


This Report has been cleared for submission to the Board by David Flynn,  
Programme Manager

Signed: 

Dated: 3 December 2018



## OFFICE OF ENVIRONMENTAL SUSTAINABILITY

### INSPECTOR'S REPORT ON AN APPLICATION FOR A CERTIFICATE OF AUTHORISATION FOR A CLOSED LANDFILL


TO:	Eimear Cotter, Director, Office of Environmental Sustainability
FROM:	Dr Magnus Amajirionwu, Inspector, Environmental Licensing Programme
DATE:	3 December 2018
RE:	Application by <b>Tipperary County Council</b> for a Certificate of Authorisation for a closed landfill at <b>Carrownreddy, Tipperary Town, County Tipperary.</b> Certificate of Authorisation Register Number H0004-01.

#### 1. Application details

Type of facility:	Closed landfill as defined in the Regulations <sup>1</sup>
Original site ownership	Joint ownership between Tipperary County Council and other entity
Current site ownership	Joint ownership between Tipperary County Council and another entity though the Tipperary County Council is in the process of acquiring the part of the site not under its ownership.
Operator of closed landfill	Tipperary County Council
Proposed use post remedial works	It is proposed to use the site post remedial works as a town park.
Risk category of closed landfill:	High risk (class A) <ul style="list-style-type: none"> <li>• Reason: pollutant linkages: <ul style="list-style-type: none"> <li>○ Leachate migration to surface water,</li> <li>○ Lateral and vertical migration of landfill gas.</li> </ul> </li> </ul>
Section 22 register number:	S22-02565

<sup>1</sup> Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008).

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Application received:	28/11/2011
AA screening determination:	01/11/2018 The EPA determined that an appropriate assessment is required – see Section 5.
Regulation 7(4) notice:	14/08/2018
Additional information received:	28/09/2018
Name of Qualified Person:	James O'Neill, C. Eng. Credentials provided by Engineers Ireland
EPA site inspection:	None required

## 2. Information on the closed landfill

Location of facility	<p>The site is located in the Townland of Carrownreddy and is within the northern outskirts of Tipperary Town (Figure 1). The waste deposition area was originally a lake that was drained in about 1940 to allow wastes to be disposed at the site. It is accessed off the Lake Road.</p> <p>The closed landfill is within a zone of archaeological potential and an archaeological assessment was carried out at the site in 2005. The resulting report stated that due to the landfilling activities of the past, test results suggest that the possible enclosure is no longer existing, if indeed any existed on the site.</p> <p>For the purposes of the risk assessment, a public amenity use has been envisaged by the Qualified Person.</p>
Period of landfilling	The site served as the landfill for Tipperary Town from about 1940, until it closed in 1990.
Surrounding area	<p>The lands adjoining the landfill are currently used primarily for low intensity agriculture, and grazing horses. There is a marsh along the north-western, northern and north-eastern boundaries, associated with the original lake (Figure 2).</p> <p>A halting site, located approximately 150m to the south of the site, contains the nearest occupied residences. There are private dwellings within 250m of the northwest and western site boundaries and a housing estate approximately 250m to the southeast. Another residential development approximately 200m is situated to the northeast of the site.</p> <p>Tipperary County Council intend to develop the lands south of the landfill for social housing and light industrial use and the area between the site and the residential estate to the north east for light industrial warehousing.</p>
Area of the closed landfill	The site occupies 1.8 hectares.

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Quantity of waste at the facility	86,400 tonnes estimated.
Characterisation of waste deposited	<p>Within the 1.8 hectares' area of the site, is a fenced off part of 0.2 hectares which was used exclusively for the deposition of dewatered wastewater sludge.</p> <p>The wastes in the northern, western and eastern edges of the site consist of mainly construction and demolition (C&amp;D) waste comprising soils and stone, with minor amounts of rubble. The central section contains more domestic and commercial types comprising a mix of plastic and glass bottles, occasional empty flattened steel drums, empty plastic drums, concrete pipes, steel, papers, tyres, tyre tubes, timber and trees.</p>

### 3. Site investigations

Current condition and appearance of closed landfill	<p>Currently, the closed landfill site is used by Tipperary County Council as a depot for road maintenance materials and machinery. There is also a building on-site used for storing salt for winter de-icing. This building is derelict and will be demolished as part of the site remedial works.</p> <p>The area north of the on-site building is covered with soils and stone mixed with minor amounts of what appears to be C&amp;D waste, as part of the capping material used. This material is on average 1.5m to 2.5m thick and was brought onto site after the facility officially closed. It has not been properly graded or compacted. The southern and part of the eastern and western perimeters of the site are fenced. The southern part of the site has a hardcore surface and is used for storing road-works materials and machinery, and chippings.</p> <p>There is no visible boundary, other than the raised landfilled area, marking the northern boundary of the site. According to the Geophysical Survey Report 2009, the extent of the landfill is defined by the steep slopes of its boundary.</p>
Site investigations	<p>Geophysical survey, 2009: Indicated that the landfill material as comprising organic waste and construction and demolition (C &amp; D) waste. The landfill stratigraphy includes a cap of C &amp; D material and mixed C &amp; D and organic waste material up to 6 metres thick underlain by organic waste material over lacustrine sediments and sandy gravelly silt/clay. The combined thickness of the landfill material was determined to range from 6.7 metres to 17 metres. In the fill area, the resistivity contrast between leachate saturated lacustrine sediments and the waste was stated to be poor. According to the report, this indicates that leachate from the waste has most likely migrated into the underlying lacustrine sediments. Areas of possible buried metal or conductive material were also identified across the site.</p> <p>Intrusive site investigations, 2009:</p> <ul style="list-style-type: none"> <li>• 17 trial pits to average depth of 6 metres below ground;</li> <li>• 3 combined leachate/landfill gas wells to depth of 10.4-13.5 metres below ground;</li> </ul>


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	<ul style="list-style-type: none"> <li>• 5 combined groundwater/landfill gas wells to depth of 10-20 metres below ground</li> <li>• 3 surface water sampling points located along the surface water drain which runs within 50 metres to the site.</li> </ul> <p>Samples of soil, leachate and surface water were dispatched for analysis.</p> <p>Landfill gas monitoring took place <i>in situ</i> on 4 occasions between 2009 and September 2010.</p>
<p>Monitoring and analysis of samples (water, gas, waste)</p>	<p>For the risk assessment, monitoring carried out between 2009 and 2015 were as follows:</p> <ul style="list-style-type: none"> <li>• 4 rounds of gas sampling were done at 8 locations.</li> <li>• Leachate samples were taken at 3 locations.</li> <li>• Eluate testing was carried out on 5 waste samples.</li> <li>• Surface water was sampled in 3 locations.</li> <li>• Groundwater was sampled in 5 locations.</li> </ul> <p>An ecological survey and appropriate assessment as part of the Tier 3 risk assessment, in accordance with EPA Code of Practice, were also conducted.</p>
<p>Hydrology</p>	<p>According to the applicant's Appropriate Assessment Screening Report for the site, the historical landfill consists of a mound, part of which has been infilled with waste over the years. The land to the west, east and north is noticeably lower, with the mound of waste which is now mainly capped and sloping towards the surrounding wetland at its edges.</p> <p>The basin is fed from the west by the Fidaghta stream. Surface water accumulates in the basin surrounding the landfill mound, which is dominated by marsh and alder woodland. Current EPA hydrology mapping depicts the Fidaghta stream continuing east from the eastern side of the wetland and being joined by the Spital-Land stream flowing north from the town. This is not the case as the actual onsite surface water flow regime was determined during the site investigation. Large volumes of spoil have been deposited on the site, raising the land level, which may have altered the course of these streams.</p> <p>The outflow from the eastern side of the wetland joins the course of the Spital-Land, but this channel flows south, rather than north as depicted on hydrology mapping. The Spital-Land is a small, slow flowing stream of relatively low capacity (wet width c. 0.6m depth c. 0.1m). The channel continues across a field to the south of the landfill, and is then culverted under Rosanna Close housing estate. The channel was not observed again, however topography indicates that it continues underneath the town and drains ultimately into the Ara River to the south. The Ara in turn joins the Aherlow, which flows into the Lower River Suir SAC approximately 18.2 km downstream of the historical landfill site.</p> <p>The actual onsite surface water flow regime, determined during the site investigation, was used in conducting the AA screening.</p>
<p>Hydrogeology</p>	<p>Based on the field observations and geophysical investigation, the gravels appear to be underlain by shaley limestone bedrock aquifer, which is moderately productive only in Local Zones (LI). Such aquifers tend to have short flow paths with discharge to the local surface water system. It is highly</p>


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	<p>likely, based on the findings of the Geophysical Survey, that there is preferentially flow laterally toward the surface water system. However, for the purposes of the Tier 3 risk assessment, it was assumed that the underlying bedrock is a Regionally Important Karst bedrock (Rkd). The Geological Survey of Ireland (GSI) data states that the site is rated as having high vulnerability.</p> <p>Based on the groundwater flow direction data, shallow groundwater in the catchment is moving toward a low point in the former lake area and discharging into the marsh. The shallow groundwater and surface water run-off enter the marsh and discharge to the drain along the eastern landfill boundary.</p> <p>There is a public groundwater abstraction located 1.4 km down gradient of the landfill site.</p>
<p>Leachate and water quality</p>	<p>Leachate monitoring results showed multiple parameters exceeded the EPA Interim Guideline Values (IGVs) for Groundwater. These included the key leachate parameters BOD, COD, and ammonia. The Tier 3 report stated that these results confirmed the presence of an aged leachate in the monitoring wells. Elevated levels of iron, manganese and chromium were also recorded in all three leachate monitoring wells. The elevated levels of iron, manganese and chromium were attributed (in the report) to elevated background concentrations as these parameters had similar levels recorded in the upstream monitoring locations.</p> <p>With the absence of a landfill liner or natural confining layer present, leachate will impact on the groundwater body beneath the site. Elevated levels of aluminium, barium, conductivity, iron, manganese, ortho-phosphate, sodium, chloride have been observed in groundwater monitoring results. The Tier 3 report concluded that there were some localised leachate impacts detected in shallow groundwater and due to the thickness of the subsoil above the bedrock aquifer, the risk posed to the bedrock aquifer was considered low. Lateral leachate migration away from the margins of the landfill were considered insignificant due to the direction of groundwater flow and vertically because of hard low permeability clay underlying the site.</p> <p>Elevated levels of ammonia, iron, manganese and chromium were recorded in the surface water monitoring results. The elevated levels of iron, manganese and chromium were attributed (in the report) to be mostly like due do elevated background concentrations. The Tier 3 report concluded that the impact of leachate on surface water quality in the drain leaving the wetland is limited, as only elevated Ammonia was recorded.</p> <p>Accordingly, the Tier 3 report concluded that the <b>potential impacts</b> on the receiving environment associated with leachate are considered significant. However, site investigations and monitoring results showed that the <b>actual impacts</b> attributable to leachate migration to surface and groundwater are low, localised and limited. The report further stated that these low, localised and limited impacts are expected to continue to decline over time.</p> <p>Water quality was monitored at the public groundwater abstraction located 1.4km down gradient of the landfill site and was considered good in the Tier 3 report.</p> <p>Leachate generation and migration into surface water are highlighted in the risk assessment and proposed remedial actions submitted by Tipperary</p>


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	<p>County Council. The remedial measures proposed include the installation of a low permeability cap over the waste to reduce rainwater infiltration and hence decrease the leachate head generated within the waste; and regular monitoring.</p>
<p>Landfill gas</p>	<p>There is ongoing generation of landfill gas at the landfill. However, the report noted the absence of any significant migration of gas away from the landfill in a manner that potentially poses a risk to property and people.</p> <p>There is risk posed by the presence of methane and carbon dioxide from the site. Carbon dioxide and methane were detected in all three wells (installed within the waste body) ranging from 31.5% v/v to 56% v/v for methane, and 1.5% v/v to 16% v/v for carbon dioxide. Guideline limits taken from the Department of the Environment (DOE) publication on the 'Protection of New Buildings and Occupants from Landfill Gas' (1994), stipulates that, where carbon dioxide or methane are present in a landfill at 0.5% v/v and 1% v/v respectively, then housing should not be erected within 50 metres of the landfill and private gardens should not be allowed within 10 metres. Beyond the site boundary, methane was only detected in one of well along the eastern site boundary where the concentrations ranged from 0.8% v/v to 1.3% v/v. Carbon dioxide was detected in all four wells (installed outside the waste body), with the concentrations ranging from 0% v/v to 5% v/v.</p> <p>Landfill gas generation and migration are the focus of the risk assessment and proposed remedial actions submitted by Tipperary County Council. The remedial measures proposed include installation of additional gas ventilation wells across the site; installation of a landfill gas cut-off trench along the southern boundary of the capped fill area; and regular monitoring of all gas monitoring wells.</p>
<p>Conceptual site model</p>	<p>The conceptual site model developed in 2009 and provided with the original application identified the following pollutant linkages:</p> <ul style="list-style-type: none"> <li>• human health exposure due to on-site and off-site migration of landfill gas;</li> <li>• migration of leachate into the adjoining surface water body (Marsh); and</li> <li>• migration of leachate into the underlying aquifer.</li> </ul> <p>The conceptual site model is shown in Figure 3. The source, pathways and receptors can be described as follows:</p> <p>Source:</p> <ul style="list-style-type: none"> <li>– Rainfall on the landfill will preferentially percolate through the cap and into the waste.</li> <li>– Leachate is generated in the waste albeit at low strength.</li> <li>– Gas is generated at the landfill.</li> </ul> <p>Pathway:</p> <ul style="list-style-type: none"> <li>– Leachate can migrate through the base of the landfill into low permeability clay and gravel, and underlying aquifer beneath.</li> <li>– Leachate discharge into adjoining Marsh (surface water body).</li> <li>– Gas migration can occur through the landfill cap and into silts, clays and fractured bedrock beneath the waste.</li> <li>– Gas migration beyond the site boundary through drains.</li> </ul>

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	<p>Receptors:</p> <ul style="list-style-type: none"> <li>- Users in close proximity of the site.</li> <li>- Groundwater</li> <li>- Adjoining surface water bodies (Marsh).</li> <li>- Surface water/ protected area</li> </ul>
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#### 4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only)</p>	<p>Leachate migration through surface water pathway</p> <p>SPR 8, Receptor = surface water body.</p> <p>SPR 10, Receptor = Human</p> <p>SPR 11, Receptor = Human</p> <p>Summary:</p> <p>Upon the review of the updated monitoring data, surface water assessment and the ecological assessment;</p> <ul style="list-style-type: none"> <li>- the impact of leachate migrating from the site is considered significant on the receiving water quality.</li> <li>- remedial action is warranted to address the risk of offsite migration of landfill gas from the site.</li> </ul>
<p>Proposed remedial actions</p>	<p>The risk assessment and remedial actions are based on the proposed use at the closed landfill – i.e. as a town park.</p> <p>An open space public amenity park has been assumed throughout. The standard certificate of authorisation Condition 1.5 will ensure that future developments are not unnecessarily restricted. Remediation measures proposed include:</p> <ul style="list-style-type: none"> <li>• Installation of an engineered cap over the waste body to reduce rain infiltration to minimise the generation of leachate and the impact to groundwater and surface water;</li> <li>• Biannual groundwater monitoring after landfill cap is installed;</li> <li>• Installation of gas ventilation wells installed across the site to minimise the risk of build-up of landfill gas and minimise the risk of landfill gas migration;</li> <li>• Installation of a landfill gas cut-off trench along the southern boundary of the capped fill area. It is intended to break the SPR linkages by preventing potential migration of landfill gas to offsite locations and to vent the gas in a controlled manner to the atmosphere;</li> <li>• Annual gas monitoring post remedial works.</li> </ul> <p>The draft Certificate of Authorisation allows for the importation and use of greenfield soil and stone to complete the works.</p> <p>Condition 3.15 of the recommended certificate of authorisation provides for a communications programme directed at the occupiers of buildings and land that lies adjacent to deposited waste. The communications programme will inform these people of what they should be doing to protect their property</p>

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	and health and the health and well-being of employees, neighbours and members of the public from the risk of an incident involving landfill gas.
Proposed aftercare monitoring and assessment	Monitoring as specified in Condition 3.5 of the recommended certificate of authorisation.  Validation report to be submitted within 30 months.
Adequacy of risk assessment	Regulation 7(7) of the Waste Management Regulations states that the EPA must be satisfied with the risk assessment before proposing to grant a certificate of authorisation. The risk assessment is adequate for the following reasons: <ul style="list-style-type: none"> <li>• It has identified, assessed and adequately addressed the associated risks inherent with the landfill site.</li> <li>• A detailed ecological survey and Appropriate Assessment screening was also completed to evaluate the potential risk to the sensitive habitats associated with the adjoining receiving waters</li> <li>• Report of Tier 2 intrusive investigation show that municipal waste deposited in the landfill was relatively low in biodegradable waste. Therefore, the waste deposits in the "closed landfill" will present relatively low risks of ongoing leachate and gas generation.</li> </ul>

## 5. Appropriate assessment

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the proposed activity, individually or in combination with other plans or projects is likely to have a significant effect on any European Site. In this context, particular attention was paid to the European Sites at the Lower River Suir SAC (site code 002137).

The activity is not directly connected with or necessary to the management of any European Site and the Agency considered, for the reasons set out below, that it cannot be excluded, on the basis of objective information, that the activity, individually or in combination with other plans or projects, will have a significant effect on any European Site and accordingly determined that an Appropriate Assessment of the activity was required. The reasons for this determination are as follows:


- The closed landfill site is connected hydrologically to the Lower River Suir SAC (002137).
- Leachate monitoring results showed multiple parameters exceeded the EPA Interim Guideline Values (IGVs) for Groundwater.
- Elevated levels of ammonia, iron, manganese and chromium were recorded in the surface water monitoring results.

An Inspector's Appropriate Assessment has been completed and has determined, based on best scientific knowledge in the field and in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, pursuant to Article 6(3) of the Habitats Directive, that the activity, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site, in particular Lower River Suir SAC (002137), having regard to their conservation objectives and will not affect the preservation of these sites at favourable conservation status if carried out in accordance with the application, risk assessment and recommended certificate of authorisation and the conditions attached hereto for the following reasons:

- The Lower River Suir SAC (site code 002137) is located approximately 6.5km northeast, east & south of the historical landfill site. Given the distance and water monitoring results from site



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investigations, it is unlikely that the Carrownreddy closed landfill site and the proposed construction works present any significant risk to the Lower River Suir SAC (site code 002137).

- Specifically, the construction works will be undertaken to avoid the potential for water pollution and will ensure that there will be no significant impact on Lower River Suir SAC (002137).
- the project, alone or in-combination with other projects, will not adversely affect the integrity, and conservation status of any of the qualifying interests of the Lower River Suir SAC (002137).
- Condition 3.5 requires ongoing environmental assessment and monitoring.

In light of the foregoing reasons no reasonable scientific doubt remains as to the absence of adverse effects on the integrity of the European Site: Lower River Suir SAC (site code 002137).

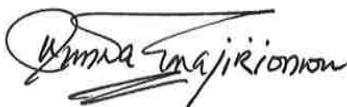
## **6. Consultation**

I consulted with Mr John Gibbons (OEE) on landfill gas assessment and treatment, and Dr Karen Creed (ELP) on appropriate assessment.

## **7. Recommendation**

I recommend granting the certificate of authorisation as proposed.

Signed



Dr. Magnus Amajirionwu

Inspector

3/12/2018


Date

## **Procedural Note**

Any representations received by the Agency within 30 days of the draft certificate of registration being made available will be considered by the Agency.

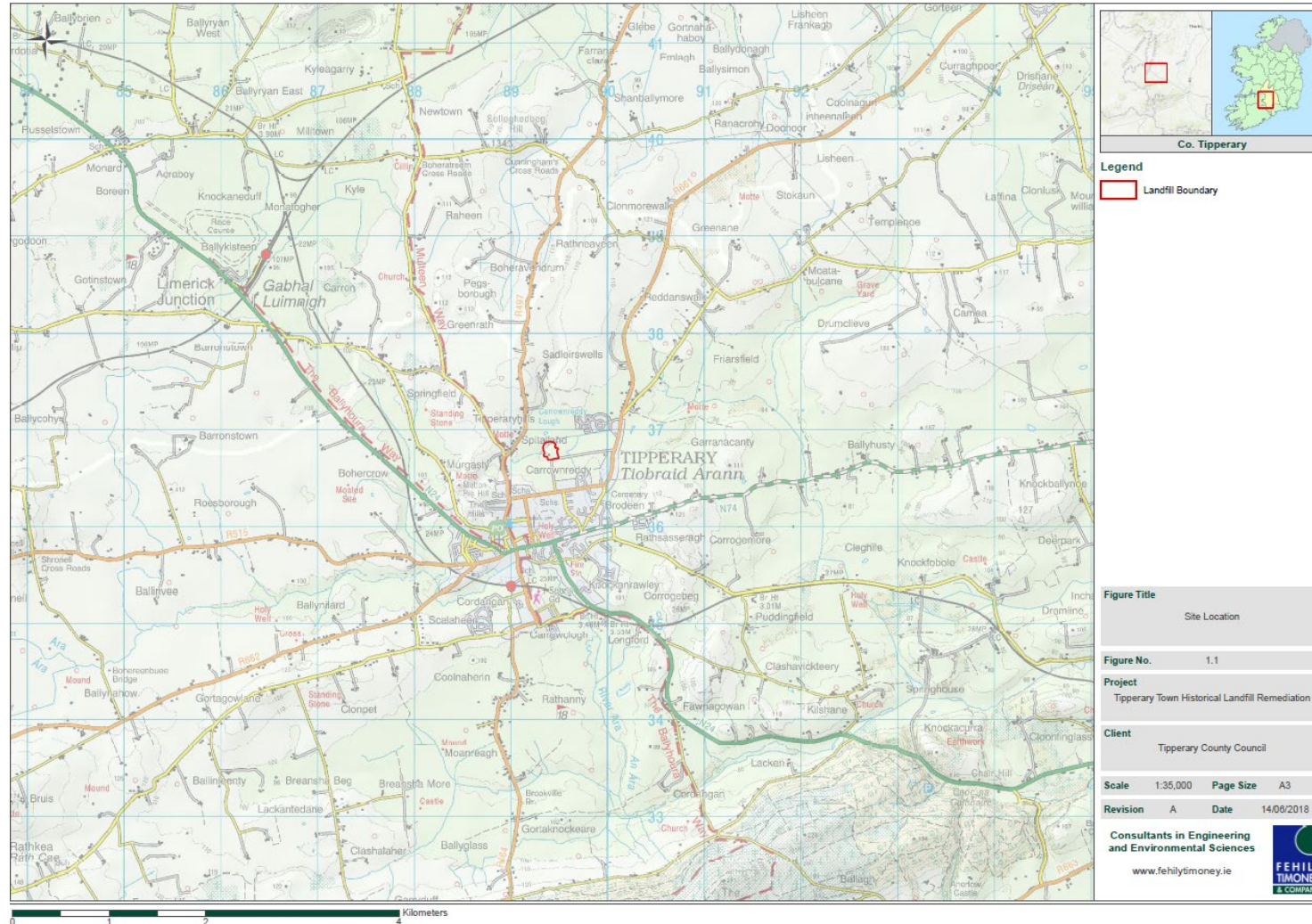
As soon as practicable after the expiry of the 30-day period the Agency will determine the certificate of authorisation, which may vary from the draft certificate, and shall issue an appropriately validated certificate of authorisation in accordance with the *Waste Management (Certificate of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008*.

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Figure 1 Location of landfill (red boundary)



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Figure 2 Boundaries at the closed landfill and habitats.



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Figure 3 Conceptual site model

