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CLOSURE, RESTORATION AND AFTERCARE MANAGEMENT PLAN (CRAMP)

2021 REVIEW

IE LICENCE NO. W0167-03

Technical Report Prepared For

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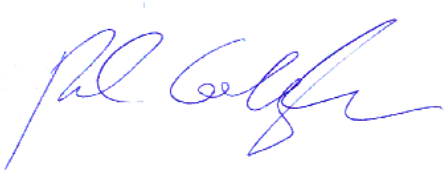
Signature		
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EXECUTIVE SUMMARY

Indaver Ireland Ltd. (Indaver) operate a Waste to Energy (WtE) facility, with approval to accept up to 235,000 tonnes per annum of waste, at Carranstown, Duleek, Co. Meath. The facility has been accepting waste since August 2011 and currently operates under an Industrial Emissions (IE) licence issued by the EPA (Ref. no. W0167-03). The current IE licence is granted with main activity Class No. 11.3.0 'Waste' and falls within the scope of the following Directive Annex I category:

Category 5.2: Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants:

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour,

(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

Report Preparation and Guidance

This document presents a revised Closure Restoration and Aftercare Management Plan (CRAMP required as part of Indaver's IE licence. This plan has been updated from the previous version submitted to the EPA in 2018 and has been prepared in accordance with the requirements of the EPA (2014) publication "*Guidance on Assessing and Costing Environmental Liabilities*".

Comparison with Previous Plans

This is the fourth CRAMP prepared for the facility as summarised below.

Year	Cost (€)	Financial Provision	Expiry Date of Financial Provision
2021	€3.887M	Bond	To be agreed with the Agency
2018	€5.040M	Bond	Jan 2022
2015	€3.378M	Bond	June 2021
2011	€585,125	Bond	2017

The scope of this Plan addresses the key issues, which would occur in an orderly shutdown of all the site activities on a phased basis over an estimated time period of 6 months. (Costing of the shutdown process has been based on a Sudden Closure scenario as required under the current revised guidance).

Clean closure is envisaged for the site. The basis of the plan is to ensure that, upon completion of the plan, the facility would be in a suitable state for future industrial use and its condition would not pose a risk to public health and safety or the environment.

It is not intended to remove all structures or systems from the site. In general, specialist equipment will be decommissioned and sold, where possible, in the event of a shut down. Buildings and infrastructure will remain onsite for future users of the property.

Indaver intends to utilise existing staff resources to form a team to manage and execute the plan, supplemented where appropriate by outside resources. This CRAMP team would be responsible for managing and executing the complete plan. Outside contractors required for cleaning, waste disposal etc. will be fully approved and licensed prior to commencement.

The costs associated with decommissioning are generally related to the disposal and recycling of equipment and the use of external resources to implement the CRAMP. In certain instances, costs will be recouped through the sale of equipment or materials. (Though this has not been

taken into account in the costing assessment to ensure the overall costing is suitably conservative and robust).

As required under the new guidance, a significantly more detailed costing exercise has been completed as part of this CRAMP report. It is estimated that in the event of sudden closure a cost of approximately €3,886,988 would be incurred to decommission the site, including external resources costs.

Indaver Ireland Ltd. is part of an established European waste management organisation. The company operates and manages waste facilities in Ireland across Europe in more than 30 locations in Belgium, Germany and the Netherlands. Any decision to close the WtE facility at Meath will be taken by both management at Indaver Ireland Ltd. and its corporate entity.

Report Preparation and Guidance

This document presents a revised Closure Restoration and Aftercare Management Plan CRAMP required as part of Indaver's IE licence. This plan has been updated from the previous version submitted to the EPA in 2015 and has been prepared in accordance with the requirements of the EPA (2014) publication "*Guidance on Assessing and Costing Environmental Liabilities*".

CONTENTS

Page

EXECUTIVE SUMMARY ii

1.0 INTRODUCTION 1
- 1.1 Site Description (Activity and Context) 1
- 1.2 Scope of Work 1
- 1.3 Primary Changes Since the Previous Reports 2
- 1.4 Closure Scenarios Covered in the Plan 3
- 1.5 Key Assumptions 3
- 1.6 Disclaimer 3

2.0 SITE EVALUATION 4
- 2.1 Description of Site Processes and Activities 4
- 2.2 Inventory of Raw Materials, Products and Waste 7
- 2.3 Emissions 10
- 2.4 Waste 13
- 2.5 Nuisances 13
- 2.6 Environment Pathways and Sensitivity 13
- 2.7 Operator Performance 16
- 2.8 Tank, Drum, Pipeline and Bund Integrity Testing 18
- 2.9 Solidification 20

3.0 CLOSURe tasks and programmes 21
- 3.1 Closure Declaration 21
- 3.2 Scope of the Closure Plan 21
- 3.3 Criteria for a Successful Closure 21
- 3.4 Roles and Responsibilities during Site Closure 22
- 3.5 Procedure to Achieve the Stated Criteria 23
- 3.6 Surface Water Protection during Decommissioning 28
- 3.7 Contaminated Land Treatment, Removal and/or Disposal 28
- 3.8 Closure Plan Validation 29

4.0 CRAMP COSTINGS 31
- 4.1 Ongoing Costs 32
- 4.2 Future Proofing of Costs 32

5.0 FINANCIAL PROVISION 33

6.0 FUTURE REVIEWS OF THE CRAMP 34

INSERTS

Insert 2.1 Simplified process schematic 8

Insert 2.6 Extract from 2014 Soil Water Baseline Report Indaver…….....15

TABLES

Table 2.6 Extract from Soil Water Baseline Report - Pollutant Linkages……...15

Table 2.7 Non-Compliances 2018-2020……...17

Table 2.8 Tanks and Bunds Tested 2018-2020……19

Table 3.1 Roles and Responsibilities as part of Closure Plan ……22

Table 3.2 Summary of main equipment requiring decontamination at facility..... 26

Table 3.3 Aftercare Monitoring Plan…….30

Table 4.1 Summary of estimated closure costs 31

FIGURES

Figure 1 Site Location Map
Figure 2 Site Layout Map
Figure 3 Emissions Monitoring Locations
Figure 4 Location of Principal Chemicals Storage and Treatment Areas

APPENDICES

Appendix A Inventory of Chemicals stored On-site
Appendix B Gannt Timeline
Appendix C Detailed Costings for Facility Closure Period

1.0 INTRODUCTION

Indaver Ireland Ltd. (Indaver) commissioned AWN Consulting Ltd. (AWN) to undertake a review of their Environmental Liabilities Risk Assessment (ELRA) and Closure, Restoration and Aftercare Management Plan (CRAMP) for their Waste to Energy facility at Duleek, Co. Meath.

1.1 Site Description (Activity and Context)

Indaver's facility is designed to incinerate and recover energy from the residual fraction of non-hazardous household, commercial and industrial waste, wastewater sludges and certain hazardous waste materials. It is currently licensed to accept up to 235,000 tonnes per annum (tpa) of waste for incineration of which up to 10,000 tpa may be suitable hazardous waste types. The licensed activities are:

Category 5.2: Disposal or recovery of waste incineration plants or in waste co-incineration plants:

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour

(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

The facility activities also fall within the Scope of Annex II of Council Directive 2008/98/EC on waste under

Operation D10 – Incineration on Land and

Operation R1 – Use of waste principally as a fuel or other means to generate energy.

The facility in Duleek was initially granted a Waste Licence (W0167-01) in November 2005. Applications for revised licences were submitted in March 2009 and April 2012 and subsequently granted to allow for increased throughput, additional waste streams and operational changes (most recently W0167-03). The facility commenced the acceptance of waste in August 2011.

Following on from the implementation of the EU Industrial Emissions Directive (2010/75/EU), the EPA (herein referred to as 'the Agency') determined in December 2013 that the facility's licence should be an Industrial Emissions (IE) Licence (and no longer a Waste Licence).

This document presents the CRAMP as required by the Agency. The ELRA is presented under a separate cover (AWN Ref. CM/21/12126R02). Both documents are prepared in accordance with the 2014 EPA publication entitled *'Guidance on Assessing and Costing Environmental Liabilities'*.

1.2 Scope of Work

The scope of work for this revision of the CRAMP is principally defined by paragraphs of Condition 10 of the facility licence, which states:

10.2 Decommissioning Management Plan (DMP)

> *10.2.1 The licensee shall maintain, to the satisfaction of the Agency, a fully detailed and costed plan for the decommissioning or closure of the site or part thereof.*
>
> *10.2.2 The plan shall be revised and agreed by the Agency prior to the acceptance of hazardous waste at the installation.*

10.2.2 The plan shall be reviewed annually, and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the agreement of the Agency.

10.2.3 The licensee shall have regard to the Environmental Protection Agency Guidance on Environmental Liability Risk Assessment, Decommissioning Management Plans and Financial Provision and the baseline report when implementing Condition 10.2.1 above.

10.3 The Decommissioning Management Plan shall include, as a minimum, the following:

(a) A scope statement for the plan,

(b) The criteria that define the successful decommissioning of the activity or part thereof, which ensures minimum impact on the environment,

(c) A programme to achieve stated criteria,

(d) Where relevant, a test programme to demonstrate the successful implementation of the decommissioning plan; and

(e) Details of the costings for the plan and the financial provisions to underwrite those costs.

The scope of the work for preparation of this CRAMP included the following:

- Review of the existing CRAMP produced by AWN Consulting in 2018,
- Review of IE licence files (Ref. W0167-03) and associated correspondence with the Agency,
- Review of Annual Environmental Reports (AERs) 2018-2020,
- Quantification of costs associated with known environmental liabilities.

Based upon a review of the existing CRAMP, licence submissions, desk-top research and discussions with site management, a thorough assessment was made of liabilities associated with the closure of the site to which costs could be assigned. This assessment was completed by an independent and appropriately qualified Environmental Consultant.

1.3 Primary Changes Since the Previous Reports

A Mist-Air De-Mister was installed in 2019 to control dust and odour in three different 'zones' of the plant as outlined below:

- Bunker hopper
- Bunker
- Tipping Hall

TOC analyser units at the pond were replaced in 2020 with new units as the old equipment had reached end of life. several large items of plant equipment underwent maintenance in 2020 including the steam turbine, the superheaters and the stacks.

A new residue bagging plant is planned to be installed within the process building and is due to come into use by September 2021.

An additional storage tank for boiler blowdown water was due to be installed in 2021 but has been put on hold until Q1 2022.

1.4 Closure Scenarios Covered in the Plan

As described in Section 3 of this report, clean closure of the facility is currently anticipated. A restoration and aftercare management plan has been prepared.

This plan has been prepared based on full closure scenario only i.e., complete shutdown of all activities on site at the same time. It is not anticipated at present that the facility will be suitable for any sort of phased or partial closure. (This will be reviewed in future revisions of the CRAMP report).

1.5 Key Assumptions

It is assumed that Indaver will maintain the site in accordance with their IE Licence until closure. Future revisions of this document will account for any significant changes in the environmental condition of the site and/or changes in the facility operations. No provision has been made for costs associated with any legal proceedings that could arise relating to closure as there is goodwill and a strong desire by Indaver to remain compliant with relevant legislation and the Agency's licensing requirements and ultimately to achieve clean closure.

Successful decommissioning will be determined as being complete when all equipment, wastes or any other materials that could result in environmental pollution are removed from site and recycled, recovered, or disposed of, in accordance with the relevant regulations at that time. This CRAMP will result in a decommissioned and decontaminated site suitable for future industrial use. Buildings and site services, whilst emptied and cleaned as part of the decommissioning, will remain in place after final closure.

Any gas, water, communication, or electrical installations at the site will be maintained or decommissioned by the relevant service provider following closure. It is anticipated that this will depend on whether future occupiers of the site are in place at the time of closure.

1.6 Disclaimer

This report is based on information supplied by Indaver to AWN. This report has been prepared for the use of Indaver only and for submission to the Agency. Specified costs are based on best estimates within the marketplace at the time of submission and will vary with time.

2.0 SITE EVALUATION

The Meath WtE facility is located on the R152 Drogheda to Duleek road in the townland of Carranstown, approximately 3km north-east of Duleek in Co. Meath. The land use in the area is predominantly agricultural with the exception of the Platin Cement Works, and its associated quarry, which is located approximately 300m to the north-west. The south-eastern boundary of the site runs along the R152 secondary road between Duleek and Drogheda and a commercial freight railway line runs close to the north-westerly boundary. The lands to the north-east and the south-west are agricultural. The closest businesses and residents are located across the R152 main road to the south-east and adjacent to the site to the north-east.

A site location map including the surrounding areas is presented in Figure 1 at the end of this report.

The topography of the area is generally quite flat with a slight increase in elevation towards the north and north-west. There is a high-pressure natural gas pipeline crossing the site underground from east to west and overhead 110kV power lines cross the site near the weighbridge. There is also a low-pressure gas main line which runs along the R152 road in front of the facility. The site lies in the catchment of the River Nanny which runs approximately 2km south of the facility and discharges into the Irish Sea at Laytown. There are a number of small drainage ditches in the area which flow into the River Nanny and these are typically dry in summer months.

Indaver Ireland is part of the Indaver Group which operates and manages waste facilities across Europe in more than 30 locations in Ireland, Belgium, Germany, and the Netherlands. In Ireland, Indaver also operates a hazardous waste disposal and recovery facility at Dublin Port. The Meath WtE facility is currently licensed to accept up to 235,000 tpa of waste for incineration (of which 10,000 tpa may be hazardous waste) and can generate up to 21MW of electricity from heat generated by the process. The facility is also licensed to accept up to 2,000 tpa of waste in a residue solidification plant. The site was developed from a green field in August 2008 and occupies an area of approximately 10 hectares, of which, less than half is currently covered by buildings. There are currently 40 Indaver employees at the facility.

2.1 Description of Site Processes and Activities

An inventory of facility buildings/areas is presented below. Main process building, incorporating:

  - Waste processing areas
  - Control room
  - Flue Gas Treatment and Abatement
- Administration Offices,
- Building housing the air-cooled condenser,
- Contractors compound/building,
- Workshop area,
- Warehouse (formerly temporary now made permanent),
- Transformer compound and ESB substation with emergency generator,
- Security building with weighbridge,
- Water storage tank and pump house,
- Solidification plant.

The primary structure on site is the main process building where waste is received and incinerated. There are several ancillary structures around the main building to support the main site activities. Most of the site is covered in concrete or tarmacadam hard standing with approximately 2 hectares of grass and/or vegetation cover. There is one main access road from the site entrance leading past the staff carpark and the weighbridge to the tipping hall at the western end of the main process building. There is also a one-way route which continues around the main building to facilitate access to the building and ancillary services.

The site layout is provided in Figure 2.

2.1.1 Main Process Building

The main process building is a large structure comprised of different elements in series to facilitate receiving and incineration of waste and manage the process by-products. The building is approximately 160m long, 40m wide at the widest point and 40m high at the highest point. There is a venting stack at the eastern end of the site which is 65m high.

Waste materials are transported to the site Monday to Saturday by waste contractors. On entering the site, waste contractors follow a route to the tipping hall where inspections of the waste are carried out on a routine basis by Indaver. In the tipping hall, waste is deposited into the waste bunker where it is mixed by a grab before being placed into the hopper that feeds the furnace. In the furnace, waste is incinerated at temperatures more than 850°C.

The combustion gases from the incineration process pass through several treatment stages. These include two stages of dosing for acid removal (lime milk and lime) and two stages of dosing for dioxin removal (expanded clay and activated carbon), before passing through filter bags and being discharged to atmosphere via the stack. The emissions to air are monitored continuously and the results are fed back to the control room for the facility where the levels of dosing can be adjusted accordingly.

A schematic of the waste incineration process is provided in Insert 2.1.

The primary facility processes and activities are summarised as follows:

Inputs:

- Waste material feed
- Chemicals
    - Quicklime
    - Hydrated Lime
    - Expanded Clay
    - Activated Carbon
    - Ammonia Solution (25% v/v)
- Electricity (imported from national grid and on-site generation)
- Diesel
- Water

Unit Operations:

- Waste receiving, offloading and inspection
- Waste mixing/blending
- Hopper feed to furnace
- Waste incineration
- Ash collection

- Metal recovery
- Ammonia solution injection
- Combustion gas treatment
- Turbine operation for electricity generation
- Direct injection of aqueous wastes

Outputs:

- Waste disposal/recovery
  - Bottom Ash
  - Boiler Ash & FGR solidified blocks
  - Ferrous Metals
  - Non-Ferrous Metals
  - Aqueous liquid wastes
  - Septic tank sludge
  - Wood waste
  - C&D waste
  - WEEE waste
- Electricity

The facility is licensed to accept waste materials from 07:00-18:30 Mon-Fri and 08:00-14:00 on Saturday, while the incineration plant is licensed to operate 24 hours per day, Monday to Sunday inclusive.

2.1.2 Ancillary Facilities

There is an office block located to the front of the main process building which comprises the main administration operations of the facility.

Storage Areas

Diesel (44m^3 with operating capacity of 40m^3) and ammonia solution (62m^3) are stored on site in above ground storage tanks at the rear of the facility next to the air-cooled condenser building. Both substances are stored in double skinned tanks with leak detection and over-fill protection in the form of level switches/interlocks. There is a drainage channel at the designated ammonia solution and diesel unloading area which leads to a 10,000-litre forecourt separator where spills can be contained. There is also a diversion to a 2.5m^3 holding tank which is engaged during filling operations. Smaller quantities of diesel are also stored in tanks for operation of fire water pumps (3 x 0.8m^3 tanks), emergency generator (9m^3 tank) and filling of the front loader (1.5m^3 Tank).

Hydrated lime (150m^3), quicklime (115m^3), activated carbon (80m^3) and expanded clay (80m^3) are stored in silos within the main process building.

All other hazardous materials on site are stored in small quantities (i.e. drums, IBCs etc.) in individual bunds on paved areas. Small quantities of hazardous liquids for maintenance and contractor use are stored in the spare parts warehouse in dedicated storage units with integrated bunding.

There are three different types of waste ash generated at the facility. Bottom ash is stored in a 1,600m^3 ash hall. Ash from the boiler is stored in a silo of 122m^3 capacity. Flue gas cleaning residue is stored in two silos which have capacity of 236m^3 each. (Storage time for each ash and residue stream is generally 7-10 days but variable). The boiler ash and FGR will be treated in the solidification plant and transported offsite for use in the stabilisation of salt mines.

Bottom ash is transported offsite for disposal or reuse in landfills.

There is a water storage tank on site, mainly used for fire water storage, with a total capacity of 2,185m^3. The tank is located at the north-western corner of the main process building. The underground fire water retention tank has a capacity of 300m^3.

There are two underground recovery tanks (50m^3 capacity each) which collect water from the internal drainage system. The water collected in these can be removed for treatment, if required, or reused within the treatment process.

There are skips on site for the storage of waste from the process which may be moved to offsite treatment facilities e.g., WEEE, C&D, Timber. There are also curtain siders on the site which have the solidified material from the solidification plant prior to shipping off site. There is a double skinned tank for aqueous liquids awaiting injection and storage space for 3 road tankers for aqueous liquids also.

Utilities

Water for domestic use in the offices is provided from the local mains supply and consumption is estimated at 1m^3 per hour (based on facility water balance). Process water and firewater are supplied from two abstraction wells drilled on the site.

The plant uses diesel at start up and shut down to bring the furnaces to the required operating temperature. Diesel is also required, on occasion, as a supplementary fuel to maintain the temperature in the furnace, if waste of an exceptionally low calorific value is received. Diesel is also used to power the emergency back-up generator on site, the site fire water pumps, and the waste loading machinery.

Electricity is generated on-site from the thermal energy produced by the combustion of waste. A small portion of this electricity is used to power the plant with the remainder exported to the national grid. During short plant process shutdown periods, electricity is imported from the grid to power the site.

Spare Parts Warehouse

There is a warehouse at the eastern end of the main process building which is used to store maintenance equipment, spare parts, and contractor equipment on-site. This warehouse is also used as a workshop as needed for general site maintenance.

Wastewater Treatment

All effluent generated from toilets, showers and utility areas is collected in a domestic type of effluent collection system. All effluent is passed through a septic tank and secondary treatment system (Puraflo) before being discharged to the percolation area. The wastewater treatment area is located adjacent to the office block.

A second smaller effluent collection and discharge system is provided at the site security building.

2.2 Inventory of Raw Materials, Products and Waste

An inventory of the primary raw materials, products and wastes for the site along with storage capacities and details are provided in Appendix A.

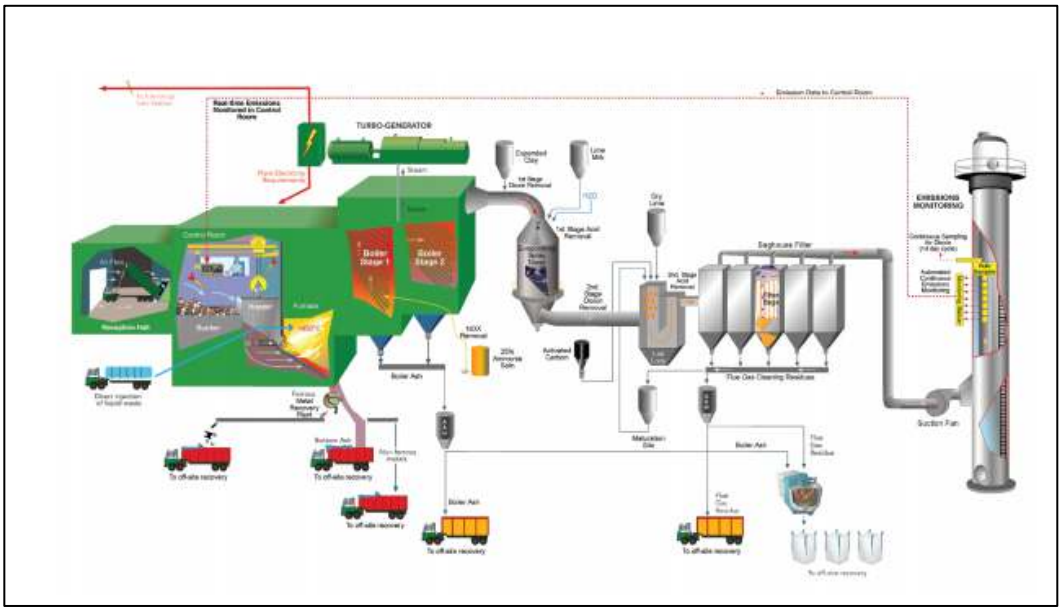
2.2.1 Unit Operations

The WtE plant consists of several main processes and items of plant as follows:

- Waste Reception
- Moving Grate Incinerator

- NO_x – Ammonia Solution Injection
- Waste Heat Boiler
- Turbine
- Evaporating Spray Reactor
- Activated carbon or lignite coke & Baghouse Filter
- Wet Scrubber
- Ash Handling
- Emissions Monitoring Station
- Solidification plant

A simplified schematic of the overall incineration process flow is shown below in Insert 2.1.



Insert 2.1 *Simplified process schematic.*

Waste Reception

All trucks entering the site report to the weighbridge, where they present documentation to staff in the gatehouse and are weighed. Details on all waste entering the facility will be recorded in a tracking system. Deliveries are only accepted at the facility from authorised carriers holding relevant waste collection permits.

Trucks then drive to the enclosed waste acceptance hall and discharge loads into the bunker through one of the five discharge chutes. Liquid wastes are pumped directly into the furnace. Frequent inspections of waste take place in the reception hall to ensure all waste is in compliance with the facility's waste acceptance criteria. Any nonconforming waste is consigned to a waste quarantine area in the service yard where it is held until alternative disposal arrangements are made.

Operators located in the control room overlooking the bunker screen and mix the waste using overhead grab cranes. The blended waste is fed to the highest point in the furnace via hoppers and forms a plug that isolates the furnace from the bunker. The reception hall is enclosed and maintained under negative pressure to ensure there are no odour or litter emissions. The bunker has a typical maximum capacity of c.7,111

tonnes, which facilitates the storage of waste for a continuous feed of fuel to the furnace outside of waste acceptance hours. The average retention time of the waste in the bunker is approximately three days.

Moving Grate Furnace

The waste in the hoppers is fed to the furnace at a controlled rate by feeding rams. The furnace consists of a grate mechanism, which promotes the complete and efficient combustion of waste through slow and continuous movement, mechanical breakup and effective air distribution. The combustion of waste on the grate produces both gases and solid residues. The gases pass into a post-combustion chamber situated over the grate, where further combustion takes place. Bottom ash is discharged at the end of the grate into a water bath or 'wet de-slagger'.

The average residence time of waste in the furnace is approximately one hour. Oxides of nitrogen (NO_x) are treated using Selective Non-Catalytic Reduction (SNCR). This involves injecting an SNCR reagent (ammonia solution) at two levels into the post-combustion chamber. The control system in the furnace monitors a range of parameters and makes adjustments to the process to ensure complete combustion and that emissions limits are met.

Boiler

The boiler immediately follows the furnace and has been designed to recover energy from hot flue gases to produce steam. In the process, the flue gases are cooled from about 950°C to about 190°C. The total residence time of gases in the boiler is approximately 30 seconds.

In order to comply with the Industrial Emissions Directive 2010/75/EU, the boiler is designed to ensure that flue gases are maintained at 850°C for at least two seconds after the last air/fuel injection. Auxiliary burners are used where necessary to ensure these conditions are met, for example during start-up. The burners are not required during normal operation. The velocity of gases in the boiler is controlled to minimise dioxin formation and promote the deposition of boiler ash into a hopper for removal.

Electricity generation and Steam Cycle

Steam from the boiler at 40 bar and 400°C is sent to the steam turbine, which drives a generator set to give an electrical output of approximately 21MW. Only about 2MW of this is required for use within the plant with the remaining 19MW available for export to the national grid.

To maximise energy recovery, steam leaving the turbine is maintained at extremely low pressure by an air-cooled condenser. Using air cooled condensers rather than cooling water reduces water consumption and avoids water discharge. The flow of steam through the cycle is approximately 82 tonnes per hour at 100% load. A small quantity of water is purged constantly from the steam cycle and replaced with fresh make-up water from a water purification (demineralisation) plant. This 'boiler blow-down' is recycled within the process plant.

Flue gas treatment system

The flue gas treatment system is designed to ensure emissions from the stack are well below limits set by the IED Directive 2010/75/EU. The system has been designed to produce no effluent and to minimise the consumption of water, reagents and energy. The key stages of the treatment system include:

- A first dioxin removal stage, where expanded clay (dioxorb) is injected into a duct at the outlet of the boiler. Any dioxins and heavy metals are adsorbed into the clay for removal in the bag-house filter downstream.
- A spray drier absorber, which cools flue gases and injects lime milk to react with acid gases such as HCl and SO_2. This forms reaction salts, which are also removed in the bag-house filter downstream.
- A second stage dioxin removal and acid gas treatment, which takes place in a reaction duct with the injection of activated carbon, recirculated and reactivated reagent from the bag-house filter and hydrated lime absorbent (where necessary). This ensures that any remaining pollutants are captured.
- A high-performance bag-house filter to trap dust and heavy metals. The residue is shaken off the filters into dust collection hoppers. As it still contains some unreacted lime, most of it can be reactivated and recycled into the maturation silo to minimise the amount of residue going for disposal.
- An induced draught fan and a stack equipped with continuous emissions monitoring systems. The fan maintains the flue gas system under constant pressure to ensure that all gases pass through the system. Treated gases will then leave the 65m high stack at a temperature of ~140°C. The flue gas treatment system will be controlled using parameters measured at the stack, and at the boiler exit.

Residues Handling

Solid residues are collected from three different process areas including:

- Bottom ash and grate siftings from the grate furnace. This constitutes the bulk of residue from the facility at circa 15.2% of waste input by weight or 34,700 tpa.
- Boiler ash from the boiler ash hopper. This constitutes about 0.8% of the waste input by weight or 1,900 tpa.
- Flue gas treatment residues from the spray drier absorber and bag-house filter hoppers. This constitutes about 4.3% of the waste input by weight or 9,800 tpa.

The bottom ash and grate siftings are passed over a sieve to separate out oversized ash particles (c.800 tonnes per annum or 0.35% of waste input). Approximately 3,840 tpa of ferrous metals and 720 tpa of non-ferrous metals are also separated out for recycling. The Flue Gas Residues (FGR) and boiler ash will be pre-treated in the solidification plant. The FGR and boiler ash will be mixed with water and the mixture will be bagged. It will then be compressed in a mould to for solid blocks. The blocks will be subject to hardness testing and then transported from site.

2.3 Emissions

A site layout map identifying the locations of all emissions and monitoring points is included in Figure 3.

2.3.1 Air Emissions

Main Emissions

There is only one point source emission from the 65m high stack through which treated flue gases are discharged (reference A1-1). The flue gases consist primarily of CO_2 and water vapour but may also contain a number of substances regulated by legislation. The parameters required to be monitored at the stack discharge are:

- Total dust,
- PM_{10} and $PM_{2.5}$,
- Gaseous and vaporous organic substances, expressed as total organic carbon (TOC),
- Hydrogen chloride (HCl),
- Hydrogen fluoride (HF),
- Sulphur dioxide (SO_2),
- Oxides of nitrogen (NO and NO_2 expressed as NO_2),
- Nitrous oxide (N_2O),
- Cadmium (as Cd) and thallium (as Tl) and their compounds,
- Mercury (as Hg) and its compounds,
- Antimony (as Sb), arsenic (as As), lead (as Pb), chromium (as Cr), cobalt (as Co), copper (as Cu), manganese (as Mn), nickel (as Ni) and vanadium (as V) and their compounds,
- Dioxins/furans, and
- Carbon monoxide (CO).

CO, Total dust, TOC, HCl, SO_2 and NOx are required to be monitored on a continuous basis with the remaining parameters monitored on a quarterly or biannual basis by an external contractor.

Minor Emissions

There are no minor emission parameters required to be monitored under the Waste Licence.

Fugitive Emissions

To limit fugitive emissions from the facility, the main process building is maintained under negative pressure. The storage, treatment and handling operations for waste, consumables and residues are carried out in enclosed environments with filters or closed loop loading systems fitted where necessary. The storage area for consumables, boiler ash and flue gas treatment residues are isolated from the main process building to contain any emissions that may arise from this area.

Odour Emissions

There are no significant odour emissions from the facility. An odour impact assessment found that all predicted ground level concentrations are lower than the recommended EPA limit even during a worst-case meteorological year.

2.3.2 Emissions to Sewer

There are no emissions to sewer from the facility. All sanitary effluent from staff and visitor facilities is treated on-site in a Puraflo treatment system, which discharges treated effluent to ground as described below.

2.3.3 Emissions to Ground

There are currently only minor emissions to ground of treated sanitary effluent from the foul drainage system. The Puraflo system (one at each of the main admin block

and security buildings) provides a combination of physical, chemical and biological treatment of the wastewater in a biofibrous medium.

There will be no fugitive or uncontrolled emissions to ground or groundwater.

2.3.4 Site Drainage

The drainage system for the site can be divided into three independent systems:

- Storm-water drainage system from roofs and outdoor hard-standing areas,
- Process building indoor drainage system, and
- Domestic type effluent system.

All stormwater collected in the storm-water drainage system is monitored continuously for pH, TOC and conductivity and passes through a Class 1 by-pass petrol interceptor before passing to the surface water attenuation pond or, in the case of an emergency, the firewater retention tank. From the surface water attenuation pond, water is pumped to the hydrobrake which flow to the outfall from the site. The drainage channel located at the delivery area for the ammonia solution tank and diesel tank leads to a 10,000-litre forecourt separator before joining the surface drainage system to the petrol interceptor. The monitoring points in the surface water drainage system are in monitoring chambers after the petrol interceptor and before the outfall sump pump.

If, after passing through the petrol interceptor, any surface water levels (pH, conductivity or TOC) are outside the set parameters, the diversion valve to the firewater retention tank closes automatically. Water that is contained in the firewater retention tank is tested and depending on the results, tankered to the internal drainage recovery tanks for reuse in flue gas cleaning process or removed form site for treatment or disposal to an appropriately licensed facility.

The outfall pump for transferring the water from the surface water attenuation pond to the drainage ditch can be de-activated automatically if surface water levels are outside the set parameters or remotely from the control room if any contamination in the surface water is detected or the fire alarm is triggered. The firewater retention tank has a total capacity of 300m^3 and in the event of this capacity being exceeded, the system will overflow to the surface water attenuation pond and be contained there.

The process building indoor drainage system collects water from internal areas and drains to the internal drainage recovery tanks (2 X 50m^3) where the water can be removed for treatment or reused within the treatment process.

The domestic effluent system is described previously above.

2.3.5 Noise Emissions

There are six potential sources of continuous noise, all from process equipment at various points in the plant. The stack, air cooled condensers and turbine coolers are the most significant continuous sources of noise as they are located externally.

Traffic noise assessments have found site traffic to have little impact on overall noise in the locality and is therefore not considered to be a significant emission.

Annual noise monitoring is carried out at four locations outside the site boundary as identified in Figure 3. The 2018 - 2020 AERs concluded that noise emissions have a minimal impact on the local environment.

The 2020 noise assessment was completed and was in line with previous years assessments. The 2021 noise assessment is planned for August 2021.

2.4 Waste

Waste materials are accepted at the facility as feedstock for the incineration and energy recovery processes. The facility is permitted to accept a maximum of 235,000 tonnes of industrial, commercial, and household non-hazardous waste per annum, which may include up to 10,000 tpa of suitable hazardous wastes. There are several suitable hazardous waste streams which may be included in the process feedstock. The list of licensed waste types along with their corresponding European Waste Catalogue (EWC) numbers are presented in the facility IE licence.

A dedicated waste inspection area is provided in the reception hall to facilitate the regular inspection of waste loads from new and existing contractors. The inspection area drains to the bunker. Any non-conforming waste is loaded into suitable covered containers or trucks, which are consigned to a designated waste quarantine area. The quarantine area is located in the service yard away from the main activity areas. The trucks or containers are held in this area for a short period to allow the waste contractor time to make alternative disposal arrangements, if necessary. All refused loads of waste will be recorded.

Wood, iron, steel, soil and stones and mixed construction and demolition wastes were collected from the facility by suitably permitted and licensed operators for recovery at licensed facilities. Ferrous metals and non-ferrous metals taken from the bottom ash are recovered by suitably permitted and licensed operators.

Bottom ash generated at the facility has been classified as non-hazardous and consists mostly of inert materials such as glass, sand, metal pieces and stones. Approximately 3,840 tpa of ferrous metals and 720 tpa of non-ferrous metals are also separated out for recycling. Bottom ash is currently being sent to non-hazardous landfills.

FGR and boiler ash are classified as hazardous and are currently sent for re-use in the remediation of salt mines in Germany. Once the Solidification plant is operational the FGR and boiler ash will be processed on site prior to shipment off-site.

2.5 Nuisances

To limit nuisances such as vermin, dust emissions and litter, all deliveries, handling and storage activities take place in fully enclosed environments. The main process building is maintained under negative pressure and the facility is always kept clean and tidy. Specialist vermin control contractors are engaged to provide vermin management services. Roads, parking areas and service yards are paved and therefore minimise the potential for the generation of dust. Measures for limiting the impact of traffic movements on the road network include road widening, the provision of a ghost island junction to facilitate a turning lane and a 25km/h site speed limit.

2.6 Environment Pathways and Sensitivity

2.6.1 Geology and Hydrogeology

The geology at the site has been determined primarily from boreholes and trial pits undertaken in 2001 by Project Management as part of the project EIS. According to the report, the site is underlain by predominantly boulder clay type soils which are generally poorly drained in nature. The soil layer thickness varies across the site, ranging from 5m deep in the west of the site to >20m depth near the centre.

The hydrogeological study carried out for the EIS determined that the site is underlain by a thick deposit of low permeability brown silty clays. The limestones found beneath the site are part of the Platin Formation which has been classified by the GSI as a regionally important diffuse karst aquifer with good development potential.

The online GSI mapping database ranks the site as having moderate vulnerability due to the thickness and type of overburden cover present at the site. The EIS identified that the groundwater flow beneath the site is influenced by a cone of depression centred on the Platin Quarry excavation works located nearby. Prior to the quarry development, the groundwater flow beneath the WtE facility would have been towards the River Nanny and in a general south-easterly direction. The groundwater flow beneath the site has been reversed and is now moving north-west towards the nearby quarry due to the lowering of the water table within the excavation.

The site lies within the River Nanny catchment basin. The River Nanny rises in the south-east of Co. Meath and flows through Duleek towards Laytown where it discharges to the sea. The River Nanny is located approximately 2km south of the site and surface water in the vicinity of the site drains naturally towards the river.

The EIS identified that groundwater is extensively used by the local community as a source of water supply with 22 recorded wells within 3km of the site.

2.6.2 Environmental and Ecological Designations

The River Boyne and river Blackwater Special Area of Conservation (SAC) (Site ref. 002299) is located, at its closest, approximately 5km to the north-west of the site. Duleek Commons (Site ref. 001578) is located approximately 2km to the south-west and is a proposed Natural Heritage Area (pNHA).

The Boyne Estuary Special Protected Areas (SPA) (Site ref. 004080), River Boyne and river Blackwater SPA (Site ref. 002299) and River Nanny Estuary and Shore SPA (Site ref. 004518) are located nearby and are designated for the protection of endangered species of wild birds. There are a variety of wintering bird species of identified in the area.

As part of the environmental assessments prepared in advance of the licensing and planning applications for the facility, mitigation measures to protect local Bat species have been employed. Bat boxes are provided on suitable trees surrounding the site and these are checked and maintained regularly.

As outlined in the facility license, it has been determined '*that the facility does not have the potential for significant effects on any European site due to the nature and scale of the waste to energy plant operations and the distance between the installation and the designated sites'*.

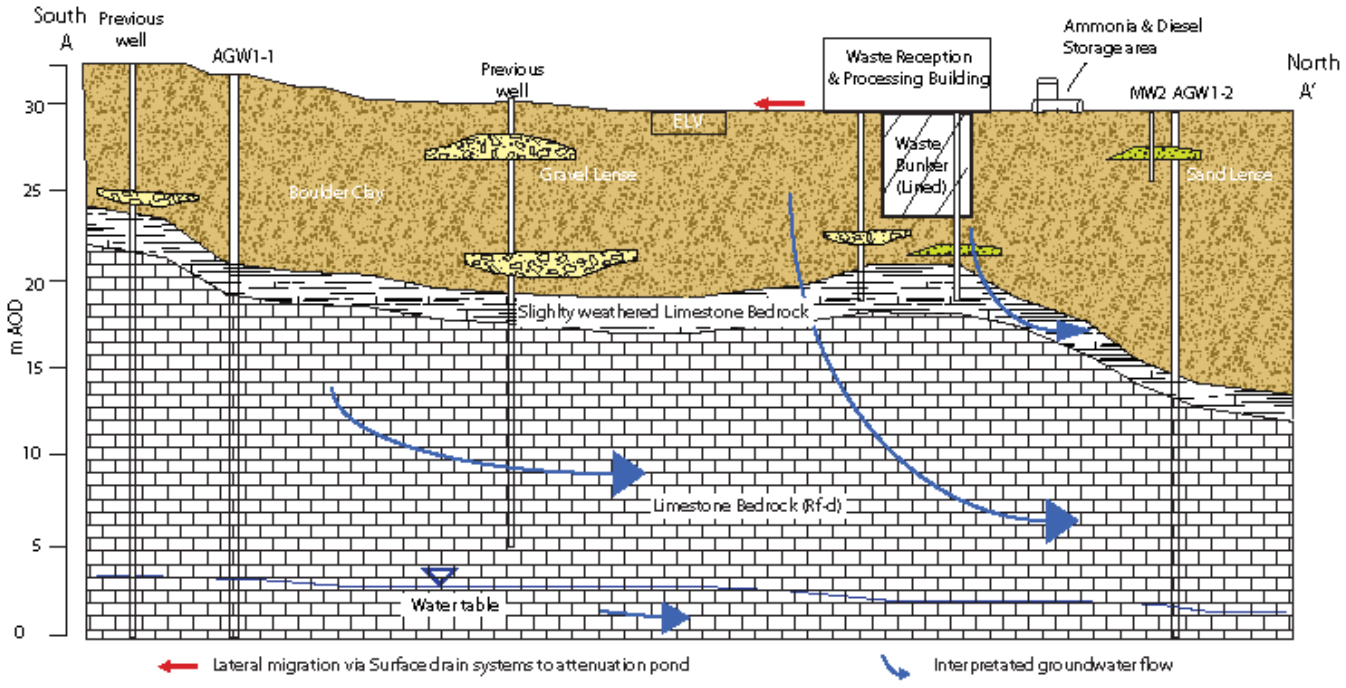
2.6.3 Source Pathway Receptor Assessment

As part of the 2014 Soil Water Baseline assessment detailed further under Section 2.7 below, a source pathway receptor assessment was conducted. The pollutant linkages based on the primary sources of possible contaminants on site are summarised in Table 7.1 (extracted from the baseline report below). This CSM was presented on the basis that contamination following a leak/spill is not mitigated by the extensive mitigation measures operating at the site.

Source	Pathways	Receptor
Ammonia and/or Diesel Fuel Spill or leakage impacting lands outside containment area. Tanker leakage impacting area outside of site drainage area.	Vertical and lateral migration via fill and boulder clay to underlying limestone bedrock. Lateral migration via groundwater within the bedrock aquifer Lateral migration via drainage system	Limestone Bedrock Aquifer Abstraction Wells at Platin Drainage ditch and Nanny tributaries.

Table 2.6 Extract from Soil Water Baseline Report - Pollutant Linkages

The CSM from the report is also presented below.



Insert 2.6 Extract from 2014 Soil Water Baseline Report - Conceptual Site Model for Indaver (June 2014)

2.7 Operator Performance

2.7.1 Environmental Management System

Indaver have an integrated Quality, Environmental and Safety & Health (QESH) management system. In June and December 2020 Indaver Ireland/UK successfully passed a re-assessment audit to ISO 9001:2015, ISO 14001:2015 and completed a full upgrade to a new standard ISO 45001:2018. Both audits were passed with only positive comments, with no non-conformance, or observations, noted.

The objectives and targets for the facility are set out in the Indaver Goals and Plan Book Action (part of Indaver's Environmental Management Programme agreed with the Agency in 2012). Actions are added and closed on an ongoing basis and further details of these are included in the AER for the facility.

2.7.2 Compliance and Enforcement History

There were 5 environmental complaints registered in 2018, all were related to odour. Only 2 of these were attributable to our activities. A full site odour investigation was conducted in 2019 by an external consultancy and the report was submitted to the Agency.

There were 33 complaints received in 2019 regarding a sulphur type odour and 1 complaint was received regarding a waste odour. Following a full investigation by independent consultants, the sulphur type odour was found to not be attributable to Indaver's activities and is now closed (COM008710). The waste odour was found to be attributable to Indaver's activities, and a full root cause analysis was conducted internally and appropriate actions have been taken and this complaint is now closed (COMPASS ID 332). 2 complaints were received relating to noise, and following investigation, both were found to not be attributable to Indaver's activities and are now closed (COM009684). 1 complaint was in relation to a concern over local air quality, and following investigation, it was found to not be attributable to Indaver's activities and is now closed (COMPASS ID 324). 1 complaint was in relation to a sighting of a rat, and this was closed out as it was noted in the original environmental impact statement that there were rats inhabiting the area prior to the construction of the facility, as the surrounding landscape is rural and agricultural (COMPASS ID 169).

There were 11 odour complaints were received in 2020. Of the eleven-complaints received, four were not attributable to Indaver's activities. The seven which were attributable were investigated and measures were put in place to stop the odours. There is an engineering project underway at the facility trialling ventilation and odour suppression systems in the waste bunker. The sensitive neighbours and the EPA were made aware of the trials before they took place and the complaints were anticipated. Three waste odour complaints were received from neighbours during the trials, and the conditions under which the complaints were received were fully investigated. The root causes were identified and are being used by the project team to engineer permanent solutions to eliminate future odour complaints.

The EPA requested an odour investigation in response to an EPA request into an odour complaint. The complaint was fully investigated using dispersion modelling, odour surveys, olfactometry and emission analysis both inhouse and by three independent consultants – AWN, Katestone Environmental and Element Materials Technology – and was found not to be attributable to Indaver's activities and was closed out by the EPA in early 2020.

One noise complaint was received in 2020 which was not attributable to Indaver's activities.

One odour complaint, and one noise complaint were received in 2021, neither of which were attributable to Indaver's activities.

To date in 2021 there has been one reportable incidents and one non-compliance issued by the EPA in 2021. It is concluded that the facility continues its good relationship with the local community as evidenced by the generally low number of complaints.

The numbers of non-compliances for the site over the previous years is shown below:

Year	No. Of Non-Compliances
2021	1
2020	0
2019	2
2018	2

Table 2.7 *Non-Compliances 2018-2021*

2.7.3 Soil and Water Baseline Study

In June 2014, AWN Consulting prepared a Soil and Water Baseline study for the facility in order to meet Indaver's licensing requirements under the Industrial Emissions Directive. The report concluded that the site is underlain by c. 8 meters of generally low permeability glacial till which provides a moderate amount of protection to the underlying regionally important karstified and fractured aquifer. Receptors include the aquifer, groundwater abstraction wells and drainage ditches which feed tributaries of the Nanny River. Dewatering for Platin Quarry controls the local groundwater flow direction.

A review of soil quality from the 2000 baseline and geotechnical assessment and additional data collated in 2014 confirm that there is no evidence of significant soil or groundwater contamination at the site. Compliance groundwater monitoring since the plant commenced operation in 2011 has also been reviewed and again there have been no exceedances that suggest soil or groundwater contamination has occurred due to the operation of the site. Chloride levels though not exceeding guidelines are elevated above typical background concentrations suggesting previous impact by the historical use of the site for agricultural grazing.

Ammonium Hydroxide (NH_4OH) Solution, Diesel, FGR and Boiler Ash were identified as hazards present at the site which have the potential to impact soil and groundwater if not adequately mitigated during storage and operation at the plant. However, the risk prevention measures present at the Indaver facility significantly reduce the potential for an environmental impact to soil or water to occur. These measures include fire-fighting systems, drainage and containment systems and spill procedures.

Groundwater well AGW1-2 exhibited an upward trend for chloride in the period October 2016- August 2017, but levels remained below warning levels onsite. An investigation was conducted however, no onsite process activities were identified as a potential source of elevated chloride levels at well AGW1-2. The likely source was deemed to be a failure of the foul sewer line in close proximity to the well, which failed hydrostatic tests. Indaver prepared a work order (Ref. 5295928) to repair the foul water line. The chloride trend has now reduced.

A trend of elevated chloride concentrations was noted in three of the licenced groundwater monitoring points beginning in May 2016. The EPA requested that Indaver investigate the possible source of these elevated levels. Following

investigation by AWN Consulting in 2019 including a desktop review of historical chloride concentrations, a review of onsite storage and use of chemicals and an onside hydrogeological investigation, it was found that there were no plausible anthropological contaminant sources within the Indaver site boundary. It was recommended to continue monthly sampling onsite to monitor trends.

2.8 Tank, Drum, Pipeline and Bund Integrity Testing

Pipeline testing is carried out on a schedule as required by the licence.

Tank and bund integrity testing is carried out on a schedule as required by the licence. All tanks and bunds tested in the last three years have passed the integrity tests. A full list of the underground tanks with their use and size is included in Table 2.8. Testing on two bunds (one underground and one chemical storage cabinet) are scheduled for August 2021 in line with the testing schedule.

Pipeline testing is carried out on a schedule as required by the licence. Foul and process underground pipeline testing was due to take place in November 2020 but was rescheduled to 2021 as the annual maintenance shutdown had been delayed from May until November due to COVID19, and the testing could not take place while the maintenance shutdown was taking place.

The process underground pipeline testing identified two failures; the pipeline from Manhole T6.00 to Manhole T4.02 and Manhole no. T4.02.

The foul underground pipeline testing identified five failures; one pipeline from Manhole AJ1 to Manhole AJ2 and four Manholes including F1.00, F1.01, F1.02 and F2.00.

A quotation for the repairs to the pipelines mentioned above have been accepted and repairs and retests have been scheduled for Quarter 3 2021.

	Tank	Description	Above/Under Ground	Indaver Bund Tag ID	Test Type	Tank Construction Detail	Contains	Use	Capacity	Pipe Leak detection system	Last Test Date	Next SAP Call(Audit)	Confirmed Certs
1	y	Main diesel tank	Above ground	UYA99-BB001	Visual + Leak Detection	Hot Rolled Steel BS EN 10025-2:2004	Diesel	Diesel Oil for Aux Burners	44m³	Welded Pipework with 1 Flange (12m Insp.)	25/10/2019	25/10/2022	ok
2	y	3 * diesel for pump house	Above ground	UYA99-BB002	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/10/2022	ok
3	y	3 * diesel for pump house	Above ground	UYA99-BB003	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/10/2022	ok
4	y	3 * diesel for pump house	Above ground	UYA99-BB004	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/09/2022	ok
5	y	Back up diesel generator tank	Above ground	UYA99-BB005	Visual + Leak Detection	Mild Steel 42A	Diesel	Containment for Deisel Spill	7.5m³	N/A	27/02/2018	20/08/2021	
6	n	T1 bund under electrical rooms	N/A	UYA99-BB006	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
7	n	T2 bund under electrical rooms	N/A	UYA99-BB007	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
8	n	T3 bund under electrical rooms	N/A	UYA99-BB008	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
9	y	Underground recovered water pit (Dirty Water Pit)	Underground	UYA99-BB009	Water Test	PreCast Concrete	Contaminated Water	Containment for washings from process area & secondary containment for tanker unloading Area	50m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
10	y	Underground recovered water pit (Clean Water Pit)	Underground	UYA99-BB010	Water Test	PreCast Concrete	Boiler Blow Down Water	Containment for rejected Demin Water & boiler blow down	50m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
11	y	Underground retetion tank beside the pond/Fire Water Retention tank	Underground	UYA99-BB011	Water Test\Hydrostatic Testing	PreCast Concrete	Surface Water	Fire Water Retention Tank & Diverted Surface Water	3000m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
12	n	Nitric acid spill containment	N/A	UYA99-BB012	Water Test	Mild Steel	Empty	Containment for Nitric Acid	1.2m³		25/10/2019	25/09/2022	ok
13	y	Ammonia solution Tank	Above ground	UYA99-BB013	Visual + Leak Detection	Stainless Steel ASTM-A240-304	Ammonia	Containment for Nitric Acid	66m³	Welded Pipework with 1 Flange (12m Insp.)	25/10/2019	25/09/2022	ok
14	n	Bund Tray in Chemstore Unit for Warehouse	N/A	UYA99-BB014	Water Test	Chemstore	Empty	Contrainment for Chemical Liquids	1m³		01/07/2020	01/06/2023	ok
16	y	2.5m3 Storage tank Ammonia Slab area	Underground	UYA99-BB016	Visual + Leak Detection	Reinforced Mass Concrete	Empty (Spill Containment Only)	Contrainment for Chemical Liquids	2.5m³		01/07/2020	01/06/2023	ok
17	n	T41 Transformer Compound in Sub Station	N/A	UYA99-BB017	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	8m³		25/10/2019	25/09/2022	ok
18	n	New Chemstore-2nd Unit for Maintenance	N/A	UYA99-BB018	Water Test	Mild Steel	Empty	Contrainment for Chemical Liquids	1m³		17/08/2018	20/08/2021	
19	n	T4 Bund at Warehouse	N/A	UYA99-BB019	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.3m³		25/10/2019	25/09/2022	ok
20	n	New Chemstore - Oil Storage	N/A	UYA99-BB020	Water Test	Mild Steel	Misc	Containment for Chemical Liquids	.5m³		01/07/2020	01/06/2023	ok
21	n	New Chemstore - Tipping Hall	N/A	UYA99-BB021	Water Test	Mild Steel	Misc	Containment for Chemical Liquids	.5m³		01/07/2020	01/06/2023	ok
22	n	Nitric Atomiser Disk Cleaning bath	N/A	UYA99-BB022	Water Test		Nitric Acid	Containment for Nitric Acid	.8m³		24/01/2019	25/09/2022	ok
23	n	Nitric Atomiser Disk Rincing bath	N/A	UYA99-BB023	Water Test		Nitric Acid	Containment for Nitric Acid	.8m³		24/01/2019	25/09/2022	ok
24	y	Lime Milk Pit	Underground (but visible from above i.e. grating over the top)	UYA99-BB024	Water Test\Hydrostatic Testing	Reinforced Mass Concrete	LimeMilk	Washings from Lime Milk prep tank	15m³		01/07/2020	01/06/2023	ok
25	y	Diesel Filling Station	Above ground	UYA99-BB025	Visual + Leak Detection	Medium Based Polyethylene	Diesel	Containment for Diesel Spill	14m³		01/07/2020	01/06/2023	ok
26	y	Pre Treatment Bund	Underground	UYA99-BB026	UYA99-BB026	Reinforced Mass Concrete	Contaminated Water	Containment for Contaminated Water	2.2m³		15/10/2018	20/08/2021	
27	y	Baker Tank Bund	Above ground	UYA99-BB027	UYA99-BB027	Carbon Steel	Polluted Water	Polluted Water Injections	70m³	N/A	25/09/2019	25/09/2022	ok
28	n	Sulphuric Acid Bund - Inlet	N/A	UYA99-BB028	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	01/06/2023	
30	n	Sodium Hydroxide - Inlet	N/A	UYA99-BB030	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	01/06/2023	
31	n	Sulphuric Acid Bund - Outlet	N/A	UYA99-BB031	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	02/06/2023	
32	n	Sodium Hydroxide - Outlet	N/A	UYA99-BB032	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	03/06/2023	

Table 2.8 *Tanks and Bunds Tested 2018-2020*

2.9 Solidification

The solidification plant was commissioned in September 2018. It pre-treats FGR and boiler ash. The FGR and ash is mixed with water and the mixture is then bagged. The mixture is compressed in a mould to form solid blocks. The blocks are hardness tested and they are then transported to Irish Salt Mining and Exploration (ISME) in Co. Antrim where they are used in a recovery process to stabilise the salt mines after they have been excavated.

3.0 CLOSURE TASKS AND PROGRAMMES

3.1 Closure Declaration

Based on the information provided in the previous sections such as the facility processes, site conditions and environmental compliance record, clean closure of the facility is likely. There have been no recent contamination issues and it is expected that the likelihood of contamination on closure of the facility is very low.

3.2 Scope of the Closure Plan

The scope of this plan addresses the key issues, which would occur in an orderly shutdown of all the site activities on a phased basis over an estimated time period of approximately six months. A Gannt chart showing the outline programme of works is presented in Appendix B. In terms of costing for closure, AWN notes that the Agency guidance requires costings to allow for sudden closure scenarios. This has been addressed in the costings provided in Section 4 and Appendix C.

The scope of the plan includes the following primary activities,

- Setting up a management structure to oversee the CRAMP,
- Cessation of all waste acceptance and incineration activities,
- Removal of all remaining waste feed, raw materials and ash from the site,
- Cleaning and decontamination of all equipment and buildings,
- Shutting down of all abatement and utility systems,
- Completion of report on all aspects of the site decommissioning within 60 days of completion of closure plan activities; and
- Maintaining an on-going security and monitoring service.

3.3 Criteria for a Successful Closure

The principal criteria against which successful closure will be gauged are as follows:

- All buildings and facilities will be uncontaminated and secured from unauthorised access,
- There will be no constraints on future land use due to residual contamination or structures,
- Materials/wastes arising from decommissioning will be treated in such a manner that,
  - equipment or uncontaminated materials can be sold for re-use or sold for scrap.
  - contaminated materials will be disposed of using authorised hazardous waste contractors.
- All relevant documents relating to waste, material movements or disposal will be managed and retained throughout the closure process; and
- The Environmental Management System in place at the facility will be implemented and remain in place throughout the closure process.

The basis of the closure plan is to ensure that, upon completion of the plan, the facility would be in a suitable state for future industrial use and would not pose a risk to public health and safety or the environment.

It is not intended to remove all structures or systems from the site. In general, specialist equipment, pipelines and storage tanks will be sold for reuse, where possible, or disposed of off-site. The facility building and external features will remain in a suitable condition for future site users.

Assuming an orderly shutdown, Indaver will use existing staff resources to form a team to manage and execute the requirements of this CRAMP supplemented where appropriate by external resources. This closure team will be responsible for managing and executing the complete plan.

3.4 Roles and Responsibilities during Site Closure

The following personnel outlined in Table 3.1 will have specific responsibility in the event of closure of the site. In the case of an orderly shutdown, the Group Managing Director will typically determine if and when the facility is to be closed and will have corporate responsibility for ensuring a clean site closure occurs.

Personnel	Area of Responsibility as part of Closure Plan
Plant Manager/ Maintenance Manager	The Meath WtE Plant Manager will have ultimate responsibility for implementing the closure process. He/she will ensure that closure is carried out as per this strategy and ensuring site closure processes are carried out in an environmentally friendly manner so that there is no future risk to the environment following closure of the site. His/her primary responsibilities will include: • Responsibility for Decommissioning of all Plant, Equipment and for the process of sale or disposal of the equipment once decommissioned, and • Responsibility for the management of non-plant related closure aspects i.e., overseeing the decontamination process and direction of all residual raw materials and waste for disposal off site.
Environmental Manager or equivalent	Providing correspondence and liaison with the EPA during the closure process. Coordination of external consultants to carry out environmental monitoring and closure audit. Ensuring all waste documentation is maintained and daily inspections are carried out during closure. Responsible for correct waste storage and disposal/recovery. During decommissioning, all documentation relating to all movements of materials/machinery whether disposed of or sold for reuse must be maintained. In addition, certificates for cleaning of all tanks, bund drains etc. must be maintained.
Maintenance and Plant Staff	4 maintenance and plant staff will be retained for 6 months during the active phase of decommissioning of the plant.

Table 3.1 *Roles and Responsibilities as part of Closure Plan*

3.5 Procedure to Achieve the Stated Criteria

This section outlines the phased procedures to be followed in the event of a site closure:

- Phase I – Cancellation of existing waste feed contracts, incineration of waste already on site, removal of unused raw materials and removal of quarantined waste.
- Phase II – Decontamination of all process equipment and services equipment.
- Phase III – Decommissioning of all process equipment and services equipment.
- Phase IV – Removal of equipment and facilities from spare parts warehouse.
- Phase V – Cleaning of all underground drainage lines, tanks, and surface water attenuation pond.
- Phase VI – Removal of equipment and facilities from offices, collection of remaining waste materials and decommissioning of wastewater treatment system.

3.5.1 Phase I – Cancellation of existing waste feed contracts, incineration of waste already on site and removal of unused raw materials, ash and quarantined waste

Prior to the date of closure and decommissioning of the site, incoming contracts and deliveries of waste will be cancelled and the waste bunker will be run down to minimise the quantity of any residual waste left to be incinerated and for which an alternative disposal route will be required (i.e., material that has not been incinerated will be disposed of via an alternative route). During normal operations, waste in the bunker has a typical retention time of 1 week so this is expected to be the maximum time required to run down the waste supply. Any surplus waste material will be transferred to other Indaver sites or disposed of to a licensed waste disposal facility. Records of dispatch and notifications of receipt will be held for each consignment of waste removed from site.

(It is noted that in the event of a sudden closure, running down the quantities of waste in the bunker will not be possible and the scenario for a full bunker has been costed accordingly).

Deliveries of raw materials will be cancelled or reduced, as required, to ensure sufficient supply to provide correct treatment of combustion gases during incineration of the final waste volumes. When the final waste volume has passed through the furnace and operations have ceased, unused raw materials such as ammonia solution, activated carbon, nitric acid, expanded clay and lime will be returned to the supplier, utilised on other Indaver sites or, as a last resort, disposed of as waste.

During normal operations, ash generated by the incineration process is collected and stored before being removed for disposal off-site at an appropriately licensed waste facility under Indaver's current vendor control procedures and will be transported using vendor approved waste carriers. It is expected that in a closure scenario ash will continue to be disposed of off-site as per normal routine but will require additional shipments to empty the bunker/silos and dispose of the residual ash materials.

Some wastes which are delivered to the site and are not suitable for incineration are temporarily stored in a designated waste quarantine area in the service yard. Arrangements will be made for collection and disposal of this material using existing licensed contractors.

All contracts other than those that are concerned with the requirements of the closure process or related to safety of personnel, or the environment will be terminated.

At the start of the closure process, an inventory of all existing waste feedstock and raw materials will be carried out and the destination of all raw materials will be documented.

The estimated time for completion of Phase I of the CRAMP is one week.

3.5.2 Phase II – Decontamination of all process equipment and services equipment

Indaver has a detailed inventory of all assets on site covering all plant and equipment including process, services, engineering, transport and office/administration equipment. During closure, all equipment will be disconnected from power sources and isolated in accordance with relevant equipment procedures. Valves and connections on tanks and chemical supply lines will also be isolated in advance of equipment decommissioning.

Process Equipment

The incineration process plant and equipment will be divided into the following individual zones and a decommissioning checklist will be prepared for each:

- Tipping hall & Waste Bunker,
- Furnace boiler,
- Steam condensate and turbine,
- Flue gas treatment,
- Ash storage and loading,
- Warehouse,
- Solidification plant, and
- Infrastructure including Transformers, Tanks, Air-Cooled Condensers etc.

These checklists will contain the following items:

- List of plant and equipment items and ancillary equipment; and
- List of checks to be carried out (e.g., empty/drain, vent, clean, close-off, isolate).

The items of plant and equipment used in the incineration process will be identified and the specific steps required for decommissioning the items will be prepared.

The incineration process plant and equipment will be emptied, cleared, drained, vented and isolated as required by the checklists. As the maintenance and cleaning of all the incineration process equipment is frequent and is a routine operation, the emptying and cleaning of the equipment during the closure period is not likely to generate significant quantities of additional waste for disposal off-site.

The waste bunker will be emptied as per Phase I of the closure process. The bunker will then be jet washed and any residual waste and runoff from cleaning will be taken off-site for disposal, as required. All ash storage will be emptied, cleared, and washed down as required by the checklists.

The turbine plant and 2MVA transformers will be decommissioned during the closure phases of this plan. Following final closure of the site, the lube oil tank for the turbine and transformer oil will be emptied, the tank, transformers and pipelines cleaned, and the oil transferred to other Indaver sites, returned to the supplier, recycled or disposed of as waste.

Services Plant and Equipment

As with the incineration process plant and equipment, the services plant and equipment will be emptied, cleared, drained, and vented as required by the checklists. All cooling/refrigeration systems will have their glycol circuits drained and disposed of as waste. Any refrigeration units to be disposed of as waste will be degassed by a specialist contractor. All chemical holding vessels and distribution pipelines will be flushed through and drained.

The fuel in the diesel tank will be run down and any residual diesel will be transferred off-site for recovery or disposal or returned to suppliers. The diesel tank associated with the generator plant will be maintained until the end of the closure period in case the generator is needed. The diesel tank and piping will be cleaned, and the waste disposed of by a licensed waste contractor.

The ammonia tank will also be run down, and the tank and piping will be cleaned, with the washwater collected and disposed of a licenced contractor.

The electrical sub-stations in the 38kV compound area will be maintained throughout the implementation of the CRAMP by Indaver and the ESB. All transformers on the site will be drained of transformer oil (PCB free) and the oil disposed of as waste.

The fire water system consisting of the fire water tank, hydrants, sprinkler systems and foam tank will be maintained during the closure period until it is no longer required. When the requirement for the system ceases, the firewater will be released to the surface water drainage system in a controlled manner. All foam will be collected and removed from site for disposal, as required.

Any draining of oil/hazardous materials from equipment will be carried out indoors or in bunded areas, where possible, to ensure no risk of contamination to the ground or surface drainage. Any waste oils will be temporarily stored in double skinned containers pending collection by appropriate waste contractors.

The estimated timeframe for completion of Phase II is six weeks. A breakdown of some of the key items requiring cleaning and decontamination are outlined in Table 3.1.

Plant Details	Quantity	Decontamination Required		Method of Decontamination	Timeframe for Completion
		Yes	No		
Waste Reception and Process Infrastructure - Bunker, Furnace, Boiler, Turbine etc	1	✓		Empty contents, high pressure wash-down and other cleaning	11 days
Ammonia Solution tank	1	✓		Disposal of contents and cleaning using specialised tank cleaning equipment	1 day
Diesel tanks	5	✓		Disposal of contents and cleaning using specialised tank cleaning equipment	2 days
Firewater retention tank	1	✓		Disposal of contents and cleaning using specialised tank cleaning equipment and infill with inert material	1 day
Silos – ash and process materials	8	✓		Disposal of contents and cleaning using specialised tank cleaning equipment	8 days
Spray dry reactor	1	✓		Specialised tank cleaning equipment	1 day
Cooling system - glycol	-	✓		Drain, disposal of equipment and circuit system cleaning	1 day
Bottom ash wet bath	1	✓		Disposal of contents, specialised cleaning equipment	1 day
Baghouse filters	1944 socks in six compartments	✓		Removal and disposal of waste filter residue	2 days
Chemical IBCs	Variable		✓	Return to supplier if possible or disposal by authorised hazardous waste contractor	0.5 days
Service tank demineralise water for SNCR	1		✓	Drain and disposal of material	0.5 days
Buffer, slacker (x2) and service tanks	7		✓	Disposal of contents high pressure wash-down with specialist equipment	1 day
Foam tank	1		✓	Disposal of foam	0.5 days
Refrigeration system – individual sealed systems	1	✓		Draining of refrigerant, cleaning and removal of units for reuse/disposal	1 day
Neutralisation tank	1		✓	Drain and disposal of salty water	0.5 days
Compressors	3		✓	Removal and disposal of waste oily water and disposal of equipment	0.5 days
Surface water drainage lines/foul drainage and CCTV survey	-	✓		High pressure wash-down and clean, survey with CCTV	5 days
Oil interceptors/separators	2	✓		Removal of contents, high pressure wash-down and replace	1 day
Dirty Water tanks	2	✓		Removal and disposal of oily water, high pressure wash-down and infilling with inert material	2 days
General waste	N/A		✓	Collection of residual waste in skips and disposal	Full duration of closure period
Wastewater treatment system	1		✓	Emptying of contents, wash-down and infilling with inert material	1 day
Buffer Vessels (FGR and boiler ash)	2	✓		Disposal of contents high pressure wash-down with specialist equipment	1 day
Solidification plant scrubber	1	✓		Disposal of contents high pressure wash-down with specialist equipment	1 day
Solidification sump tank	1	✓		Disposal of contents and cleaning using specialised tank cleaning equipment	1 day

Table 3.2 *Summary of main equipment requiring decontamination at facility*

3.5.3 Phase III – Decommissioning of all process equipment and services equipment

Using the equipment lists for the site, the proposed method of disposal will be identified against each item of plant and equipment, namely:

- Transfer to another Indaver site,
- Sale to a third party,
- Sale for scrap, or
- Disposal/recovery as a waste.

A record for the disposal route for each item of plant and equipment will be maintained. The extent to which plant, equipment, piping, ducting and electrical services etc. will be removed from site will depend on the terms of any prospective sale agreement for the facility post closure. Process plant, equipment and materials will be recovered, where practicable, and removed off-site. Non-recoverable materials will be disposed of using appropriately licensed waste contractors.

All service materials will be removed by appropriate contractors and taken off-site for transfer to other Indaver sites, where practicable, or for recovery/disposal. The generator plant will be maintained at the site until the end of the closure period along with the back-up diesel fuel store. As a final activity, the generator fuel tank and plant will be decontaminated as outlined previously and the plant will be either sold in working condition or disposed of as scrap.

Refrigeration units will remain on site if considered suitable for future site users. Where this is not the case, refrigeration units will be disposed of by suitably licensed contractors.

3.5.4 Phase IV – Removal of equipment and facilities from spare parts warehouse

All chemicals within the workshop areas will be run down as part of closure of the facility. Surplus chemicals will be returned to the suppliers where practicable and convenient. Alternatively, surplus chemicals will be transferred to other Indaver sites, recovered or disposed of, as suitable.

Compressed gases used for cutting and welding will be returned to the supplier(s). Site vehicles, including waste moving vehicles, will be transferred to other Indaver sites or sold for reuse, where possible. Non-production materials (engineering and services equipment and materials) in the storage areas of the site, including the contractors' compound/workshop will be run down during the progressive cessation of activities and disposed or removed for reuse, as appropriate.

3.5.5 Phase V – Cleaning of all underground drainage lines, tanks and surface water attenuation pond

The petrol and forecourt interceptors will be inspected and cleaned out with any residual sludge taken off-site for disposal, as required. Manholes, sumps and inspection pits will also be de-sludged appropriately. The surface water drains will be flushed out, cleaned and inspected following dismantling and equipment removal activities to ensure that there is no leakage within the system. Suitable hazardous waste contractors will be engaged to extract liquid wastes for disposal and/or treatment.

Any small volumes of residues generated during cleaning of drainage will be temporarily stored in IBCs in a bunded area and disposed of by authorised waste contractors.

The surface water retention pond will be decommissioned and cleaned in line with site procedures for equipment and facilities.

The groundwater extraction system will be maintained during the closure period until the fire water tank is no longer in operation. Once the fire water system has been decommissioned, the groundwater extraction well will have its pumping equipment removed and returned to the supplier, sold, recovered or disposed, as appropriate. If appropriate for use by future users, the well will be temporarily capped and protected. The two wells will be used for environmental sampling compliance for two years post closure of the facility.

3.5.6 Phase VI – Removal of equipment and facilities from offices, collection of remaining waste materials and decommissioning of wastewater treatment system

All electrical and electronic equipment from the office will be either sent to other Indaver sites for reuse, sold or disposed of as waste electronic and electrical equipment (WEEE) in line with relevant legislative guidelines. Paper, cardboard and other recyclable materials will be managed through existing recycled waste contracts for recovery off-site. Canteen/welfare supplies will be run down as site activity is wound down and any excess materials will be disposed of in line with current procedures. General waste materials generated on the site after the incineration process has shut down will be recovered or disposed of in accordance with waste regulations.

The wastewater treatment system consisting of the septic tank, secondary treatment system and percolation area will be decommissioned as one of the final activities at the end of the CRAMP. The septic tank will be drained, hosed down and filled with an inert material. The media in the secondary treatment system will be removed and disposed of as waste.

3.6 Surface Water Protection during Decommissioning

The following surface water protection measures will be implemented during decommissioning:

- Dismantling of equipment will take place indoors, where possible, isolated from any surface water collection points,
- All loading and unloading of vehicles as part of the decommissioning will be isolated from surface water collection points,
- All waste oils/greases drained from equipment will be stored in containers in bunded areas,
- The facility's procedures for accident prevention and emergency response plan will be adhered to in the event of any potential spill; and
- Additional spill kit equipment will be brought on site during decommissioning works.

3.7 Contaminated Land Treatment, Removal and/or Disposal

There have not been any contamination issues reported at the site and, by implementing the procedures outlined in this report, it is not anticipated that any contamination will occur because of the decommissioning process. The areas of the site where decontamination of equipment will need to take place are covered in hard standing so any potential hazardous material spills can be quickly managed and contained.

3.8 Closure Plan Validation

An Independent Closure Audit (ICA) of the site will be undertaken prior to cessation of operations and actual decommissioning of the facility. The audit will compile an accurate inventory of all plant, equipment and wastes on the site. This inventory will be used as a benchmark against which successful decommissioning will be assessed.

3.8.1 Environmental Monitoring

All environmental monitoring currently required as a condition of the facility's IE licence will remain in effect over the course of the closure period.

Most of the environmental monitoring carried out at the facility is continuous monitoring of air emissions from the flue gas treatment system and associated abatement systems. It is anticipated that once waste acceptance finishes at the facility and all resulting residue streams have been removed and disposed off-site, continuous air emissions, which may arise due to decommissioning or decontamination works for closure, will be conducted upon request by the Agency.

Noise monitoring is currently conducted annually. It is anticipated that following closure, no noise monitoring will be required.

Other than air or noise emissions, other environmental monitoring requirements will include surface water and groundwater monitoring of a minimum of 3 on-site monitoring boreholes. Surface water monitoring will continue during the closure period, and it is anticipated that it will no longer be required following a clean closure. The groundwater boreholes are currently monitored for a reduced suite of parameters every month and a broad suite bi-annually. It is expected that monitoring will continue for two years following closure.

3.8.2 Closure Validation Audit

The Agency will require the following list of information for a site which proposes to close in the immediate future:

- Submit name of person(s) completing closure audit for approval,
- Identify environmental liabilities or remediation issues with proposals on how these shall be dealt with post closure,
- Proposal for revised sampling analysis and reporting arrangements on foot of changes on site for agreement with the Agency,
- Submit name of person(s) completing hydrogeological investigation; and
- Submit names of all proposed waste handling procedures during closure i.e., waste contractors, proposed destination etc. for approval.

3.8.3 Closure Validation Report and Aftercare Plan

As is typically required in the conditions of an EPA IE licence, a final validation report for the site will be submitted to the Agency within three months of execution of the plan. The report will present all the information required to demonstrate that the criteria for successful closure (Section 3.3) has been achieved as well as the information necessary for making an application for surrender of licence where appropriate.

In terms of the aftercare plan, it is proposed to comprise the following sampling and analysis as a minimum. It is anticipated that this scope will be refined and agreed with the Agency in advance of the assessment following confirmation of a closure.

Media	No of Samples/Parameters	Description/Locations
Soil	Up to 25 samples for soil chemistry for all known contaminants used/present on site at the time of closure.	Repeat the soil analysis at locations completed as part of the 2014 Soil Water Baseline Assessment (as a minimum).
Groundwater	3 samples for chemical characterisation including all known contaminants used/present on site at the time of closure.	Repeat the water testing completed as part of the 2014 Soil Water Baseline Assessment (as a minimum). Groundwater monitoring of one upgradient and 2 downgradient monitoring boreholes.
Surface Water	1 sample for full chemistry	At outlet from Surface Water Retention Pond
Ambient Dust/PM10	Minimum of 3 locations (upwind and downwind) for total dust/PM10	To be agreed with the Agency

Table 3.3 Aftercare Monitoring Plan

3.8.4 Closure Validation Certificate

Indaver and its consultants will carry out the above tests and investigations and submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.

4.0 CRAMP COSTINGS

As required under the new EPA guidance, a detailed cost assessment has been completed as part of the preparation of this CRAMP.

A detailed breakdown of costs is presented in Appendix C and is summarised in Table 4.1 below. In general, the closure requirements and associated costs likely to arise for this activity are well defined and are not subject to significant unknowns. Nevertheless, to ensure adequate cost provision, a contingency of 25% has been allowed for unplanned and unforeseen items.

The costings in Table 4.1 have been designed to be sufficient to cover a sudden closure scenario though it is anticipated that a phased shut-down of the facility would most likely occur over a significant duration so as to maximise the value of existing assets at the site.

It should be noted that an allowance has been made in the costs for wastes disposal and recovery for additional waste generated from cleaning and decontamination. (In general, an allowance of 5% of the volume of each particular item or tank has been allowed for. This should be more than sufficient to cover any wastes generated from washing or other cleaning down of plant, equipment or tanks).

Activity	Estimated Costs (€)
Plant Building and Equipment Cleaning and Decontamination	397,900
Plant Building and Equipment Decommissioning	61,860
Waste disposal and Recovery	1,872,042
Environmental Monitoring (2 years)	16,800
Security	84,000
Validation Audit, Documenting Closure	20,000
Management and Staffing Costs during Closure	270,000
Agency Costs (estimated)	55,000
Insurance	229,015
Power	87,273
Water	4,500
Fuel (3 months diesel usage)	11,200
Subtotal	3,109,590
Contingency (25%)	777,397
Total	3,886,988

Table 4.1 *Summary of estimated closure costs*

It is estimated that a cost of approximately €3.887m would be incurred to decommission the site, including all external resource costs, maintenance of the site for 6 months during decommissioning of activity, security for 12 months and allowing a contingency of 25% for unforeseen events.

4.1 Ongoing Costs

It is anticipated that environmental monitoring and security will continue for a 1 year period post final closure. Environmental monitoring will continue for 2 years. A number of staff members would be required to remain on site for a period of three to six months to successfully implement this closure plan. These are expected to comprise 2 senior managers and 4 maintenance personnel for six months.

4.2 Future Proofing of Costs

It is anticipated that upon closure, the majority of the closure costs set out above will be incurred immediately or within a maximum of twelve months of the date from which decommissioning occurs. As such there is no need to allow for additional future proofing of the costs associated with closure.

Future revisions of this CRAMP will need to be updated in line with inflation. It should be noted that the costs presented in Table 4.1 are subject to the following assumptions:

- The site will be left in a clean condition, i.e., decontaminated and certified as being free of any potential hazard. All buildings will be retained. All bulk materials and process intermediates and products will be removed.
- No liabilities will be incurred due to activities of contractors storing and disposing of materials removed from the site as part of the decommissioning process. Waste management procedures as outlined in previous sections will be implemented to ensure this.
- No civil liability will be incurred because of third parties alleging environmental damage arising from the operational phase or closure.
- The maximum asset value of the facility will be maintained, and no further action would be required to be taken to prepare the site for a trade sale as a going concern or otherwise.
- Normal practice would be applied to minimise ongoing liabilities and to fulfil insurance requirements.
- It is understood that Meath County Council have their own bonding requirement for re-instatement of the site after closure. The planning authority will be notified of the plans to decommission and will be consulted in relation to the isolation of facilities and services on site.
- No factors have been identified that would indicate an unusual liability for the site in comparison with other process industry sites.

5.0 FINANCIAL PROVISION

Indaver is an established organisation with a history of over thirty years of successful operation. Any decision to close the Meath WtE facility at Duleek will be taken by both management at Indaver Ireland Ltd. and its corporate entity. The cost of implementing the CRAMP will be borne by Indaver in the event of closure of the facility.

Indaver NV has been operating since 1985 and is in a strong financial position to continue to invest in waste management infrastructure in Ireland. Indaver NV stands over all liabilities and obligations of Indaver Ireland Limited.

The current financial provision agreed with EPA for closure costs is a bond which expires in 2022. This will be updated in line with this report after agreement with the EPA.

6.0 FUTURE REVIEWS OF THE CRAMP

This plan shall be reviewed annually as part of the company's annual environmental review of the facility. The review shall be carried out by the Enviromental Manager or team.

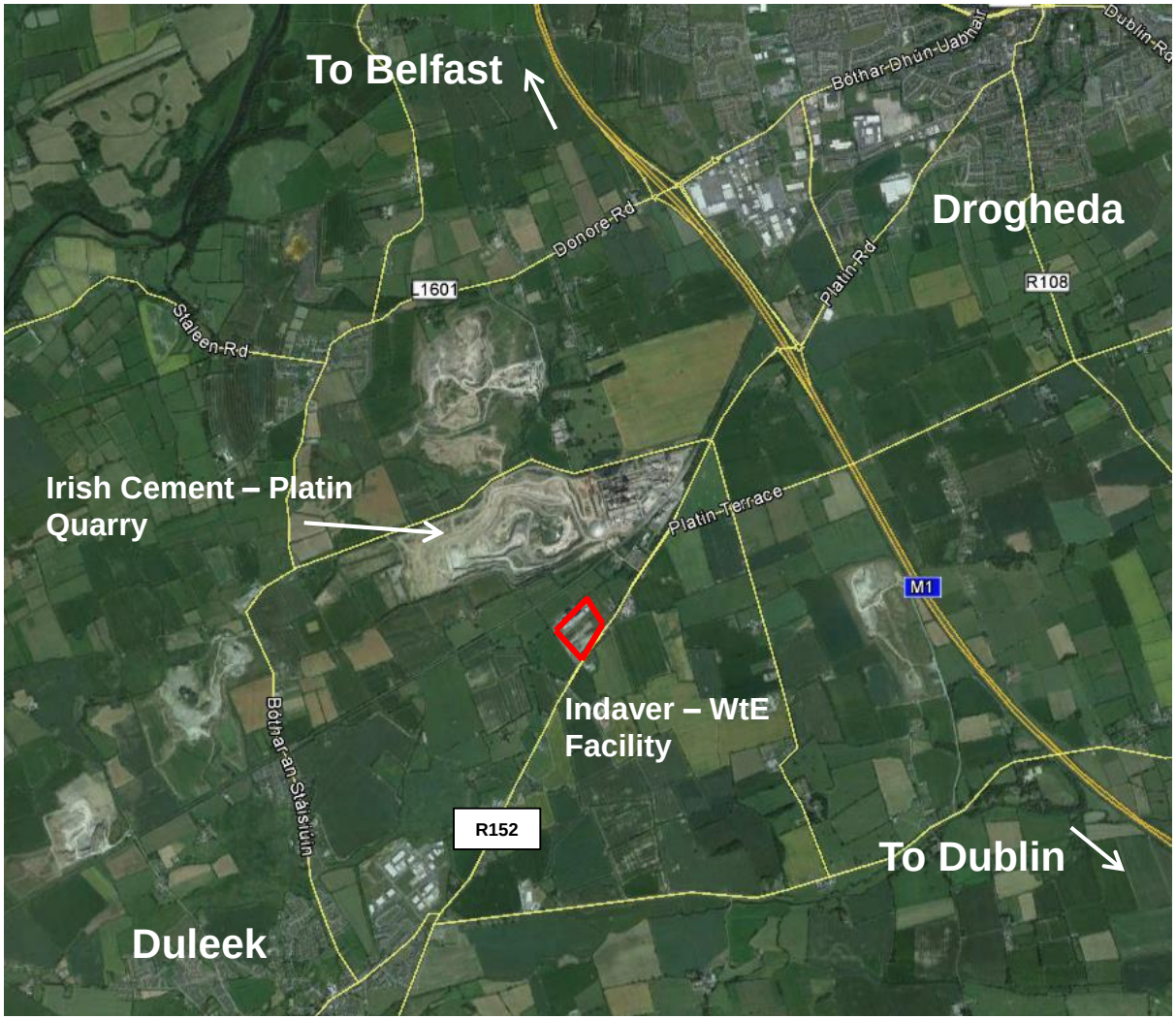
Any change and/or proposed amendments to the CRAMP shall be notified to the Agency for agreement as part of the facility's annual environmental review.

6.1 Scope of Review

The annual CRAMP review shall take note of the following items:

- Updates to raw materials stored on site and storage types,
- Additional equipment brought on site,
- Additional waste streams being generated on site,
- Additional emission points and/or decommissioning of emissions points,
- Updated costings associated with closure plan; and
- Any production process changes.

Figure 1 – Site Location



N

Source: Google Earth

Drawing is for illustrative purposes only. Do not use to scale.

awnconsulting
The Tecpro Building, Clonshaugh Business & Technology Park, Dublin 17
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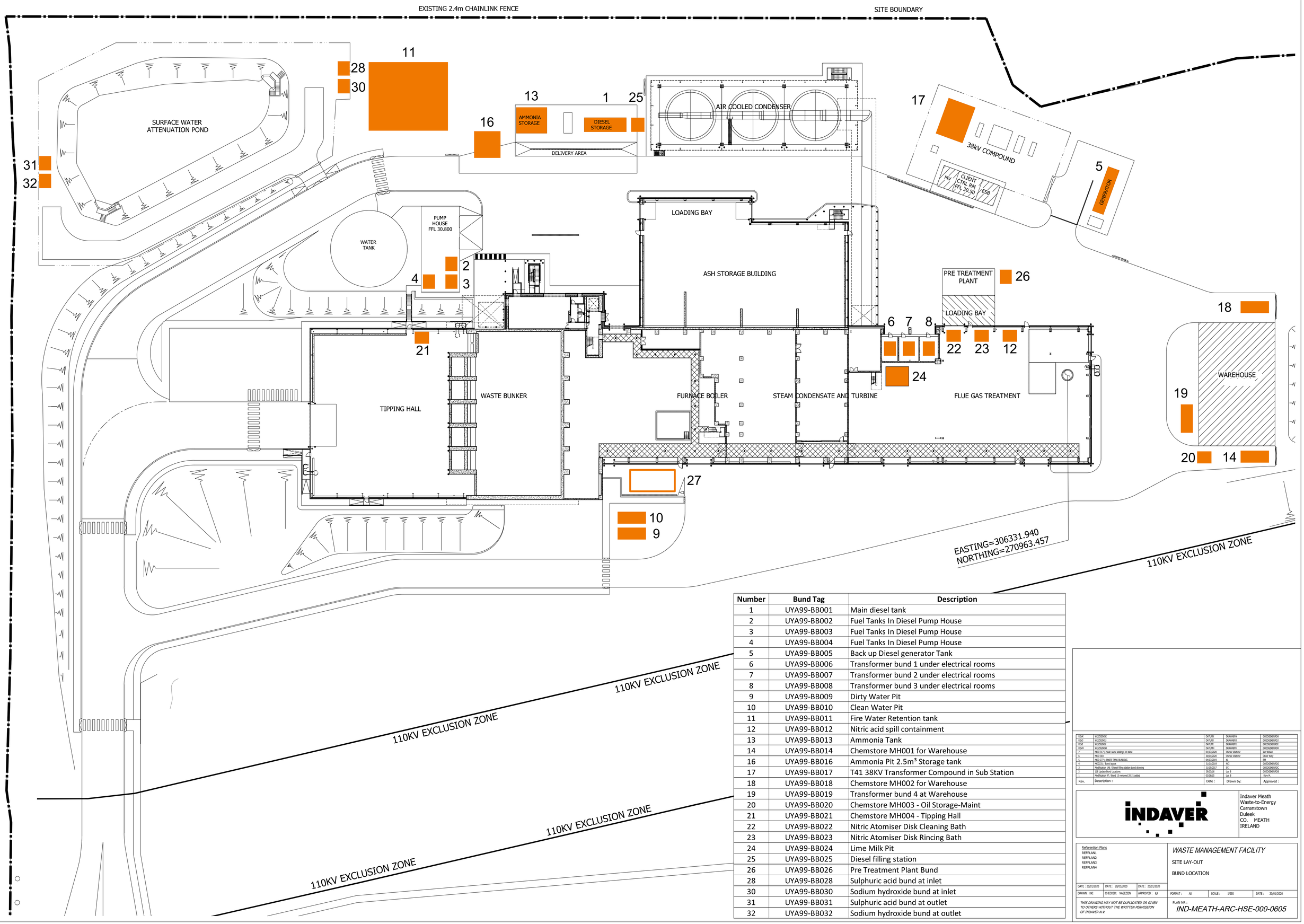
Project:	Client:	Reference:	
Environmental Liability Risk Assessment (2018 Review)	Indaver Ireland Ltd.	GR/18/10175R02	**Figure 1**
	Drawing: Site Location Map		

Figure 2 – Site Layout

NOTES



Number	Bund Tag	Description
1	UYA99-BB001	Main diesel tank
2	UYA99-BB002	Fuel Tanks In Diesel Pump House
3	UYA99-BB003	Fuel Tanks In Diesel Pump House
4	UYA99-BB004	Fuel Tanks In Diesel Pump House
5	UYA99-BB005	Back up Diesel generator Tank
6	UYA99-BB006	Transformer bund 1 under electrical rooms
7	UYA99-BB007	Transformer bund 2 under electrical rooms
8	UYA99-BB008	Transformer bund 3 under electrical rooms
9	UYA99-BB009	Dirty Water Pit
10	UYA99-BB010	Clean Water Pit
11	UYA99-BB011	Fire Water Retention tank
12	UYA99-BB012	Nitric acid spill containment
13	UYA99-BB013	Ammonia Tank
14	UYA99-BB014	Chemstore MH001 for Warehouse
16	UYA99-BB016	Ammonia Pit 2.5m³ Storage tank
17	UYA99-BB017	T41 38KV Transformer Compound in Sub Station
18	UYA99-BB018	Chemstore MH002 for Warehouse
19	UYA99-BB019	Transformer bund 4 at Warehouse
20	UYA99-BB020	Chemstore MH003 - Oil Storage-Maint
21	UYA99-BB021	Chemstore MH004 - Tipping Hall
22	UYA99-BB022	Nitric Atomiser Disk Cleaning Bath
23	UYA99-BB023	Nitric Atomiser Disk Rincing Bath
24	UYA99-BB024	Lime Milk Pit
25	UYA99-BB025	Diesel filling station
26	UYA99-BB026	Pre Treatment Plant Bund
28	UYA99-BB028	Sulphuric acid bund at inlet
30	UYA99-BB030	Sodium hydroxide bund at inlet
31	UYA99-BB031	Sulphuric acid bund at outlet
32	UYA99-BB032	Sodium hydroxide bund at outlet

Rev.	Description :	Date :	Drawn by:	Approved :
REVK	W1252ING9K	24TJAN	DIANABYK	GDEDGENSUBDK
REVJ	W1252ING9J	24TJAN	DIANABYJ	GDEDGENSUBDJ
REVI	W1252ING9I	24TJAN	DIANABYI	GDEDGENSUBDI
REVH	W1252ING9H	24TJAN	DIANABYH	GDEDGENSUBDH
7	MOD 317 / Made some addings on table	01/07/2020	Chiriac Vladimir	Ian Wilson
6	MOD 303	20/01/2020	Chiriac Vladimir	Oliver Kelly
5	MOD 277 / BAKER TANK BUNDING	04/07/2019	KL	BM
4	MOD231 / Bund layout	31/01/2019	NCJ	GDEDGENSUBDD
3	Modification 146 / Diesel filling station bund drawing	31/05/2017	SYJ	GDEDGENSUBDC
2	118 Update Bund Locations	29/03/16	Luc B	GDEDGENSUBDB
1	Modification 97 / Bund 15 removed 20-21 added	03/08/15	Luc B	Rory M.

INDAVER

Indaver Meath
Waste-to-Energy
Carranstown
Duleek
CO. MEATH
IRELAND

Referention Plans
REFPLAN1
REFPLAN2
REFPLAN3
REFPLAN4

WASTE MANAGEMENT FACILITY

SITE LAY-OUT

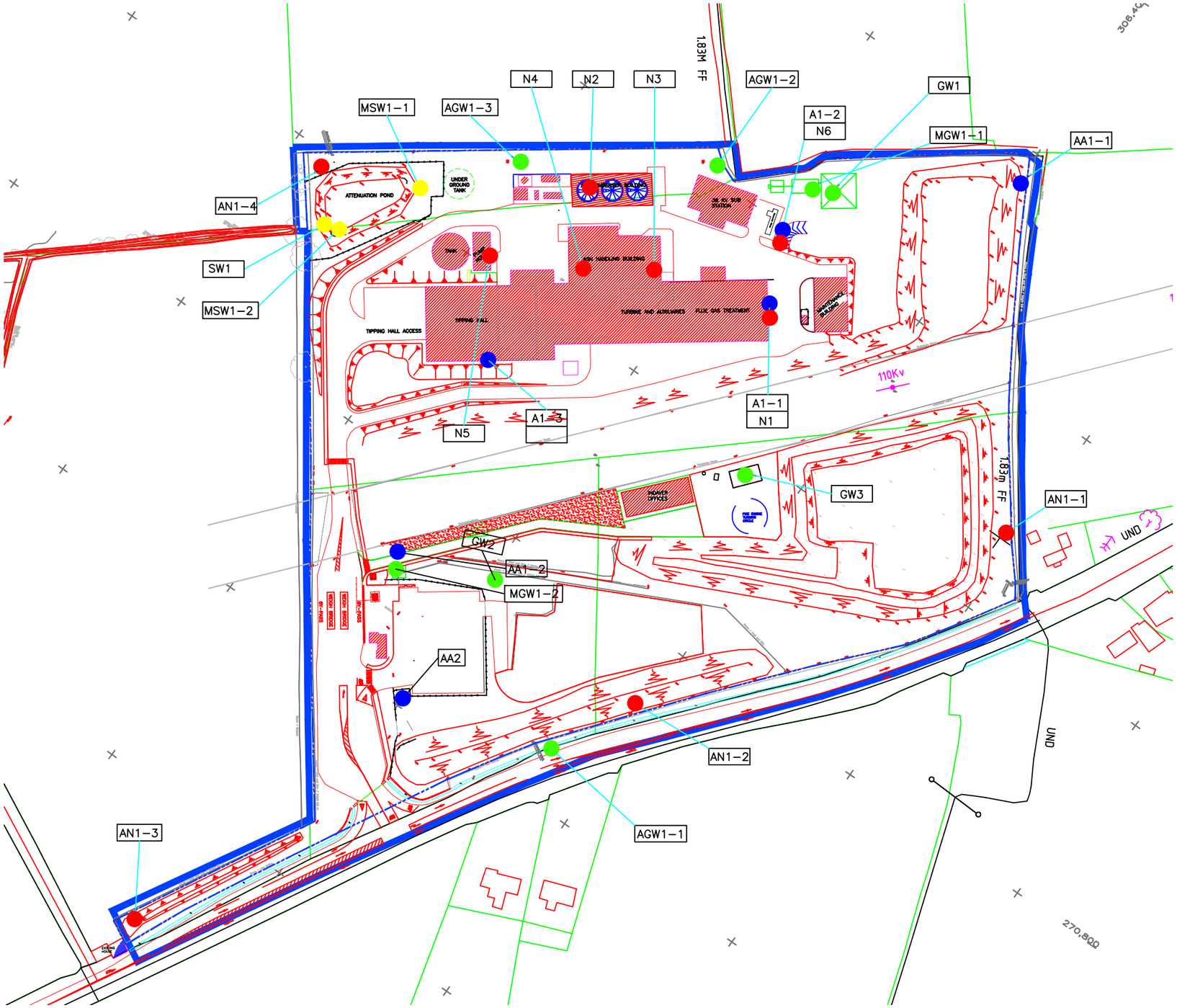
BUND LOCATION

DATE : 20/01/2020	DATE : 20/01/2020	DATE : 20/01/2020			
DRAWN : KKI	CHECKED: NAGEDEN	APPROVED : RA	FORMAT : A0	SCALE : 1/250	DATE : 20/01/2020

PLAN NR :

IND-MEATH-ARC-HSE-000-0605

Figure 3 – Emissions Monitoring Locations



NAME		LABEL
A1-1	●	STACK AIR EMISSION/MONITORING POINT
A1-2	●	EMERGENCY GENERATOR AIR EMISSION
A1-3	●	CARBON UNIT AIR EMISSION
AA1-1	●	DOWNWIND ODOUR MONITORING
AA1-2	●	UPWIND ODOUR MONITORING
SW1	●	SURFACE WATER DRAINAGE OUTFALL EMISSION
MSW1-1	●	SURFACE WATER MONITORING CHAMBER 1
MSW1-2	●	SURFACE WATER MONITORING CHAMBER 2
GW1	●	GROUNDWATER PERCOLATION AREA EMISSION
GW2	●	GROUNDWATER PERCOLATION AREA EMISSION
GW3	●	GROUNDWATER PERCOLATION AREA EMISSION
MGW1-1	●	GROUNDWATER PURAFLO MONITORING CHAMBER
MGW1-2	●	GROUNDWATER PURAFLO MONITORING CHAMBER
AGW1-1	●	UPSTREAM GROUNDWATER MONITORING WELL
AGW1-2	●	DOWNSTREAM GROUNDWATER MONITORING WELL 1
AGW1-3	●	DOWNSTREAM GROUNDWATER MONITORING WELL 2
N1	●	STACK NOISE EMISSION
N2	●	AIR COOLED CONDENSOR NOISE EMISSION
N3	●	TURBINE COOLING NOISE EMISSION
N4	●	GRATE COOLING No's 1& 2 NOISE EMISSION
N5	●	PUMP HOUSE LOUVER NOISE EMISSION
N6	●	EMERGENCY GENERATOR LOUVRE NOISE EMISSION
AN1-1	●	AMBIENT NOISE MONITORING 1
AN1-2	●	AMBIENT NOISE MONITORING 2
AN1-3	●	AMBIENT NOISE MONITORING 3
AN1-4	●	AMBIENT NOISE MONITORING 4
AA2	●	WEATHER MONITORING STATION

McElroy Associates
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Rev.	Description:	Date :	Approved:
C	UPDATE LOCATIONS	13/09/2013	OK
B	REISSUED FOR WASTE LICENCE	25/10/2012	MC
A	ISSUED FOR WASTE LICENCE	19/04/2012	MC

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Plant:
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FAX: +353 1 28 07 885

Reference drawings:

INDAVER MEATH

EMISSION AND MONITORING POINTS
SITE PLAN

DATE: 13/09/2013	DATE:	DATE:	
DRAWN BY: TDR	CHECKED:	APPR.:	
FORMAT: A3	SCALE: 1/2500	DATE: 13/09/2013	

DRAWING NUMBER:
MEA-MEATH-HSE-DWG-000-7401

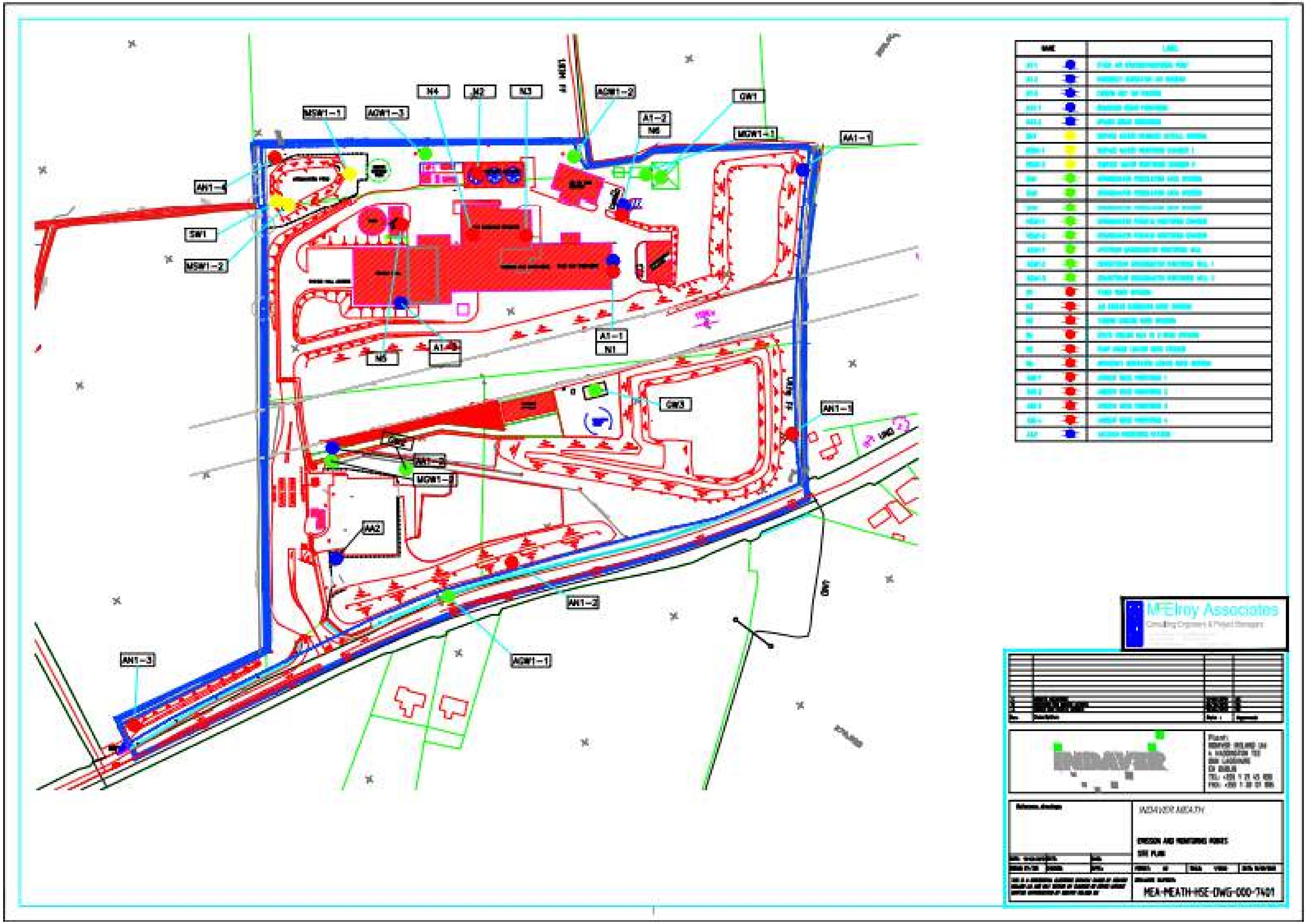
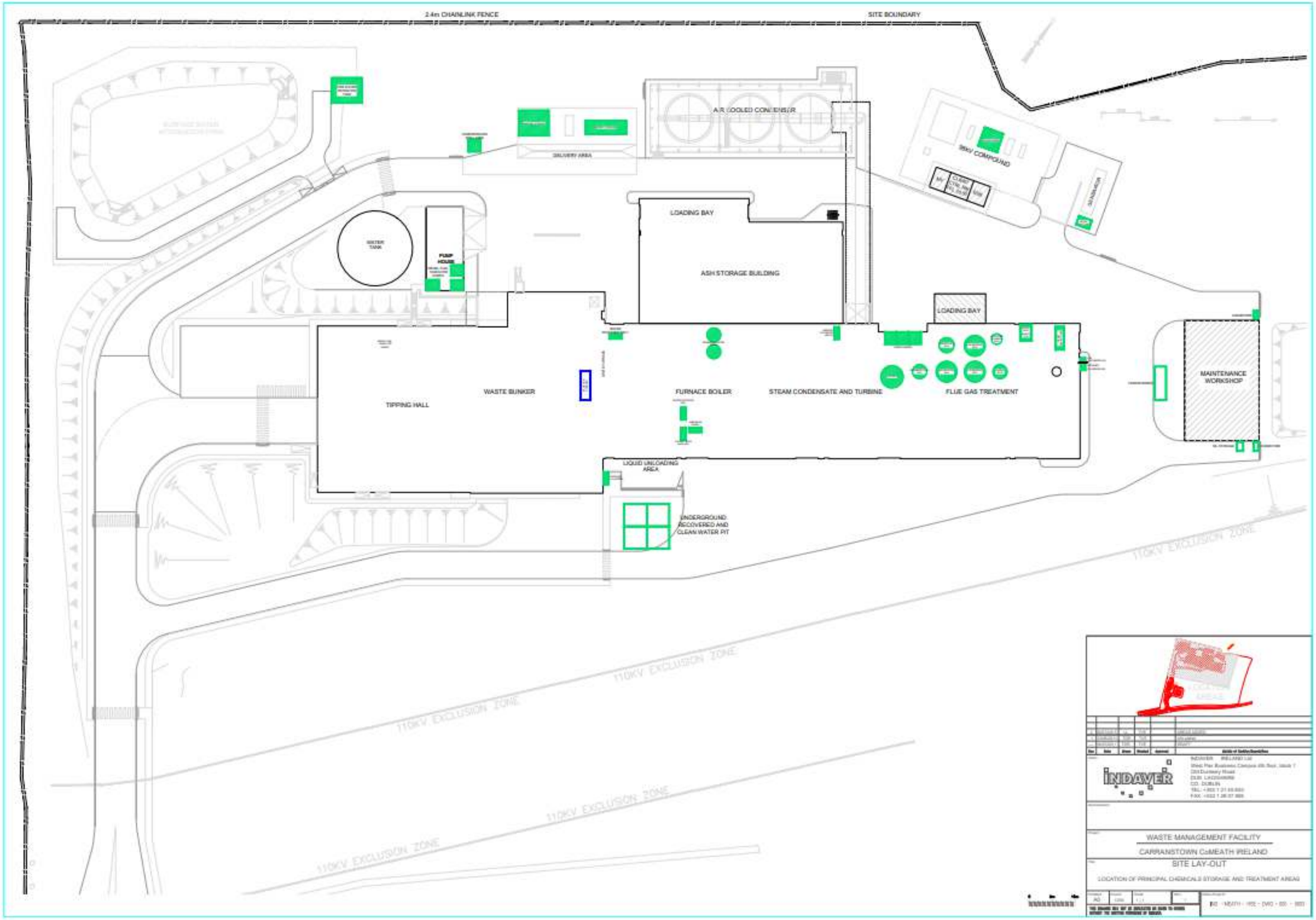

N4
N2
N3
AGW1−2
GW1
A1−2
N6
MGW1−1
AA1−1
MSW1−1
AGW1−3
AN1−4
SW1
MSW1−2
A1−1
N1
N5
GW3
AN1−1
AN1−2
MGW1−2
AA2
AN1−2
AGW1−1
AN1−3
McElroy Associates
Consulting Engineers & Project Managers
INDAVER
INDAVER MEATH
EMISSION AND MONITORING POINTS
SITE PLAN
MEA-MEATH-HSE-DWG-000-7401

Figure 4 - Location of Principal Chemicals Storage and Treatment Areas


2.4m CHAINLINK FENCE
SITE BOUNDARY
A/R COOLED CONDENSER
DELIVERY AREA
WATER TANK
PUMP HOUSE
LOADING BAY
ASH STORAGE BUILDING
WEIGHBRIDGE
WEIGHBRIDGE
LOADING BAY
MAINTENANCE WORKSHOP
TIPPING HALL
WASTE BUNKER
FURNACE BOILER
STEAM CONDENSATE AND TURBINE
FLUE GAS TREATMENT
LIQUID UNLOADING AREA
UNDERGROUND RECOVERED AND CLEAN WATER PIT
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
INDAVER
WASTE MANAGEMENT FACILITY
CARRANSTOWN CoMEATH IRELAND
SITE LAY-OUT
LOCATION OF PRINCIPAL CHEMICALS STORAGE AND TREATMENT AREAS

Appendix A – Inventory of Chemicals stored On-site.

No.	Chemical Name	CAS Number	Storage Area	Container/Drum Size	Amount Stored on Site	Nature of Use	Hazard Statement	Danger Category
	Process							
1	Ammonia Solution (25% v/v)	1336-21-6	Double skinned tank Hardstanding Area with spill drainage channel	62 m3	1	Neutralise the NOx present in the flue gas	H314 H400	Skin Corr. 1B Aquatic Acute 1
2	Diesel	94114-59-7	Double skinned tank/IBC in Hardstanding Area with spill drainage channel	52.9 m3	1	Control heating/cooling of the furnace	H350 H351	Carc. 2
3	Sodium Hydroxide (30% v/v)	1310-73-2	Jerricans in the Flue Gas Treatment Area	0.15 m3	1	Stabilise the pH of the boiler drum	H314	Skin Corr. 1A
4	Nitric Acid (27%)	7697-37-2	IBCs in the Flue Gas Treatment Area	3 m3	1	Pipework and atomiser cleaning	H272 H314	Ox. Liq. 2 Skin Corr 1B
5	Sodium Chloride	7647-14-5	Bags stored on pallets in Demineralisation Plant	4 tonnes	1			
6	Quicklime (95%)	1305-78-8	Silo in Flue Gas Treatment Area	115 m3	1	Neutralisation of the acids in the flue gas		
7	Hydrated Lime	1305-78-8	Silo in Flue Gas Treatment Area	150 m3	1	Neutralisation of the acids in the flue gas		
8	Activated Carbon	931-328-0	Silo in Flue Gas Treatment Area	80 m3	1	Adsorption of dioxins/furans in the flue gas		
9	Expanded Clay		Silo in Flue Gas Treatment Area	80 m3	1	Adsorption of dioxins/furans in the flue gas		
10	Ethylene Glycol	107-21-1	Closed loop vessels and IBCs in the Plant	12 m3	1	Cooling circuits	H302	Acute Tox. 4
11	Lubricant Oil		Tank in Turbine Hall	7 m3	1	Turbine		
12	Propane		Cage at Baker Tank	18-50 kg	22	Oil burners for start up; forklifts	H220	Flam. Gas 1
	Waste							
13	Waste Feed		Bunker	7111 tonnes	1	Waste		
14	Bottom Ash		Ash Storage Building	600 tonnes	1	Waste		
15	Boiler Ash		Ash Storage Building	122 m3	1	Waste		
16	Flue Gas Residue		Ash Storage Building	476 m3	1	Waste		
17	Recovered Ferrous Metal		Receiving Hall	100 tonnes	1	Waste		
18	Non Ferrous Metal		Receiving Hall	25 tonnes	1	Waste		
19	Waste Oils		Spare Parts Warehouse	1000L	1	Waste		
20	Interceptor Residue		Temporary Storage IBC 1 m3	5 m3	1	Waste		
21	WEEE		Storage Yard	<25 T	1	Waste		
22	Recyclables		Waste Storage Area	20T	1	Waste		
23	Biowaste		Puraflo x2 and Septic Tanks	max. 65m3	1	Waste		
24	Miscellaneous Hazardous		Storage Yard	1T	1	Waste		
25	Solidified Residues		Curtian siders in the yard	100T	1	Waste		
26	Liquids for Injection		Aqueous liquid injection area	220T	1	Waste		
	Miscellaneous Chemicals / Oils / Greases / Lubricants							
27	Acetone	67-64-1	Chemstore	25L	1	not used		
28	ANTI-FREEZE COOLANT ELF FINOL 20 LTR		Chemstore	20L	1	Production		
29	Buffer Solution pH 4		Chemstore	1L	4	Pond		
30	Buffer Solution pH 7		Chemstore	1L	4	Pond		
31	Chilltech		Chemstore	25L	4	Production		
32	Conductivity Standard 1413uS/cm		Chemstore	500ml	4	Pond		
33	Disinfectant FAM 30 5L		Chemstore	5L	3	Production		
34	Ethylene Glycol	107-21-1	Plant	1000L	1	Cooling circuits	H302	Acute Toxicity
35	GREENOX Adblue (Urea)	57-13-6	Chemstore	20L	4	Production		
36	LUBRICANT BRILUBE 30 (20L)		Chemstore	20L	2	Lubricant		
37	LUBRICANT QUAKER 888-46 F/R 180KG		Chemstore	208L	3	Furnace and flue gas hydraulics		
38	Methanol	67-56-1	Chemstore	25L	1	not used		
39	OIL MOBIL DTE26 (208L)		Chemstore	208L	1	Lubricant		
39	Pedrogen (Hydrogen Peroxide Solution)	7722-84-1	Chemstore	1L	1	Mech	H302 H318 H413	Acute Toxicity Irritant Aquatic Chronic
40	sulphuric acid	7664-93-9	Pond bund	200L	2	Easl (E+I)	H290 H315 H319	
41	Phosphoric Acid	7664-38-2	Chemstore	25L	4	not used	H314	Irritant (Skin Corrosive 1B)
42	REAGECON BUFFER SOL.TOC100 100PPM-500MLS		Chemstore	500ml	2	Pond		
43	RoClean 12		Chemstore	1kg	3	Mech		
44	RoClean 2	77-92-9	Chemstore	500g	3	Mech	H319	Irritant (Eye Irritant 2)
45	SODIUM BISULPHATE SOLUTION (25L DRUM)		Chemstore	25L	1	not used		
45	Sodium Hydroxide 22%		Chemstore	5L	1	CEMS multigas analyser		
46	Sodium Hydroxide	1310-73-2	Pond bund	200L	2	Easl (E+I)	H290 H314	
47	Sodium Persulphate	7775-27-1	Chemstore	25L	4	not used		
48	Testomat 2000		Warehouse	500ml	3	Production		
49	Thermbond		Chemstore	1 gallon	16	Maintenance		
50	Toluene	108-88-3	Chemstore	25L	1	Cleaning of dioxin probe during service	H225 H315 H304 H336 H373 H361d	Flammable Irritant STOT Aspiriation Tox. Toxic for Reproduction
51	Caustic Liquor		Chemstore	25L	2	Production		
52	CAT Transmission and Drive Train Oil		Chemstore	20L	1	Loader		
53	CAT Hydraulic Oil		Chemstore	20L	3	Loader		
54	CAT Extended Life Coolant		Chemstore	20L	1	Loader		
55	CAT Engine Oil		Chemstore	20L	1	Loader		
56	Karcher Machine Protector Advance 1		Chemstore	1L	5	Loader		
57	Karcher Active Cleaner		Chemstore	1L	1	Loader		
58	Disofil 32 Refractory Binder		Chemstore	5L	37	not used		
59	Carter SY 220		Chemstore	20L	2	Shutdown		
60	Ecocool 420 (Slugger Metal Working Fluid)		Mech	5L	1	Coolant for bandsaw		
61	Lubricant/Coolant for Bredel Hosepump		Warehouse	5L	4	Lubricant for hose		
62	MOBIL CHASSIS GREASE LB2		Mech	15L	1	Chassis grease		
63	MOBIL DTE 26		Mech	208L	2	Lubricant		
64	Mobil SHC 630		Chemstore / L4	20L	1	Lubricant		
65	MOBIL XMP 220		Mech	20L	2	Gearboxes		
66	Mobilgear 600 XP 150		Mech	20L	3	Bunker cranes		
67	Mobilgear 600 XP 220		Mech	20L	2	Gearbox oil		
68	Mobilgear 600 XP 460		Mech	20L	2	Gearbox in the maturation silo		
69	Mobilgear 600 XP 680		Mech	20L	2	Gearbox in the maturation silo		
70	Mobilgrease XHP 222		Mech	400g	12	Bearings		
71	Mobil NUTO H 46		Chemstore	20L	1	Pumps		
72	Total Preslia GT 46		Chemstore	208L	4	Lubricant for turbine		
73	Ridgid Dark Thread Cutting Oil		Mech	2L	1	Thread cutting machine oil		
74	TOTAL PRESLIA GT46		Chemstore	208L	3	Lubricant		
75	Total Multis Complex EP3		Mech	400g	12	Motor grease		
76	Renolith 443 HD 88		Mech	400g	12	Double deck		
	CEMS Gases							
77	Hydrogen	1333-74-0	CEMS/Cage	50L	4	Continous Emissions Monitoring	H220 H280	Flammable Gases under Pressure
78	Ineregen Mixture of Gases (Oxygen, Carbon Dioxide, Argon 93%)	7440-37-1	Plant	143kg	3	Fire Suppression	H280	Gases under Pressure
79	Mixture of Gases (Anhydrous Ammonia, Nitrogen 99.98%)	7727-37-9	Cage	10L	2	Continous Emissions Monitoring	H280	Gases under Pressure
80	Mixture of Gases (Carbon Dioxide 12%, Nitrogen 88%)	124-38-9 7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
81	Mixture of Gases (Dinitrogen Oxide, Nitrogen 99.998%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
82	Mixture of Gases (Hydrogen chloride, Nitrogen 99.76%)	7727-37-9	Spray Dryer	10L	1	Continous Emissions Monitoring	H280 H314	Gases under Pressure Corrosive (Skin Corr. 1B)
83	Mixture of Gases (Nitrogen dioxide, Nitrogen >99.99%)	7727-37-9	CEMS	50L	1	Continous Emissions Monitoring	H280	Gases under Pressure
84	Mixture of Gases (Oxygen, Nitrogen 99.6%)	7727-37-9	Spray Dryer/Cage	50L	3	Continous Emissions Monitoring	H280	Gases under Pressure
85	Mixture of Gases (Oxygen, Nitrogen 92%)	7727-37-9	Spray Dryer/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
86	Mixture of Gases (Oxygen, Nitrogen 98%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
87	Mixture of Gases (Propane, Nitrogen >99.99%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
88	Mixture of Gases (SO2, CO, NO, Nitrogen >99.9%)	7727-37-9	CEMS/Cage	50L	3	Continous Emissions Monitoring	H280 H332	Gases under Pressure Acute Tox. 4
89	Mixture of Gases (Sulphur dioxide, Nitrogen >99.91%)	7727-37-9	Spray Dryer/Cage	10L	3	Continous Emissions Monitoring	H280	Gases under Pressure
90	Nitrogen	7727-37-9	CEMS/Cage	50L	3	Continous Emissions Monitoring	H280	Gases under Pressure

Appendix B – Gannt Timeline

OUTLINE GANNT CHART FOR IMPLEMENTATION OF INDAVER IRELAND CRAMP

	Closure Action Description	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month7 - 12	Month 12-18	Month 18-24
0	Initial ICA Site Visit to prepare inventory of items requiring decommissioning									
1	Cancellation of existing waste feed contracts, incineration of waste already on site, removal of unused raw materials and removal of any quarantined wastes									
2	Decontamination of all Process Equipment and Services equipment									
3	Decommissioning of all Process equipment and Services Equipment									
4	Removal of Equipment and Facilities from Spare Parts Warehouse									
5	Cleaning of all underground drainage lines, tanks and surface water attenuation pond									
6	Removal of Equipment and Facilities from Offices, Collection of any remaining wastes, decommissioning of WWTPs									
7	Completion of Site Closure Validation Test Programme (Months 7&8)									
8	Submission of ICA Validation Report (9 months)									
9	Environmental Monitoring Rounds (Biannual GW, SW, Dust etc)									
10	Security Provision									
11	Final Closure Reporting (date of surrender of licence application to be agreed with EPA at outset of ICA process)									

Appendix C - Detailed Costings for Facility Closure Period

BREAKDOWN COSTING FOR INDAVER IRELAND CRAMP REVIEW 2018

Task	Description	Quantity No.	Measurement Unit	Unit Rate €	Cost €	Source of Unit Rates
Plant, Building and Equipment Cleaning	Waste Bunker (including cleaning of metal recovery plant, reception hall and main waste hopper)	5	days	1500	7500	Indaver Production
	Furnace (bottom ash wet bath), Boiler, Flue gas treatment system (Spray dry reactor, bag house filters)	6	days	55000	330000	Indaver Production
	Turbine	1	days	1500	1500	Indaver Production
	Air Cooled Condenser	2	days	300	600	Indaver Production
	Stack Cleaning	1	days	1500	1500	Indaver Production
	Electricity Export Infrastructure	1	days	1500	1500	Indaver Production
	General Administrative Area and Control Room Clean out	3	days	175	525	Indaver Admin Manager
	Ammonia Solution Tank (62m3)	1	days	1500	1500	Indaver Production
	Oil Tanks (Auxilary Diesel - 40m3, 3 no. Fire Water Pump Diesel Tanks - 2.4m3, Back-up Generator Diesel Tank - 9m3, Turbine Lube Oil Tank - 7m3, Hydraulic Oil for Furnace - 1m3, Control Oil Tank - 1m3)	2	days	1500	3000	Indaver Production
	Recovery Tanks (2 tanks 50m3)	1	days	1500	1500	Indaver Production
	Fire Water Retention Tank (300m3)	2	no.	300	600	Indaver Production
	Underground containment Tanks (Diesel/Ammonia Unloading 2.5m3)	1	days	1500	1500	Indaver Production
	Oil Interceptors/Separator	1	days	1500	1500	Indaver Production
	Silos (Clay Silo - 80m3, Quicklime Silo - 115m3, Hydrated lime silo 80m3, Activated Carbon Silo - 80m3, 2 no. Flue Gas Residue Silos - 236m3 each, Boiler Ash Silo - 122m3, Maturation Silo - 100m3)	8	days	1500	12000	Indaver Production
	Compressors (0.2m3) - Oil/Water Contents	1	days	1500	1500	Indaver Production
	Spray dry Reactor (1,619m3)	1	days	1500	1500	Indaver Production
	Glycol Cooling System (9,800 litres in Cooling Circuit)	1	days	1500	1500	Indaver Production
	Demin water tanks 2 x 45m3	1	days	1500	1300	Indaver Production
	Chemical Bulk Tanks (2 no. Nitric Acid IBC - 1m3 each, 2 no. Sodium Hydroxide - 1m3 each)	1	days	1500	1500	Indaver Production
	Service Tank Demineralised Water for SNCR (1m3)	0.25	days	1500	375	Indaver Production
	Buffer, Prep and Service Tanks (4 no. Buffer Tanks - 1m3 each, Deaerator/Boiler Feedwater Tank - 92m3, 2 no. Lime Milk Tanks - 10m3 each)	1	days	1500	1500	Indaver Production
	Foam Tank (13,000L)	1	days	1500	1500	Indaver Production
	Neutralisation Tank (2m3) - Salty Water	0.5	days	1500	750	Indaver Production
	Foul Water Drainage Network Cleaning and CCTV Inspection (328m foul and 173m process)	5	days	1500	7500	AWN Estimate
	Fire Water Tank Pumps	1	days	1500	1500	Indaver Production
	Transformer Oil Draining and Cleaning	1	days	1500	1500	Indaver Production
	Surfacewater Attenuation Pond	2	days	1500	3000	Indaver Production
	Wastewater Treatment Systems (Security, village and Main Administration Block)	3	days	1500	4500	Indaver Production
	Aqueous Unloading Area	0.5	days	1500	750	Indaver Production
	Solidification Plant clean out	2	days	1500	3000	Indaver Production
	SUBTOTAL A				**397900**	
Plant, Building and Equipment Decommissioning	Recovery Tanks Inert Filling	100	m3	110	11000	Indaver (Price was taken from average prices of fill)
	Groundwater Well Decommissioning and Pump Removal	6	wells	900	5400	AWN Estimate
	Fire Water Retention Tank Inert Filling	300	m3	110	33000	Indaver (Price was taken from average prices of fill)
	Removal and Decommissioning of Oil and Forecourt Separator	2	no.	500	1000	Indaver Maintenance Dept
	Packaging and Transport off-site of Baghouse Filters Content	1	no.	1500	1500	Indaver Production
	Decommissioning and Removal from site of 24 no. air conditioning units	24	no.	350	8400	Indaver Maintenance Dept
	Wastewater Treatment Systems infilling post clean out (septic tanks and puraflo)	13	m3	120	1560	Indaver (Price was taken from average prices of fill)
	SUBTOTAL B				**61860**	
Waste Disposal (typically assumes 5% of tank volume generated as waste wash-water and includes transport and associated packaging and admin costs)	Ammonia Solution Tank (62m3)	62	tonne	700	43400	Indaver Waste treatment department
	Wash water from ammonia solution tank (at 5% of size)	3.1	tonne	700	2170	Indaver Waste treatment department
	Oil Tanks: Auxilary Diesel - 40m3	40	tonne	140	5600	Indaver Waste treatment department
	Oil Tanks: 3 no. Fire Water Pump Diesel Tanks - 2.4m3	7.2	tonne	140	1008	Indaver Waste treatment department
	Oil Tanks: Back-up Generator Diesel Tank - 9m3	9	tonne	140	1260	Indaver Waste treatment department
	Oil Tanks: Turbine Lube Oil Tank - 7m3	7	tonne	140	980	Indaver Waste treatment department
	Oil Tanks: Hydraulic Oil for Furnace - 1m3	1	tonne	140	140	Indaver Waste treatment department
	Oil Tanks: Control Oil Tank - 1m3	1	tonne	140	140	Indaver Waste treatment department
	Wash water from cleaning of oil tanks	3.26	tonne	140	456.4	Indaver Waste treatment department
	Recovery Tanks (2 x 50m3) - Process cleaning water contents	100	tonne	140	14000	Indaver Waste treatment department
	Wash-water from cleaning of recovery tanks	5	tonne	140	700	Indaver Waste treatment department
	Fire Water Retention Tank (300m3) - Dirty Water Contents	300	tonne	140	42000	Indaver Waste treatment department
	Oil and Forecourt Separator (20m3) - Oil/Water Contents	20	tonne	140	2800	Indaver Waste treatment department
	Wash water from oil/forecourt seperator and fire water retention tank	301	tonne	140	42140	Indaver Waste treatment department
	Clay Silo - 80m3	80	tonne	230	18400	Indaver Waste treatment department
	Quicklime Silo 115m3	115	tonne	230	26450	Indaver Waste treatment department
	Hydrated lime silo 80m3	80	tonne	230	18400	Indaver Waste treatment department
	Activated Carbon silo 80m3	80	tonne	230	18400	Indaver Waste treatment department
	Flue gas residue silo 2 x 236m3	472	tonne	230	108560	Indaver Waste treatment department
	Boiler Ash Silo - 122m3	122	tonne	230	28060	Indaver Waste treatment department
	Maturation Silo - 100m3	100	tonne	230	23000	Indaver Waste treatment department
	Wash waters from silo cleaning	52.45	tonne	1200	62940	Indaver Waste treatment department
	Compressors (0.2m3) - Oil/Water Contents	0.2	tonne	140	28	Indaver Waste treatment department
	Spray Dry Reactor (1,619m3) (10 tonne removed during shutdown)	10	tonne	230	2300	Indaver Waste treatment department
	Wash waters from spray dry reactor	80.95	tonne	1200	97140	Indaver Waste treatment department
	Glycol Cooling System (9,800 litres in Cooling Circuit) - Glycol Contents and Transport	9.8	tonne	300	2940	Indaver Waste treatment department
	Wash waters from glycol cooling system	0.49	tonne	300	147	Indaver Waste treatment department
	Sodium hydroxide jerricans (2 x 25L jerricans plus 100L dosing tank)	0.15	tonne	1200	180	Indaver Waste treatment department
	Wash water from cleaning sodium hydroxide dosing tank	0.005	tonne	1200	6	Indaver Waste treatment department
	Nitric acid IBC 2 x 1m3	2	tonne	1200	2400	Indaver Waste treatment department
	Ethylene glycol IBC 2 x 1m3	2	tonne	120	240	Indaver Waste treatment department
	Diesel Tank 1.5m3	1.5	tonne	120	180	Indaver Waste treatment department
	Wash water from cleaning diesel tank	0.075	tonne	120	9	Indaver Waste treatment department
	Service Tank Demineralised Water for SNCR (50m3)	50	tonne	35	1750	Indaver Production
	Wash water from service tank demineralised water fro SNCR	2.5	tonne	35	87.5	Indaver Production
	Buffer, Slacker and Service Tanks: 4 no. Buffer Tanks - 1m3 each	4	tonne	120	480	Indaver Waste treatment department
	Wash water from buffer, slacker and service tanks	0.2	tonne	120	24	Indaver Waste treatment department
	Deaerator/Boiler Feedwater Tank - 80m3	80	tonne	120	9600	Indaver Waste treatment department
	Wash water from deaerator/boiler feedwater tank	4	tonne	120	480	Indaver Waste treatment department
	Lime milk tanks 2 x 10m3	20	tonne	120	2400	Indaver Waste treatment department
	Wash water from lime milk tanks	1	tonne	120	120	Indaver Waste treatment department
	Fire Water Foam Tank (13,000 litres) - Foam Contents	13	tonne	100	1300	Indaver Waste treatment department
	Wash water from fire water foam tank	0.65	tonne	100	65	Indaver Waste treatment department
	Neutralisation Tank (2m3) - Salty Water	2	tonne	110	220	Indaver Waste treatment department
	Wash water from neutralisation tank	0.1	tonne	110	11	Indaver Waste treatment department
	Baghouse Filters - Contents Disposal	200	FIBC	400	80000	Indaver Waste treatment department
	Waste from waste bunker	7111	tonne	150	1066650	Indaver Waste treatment department
	Washwater generated during bunker cleaning (5% of total volume of waste bunker @ 12,000m3))	600	tonne	75	45000	Indaver Waste treatment department
	Bottom Ash	600	tonne	55	33000	Indaver Waste treatment department
	Wash water from cleaning of bottom ash hall	80	tonne	75	6000	Indaver Waste treatment department
	FGR/Boiler Ash blocks	100	tonne	120	12000	Indaver Waste treatment department
	Refrigeration System - Refrigerant	0.215108	tonnes	110	23.66188	Indaver Waste treatment department
	General Waste (estimated @ 1 x 6cum skip per week)	26	week	180	4680	Indaver Production
	Wastewater Treatment System (5.7m3)	1	no.	500	500	Indaver Waste treatment department
	38 kV Compound - Transformer Oil	8.4	tonne	120	1008	Indaver Waste treatment department
	4 no. 2 MVA Transformers - Transformer Oil	1.91	tonne	120	229.2	Indaver Waste treatment department
	Boiler water	140	tonne	26	3640	Current outlet for excess boiler water
	Liquid tanks	220	Tonne	110	24200	Indaver Waste treatment department
	Pretreatment washings as waste (Haz liquid)	10	Tonne	1200	12000	Indaver Waste treatment department
	SUBTOTAL C				**1872042.762**	
Environmental Monitoring (assuming a minimum of 2 rounds of environmental monitoring for 2 years post closure)	Water Monitoring sampling and analysis (3 no. gw wells and 1 no. sw location)	16	samples	300	4800	AWN Estimate
	Reporting (based on current monitoring reporting costs)	2	reports	6000	12000	Indaver In house Staff cover
	SUBTOTAL D				**16800**	
Gatehouse Staff for 1 year post closure	Gatehouse Staff	12	months	7000	84000	Indaver In house Staff cover
Validation Audit, Documenting Closure Process, Reporting	Environmental Consultant Costs	1	no.	20000	20000	AWN Estimate
Management and Staffing Costs	Manager/Supervisors x 2 (Maintenance and QE Managers)	6	months	20000	120000	Indaver In house Staff cover
	Labour (4 no. maintenance staff)	6	months	25000	150000	Indaver In house Staff cover
	SUBTOTAL E				**374000**	
Agency Costs	EPA Costs for 6 months (including surrender fees)	1	no.	55000	**55000**	AWN Estimate
Insurance	Annual Insurance Premium for site during closure (allocated on a proportionate basis)	1	no.	229,015	**229015**	Indaver Purchasing Dept
Power Usage	Approx. 2MWh demand during operations (estimated 5% of load post closure for 6 months)	436,363	kWh	0.20	**87273**	Indaver accounts dept
Water Usage	Consumption of mains water supply during shutdown	1	no.	4500	**4500**	Indaver production dept
Fuel Usage	Diesel consumption during shutdown period (16,000L for 1 x 4 hour shutdown)	16,000	L	0.7	**11200**	Indaver process engineer
TOTAL					**3,109,590.47**	
CONTINGENCY	**25% CONTINGENCY OF TOTAL ABOVE**				**777397.618**	
TOTAL INCLUDING CONTINGENCY					**3,886,988.09**	