


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

Signed: 

Dated: 10 April 2019



## OFFICE OF ENVIRONMENTAL SUSTAINABILITY

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

TO:	Eimear Cotter, Director	
FROM:	Magnus Amajirionwu, Inspector	Environmental Licensing Programme
DATE:	29 March 2019	
RE:	Application by <b>Wicklow County Council</b> for a Certificate of Authorisation for a closed landfill at <b>Fassaroe 3B, Bray, County Wicklow</b> . Certificate of Authorisation Register Number <b>H0476-01</b> .	

#### 1. Application details

Type of facility:	Closed landfill as defined in the Regulations <sup>1</sup>
Original site ownership	Wicklow County Council
Current site ownership	Borg Developments (a private development company)
Operator of closed landfill	Wicklow County Council
Proposed use post remedial works	The site of the landfill is within a larger land bank currently zoned for housing / development. The landfill site will be an open space in the long term, with development adjacent to it.
Risk category of closed landfill:	Low risk (class C) <ul style="list-style-type: none"><li>Reason(s): pollutant linkages:<ul style="list-style-type: none"><li>Potential for lateral landfill gas migration to human receptors (buildings within 100m of site).</li></ul></li></ul>
Section 22 register number:	S22-02635

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

Grid Reference	722727 E and 718074 N
Application received:	03/01/2019
AA screening determination:	08/03/2019
Regulation 7(4) notice:	11/03/2019
Additional information received:	15/03/2019
Name of Qualified Person:	Michael Boland (BSc, MSc, P. Geo) Credentials provided by Institute of Geologists of Ireland
EPA site inspection:	27/11/2018

## 2. Information on the closed landfill

Location of facility	<p>Fassaroe 3B landfill is one of five landfill sites collectively known as the Fassaroe Historic Landfills. The four other landfill sites are Fassaroe 1, 2, 3A and 3C. As their names indicate, they lie within the area of Fassaroe, Bray, Co. Wicklow (see Figure 1).</p> <p>However, Fassaroe 1 landfill site was privately owned and operated. Therefore, it does not qualify as a historic landfill site, as defined in the Regulations.</p> <p>The Fassaroe 3B landfill site general location is shown on Figure 2.</p>
Period of landfilling	1994 to 1995
Surrounding area	The Ballyman Glen, a designated SAC (Site Code: 000713), is located to the north of the site. A sports ground and associated facilities are located in lands immediately to the east of the site. A MV ESB overhead line traverses the western margin of the site and it is flanked by agricultural land to the west, north and south.
Area of the closed landfill	Fassaroe 3B landfill covers an area of 0.49 Ha (Figure 3).
Quantity of waste at the facility	Approximately 8,500 tonnes.
Characterisation of waste deposited	The Tier 2 site investigation report dated 2016, showed that the waste body predominantly comprised of municipal waste including; plastic bags, bottles, metals, glass, textiles and footwear, household refuse and timber.

## 3. Site investigations

Current condition and appearance of closed landfill:	<p>The site profile is relatively flat with a gradual slope occurring in a south to north direction from 101mOD to 99mOD.</p> <p>The landfill site has been capped with topsoil. Vegetative die back was notable during the site visit.</p>
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<p>Site investigations</p>	<p>Geophysical survey conducted in 2015 and 2016, indicated that the lateral extent of the waste material is approximately 0.49 Ha. Approximately, there is 4.9m depth of waste with high organic and metallic content.</p> <p>Intrusive site investigation was conducted in 1998, 2015 and 2016 and it included a site walk-over, trial pits, and installation of boreholes. Specifically, at Fassaroe 3B landfill site there were:</p> <ul style="list-style-type: none"> <li>• 4 No. trial pits of depth from 4.00mbgl to 4.25mbgl; within an approximately 75m grid to characterise the waste, ascertain base of waste and identify natural ground</li> <li>• 1 No. offsite groundwater and gas monitoring wells,</li> <li>• 3 No. onsite combined landfill gas and leachate monitoring wells, and</li> <li>• 3 No. offsite landfill gas monitoring wells</li> </ul> <p>Samples of groundwater, soil and leachate were dispatched for analysis.</p>
<p>Monitoring and analysis of samples (water, gas, waste):</p>	<p>For the risk assessment, monitoring was carried out in 2016, 2017 and 2018 as follows:</p> <ul style="list-style-type: none"> <li>• 18 rounds of gas sampling were conducted at 7 locations.</li> <li>• 3 rounds of leachate and gas sampling were completed at 1 location.</li> <li>• 3 rounds of groundwater sampling were completed at 3 locations.</li> <li>• Eluate testing was carried out on 4 waste samples.</li> <li>• Soil was sampled in 2 locations.</li> </ul> <p>An ecological survey and assessment as part of the Tier 3 risk assessment, in accordance with EPA Code of Practice, was also conducted.</p>
<p>Hydrology</p>	<p>The County Brook River is located north of the Fassaroe 3B landfill site. County Brook River flows eastwards into the Dargle River and flows into St. Georges Channel and into the Irish Sea. The Dargle River is a registered salmonid river under the Salmonid Regulations (S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988).</p> <p>The Dargle River catchment forms part of the Eastern River Basin District. Outside of the river valley, the Fassaroe site is underlain by thick permeable subsoil and as a result the surface water drainage density is low, with very few field drains in the area and no ponds or tributaries to the County Brook River. As such there is no formal drainage system connecting the land around the historical landfill sites in Fassaroe and the County Brook River or its associated drainage system within the valley. Groundwater fed springs and seepages are evident in the riparian zone along the County Brook River. These springs feed the alkaline fen and tufa deposits. The spring flows are relatively small and coalesce downstream to form a more defined channel.</p>
<p>Hydrogeology</p>	<p>The Enniskerry groundwater body (IE_EA_G_038) is designated a locally important gravel aquifer (Lg). The bedrock beneath the gravel aquifer, the Maulin Formation, is classified by the GSI as a locally important, moderately productive bedrock aquifer in local zones (LI).</p> <p>The aquifer vulnerability at the Fassaroe site is classified as High due to the presence of greater than 3m thick unsaturated zone overlying a gravel aquifer. Groundwater flow within the granular aquifer is expected to be north-easterly, towards the local river, where groundwater discharges emerge as springs and seeps along the lowest boundary of the</p>

	<p>groundwater body (and regionally towards the Irish Sea). Previous GSI reports have shown the local groundwater regime at the site is dominated by the County Brook River valley to the north, and the valley of the River Dargle to the east.</p> <p>The Water Framework Directive (WFD) status for the Enniskerry Gravel water body has been assigned as 'Good' between 2007 and 2012. The Ballyman Glen SAC which runs along the County Brook River, and north of the Fassaroe 3B landfill site, comprises riparian wet woodland and contains a small strip of fen. The fen is very alkaline and is associated with petrifying springs and seepage areas, which have given rise to thick deposits of marl.</p> <p>The GSI well database lists a number of springs and old boreholes (from 1965) in the surrounding areas of Enniskerry and Bray, of which only a small number have been assigned as domestic use. The nearest spring, St Kevin's Well (GSI code 3224SWW137) is located north of the site. No private or public groundwater supply sources are present down-hydraulic gradient from the landfill site.</p>
<p>Leachate and water quality:</p>	<p>In the geophysical report (2016), a leachate body is assumed to be perched above groundwater in the Enniskerry groundwater body with mixing at the water table expected. Leachate results compared against published minimum and maximum observed ranges (EPA Landfill Manual) show that the leachate parameters including ammoniacal nitrogen, total phosphate, calcium, barium, boron, heavy metals (including aluminium, arsenic, iron, lead, nickel, zinc), petroleum hydrocarbons and Polycyclic Aromatic Hydrocarbons (PAH) were above the published ranges. Leachate data for this site was also characterised by the presence of short chain Total Petroleum Hydrocarbons (TPH) including benzene, toluene, BTEX hydrocarbons and a larger range of VOCs and SVOCs than seen at the other sites.</p> <p>Groundwater samples taken from the site showed groundwater concentrations higher than the relevant GTV or IGV for the parameters calcium and metals including aluminium, cadmium, iron, lead, nickel, zinc, manganese, and potassium. There are no detections of ammonia or trace organic compounds in groundwater at Fassaroe 3B.</p> <p>According to the Tier 3 report, the groundwater table at the site is located at shallow depth. It appears that the waste body is perched above the water table. Some deeper portions of the waste body are therefore expected to be saturated to the north, where groundwater is intercepted. The unsaturated sand and gravel deposits can provide both lateral and vertical migration pathways for generated leachate and landfill gas at the site. The saturated waste located to the north of the site could also result in the migration of leachate and dissolved gas in groundwater.</p> <p>There are however, no residential properties or private wells situated down gradient of the landfill sites (as there is a water main connection in the area).</p>
<p>Landfill gas:</p>	<p>The ongoing generation of landfill gas at the landfill means there is risk posed by the presence of methane from the site. A total of seven boreholes were monitored for gas at Fassaroe 3B; three onsite combined gas/leachate boreholes and four offsite boreholes comprising three gas boreholes and one groundwater borehole.</p> <p>The gas monitoring data collected from onsite monitoring locations over the monitoring period recorded methane concentrations ranging from 22% v/v</p>

	<p>to 73.1% v/v and carbon dioxide concentrations ranging from 17.2% v/v to 39.3% v/v.</p> <p>The gas monitoring data collected for offsite monitoring locations generally recorded no detections to 2.1% v/v.</p> <p>Offsite carbon dioxide concentrations varied ranging from 0.5% v/v to 4.2% v/v.</p> <p>The Department of the Environment (DOE) publication on the 'Protection of New Buildings and Occupants from Landfill Gas' (1994) guidelines stipulate 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 50m of the landfill and private gardens should not be allowed within 10m.</p> <p>As already stated, a sports ground and associated facilities are located in lands immediately to the east of Fassaroe 3B and a housing development is planned around the landfill site with the landfill as an open space. Landfill gases were rarely detected in landfill gas monitoring wells located offsite of the landfill. This would indicate that lateral migration of gas is not occurring in significant quantity.</p> <p>Landfill gas generation and migration is the focus of the risk assessment and proposed remedial actions submitted by Wicklow County Council at Fassaroe 3B. Current records do not show any existing services present at the site. The remedial measures proposed include passive venting by means of a Virtual Gas Curtain (VGC) around the site.</p> <p>Consequently, Condition 3 of the recommended certificate of authorisation requires Wicklow County Council to install and maintain appropriate landfill gas management infrastructure.</p>
<p>Conceptual site model:</p>	<p>The original conceptual site model developed in 2015 was provided with the original application. It was reviewed in 2018 and identified the following pollutant linkages:</p> <ul style="list-style-type: none"> <li>• human health exposure and emission into buildings due to off-site migration of landfill gas;</li> <li>• migration of leachate into the underlying aquifer and discharge to the adjoining surface water body.</li> </ul> <p>The SPR linkages of primary concern relate to the potential risk of lateral migration of landfill gas to human presence:</p> <ul style="list-style-type: none"> <li>• human health exposure pathway of off-site migration of landfill gas and emission into on-site building (SPR 10).</li> </ul> <p>The conceptual site model is shown in Figure 4. 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.</li> <li>– Gas is generated at the landfill.</li> </ul> <p>Pathway:</p> <ul style="list-style-type: none"> <li>– Leachate migration from the site through the unsaturated sand and gravel deposits.</li> <li>– Leachate can migrate through the base of the landfill into underlying aquifer beneath and discharge to the adjoining surface water body.</li> </ul>

	<ul style="list-style-type: none"> <li>- Gas migration can occur through the permeable cap and into the unsaturated sand and gravels; and through fractured bedrock beneath the waste.</li> <li>- Gas migration beyond the site boundary.</li> </ul> <p>Receptors:</p> <ul style="list-style-type: none"> <li>- the underlying sand and gravel aquifer;</li> <li>- current and future site users; and</li> <li>- existing and proposed offsite buildings and structures</li> </ul> <p>No private or public groundwater supply sources are present down-hydraulic gradient from Site.</p>
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#### 4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only):</p>	<p>Landfill gas migration through lateral and vertical pathway</p> <p>SPR 10, Receptor = Human</p> <p>Summary:</p> <p>Upon the review of the updated monitoring data and the ecological assessment;</p> <ul style="list-style-type: none"> <li>- Remedial action is warranted to address the risk of leachate migrating from the site to the receiving groundwater body.</li> <li>- remedial action is warranted to address the risk of offsite migration of landfill gas.</li> </ul>
<p>Proposed remedial actions:</p>	<p>The Fassaroe area in the vicinity of the landfill sites is zoned for future development including residential, open space and recreation, education, retail and employment. In this regard, the remediation proposals for the landfills at Fassaroe addresses both environmental risk associated with the landfills and potential risk to human health. This is to ensure appropriate safety standards for potential future development at the lands. Therefore, it is anticipated that no buildings would be located within the landfill areas and these would be developed instead as open space / amenity.</p> <p>The overall remediation strategy includes the proposed installation of landfill gas ventilation curtain (VGC) around the site. The VGC is expected to reduce the risk posed by the presence of landfill gas to receptors by intercepting the preferential lateral pathway for gas migration out of the landfill site and thus breaking the source-pathway-receptor linkage. The VGC forms a low pressure or low gas concentration area relative to the surrounding gassing ground to encourage gas to flow towards the VGC barrier, and allow subsequent venting to atmosphere.</p> <p>Leachate management will include capping with a low permeability barrier, surface water collection layers and a minimum of 1m of cover soils. Condition 3 of the recommended certificate of authorisation requires capping and leachate management measures to be undertaken at the site.</p> <p>The proposed remedial actions are intended to break the SPR linkages by preventing:</p> <ul style="list-style-type: none"> <li>- potential migration of leachate to groundwater;</li> <li>- migration of landfill gas to offsite locations; and</li> <li>- to vent the landfill gas in a controlled manner to the atmosphere.</li> </ul>

	<p>The draft Certificate of Authorisation allows for the importation and use of 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 adjacent to deposited waste (the site). The communications programme will inform these people of what they should be doing to protect their property health and well-being, and members of the public from the risk of an incident involving landfill gas.</p>
Proposed aftercare monitoring and assessment:	<p>Monitoring as specified in Condition 3.5 of the recommended certificate of authorisation.</p> <p>Validation report to be submitted within 30 months.</p>
Adequacy of risk assessment:	<p>Regulation 7(7) of the 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:</p> <ul style="list-style-type: none"> <li>• It has identified, assessed and adequately addressed the associated risks inherent with the landfill site.</li> <li>• An Appropriate Assessment screening was also completed to evaluate the potential risk to the European sites associated with the nearby 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 Ballyman Glen SAC [Site Code: 000713].

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 reason for this determination is as follows:

- though this landfill site is situated approximately 70 m south of the Ballyman Glen SAC [Site Code: 000713], there is groundwater connectivity between the landfill site and the SAC.

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 Ballyman Glen SAC [Site Code: 000713], 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:

- Specifically, the remedial works will be undertaken to avoid the potential for water pollution and will ensure that there will be no significant impact on Ballyman Glen SAC [Site Code:

000713], and with a further objective to result in positive impacts to current water quality conditions.

- 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 Ballyman Glen SAC [Site Code: 000713].
- 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 those European Site: Ballyman Glen SAC [Site Code: 000713].

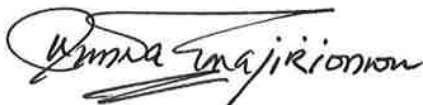
## 6. Consultation

I consulted with Mr John Gibbons (OEE) on landfill gas assessment and treatment.

## 7. Recommendation

I recommend granting the certificate of authorisation as proposed.

Signed



Date 29/03/2019

Magnus Amajirionwu

## 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.

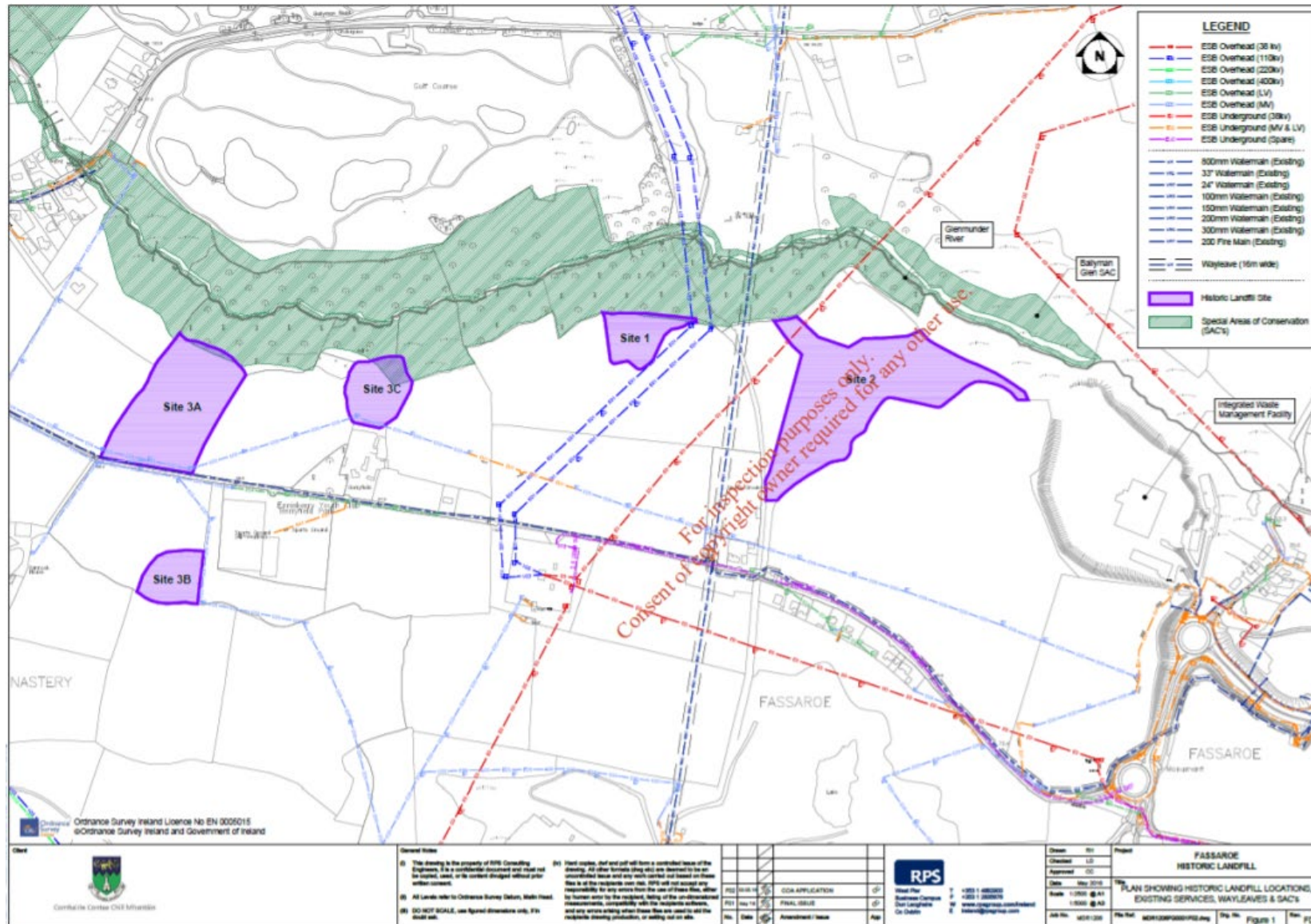
As soon as practicable after the expiry of the 30-day period the Agency will determine the certificate of authorisation, which may vary from the draft certificate, and shall issue an appropriately validated certificate of authorisation in accordance with the Waste Management (Certificate of Historic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



Figure 1 Location of Fassaroe Historical Landfill Sites



Figure 1 Location of the Five Fassaroe Historical Landfills



**Figure 3 Location and boundary map of Fassaroe Historical Landfill (outlined in Red and labelled Site 3B).**

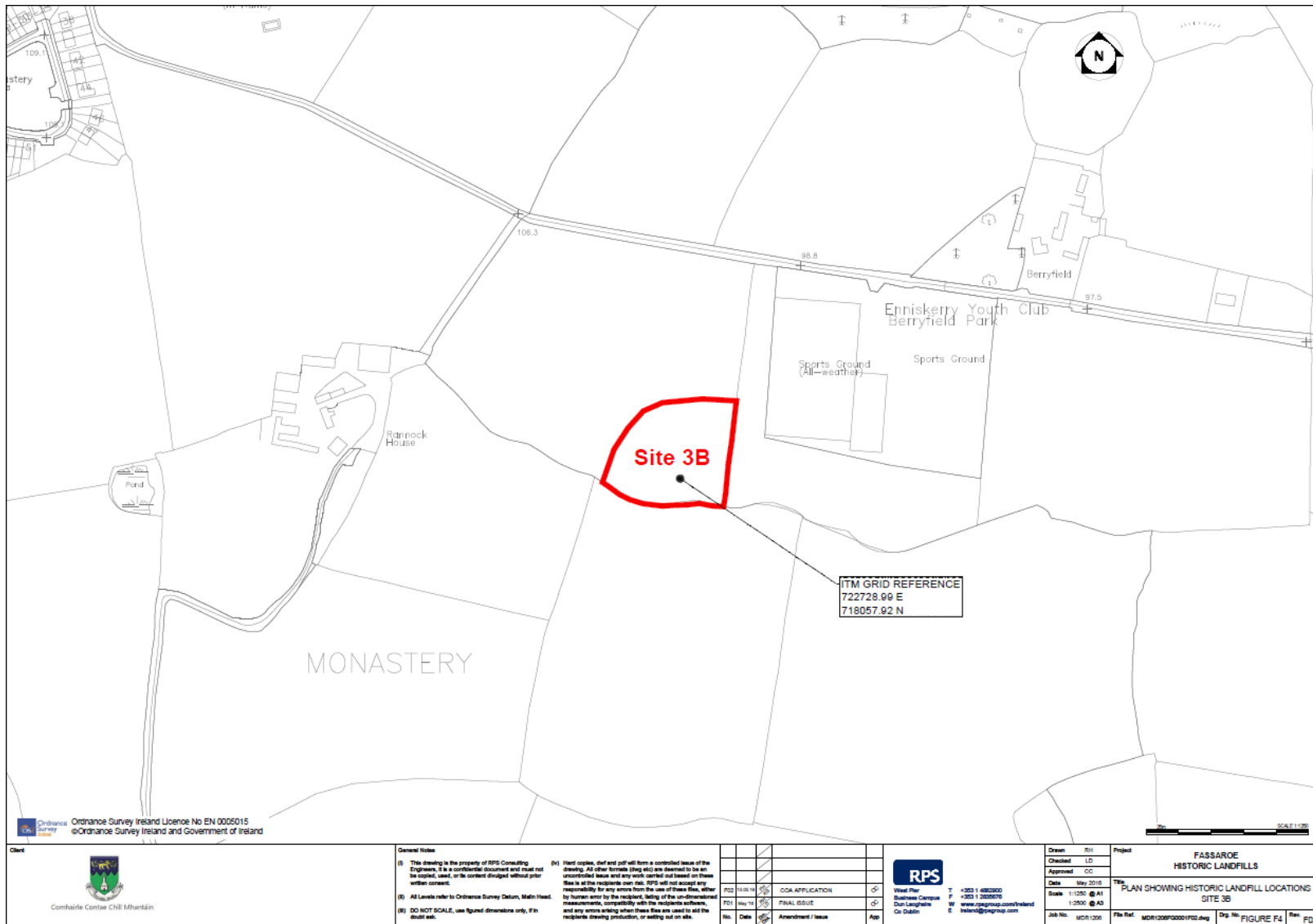
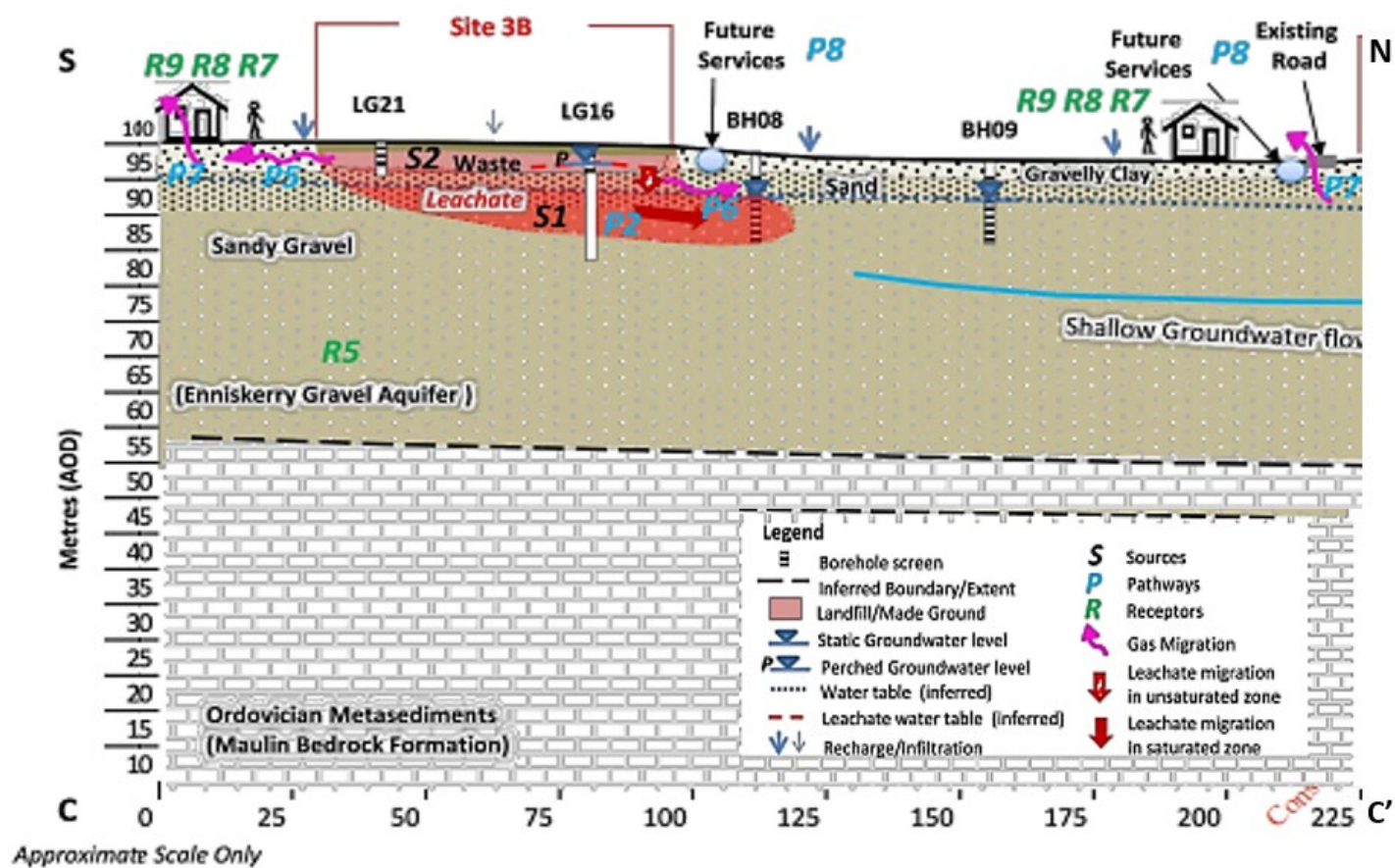


Figure 4 Conceptual site model for Fassarooe 3B site



**Appendix 1: Assessment of the effects of activity on European sites and proposed mitigation measures.**

Site Code	Site Name	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
000713	Ballyman Glen SAC	Petrifying springs with tufa formation (Cratoneurion) [7220] Alkaline fens [7230]	NPWS (2018) Conservation objectives for Ballyman Glen SAC [000713]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.	<p><u>Emission to Water</u></p> <p>Any change in water quality has the potential to impact on water dependant habitats and species.</p> <p>The Tier 3 risk assessment carried out in accordance with the EPA Code of Practice show that the presence of leachate at the site and the potential impact on groundwater is expected to continue declining overtime.</p> <p>Tier 3 risk assessment of the potential impact associated with leachate migrating to the adjoining surface waters indicate that it will not have significant impact on the overall water quality of the Fassaroe stream and the Ballyman Glen SAC.</p> <p><u>Conclusion:</u></p> <p>Due to risk of potential impacts on the receiving environment associated with leachate remedial action is warranted. Condition 3 of the certificate of authorisation outlines the remedial actions required at the site.</p> <p>Condition 3.5 requires monitoring, sampling, analysis and characterisation of leachate. It also requires annual sampling of surface water from the adjacent stream; and sampling, analysis and characterisation of groundwater from onsite and off-site boreholes.</p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of the European sites are protected.</p> <p><u>Emissions to Air</u></p> <p>Landfill gas migration beyond the site boundary is currently associated with the site. The Tier 3 risk assessment affirms that there is immediate risk to any of the offsite properties associated with gas arising from the site. As a mitigation measure, the installation of virtual gas curtains is recommended for the site.</p> <p><u>Conclusion:</u></p>

Site Code	Site Name	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
				<p>Condition 3.1 requires the installation of gas curtains along the perimeter of the closed landfill.</p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of the European sites are protected.</p>