



Energy for
generations

**West Offaly Power Generating Station
Industrial Emissions Licence Register Number:
P0611-02**

Decommissioning Management Plan (DMP)
and
Closure, Restoration and Aftercare Management Plan
(CRAMP)

ESB

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Appendix V - Station Map showing Historic Landfill Area

Summary

Activity Details

Name: Electricity Supply Board

Address: West Offaly Generating Station, Shannonbridge, Co. Offaly, Ireland.

Licence/Permit Number: P0611-02

Report Preparation: The report was prepared on behalf of the operator by ESB Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Dublin.

Licensed Activities

As per a Section 96(1)(b) Amendment to Licence Reg. No. P0611-02 dated June 2018, the following activities are licensed:

- 2.1 Combustion of fuels in installations with a total rated thermal input of 50 MW or more.
- 11.5 Landfills, within the meaning of section 5 (amended by Regulation 11(1) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity (Regulations 2008 (S.I. No. 524 of 2008)) of the Act of 1996, receiving more than 10 t of waste per day or a with a total capacity exceeding 25,000 t, other than landfill of inert waste.

Scope and Review

The Decommissioning Management Plan (DMP) addresses the key issues that would occur in the shut-down of power station activities at West Offaly Power Generating Station.

The Closure, Restoration and Aftercare Management Plan (CRAMP) addresses the key issues that would occur in the shut-down of landfill activities at West Offaly Power Generating Station.

Costs and Financial Provision

Costs arising at the Power Station and Ash Disposal Facility including aftercare over a 10 year period amount to €17,309,315.

The aftercare element of the costs has been adjusted to provide for an annual inflation rate of 2.5%.

ESB makes specific financial provision for closure of its power stations and the provision at 31 December 2019 for closure of generating stations including West Offaly Power Generating Station

was €171 million. The company has successfully decommissioned a number of power stations, many of which have included ash landfilling activities.

1 Introduction

1.1 IE Licence Reg. No. P0611-02

Environmental management at ESB's West Offaly Power Generating Station is regulated by the conditions of Industrial Emissions (IE) Licence Reg. N° P0611-02, issued in September 2013 as amended by a Section 82A(11) Amendment to Licence Reg. No. P0611-02 issued in January 2014 and amended under Section S96(1) Technical Amendments A and B to Reg. N° P0611-02 issued in December 2018 and June 2019 respectively. The following activities are licensed:

- 2.1 *Combustion of fuels in installations with a total rated thermal input of 50 MW or more.*
- 11.5 *Landfills, within the meaning of section 5 (amended by Regulation 11(1) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity (Regulations 2008 (S.I. No. 524 of 2008)) of the Act of 1996, receiving more than 10 t of waste per day or a with a total capacity exceeding 25,000 t, other than landfill of inert waste.*

Activities were previously regulated under IE Licence Reg. N° P0611-01, issued in March 2002.

1.2 Licence Requirements for DMP and CRAMP

The requirements regarding Decommissioning and Residuals Management are outlined in Condition 10 of the IE Licence Reg. No. P0611-02 as follows:

- 10.1 *Following termination, or planned cessation for a period greater than six months; of use or involvement of all or part of the site in the licensed activity, the licensee shall, to the satisfaction of the Agency, decommission, render safe or remove for disposal/recovery any soil, subsoil, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*
- 10.2 *Decommissioning Management Plan (DMP) and Closure, Restoration and Aftercare Management Plan (CRAMP)*
 - 10.2.1 *The licensee shall maintain, to the satisfaction of the Agency, a fully detailed and costed plan (DMP) for the decommissioning or closure of the site or part thereof, other than the landfill area in which waste has been deposited*
 - 10.2.2 *The licensee shall prepare and maintain, to the satisfaction of the Agency, a fully detailed and costed plan (CRAMP) for the closure, restoration and aftercare management of the on-site landfill or part thereof. The CRAMP shall be submitted to the Agency for agreement within six months of the date of grant of this licence in relation to the Ash Disposal Facility.*

10.2.3 *The plans (DMP and CRAMP) shall be maintained and 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.*

10.2.4 *The licensee shall have regard to the Environmental Protection Agency Guidance on Environmental Liability Risk Assessment, Decommissioning Management Plans and Financial Provision when implementing Conditions 10.2.1 and 10.2.2 above*

10.3 *The DMP and CRAMP shall each include, as a minimum, the following:*

(i) a scope statement for the plan;

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

(iii) a programme to achieve the stated criteria;

(iv) where relevant, a test programme to demonstrate the successful implementation of the decommissioning plan;

(v) details of the long-term supervision, monitoring, control, maintenance and reporting requirements for the restored landfill (CRAMP only); and

(vi) details of the costings for the plan and the financial provisions to underwrite those costs

In terms of closure of the station's Ash Disposal Facility, the following is also outlined in Condition 10 of the IE Licence Reg. No. P0611-02

10.7 Final Capping

10.7.1 *The final capping shall be in accordance with the requirements of Council Directive 1999/31/EC on the landfill of waste.*

1.3 Scope of DMP and CRAMP

The Decommissioning Management Plan (DMP) is presented in Section 3 of this report and refers to the site, other than the Ash Disposal Facility. Its scope addresses the key issues that would occur in the shut-down of power station activities at West Offaly Power Generating Station.

The Closure, Restoration and Aftercare Management Plan (CRAMP) is presented in Section 4 of this report and refers to management of the Ash Disposal Facility. Its scope addresses the key issues that would occur in the shut-down of landfill activities at West Offaly Power Generating Station.

1.4 Application of DMP and CRAMP

The scope of the DMP and CRAMP addresses the pertinent issues that would occur in the shut-down of all of the station activities.

Condition 10.1 of the IE Licence refers to planned cessation of operations for a period of greater than six months. The current planning permissions for West Offaly Power Generating Station will expire at the end of 2020. Following review by ESB of the options for the station post 2020, no viable business model beyond 2020 was identified and the station will cease generation of electricity at the end of December 2020. The station will therefore be due for closure and the DMP and CRAMP will then be implemented. There are no direct references within the DMP and CRAMP to partial closure. West Offaly Generating Station comprises a single generating unit and no circumstances are currently envisaged under which partial closure could occur.

1.5 Exclusions

Successful decommissioning is determined as being completed when all buildings, equipment, wastes, soil, subsoil or any other materials that could result in environmental pollution are removed from the site and recycled, recovered or disposed of in accordance with all regulations in force at that time. The DMP will result in a decommissioned and decontaminated site suitable for future industrial use. All buildings and some site services, whilst emptied and cleaned as part of the DMP, will remain in place following decommissioning.

The DMP and CRAMP apply to the site, except as follows:

- Certain areas at the power station will continue to operate or remain operational. These include facilities such as the diesel supply to back-up engine of the fire protection system.
- Routine services that are performed by contractors on an ongoing basis include the following: hygiene services, general building work, rodent control, landscaping, laundry, lagging, tool hire and specialist welding. These activities have no implication for the DMP.
- All equipment and plant is the property of West Offaly Generating Station, other than the following:
 - Certain facilities are owned and operated by Bord na Móna in its role as the supplier of the main fuel and operator at the ADF, as described in the West Offaly Power ADF Operational Plan. These include a wash slab and shipping containers used for site offices, welfare and storage.
 - The Intermediate Bulk Container (IBC) in which ammonia (30-33%) used in steam/water cycle treatment is held is the property of the supplier.

- Cylinders in which bottled gas is delivered are the property of the supplier, who will be responsible for their removal.
- Network transformers and cables and other facilities including GIS relay equipment are the property of ESB Networks.

1.6 Implementation

Closure of West Offaly Generating Station was previously addressed in a Residuals Management Plan (RMP) (Report Ref. P04E519A – R1, December 2005).

Since its commissioning in 2004, the presence of West Offaly Generating Station has not resulted in significant environmental impacts and the station will continue to be operated in a responsible manner. Issues that are likely to arise upon closure at West Offaly Generating Station have all been dealt with successfully in the past at other ESB power stations and similar care will be taken when decommissioning at this site.

ESB has successfully decommissioned a number of power stations, many of which have included ash landfilling activities. These were at Miltown Malbay, Screeb, Gweedore, Allenwood, Portarlinton, Ringsend, Cahirciveen, Rhode, Ferbane, Arigna, Bellacorick, Lanesboro and Shannonbridge.

2 Site Evaluation

2.1 Description

2.1.1 West Offaly Power Generating Station

West Offaly Power Generating Station is located on the banks of the River Shannon, just downstream of its confluence with the River Suck, in Co. Offaly. It is adjacent to the village of Shannonbridge, which is approximately 850 m to the north, while the River Shannon borders the site to the west.

The plant is fired on milled peat supplied by Bord na Móna with a start-up and combustion support facility for firing standard refinery fuel oil.

The power station site covers an area of approximately 20 hectares (ha) and is adjacent to the site of ESB's former Shannonbridge Generating Station, which operated as a peat burning power station from the early-1960s until its closure in 2004. The former station was a previously EPA licenced facility, Licence Reg No. P0626-01, and the licence was successfully surrendered in November 2011 following closure. The licenced site boundary is shown in Appendix III.

2.1.2 West Offaly Power Ash Disposal Facility

The station's off-site Ash Disposal Facility (ADF) is located on remote Bord na Móna cutaway bogland at Derrylahan, Co. Offaly, approximately 8 km east from the power station. Access to the ADF is from the R357 Shannonbridge – Cloghan Regional Road, via a minor road that passes Bord na Móna's Blackwater works. Access is also possible from the north east via a minor road off the R444 Clonmacnoise - Moate Regional Road. The ADF is located within the licenced boundary area and its activities are licensed under IE Licence Reg. No. P0611-02, as shown in Appendix IV.

The deposited ash comprises bottom ash and fly ash. Of the total ash arising, approximately 5% is bottom ash. The facility is operated by Bord na Móna on the station's behalf.

The ADF site area extends to approximately 36 ha. The ash landfill will ultimately comprise 6 separate cells of varying dimensions and cover an area of approximately 14.44 ha.

The ADF's distance from the point of access from the public road is approximately 3 km via a site access track. The area is sparsely vegetated and is surrounded by tracts of production bogland.

2.2 Facilities and Operations

2.2.1 WOP Station

The power station comprises a single boiler/turbine unit with an electrical output of 150 MW and its main features are as follows:

- Main building housing fluidised-bed boiler and 150 MWe rated turbo-alternator unit.
- Fuel handling system comprising peat wagon tipplers, screens, conveyors and an intermediate peat storage (IPS) facility.
- Water treatment plant (WTP) for processing of water prior to its storage and use in the boiler. Chemicals are used and stored in the WTP facility. Further details of chemical storage on site are included in Appendix I.
- Cooling water system, comprising a pumphouse, inlet and outlet culverts and outfall, for condenser cooling.
- Flue gas system comprising cyclone separators and bag filters for removal of peat ash from exhaust gases.
- Chimney for discharge of exhaust gases to the atmosphere.
- Ash handling system comprising conveying systems and storage silos.
- Gas-Oil tank for storage of auxiliary fuel.
- Storage facilities for limestone, lime and sand.
- Generator transformers, high voltage switchgear, and unit and house transformers.
- Supporting facilities including the following:
 - Administration offices
 - fire protection system
 - auxiliary cooling water system
 - Auxiliary fuel (gasoil) pumphouse
 - diesel generator
 - chemicals storage tanks
 - chemical laboratory
 - sewage treatment plant
 - workshop and stores
 - groundwater monitoring wells (2 no.)

The structural form of station buildings is conventional structural steel supported on reinforced concrete foundations. Gentries and walkways for access to plant and equipment are constructed of stainless/galvanised steel open grating type flooring. These are supported on steel beams and

columns. External walls comprise profiled metal cladding and roofs are constructed of profiled metal decking on purlins spanning between rafters. The materials used pose no environmental threat in the event of station closure.

The location of the station buildings are shown in Appendix III.

2.2.2 Ash Disposal Facility

2.2.2.1 Transport of Ash to ADF

Fly ash and bottom ash are transported to the ADF on Bord na Móna's narrow gauge rail system in specially designed saddleback wagons. One train (rake), each containing up to 12 wagons, is used daily Monday – Saturday. Each wagon comprises two ash buckets with combined capacity of approximately 7-9 m³ of ash.

2.2.2.2 Placement into ADF Cell

Once at the ADF, the ash is tipped from the wagons and is placed in the cells using low bearing pressure tracked earthmoving plant. The ash is placed semi-dry and is wetted to control potential dust emissions. A tractor drawn spray tanker or fixed spray system is used in wetting the ash to aid compaction and further prevent dust nuisance.

The ash is graded to flat during the filling of the cells to limit rainwater ponding in the cell. Leachate that is generated is captured and re-circulated over the active cell to dampen the ash.

2.2.2.3 Capping of ADF Cells

Four cells (Cells 1, 2, 3 and 4) are already closed and capped, and Cells 5 and 6 are open with Cell 5 currently in operation. It is expected that Cell 5 will remain open until station closure, with Cell 6 now unlikely to be required for ash landfill, due to the reduced level of station activity expected before closure. Both Cells 5 and 6, if used, will be fully capped and closed by early 2022. The total capacity of the ADF will be approximately 602,000m³ when Cell 5 is capped and closed. Cell 6 would add an additional capacity of 106,000 m³ if required. If Cell 6 is not required, no embankment lining or capping will be required. In that instance, the excavated footprint of the cell will be reinstated with a layer of peat.

The original capping layer that was in place for completed cells comprised a 1 m layer of peat / subsoil, which was added in a concave mound design. All cells will have a basal and capping liner (permanent low permeability Geosynthetic Clay Liner). The material used for the restoration layer is a mixture of peat and soil and sourced on site from existing uprisings stockpiles and cutaway bog within the site boundary.

As per the Operational Plan for West Offaly Ash Disposal Facility, prepared by Bord Na Móna for submission to the EPA, a re-capping programme of the completed cells commenced in

September 2014 and Cells 1-4 are now capped with a less permeable capping system which consists of peat layer, underlying a Geo-Synthetic Clay Liner (GCL) underlying a Composite Drainage Layer (CDL). The peat of the initial capped cells was stripped, temporarily stored, and re-used as the final capping layer in this re-capping programme. Cells 5 and 6 will be capped using the same capping system currently in place in Cells 1-4.

After capping is completed, all cells are revegetated to blend with the natural landscape.

2.2.2.4 Basal Liner of ADF Cells

The basal liner of each Cell is lined in a similar arrangement to the capping liner with a Geo-Synthetic Clay Liner (GCL) underlying a Composite Drainage Layer.

The height of the basal liner above the base of the ash cell varies depending on the design are discussed in more detail in Section 4 of this report.

2.2.2.5 Leachate Management & Collection System ADF

The ADF cells have auxiliary infrastructure associated with the leachate management and collection system. Further details of the leachate collection system are discussed in more detail in Section 4 of this report.

2.2.2.6 Additional Infrastructure at the ADF

There are several container units at the West Offaly ADF, including a canteen unit, site office, oil store, toilet block and storage container. There is also a wash slab area consisting of a concrete slab, power washer container and storage tank.

This area is currently managed by Bord na Móna and will be removed by Bord Na Móna on closure if not required for subsequent site closure and aftercare.

There is also a backup power diesel generator currently located at the ADF, which is used for the leachate pump in the event of a power outage. The generator has an integrated fully bunded diesel tank, and a separate fully bunded fuel cube with a feed and return line to and from the generator, with a capacity of 900L. This will remain at the site for six months after station closure as part of the site infrastructure as part of the proposed leachate management system.

2.3 Key Considerations

2.3.1 Bulk Materials and Chemicals

In addition to the general requirements for decommissioning, the principal issues to be considered for West Offaly Power Generating Station are identified as:

- Liquid fuel (diesel) removal
- Residual chemicals and chemical storage tank cleaning.
- Cleaning of pipelines, tanks and sumps

2.3.2 Supplementary Raw Materials and Low Volume Chemicals

The power station's stores hold a variety of coded raw materials (excluding fuel) that are used in operations and maintenance activities. The coding system provides for stock control and most items are of no environmental significance.

Appendix I lists environmentally significant raw materials that may require disposal during decommissioning (derived from Section 10 of the station's application for its IE Licence). The list contains details of the maximum quantities of these materials stored at the power station. The actual quantities remaining at shut-down will likely be much less due to scaling down of activities prior to closure, allowing a staged reduction in inventory. Any remaining residual materials which cannot be used at another ESB location will be considered as waste material for disposal by an appropriately licenced contractor.

2.3.3 Wastes

Site operations generate hazardous and other wastes. The types of waste generated are outlined in the West Offaly Power Generating Station's Annual Environmental Report (AER). Types of waste and quantities thereof vary from year to year. The full range of waste categories arising over the period 2016-2018 are presented in Appendix II where the annual average amount for the period is also shown. HVAC gases including SF6 are managed by a certified F-Gas contractor and disposed of appropriately if required.

The amount of wastes generated will increase during implementation of the DMP with the following being of particular note:

- Batteries
- Smoke detectors
- Chemical paints and additives.
- Waste lubricating oils

- Waste transformer oils
- Coolants (spent machine)
- Water Treatment Plant Resins
- Radiological Waste

Wastes arising during decommissioning will be managed in accordance with Condition 8 of the IE Licence Reg. N° P0611-02. Average annual volumes for waste streams generated by the station are listed in Appendix II.

2.3.4 Drainage Line Cleaning

All WOP licenced discharge points, drainage lines and underground pipework will be cleaned appropriately to ensure no residuals remain. Cleaning will involve water jetting using the existing oil interceptor system, vacuum tankers and pressure washer and bowser. All residues from drainage line cleaning will be disposed of appropriately. See Section 3.2.6 for further detail.

2.3.5 Transformer Oils

Transformer Oils have been tested and were found to be free of PCBs and therefore no PCB register is required. All oils and residues will be disposed of appropriately.

2.4 Ash Disposal Facility

The existing Ash Disposal Facility has been operational since 2004. Condition No. 2 of An Bord Pleanála's decision of February 2002 states that the existing planning permission expires at the end of 2020.

The final capacity of the ADF site will not be reached within the limitations of the current planning permission and all ash produced before the closure of the station will be disposed of at the ADF.

2.4.1 Leachate Management

Leachate will be managed in accordance with the Operational Plan for West Offaly Power ADF. The permanent leachate treatment system was installed in 2015 and will be extended to the current operational cells when they are completed and capped. See Section 4.3.1 for further detail of the leachate management system. Compliance Record and Long-term Liabilities

2.4.2 Significant Licence Non-Compliances or Environmental Incidents

Environmental incidents and complaints are reported in the Annual Environmental Reports (AER) for West Offaly Power Generating Station. These confirm that operations since commencement have resulted in neither significant licence non-compliances nor significant environmental

incidents that could give rise to long-term liabilities. A report file is held in the station for all incidents on site.

No major incidents, with the potential to negatively impact soil or water quality, have occurred on site since the commissioning of WOP station in 2004. Details of all minor incidents, non-compliances and complaints which have occurred at WOP have been reported to the EPA as they occurred within the AERs and have been closed out.

2.4.3 Non-Compliances

It is noted that a non-compliance in relation to a breach of a quarterly ELV relating to surface water at PS-SW5 occurred in 2017 as sampling was undertaken after a condensate polisher regeneration (ammonia ELV is 50 mg/l for a CPP regeneration). WOP station subsequently undertook and submitted to the EPA additional analysis on this sampling point for approximately two months to demonstrate compliance with the required ELV. No further action was required by the Agency.

Non-compliances with Condition 5.5 have been issued by the EPA in the past in relation to the discharge of heated cooling water. Monthly datalogger reports are issued to the EPA for compliance monitoring. Thermal Plume is an ongoing non-compliance issue for the station which will continue to be monitored up until closure. This issue of Thermal Plume is expected to cease with the cessation of electricity generation at the site when there will no longer be any discharge of heated cooling water into the Shannon.

2.4.4 Environmental Monitoring & Long-Term Liabilities

The environmental monitoring programme at West Offaly Power Generating Station is in accordance with the requirements of its IE Licence. Such monitoring is designed to identify any impacts associated with operation of the station to allow effective remedial action or minimise environmental pollution. Improved or additional operational controls are implemented as soon as a need is identified, such as the introduction of an online alarmed tracking system for leachate level monitoring at the ADF.

A significant soil and groundwater programme after station decommissioning is not anticipated at the Station. The current soil and groundwater monitoring programme in accordance with the IE Licence requirements in place at the Station will continue until decommissioning works are finalised and when the EPA are satisfied monitoring is no longer required.

The current soil and groundwater monitoring programme at the ADF will continue throughout the decommissioning period and following closure as part of the CRAMP. This monitoring programme will be in place provisionally for 10 years but will be reviewed on an annual basis. Monitoring points and wells will be maintained throughout this time.

An area of residual below ground waste remains on site within the licence boundary. This historical waste storage area was identified within previous site investigations of the subject area and was delineated as part of remediation of the former adjoining disposal area. The residual disposal area could not be fully remediated at the time of the closure of the old Shannonbridge Station due to the close proximity to the Bord na Móna access railway line which was in use.

The use of this historical disposal area ceased in 1974. Although the residual disposal area is not related to the current licenced station's activities, following further assessment if it is determined that the area requires remediation, it is proposed the area will be remediated as part of the DMP. See **Section 3.2.7** for further details.

3 Decommissioning Management Plan

This section is focussed on the DMP aspects for the activity.

3.1 Basis of DMP

The basis of the DMP is as follows:

- A review of the activities, including processes and services.
- Identification of existing and potential hazards, including evaluation of materials consumed and wastes generated.
- Consideration of historic environmental incidents and remediation works undertaken.
- Identification of items of plant and other materials that may be decommissioned, rendered safe or removed from the site for disposal or recovery in the event of closure.
- Identification of locations where cleaning, decontamination or remediation works may be required in the event of decommissioning to prevent environmental pollution.

The DMP includes the decommissioning and decontamination of all of the above and below ground structures and the management and safe removal of any residuals arising as a result of decommissioning.

3.2 Tasks and Programme

The purpose of the process is to ensure that the site does not pose an environmental risk upon closure.

ESB intends to manage and execute the DMP using a combination of internal resources, supplemented as necessary and appropriate with external resources and contractors. All external resources used for cleaning, infrastructure decommissioning and removal, waste collection and disposal, etc. will be fully approved and licensed as appropriate.

The decommissioning project will be managed and supervised by personnel with appropriate experience and expertise. Only suitably qualified personnel and those with any necessary permits or licences will carry out decontamination works.

In accordance with the waste management hierarchy the following residuals management options are available to ESB:

- Recovery/Recycling Removal for reuse at other ESB power station(s).
- Return to supplier
- Sale to third-party
- Disposal: Disposal as waste

Waste materials generated will be minimised where possible. Waste sent off-site for recovery / recycling or disposal will only be conveyed by a permitted waste contractor and only transported from the station to the site of a suitably licenced waste receiving facility for recovery / disposal in a manner that will not adversely affect the environment and in accordance with the waste regulations.

3.2.1 Activities

The activities within the DMP will be as follows:

- Cessation of all production.
- Cancellation of all incoming deliveries of materials to the station.
- Termination of all contracts other than those that are concerned with the DMP or related to safety of personnel or the environment.
- Return of materials to suppliers where possible, for resale or reuse.
- Isolation and purging of transfer lines from bulk storage to direct pipe contents back to bulk storage.
- Shutting and blanking of supply lines for oils and chemicals to intermediate storage and/or dilution tanks.
- Clearing of peat stocks.
- Cleaning and decontamination of all plant and equipment.
- Removal of all laboratory chemicals.
- Cleaning and decontamination of all laboratory analytical instruments.
- Cleaning, decontamination and inspection of bunds, sumps and underground drains.
- Destocking of the workshops and stores.
- Isolation and disconnection of all electrical supplies to pumps and motors.
- Draining of oil from transformers that will not be reused elsewhere.

- Cleaning of residues from boilers and cleaning and blanking off of fuel lines.
- Draining and cleaning of lube oil systems.
- Draining of water systems such as raw feedwater tanks, condensate storage tanks and supplementary cooling systems.
- Transfer of ion exchange resins to drum storage.
- Maintenance of parts of the water supply system to provide wash-down and cleaning facilities during decommissioning and to meet the ongoing needs for fire protection and sanitary services.
- Maintenance of site drainage system and oil interceptors during decommissioning activities.
- Groundwater monitoring borehole removal and decommissioning.
- Remediation of the residual landfill area.
- Secure archiving of all relevant documentation including drawings, instrumentation diagrams, validation documentation, vendor manuals and data, project files, maintenance records, inspection records and other appropriate documentation.
- Maintenance of a security presence on site on a 24-hour basis, as necessary, for ongoing monitoring of the site from a safety, fire protection and environmental perspective.
- Maintenance of defined site access procedures.

It is anticipated that any necessary decontamination of plant and equipment will be carried out on site. It will primarily involve cleaning in place and power washing of internal and external surfaces.

ESB will seek approval from the EPA for any decontamination procedures and monitoring requirements to be employed.

3.2.2 Management of Residual Liquid Fuel, Fuel Storage and Pipelines

The power station's storage of gas oil (diesel) consists of a single tank of 200 m³ capacity. Additional miscellaneous minor volume storage tanks are listed in **Table 1**.

Table 1: Minor Volume Storage Tanks

Type	Capacity	Number of tanks	Location
Emergency Diesel Generator Tank	1.3m ³	1	House Transformer Area
Diesel Fire Pump Oil Storage Tank	1.06m ³	1	Cooling Water Pumphouse
Waste Oil Tank	1.0m ³	1	Gas Oil Unloading Area
Diesel Storage Tank (Bord Na Móna)	25.0m ³	1	Peat Handling Area
Small Diesel Storage Tanks (Bord Na Móna)	2.3m ³	2	Peat Handling Area
Gear Oil Tank (Bord Na Móna)	2.3m ³	1	Peat Handling Area
Anti-freeze Tank (Bord Na Móna)	1.0m ³	1	Peat Handling Area

The maximum quantity of liquid fuel will be used prior to the cessation of power generation so that the minimum quantity of unused diesel remains on site. Appendix V shows the locations of all fuel storage on site.

3.2.2.1 Fuel Storage

The remaining diesel will be recovered or disposed of and the tank will be jet washed with water / detergent to remove remaining residues. The tanks will then be suitable for either retention on site or removal for clean scrapping. All decommissioned tanks will be tagged, dated and referenced. All works will be undertaken by suitably experienced personnel or contractors.

3.2.2.2 Pipelines

Pipework will be cleaned by a variety of methods including an in-situ pneumatic pipe cleaner / scourer machine (a 'pig'), retro-jetting with water, flushing with water or kerosene, or high-pressure air flushing. At this stage of cleaning the pipework will be in an acceptable state for either retention on site or removal for clean scrapping. All decommissioned pipes will be tagged, dated and referenced. All works will be undertaken by suitably experienced personnel or contractors.

All cleaning activities will be facilitated by maintaining the steam heating system for all pipes and tanks to supply steam to aid the flow and removal of oil. Drain locations are shown in Appendix III.

Drains in the areas where these facilities are located will be isolated before commencement of decommissioning activity

3.2.3 Management of Residuals Chemicals and Chemical Storage

The main bulk chemicals used at the station and that will be addressed in decommissioning or closure are as follows:

- Caustic Brine (25% NaCl + 5% NaOH): Used in treatment of boiler water - 30 m³
- Sodium Hydroxide (30% NaOH): Used in regenerating resins in WTP - 30 m³
- Sulphuric Acid (96% H₂SO₄): Used in regenerating resins in WTP - 30 m³

Further to the above, the following are in place, but are not in use.

- Sodium Hypochlorite (12-14% NaOCl): Used in water side of condenser - 10.8 m³. No further waste will be generated from this unit.
- Ammonia (30-33% NH₃): Used in treatment of NO_x emissions - 0m³ – Tank decommissioned. No further waste will be generated from this unit.

Stocks of the chemicals consumed in operation of the power station will be run down to a minimum at the cessation of power generation. Remaining bulk quantities of chemicals will then be available for either transfer to other ESB power station(s), return to their supplier or disposal by contractors at licensed facilities.

Further to this, bulk storage tanks will be cleaned internally by contractors.

With wet chemistry carried out in the station laboratory being substantially eliminated by the use of modern instrumentation, remaining stocks of laboratory chemicals that require disposal will be minimal.

Appendix I contains further detail on the estimated volume chemicals and materials stored on site. Appendix V shows the locations of all chemical storage on site.

3.2.4 Tanks and Sumps

Notable additional tanks and sumps within the power station are as follows:

- Turbine Lube Oil Tank: This tank (8 m³) is located within the power station main building and is banded. Details on additional turbine and waste oils are included in Appendix I.
- Boiler Blowdown Tank: Boiler blowdowns are discharged to a tank to reduce pressure prior to entering drains.

- Water Treatment Neutralisation Sump: Alternate acidic and basic waste streams, which arise in regeneration of ion exchange resins, are collected in this sump (110 m³).
- Settlement Basin - A large capacity settlement basin is provided on the drainage system.

All bunds and sumps at West Offaly Power are integrity tested on a 3-yearly schedule with all testing up to date.

In addition to the above, Bord na Móna operated facilities within the peat handling area of the power station include small capacity bunded storage tanks for gear oil and anti-freeze. Bunds are tested on a 3-yearly schedule and testing is up to date. All sumps and chambers are also fitted with high level liquid alarms.

The residual contents of the above tanks and sumps will be removed for appropriate disposal and tanks, sumps and associated pipework will be cleaned down and decommissioned.

3.2.5 Boiler Storage and Decommissioning

A decision on station closure would likely be preceded by a period where the station boiler is in storage, with dry storage being the preferred method. Decommissioning of the boiler will involve cleaning activities that already take place routinely at West Offaly Power Generating Station and are managed successfully.

Unlike at coal fired plants, no non-routine environmental emissions will result from either boiler storage or boiler decommissioning at West Offaly Power Generating Station.

3.2.6 Management of Drainage Line Cleaning

Drainage systems within the power station involve seven licenced emission points combined to discharge to three separate discharge points to the River Shannon. These systems, whose designations below are those used in the IE Licence Reg. N° P0611-02, are listed in **Table 2**. Drains at the site are shown on the site map in Appendix III.

Table 2: WOP Licenced Discharge Points

Monitoring point	Source Area	Discharge Type
SW1	Cooling Water Pump House	Cooling Water
SW2	Cooling Water Pump House	Wash Water
SW3	Facilities	Sewage Treatment Effluent
PS-SW4	Boiler Drum and river water	Boiler Blowdown
PS-SW5	WTP	Neutralisation Tank Effluent
PS-SW6	Surface water drains	Station Drainage
PS-SW7	Surface water drains	Station Drainage

Three discharges fully or partly comprise trade effluents, namely SW1 and SW2 (discharge to a combined discharge point). SW4 SW5 and SW6 discharge through one discharge point to the River Shannon. SW6 and SW7 comprise surface waters/station drainage exclusively. SW3 comprises sewage treatment effluent (combined with SW7). SW1 and SW2 include discharge of heated cooling water abstracted from the River Shannon and screen wash water at the cooling water intake. Discharge of heated cooling water will cease with the cessation of electricity generation at the station. All discharge locations are shown in Appendix III.

Protection by oil interceptors is provided as appropriate and there is no potential for impact upon the River Shannon if the drainage system is left in place after decommissioning. All oil interceptors will be cleaned of oil and oily water, and then left in-situ as part of the site drainage infrastructure following the decommissioning works. Oil and oily water will be disposed or recovered by a suitably licenced haulier and licenced waste facility.

This will involve water jetting using the existing oil interceptor system and vacuum tankers. Residues / washings from drainage line cleaning will be disposed of appropriately following testing to confirm that their suitability for discharge. No areas of heavy or free product oil residues that would require steam cleaning are expected. On completion of decommissioning the site drainage will be in a suitable condition for removal or more likely to be left in place to continue to provide surface water drainage for the site and to prevent surface flooding following rainfall.

The station will continue to properly operate and maintain the site drainage system prior to and during implementation of the DMP.

3.2.7 Historic Disposal Area

Prior to the site's redevelopment in 1974, a localised area of the site was used in the disposal of site generated waste by the former Shannonbridge Generating Station, some of which contained asbestos containing material.

Most of this historic disposal area was remediated prior the development of the existing station. This area and associated remedial works were assessed and approved in consultation with the EPA in the following reports;

- URS Ireland Limited (2004) *Environmental Site Assessment Former Dump Area, ESB Shannonbridge, Co. Offaly*. Dated 17 November 2004. Ref: 44871-030-447
- AECOM (formerly URS Ireland Limited); *ESB WOP Further Environmental Assessment, 2015*

The remaining section of the disposal area lies beneath a Bord na Móna railway line laid in 1974, in the south east of the existing site and was not remediated at the time of previous station closure. This line was used for transporting peat and ash between the station and the ADF. This remaining section of the disposal area is situated partly within the licenced boundary of the existing West Offaly Power Station, as shown in the site map in Appendix V.

An Environmental Site Assessment of the area beneath this railway line was undertaken by AECOM (as URS Ireland) in 2004. This investigation found asbestos containing material within the waste body. Due to the depth of the material several metres beneath the ground, and the length of time that would be required for its removal, it was not feasible to remove this prior to commissioning of West Offaly Power Generation Station. Given the timeframe since its initial assessment, ESB will reassess this area beneath the railway line and remediate as necessary and in agreement with the EPA as part of the DMP when the existing station closes.

Based upon the results of past site investigations, other waste material observed from the 2004 site investigation identified included small quantities of inert brick, metal, plastic materials and ash.

Information gathered during previous investigations at the former Shannonbridge Station historic disposal area has been used to develop cost estimates for the remediation of this area as part of the DMP. Taking data gaps into account, costs are based on the assumption that following further assessment by specialists, the entire residual disposal area volume may contain small quantities of asbestos materials. In this case, all material may need to be excavated and disposed of at suitably licenced waste receiving facilities. In this scenario, it is assumed that all the entire waste body would be classified as hazardous waste and removed for disposal at a hazardous waste facility at significantly increased costs. It is also assumed remediation will be undertaken by specialist consultants, engineers (the railway line may need to be removed) and contractors, including the site investigation, validation and reporting.

If excavated waste material is saturated, it will be placed into dedicated stockpiles for sufficient drying. Following drying, the waste will be processed by mechanical separation and hand picking of non-hazardous and hazardous waste streams. A drainage system including a temporary drainage layer, sump pump, settlement tank and separator would be installed for the duration of the separation works. Non-hazardous and hazardous waste streams would be separated, and wastes would be assessed to determine the suitability for disposal at suitable waste disposal facilities. All staff involved in waste separation will undertake asbestos training.

The excavated area will be backfilled with imported clean uncontaminated material to bring the excavation back to acceptable levels.

Other considerations in relation to possible remediation works include ground gas monitoring, health and safety mitigation measures including asbestos air quality monitoring as well as waste minimisation and management procedures also considered.

Cost estimates have been developed to accommodate a 70-week schedule.

3.3 Costing

Cost Estimates for the DMP were compiled from a number of sources, including:

- Guidance on assessing and costing environmental liabilities – Unit Cost Rates for Verification (EPA, 2014)
- Existing ESB Framework Rates
- Specialist Contractor & Consultancy Rates or Estimates¹

The estimated costs associated with the implementation of the DMP are as follows:

¹ Estimated consultant costs, estimated civil contractor costs, and estimated waste disposal costs using typical market rates. Most of these estimates and were not verified by a consultant tender.

Table 3: Activities and Cost Estimates, Power Station DMP

Item	Description	Activity	Cost Estimate	Source
Plant Decommissioning				
Oils Removal and Disposal				
Gasoil Storage	1 x 200 m ³ Tank	Appropriate cleaning	€20,320	EPA Unit Rates ²
Various Diesel Storage	Miscellaneous	Appropriate cleaning	€50,800	
Sub-total: Oils Removal and Disposal			€71,120	
Recycling of Chemicals				
Caustic Brine (25% NaCl + 5% NaOH)	1 x 30 m ³ Tank	Internal cleaning	€17,740	EPA Unit Rates ²
Sodium Hydroxide (30% NaOH)	1 x 30 m ³ Tank	Internal cleaning	€17,740	
Sulphuric Acid (96% H ₂ SO ₄)	1 x 30 m ³ Tank	Internal cleaning	€17,740	
Ammonium Hydroxide IBC	2 x 1m ³ Tank	Cleaning and Recovery	€5,000	
Firefoam IBC		Cleaning and Recovery	€10,000	
Lab Instruments and Chemicals		Cleaning and Recovery	€10,000	
Contingent Chemical Disposal and Recovery			€55,000	
Sub-Total: Recycling of Chemicals			€133,220	
Drainage Line and Oil Interceptor Cleaning				
Trade Effluents: Four discharges) SW1, SW2, SW4, SW5	Underground pipework	Water jetting using oil interceptor system and vacuum tankers.	€25,240	EPA Unit Rates ²
Surface Water Drainage: Two discharges) SW6 & SW7	Underground pipework	Water jetting using oil interceptor system and vacuum tankers.	€10,160	

² EPA Guidance on assessing and costing environmental liabilities – Unit Cost Rates for Verification (EPA, 2014)

Item	Description	Activity	Cost Estimate	Source
One discharge (sewage treatment effluent) SW3	Underground pipework	Water jetting using oil interceptor system and vacuum tankers.	€10,000	
Pressure Washer and Bowser			€3,000	
Disposal of cleaning waste	Underground pipework	Disposal of contaminated water from decommissioning and cleaning	€20,1260	
Sub-Total: Drainage Line and Oil Interceptor Cleaning			€68,560	
Asbestos – Excavation and Removal - Historic Disposal Area at Shannonbridge Generating Station				
Site Investigation		Consultant review, sampling, analysis and reporting	€152,237	Consultant Estimates ¹
Disposal of Soil containing asbestos		Volume of Hazardous Material: 9423m ³ (€750/tonne)	€7,067,250	
Additional Volume assuming over dig (Soil containing asbestos materials/ Natural Clay)		1580m ³ (€750/tonne)	€1,185,000	
Mobilisation and Preparatory Works		Office Accommodation	€50,000	
Preparatory Earth Moving		Excavating the Waste (500m ³ /wk)	€110,030	
Stockpiling Material and Installation of Drainage Systems			€177,875	
Backfilling excavation with imported inert material		Replacing material that has been disposed of off-site as waste	€82,523	
Processing and Hand-Picking Waste			€110,030	
Disposal of C&D Waste		Skip Waste	€140,000	
Asbestos Training and Asbestos Fit Test			€20,000	
Remediation Works		Supervision, Methane Monitoring, Asbestos Air Monitoring CQA and Consultants	€303,674	
Bord na Móna Charges		Lifting and relaying of rail tracks	€50,000	
Project Management - Office and Weekly Site Supervision		ESB Staff - Time & Expenses	€148,390	
Overall Asbestos Removal Contingency Cost (20%)			€1,919,402	
Sub-Total: Asbestos Excavation and Removal			€11,516,411	
Management/Administration/Security/Consultants/Insurance				
Management		Annual Management Cost	€285,197	EPA Unit Rates ²
Administration		Annual Administration cost	€72,750	

Item	Description	Activity	Cost Estimate	Source
Consultants	Annual Consultants Costs		€339,498	
Security	Annual Security Personnel Costs		€461,540	
Security Accommodation	Annual Security Accommodation Costs		€36,400	
Site Accommodation including running costs	Annual accommodation running costs, including water, electricity, fuel.		€320,426	
Insurance	Annual Insurance Costs		€105,664	
Sub-Total Annual Management, Admin, Security, Consultants / Insurance / Utilities			€1,622,058	
Sub-Total Management, Admin, Security, Consultants / Insurance / Utilities - Costs over 18 month Decommissioning Period			€2,433,087	
Waste Disposal				
Removal of residual wastes: Batteries, smoke detectors, chemical paints and additives, lubricating oils, transformer oils and coolants etc.			€25,861	Contractor Framework Rates
Bag Filter Disposal			€13,000	
Radiological Waste Disposal			€22,217	Specialist Contractor Rates
WTP Ion Exchange Resin Removal			€19,965	
Contingent Waste			€20,000	
Sub Total Waste Removal			€101,043	
Boiler Cleaning				
Sandblast/clean first pass		Internal cleaning	€101,600	EPA Unit Rates ²
Sandblast/clean separators		Internal cleaning	€50,800	
Sandblast/clean second pass		Internal cleaning	€50,800	
Sub-Total Cost Boiler Cleaning			€203,200	
Sump Cleaning and Waste Removal				
Various Station, WTP and Bord Na Móna Sump Cleaning		Appropriate Cleaning	€4,870	Contractor Framework Rates
Removal and disposal of Sump Waste and Contaminated Water			€3,000	
Sub Total Sump Cleaning			€7,870	
Total West Offaly Generating Station Closure Cost			€14,534,511	
Contingency (10%)* Excluding Asbestos Remediation Contingency			€301,810	
Total (including Contingency)			€14,836,321	

4 Closure, Restoration and Aftercare Management Plan

This section is focussed on the CRAMP aspects for the activity.

4.1 Basis of CRAMP

The basis of the CRAMP is as follows:

- A review of the activities, including processes and services.
- Identification of existing and potential hazards, including evaluation of materials consumed and wastes generated.
- Consideration of historic environmental incidents and remediation works undertaken.
- Identification of items of plant and other materials that may be decommissioned, rendered safe or removed from the site for disposal or recovery in the event of closure.
- Identification of locations where cleaning, decontamination or remediation works may be required in the event of decommissioning to prevent environmental pollution.

The Ash Disposal Facility is divided at 15 m centres by shallow drainage channels, which are collected into a piped outfall that is pumped as a single discharge (AL- SW1) directly to the Gowlan River, which is a small tributary of the River Shannon.

4.2 Ash Disposal Facility (ADF)

The ADF at Derrylahan is being developed on a cellular basis in order to minimise the active filling areas and leachate generation. Ash quantities depend on the source and quantity of peat burned.

The ADF has been restored on a phased basis. Cells have been restored as they reach their capacity, with restoration being focussed on future development of an area that replicates the areas of natural vegetation found in similar habitats.

As referenced in Section 9 of the ADF Operational Plan (Leachate Management and Disposal), cell floors to date have been lined with a Geo-synthetic Clay Liner (GCL) and a Composite Drainage Layer (CDL). The embankments of Cells 1-3 are lined to a height of 1m above the cell floor. The embankments of Cells 4 and 5 are lined to the top of the embankment. Leachate drains to a leachate collection drain in each cell which subsequently flows to the leachate monitoring manhole, located in the lowest corner of each cell. Leachate is pumped out whenever the leachate reaches a level of 0.8m in the monitoring manhole and is recirculated over the operational cells for dust suppression purposes. The leachate drainage collection system combined with the cell liner ensure that leachate will not seep into the surface water system.

Completed cells are capped and lined with a Geo-Synthetic Clay Liner underlying a Composite Drainage Layer providing a similar arrangement to the cell floor. The liners are then covered with a peat/soil capping layer. Cells 1-4 have now been fully capped.

Material for the capping layer of each cell is sourced from the peat / subsoil excavated for future cells and from within the ADF area, which extends to 36 ha.

4.3 ADF Closure

The development of the ADF did not involve construction of permanent structures and restoration will therefore not necessitate demolition and removal of buildings. Several shipping containers used for storage and welfare facilities, including a concrete slab and wash slab, backup generator, and a storage tank, will also be removed from the ADF by Bord na Móna.

Ground investigations and soil and groundwater testing programmes have been undertaken at the ADF since operations began. In accordance with Condition 6.14 of IE Licence P0611-02 requirements, groundwater monitoring is undertaken at four monitoring wells at the ADF. The monitoring programme includes monitoring for pH, electrical conductivity, ammoniacal nitrogen, total hydrocarbons and heavy metals, monitored on either a monthly or quarterly basis, and reported annually to the EPA, through the station's AER. No significant environmental impacts have been detected.

Cell 5, and also Cell 6 if required, will be operational at time of closure and would require restoration (total area 29,932m²) as part of the CRAMP. Cells will be capped and lined with a Geo-Synthetic Clay Liner underlying a Composite Drainage Layer, and then covered with a peat/soil capping layer to allow for revegetation. All SEWs in relation to the capping of cells have been approved by the EPA.

Cells 5 and 6 will be available to receive ash up to 31st December 2020. At this point the ash will be graded appropriately to prevent rainwater ponding on top of the capped cells. Depending on the levels of ash in the Cells when complete, the embankments may need to be lowered to allow rainwater to drain freely to existing site drainage network and prevent ponding. Lowering of the embankment would require the removal of material from the top of the embankment to achieve the required finished height. As these embankments are fully lined and complete to design levels, care will need to be taken when stripping the existing liner material and relaying at the new required level. Any proposed amendments to the inter-cell bund wall heights and the capping system height will be submitted to the EPA as part of a revised SEW.

As no further ADF cells will be constructed, alternative capping material for capping of the remaining operational cells will need to be sourced, with agreement by the EPA. Capping material

used for capping Cell 5 and 6 will consist of wet peat sourced from the surrounding bog predominantly south east of Cell 5 and 6. Hauling and stock piling of capping material in preparation for capping Cell 5 and 6 has commenced. Restoration is expected to be completed within 10 weeks, and plant engaged in earthworks will comprise a dozer, an excavator, a dumper and a water bowser.

The capping system installed at the ADF is in accordance with conventional capping requirements/best practice for non-hazardous waste landfills, comprising a barrier layer consisting of LLDPE with welded seams, a drainage layer and a stability layer. Given the nature of the stored ash, gas generation is unlikely to occur, and a gas drainage layer will not be required.

4.3.1 Leachate Management

A leachate drainage system which includes a leachate collection layer, pumps & sumps, piping, and a leachate lagoon is currently in place at the ADF which collects leachate generated from all cells and re-disperses this over the operational cells. The current leachate management system (circulation) will require an amendment to facilitate the ADF closure. It is currently proposed that leachate generated after the capping of the final operational cells will be pumped to the leachate lagoon where it will be stored before it is treated before being discharged to off-site surface waters.

The lagoon capacity is approximately 3,500m³. The leachate lagoon at the Ash Disposal Facility has been constructed and lined in accordance with the Construction Quality Assurance Plan and a validation report for the leachate lagoon was submitted to the EPA, post construction.

Discharge of treated leachate to surface waters is covered under the existing licence if Emission Limit Values (ELVs) outlined in IE Licence P0611-02 Schedule B for pH, suspended solids and toxicity are not exceeded. Before discharging leachate from the site, a sample is taken from the lagoon and it is sent to an independent laboratory for testing. Once the water analyses have been received and it confirms that the ELVs will not be exceeded, the leachate is then discharged to the Gowlan River. During this operation, further samples are then taken at the discharge point to ensure that ELVs are not being exceeded.

Proposals for long-term leachate treatment include use of chemicals for pH correction, then treatment of the pH corrected leachate in a settlement tank to reduced suspended solids. All treatment works will be undertaken by an appropriately licenced contractor. Installation of the system is estimated to take around 3 weeks. Discharge of the treated leachate is estimated to take around 29 working days based on an estimated 15m³/hr flowrate.

The temporary backup generator at the ADF will remain on site for several months as part of the leachate management system. When no longer required, the generator and associated diesel tank and supply lines will be deinstalled and removed from site by Bord Na Móna.

Any proposed changes to current leachate management at the ADF will first be agreed with the EPA.

4.4 Aftercare

There are currently four groundwater monitoring locations at the Ash Disposal Facility, as follows: ADF-GW3, ADF-GW4, ADF-GW5 and ADF-GW6, which are monitored in accordance with Schedule 5(i). It is not envisaged that additional well installation(s) will be required.

A surface water monitoring point is currently located at the ADF Lagoon outfall: AL-SW1. Water quality monitoring will continue at this location until all leachate has been discharged and the lagoon is no longer operational. All ADF monitoring locations are shown in Appendix IV.

The achievement of aftercare targets will be assessed through a programme of medium-term monitoring. This monitoring will take place at the existing monitoring wells and the period of monitoring required will be reviewed on an annual basis but conservatively will be in place for 10 years unless and until agreed with the EPA. After this time, the monitoring wells will be decommissioned as per standard industry practice.

4.5 Costing

Cost Estimates for the CRAMP were compiled from a number of sources, including:

- Bord Na Móna Restoration Plan Estimates, provided in February 2020;³
- Existing ESB Waste Disposal Framework Rates;
- Specialist Contractor & Consultancy Rates and estimates;
- Guidance on assessing and costing environmental liabilities – Unit Cost Rates for Verification (EPA, 2014)

The estimated costs associated with the implementation of the CRAMP are as follows:

Table 4: Activities and Cost Estimates, Ash Disposal Facility CRAMP

Activity	Cost Estimate	Source
WOP Capping (Cells 5 and 6)		
Preliminaries and General Items	€64,394	Bord na Móna Estimates ³
Earthworks	€250,742	
Lining	€286,225	
Connection to Surface Water Drainage	€7,500	
Double Handling of Ash	€49,739	
Margin on agreed final cost	€50,460	
Insurance	€21,668	
Capping Total Estimated Cost	€730,728	
Permanent Leachate Works - Extension of Leachate System to Cell 6		
Preliminaries and General Items	€6,923	Bord na Móna Estimates ³
Pipe Supply	€1,616	
Pipe Installation	€1,197	
Pump Supply	€12,302	
Pumps Installation	€1,610	
Electrical Upgrade Works	€13,936	
Margin of 1.45% on agreed final cost	€546	
0.62% Insurance	€234	
Total Leachate Extension Works Cost	€38,364	
Leachate Treatment Disposal		

³ Bord Na Móna Cost Estimates, February 2020

Activity	Cost Estimate	Source
Preliminaries and General Items	€23,331	Bord na Móna Estimates ³
Provisional sum for the implementation of short-term leachate treatment proposal	€20,000	
Provisional sum for the implementation of long-term leachate treatment proposal	€125,000	
Margin of 8.5% on agreed final cost	€14,308	
3.65% Insurance	€6,144	
Leachate Treatment Total Cost	€188,783	
Miscellaneous Additional Works (e.g. Leachate Management)	€130,000	
Total Capping and Leachate Management Costs for WOP	€1,087,875	
Additional CRAMP Costs		
Concrete Slab Demolition and Removal (16.8m ³)	€5,500	Contractor Framework Rates & EPA Unit Rates ²
Washslab Storage Tank Cleaning and Removal (8m ³)	€3,000	
Diesel/Oil Drum Waste Removal (<100L)	€125	
Septic Tank De-sludging and Removal	€3,000	
Oil Store Container - Disposal and Recovery of Chemicals	€20,000	
Removal of 4 Shipping Containers	€2,500	
Backup Generator Rental and Fuel Costs for 6 months	€18,000	
Backup Generator Deinstallation and Removal from site	€2,000	
Total Additional ADF Costs	€54,125	
Total CRAMP costs	€1,162,000	

Table 5: Annual Aftercare Cost Estimates

Aftercare Management, Administration, Consultants, Security, Accommodation and Insurance				Annual Cost	Source
Management				€28,520	EPA Unit Rates ²
Administration				€14,550	
Consultants				€16,975	
Security				€5,283	
Security Accommodation				€3,150	
Site Accommodation including running cost				€11,176	
Insurance				€10,160	
Summary Cost Aftercare Management etc.				€89,814	
Aftercare Monitoring Programme	Location	Frequency	Duration	Annual Cost	
COD, Total Ammonia, Total Nitrogen, Metals/non-metals ⁴ , Nitrate, Ortho-phosphate (as P), Mercury	GW1 - GW6 inclusive, plus additional locations as may be determined under the Landfill Operational Plan	Annually	10 years	€96	Environmental Consultancy Rates ⁵
Hydrocarbons, Chloride Sulphate (SO ₄)	GW1 - GW6 inclusive, plus additional locations as may be determined under the Landfill Operational Plan	Quarterly	10 years	€225	
pH, Electrical Conductivity	GW1 - GW6 inclusive, plus additional locations as may be determined under the Landfill Operational Plan	Monthly	10 years	€64	
pH, Conductivity (Monthly) COD, Total Ammonia, Total Nitrogen, Suspended solids, Total Dissolved Solids, Mineral oil, Oils, fats & greases, Visual Inspection	Storm Water PS-SW6, PS-SW7	Quarterly	10 years	€517	

⁴ Metals to be analysed will include the following: Arsenic, Boron, Cadmium, Calcium, Chromium (total), Copper, Iron, Lead, Magnesium, Nickel, Potassium, Sodium, Zinc, Molybdenum and Selenium

⁵ Rates provided by RSK, March 2020

Visual Inspection/Odour, Leachate Level, Electrical Conductivity, pH (Weekly)					
Total ammonia (as N), COD, Total Suspended Solids, Sulphate, Heavy Metals ⁴ , Ortho-phosphate (as P) Toxicity (As may be required)	ADF (AL-SW1)	Quarterly	10 years	€2,284	
Lab Courier and Sample Containers			10 years	€660	
On-Site Monitoring Rate (including expenses)			10 years	€8,808	
Annual Report		Annual	10 years	€2,000	
Project Consumables and Project management			10 years	€900	
Summary Monitoring				€15,554	
Total Annual Aftercare Costs				€105,368	
Contingency (10%)				€10,537	
Total including (Contingency (10%))				€115,905	

Table 6 Summary of Closure and Aftercare Costs

Activity	Cost Estimate
West Offaly Generating Station Decommissioning Management Plan	€14,836,321
Ash Disposal Facility – Closure, Restoration and Aftercare Management Plan	€1,142,000
Total DMP and CRAMP	€15,978,321
Annual Aftercare Cost	€115,905

5 Future Proofing Costs

5.1 Inflation Adjusted Costs

As stated, landfill aftercare will be undertaken over ten years. Accordingly, the costs for closure and restoration / aftercare have been adjusted to provide for inflation at a rate of 2.5% per annum as shown in Table 5.

Table 7: Cost Adjustment for Inflation (Rate 2.5%)

Activity	Cost Estimate
Cost Year 0	€15,978,321
Aftercare Year 1	€118,803
Aftercare Year 2	€121,773
Aftercare Year 3	€124,817
Aftercare Year 4	€127,938
Aftercare Year 5	€131,136
Aftercare Year 6	€134,415
Aftercare Year 7	€137,775
Aftercare Year 8	€141,219
Aftercare Year 9	€144,750
Aftercare Year 10	€148,369
Total	€17,309,315

5.2 Review 2020

The DMP and CRAMP review will address all developments at West Offaly Power and evaluate the scope of the DMP and CRAMP in the context of any changes at the station or the ADF.

The significant updates since the previous revision in 2016 are listed below:

- Rates for some items were revised to reflect current tender rates received from tendering contractors.
- Additional costings have been provided for waste removal to reflect current market rates and the more detailed study of expected waste arisings carried out.
- Asbestos excavation and remediation at the former Shannonbridge disposal area have been costed to include worst case scenario estimates, in the event that all material within the historic disposal area may be classified as hazardous waste.
- Currently at West Offaly Power only Cell 5 and 6 are open and Cell 5 is in operation and therefore the current costs associated with their completion are reflected in the costings.
- The current capping and lining status of all remaining cells at the ADF has been updated.
- Removal of temporary container structures and demolition of the concrete slab at the ADF have been included.
- Landfill capping mechanism and associated costs agree with the typical specified engineering works (SEW).
- Costs for the extension of the Leachate System to Cell 6 have been included. Leachate treatment disposal costs have been included.

5.3 Financial Provision

ESB has a very significant working capital and any decommissioning or closure of West Offaly Power Generating Station would evidently be a well-resourced activity. The company has adequate resources of finance and manpower to implement the DMP and CRAMP through to completion.

More significantly, ESB makes specific financial provision for closure of its power stations and this is outlined in the company's annual accounts. The provision at 31 December 2019 of €171million represents the present value of the current estimate of the costs of closure of the stations, including West Offaly Power Generating Station, at the end of their useful economic lives.

6 Plan Implementation

6.1 Criteria for Successful Closure

The following criteria have been established to set the benchmark for the successful closure of the site.

- Plant safely decontaminated using standard procedures and authorised contractors;
- Wastes handled, packaged, stored and disposed or recovered in a manner which complies with regulatory requirements;
- Relevant records relating to waste and materials management retained throughout the closure process;
- No soil or groundwater contamination at the site verified using monitoring data and a soil and groundwater assessment at the time of closure (if required);
- Hazard and/or risk of environmental pollution addressed, and the EPA is satisfied that the site is returned to a satisfactory state;
- Sufficient funds available to cover the full cost of closure; and
- Environmental management system in place and actively implemented during the closure period.

6.2 Nuisance Mitigation

Works that are carried out in connection with or associated with the RMP have the potential to lead to elevated noise levels and to creation of dust. Additional traffic movements will also arise. The following mitigation measures are proposed:

- **Noise**

All works will be carried out during daylight hours and noise levels will be monitored to ensure compliance with the requirements set out in IE Licence N° P0611-02. Noise minimisation measures will be employed. These will include such measures as using saw-cutting machinery instead of rock breaking equipment.

- **Dust**

Surfaces that have the potential to generate dust during their decommissioning will be wetted prior to the work commencing. Activities that have the potential to create dust will be avoided on windy days to the extent possible.

- **Traffic**

While traffic will arise in the removal from site of residuals, this will coincide with the elimination of current sources of traffic associated with station operations. It is considered that the demolition related traffic will not pose undue difficulties.

6.3 Closure Plan Validation

6.3.1 Monitoring

The monitoring and reporting requirements set out in the IE Licence N° P0611-02 will be complied with in full until the licence is surrendered to the Agency. The monitoring will identify if any contamination of air, surface water, groundwater or soils has occurred during the lifetime of the IE Licence.

In the event that a future environmental incident causes contamination of these media, which has not been quantified at the time of the closure of the facility, a test programme will be established as part of the DMP to identify the nature and scale of any associated environmental pollution.

Tests will be carried out on wash waters generated during the decontamination works to confirm that they are suitable for discharge or disposal.

6.3.2 Validation Report

Following implementation of the DMP, a validation report will be produced to demonstrate its successful implementation. It will confirm that there is no continuing risk of pollution to the environment from the site.

The Report will address:

- Disposal of materials.
- Decontamination of items of plant and equipment.
- Decommissioning of plant and equipment.
- Results of monitoring and testing.
- Capping and landscaping of waste disposal areas
- The need for ongoing monitoring and investigations.

The qualification and experience of the auditor will be provided and agreed with the EPA prior to the validation commencing. The scope of the validation audit will be agreed in advance with the EPA. The completed Validation Audit report will be submitted to the EPA for approval.

6.4 Environmental Summary Report

In addition to the above validation, in line with ESB's policy in relation to closure of its power stations, a full environmental summary report will be prepared. This will outline the following:

- The full history of West Offaly Power Generating Station site from its initial development through to closure.

- The various investigations undertaken and reports prepared during the operation of the plant
- The actions taken in the course of the DMP and CRAMP.

The Environmental Summary Report will be made available to future users of the site, whether this is ESB or a third party.

6.5 Update and Review

Condition 10.2.3 of the IE Licence Reg. No. P0611-02 requires as follows:

The plans (DMP and CRAMP) shall be maintained 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. .

The operator commits to reviewing the closure plan on an annual basis and updating to reflect any significant alterations on site.

The DMP and CRAMP will be updated as necessary, particularly taking into account any environmental incidents at West Offaly Power Generating Station that could lead to long-term liabilities at the station.

Appendix I – Key Substances

Material / Substances	Amount Stored	Nature of Use	Hazardous
Ammonium Hydroxide Solution	1 m ³	Treatment of boiler water	Yes
Ammonium Hydroxide Solution	0 m ³	Decommissioned Tank	Yes
Ash Silo	900 m ³	On site ash storage	No
Foam Compound	2,000 l	Fire fighting	Yes
Fyrquel (Natural Trixylyl Phosphate)	0.1 t	Fire retardant	No
Gasoil	150 m ³	Fuel	Yes
Grease	0.5 t	Lubricant	Yes
Hydraulic Fluid	0.125 t	Hydraulic power	Yes
Ion Exchange Resin	21.7 m ³	Water treatment	Yes
Limestone	150 t	Added to boiler to reduce SO ₂	No
Lime	80 m ³	Added to boiler to reduce SO ₂	No
Peat	8,400 t	Fuel	No
Sand	100 m ³	Furnace bed	No
Sodium Hydroxide	30 m ³	Regenerating resins in WTP	Yes
Sulphuric Acid	30 m ³	Regenerating resins in WTP	Yes
Transmission Lubricant	0.125 t	Transmission lubricant	Yes
Turbine Lubricating Oil	8 m ³	Turbine lubrication	Yes
Waste Oil	1 m ³	Waste Oil collected	Yes

The use of Hydrazine, Trisodium Phosphate and Sodium Hypochlorite was originally considered during the application for the station's IE Licence. Following an internal review, it was deemed that other treatment technologies could be used in their place. Therefore, these items are not currently used at the station.

Appendix II – Station Waste

Code	Non-Hazardous Waste	Disposal / Reuse / Recycling	Average Annual Amount (t)
10 01 01	Bottom Ash	D1	5,657
10 01 03	Fly Ash	D1	37,662
10 01 99	Fuel Debris	D1	1,275
11 01 14	Degreasing Waste	R13	0.26
15 01 03	Wooden Packaging	R1	4.65
15 01 07	Glass	R5	0.03
16 02 14	Discarded Equipment	R4	0.17
16 06 05	Batteries	R4	0.02
17 04 05	Iron and Steel	R4	6,793
17 04 07	Mixed Metals	R4	15.31
17 05 04	Stones/Sand	R5	619.22
17 06 04	Insulated Material	R1	3.51
17 09 04	Mixed C & D	R5	12.12
19 12 05	Glass	R1	3.21
20 01 02	Glass	R5	8.54
20 01 04	Mixed Metals	R4	1.28
20 03 01	Mixed Municipal Waste	R5	61.29

Code	Hazardous Waste	Disposal / Reuse / Recycling	Average Annual Amount (t)
13 02 08	Oil - Liquid	R4	3.65
13 05 03	Interceptor Sludges	R1	2.07
13 05 07	Oily Water	R1	7.41
13 07 01	Fuel Oil and Diesel	R13	2.09
15 01 10	Contaminated Packaging	R1	0.122
15 02 02	Absorbents/ filter materials	R1	1.41
16 01 07	Oil Filters	R4	0.16
16 02 13	WEEE	R4	0.08
16 05 04	Aerosols	R4	0.04
16 06 01	Lead Batteries	R4	0.02
16 06 04	Alkaline Batteries	R4	0.1
20 01 21	Fluorescent Tubes	R4	0.12

Note: Individual waste streams may not arise in each year and the average annual amount is the average for the years 2016-2018, as reported in the station's AER.

Appendix III – West Offaly Power Station Site Layout, Site Boundary, Emission & Sampling Points

LEGEND

- ECL DEMINERILIZATION WATER TANK
- UAG TRANSFORMERS
- UBA ELECTRIC ROOM
- UBB MAIN TRANSFORMER
- UBE AUXILIARY TRANSFORMER
- UBR ELECTRICAL SUPPLY BUILDING
- UCA OFFICE BUILDING
- UEA TIPPLER AND LORRY BUILDING
- UEB INTERMEDIATE PEAT HOUSE
- UED CONVEYOR
- UEE SCREEN BUILDING
- UEJ OIL TANK
- UEL PUMP HOUSE
- UET ASH SILOS
- UGD DIMINERILIZATION PLANT
- UGV SEWERAGE TREATMENT
- UHA BOILER HOUSE
- UHQ PRECIPITATOR
- UMA TURBINE HOUSE
- UQA PUMPING HOUSES, INLET
- UST WORKSHOP
- USV LABORATORY BUILDING
- USX MAINTENANCE BUILDING
- UTJ STACK
- UTS CHEMICAL TANKS
- UZE RAILWAY SERVICE BUILDING
- UZY BRIDGE

- WEST OFFALY POWER STATION IE LICENCE BOUNDARY
- AREA EXCLUDED FROM WEST OFFALY POWER STATION IE LICENCE
- EMISSION POINT
- SAMPLING POINT
- CENTRE POINT OF SITE
- GROUND WATER FLOW
- STORM DRAIN
- LAND DRAIN
- FOUL DRAIN

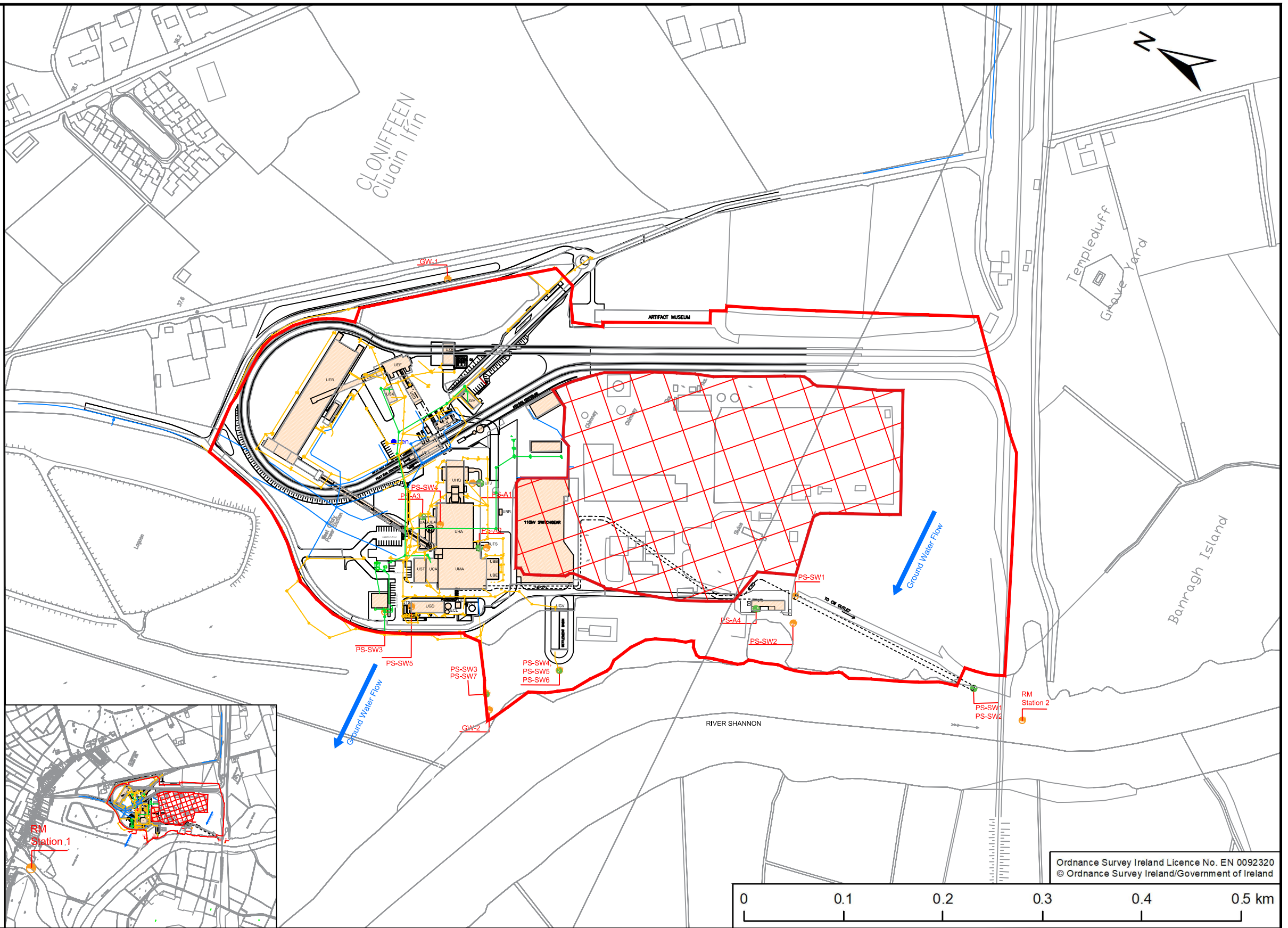
Air Emissions			
Emission	Description	Easting	Northing
PS-A1	Boiler exhaust gases	197363	224777
PS-A2	Auxiliary boiler exhaust gases	197304	224749
PS-A3	Diesel Generator Stack	197308	224814
PS-A4	Diesel Fire Pump	197371	224475

Surface Water Emissions			
Emission	Description	Easting	Northing
PS-SW1 & PS-SW2	Combined Cooling Water and Screen Wash Water Discharge	197395	224246
PS-SW3	Sewage Treatment Effluent	197177	224679
PS-SW4	Boiler blowdown	197229	224624
PS-SW5	Neutralised Water Treatment Effluent	197229	224624
PS-SW6	Surface Water Drainage 1	197229	224624
PS-SW7	Surface Water Drainage 2	197177	224679

Sampling Points			
Point	Description	Easting	Northing
PS-A1	Boiler exhaust gases	197363	224777
PS-A2	Auxiliary boiler exhaust gases	197304	224749
PS-SW1 Monitoring Location	Cooling Water	197399	224446
PS-SW2 Monitoring Location	Screen Wash Water Discharge	197374	224436
PS-SW3 Monitoring Location	Sewage Treatment Effluent	197206	224806
PS-SW4 Monitoring Location	Boiler blowdown	197308	224794
PS-SW5 Monitoring Location	Neutralised Water Treatment Effluent	197222	224784
PS-SW6 - Monitoring Location	Surface Water Drainage 1	197229	224624
PS-SW7 - Monitoring Location	Surface Water Drainage 2	197177	224679
RM Station 1	River Monitoring	196647	225302
RM Station 2	River Monitoring	197387	224189
GW1	Groundwater Borehole	197531	224895
GW2	Groundwater Borehole	197164	224670

CENTRE POINT OF SITE			
POINT	DESCRIPTION	EASTING	NORTHING
CEN	CENTRE POINT OF SITE	197362	224872

NOTE:
ALL COORDINATES TO IRISH NATIONAL GRID



Rev.	Date	Revision description	Drn.	Prod.	Ver.	App.
0	26/08/20	ISSUED FOR XXXXXXXX		T.O'R	T.G.	E.D.

Purpose of issue - Preliminary unless indicated

Client Approval Planning Tender Construction As-Built



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Client ESB Generation and Trading
Project West Offaly Power DMP and CRAMP
Contract

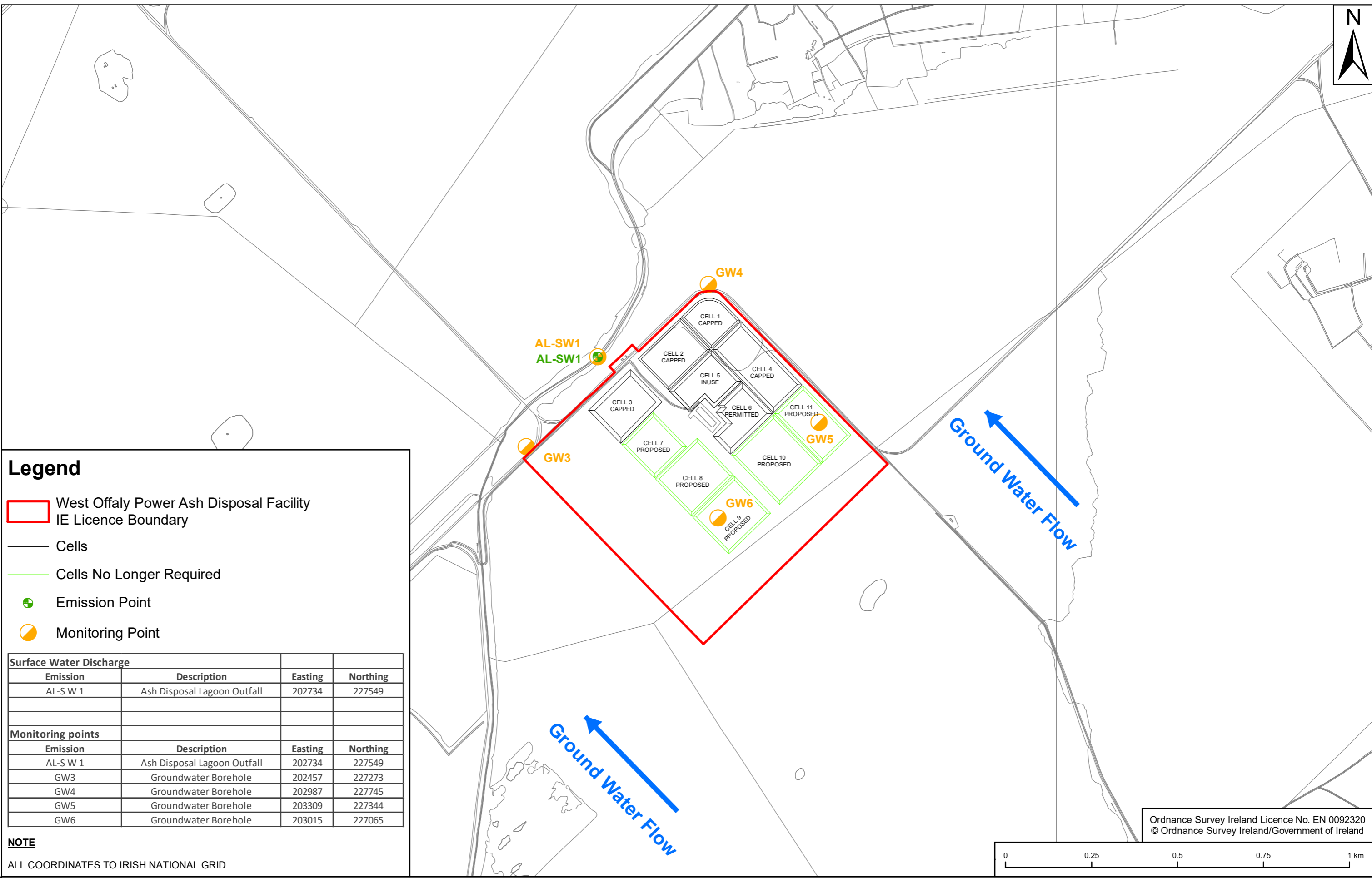
Production unit Civil & Environmental Engineering
Drawing title West Offaly Power Generating Station Site Plan (1 of 2)

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Drawn	Produced	Verified	Approved	Approval date
T.O'Rourke	T.O'Rourke	T. Girvan	E. Delaney	26/08/2020
Client ref.		No. of sheets	Size	Scale
		1	A3	1:4000
Drawing number QS-000139-01-D460-038-000				

Appendix IV – West Offaly Power Ash Disposal Facility Site Plan, Site Boundary & Monitoring Points⁶

⁶ Map also includes proposed Cells for ADF which are no longer required before station closure.



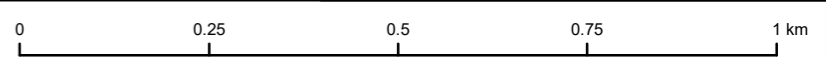
Legend

- West Offaly Power Ash Disposal Facility
IE Licence Boundary
- Cells
- Cells No Longer Required
- ⊕ Emission Point
- Monitoring Point

Surface Water Discharge			
Emission	Description	Easting	Northing
AL-S W 1	Ash Disposal Lagoon Outfall	202734	227549
Monitoring points			
Emission	Description	Easting	Northing
AL-S W 1	Ash Disposal Lagoon Outfall	202734	227549
GW3	Groundwater Borehole	202457	227273
GW4	Groundwater Borehole	202987	227745
GW5	Groundwater Borehole	203309	227344
GW6	Groundwater Borehole	203015	227065

NOTE
ALL COORDINATES TO IRISH NATIONAL GRID

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REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	31/08/20	ISSUED FOR REPORT	T.O.R	T.O.R	T.G	E.D

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL PLANNING TENDER CONSTRUCTION AS-BUILT

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division of ESB.

CLIENT: ESB Generation and Trading
PROJECT: West Offaly Power DMP and CRAMP
CONTRACT:

PRODUCTION UNIT: Civil & Environmental Engineering
DRAWING TITLE: West Offaly Power Ash Disposal Facility Site Plan (2 of 2)

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DRAWN T. O'Rourke	PRODUCED T. O'Rourke	VERIFIED T. Girvan	APPROVED E. Delaney	APPROVAL DATE 31/08/2020
CLIENT REF. 00-00		NO. OF SHEETS 00-00	SIZE A3	SCALE 1:10,000
DRAWING NUMBER QS-000139-01-D460-039-000				

Appendix V – Station Map showing Historic Landfill Area⁷

⁷ Map from WOP Risk Screening and Technical Assessment (AECOM, 2015)

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WOP Risk Screening and Technical Assessment.
Shows Groundwater and Surface Water Locations.
Also Shows Shannonbridge Chemical and Fuel Storage Areas

- NOTES**
- Site Boundary
 - Historic Landfill Waste Materials
- Chemical Storage**
- 1 Sulphuric Acid - 30m³
 - 2 Caustic Soda - 30m³
 - 3 Caustic Brine - 30m³
 - 4 Diesel /Gas Oil - 200m³
 - 5 Waste Oil Storage - 1.0m³
 - 6 Bunded Storage Containers - containing various lubricating oils
 - 7 Ammonia - 1m³
 - 8 Diesel - 1.3m³
 - 9 3No. Diesel Tanks - 25m³, 2.3m³, 2.3m³
 - 10 Gear Oil Tanks - 2.3m³
 - 11 Anti Freeze Tank - 1.0m³
- Decommissioned Chemical Storage**
- 1 Sodium Hypochlorite (7m³)
 - 2 Ammonia Tank (50m³)
- Approximate Location of Oil / Water Interceptors
 - CSM Direction



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CLIENT
ELECTRICITY SUPPLY BOARD

PROJECT
WEST OFFALY POWER RISK SCREENING AND TECHNICAL ASSESSMENT

DRAWING TITLE
FIGURE 3 _ WEST OFFALY POWER SITE SHOWING LOCATION OF BULK CHEMICAL STORAGE

DRAWN SML	TRACED	CHECKED CF	APPROVED JL/DUB	DATE MAR 2015
SCALE ILLUSTRATION ONLY	JOB NO. 47092932			REV