


This Report has been cleared for submission to the Director by Warren Phelan
Programme Manager.

Warren Phelan

Signed: Eve O'Sullivan

Dated: 16 October 2023

 <p>OFFICE OF ENVIRONMENTAL SUSTAINABILITY</p>
<p>INSPECTOR'S REPORT ON AN APPLICATION FOR A CERTIFICATE OF AUTHORISATION FOR A CLOSED LANDFILL</p>
<p>TO: Micheál Lehane, Director</p>
<p>FROM: Seán Byrne, Inspector Circular Economy Programme</p>
<p>DATE: 16 October 2023</p>
<p>RE: Application by Kerry County Council for a Certificate of Authorisation for a closed landfill at Ahascra Historic Landfill, Lisselton, Co. Kerry. Certificate of Authorisation Register Number H0194-01.</p>

1. Application details

Type of facility:	Closed landfill as defined in the Regulations ¹ .
Original site ownership	Kerry County Council.
Current site ownership	Kerry County Council.
Operator of closed landfill	Kerry County Council has operated this site since c.1975.
Proposed use post remedial works	Kerry County Council intends the site to continue to be used for cattle grazing and as agricultural storage and gravel compound.
Risk category of closed landfill:	High risk (Class A) due to <ul style="list-style-type: none"> leachate migration through surface water pathway (SPR8). The principal risk identified is the risk of leachate migration into the surface water drainage channel along the eastern site boundary.
Historic landfill (Section 22) register number:	S22-02664
Grid Reference	91150 E and 136496 N (ING)
Application received:	17 th September 2021

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

AA screening determination:	9 th May 2022
Regulation 7(4) notice:	4 th April 2022
Additional information received:	Regulation 7(4) reply received on 22 nd December 2022.
Name of Qualified Person:	Chris Cronin, credentials provided by Engineers Ireland.
EPA site inspection:	No inspection was required.

2. Information on the closed landfill

Location of facility	<p>The closed landfill is located in the townland of Ahascra, Lisselton, 4.3km north-east of Ballyduff village in County Kerry.</p> <p>The location of the landfill site is shown in Figure 1.</p>
Period of landfilling	c.1975 to c.1990.
Surrounding area	<p>The site is surrounded by agricultural lands to the north, west and partially to the south and east. To the east and also to the south of the site lies a bog, as shown in Figure 2. A local access road runs along the eastern site boundary. There are surface water drainage channels along the northern, western and eastern site boundary.</p> <p>Domestic dwellings are located to the north-west, west and south of the landfill with the closest dwelling being located approximately 100m north-west of the site, as also shown in Figure 2.</p>
Area of the closed landfill	The site covers an area of approximately 2.65 ha.
Quantity of waste at the facility	Approximately 88,550 tonnes (63,250 m ³).
Characterisation of waste deposited	<p>The waste comprises of municipal waste, commercial and industrial (C&I) waste and construction & demolition (C&D) waste. The waste encountered during site investigations includes 'black/organic waste', plastic bags, plastic bottles, wire rope, an engine part, glass, including jars and glass bottles and fragments, cloth and cloth fragments, clothing, wood, saw dust, a block and concrete.</p> <p>Waste was deposited across the entire site apart from a small area within the eastern boundary where the agricultural storage and gravel compound is located. The extent of the deposited waste is shown in Figure 3.</p>

3. Site investigations

<p>Current condition and appearance of closed landfill:</p>	<p>The landfill is dome shaped with steep edges on all sides and raises above the surrounding lands. The site elevations range from approximately 8m to 12.2m AOD. A number of depressions and standing water were observed on site during a site walkover on 23rd October 2019, as shown in Figure 4, indicating inadequate sloping of the landfill surface to provide for sufficient drainage of rainfall. <i>EPA Landfill Manuals – Landfill Site Design</i> states that the topsoil should be uniform and have a minimum slope of 1 to 30 to prevent surface water ponding and to promote surface water run-off. Accordingly, Condition 3.1(b)(iii) requires that the landfill cap shall incorporate reprofiled gradients to provide for run-off of rainwater in accordance with <i>EPA Landfill Manuals – Landfill Site Design</i>. Condition 3.13 also requires that only greenfield soil and stone, or soil and stone of equivalent nature and character, can be imported for use in remedial, corrective, or other engineering works at the site. Leachate seepage/breakout into the adjacent drainage channel along the western site boundary was also observed on 23rd October 2019. Condition 3.1(b) requires a low permeability landfill cap over the entire waste body. In addition, Condition 3.1(g) requires a vertical LLDPE cut-off barrier between the waste body and the adjacent drainage channels to reduce gas and leachate migration. There are six passive gas vents within the waste body. There are no buildings within the site boundary.</p>
<p>Site investigations</p>	<p>The site investigations carried out as part of Tier 1, 2 and 3 assessments established the following facts:</p> <ul style="list-style-type: none"> • There is no liner beneath the waste body; • The waste was placed on top of blanket of peat. Beneath the peat lies limestone bedrock; • The existing landfill cover material comprises of a 0.1m topsoil layer and an average clay subsoil of 0.7m. The cover material is however not uniform across the site; • The average waste thickness is 2.75m; • Landfill leachate is migrating into groundwater; • Landfill leachate is migrating into the adjacent drainage channels; and, • Landfill gas is being generated and migrates outside the waste body.
<p>Monitoring and analysis of samples (water, gas, waste):</p>	<p>The following site investigations were carried out as part of Tier 1, 2 and 3 assessments:</p> <ul style="list-style-type: none"> • A desk study including, but not limited to, studying Geological Survey Ireland (GSI) maps, National Parks and Wildlife Service maps and Local Authority maps; • Site walkovers were carried out on 25th June 2007, 25th October 2013, 14th February 2019 and 23rd October 2019; • Topographical survey was carried out on 13th March 2019; • Geophysical surveys to determine physical characteristics of the landfill were carried out on 8th March 2019, 29th March 2019, 17th November 2019 and 25th October 2022;

	<ul style="list-style-type: none"> • Surface water monitoring; three rounds at three monitoring locations in total were carried out in 2019 and 2022; • Assimilative capacity and mass balance calculations to estimate impact of potential leachate breakouts on surface water; • Trial pit investigation, at five trial pits in total, in 2019; • Waste analysis, at two samples from two trial pits, was carried out in 2019; • In-situ capping permeability testing was carried out on one sample from one trial pit in 2019; • Leachate monitoring was carried out at one borehole in 2022; • Dispersion modelling of leachate contaminants in groundwater; • Groundwater monitoring; three rounds at three boreholes in total were carried out in 2019 and 2022; • Landfill gas monitoring at two boreholes was carried out 2019; and • LandGEM gas generation modelling was carried out in 2019.
Hydrology	<p>The site is located within the Tralee Bay-Feale catchment (Catchment Identification Number: 23) and sub-catchment of the Glouria (Sub-catchment Name: Glouria_SC_010, Sub-catchment Id: 23_12).</p> <p>There are existing surface water drainage channels bordering the site. The location of these drainage channels and the direction of water flow within them is shown in Figure 5. All of these drainage channels and others in the surrounding area ultimately flow towards and discharge into the Feale river (segment code: 23_3056) which flows in a northerly direction approximately 1.9km west of the site. As part of the remediation measures, the applicant proposes additional surface water drainage channels, as outlined in detail in Section titled '<i>Proposed remedial actions</i>' below. The Appropriate Assessment Screening Report also states that aerial photography indicates that there is also a drainage channel located along the site's south-eastern boundary and it is likely to drain in a south-west direction. It is noted that this channel is not shown in Figure 5. Condition 3.8 requires a drawing showing, amongst other elements, the adjacent drainage channels and the direction of water flow in them.</p> <p>The Feale river forms part of the Cashen transitional waterbody (transitional waterbody code: IE_SH_060_0100). The WFD status of the Cashen transitional waterbody is Poor. The Cashen transitional waterbody discharges to the Mouth of the Shannon coastal waterbody (coastal waterbody code: IE_SH_060_0000). The WFD status of this coastal waterbody is Good.</p> <p>Urban wastewater discharge from Ballyduff wastewater treatment plant (WWTP) (Licence Reg. No. D0418-01) and agriculture are identified in the catchment monitoring assessment reports¹ as significant pressures on the Cashen transitional waterbody. Other identified pressures include urban wastewater discharges from Listowel WWTP (Licence Reg. No. D0179-01)</p>

¹ Source: Water Framework Directive (WFD) website available at https://wfd.edenireland.ie/waterbody/ie_sh_060_0100/characterisation?charIt=C1000002 (Accessed 29th March 2023).

and Ballybunion WWTP (Licence Reg. No. D0183-01). The locations of the three WWTPs are shown in Figure 1.

The Glouria river (waterbody code: IE_SH_23G750710, segment code: 23_2949) flows approximately 1.1km south-east of the site in a south-westerly direction before discharging into the Feale river approximately 2km south-west of the site. The Water Framework Directive (WFD) status assigned to the Glouria river is Moderate. Agriculture and hydromorphology, including embankments and channelisation, are identified in the catchment monitoring assessment reports¹ as significant pressures contributing to the Moderate ecological status of the Glouria river.

Surface water monitoring

Three surface water monitoring rounds were carried out at three monitoring locations in total. Two locations SW01 and SW02 were monitored on 16th July 2019, 3rd September 2019 and 22nd November 2022, as shown in Figure 5, and an additional location SW03 was also monitored in the 2022 monitoring.

Table 1: Surface water monitoring locations

Monitoring location Id.	Location
SW01	Upstream of the site on the peatland drainage channel which runs along the eastern site boundary, approximately 50m of the north-eastern corner of the site.
SW02	Upstream of the site and 25m east of the eastern site boundary, on the same peatland drainage channel as point SW01.
SW03	Downstream of the site on the drainage channel which runs towards the west, along the northern site boundary, 95m downstream of the site.

The table below shows the monitoring results from the most recent monitoring event in November 2022.

Table 2: Surface Water Monitoring Results, 22nd November 2022

Parameter	EQS ² / Parametric values ³	Monitoring locations		
		SW01 (Up-stream)	SW02 (Up-stream)	SW03 (Down-stream)
Ammoniacal Nitrogen [mg/l]	≤ 0.090 ²	<0.2	<0.2	1.33

¹ Source: Water Framework Directive (WFD) website available at https://wfd.edenireland.ie/waterbody/ie_sh_23g750710/characterisation?charIt=CI000002 (Accessed 29th March 2023).

² European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

³ European Union (Drinking Water) Regulations 2023.

	high status, 95%, for Total Ammonia [mg N/l]			
Chloride [mg/l]	250 ³	43.8	34.6	48.2
Chemical oxygen demand [mg/l]	40 ³	121	155	164
Conductivity at 20°C [mS/cm]	2.5 ³	0.264	0.124	0.309
Mercury [µg/l]	0.07 ²	0.012	0.019	0.0143
Arsenic [µg/l]	10 ³	0.84	0.598	2.71
Copper [µg/l]	30 ²	1.05	8.48	1.74
Lead [µg/l]	1.2 ²	0.345	2.76	0.396
Manganese [µg/l]	50 ³	115	50	44.5
Nickel [µg/l]	4 ²	1.06	0.835	1.22
Phosphorus [µg/l]	≤ 45 ² High status, 95%, for Molybdate Reactive Phosphorus (MRP) [µg/l] ²	89.5	30.4	95.6
Zinc [µg/l]	100 ²	10.5	67.4	22.5
Sodium [mg/l]	200 ³	17.7	11.2	19.3
Iron [mg/l]	0.2 ³	1.44	1.23	0.835
Benzo(a)pyrene [µg/l]	0.00017 ²	<2	<2	<2

The surface water monitoring results show exceedances of the EQSs at the downstream point SW03 for ammoniacal nitrogen and MRP, and an exceedance of the parametric value for chemical oxygen demand. These exceedances indicate that leachate may be migrating into the drainage channel downstream of the landfill. Additionally, applicant correspondence dated December 2022 refers to the exceedance of the EQS for lead at the upstream point SW02 and states that this may indicate the presence of a pathway from the landfill to the peatland drainage channel along the eastern site boundary. It is further noted that it cannot be determined whether the actual concentration for benzo(a)pyrene was within the relevant standard as the limit of detection for the monitoring methods utilised was above the EQS.

	<p>Condition 3.9(d) requires quarterly monitoring of surface water in accordance with Schedule A.3, at locations SW01 to SW03 and at the outlet from the proposed site water drainage system, as outlined in Section titled 'Proposed remedial actions' below. Condition 3.9(g) also requires that the sensitivity of the monitoring methods utilised shall have an appropriate limit of detection to allow for comparison of pollutant concentrations against the relevant standard reference values.</p>																											
<p>Hydrogeology</p>	<p>The closed landfill lies within the Ballybunion groundwater body (GWB Number: IE_SH_G_027). The status of the groundwater body is good. The underlying bedrock groundwater aquifer is classified as a Regionally Important Aquifer – Karstified (Diffuse) Bedrock (Rkd). The vulnerability of the aquifer beneath the site is Moderate. Groundwater beneath the site flows in a north-westerly direction, as shown in Figure 6.</p> <p><i>Drinking water abstractions</i></p> <p>There are no public drinking water abstractions downstream or downgradient of the site. The nearest groundwater protection zone is located approximately 15.8km south-west of the site.</p> <p>There are eight private wells/ boreholes located downgradient of the site, within 2km of the site, as set out in Table 3 below.</p> <p><i>Table 3: Downgradient private water wells/boreholes</i></p> <table border="1" data-bbox="526 926 1362 1581"> <thead> <tr> <th data-bbox="526 926 761 1016">Well/Borehole GIS Name</th> <th data-bbox="761 926 1167 1016">Location</th> <th data-bbox="1167 926 1362 1016">Use</th> </tr> </thead> <tbody> <tr> <td data-bbox="526 1016 761 1085">0813SWW071</td> <td data-bbox="761 1016 1167 1085">1.1km west of the site</td> <td data-bbox="1167 1016 1362 1085">Unknown</td> </tr> <tr> <td data-bbox="526 1085 761 1155">0813SWW077</td> <td data-bbox="761 1085 1167 1155">1.2km west of the site</td> <td data-bbox="1167 1085 1362 1155">Unknown</td> </tr> <tr> <td data-bbox="526 1155 761 1224">0813SWW072</td> <td data-bbox="761 1155 1167 1224">1.35km west of the site</td> <td data-bbox="1167 1155 1362 1224">Unknown</td> </tr> <tr> <td data-bbox="526 1224 761 1293">0813SWW074</td> <td data-bbox="761 1224 1167 1293">1.4km west of the site</td> <td data-bbox="1167 1224 1362 1293">Unknown</td> </tr> <tr> <td data-bbox="526 1293 761 1362">0813SWW075</td> <td data-bbox="761 1293 1167 1362">1.4km west of the site</td> <td data-bbox="1167 1293 1362 1362">Unknown</td> </tr> <tr> <td data-bbox="526 1362 761 1432">0813SWW058</td> <td data-bbox="761 1362 1167 1432">1.54km north-west of the site</td> <td data-bbox="1167 1362 1362 1432">Unknown</td> </tr> <tr> <td data-bbox="526 1432 761 1501">0813SWW059</td> <td data-bbox="761 1432 1167 1501">1.6km north-west of the site</td> <td data-bbox="1167 1432 1362 1501">Unknown</td> </tr> <tr> <td data-bbox="526 1501 761 1581">0813SWW060</td> <td data-bbox="761 1501 1167 1581">1.62km north-west of the site</td> <td data-bbox="1167 1501 1362 1581">Unknown</td> </tr> </tbody> </table> <p>Due to the fact that groundwater beneath the site flows in a north-westerly direction, there may be a potential impact on the above private wells located in the direction of groundwater flow. However, the appropriate capping will limit ingress of rainwater into the waste body thus limiting the generation of leachate.</p> <p>Condition 3.9(e) requires monitoring of groundwater in accordance with Schedule A.4, which requires groundwater monitoring upgradient and downgradient of the waste body on a quarterly basis and specifies the minimum parameters to be monitored. Furthermore, Condition 3.4</p>	Well/Borehole GIS Name	Location	Use	0813SWW071	1.1km west of the site	Unknown	0813SWW077	1.2km west of the site	Unknown	0813SWW072	1.35km west of the site	Unknown	0813SWW074	1.4km west of the site	Unknown	0813SWW075	1.4km west of the site	Unknown	0813SWW058	1.54km north-west of the site	Unknown	0813SWW059	1.6km north-west of the site	Unknown	0813SWW060	1.62km north-west of the site	Unknown
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	requires appropriate monitoring on a biannual basis to identify any impact on the quality of water abstracted at wells downgradient of the landfill and the assessment of the monitoring results against drinking water standards.																																															
Leachate and water quality:	<p><u>Trial pit investigation</u></p> <p>Five trial pits TP01 – TP05 were excavated to depths of 1.7m bgl to 2.6m bgl on 30th May 2019, as shown in Figures 3 and 7. Waste and made ground were encountered in all trial pits. Thickness of waste ranged from 0.10m bgl to 2.6m bgl. Bedrock or groundwater was not observed in any of the trial pits. The Tier 2 assessment states that the trial pitting shows that the existing soil cover is not uniform across the landfill and therefore, is unlikely preventing rainfall percolation into the waste body and minimising leachate generation. Condition 3.1(b) requires an engineered cap, which will prevent rainfall ingress into the waste body and generation of leachate.</p> <p><u>In-situ capping permeability testing</u></p> <p>Permeability testing was carried out on one sample from trial pit TP03, at 0.5m bgl, in 2019. The cover material was classified as <i>Brown gravelly very sandy very silty CLAY</i> with a permeability of 3.5×10^{-10} m/s. The Tier 2 assessment states that such permeability is technically suitable as a low permeability capping material as it is below the permeability of 1×10^{-9} m/s.</p> <p><u>Waste analysis</u></p> <p>Two soil samples were collected from trial pits TP03 and TP04 on 30th May 2019 and analysed for a number of parameters in accordance with the waste acceptance criteria at landfills ¹, as shown in the table below.</p> <p><i>Table 4: Waste analysis results</i></p> <table border="1"> <thead> <tr> <th rowspan="2">Parameter</th> <th colspan="3">Landfill Waste Acceptance Criteria Limits ¹</th> <th colspan="2">Sample</th> </tr> <tr> <th>Inert</th> <th>Non-haz</th> <th>Haz</th> <th>TP03 2.1m bgl</th> <th>TP04 2.2m bgl</th> </tr> </thead> <tbody> <tr> <td>Total Organic Carbon [%]</td> <td>3</td> <td>5</td> <td>6</td> <td>8.3</td> <td>4.1</td> </tr> <tr> <td>Loss on Ignition [%]</td> <td>-</td> <td>-</td> <td>10</td> <td>11</td> <td>6.9</td> </tr> <tr> <td>Mineral Oil (C10 to C40) [mg/kg]</td> <td>500</td> <td>-</td> <td>-</td> <td>1,500</td> <td><10</td> </tr> <tr> <td colspan="6">10:1 Eluate</td> </tr> <tr> <td>Mercury [mg/kg]</td> <td>0.01</td> <td>0.2</td> <td>2</td> <td>0.026</td> <td>0.017</td> </tr> <tr> <td>Antimony [mg/kg]</td> <td>0.06</td> <td>0.7</td> <td>5</td> <td>0.068</td> <td>0.032</td> </tr> </tbody> </table>	Parameter	Landfill Waste Acceptance Criteria Limits ¹			Sample		Inert	Non-haz	Haz	TP03 2.1m bgl	TP04 2.2m bgl	Total Organic Carbon [%]	3	5	6	8.3	4.1	Loss on Ignition [%]	-	-	10	11	6.9	Mineral Oil (C10 to C40) [mg/kg]	500	-	-	1,500	<10	10:1 Eluate						Mercury [mg/kg]	0.01	0.2	2	0.026	0.017	Antimony [mg/kg]	0.06	0.7	5	0.068	0.032
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¹ Waste Acceptance Criteria (WAC) as set out in *Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.*

Sulphate [mg/kg]	1,000	20,000	50,000	2,300	1,400
Total Dissolved Solids [mg/kg]	4,000	60,000	100,000	4,800	3,100

The results show that the concentration of total organic carbon and loss of ignition meet the hazardous landfill waste acceptance criteria and according to the Tier 2 assessment is most likely due to the degradation of organic fractions within the municipal solid waste. The results also show the concentrations of mercury, antimony, sulphate and total dissolved solids meet the non-hazardous landfill waste acceptance criteria.

Leachate monitoring

One leachate monitoring borehole LH01 was installed within the waste body, as shown in Figures 5 and 7, and described in the table below.

Table 5: Leachate monitoring borehole

Borehole & depth (m bgl)	Stratum & water strike (m bgl)
LH01 4.00m	<ul style="list-style-type: none"> • Topsoil to 0.10m bgl. • Made ground of brown sandy gravelly CLAY, between 0.10m bgl and 1.10m bgl. • Made ground with fragments of plastic, cloth and wood, between 1.10m bgl and 4.00m bgl. <p>Water strike at 2.60m bgl.</p>

Leachate monitoring was carried out at location LH01 on 22nd November 2022, as shown in Figures 5 and 7. The monitoring results are shown in the table below.

Table 6: Leachate sampling results 22nd November 2022

Parameter	Groundwater Threshold Value /Limit ^{1,2,3}	LH01
Ammoniacal Nitrogen [mg/l]	0.065 ¹ Ammonium as N	34.2
Chloride [mg/l]	187.5 ¹	53.2
Conductivity at 20°C [µS/cm]	2,500 ³	1,510

¹ Groundwater threshold value (GTV), as set out in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

² Environmental quality standard (EQS), as set out in the Environmental Quality Standard (EQS) as set out in European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

³ Interim guideline values (IGV), as set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

Biochemical oxygen demand BOD [mg/l]	2.2 ²	21.7
Sulphate [mg/l]	187.5 ¹	16.5
Arsenic [µg/l]	7.5 ¹	0.908
Barium [µg/l]	100 ³	101
Chromium [µg/l]	7.5 ¹	1.42
Copper [µg/l]	30 ³	0.72
Manganese [µg/l]	50 ³	980
Nickel [mg/l]	0.02 ³	0.003
Phosphorus [µg/l]	Molybdate Reactive Phosphorus MRP 35 µg/l ¹	37.7
Potassium [mg/l]	5 ³	16.7
Calcium [mg/l]	200 ³	259
Iron [mg/l]	0.2 ³	30.5
Chlorobenzene [µg/l]	1.0 ³	3.64
Naphthalene [µg/l]	Total Polycyclic Aromatic Hydrocarbons 0.075 ¹	1.74
Anthracene [µg/l]		<10
Benzo(b)fluoranthene [µg/l]		<10
Benzo(k)fluoranthene [µg/l]		<10
Benzo(ghi)perylene [µg/l]		<10
Indeno(1,2,3-cd)pyrene		<10
<p>The leachate monitoring results show exceedances in the groundwater threshold values of ammoniacal nitrogen, chloride, sulphate, MRP and Total PAH. Furthermore, the monitoring results show exceedance of EQS for BOD and of IGVs for conductivity, barium, manganese, potassium, calcium and iron. Applicant correspondence dated December 2022 states that the results are considered typical of municipal solid waste landfill leachate.</p> <p>Condition 3.9(b) requires leachate monitoring on a biannual basis in accordance with Schedule A.1.</p> <p><i>Modelling of leachate contaminants dispersion in groundwater</i></p> <p>The applicant used the UK EA Remedial Targets Worksheet model to examine the potential impacts of leachate on aquifer/groundwater quality. The model predicted concentrations of ammoniacal nitrogen, chloride and arsenic at 25m, 100m, 250m and 500m downstream of the site after 25, 50, 100, 500 and 1,000 years of dispersion. The model assumed a worst-case scenario of a non-depleting source concentration over time.</p> <p><i>Table 7: Modelled downstream concentration results</i></p>		

Ammoniacal nitrogen [mg/l]			Groundwater threshold value (GTV)¹ = 0.175 mg/l		
Years of dispersion	Initial plume conc. [mg/l]	Conc. at 25m [mg/l]	Conc. at 100m [mg/l]	Conc. at 250m [mg/l]	Conc. at 500m [mg/l]
25	4.37	2.099	0.734	0.101	0.00
50	4.37	2.352	0.99	0.321	0.03
100	4.37	2.479	1.12	0.502	0.182
500	4.37	2.507	1.15	0.551	0.295
1,000	4.37	2.507	1.15	0.551	0.295
Chloride (mg/l)			IGV² = 30 mg/l GTV = 187.5 mg/l		
Years of dispersion	Initial plume conc. [mg/l]	Conc. at 25m [mg/l]	Conc. at 100m [mg/l]	Conc. at 250m [mg/l]	Conc. at 500m [mg/l]
25	100	57.347	26.3	12.568	6.560
50	100	57.373	26.3	12.619	6.749
100	100	57.373	26.3	12.619	6.749
500	100	57.373	26.3	12.619	6.749
1,000	100	57.373	26.3	12.619	6.749
Arsenic (mg/l)			IGV = 0.01 mg/l GTV = 0.0075 mg/l		
Years of dispersion	Initial plume conc. [mg/l]	Conc. at 25m [mg/l]	Conc. at 100m [mg/l]	Conc. at 250m [mg/l]	Conc. at 500m [mg/l]
25	1.31	0.0199	0	0	0
50	1.31	0.075	0	0	0
100	1.31	0.162	0	0	0
500	1.31	0.4	0.033	0	0
1,000	1.31	0.504	0.102	0.001	0

The modelling results show that the predicted concentrations of ammoniacal nitrogen exceed the GTV for ammonium of 0.175 mg/l at all distances from the site. The results also show that the predicted concentrations of chloride exceed the IGV of 30 mg/l at a distance of 25m from the site but remain within the GTV of 187.5 mg/l at all other distances. The results further show that the predicted concentrations of arsenic exceed the GTV of 0.0075 mg/l through all years of dispersion at

¹ As set out in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

² As set out in the Interim guideline values (IGVs) as set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

25m from the site. Arsenic is also in exceedance after 500 and 1,000 years of dispersion at 100m from the site.

The Tier 3 assessment states the model suggests that pollutant dispersion is more likely to be a local issue and that the landfill is not likely to influence groundwater on a regional scale. The Tier 3 assessment further states however, that the existing cover material is limited to a basic soil cap, facilitating continuous rainwater percolation and potential generation of leachate.

Accordingly, Condition 3.1(b) requires the installation and maintenance of a low permeability landfill cap over the waste body in accordance with the EPA Landfill Manuals – Landfill Site Design.

Impact of potential leachate breakouts on surface water

The applicant carried out an assimilative capacity and mass balance calculations to estimate the impact of potential leachate breakouts on surface waters. The calculations concluded that the available assimilative capacity for ammoniacal nitrogen in the river is 0.29 kg/day. The calculations also estimated how leachate breakouts, with flow rates varying from 1 l/s to 5 l/s, contribute to an increase in concentration of ammoniacal nitrogen downstream of the landfill and on the available assimilative capacity. The table below shows the calculations results.

Table 8: Assimilative capacity and mass balance calculations results

Leachate Breakout Flow [l/s]	Leachate breakout flow [m ³ /day]	Leachate mass emission assuming ammoniacal nitrogen at 2.2 mg/l [kg/day]	Impact of the breakout on assimilative capacity of 0.29 kg/day [%]	Down-stream conc. of ammoniacal nitrogen [mg/l]
1	86	0.19	65	0.111
2	173	0.38	130	0.156
3	259	0.57	196	0.198
4	346	0.76	261	0.239
5	432	0.95	326	0.279

The calculation results show that the breakout at a discharge rate of 1 l/s will consume 65% of the assimilative capacity. The calculations also show that the leachate breakouts at discharge rates between 2 l/s and 5 l/s will significantly exceed the available capacity of the receiving surface water body. Accordingly, it cannot be considered that such breakouts will have a low impact on the assimilative capacity of the receiving water body. The calculations further show that the breakouts varying from 1 l/s to 5 l/s, will result in downstream concentrations of ammoniacal nitrogen being higher than the upstream concentration of 0.065mg/l by 71% to 329%. It is also noted that the concentration of total ammonia at a 5 l/s leachate breakout (0.279mg/l) will result in an exceedance of the EQS (Good status) for this parameter (0.140mg/l) by 99.3%. Assimilative capacity assessment and mass balance calculations indicates that a potential breakout of leachate is likely to have an impact on water quality downstream of the site.

Condition 3.1(i) requires that the local authority shall assess the need to install a leachate management system to remove or otherwise manage leachate from the landfill. Condition 3.1(j) requires that a leachate system, if required following the assessment in accordance with Condition 3.1(i), is installed, operated and maintained.

Groundwater monitoring

There were three rounds of groundwater monitoring at three monitoring locations in total, as shown in Figures 5, 6 and 7. Boreholes BH01 and BH02 (also referred to as BH-GW-01 and BH-GW-02) were monitored on 3rd September 2019, 16th July 2019 and 22nd November 2022. An additional borehole, BH03 was also monitored in November 2022. The table below outlines the information on the borehole profile and status encountered.

Table 9: Groundwater monitoring borehole log

Borehole Id & depth (m bgl)	Location	Stratum & water strike
BH01 (BH-GW-01) <i>Downgradient of the waste body</i> 8.5m	Approximately 50m north of the site.	<ul style="list-style-type: none"> • Topsoil to 0.3m bgl. • Peat between 0.3m bgl and 3.2m bgl. • Grey sandy gravelly CLAY between 3.2m bgl and 7.0m bgl. • Grey limestone between 7.00m bgl and 8.5m bgl. Water strike at 7.0m bgl.
BH02 (BH-GW-02) <i>Upgradient of the waste body</i> 8.5m	Adjacent to the gravel compound, approximately 10m of the eastern site boundary.	<ul style="list-style-type: none"> • Topsoil to 0.3m bgl. • Peat between 0.3m bgl and 2.0m bgl. • Grey limestone between 2.0m bgl and 8.5m bgl. Water strike at 6.9m bgl.
BH03 <i>Downgradient of the waste body</i> 5.5m	Approximately 100m north-west of the site.	<ul style="list-style-type: none"> • Topsoil to 0.1m bgl. • Brown peat between 0.1m bgl and 2.2m bgl. • Grey sandy gravelly CLAY between 2.2m bgl and 4.0m bgl. • Grey limestone between 4.0m bgl and 5.5m bgl. Water strike at 4.0m bgl.

Groundwater monitoring was carried out on 22nd November 2022 at BH01, BH02 and BH03, as shown in Figures 5, 6 and 7. The table below shows the monitoring results.

Table 10: Groundwater monitoring results, 22nd November 2022

Parameter	Groundwater Threshold	BH02 (upgradient)	BH01 (downgradient)	BH03 (downgradient)

	Value/Limit 1,2,3			
Ammoniacal Nitrogen [mg/l]	0.065 ¹ Ammonium as N	6.73	2.03	1.92
Chloride [mg/l]	187.5 ¹	44.6	35	36.6
Alkalinity, total CaCO ₃ [mg/l]	200 ²	480	307	479
Arsenic [µg/l]	7.5 ¹	20.8	82.5	49.5
Barium [µg/l]	100 ²	63.9	22.8	48.4
Manganese [µg/l]	50 ²	1,230	397	832
Nickel [µg/l]	15 ¹	0.714	0.736	1.09
Phosphorus [µg/l]	35 ¹ Molybdate Reactive Phosphorus as P	21.6	24.4	12.7
Potassium [mg/l]	5 ²	6.61	1.25	1.57
Iron [mg/l]	0.2 ²	7.07	5.38	2.25
Mineral oil >C10 C40 (aq) [mg/l]	Total hydrocarbons to include mineral oil 0.01 mg/l ²	<0.1	<0.1	0.932
Naphthalene [µg/l]	Total Polycyclic Aromatic Hydrocarbons 0.075 ¹	<8	<10	<4
Anthracene [µg/l]		<8	<10	<4
Benzo(b)fluoranthene [µg/l]		<8	<10	<4
Benzo(k)fluoranthene [µg/l]		<8	<10	<4
Benzo(ghi)perylene [µg/l]		<8	<10	<4
Indeno(1,2,3-cd)pyrene		<8	<10	<4
Total Coliforms [CFU/100ml]	Coliform bacteria	45	15.6	866
Faecal Coliforms [CFU/100ml]	0 number/100 mg ³	<1	<1	>100

¹ Groundwater threshold value (GTV), as set out in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

² Interim guideline values (IGV), as set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

³ Parametric value, as set out in the European Union (Drinking Water) Regulations 2023, and any subsequent amendments.

	<p>The monitoring results at the downgradient locations show exceedances of the GTVs for ammonium, chloride, arsenic and Total PAH and IGVs for alkalinity, manganese, iron and mineral oil and the parametric value for coliform bacteria. It is noted that other sources apart from the landfill may also be impacting results as a number of parameters exceed their relevant thresholds limits at the upgradient monitoring location BH02. Applicant correspondence dated December 2022 states that 'given the presence of peat soils surrounding the site, ammoniacal N levels are likely going to be naturally high' and that the notable differences in arsenic concentrations between upgradient well BH02 and downgradient BH01 and BH03 may be an indication of a leachate plume. Additionally, the correspondence states that the presence of elevated ammonia, chloride, arsenic and mineral oil concentrations are typically present in landfill leachate and suggest that leachate is migrating into the underlying and adjacent groundwaters. The correspondence further states that the levels detected at borehole BH02 indicate that the landfill is likely impacting water quality locally at this location.</p> <p>Condition 3.9(e) requires groundwater monitoring for parameters on a quarterly basis in accordance with Schedule A.4. Also, based on the monitoring results above and as the waste contains municipal waste and industrial waste, it is considered that monitoring for organic compounds in the groundwater is appropriate. Accordingly, Condition 3.9(f) requires an annual screening of groundwater for trace organic substances.</p>															
Landfill gas:	<p>Based on the Tier 2 assessment, there is a risk of lateral landfill gas migration to the nearby residences through the underlying peat. There are several residences located in close proximity to the landfill.</p> <p><u>Landfill gas monitoring</u></p> <p>Gas monitoring was carried at two monitoring boreholes BH01 (referred to also as BH-GW-01) and BH02 (referred to also BH-GW-02) outside the waste body on 23rd October 2019, as shown in Figures 5, 6 and 7. The table below shows the gas monitoring results.</p> <p><i>Table 11: Landfill gas monitoring results, 23rd October 2019.</i></p> <table border="1" data-bbox="529 1356 1344 1598"> <thead> <tr> <th rowspan="2">Monitoring Location Id</th> <th rowspan="2">CH₄ (% v/v)</th> <th rowspan="2">CO₂ (% v/v)</th> <th colspan="2">Trigger levels outside the waste body ¹</th> </tr> <tr> <th>CH₄ (% v/v)</th> <th>CO₂ (% v/v)</th> </tr> </thead> <tbody> <tr> <td>BH01</td> <td>0.2</td> <td>0.1</td> <td rowspan="2">1</td> <td rowspan="2">1.5</td> </tr> <tr> <td>BH02</td> <td>0.5</td> <td>0.3</td> </tr> </tbody> </table> <p>The monitoring results show no exceedances of the trigger levels for methane and carbon dioxide at monitoring locations outside of the waste body.</p> <p>There are six boreholes, OLD-BH-01 to OLD-BH-06, within the waste body which are serving as passive gas vents, as shown in Figures 5 and 7. No gas monitoring has been carried out at these boreholes to date. The Tier</p>	Monitoring Location Id	CH ₄ (% v/v)	CO ₂ (% v/v)	Trigger levels outside the waste body ¹		CH ₄ (% v/v)	CO ₂ (% v/v)	BH01	0.2	0.1	1	1.5	BH02	0.5	0.3
Monitoring Location Id	CH ₄ (% v/v)				CO ₂ (% v/v)	Trigger levels outside the waste body ¹										
		CH ₄ (% v/v)	CO ₂ (% v/v)													
BH01	0.2	0.1	1	1.5												
BH02	0.5	0.3														

¹ As set out in the EPA Landfill Manuals - Landfill Monitoring, 2nd Edition, 2003.

Tier 3 assessment recommends that the six boreholes shall be '*retained and sealed*' for gas monitoring rather than be utilised as gas vents and proposed instead one (new) passive gas vent for the site, as shown in Figure 9.1. Condition 3.1(d)(ii) requires the boreholes BH-OLD-01 to BH-OLD-06 be modified to accommodate gas monitoring.

The Tier 3 assessment further recommends annual gas monitoring at '*any future oxidation or venting outlet*' and states that the engineering solutions will need to consider '*oxidation using biological filter or similar approved if required*'. Accordingly, Condition 3.9(c) requires gas monitoring in accordance with Schedule A.2, which requires monitoring of landfill gases and gas flow at the three existing off-site boreholes BH01 to BH03, six existing boreholes OLD-BH-01 to OLD-BH-06, the proposed gas vent and, if required and installed, the biological filter. Taking account of the capping requirements, it is considered that gas monitoring at a higher frequency than annual is initially appropriate. Accordingly, Schedule A.2 requires monitoring at a quarterly frequency. Condition 3.12 enables changes to monitoring requirements, with the agreement of the Agency following evaluation of test results and/or relevant proposals. In addition, Condition 3.11 requires gas monitoring at all relevant buildings, including domestic dwellings, adjacent to the landfill, subject to owner's permission.

Furthermore, it is noted that a gas pumping trial is listed in the remediation cost estimate. However, no reason for or details on the gas pumping trial were given by the applicant. Condition 3.1(e) requires that, within 12 months, following gas monitoring, the local authority shall assess the impact from landfill gas arising from the landfill and seek agreement of the Agency regarding whether to carry out a gas pumping trial for the purpose of determining the quantity and quality of landfill gas.

Gas modelling

LandGEM gas modelling was carried out in 2019. The modelling shows that gas will continue to be generated for several years. The modelling shows predicted gas generation results in 2029, as outlined in the following table:

Table 12: Estimated landfill gas generation (2019 to 2029)

Gas/ pollutant	Tonnes/year		Tonnes/hr		m ³ /hr	
	2019	2029	2019	2029	2019	2029
Total landfill gas	311	188.639	0.036	0.022	28.430	17.244
Methane	83	50.388	0.009	0.006	14.215	8.622
Carbon dioxide	228	138.252	0.026	0.016	14.215	8.622
Non-methane organic compounds (NMOC)	4	2.166	0.000	0.000	0.114	0.069

	<p>The LandGEM model predicted that in 2019 the site was generating 14.215 m³/hr of methane and that methane generation will reduce to 8.622 m³/hr by 2029. The modelled gas rates fall within the gas rate ranges for which technologies like passive venting, biofiltration or oxidation are recommended in EPA 'Management of Low Levels of Landfill Gas' publication.</p>
Conceptual site model:	<p>An initial Tier 1 assessment was completed in 2007 and determined that the risk score for the closed landfill was High (Class A) due to the risk of direct leachate migration into surface waters. The initial Tier 1 assessment was updated in 2013 and determined that the overall risk score for the closed landfill was Moderate (Class B) due to the risk of leachate migration into groundwater.</p> <p>Tier 2 assessment modified this classification to High Risk (Class A) due to the risk of leachate migration to the surface water peatland drainage channel along the eastern site boundary. The Tier 3 assessment retains the High Risk classification.</p> <p>The conceptual site model for the site is shown in Figure 8.</p>

4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only):</p>	<p>Leachate and gas migration scores:</p> <p><u>High scores:</u></p> <p>One pathway was identified as High Risk:</p> <ul style="list-style-type: none"> • Migration of leachate, via surface water drainage/runoff, to surface water bodies (SPR 8). <p><u>Moderate scores:</u></p> <p>Three pathways were identified as Medium Risk:</p> <ul style="list-style-type: none"> • Migration of leachate, via groundwater flowing to water drainage/runoff, into surface waterbodies (SPR 1); • Migration of leachate to the underlying aquifer (SPR 5); and • Migration of leachate, via groundwater migration, to surface water bodies (SPR 7). <p><u>Low scores:</u></p> <p>Three pathways were identified as Low Risk:</p> <ul style="list-style-type: none"> • Migration of leachate to private wells (SPR 3); • Human health exposure pathway of off-site lateral migration of landfill gas into nearby buildings (SPR 10); and • Vertical landfill gas migration (SPR 11). <p>Summary:</p> <p>Upon review of the monitoring data;</p> <ul style="list-style-type: none"> • remedial action is warranted to address the risk of leachate migrating from the site directly into adjacent drainage
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	<p>channels and into the underlying aquifer and, via groundwater, to surface waters.</p> <ul style="list-style-type: none"> remedial action is warranted to address the risk of migration of landfill gas within the site and off-site.
<p>Proposed remedial actions:</p>	<p>The applicant considered the following remedial measures as the feasible options:</p> <p><u>1. Engineered Landfill Cap, including surface water drainage and gas management system</u></p> <p>(i) 200mm topsoil and 800mm subsoil;</p> <p>The applicant proposes to clear and regrade the existing surface in preparation of the engineered cap. The applicant further proposes that any excavated soil will be reused as part of the topsoil and subsoil layer of the proposed engineered cap.</p> <p>Condition 3.1(b) requires a landfill cap that comprises of a minimum 1m thick mineral layer and requires reprofiled gradients to provide for run-off of rainwater in accordance with <i>EPA Landfill Manuals – Landfill Site Design</i>.</p> <p>(ii) Subsurface and surface water drainage;</p> <p>The Tier 3 assessment recommends a subsurface drainage layer, with hydraulic conductivity equal to or greater than $1 \times 10^{-4} \text{m/s}$ with a thickness of 500 mm, or equal approved geocomposite, be placed between the subsoil and the barrier layer. The Tier 3 assessment further recommends that the drainage layer discharges to a sub-surface pipe work collection system and then to the surface water drainage system.</p> <p>The Tier 3 assessment recommends that the grassed waterways shall collect and direct surface water runoff, including subsurface drainage outfall flows, to one or more dedicated surface drainage outfalls into the existing surface water perimeter drains.</p> <p>Condition 3.1(b) requires a water drainage layer to be incorporated into the cap. Condition 3.1(h) requires construction of the proposed site water drainage system.</p> <p>(iii) Barrier layer;</p> <p>The Tier 3 assessment recommends 1mm linear low-density polyethylene (LLDPE) with vertical cut-offs on all boundaries to mitigate the risk of landfill gas migration and leachate egress following secondary consolidation, or similar approved.</p> <p>Condition 3.1(g) requires vertical LLDPE cut-off barrier between the waste body and the adjacent drainage channels to reduce gas and leachate migration.</p> <p>(iv) Gas collection geocomposite, or similar;</p> <p>The Tier 3 assessment recommends that the landfill gas collection system shall comprise of an under-liner gas collection geocomposite or similar approved stone drainage layer. The Tier 3 assessment further recommends that the gas collection layer makes provision for passive venting of landfill gas above the liner with methane oxidation if required and management of below</p>

liner leachate breakouts or condensate using gravel soakaways or similar approved. The correspondence dated December 2022 clarified however, that no leachate will discharge to ground using gravel soakaways. Condition 3.1(i) requires that the local authority shall assess the need to install a leachate management system to remove or otherwise manage leachate from the landfill. Condition 3.1(j) requires that a leachate system, if required following the assessment in accordance with Condition 3.1(i), is installed, operated and maintained.

Condition 3.1(b) requires a gas drainage layer to be incorporated into the landfill cap. The Tier 3 assessment also states that '*gas management proposals shall carry out a gas management risk assessment (and) review and update as required the gas prediction model estimates... to inform the most appropriate landfill gas oxidation solution or venting as may be required.*' Condition 3.1(c) requires carrying out a gas risk assessment to inform the final design of the gas management system at the facility. Condition 3.1(c) further requires that the final design shall be in accordance with the EPA Landfill Manuals – Landfill Site Design and shall be submitted to the Agency for approval prior to implementation. Condition 3.1(d) requires the installation, operation and maintenance of a gas management system. This system shall include vertical gas vent pipes, biological filter, if approved by the Agency and any infrastructure as may be recommended by the findings of the gas risk assessment, as per Condition 3.1(c).

The correspondence dated December 2022 states that the proposed design solution will prevent rainfall infiltration, decrease leachate generation and subsequent contamination of surface and groundwater.

2. Environmental Monitoring

2.1 Groundwater monitoring

The Tier 3 assessment recommends that annual groundwater monitoring be carried out at only two existing boreholes, BH01 (BH-GW-01) and BH02 (BH-GW-02). However, it is considered that groundwater monitoring at the three boreholes, BH01 to BH03, on a quarterly basis is appropriate and this is included in Condition 3.9(e) for the parameters set out in Schedule A.4.

2.2 Surface water monitoring

The Tier 3 assessment recommends that surface water be monitored annually at the outfall from the proposed site water drainage system, in the north-western corner of the site, as shown in Figures 5 and 9.1.

It is considered that surface monitoring at the existing locations SW01, SW02 and SW03 on the adjacent drainage channels is also appropriate and that the initial frequency should be on a quarterly basis. Accordingly, this is set out in Condition 3.9(d) and Schedule A.3.

2.3 Landfill gas monitoring

	<p>The recommended gas monitoring is outlined in Section titled <i>'Landfill gas monitoring'</i> above.</p> <p>Having regard to the monitoring results submitted in support of the application for a certificate of authorisation, the age of the closed landfill and the location of the nearest private well (1.1km west of the site) the above remedial measures are considered appropriate and recommended in Condition 3.1. Additional remediation measures, also listed in Condition 3.1, include:</p> <ul style="list-style-type: none"> • Requirement to minimise the disturbance of deposited waste to the extent possible – Condition 3.1(a); • Gas vent specification and spacing requirements – Condition 3.1(d)(i); • Modification of the existing boreholes BH-OLD-01 to BH-OLD-06 to accommodate gas monitoring – Condition 3.1(d)(ii); • Seeking agreement of the Agency regarding whether to carry out a gas pumping trial – Condition 3.1(e); • Removal or alteration of the gas management system and associated infrastructure subject to approval by the Agency – Condition 3.1(f); and • Requirement to reseed grass within the site – Condition 3.1(k). <p>The proposed remedial actions are intended to break the SPR linkages by preventing:</p> <ul style="list-style-type: none"> • migration of leachate into the aquifer and, subsequently, into surface water bodies; • migration of landfill gas to off-site buildings. <p>The proposed capping will also prevent any waste materials from appearing on the surface of the landfill site.</p> <p>The recommended certificate of authorisation allows for the importation and use of soil and stone to complete the works.</p>
Proposed aftercare monitoring and assessment:	<p>Monitoring as specified in Condition 3.9 and Schedule A 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 and additional information received is adequate as it has identified, assessed and adequately addressed the associated risks inherent with the landfill site.</p>

5. Appropriate assessment

Appendix 1 lists the European Sites assessed, its associated qualifying interests and conservation objectives along with the assessment of the effects of the activity on these European Sites. A screening for Appropriate Assessment was undertaken to assess, in view of

best scientific knowledge and the conservation objectives of the site, if the 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 Lower River Shannon SAC (Site code: 002165), Kerry Head SPA (Site code: 004189), River Shannon and River Fergus Estuaries SPA (Site code: 004077), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site code: 004161) and Moanveanlagh Bog SAC (Site code: 002351).

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. A Natura Impact Statement was not requested as it was considered that there was sufficient information available to allow Appropriate Assessment to be carried out.

The reasons for this determination are as follows:

- There is a hydrological connection between the closed landfill and the Lower River Shannon SAC (Site code: 002165) via the site perimeter drains which discharge, via a network of drainage channels, into the Feale river (river segment code: 23_2056) (assigned also as the Cashen transitional waterbody (transitional waterbody code: IE_SH_060_0100)). The Feale river /Cashen transitional waterbody are designated as part of the Lower River Shannon SAC (Site code: 002165).
- There is a hydrological connection between the closed landfill and the Kerry Head SPA (Site code: 004189) and the River Shannon and River Fergus Estuaries SPA (Site code: 004077) via the site perimeter drains which discharge, via a network of drainage channels, into the Feale river (river segment code: 23_2056) /Cashen transitional waterbody (transitional waterbody code: IE_SH_060_0100), which in turn discharge into the Coastal Waters (European code: IE_SH_060_0000). Parts of the Coastal Waters (IE_SH_060_0000) are designated as the Kerry Head SPA (Site code: 004189) and the River Shannon and River Fergus Estuaries SPA (Site code: 004077).
- There is no hydrological connection between the closed landfill and the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site code: 004161) or Moanveanlagh Bog SAC (Site code: 002351).

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 the Lower River Shannon SAC (Site code: 002165), Kerry Head SPA (Site code: 004189), River Shannon and River Fergus Estuaries SPA (Site code: 004077), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site code: 004161) and Moanveanlagh Bog SAC (Site code: 002351), 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 prevent the potential for water pollution in the Lower River Shannon SAC (Site code: 002165), Kerry Head SPA (Site code: 004189) and River Shannon and River Fergus Estuaries SPA (Site code: 004077) and will ensure that there will be no significant impact on these European Sites;
- the project alone, which consists of the remediation of the closed landfill, 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 Shannon SAC (Site code: 002165), Kerry Head SPA (Site code: 004189) and River Shannon and River Fergus Estuaries SPA (Site code: 004077); and

- There is no hydrological connection between the closed landfill and the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site code: 004161) or Moanveanlagh Bog SAC (Site code: 002351).

In light of the foregoing reasons, no reasonable scientific doubt remains as to the absence of adverse effects on the integrity of those European Sites: Lower River Shannon SAC (Site code: 002165), Kerry Head SPA (Site code: 004189), River Shannon and River Fergus Estuaries SPA (Site code: 004077), Stack's to Mullaghareirk Mountains West Limerick Hills and Mount Eagle SPA (Site code: 004161) and Moanveanlagh Bog SAC (Site code: 002351).

6. Recommendation

This report has been prepared by Seán Byrne and Ewa Babiarczyk.

I recommend granting the certificate of authorisation as proposed.

Signed



Seán Byrne

Date: 16th October 2023

Procedural Note

Any representations received by the Agency within 30 days of the draft certificate of authorisation 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.

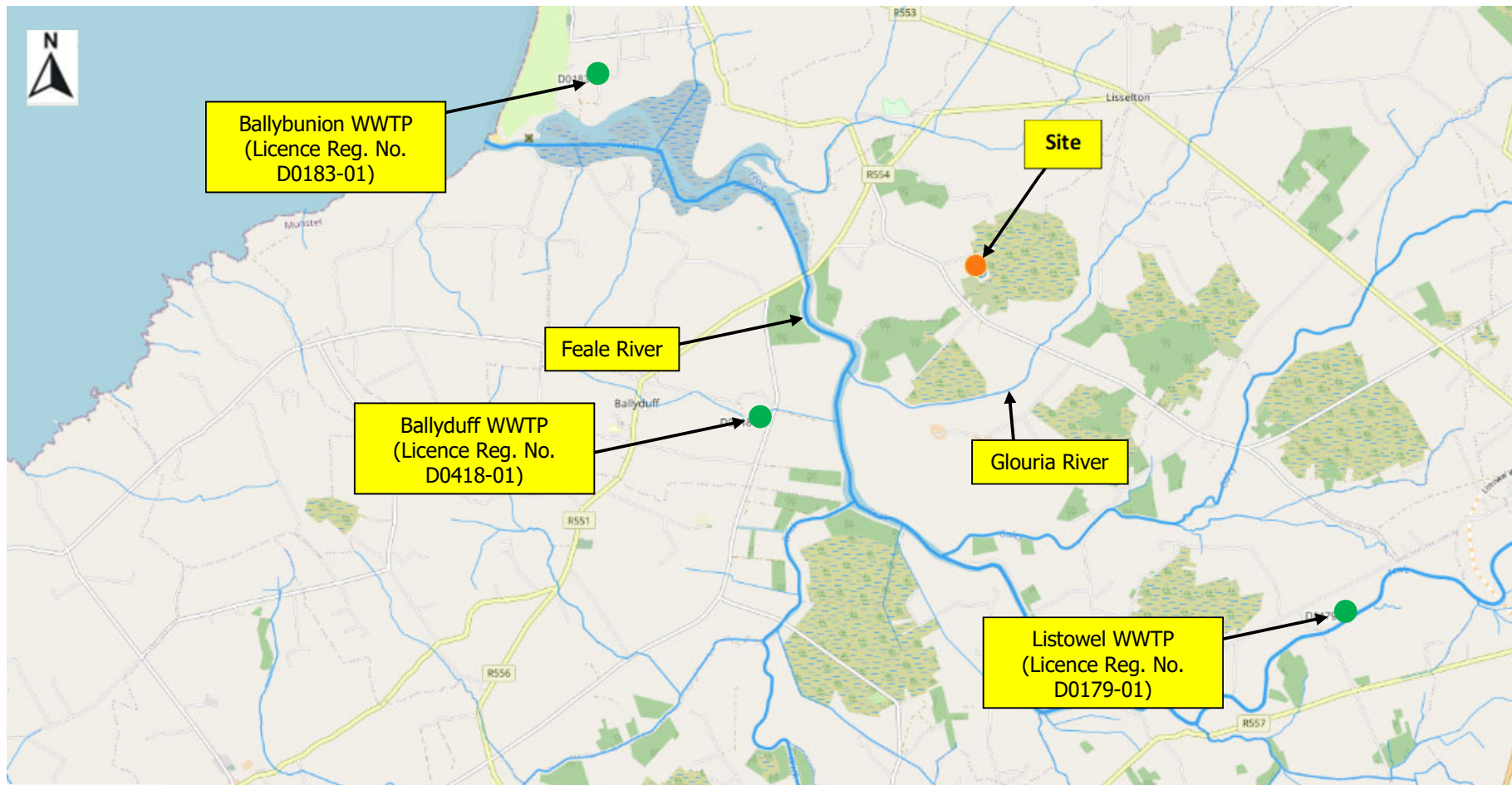


Figure 1: Location of Ahascra Historic Landfill

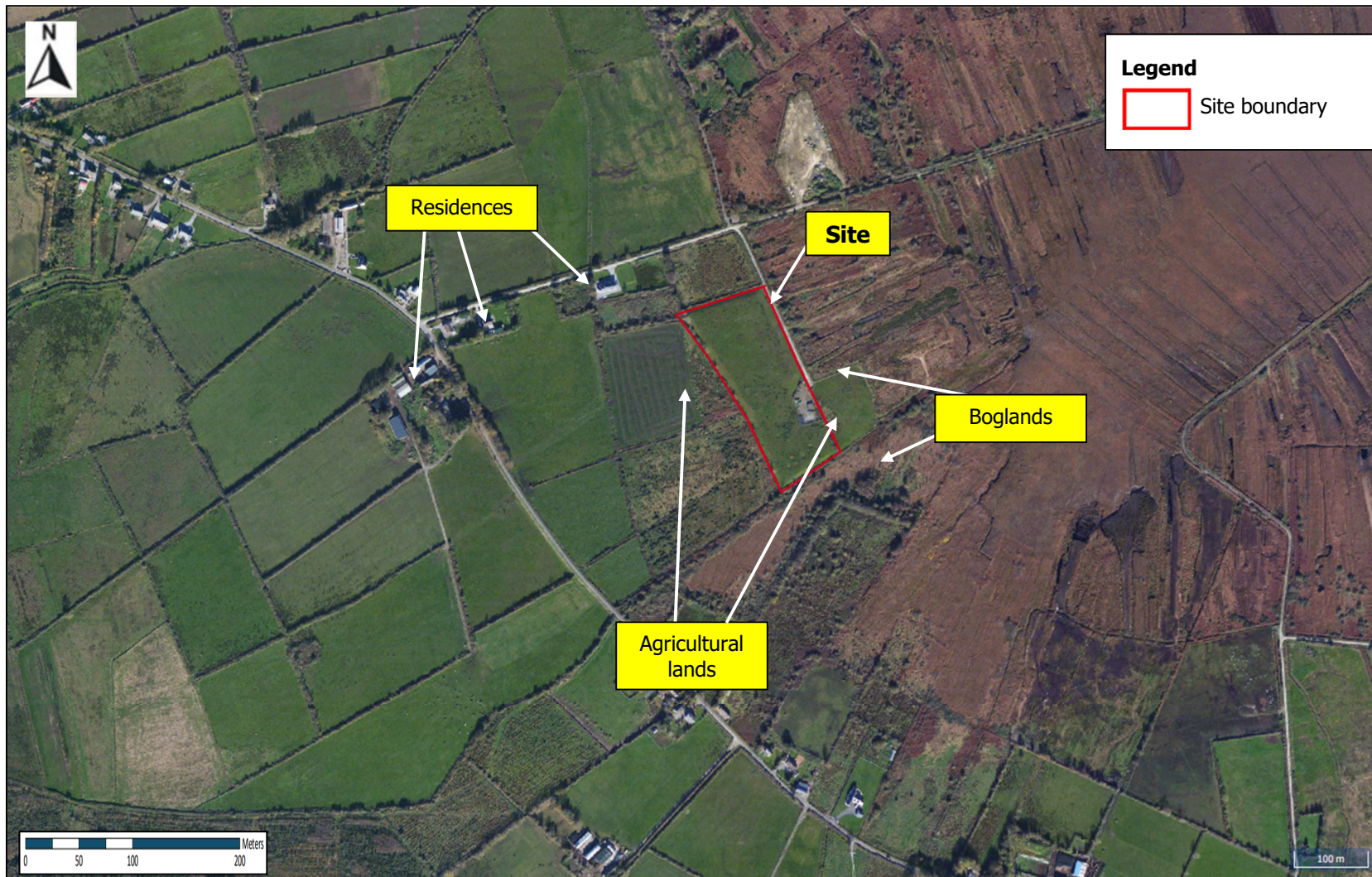


Figure 2: Site layout and site surroundings

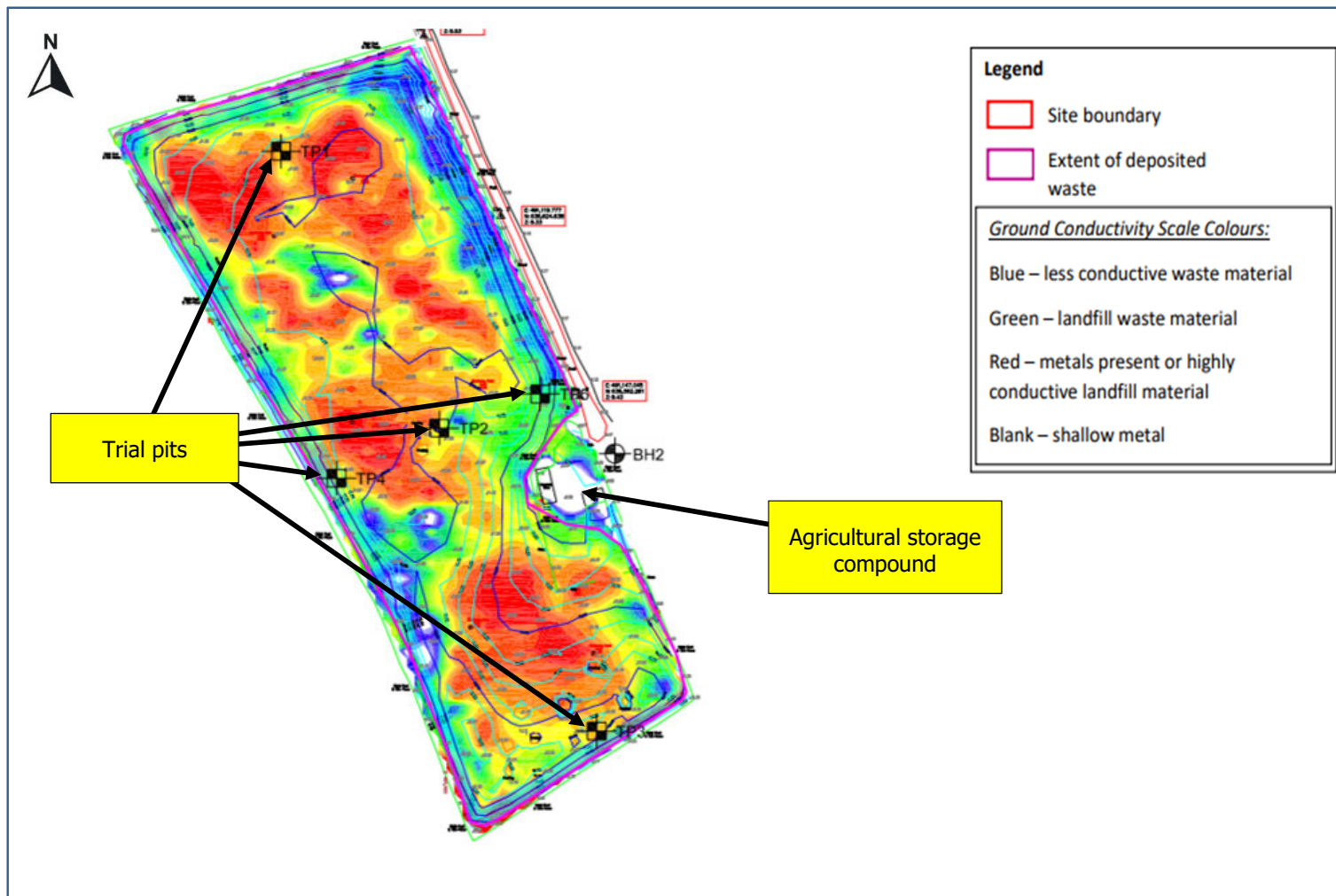


Figure 3: Extent of deposited waste and trial pit locations (TP)

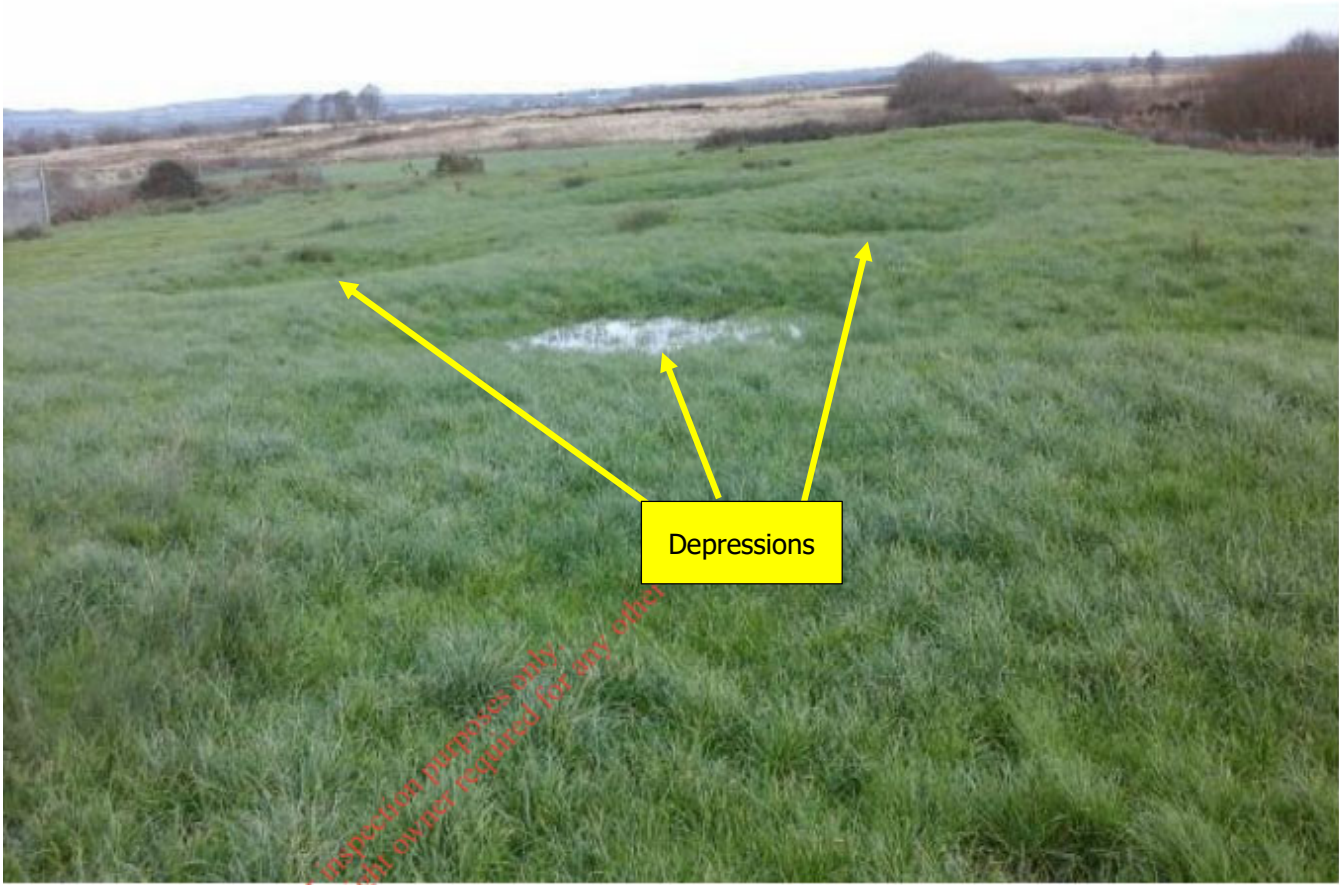
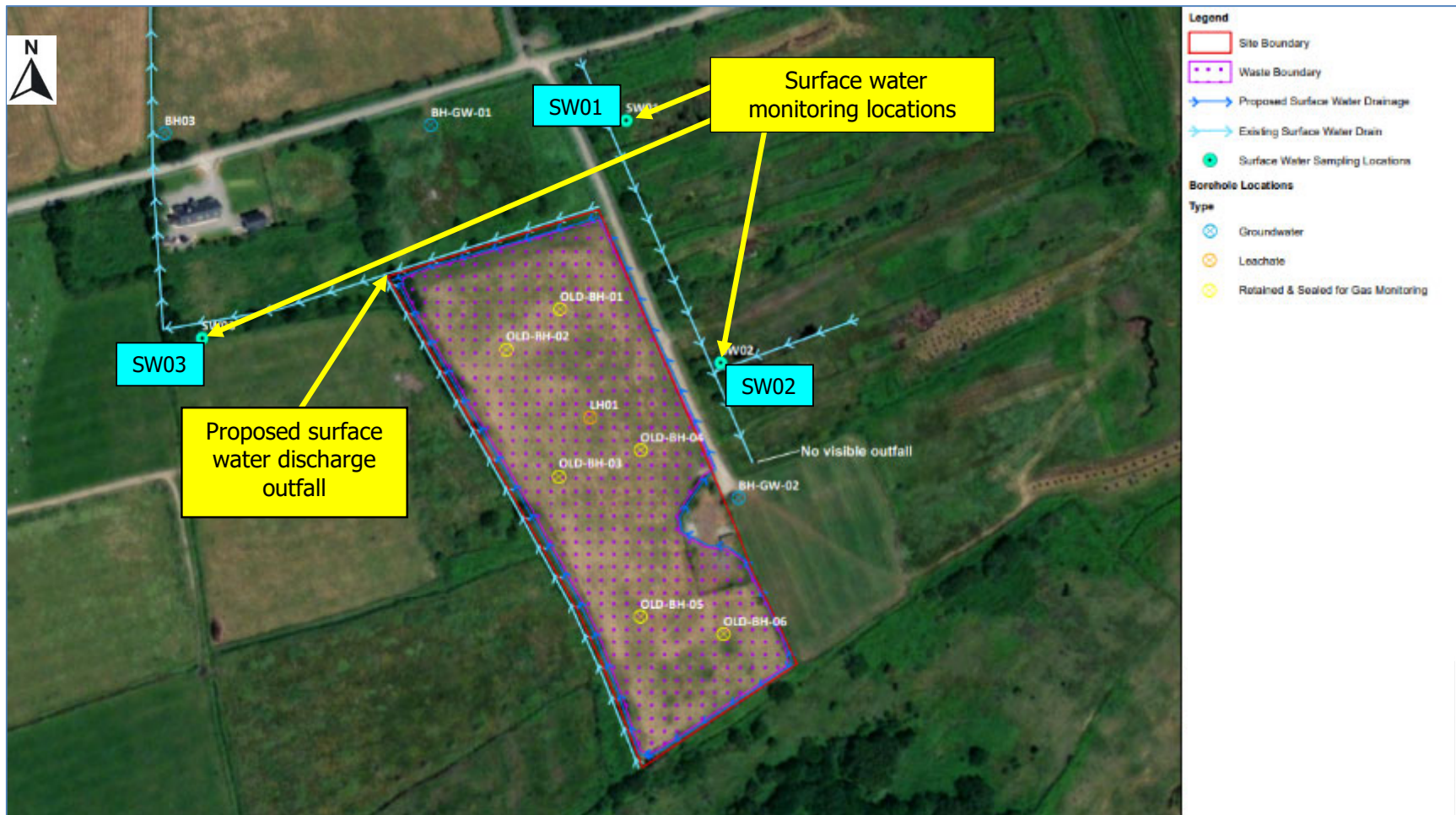


Figure 4: Depressions across the landfill surface



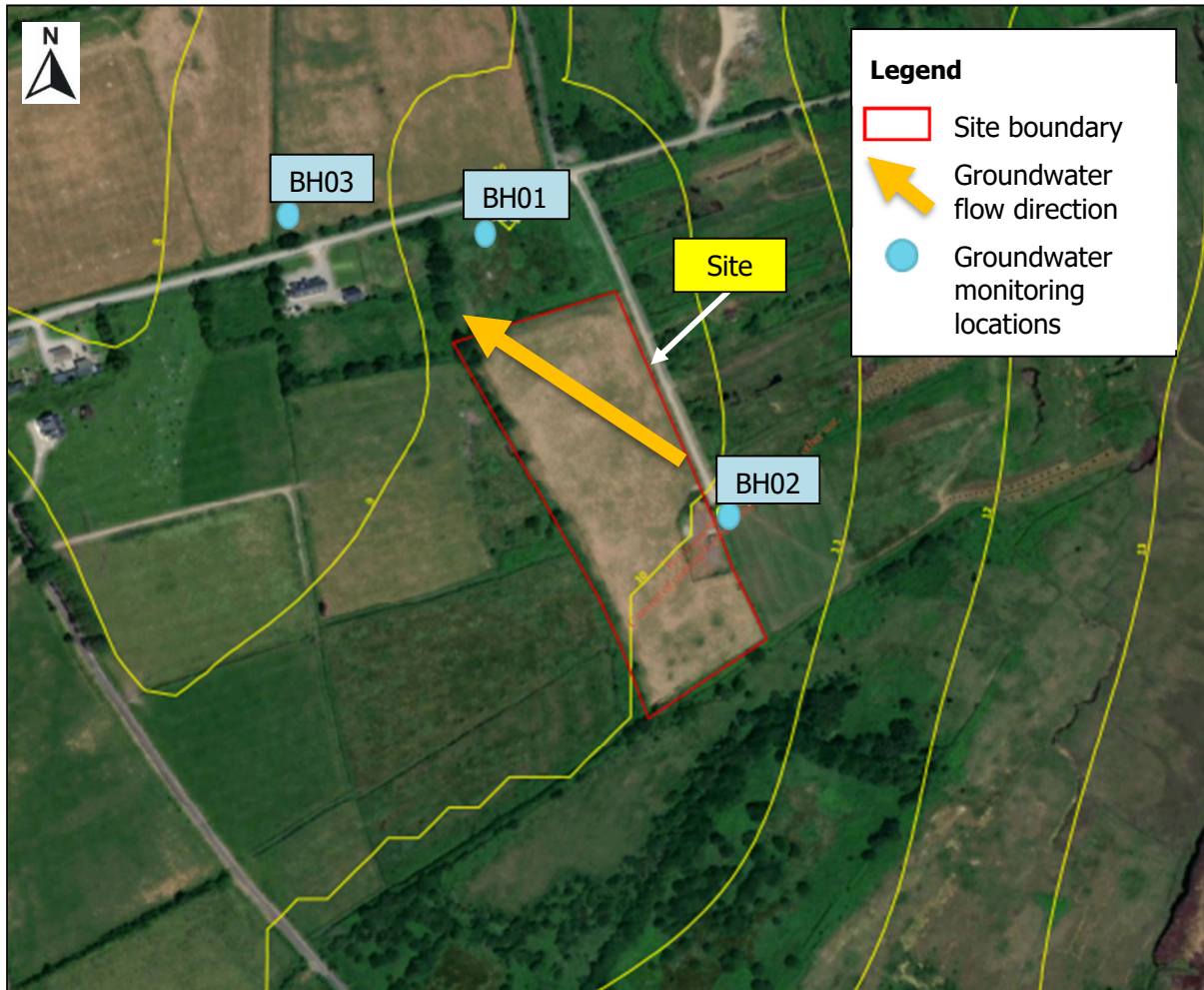


Figure 6: Groundwater flow direction and groundwater monitoring locations (BH)

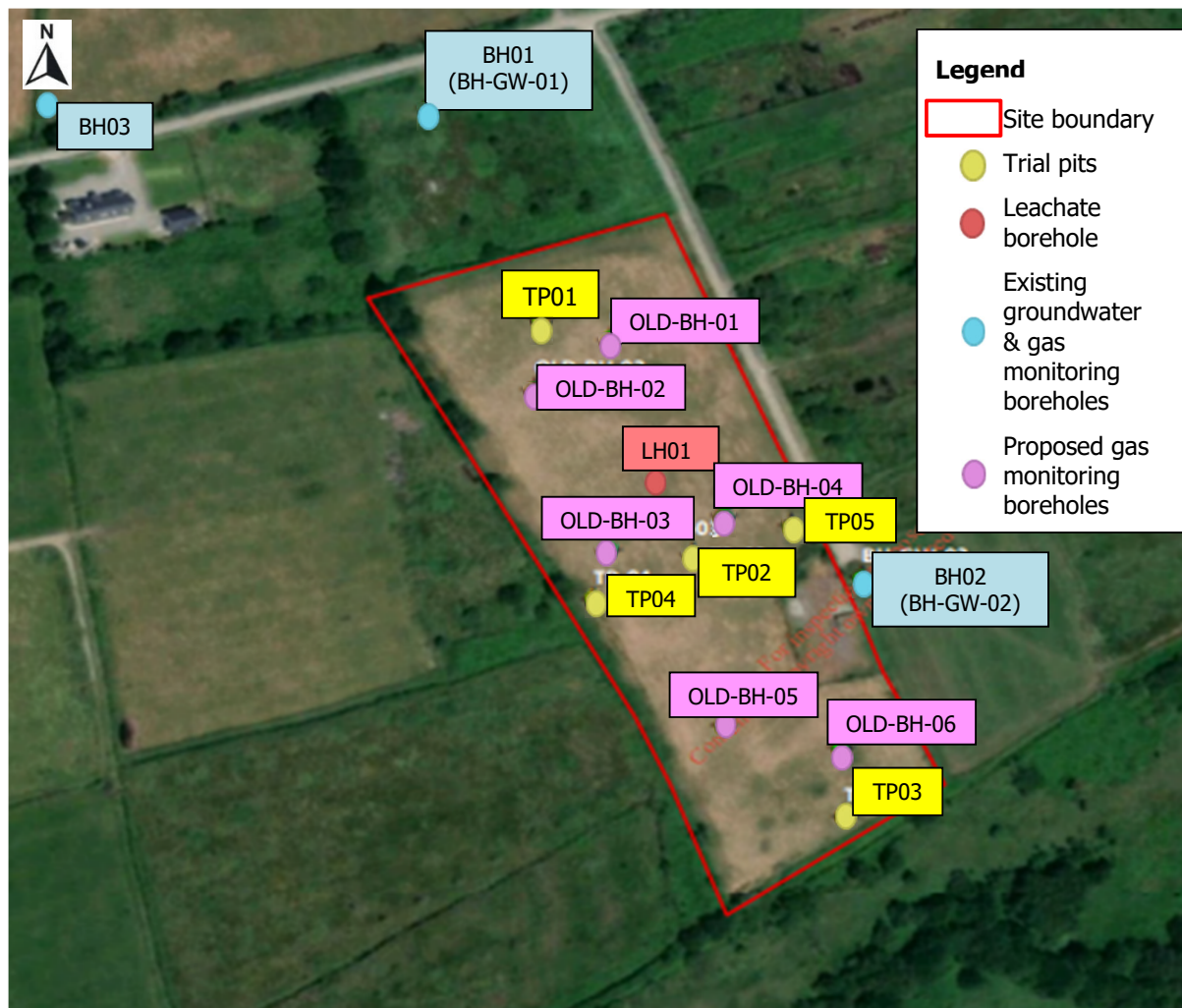


Figure 7: Trial pit (TP), groundwater borehole (BH, BH-GW), gas borehole (BH, BH-GW and OLD-BH) and leachate borehole (LH) locations

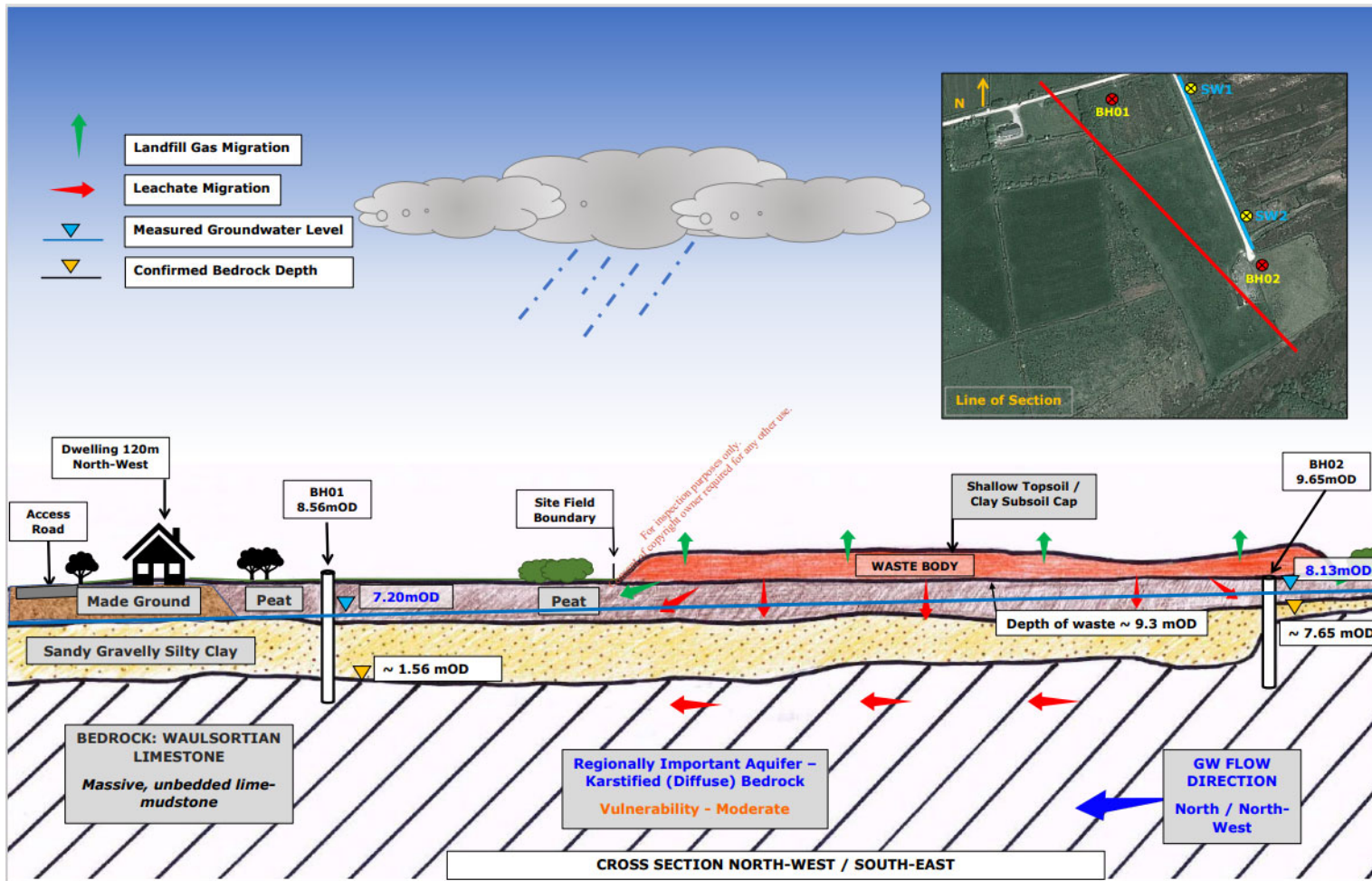


Figure 8: Conceptual site model for the Ahascra Historic Landfill

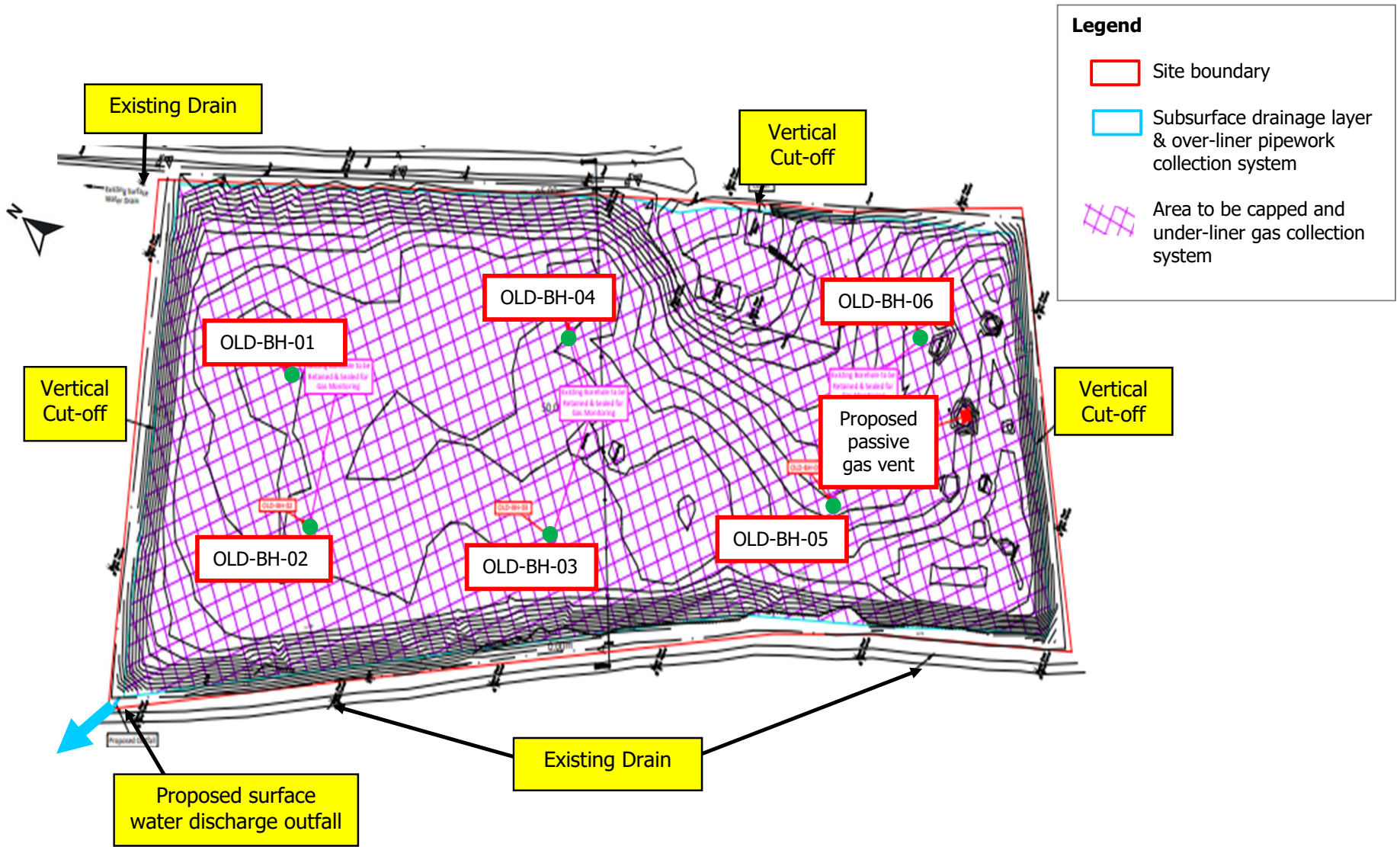


Figure 9.1: Area to be capped

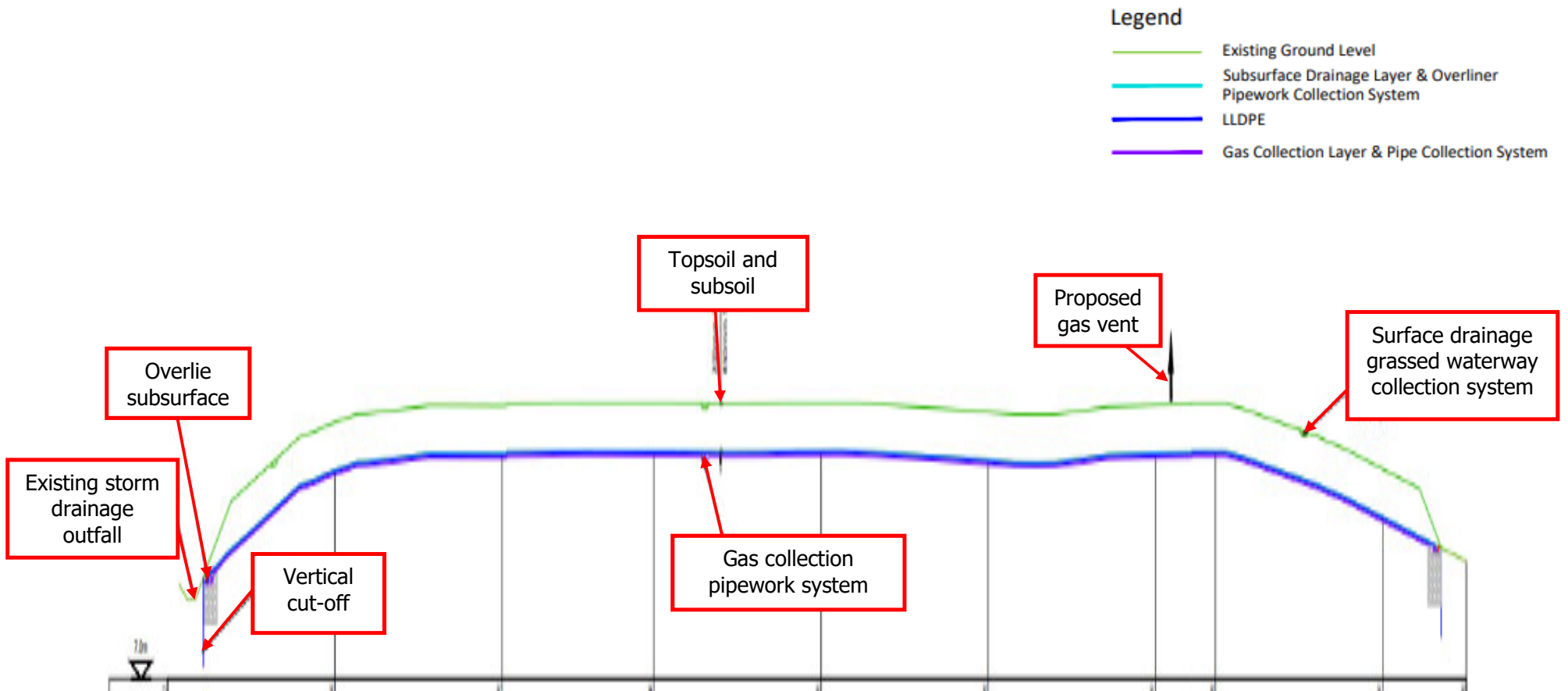


Figure 9.2: Cross section through area to be capped

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

European Site	Distance from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
Lower River Shannon SAC (Site code: 002165)	1.5km south of the closed landfill.	<p>Species:</p> <p>[1029] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel)</p> <p>[1095] <i>Petromyzon marinus</i> (Sea Lamprey)</p> <p>[1096] <i>Lampetra planeri</i> (Brook Lamprey)</p> <p>[1099] <i>Lampetra fluviatilis</i> (River Lamprey)</p> <p>[1106] <i>Salmo salar</i> (Salmon)</p> <p>[1349] <i>Tursiops truncatus</i> (Common Bottlenose Dolphin)</p> <p>[1355] <i>Lutra lutra</i> (Otter)</p> <p>Habitats:</p> <p>[1110] Sandbanks which are slightly covered by sea water all the time</p> <p>[1130] Estuaries</p> <p>[1140] Mudflats and sandflats not covered by seawater at low tide</p> <p>[1150] *Coastal lagoons</p> <p>[1160] Large shallow inlets and bays</p> <p>[1170] Reefs</p>	NPWS (2012) Conservation Objectives Series: Lower River Shannon [SAC 002165]. Department of Art, Heritage and the Gaeltacht [dated 7 th August 2012].	<p>The main potential for impact on the Qualifying interests of this SAC would arise from changes in water and air quality, which could affect habitats and water-dependent species directly or indirectly.</p> <p>There is a potential risk from migration of landfill leachate into surface waters and groundwater and from migration of passive landfill gas into atmosphere.</p> <p>The recommended certificate of authorisation specifies conditions to protect the surface waters and groundwater and in turn the qualifying interests of this European Site.</p> <p>The capping, as required under Condition 3.1, will limit ingress of rainwater into the waste body thus limiting the generation of leachate.</p> <p>Condition 3.9 requires monitoring of leachate, groundwater upgradient and downgradient of the landfill and surface water upstream and downstream of the landfill and at the outlet from the site water drainage system.</p> <p>Additionally, Condition 3.1(d) requires installation, operation and maintenance of a gas management system to accommodate passive gas venting.</p> <p>Condition 3.9 and Schedule A require gas monitoring at the existing monitoring locations, the proposed gas vent, the existing gas</p>

		<p>[1220] Perennial vegetation of stony banks</p> <p>[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts</p> <p>[1310] Salicornia and other annuals colonising mud and sand</p> <p>[1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)</p> <p>[1410] Mediterranean salt meadows (<i>Juncetalia maritim</i>)</p> <p>[3260] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation</p> <p>[6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)</p> <p>[91E0] *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)</p>		<p>monitoring boreholes, the biological filter if required and installed and, if required, the relevant adjacent buildings, including domestic dwellings.</p> <p>Furthermore, Condition 3.3 requires that the closed landfill and the remedial works shall not cause environmental pollution or deterioration in the status of the receiving surface water body or groundwater body.</p> <p>In addition, Condition 3.14 requires that no emissions arising from activities carried on at the site, including, amongst others, leachate, gas, litter and mud shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the activity will not negatively impact on water or air quality and that the qualifying interests of this European Site are protected.</p>
Kerry Head SPA (Site code: 004189)	7.9km west of the site	<p>Species:</p> <p>[A009] Fulmar (<i>Fulmarus glacialis</i>)</p> <p>[A346] Chough (<i>Pyrhocorax pyrrhocorax</i>)</p>	NPWS (2022) Conservation objectives for Kerry Head SPA (004189). Department of Housing, Local Government and Heritage [dated 12 th October 2022].	<p>The main potential for impact on the Qualifying interests of this SPA would arise from disturbance to the habitat.</p> <p>The distance of almost 8km from the landfill to the SPA means there will be no negative impacts from the facility.</p> <p>Condition 3.3 requires that the closed landfill and the remedial works shall not cause environmental pollution or deterioration in the status of the receiving surface water body or groundwater body.</p>

				<p>In addition, Condition 3.14 requires that no emissions arising from activities carried on at the site, including, amongst others, leachate, gas, litter and mud shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the qualifying interests of this European site are protected.</p>
<p>River Shannon and River Fergus Estuaries SPA (Site code: 004077)</p>	<p>11.2km north of the site</p>	<p>Species:</p> <p>[A017] Cormorant (<i>Phalacrocorax carbo</i>)</p> <p>[A038] Whooper Swan (<i>Cygnus cygnus</i>)</p> <p>[A046] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>)</p> <p>[A048] Shelduck (<i>Tadorna tadorna</i>)</p> <p>[A050] Wigeon (<i>Anas penelope</i>)</p> <p>[A052] Teal (<i>Anas crecca</i>)</p> <p>[A054] Pintail (<i>Anas acuta</i>)</p> <p>[A056] Shoveler (<i>Anas clypeata</i>)</p> <p>[A062] Scaup (<i>Aythya marila</i>)</p> <p>[A137] Ringed Plover (<i>Charadrius hiaticula</i>)</p> <p>[A140] Golden Plover (<i>Pluvialis apricaria</i>)</p>	<p>NPWS (2012) Conservation Objectives for River Shannon and River Fergus Estuaries (SPA 004077). Department of Arts, Heritage and the Gaeltacht [dated 17th September 2012].</p>	<p>The main potential for impact on the Qualifying interests of this SPA would arise from changes in water and air quality, which could affect habitats and species directly or indirectly, disturbance to the habitat and other human activities that could affect the waterbird population trends.</p> <p>There is a potential risk from migration of landfill leachate into surface waters and groundwater and from migration of passive landfill gas into atmosphere.</p> <p>The recommended certificate of authorisation specifies conditions to protect the surface waters and groundwater and in turn the qualifying interests of this European Site.</p> <p>The capping, as required under Condition 3.1, will limit ingress of rainwater into the waste body thus limiting the generation of leachate.</p> <p>Condition 3.9 requires monitoring of leachate, groundwater upgradient and downgradient of the landfill and surface water upstream and downstream of the landfill and at the outlet from the site water drainage system.</p>

		<p>[A141] Grey Plover (<i>Pluvialis squatarola</i>)</p> <p>[A142] Lapwing (<i>Vanellus vanellus</i>)</p> <p>[A143] Knot (<i>Calidris canutus</i>)</p> <p>[A149] Dunlin (<i>Calidris alpina</i>)</p> <p>[A156] Black-tailed Godwit (<i>Limosa limosa</i>)</p> <p>[A157] Bar-tailed Godwit (<i>Limosa lapponica</i>)</p> <p>[A160] Curlew (<i>Numenius arquata</i>)</p> <p>[A162] Redshank (<i>Tringa totanus</i>)</p> <p>[A164] Greenshank (<i>Tringa nebularia</i>)</p> <p>[A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>)</p> <p>Habitats:</p> <p>[A999] Wetlands</p>		<p>There will be passive landfill gas venting on site. However, the distance of over 11km from the landfill to the SPA means there will be no negative impacts from this passive gas.</p> <p>Condition 3.9 and Schedule A require gas monitoring at the existing monitoring locations, the proposed gas vent, the existing gas monitoring boreholes, the biological filter if required and installed and, if required, the relevant adjacent buildings, including domestic dwellings.</p> <p>Furthermore, Condition 3.3 requires that the closed landfill and the remedial works shall not cause environmental pollution or deterioration in the status of the receiving surface water body or groundwater body.</p> <p>In addition, Condition 3.14 requires that no emissions arising from activities carried on at the site, including, amongst others, leachate, gas, litter and mud shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the activity will not negatively impact on water or air quality and that the qualifying interests of this European Site are protected.</p>
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	9.9km east of the site	<p>Species:</p> <p>[A082] Hen Harrier (<i>Circus cyaneus</i>)</p>	NPWS (2022) Conservation Objectives for Stack's to Mullaghareirk Mountains, West	The main potential for impact on the Qualifying interests of this SPA would arise from changes in air quality, which could affect the species,

(Site code: 004161)			Limerick Hills and Mount Eagle (SPA 004161). Department of Housing, Local Government and Heritage [dated 23 rd September 2022].	<p>disturbance to the habitat and activities that could affect population trends.</p> <p>There is no hydrological connection between the closed landfill and the SAC.</p> <p>There will be passive landfill gas venting on site. However, the distance of almost 10km from the landfill to the SPA means there will be no negative impacts from this passive gas.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p>
Moanveanlagh Bog SAC (Site code: 002351)	12.2 east of the site	<p>Habitats:</p> <p>[7110] Active raised bogs</p> <p>[7120] Degraded raised bogs still capable of natural regeneration</p> <p>[7150] Depressions on peat substrates of the <i>Rhynchosporion</i></p>	NPWS (2015) Conservation Objectives for Moanveanagh Bog (SAC 002351). Department of Arts, Heritage and the Gaeltacht [dated 7 th December 2015].	<p>The main potential for impact on the Qualifying interests of this SAC would arise from changes in surface water quality and air quality, which could affect the habitats, and disturbance to the habitats.</p> <p>There is no hydrological connection between the closed landfill and the SAC. Also, the distance of over 12km from the landfill to the SAC means there will be no negative impacts from the passive gas.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p>