To the east and beyond Drogheda, this narrow band of limestones extends as far as the Irish Sea between the Boyne and Nanny estuaries.

9.2.2 Local Geology

The Platin outlier is fault bounded and the limestones at the nearby quarry have a general East North East strike with a shallow (10-20 degree) dip to the northwest. The deposit limestone consists of at least 300 metres deep of grainstones. The types of grainstones that have been recorded at Platin include crinoidal pepper-type, intra-clastic and skeletal. In general, the limestones are massive with few bedding structures clearly developed. The Platin limestones display karst features in and around the nearby Platin quarry.

Site specific information on the geological structure of the site has been determined from boreholes and trial pits undertaken in the course of multiple investigations. A number of additional boreholes were installed in 2010 for the site water supply and groundwater monitoring wells. A summary of the key findings is presented below.

The Carranstown site is underlain by soils from the Dunboyne-Ashbourne soil complex. The parent material of the soil is drift deposits intermixed with local limestone and shale. This type of soil is generally poorly drained.

9.2.3 Overburden Geology

The overburden geology was found to consist predominantly of brown silty clays generically known as boulder clays. These consist of medium dense brown silty clays with pebbles, cobbles and occasional boulders. The boulder clay varies in thickness across the site, ranging from four metres towards the west of the site, to in the region of 10 metres towards the centre. Sand and gravel lenses are found throughout the boulder clays.

Soil samples taken during site investigations (May 2000) indicated slightly elevated levels of heavy metals. There are no legislative guidelines for soil quality in Ireland however in general soil quality across the site is considered within normal range (including Volatile Organics, PAHs, PCBs and Pesticides). Results of soils analyses and associated trial pit logs are presented in Appendix 9.2 Results are considered indicative of the agricultural activity within the area.

9.3 PERCOLATION TESTING

Percolation testing for the installation of Puraflo™ systems to manage domestic effluent at the facility was conducted by K.T. Cullen & Co in December 2000 and PM Group as part of the Geotechnical assessments conducted in February 2009.

The test results indicated that whilst the site failed percolation tests for a traditional percolation area as per the EPA Waste Water Treatment Manual (Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, 1999) a secondary treatment system (Puraflo) and an engineered percolation area could be constructed to comply with national guidelines and protect the underlying aquifer. Two effluent treatment systems were installed (one at the main process building and one at the site gatehouse) as part of the recent construction works.

As the proposed amendments entail the conversion of an existing temporary office block to a permanent structure, an additional waste water treatment system will be required. Further detail on the additional waste water discharge to ground is provided in Chapter 10 Groundwater/Hydrogeology.

9.4 POTENTIAL IMPACTS

The following details the potential impacts on soils and geology for both the construction and operational phases of the project.

9.4.1 Construction Phase

Relative to the scale of the construction project completed at the site for the main facility in 2010/2011, the proposed amendments will entail a significantly lower intensity of construction work and excavations. Though limited excavation works are required any minor amounts of spoil or spoil found unsuitable for reuse on site will be transported off site to a licenced facility. During the main construction works, approximately 6000m3 of spoil was removed from site. A copy of the letter report submitted to Meath County Council in relation to the soil disposal is provided in Appendix 9.3.

Potential impacts during the construction phase would be associated with accidental spillage of potentially polluting substances including oils, paints and liquid wastes and any additional substances associated with the construction activities.

The development site is underlain by limestone which is known to be karstified in places. However, no difficulties were encountered during the construction of the existing facility. The modular office building and the centralised maintenance facility are constructed on existing concrete pads.

9.4.2 Operational Phase

The potential impacts during the operation phase would be limited to accidental spillage of potentially polluting substances including oils, paints, liquid wastes, or raw materials such as lime or ammonia or impact from discharge of sewage to ground. With good management practices in place it is expected that the development will not cause any impact on the soils and geology of the site.

The location of the facility, in close proximity to the Irish Cement quarry, has previously been assessed in relation to impacts from vibration. Blasting has been carried out at Platin Quarry site over the last 30 years at a maximum frequency of two blasts per week. The levels of vibration expected at the facility are well below the thresholds that could cause even cosmetic damage to the facility, In addition the anticipated vibration is less than 10% of the recommended vibration limit to prevent structural damage. On the basis of this analysis, it is considered that the vibration from blasting at Platin will not result in cosmetic or structural damage to the Indaver building or any of the additional structures proposed

9.5 MITIGATION MEASURES

9.5.1 Construction Phase

Construction works will be completed in accordance with the principles of CIRIA "Environmental good practice on site" (C692) and the Environmental Management Plan for the site.

All oils, chemicals, paints, fuels or other potentially polluting substances used during construction will be stored in designated storage areas which will be bunded to a volume of 110% capacity of the largest tank/container within the bunded area(s). It is anticipated that existing site storage infrastructure can be used to minimise risks during the construction period.

Filling and draw-off points will be fully located within the bunded area(s).

Drainage for the bunded area(s) will be diverted for collection and safe disposal.

All domestic effluent generated on site during construction will be managed through the existing site foul water treatment infrastructure.

The implementation of good construction management practices will minimise the risk of pollution to geology and soils.

9.5.2 Operational Phase

All substances with the potential to cause a negative impact on the soils and geology will be stored in appropriate containers and/or placed within bunded areas. Raw materials for the process will be stored in containers/silos within the process building. Residues will be stored in the bunker and silos within the process building.

All waste entering the facility (non hazardous and hazardous EWC codes) will be stored in fully contained structures therefore in the unlikely event of a spillage or a particularly wet load of incoming waste, there will be no potential for leakage to soils. All waste storage facilities will be impervious to the materials stored therein. All concrete underground storage structures whether for waste or liquid (as there is a possibility that firewater run-off may enter any of the tanks) have been constructed as watertight structures in accordance with the requirements of relevant Codes of practice such as BS 8007 British Standard for design and Construction of Aqueous Liquid Retaining Structures. The structures will be integrity tested in accordance with the requirements of the facility licence and guidelines given in the Code of Practice for leakage to confirm that they are watertight.

In addition, the waste bunker has a base thickness of 1.1m and a wall thickness underground of 800mm, with a secondary containment system with fully sealed membrane and leak detection system to ensure that at all times the bunker remains water tight. The leak detection system is checked on a monthly basis. In the event that any liquid is encountered in this leak detection system, the source of the liquid will be investigated and mitigation works completed as and when required.

All underground piping will be maintained and regularly inspected for integrity.

All domestic effluent will be treated by an appropriate system prior to discharge to a suitable percolation area designed and constructed in accordance with current EPA requirements.

All chemicals or other potentially polluting substances will be stored within the main process building and will be provided with adequate containment.

A petrol interceptor is in place on the surface water drainage outfall line from hardstanding areas to contain any leakages from vehicles on site. Full details of the proposed on site drainage network are presented in Section 11.

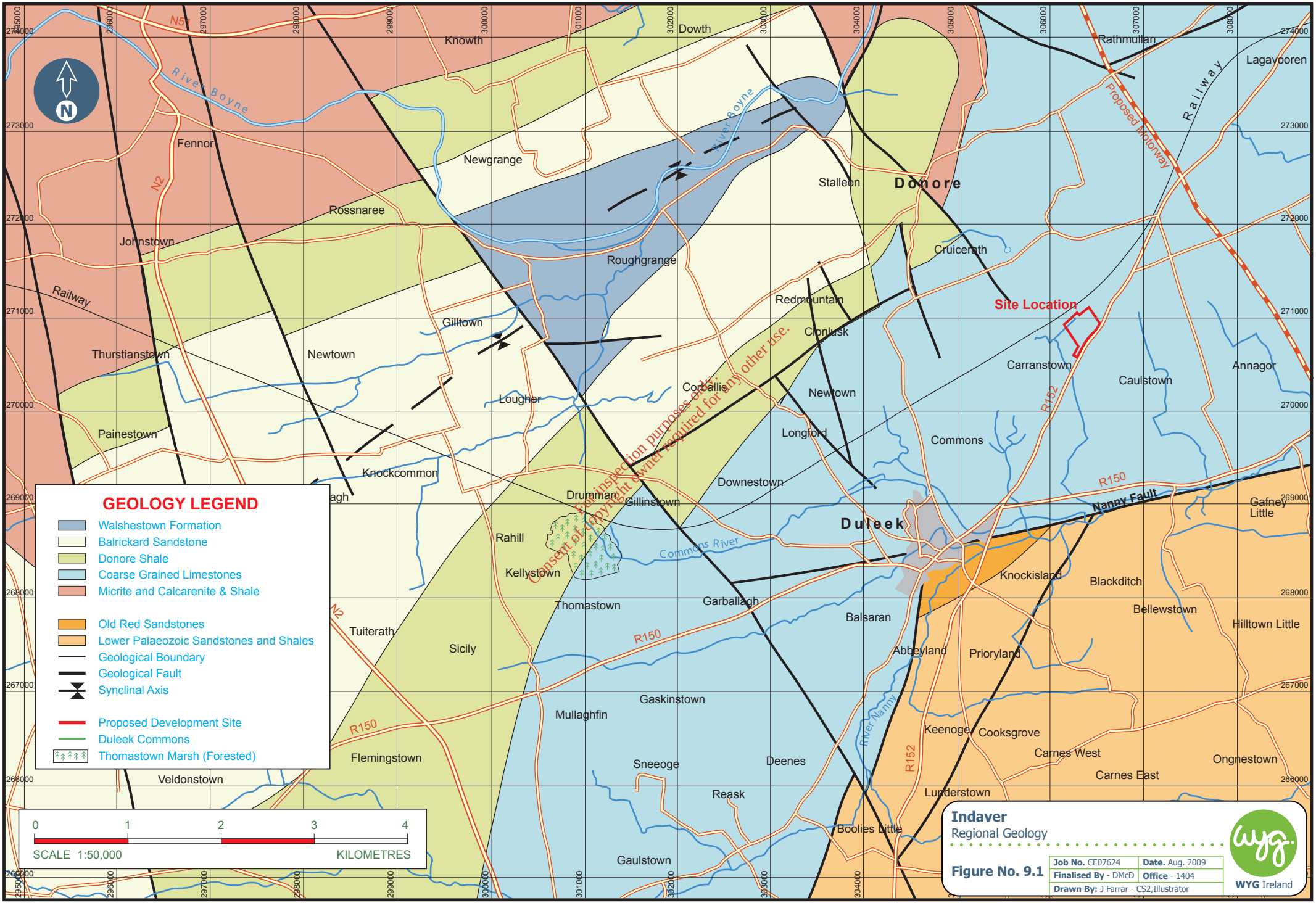
The Irish Cement quarry is operated under an Integrated Pollution Control (IPC) Licence issued by the EPA. The licence specifies limits on noise, vibration and overpressure resulting from explosive activity in

the quarry. The limit of vibration i.e. 12mm/sec is sufficiently low to prevent interference with equipment and items of plant associated with the facility and the facility itself.

9.6 RESIDUAL IMPACTS

There are no sites of geological interest within the development property. It is anticipated that the proposed amendments will have a very minor impact on the soils and geology of the site. Excavations required for construction of the proposed amendments to the facility will be minimal when compared to the construction works completed at the site to date.

In conclusion, with the mitigation measures outlined above, the amendments to the facility will not have a significant impact on the soils and geology of the site or the surrounding lands.



Appendix 9.1

IGSL Ltd.

Meath Waste Management Facility

Factual Ground Investigation Report
(Project No. 14039)

Indaver Ireland
PM Group

May 2009

ATTACHMENT 8

FACTUAL GROUND INVESTIGATION REPORT (MAY 2009)

011838-94-0008 REV B

Meath Waste Management Facility

Carranstown, Duleek, Co. Meath

Factual Geotechnical Investigation Report

(Report No. 14039)

Client: Indaver Ireland

Engineer: PM Group Ltd

May 2009

IGSL Ltd

DOCUMENT ISSUE REGISTER

Distribution	Copies	Rev.	Date of Issue	Report Prepared By:
PM Dublin	Draft – 1 No hard copy & PDF by email	A	20 March 2009	TD / PQ
PM Dublin	Final – 3 No hard copies & PDF on CD	B	30 March 2009	TD / PQ
PM Dublin	Final with addendum (stabilization test data)– 1 No hard copy & PDF by email	C	18 May 2009	TD / PQ

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APPENDICES

FOREWORD

The following conditions and notes on site investigation procedures should be read in conjunction with this report.

General

The ground investigation works have been carried out in accordance with BS 5930 (1990) and the IEI Specification & Related Documents for Ground Investigation in Ireland (2006). No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations.

Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the depth of penetration are recorded. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

Disclaimer

This report has been prepared for Project Management Group / Indaver Ireland and the information should not be used without prior approval or written permission of either party. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

1. INTRODUCTION

At the request of Project Management (PM) and Indaver Ireland, IGSL has undertaken a programme of geotechnical investigation works for a waste to energy facility at Carranstown, Duleek, Co. Meath. The works were performed as directed by PM Group, consulting engineers for the project. The site is located at Carranstown, Duleek, Co. Meath and encompasses an area of approximately 25 acres. The site is bounded to the south by the R150 Duleek to Navan Road, to the east by the Platin Cement Works and farmland to the west and north.

It is understood that the proposed development will involve the construction of a waste management facility and include a waste handling area (bunker & furnace), emissions stack, ash bunker, workshop, office and administration buildings and general site infrastructure (i.e. roads, drainage, service utilities, culverts etc). The waste handling area will require a basement type structure (bunker) with a proposed dig depth of the order of 7m below existing ground level (i.e. formation of c23m OD). Site enabling works were completed prior to IGSL commencing the geotechnical investigations and produced a platform level of 30.5m OD. It is noted that a programme of geotechnical investigations were originally carried out in 2007 and details are presented in a report prepared by Byrne Looby Partners (B580 May 2007).

The geophysical and geotechnical fieldworks works for this phase were carried out in accordance with BS 5930, Code of Practice for Site Investigations (1999) and the IEI Specification & Related Documents for Ground Investigation in Ireland (2006). The fieldworks included geophysical surveying, rotary core drillholes and percolation tests. Core drillholes GC 1 to GC 5 were positioned at the footprint of the bunker (note the location of this structure was subsequently altered) while RP 1, 2 and 5 were located at a zone where karst weathering was identified in the original investigations. The geophysical surveying was performed by Apex Geoservices and included seismic refraction spreads and surface wave analysis (MASW) to determine small strain stiffness. Geotechnical soil and rock laboratory testing was performed on selected samples in accordance with BS 1377 and ISRM.

The primary objectives of the investigation were as follows:

- Evaluate rock quality, weathering profile, strength and fracture state of the bedrock at the proposed bunker & emissions stack
- Recover samples for geotechnical laboratory testing (soil & rock)
- Assess percolation characteristics of the upper soils at designated locations

This report presents the factual geotechnical data obtained from the exploratory locations and laboratory testing. A separate geotechnical interpretative report (GIR) has been prepared and includes a discussion of the ground conditions, engineering properties of the soils and bedrock and recommendations developed on the key geotechnical issues impacting on the proposed development. The locations of the exploratory holes are presented on a site plan in Appendix 7. It is noted that sampling of the glacial till from the waste bunker and stockpiles were scheduled by PM in March 2009 and this information is included in Appendix 8 (addendum to the final report issued on 30 March 2009).

2. FIELDWORK

2.1 General

The fieldworks were carried out during the period February 2009 and comprised the following:

- Rotary core drillholes (9 No.)
- Percolation tests (2 No.)
- Geophysical surveying

2.2 Rotary Drillholes

Rotary drilling was undertaken at nine locations using a top drive Knebel rig. Geobor core drilling methods were utilized at six locations (denoted GC 1 to GC 6) with conventional air mist drilling employed at three locations (RP 1, 2 & 5). The Geobor drilling system used polymer gel flush and recirculation tanks, with the emphasis on high quality recovery in the glacial soils and upper bedrock zone.

The Geobor coring produced 102mm diameter cores while the conventional coring produced 80mm diameter cores using air mist flush. Recovery in the Geobor holes was excellent with 100% recovery in the majority of the runs. The Geobor drillholes achieved depths of between 11.80 and 15.10m while each of the conventional holes terminated at depths of 10.50m. Each of the core drillholes were backfilled with cement/bentonite grout (tremmied) as directed by PM.

The rock cores were placed in 3m capacity timber boxes and logged by an IGSL engineering geologist. This included photography of the cores with a digital camera. The core log records are presented in Appendices 1 and 2 and include engineering geological descriptions of the rock cores, details of the bedding / discontinuities and mechanical indices (TCR, SCR and RQD's) for each core run.

Where rock core was recovered, a graphic fracture log is also presented alongside the mechanical indices. This illustrates the fracture state of the rock cores and allows easy identification of highly fractured / non-intact zones and discontinuity spacings. It should be noted that no correction for dip of the joints has been made and that the spacings shown are successive joint / core intersections within the core.

2.3 Percolation Tests

Percolation or soakaway tests were performed at two locations to evaluate the infiltration potential of the upper soils. The tests were conducted in accordance with BRE 365 guidelines and the data sheets are presented in Appendix 3. The infiltration rate values (F Values) were calculated using the field data and are shown on each of the logs.

2.4 Geophysical Surveying

Geophysical surveying was carried out by Apex Geoservices and included resistivity profiling, seismic refraction spreads and multi-channel analysis of surface waves to assess soil stiffness (GMax v depth). Details of the methodologies used, x-sections / profiles and maps are presented in a separate report by Apex Geoservices.

2.5 Trial Pits & Bulk Sampling for Stabilization Testing

Samples of the glacial till were taken from the footprint of the waste bunker and stockpiles to facilitate earthwork and stabilization testing. Two trial pits were excavated at the waste bunker footprint and both extended to a depth of 4m bgl. Large bulk disturbed samples were recovered (c 50 kg) and placed in heavy duty polyethene bags and returned to Naas for testing. The trial pit logs and associated laboratory test data are presented in Appendix 8.

3. LABORATORY TESTING

Geotechnical soil laboratory testing was performed on selected Geobor core samples in accordance with BS 1377 (1990). The soils testing included the following and results are presented in Appendices 4 and 8.

- Moisture content
- Particle size analysis
- Atterberg Limits (Liquid & Plastic Limits)
- Consolidated quick undrained triaxial
- Consolidation (oedometer)
- pH & sulphate
- California Bearing Ratio (CBR)
- Moisture Condition Value (MCV)
- CBR, MCV & sulphates following the addition of lime or cement binders

Rock testing was undertaken on representative core samples and focused on Point Load Strength Index (PLSI)) and unconfined compressive strength (UCS) tests in accordance with ISRM. The results of the rock testing are presented in Appendix 5.

References

1. BRE Digest 365 Soakaway Design
2. BS 5930 (1999) Code of Practice for Site Investigation, British Standards Institution (BSI).
3. BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.
4. Indaver, Carranstown Geotechnical Assessment Report (B580), May 2007, Byrne Looby Partners
5. Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

KEY TO EXPLORATORY RECORDS

Cable Percussion Boreholes

D	Small Disturbed Sample
B	Large Disturbed Sample
T	Tub Sample (for moisture content profiling)
U100	Undisturbed Sample (driven tube sample)
W	Groundwater Sample
C	SPT N-Value (Solid Cone)
S	SPT N-Value (Split Spoon / Open Shoe)
FHT	Falling Head Permeability Test
RHT	Rising Head Permeability Test

Rotary Core Drillholes

TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Designation Value (%)
FS	Fracture Spacing (mm) Presented as Graphic Fracture Log
NI	Non-Intact (where rock core is highly fractured)
ECL	Estimated Core Loss

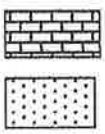
Trial Pits

B	Bulk Disturbed Sample
T	Tub Sample
VT	Vane Test (KPa) Using Genor H-70 Hand Vane
HP	Hand Penetrometer Test (KPa)
W	Groundwater Sample

Groundwater Installations

SP	Standpipe (uPVC 50mm diameter with 1mm slots)
Piez	Casagrande Piezometer (19mm diameter)

Strata Legends / Symbolic Logs



Strata legends / symbolic logs are in accordance with BS 5930 (1999). Legend codes are selected from Holebase / GINT to reflect stratum.

Appendix 1

Rotary Core Drillhole Records (Geobor Holes)

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC1
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,263.87 E 270,930.70 N	GROUND LEVEL (m)	30.10
		CORE DIAMETER (mm)	102
		INCLINATION	-90
		DATE STARTED	17/02/2009
		DATE COMPLETED	17/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	FLUSH	Polymer Gel
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	0.80		29.30		
1	0.80	86	0	0				Soft brown sandy gravelly CLAY. Gravel is sub-angular and medium grained.	1.50		28.60		
2	1.50	80	0	0				Brown clayey gravelly fine SAND. Gravel is rounded to sub-angular and fine to medium grained.	3.16				
3	3.00							Brown SILT	3.40		26.94		
		100	0	0				Brown slightly silty gravelly fine SAND. Gravel is rounded to angular and fine to coarse grained.	4.25		26.70		
4	4.50							Firm to stiff brown sandy gravelly CLAY. Gravel is sub-angular to sub-rounded and fine to coarse grained.	4.95		25.85		
5		100	0	0				Brown silty very gravelly fine SAND with occasional cobbles (5.3m-5.8m. Gravel is sub-angular to sub-rounded and fine to coarse grained.	5.80		25.15		
6	6.00								6.20		24.30		
		93	27	27					6.60	Discontinuities are rough and undulose to irregular. Apertures are open with local clay sand smearing/infill (non intact zones). Dips are commonly sub-45° with variable fractures throughout.	23.90		
7								Firm to stiff brown sandy very gravelly CLAY. Gravel is sub-angular to sub-rounded and fine to coarse grained.			23.50		
8	7.50	100	61	61				Firm brown clayey sandy gravelly SILT (sand layer at 6.4m). Gravel is sub-angular to sub-rounded and fine to coarse grained.	8.55		21.55		
9	9.00	100	99	94				Strong to very strong, locally moderately strong, medium to					

REMARKS

7 Core boxes, 10.7m Core liner used. No groundwater encountered. Grout 0.0m-12.0m. 50% flush loss from 7.5m, 100% flush loss from 11.8m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC1
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,263.87 E 270,930.70 N	GROUND LEVEL (m)	30.10
		CORE DIAMETER (mm)	102
		DATE STARTED	17/02/2009
		DATE COMPLETED	17/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10								thickly bedded, blue grey, medium grained LIMESTONE (siliceous and fossiliferous). Fresh to slightly weathered.		Discontinuities are rough and undulose. Apertures are open with clay sand smearing surfaces. Dips are sub-10° with sub-vertical fractures (10.0-10.4m, 10.5-10.97m). *(continued)*			
	10.50												
11		100	79	79				Very strong, locally strong, thickly bedded, blue grey, fine to coarse grained LIMESTONE (siliceous and fossiliferous). Fresh to locally slightly weathered. *(continued)*	12.00				
	12.00										18.10		
12								End of Corehole at 12 (m)					
13													
14													
15													
16													
17													
18													
19													

REMARKS

7 Core boxes, 10.7m Core liner used. No groundwater encountered. Grout 0.0m-12.0m. 50% flush loss from 7.5m, 100% flush loss from 11.8m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC2
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,286.09 E 270,892.72 N	GROUND LEVEL (m)	30.00
		CORE DIAMETER (mm)	102
		INCLINATION	-90
		FLUSH	Polymer Gel
		DATE STARTED	11/02/2009
		DATE COMPLETED	12/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-Intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	1.50				
1	1.50	100	0	0				Brown very sandy, very gravelly CLAY with occasional cobbles (sandy gravel at 2.95m-3.05m).	3.40		28.50		
2	3.00	100	0	0									
3	3.50	100	0	0				Brown very clayey, very sandy GRAVEL with occasional cobbles. Gravel is angular to rounded, predominantly fine grained.	5.30		26.60		
4	4.50	100	0	0									
5	5.30	100	10	0				Strong to very strong, locally moderately strong, medium to thickly bedded, blue grey, fine to medium grained LIMESTONE (siliceous and fossiliferous). Fresh to locally slightly weathered.		Discontinuities are rough and undulose. Apertures are tight to open with local clay sand smearing/infill (5.3m-6.0m6.31-6.33m, 6.73-6.9m, 7.69-7.72m, 8.09-8.1m, 9.22-9.3m, 10.46-10.61m, 11.55-11.75m, 14.13-14.28m), and local slight iron oxide stained surfaces (9.22-9.3m, 14.69m). Dips are sub-0°-20° locally 45° and local sub-vertical fractures (5.3-6.0m, 7.35-7.64m, 9.3-9.67m).	24.70		
6	6.00	100	96	96									
7	6.90	100	58	58									
8	7.50	100	80	64									
9	8.40	100	100	100									
	9.00	100	61	53									

REMARKS

8 Core boxes, 13.6m Core liner used. No groundwater encountered. Grout 0.0m-15.0m. 50% flush loss from 6.0m, 100% flush loss from 7.5m. Move & Setup 1hr.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC2
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,286.09 E 270,892.72 N	GROUND LEVEL (m)	30.00
		CORE DIAMETER (mm)	102
		DATE STARTED	11/02/2009
		DATE COMPLETED	12/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10	10.30	100	80	80				Strong to very strong, locally moderately strong, medium to thickly bedded, blue grey, fine to medium grained LIMESTONE (siliceous and fossiliferous). Fresh to locally slightly weathered. *(continued)*		Discontinuities are rough and undulose. Apertures are tight to open with local clay sand smearing/infill (5.3m-6.0m6.31-6.33m, 6.73-6.9m, 7.69-7.72m, 8.09-8.1m, 9.22-9.3m, 10.46-10.61m, 11.55-11.75m, 14.13-14.28m), and local slight iron oxide stained surfaces (9.22-9.3m, 14.69m). Dips are sub-0°-20° locally 45° and local sub-vertical fractures (5.3-6.0m, 7.35-7.64m, 9.3-9.67m). *(continued)*			
11	10.50												
		100	82	82									
12	12.00												
		100	91	91									
13													
	13.50												
14		100	100	100									
15	15.10							End of Corehole at 15.1 (m)	15.10		14.90		
16													
17													
18													
19													

REMARKS

8 Core boxes, 13.6m Core liner used. No groundwater encountered. Grout 0.0m-15.0m. 50% flush loss from 6.0m, 100% flush loss from 7.5m. Move & Setup 1hr.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEW.LOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC3
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,299.12 E 270,902.06 N	GROUND LEVEL (m)	30.14
		CORE DIAMETER (mm)	102
		DATE STARTED	12/02/2009
		DATE COMPLETED	13/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	0.70		29.44		
1	0.70	100	0	0				Firm brown (soft 0.7-0.85m) clayey very sandy (occasionally gravelly layers) SILT. Gravel is sub-angular to sub-rounded and fine to coarse grained.	2.00		28.14		
2	1.50	100	0	0									
3	2.40	100	0	0				Firm brown sandy/gravelly (fine gravel, mostly sand from 2.25m) SILT/CLAY with occasional cobbles	3.65				
4	3.40	100	0	0				Brown silty fine SAND with occasional gravel	3.75		26.49		
	4.10	100	0	0				Firm brown very sandy gravelly SILT with occasional cobbles	4.15		26.39 25.99		
5	4.50	100	10	10				Firm brown very sandy gravelly SILT/CLAY (local sand layer at 4.28m & 5.02m	5.15 5.40		24.99		
								Brown silty fine SAND	5.55		24.74		
6	6.00	100	0	0				COBBLE Brown silty very sandy GRAVEL (predominantly fine to medium) with occasional cobbles.	6.25 6.45		24.59 23.89 23.69		
7								Dark brown, gravelly, silty, fine to medium SAND					
8	7.50	100	31	31				Brown silty clayey sandy gravelly, COBBLES (possible highly weathered upper bedrock)	8.00		22.14		
9	9.00	100	15	15									

REMARKS

7 Core boxes, 11.1m Core liner used. No groundwater encountered. Grout 0.0m-11.8m. 100% flush loss from 7.0m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC3
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,299.12 E 270,902.06 N	GROUND LEVEL (m)	30.14
		CORE DIAMETER (mm)	102
		DATE STARTED	12/02/2009
		DATE COMPLETED	13/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10	10.30							Strong to moderately strong, medium bedded, blue grey medium grained LIMESTONE (fossiliferous and siliceous). Heavily infilled with clay/sand/gravel (esp. 9.4m-10.03m) (possible variably weathered upper bedrock *(continued)*					
11		100	15	11					11.80		18.34		
11.80								End of Corehole at 11.8 (m)					
12													
13													
14													
15													
16													
17													
18													
19													

REMARKS

7 Core boxes, 11.1m Core liner used. No groundwater encountered. Grout 0.0m-11.8m. 100% flush loss from 7.0m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEW.LOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC4
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,275.13 E 270,938.38 N	GROUND LEVEL (m)	30.02
		CORE DIAMETER (mm)	102
		INCLINATION	-90
		FLUSH	Polymer Gel
		DATE STARTED	16/02/2009
		DATE COMPLETED	17/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	0.70		29.32		
1	0.70	63	0	0				Soft brown mottled cream/black/dark brown, very sandy, very gravelly CLAY with occasional cobbles. Gravel is sub-angular to sub-rounded and fine to coarse grained.	1.50		28.52		
2	1.50	97	0	0									
3	3.00	87	0	0				Firm reddish brown, very sandy, very gravelly CLAY (locally slightly soft 1.5m-2.0m). Gravel is sub-angular and fine to coarse grained.	3.30		26.72		
4	4.50	100	0	0				Firm yellow brown, slightly gravelly(fine) /coarse sandy SILT	4.50		25.52		
								COBBLE	4.60		25.42		
5	5.10	100	17	17				Firm dark brown sandy gravelly SILT/CLAY	4.90 5.10		25.12		
								Very gravelly (fine to medium), dark brown fine to coarse SAND	5.25		24.92 24.77		
6	6.00	100	0	0				COBBLE	6.00		24.02		
7	6.90	100	60	53				Brown clayey/silty gravelly, medium SAND with occasional cobbles. Gravel is rounded to sub-angular and fine to medium grained.	6.90 7.15	Discontinuities are rough and undulose to irregular. Apertures are open with local clay sand smearing/infill (non intact zones). Dips are commonly sub-45° with variable fractures throughout.	23.12 22.87		
8	7.50	100	53	53				Firm brown sandy gravelly CLAY with occasional cobbles (becoming sandier towards 6.9m)					
	8.50	100	56	40				Dark brown, silty/clayey, gravelly, medium SAND					
9	9.00	100	15	15				Strong to very strong, locally moderately strong, medium to thickly bedded, blue grey, medium grained	10.00				

REMARKS

7 Core boxes, 10.85m Core liner used. No groundwater encountered. Grout 0.0m-12.1m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC4
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,275.13 E 270,938.38 N	GROUND LEVEL (m)	30.02
		CORE DIAMETER (mm)	102
		DATE STARTED	16/02/2009
		DATE COMPLETED	17/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-Intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10	10.00	100	100	100	620			LIMESTONE (siliceous and fossiliferous). Fresh to slightly weathered.		Discontinuities are rough and undulose. Apertures are open with clay sand smearing surfaces. Dips are sub-10° with sub-vertical fractures (11.6-12.07m).	20.02		
11	10.50	100	98	98	710			Very strong, locally strong, thickly bedded, blue grey, fine to coarse grained LIMESTONE (siliceous and fossiliferous). Fresh to locally slightly weathered.					
12	11.50	100	28	15				End of Corehole at 12.15 (m)	12.15		17.87		
13	12.15												
14													
15													
16													
17													
18													
19													

REMARKS

7 Core boxes, 10.85m Core liner used. No groundwater encountered. Grout 0.0m-12.1m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Dulcek	DRILLHOLE NO	RC GC5
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,280.57 E 270,916.06 N	GROUND LEVEL (m)	30.08
		CORE DIAMETER (mm)	102
		DATE STARTED	13/02/2009
		DATE COMPLETED	16/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	0.70		29.38		
1	0.70	88	0	0				Brown mottled black/dark brown, sandy gravelly CLAY with occasional cobbles	1.50		28.58		
2	1.50	100	0	0				Brown very sandy gravelly SILT/CLAY with occasional cobbles	2.20		27.88		
	2.50	100	0	0				Brown SILT/CLAY	3.20		26.88		
3	3.00	100	0	0				Brown mottled yellow/dark brown, slightly sandy gravelly (fine), CLAY with occasional cobbles	3.90		26.18		
4	4.00	100	0	0				Dark brown fine SAND with occasional gravel	4.05 4.30		26.03 25.78		
	4.50	100	0	0				Dark brown gravelly, slightly silty fine SAND	4.40 4.60		25.68 25.48		
5								Dark brown silty, gravelly SAND.					
	5.50	100	58	58				Brown very sandy gravelly SILT/CLAY with occasional cobbles	5.80	Discontinuities are rough and undulose to irregular. Apertures are open with clay/sand/gravel smeared and infilled, slightly iron oxide stained. Dips are sub-0° with sub-vertical fractures common.	24.28		
6	6.00	100	20	20				Brown silty, very sandy GRAVEL (very silty/clayey 5.5m-5.8m)					
7	7.50	100	53	53				Strong to moderately strong and locally very strong where intact, blue grey, medium to coarse grained LIMESTONE (siliceous and fossiliferous). Slightly to moderately weathered.					
8													
9	9.00	100	83	76									

REMARKS

7 Core boxes, 11.2m Core liner used. No groundwater encountered. Grout 0.0m-12.2m. 100% flush loss from 6.5m,

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC5
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,280.57 E 270,916.06 N	GROUND LEVEL (m)	30.08
		CORE DIAMETER (mm)	102
		DATE STARTED	13/02/2009
		DATE COMPLETED	16/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Polymer Gel
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10													
	10.60							Strong to moderately strong and locally very strong where intact, blue grey, medium to coarse grained LIMESTONE (siliceous and fossiliferous). Slightly to moderately weathered. *(continued)*		Discontinuities are rough and undulose to irregular. Apertures are open with clay/sand/gravel smeared and infilled, slightly iron oxide stained. Dips are sub-0° with sub-vertical fractures common. *(continued)*			
11		100	90	90									
12	12.20								12.20				
								End of Corehole at 12.2 (m)			17.88		
13													
14													
15													
16													
17													
18													
19													

REMARKS

7 Core boxes, 11.2m Core liner used. No groundwater encountered. Grout 0.0m-12.2m. 100% flush loss from 6.5m,

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC6
		SHEET	Sheet 1 of 2
CO-ORDINATES	306,325.72 E 270,960.26 N	GROUND LEVEL (m)	30.27
		CORE DIAMETER (mm)	102
		INCLINATION	-90
		FLUSH	Polymer Gel
		DATE STARTED	18/02/2009
		DATE COMPLETED	18/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	0.80		29.47		
1	0.80	100	0	0				Brown very sandy, gravelly CLAY/SILT (Gravel is fine to coarse, sub-rounded to angular)	1.50		28.77		
	1.50	100	0	0				Brown silty fine SAND	2.00		28.27		
2								Brown very silty, gravelly fine to medium grained SAND. (Gravel is fine to coarse, sub-rounded to angular)	2.50		27.77		
	2.50	100	0	0				Brown silty, sandy, gravelly CLAY. (Gravel is fine to coarse, sub-rounded to sub-angular)					
3	3.00	100	0	0									
4	4.00	100	0	0									
	4.50	100	0	0									
5													
	5.50	100	0	0									
6	6.00	100	9	9						Discontinuities are rough and undulose. Apertures are wide to very wide with sandy/clayey/gravelly smeared surfaces and infilling. Dips appear sub-40° with variably dipping fractues throughout.			
7	7.40	100	0	0									
	7.50	100	7	7					8.25		22.02		
8													
9	9.00	100	18	18									

REMARKS

8 Core boxes, 12.2m Core liner used. No groundwater encountered. Grout 0.0m-13.5m. 50% flush loss from 9.0m. ½hr dayworks - laid 60m of Geogrid to improve access to location.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC GC6
		SHEET	Sheet 2 of 2
CO-ORDINATES	306,325.72 E 270,960.26 N	GROUND LEVEL (m)	30.27
		CORE DIAMETER (mm)	102
		INCLINATION	-90
		FLUSH	Polymer Gel
		DATE STARTED	18/02/2009
		DATE COMPLETED	18/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10	10.50	90	13	13				Strong to moderately strong, medium bedded, grey, medium to coarse grained LIMESTONE (fossiliferous and siliceous). Heavily infilled with clay/sand/gravel. (10.5m-10.9m, 11.17m-11.76m, marly, sandy clayey highly weathered rock - structure locally preserved) *(continued)*		Discontinuities are rough and undulose. Apertures are wide to very wide with sandy/clayey/gravelly smeared surfaces and infilling. Dips appear sub-40° with variably dipping fractues throughout. *(continued)*			
11													
12	12.60	100	42	42									
13	13.50								13.50				
14								End of Corehole at 13.5 (m)			16.77		
15													
16													
17													
18													
19													

REMARKS

8 Core boxes, 12.2m Core liner used. No groundwater encountered. Grout 0.0m-13.5m. 50% flush loss from 9.0m. ½hr dayworks - laid 60m of Geogrid to improve access to location.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL_RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 30/3/09

Appendix 2

Rotary Core Drillhole Records (Conventional P Drillholes)

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP1
		SHEET	Sheet 1 of 2
CO-ORDINATES(_)	306,246.51 E 270,914.34 N	GROUND LEVEL (m)	29.94
		CORE DIAMETER (mm)	80
		DATE STARTED	10/02/2009
		DATE COMPLETED	10/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Air/Mist
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay					
1													
2													
3													
4													
5													
6									6.40		23.54		
								OPEN HOLE DRILLING: Observed by driller as angular gravel size returns of	6.90				

REMARKS

1 Core box. No groundwater encountered. 2hrs dayworks - laid 150m of Geogrid to improve access to location.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP1
		SHEET	Sheet 2 of 2
CO-ORDINATES(_)	306,246.51 E 270,914.34 N	GROUND LEVEL (m)	29.94
		CORE DIAMETER (mm)	80
		DATE STARTED	10/02/2009
		DATE COMPLETED	10/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Air/Mist
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
7								limestone (probable variably weathered bedrock)	7.50		23.04		
	7.50							OPEN HOLE DRILLING: Observed by driller as angular gravel size returns of limestone (probable bedrock) *(continued)*		Discontinuities are rough and undulose. Apertures are open with local clay smearing (7.79m-7.88m, 8.84-9.57m, 9.72-9.91m), and local slight iron oxide stained surfaces (8.84m-9.57m). Dips are sub-0°-20° with local sub-vertical fractures (8.84m-9.57m, 9.72-9.91m).	22.44		
8		87	79	79				Strong to very strong, thickly bedded, blue grey, medium grained LIMESTONE (siliceous and fossiliferous). Fresh to locally slightly weathered. Cavity observed by driller at 8.7m-8.9m)					
9	9.00	97	21	21									
10									10.50				
	10.50							End of Corehole at 10.5 (m)			19.44		
11													
12													
13													

REMARKS

1 Core box. No groundwater encountered. 2hrs dayworks - laid 150m of Geogrid to improve access to location.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP2
		SHEET	Sheet 1 of 2
CO-ORDINATES(_)	306,241.74 E 270,906.39 N	GROUND LEVEL (m)	30.03
		CORE DIAMETER (mm)	80
		INCLINATION	-90
		FLUSH	Air/Mist
		DATE STARTED	10/02/2009
		DATE COMPLETED	10/02/2009
CLIENT	Indaver	DRILLED BY	Petersen
ENGINEER	PM Group	LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay					
1													
2													
3													
4													
5									5.70				
6								OPEN HOLE DRILLING: Observed by driller as angular gravel size returns of limestone (probable variably weathered bedrock)			24.33		
									7.00				

REMARKS

1 Core box. No groundwater encountered.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP2
		SHEET	Sheet 2 of 2
CO-ORDINATES(_)	306,241.74 E 270,906.39 N	GROUND LEVEL (m)	30.03
		CORE DIAMETER (mm)	80
		INCLINATION	-90
		FLUSH	Air/Mist
CLIENT	Indaver	DATE STARTED	10/02/2009
ENGINEER	PM Group	DATE COMPLETED	10/02/2009
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
7								OPEN HOLE DRILLING: Observed by driller as angular gravel size returns of limestone (probable bedrock)	7.50		23.03		
	7.50	100	78	72				Strong to very strong, locally moderately strong, medium to thickly bedded, grey, medium grained LIMESTONE (siliceous and fossiliferous). Fresh to slightly weathered.		Discontinuities are rough and undulose. Apertures are open with local clay smearing (7.84m-8.06m, 8.28m). Dips are sub-0°-10° with local sub-vertical and 45° fractures.	22.53		
8													
9	9.00	97	63	63									
10									10.50				
	10.50							End of Corehole at 10.5 (m)			19.53		
11													
12													
13													

REMARKS

1 Core box. No groundwater encountered.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP5
		SHEET	Sheet 1 of 2
CO-ORDINATES(_)	306,255.43 E 270,916.96 N	GROUND LEVEL (m)	30.18
		CORE DIAMETER (mm)	80
		DATE STARTED	19/02/2009
		DATE COMPLETED	19/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Air/Mist
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								OPEN HOLE DRILLING: Observed by driller as returns of brown silty, very sandy gravelly clay	6.70		23.48		
1													
2													
3													
4													
5													
6													

REMARKS

1 Core box. No groundwater encountered. Grout 0.0m-10.5m.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 14039

CONTRACT	Indaver Waste Management Facility, Duleek	DRILLHOLE NO	RC RP5
		SHEET	Sheet 2 of 2
CO-ORDINATES(_)	306,255.43 E 270,916.96 N	GROUND LEVEL (m)	30.18
		CORE DIAMETER (mm)	80
		DATE STARTED	19/02/2009
		DATE COMPLETED	19/02/2009
CLIENT	Indaver	INCLINATION	-90
ENGINEER	PM Group	FLUSH	Air/Mist
		DRILLED BY	Petersen
		LOGGED BY	A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-Intact zones	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
7								OPEN HOLE DRILLING: Observed by driller as clayey angular gravel size returns of limestone (probable variably weathered bedrock) *(continued)*	7.50		22.68		
8	7.50	64	0	0				Moderately strong to moderately weak, grey, medium to coarse grained LIMESTONE (siliceous and fossiliferous). Moderately weathered. Non intact throughout with clayey (dry) sandy gravel and cobble size returns.	8.65				
9	8.60	91	63	63						Discontinuities are rough and undulose. Apertures are wide with sandy surfaces. Variably dipping fractues and locally sub-vertical fractures (8.91m-8.98m, 9.22m-9.41m) and sub-45 planar break at 9.85m.	21.53		
10	9.70	100	84	72				Strong to locally moderately strong, medium to thinly bedded grey, medium to coarse grained LIMESTONE (siliceous and fossiliferous). Fresh to slightly and locally moderately weathered.	10.50		19.68		
11	10.50							End of Corehole at 10.5 (m)					
12													
13													

REMARKS

1 Core box. No groundwater encountered. Grout 0.0m-10.5m.

INSTALLATION REMARKS

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC NEWLOG 10M PER PG 14039.GPJ IGSL.GDT 9/3/09

Appendix 3

Percolation Test Records

Soakaway Design f -value from field tests IGSL

Contract: Indaver Ireland Contract No. 14039
Test No. PP2
Engineer PM Group
Date:

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Soft brown SILT/CLAY with some organic matter	None
0.20	1.20	Firm brown sandy gravelly CLAY with sub-angular and angular cobbles	
1.20		Stiff brown sandy gravelly CLAY with pockets of sandy SILT and many	
	2.00	sub-angular and angular cobbles	

Notes:

Field Data

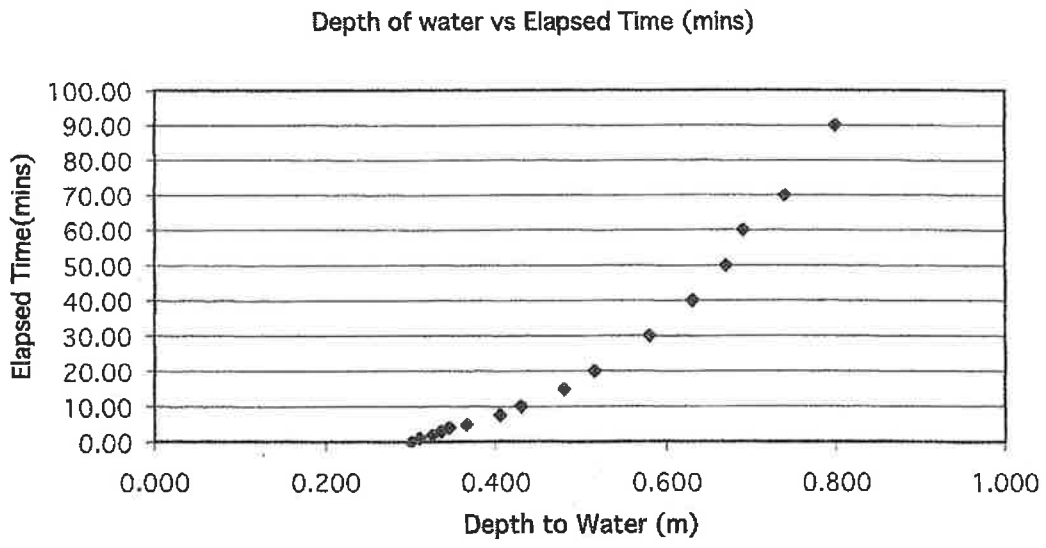
Depth to Water (m)	Elapsed Time (min)
0.300	0.00
0.310	1.00
0.325	2.00
0.335	3.00
0.345	4.00
0.365	5.00
0.405	7.50
0.430	10.00
0.480	15.00
0.515	20.00
0.580	30.00
0.630	40.00
0.670	50.00
0.690	60.00
0.740	70.00
0.800	90.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.20	m
Initial depth to Water =	0.30	m
Final depth to water =	0.80	m
Elapsed time (mins)=	90.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.48	m2
*Av. side area of permeable stratum over test period=	4.64	m2
Total Exposed area =	5.12	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00052 m/min or 8.6806E-06 m/sec



Soakaway Design f -value from field tests IGSL

Contract: Indaver Ireland Contract No. 14039
Test No. PP3
Engineer PM Group
Date:

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	Soft brown slightly sandy CLAY with some organic matter	None
0.30		Soft brown slightly gravelly, sandy CLAY with occasional rounded	
	1.10	cobbles	
1.10		Firm brown slightly gravelly, sandy CLAY with occasional sub-angular	
	1.85	and angular cobbles	

Notes:

Field Data

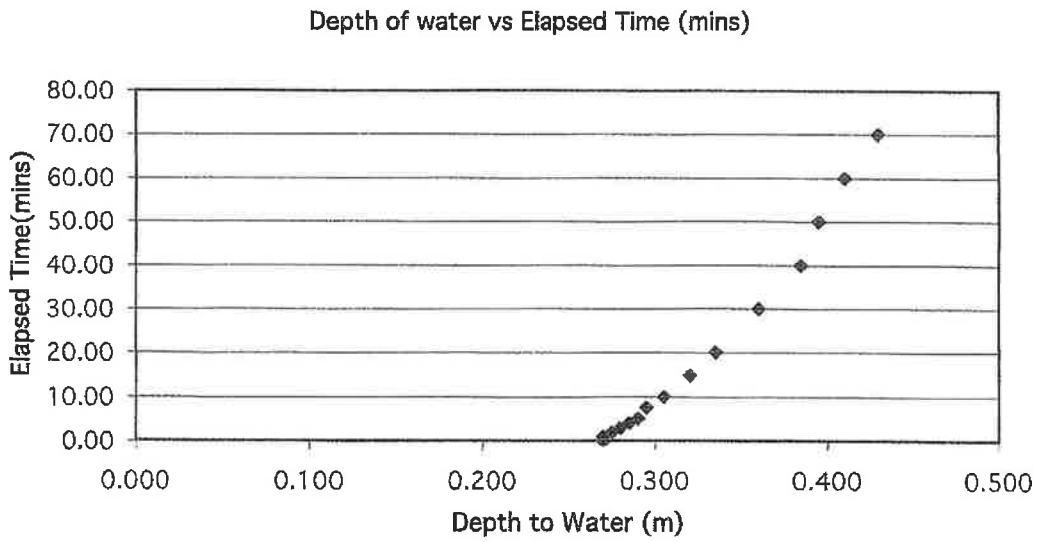
Depth to Water (m)	Elapsed Time (min)
0.270	0.00
0.270	1.00
0.275	2.00
0.280	3.00
0.285	4.00
0.290	5.00
0.295	7.50
0.305	10.00
0.320	15.00
0.335	20.00
0.360	30.00
0.385	40.00
0.395	50.00
0.410	60.00
0.430	70.00

Field Test

Depth of Pit (D)	1.80	m
Width of Pit (B)	0.45	m
Length of Pit (L)	1.10	m
Initial depth to Water =	0.27	m
Final depth to water =	0.43	m
Elapsed time (mins)=	70.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.495	m2
*Av. side area of permeable stratum over test period=	4.495	m2
Total Exposed area =	4.99	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00023 m/min or 3.779E-06 m/sec



Appendix 4

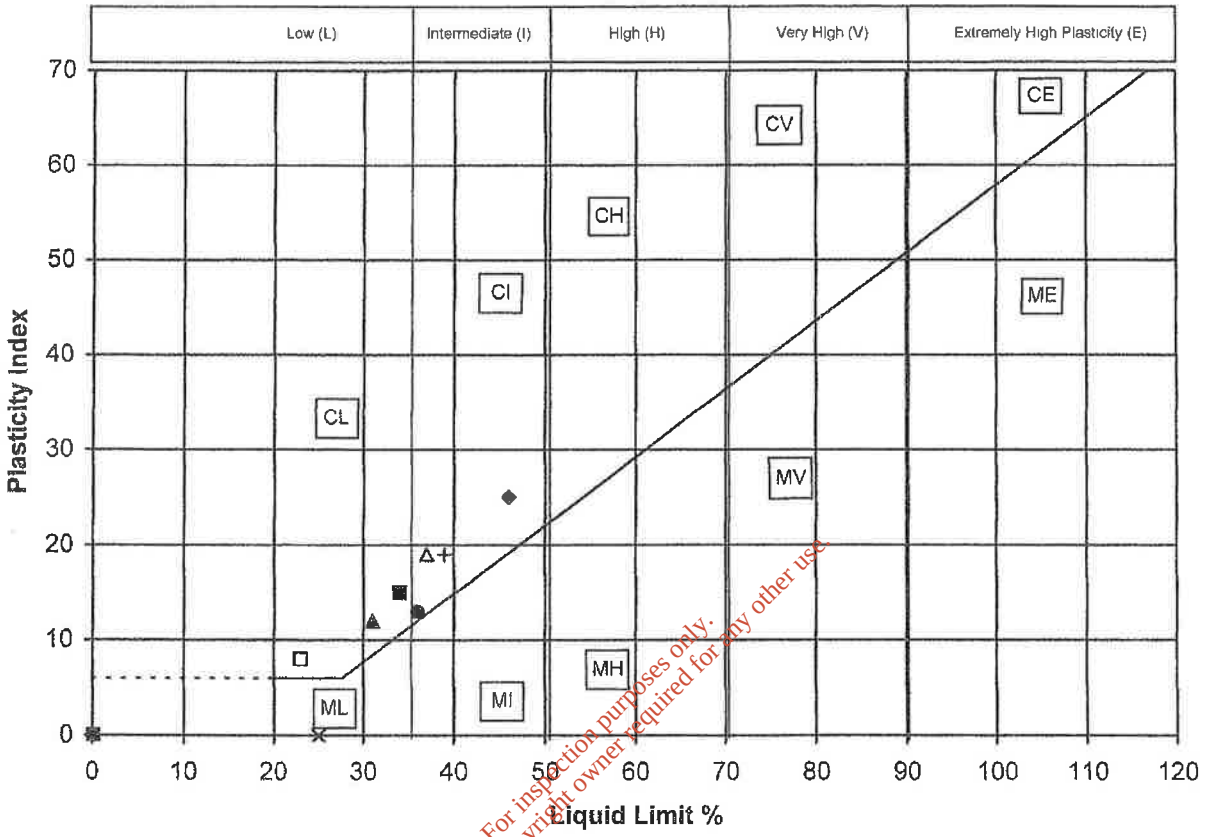
Geotechnical Soil Laboratory Test Records

Plasticity Chart - Summary of Liquid & Plastic Limit Tests

BS1377:Part 2:1990, clauses 3.2, 4 & 5

Chart in accordance with BS5930:1999, fig.18

Contract No. 14039 Contract: INDAVER WASTE MANAGEMENT FACILITY, DU



Code	BH/TP	Sample	Depth (m)	MC%	LL%	PL%	PI%	%<425µm	Description
▲	GC1	AH2527	2.60	23	31	19	12	88	Orangish brown slightly sandy slightly gravelly CLAY
■	GC2	AH2529	2.50	11.3	34	19	15	28	Grey brown silty very sandy GRAVEL
●	GC2	0	4.50	8.1	36	23	13	13	Grey brown silty sandy GRAVEL
◆	GC3	AH2525	2.00	20	46	21	25	95	Orangish brown slightly sandy slightly gravelly CLAY
×	GC3	0	4.50	13	25	NP	0	69	Light brown slightly sandy slightly gravelly SILT
+	GC4	AH2526	3.20	19.6	39	20	19	98	Light brown slightly sandy slightly gravelly CLAY
△	GC5	AH2528	3.00	18.7	37	18	19	79	Brown slightly sandy slightly gravelly CLAY
□	GC6+	AH2524	2.50	10.9	23	15	8	56	Orangish brown slightly sandy slightly gravelly CLAY
○									
◇									
▲									
■									
●									
◆									
×									
+									
△									

NP denotes specimen is non-plastic.

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Summary of Classification Tests

BS1377:Part 2:1990, clauses 3.2, 4.3, 5.3 & 5.4

BH/TP No.	Sample No.	Depth (m)	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	<425µm %	Preparation	Description	Classification
GC1	AH2527	2.60	GCS	23	31	19	12	88	WS	Orangish brown slightly sandy slightly gravelly CLAY	C L
GC2	AH2529	2.50	GCS	11.3	34	19	15	28	WS	Grey brown silty very sandy GRAVEL	
GC2		4.50	GCS	8.1	36	23	13	13	WS	Grey brown silty sandy GRAVEL	C I
GC3	AH2525	2.00	GCS	20	46	21	25	95	WS	Orangish brown slightly sandy slightly gravelly CLAY	C I
GC3		4.50	GCS	13	25	NP		69	WS	Light brown slightly sandy slightly gravelly SILT	M L
GC4	AH2526	3.20	GCS	19.6	39	20	19	98	WS	Light brown slightly sandy slightly gravelly CLAY	C I
GC5	AH2528	3.00	GCS	18.7	37	18	19	79	WS	Brown slightly sandy slightly gravelly CLAY	C I
GC6+	AH2524	2.50	GCS	10.9	23	15	8	56	WS	Orangish brown slightly sandy slightly gravelly CLAY	C L

Notes: NAT - tested as received WS - Wet sieved (425µm) NP - Non Plastic

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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	100	
28	100	
20	100	
14	95	
10	93	
6.3	91	
5	91	
3.35	90	
2	90	SAND
1.18	89	
0.6	88	
0.425	88	
0.3	87	
0.15	85	
0.063	82	SILT/CLAY
0.037	72	
0.027	65	
0.017	50	
0.010	36	
0.007	28	
0.004	19	
0.002	13	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

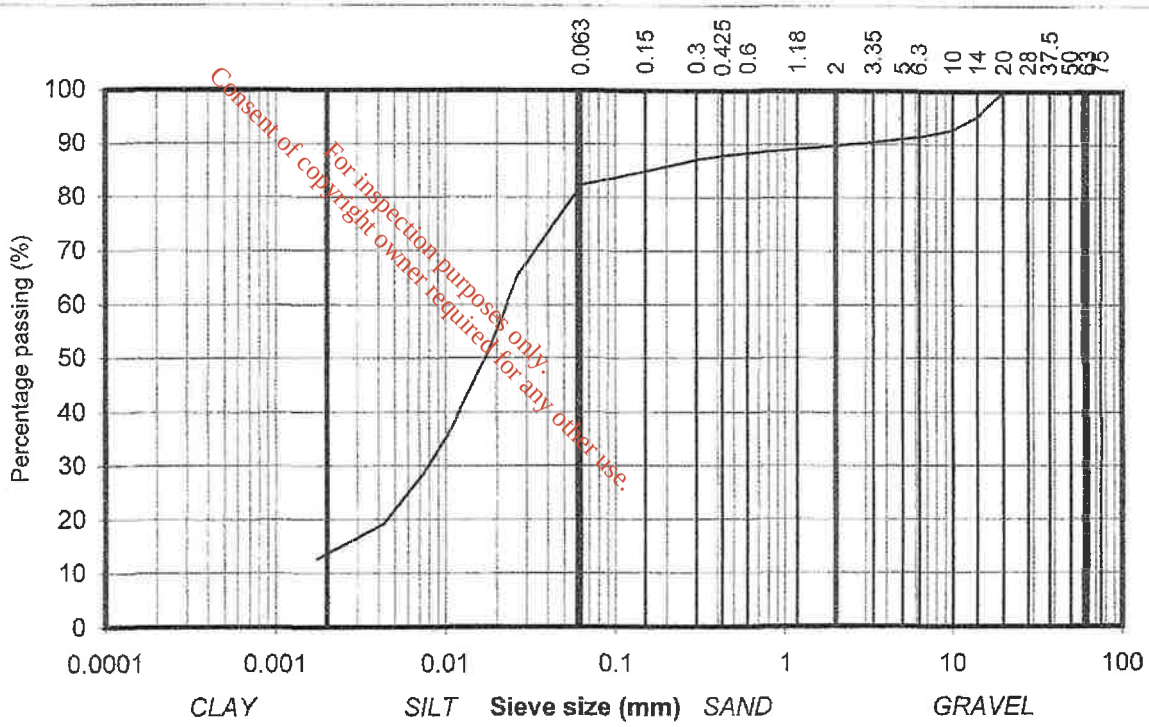
BH/TP No: GC1

SAMPLE No.: AH2527 SAMPLE TYPE: GCS

DEPTH (m): 2.60

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Orangish brown slightly sandy, slightly gravelly, CLAY



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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	
50	89	
37.5	89	
28	89	
20	82	GRAVEL
14	74	
10	65	
6.3	57	
5	52	
3.35	47	
2	42	
1.18	37	
0.6	31	SAND
0.425	28	
0.3	26	
0.15	22	
0.063	17	
0.038	12	
0.028	10	
0.018	7	SILT/CLAY
0.011	4	
0.008	3	
0.004	2	
0.002	1	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

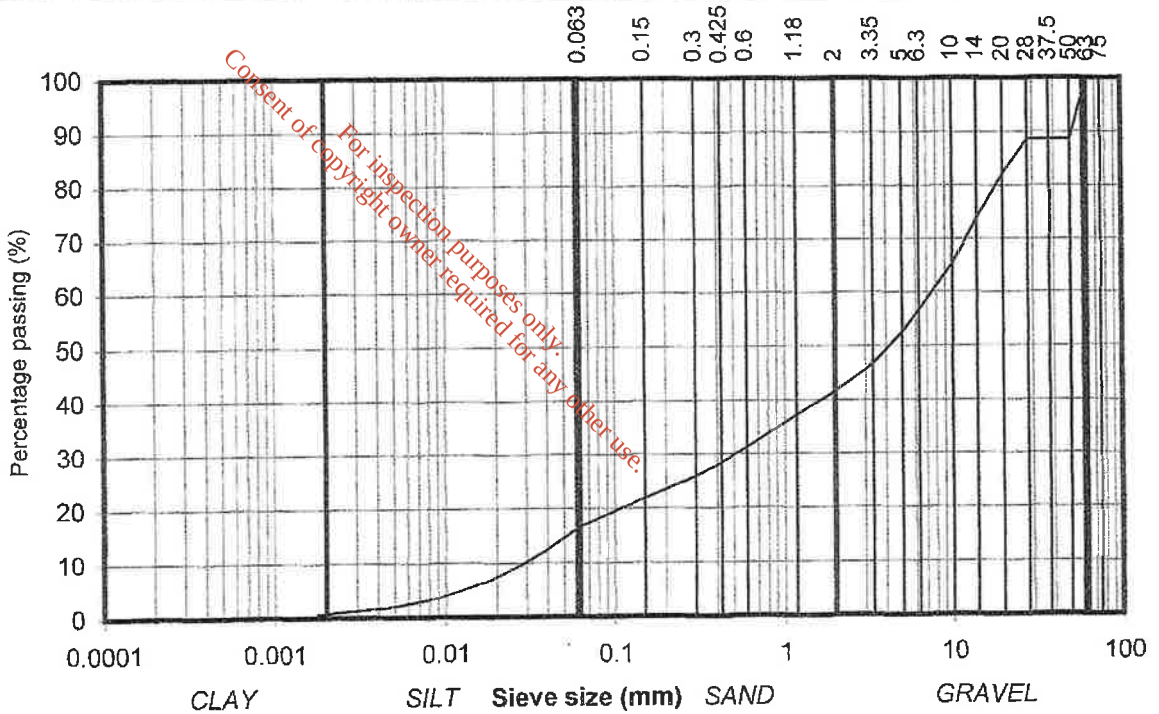
BH/TP No: GC2

SAMPLE No.: AH2529 SAMPLE TYPE: GCS

DEPTH (m): 2.50

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Grey brown silty, very sandy, GRAVEL



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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	94	
28	81	
20	68	
14	56	
10	49	
6.3	40	
5	37	
3.35	31	
2	25	SAND
1.18	20	
0.6	15	
0.425	13	
0.3	11	
0.15	8	
0.063	5	SILT/CLAY
0.043	#N/A	
0.030	#N/A	
0.019	#N/A	
0.011	#N/A	
0.008	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

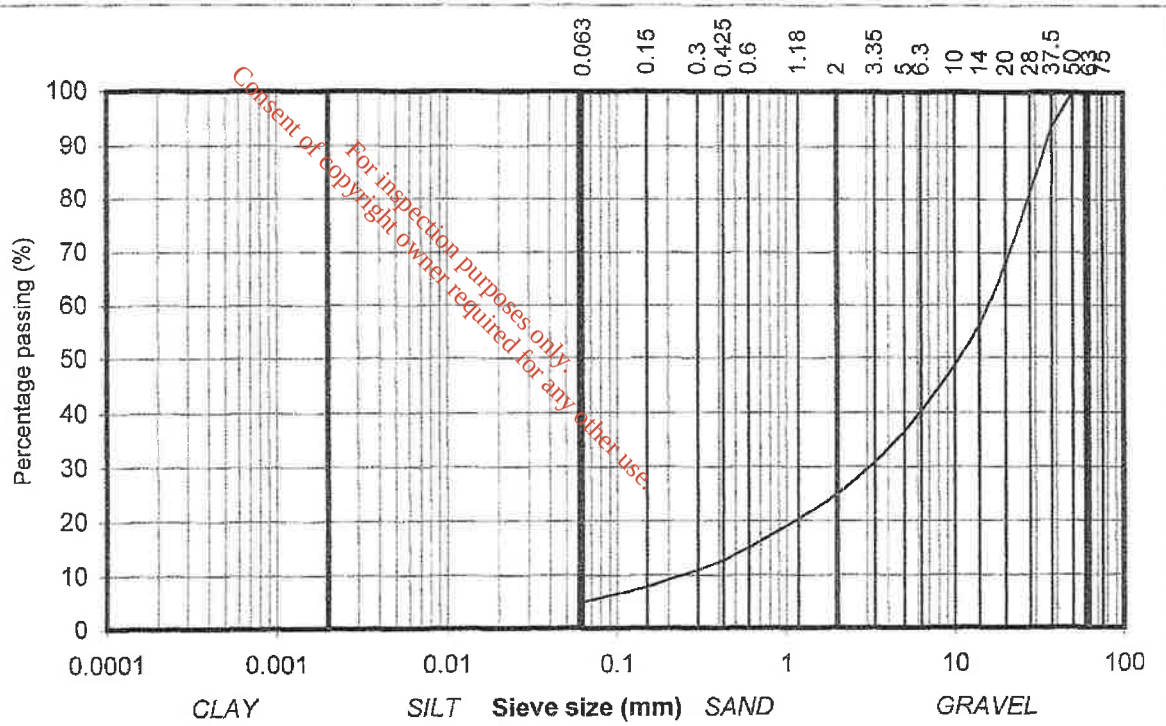
BH/TP No: GC2

SAMPLE No.: 0 SAMPLE TYPE: GCS

DEPTH (m): 4.50

TEST METHOD: Wet sieve

DESCRIPTION: Grey brown silty, sandy, GRAVEL



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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	99	
3.35	99	
2	99	SAND
1.18	98	
0.6	96	
0.425	95	
0.3	92	
0.15	83	
0.063	75	SILT/CLAY
0.037	66	
0.027	54	
0.017	42	
0.010	32	
0.007	27	
0.004	21	
0.002	16	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

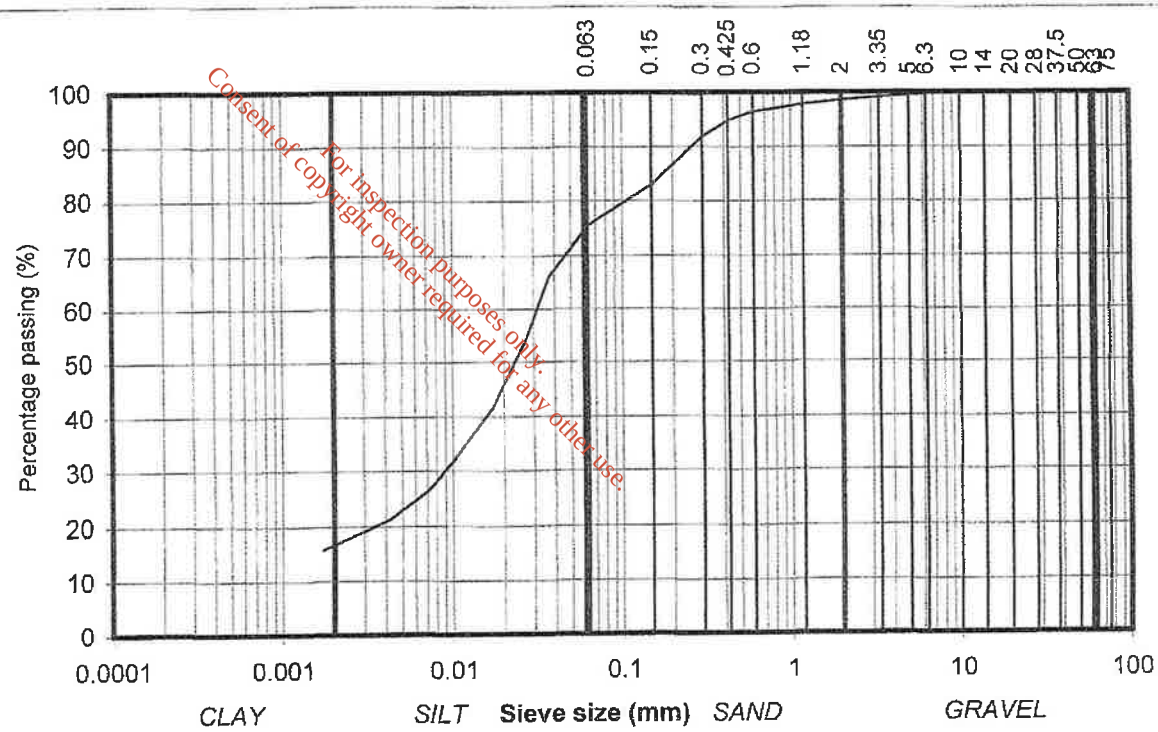
BH/TP No: GC3

SAMPLE No.: AH2525 SAMPLE TYPE: GCS

DEPTH (m): 2.00

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Orangish brown slightly sandy, slightly gravelly, SILT



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Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	100	
28	100	
20	97	
14	93	
10	89	
6.3	86	
5	84	
3.35	80	
2	77	SAND
1.18	74	
0.6	71	
0.425	69	
0.3	67	
0.15	57	
0.063	45	SILT/CLAY
0.043	#N/A	
0.030	#N/A	
0.019	#N/A	
0.011	#N/A	
0.008	#N/A	
0.005	#N/A	
0.002	#N/A	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

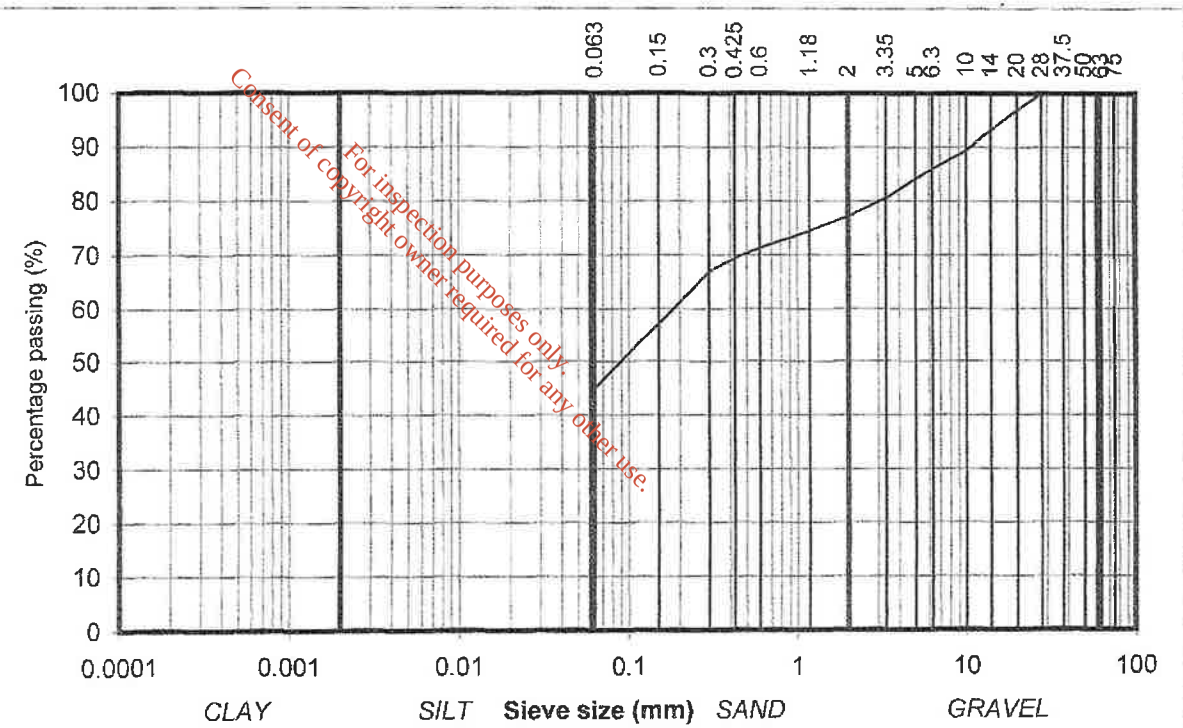
BH/TP No: GC3

SAMPLE No.: 0 SAMPLE TYPE: GCS

DEPTH (m): 4.50

TEST METHOD: Wet sieve

DESCRIPTION: Light brown slightly sandy, slightly gravelly, SILT



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IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	99	
5	99	
3.35	99	
2	99	SAND
1.18	98	
0.6	98	
0.425	98	
0.3	97	
0.15	91	
0.063	75	SILT/CLAY
0.038	60	
0.028	45	
0.018	29	
0.011	17	
0.007	14	
0.004	10	
0.002	7	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

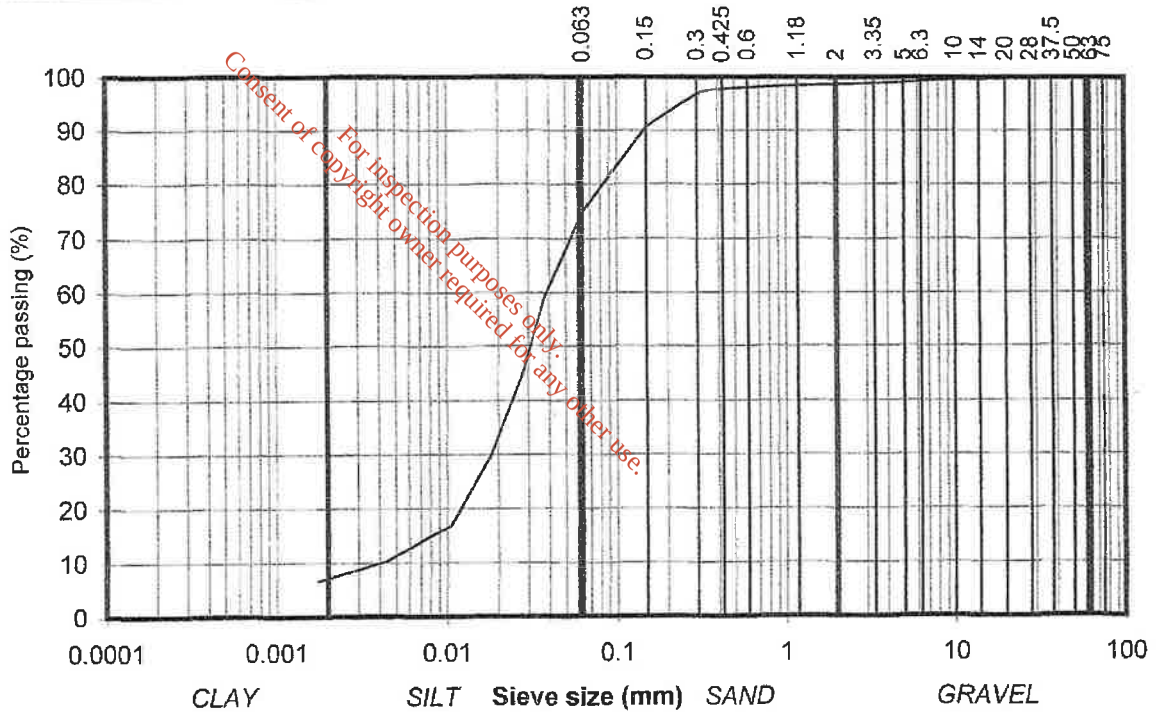
BH/TP No: GC4

SAMPLE No.: AH2526 SAMPLE TYPE: GCS

DEPTH (m): 3.20

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Light brown slightly sandy, slightly gravelly, CLAY



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IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	
20	96	GRAVEL
14	94	
10	93	
6.3	91	
5	89	
3.35	88	
2	86	
1.18	84	
0.6	81	SAND
0.425	79	
0.3	77	
0.15	71	
0.063	65	
0.037	58	
0.027	51	
0.017	43	SILT/CLAY
0.010	33	
0.007	27	
0.004	21	
0.002	10	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

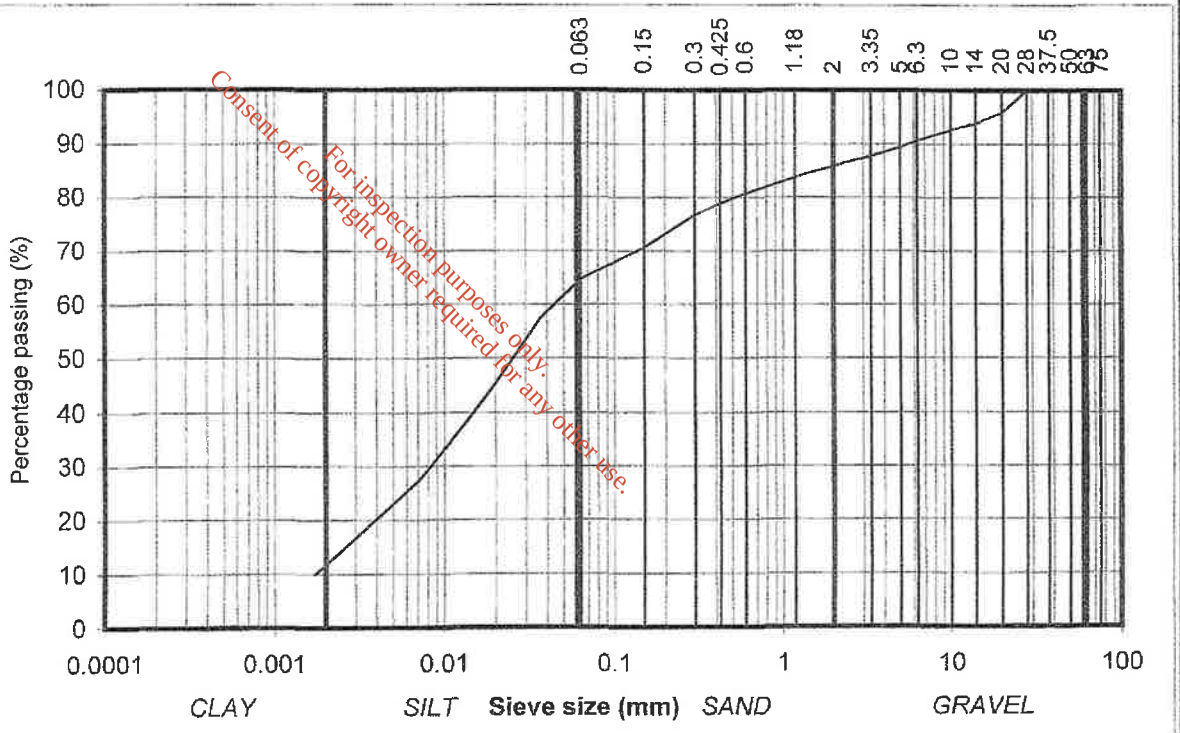
BH/TP No: GC5

SAMPLE No.: AH2528 SAMPLE TYPE: GCS

DEPTH (m): 3.00

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Brown slightly sandy, slightly gravelly, CLAY



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IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	
20	92	GRAVEL
14	88	
10	84	
6.3	78	
5	76	
3.35	71	
2	66	
1.18	62	
0.6	58	SAND
0.425	56	
0.3	54	
0.15	47	
0.063	37	
0.038	29	
0.027	24	
0.018	18	SILT/CLAY
0.010	13	
0.007	11	
0.004	9	
0.002	5	

Contract No: 14039

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

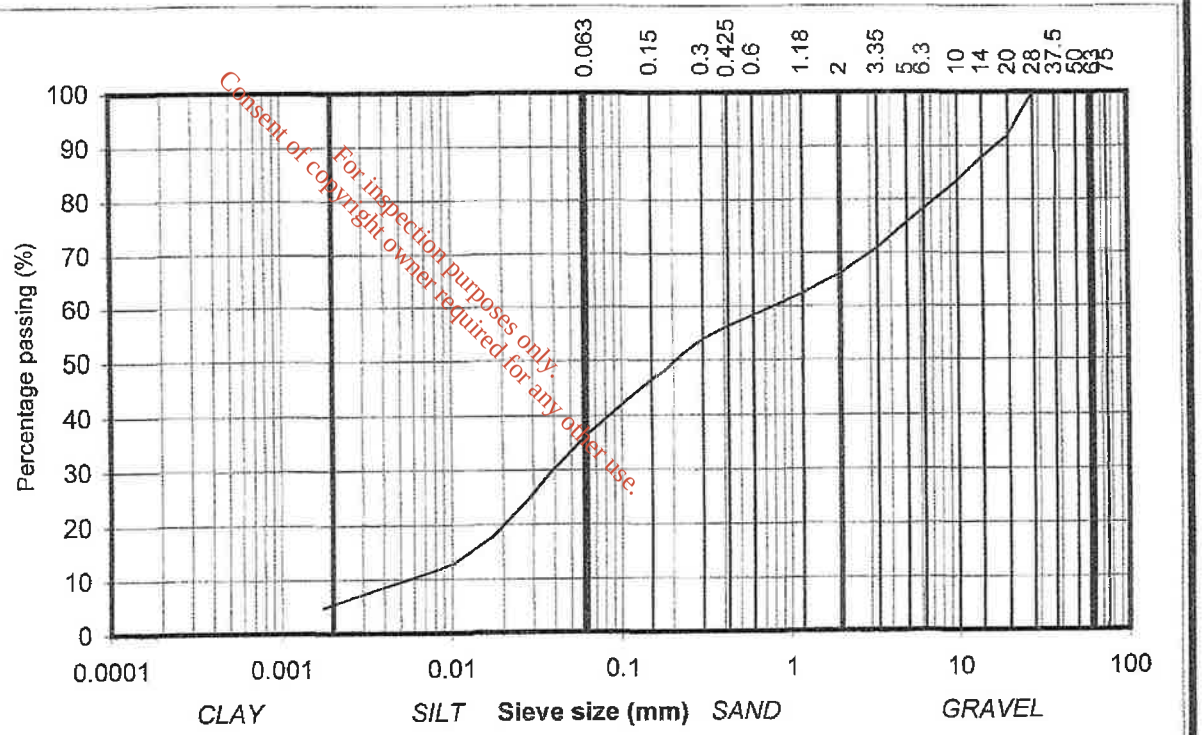
BH/TP No: GC6+

SAMPLE No.: AH2524 SAMPLE TYPE: GCS

DEPTH (m): 2.50

TEST METHOD: Wet sieve and hydrometer

DESCRIPTION: Orangish brown slightly sandy, slightly gravelly, CLAY



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IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

BH	RC1	Sample	AH2527	Depth (m)	2.6

Condition: Undisturbed

Corrections 2 membranes and side drains

Description Orangish brown sandy gravelly CLAY

Initial Conditions

Height (mm)	200	Diameter (mm)	103
Area (mm^2)	8332.29	Volume (cm^3)	1666.46
% Moisture Content	23	Bulk Density (Mg/m^3)	2.06
		Dry Density (Mg/m^3)	1.68

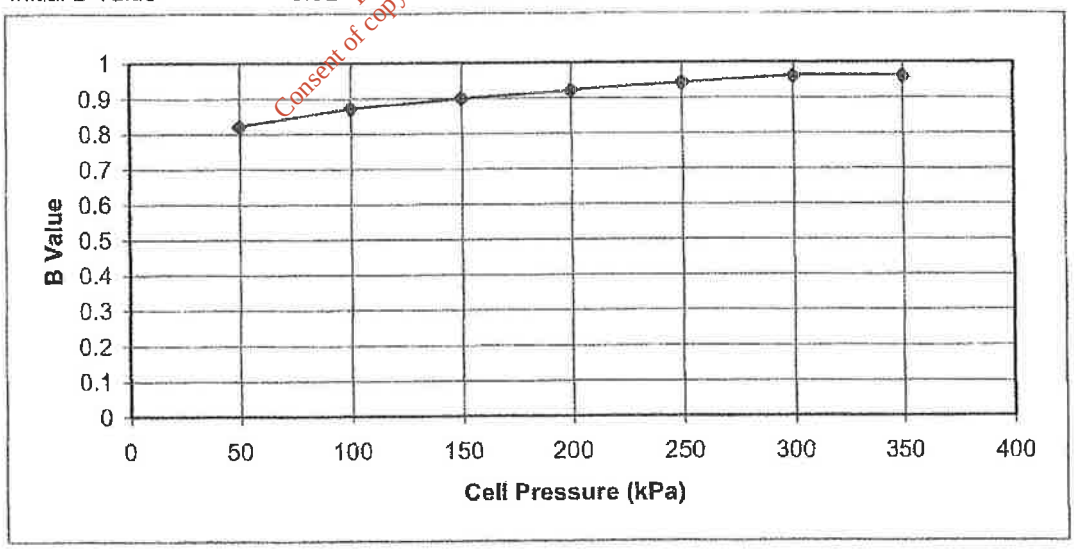
Final Conditions

% Moisture Content	20	Bulk Density (Mg/m^3)	2.02
		Dry Density (Mg/m^3)	1.69

Saturation stage

Effective stress (kPa) 50 Saturation by 50kPa Cell Pressure Increments

Initial B Value 0.82 Final B Value 0.96



IGSL Ltd.

Contract Duleek

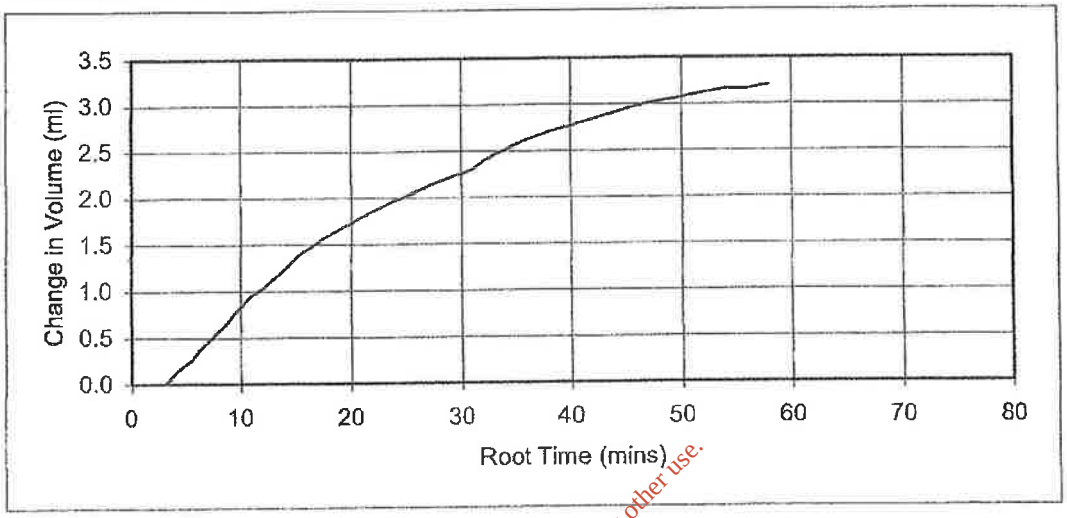
Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

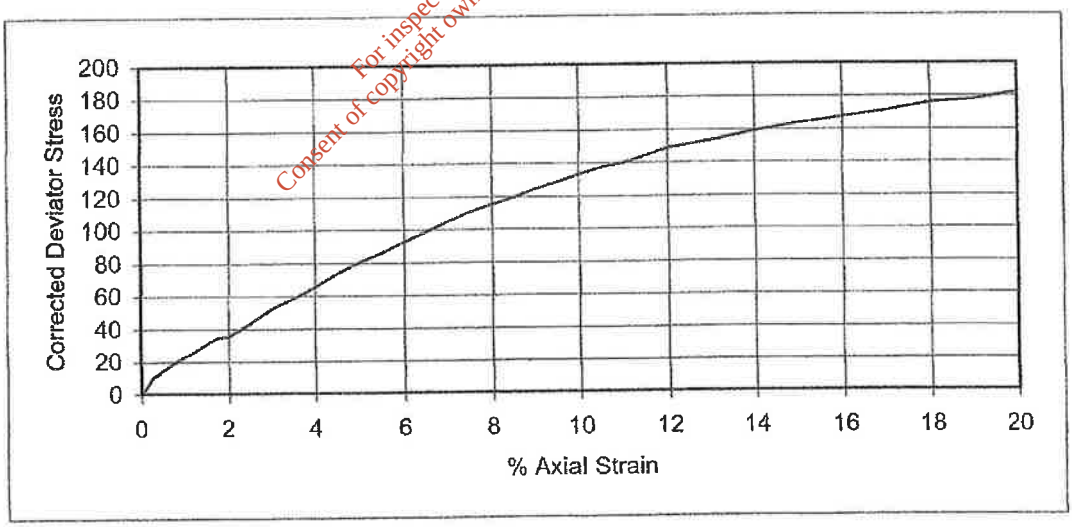
BH	RC1	Sample	AH2527	Depth (m)	2.6

Consolidation stage



Effective stress (kPa)	50	Change in Volume (ml)	3.20

Compression stage



Cell Pressure (kPa)	50	Cohesion	91
Axial strain at failure (%)	20	Failure Type	Compound

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

BH	RC3	Sample	AH2525	Depth (m)	2.0

Condition: Undisturbed

Corrections 2 membranes and side drains

Description Orangish brown sandy CLAY

Initial Conditions

Height (mm)	200	Diameter (mm)	101
Area (mm^2)	8011.85	Volume (cm^3)	1602.37

% Moisture Content	14	Bulk Density (Mg/m^3)	2.29
		Dry Density (Mg/m^3)	2.01

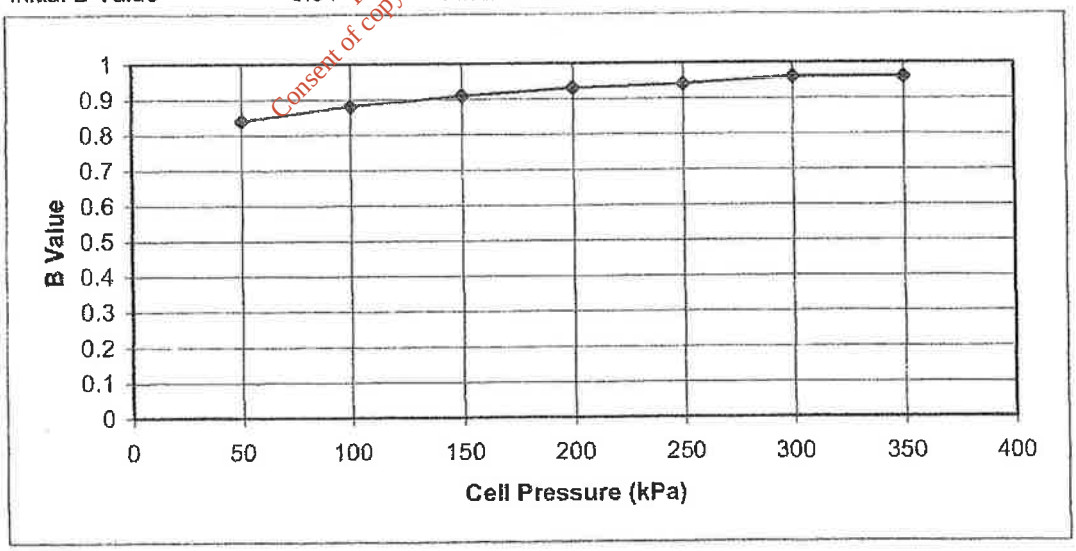
Final Conditions

% Moisture Content	14	Bulk Density (Mg/m^3)	2.29
		Dry Density (Mg/m^3)	2.01

Saturation stage

Effective stress (kPa) 50 Saturation by 50kPa Cell Pressure Increments

Initial B Value 0.84 Final B Value 0.96



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Contract Duleek

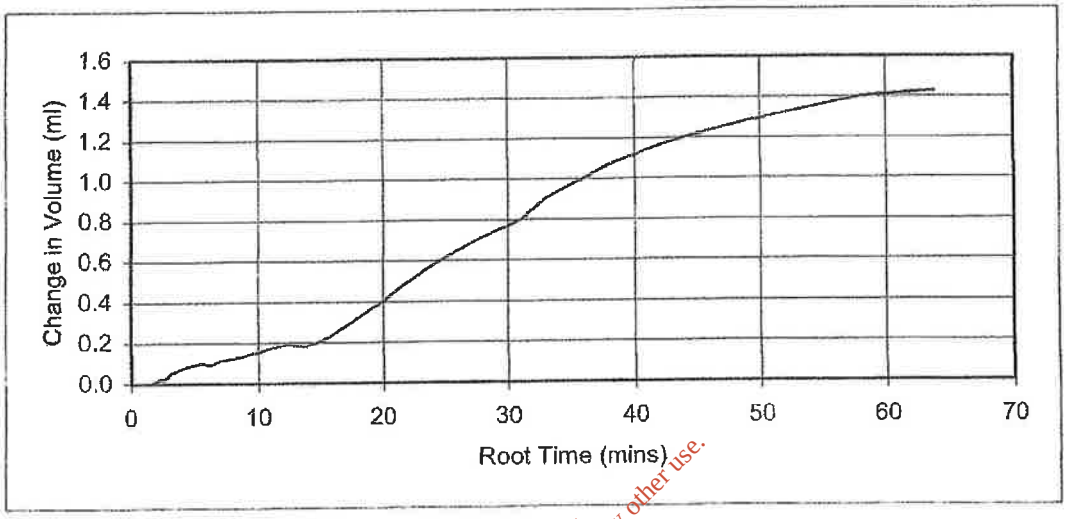
Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

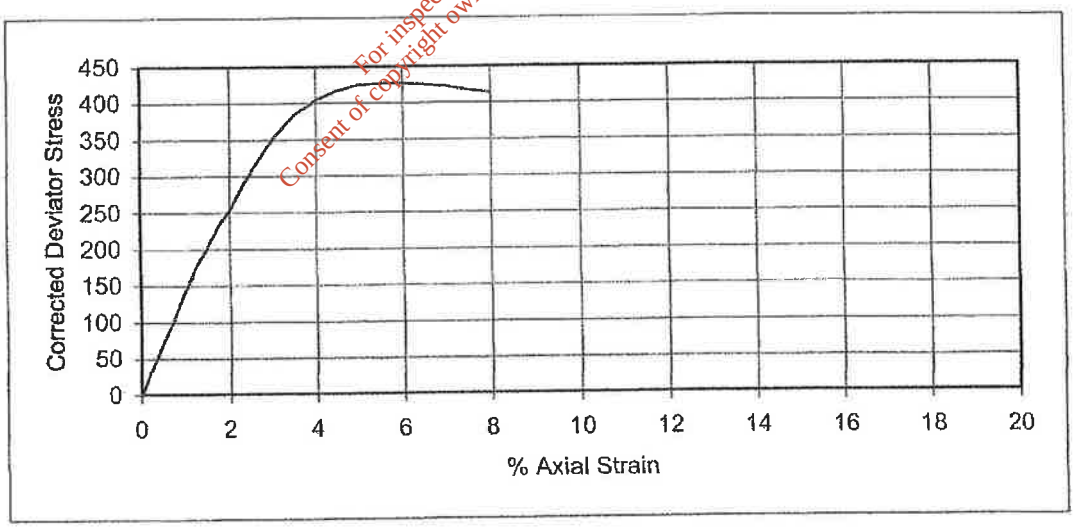
BH	RC3	Sample	AH2525	Depth (m)	2.0

Consolidation stage



Effective stress (kPa)	50	Change in Volume (ml)	1.43

Compression stage



Cell Pressure (kPa)	50	Cohesion	214
Axial strain at failure (%)	6	Failure Type	Compound

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Contract Duleek

Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

BH RC3 Sample Depth (m) 4.5

Condition: Undisturbed

Corrections 2 membranes

Description Yellowish brown sandy gravelly CLAY

Initial Conditions

Height (mm)	201	Diameter (mm)	100
Area (mm^2)	7853.98	Volume (cm^3)	1575.51
% Moisture Content	9.9	Bulk Density (Mg/m^3)	2.36
		Dry Density (Mg/m^3)	2.15

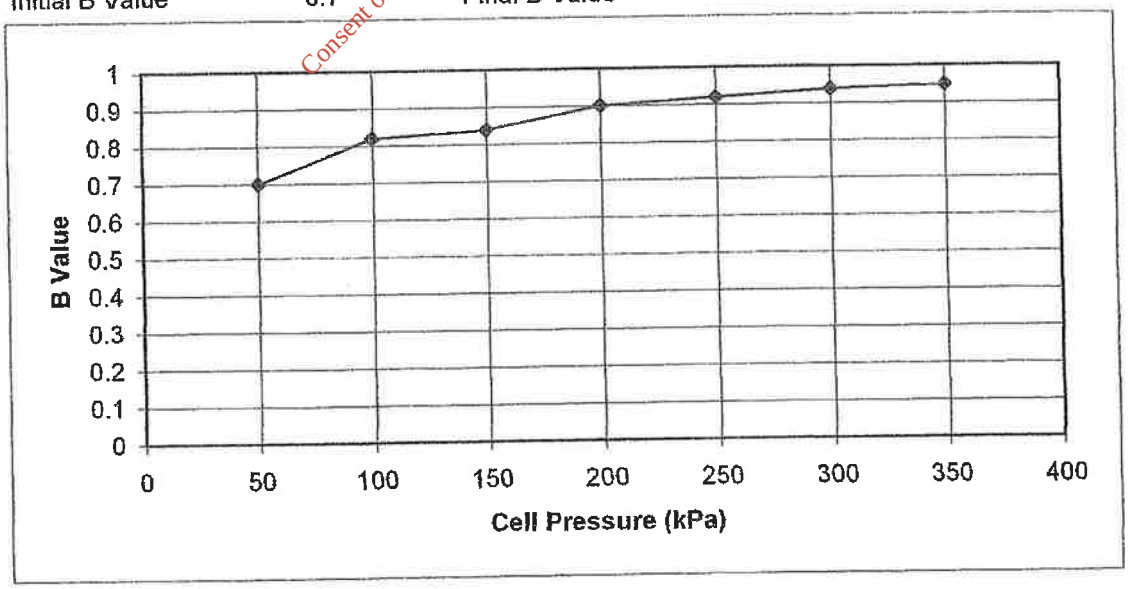
Final Conditions

% Moisture Content	9.7	Bulk Density (Mg/m^3)	2.37
		Dry Density (Mg/m^3)	2.16

Saturation stage

Effective stress (kPa) 50 Saturation by 50kPa Cell Pressure Increments

Initial B Value 0.7 Final B Value 0.95



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Contract Duleek

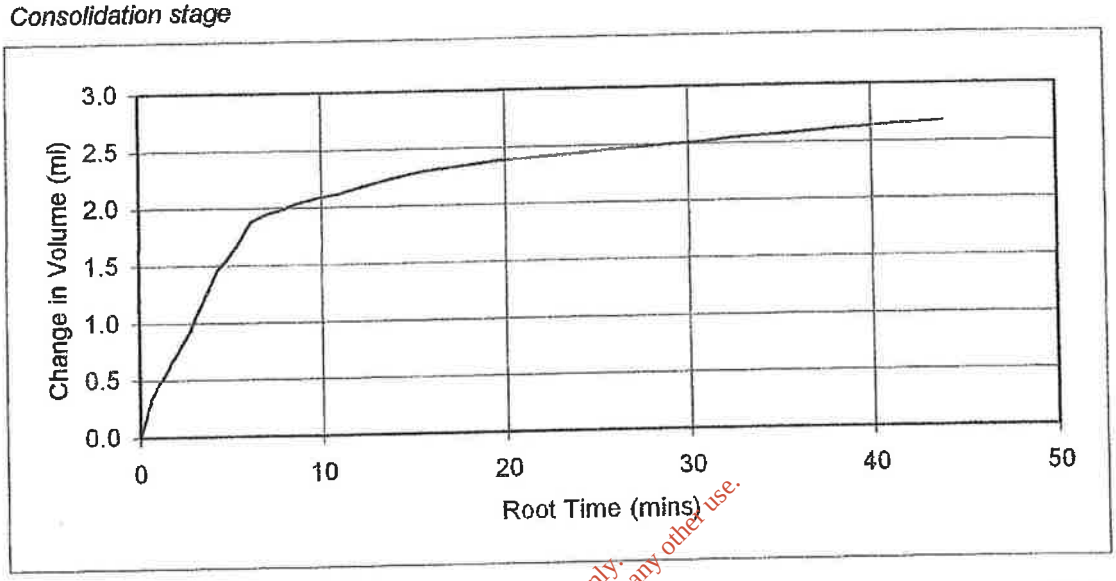
Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

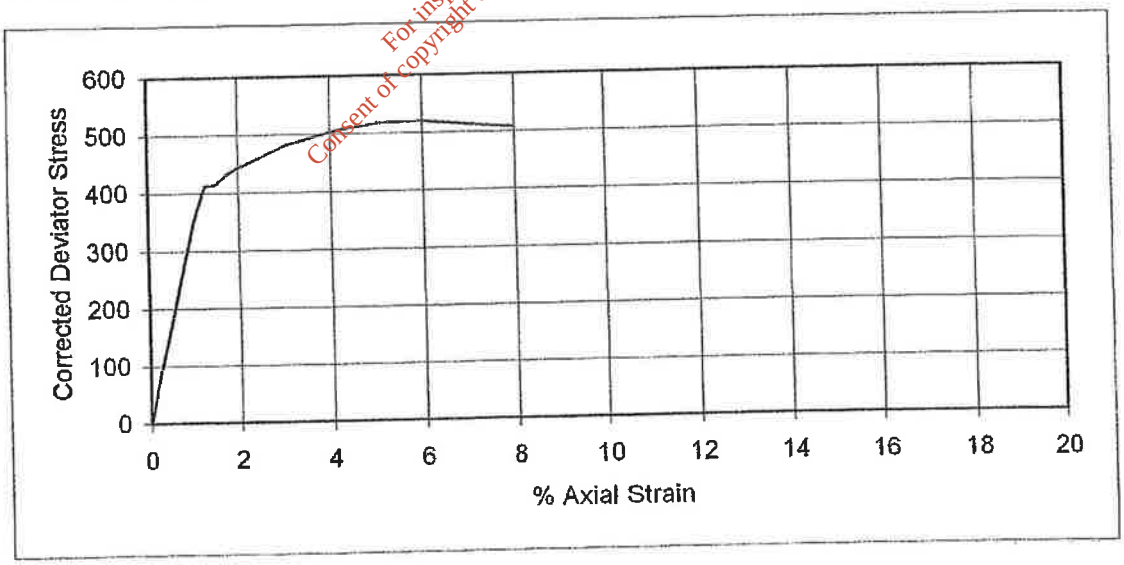
BH	RC3	Sample	Depth (m)	4.5

Consolidation stage



Effective stress (kPa)	50	Change in Volume (ml)	2.67

Compression stage



Cell Pressure (kPa)	50	Cohesion	260
Axial strain at failure (%)	5.5	Failure Type	Compound

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Contract Duleek

Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

BH	RC4	Sample	AH2526	Depth (m)	3.2

Condition: Undisturbed

Corrections 2 membranes and side drains

Description Orangish brown sandy gravelly CLAY

Initial Conditions

Height (mm)	200	Diameter (mm)	101
Area (mm^2)	8011.85	Volume (cm^3)	1602.37
% Moisture Content	23	Bulk Density (Mg/m^3)	2.16
		Dry Density (Mg/m^3)	1.76

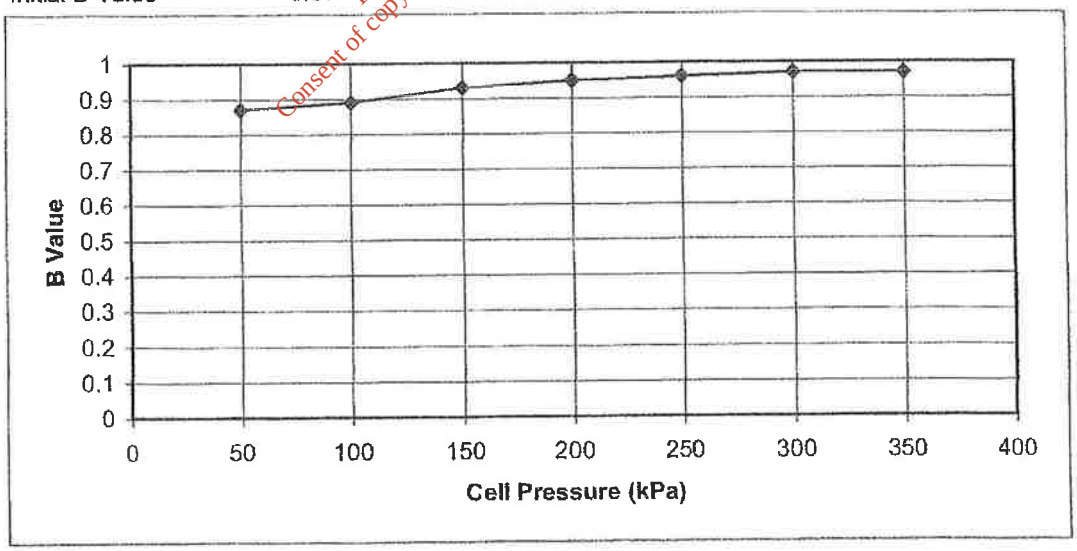
Final Conditions

% Moisture Content	22	Bulk Density (Mg/m^3)	2.15
		Dry Density (Mg/m^3)	1.76

Saturation stage

Effective stress (kPa) 50 Saturation by 50kPa Cell Pressure Increments

Initial B Value 0.87 Final B Value 0.97



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Contract Duleek

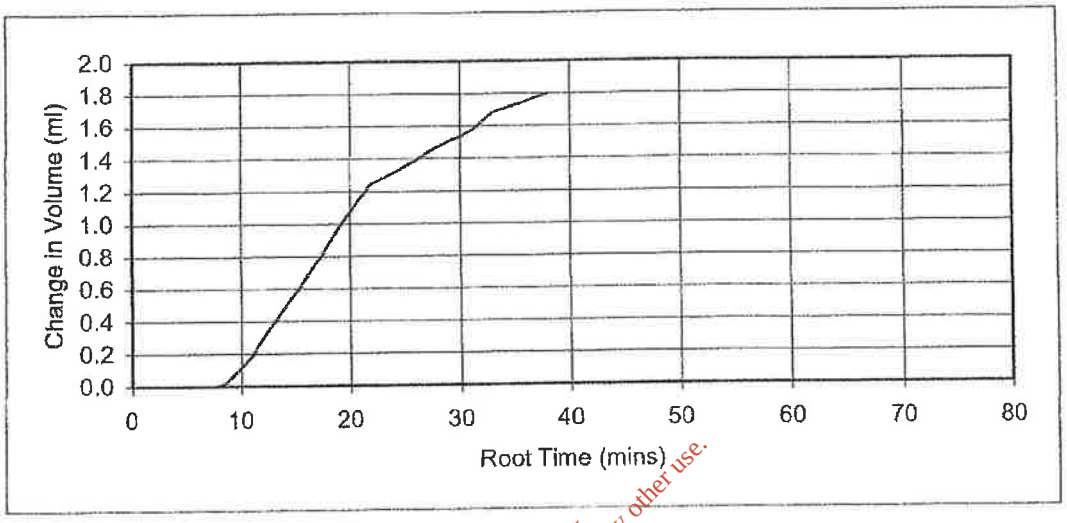
Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

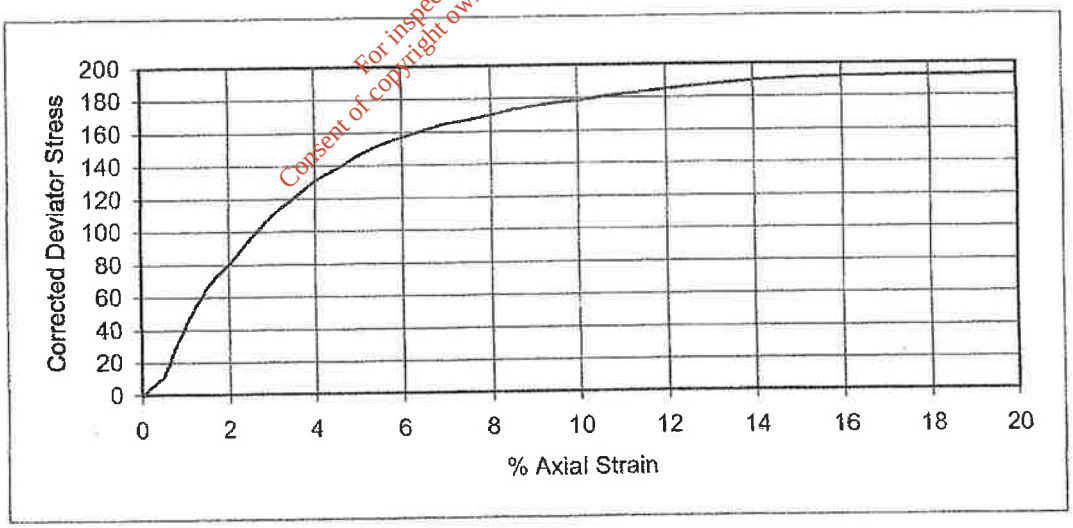
BH	RC4	Sample	AH2526	Depth (m)	3.2

Consolidation stage



Effective stress (kPa)	50	Change in Volume (ml)	1.80

Compression stage



Cell Pressure (kPa)	50	Cohesion	96
Axial strain at failure (%)	20	Failure Type	Plastic

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Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

BH	RC5	Sample	AH2528	Depth (m)	3.0

Condition: Undisturbed

Corrections 2 membranes

Description Orangish brown sandy gravelly CLAY

Initial Conditions

Height (mm)	200	Diameter (mm)	101.5
Area (mm^2)	8091.37	Volume (cm^3)	1618.27
% Moisture Content	11	Bulk Density (Mg/m^3)	2.32
		Dry Density (Mg/m^3)	2.10

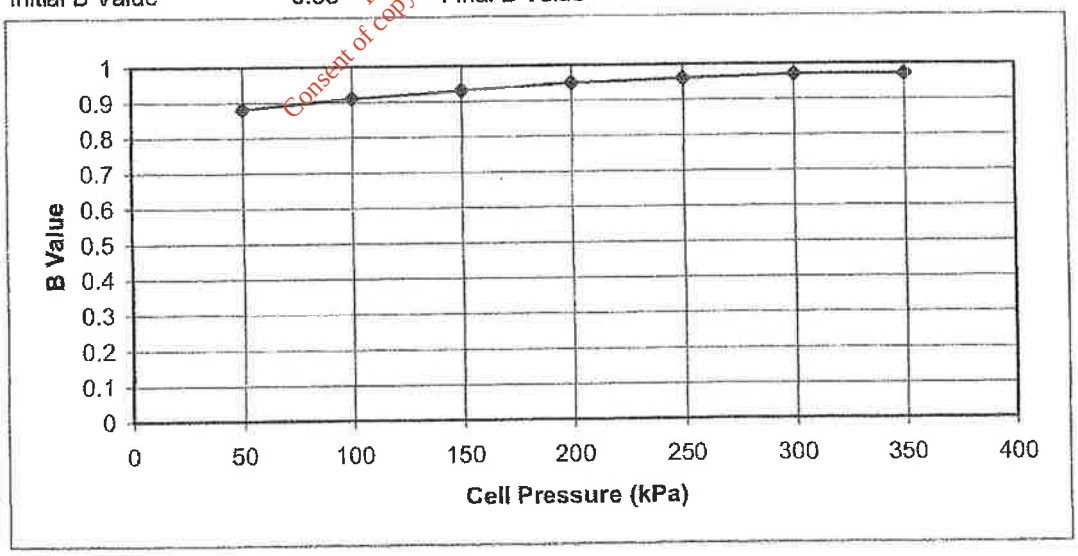
Final Conditions

% Moisture Content	11	Bulk Density (Mg/m^3)	2.35
		Dry Density (Mg/m^3)	2.11

Saturation stage

Effective stress (kPa) 50 Saturation by 50kPa Cell Pressure Increments

Initial B Value 0.88 Final B Value 0.97



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Contract Duleek

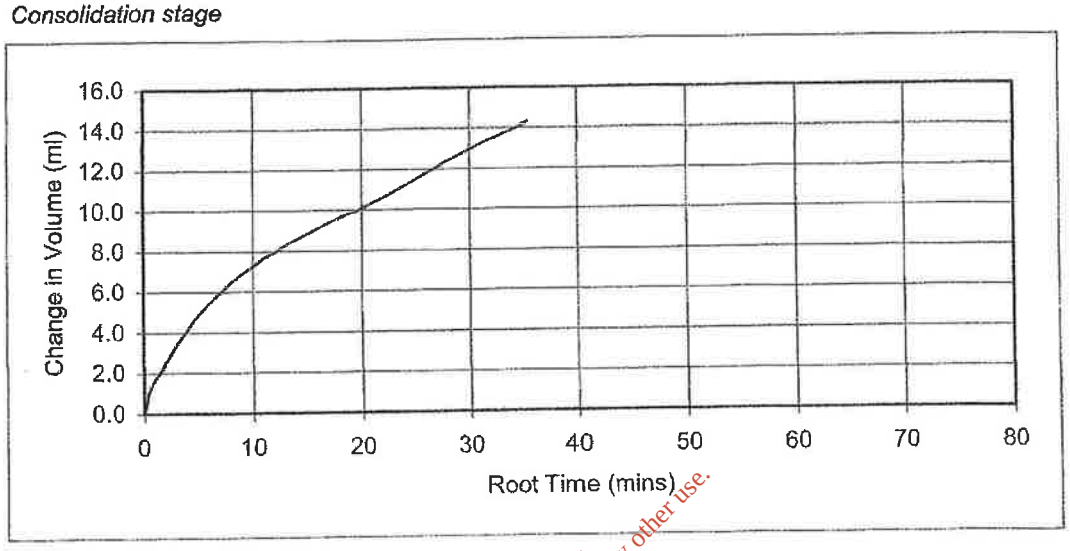
Contract No. 14039

Consolidated Quick-undrained (CQu) Triaxial Test

Manual of Soil Laboratory Testing Volume 3 KH Head Clause 19.3.3

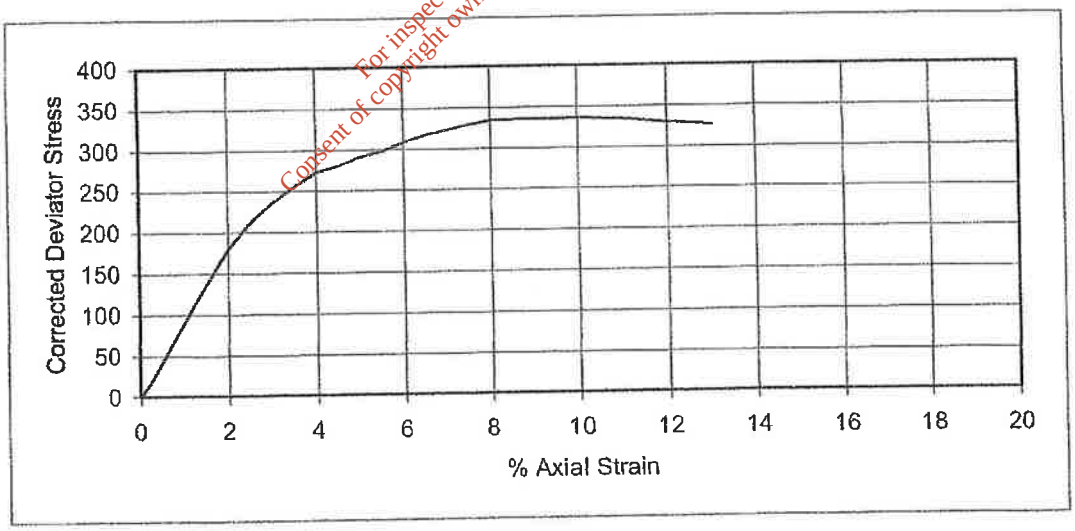
BH	RC5	Sample	AH2528	Depth (m)	3.0

Consolidation stage



Effective stress (kPa)	50	Change in Volume (ml)	14.28

Compression stage



Cell Pressure (kPa)	50	Cohesion	168
Axial strain at failure (%)	10	Failure Type	Compound

IGSL Ltd.

Contract Duleek

Contract No. 14039

CONSOLIDATION TEST CALCULATIONS IGSL

initial height	18.85	
Wt. soil+ring	278.7	
final wet wt.	280.1	
final dry wt	258.7	
wt. of ring	89.3	
w/c initial	11.8%	
w/c final	12.6%	
S.G.	2.65	Assumed
e final	0.3347698	
change in e	0.0723296	*change in Ht.
Final Height	18.454	

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK

Borehole No: GC6

Sample No: AH2524

Sample Type GCS

Depth: 2.50

Pressure range		increment	change in Ht.	change in e	e at end of stage	average e	MV (m2/MN.)	HEIGHT H	AV. HEIGHT
from	to				0.363			18.85	
0	20	20	0.092	0.007	0.357	0.360	0.245	18.758	18.804
20	50	30	0.114	0.008	0.349	0.353	0.203	18.644	18.701
50	100	50	0.13	0.009	0.339	0.344	0.140	18.514	18.579
100	200	100	0.166	0.012	0.327	0.333	0.090	18.348	18.431
200	20	-180	-0.106	-0.008	0.335	0.331	0.032	18.454	18.401
					0.335				
					0.335				
					0.335				
					0.335				
					0.335				

I.G.S.L.

CV calculations

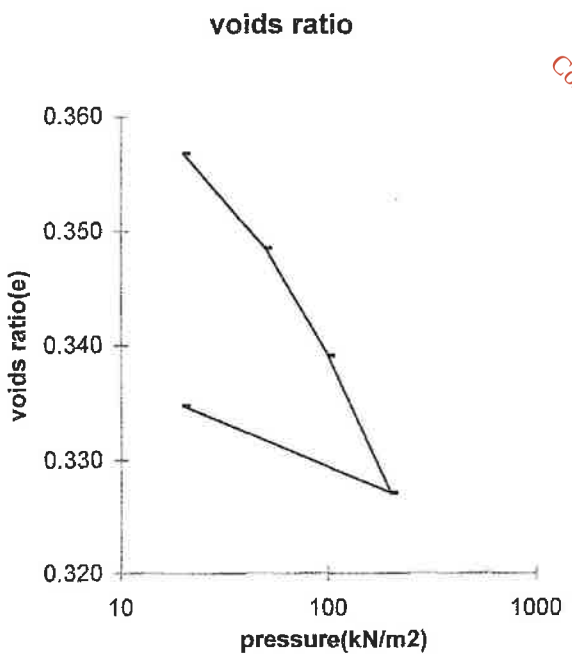
Pressure Range from	to	t 50 mins	t 90 mins	av. Height	Cv =0.026H2 / t50	Cv=0.111H2 / t90
0	20		1.21	18.804		32.44
20	50		0.81	18.701		47.93
50	100		1.69	18.579		22.67
100	200		1	18.431		37.71
200	20					

Contract	INDAVER WASTE MANAGEMENT FACILITY, DULEEK
Borehole No.	GC6
Sample No.	AH2524
Depth	2.5

CONSOLIDATION TEST RESULTS

IGSL

Sample Description: Orangish brown slightly sandy slightly gravelly CLAY



Pressure Range (kN/M2) from	to	Voids Ratio e	MV(m2/MN)	CV(m2/year)
0	20	0.357	0.24	32.44
20	50	0.349	0.20	47.93
50	100	0.339	0.14	22.67
100	200	0.327	0.09	37.71
200	20	0.335		

Contract: INDAVER WASTE MANAGEMENT FACILITY, DULEEK
Borehole No. GC6
Sample No. AH2524
Depth: 2.50