

# Appendix 1

## Tier 1 Study

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# Cartron Big Landfill

## Datagap Analysis & Tier 1 Assessment

### Longford County Council

Project number: 60549441

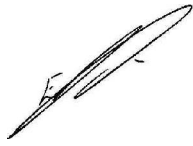
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## Table of Contents

1.	Introduction.....	5
1.1	General Introduction .....	5
1.2	Background .....	5
1.3	Objective .....	5
1.4	Scope of Works .....	6
1.4.1	Task 1 – Desktop Study .....	6
1.4.2	Task 2 – Site Walkover.....	6
1.4.3	Task 3 – Datagap Identification and Tier 1 Reporting.....	6
2.	Desktop Study .....	7
2.1	Site Setting.....	7
2.2	Historical Development .....	8
2.3	Monitoring Results .....	9
3.	Site Walkover .....	10
4.	Preliminary Conceptual Site Model .....	12
5.	Risk Assessment .....	13
5.1	Risk Screening and Prioritisation.....	13
5.2	Source Risk Screening.....	13
5.3	Pathway Risk Screening .....	14
5.4	Receptor Risk Screening .....	15
5.5	SPR Risk Scores .....	17
5.6	Risk Classification.....	17
6.	Discussion and Datagaps .....	18
7.	Recommendations.....	18
	Appendix A - Figures.....	19
	Appendix B - Site Walkover Photographs.....	20

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## 1. Introduction

### 1.1 General Introduction

AECOM Ireland Limited (AECOM) is pleased to present this report to Longford County Council (LCC) detailing a datagap analysis and Tier 1 risk assessment of an unregulated former waste disposal site at Cartron Big, Co. Longford. This report has been prepared in accordance with AECOM proposal reference OPP-DUB002, dated 25 September 2017; and authorised by Mr Bernard Shea, Senior Executive Engineer, Environment Section, LCC, under purchase order number 400144546.

### 1.2 Background

The site, known as Cartron Big Landfill, is located in an area of open farmland approximately 3 km east of Longford town at the intersection of the L1071 and L3538 roads, see Appendix A Figure 1.

AECOM understands the site was formerly used as an unregulated municipal landfill, that it is in LCC ownership and is privately leased to a local farmer for grazing.

Under waste management regulations<sup>1</sup>, LCC is required to complete a risk assessment of unregulated waste disposal sites.

The Environmental Protection Agency (EPA) prepared a code of practice<sup>2</sup> to assist local authorities in meeting the requirements of waste management regulations with regard to unregulated landfill sites. The code of practice outlines a staged process with three tiers of assessment. Once the risk assessment and, if necessary, remediation have been completed to the satisfaction of the EPA, an application can be made for the granting of a *Certification of Authorisation* to demonstrate compliance with the regulations.

The first stage, a Tier 1 Assessment, comprises the following:

- Development of a conceptual site model (CSM);
- Identification of contaminant sources, pathways of contaminant migration and potential receptors which may be vulnerable if exposed to those contaminants; i.e. the identification of Source-Pathway-Receptor (SPR) linkages; and
- The prioritisation of sites and SPR linkages based on their perceived risk.

AECOM (as URS) completed a Tier 1 assessment of the site in September 2008<sup>3</sup>. This assessment was completed in accordance with the EPA code of practice for unregulated landfill sites and, based on the available information and screening process, it was determined that the overall risk score for Cartron Big Landfill was 70%, resulting in a risk classification of High (Class A).

It is understood that subsequent tiers of assessment have not been completed and no application for a Certificate of Authorisation has been submitted to the EPA.

### 1.3 Objective

The objective of this project was to complete a Tier 1 risk assessment and to assess whether additional tiers of assessment are required in order to submit an application to the EPA for a Certificate of Authorisation for the Cartron Big Landfill.

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

<sup>2</sup> Environmental Protection Agency, Code of Practice Environmental for Unregulated Waste Disposal Sites, 2007,

<sup>3</sup> URS Ireland Limited, Tier 1 Assessment - Unregulated Waste Disposal Sites, Cartron Big Landfill, Report Reference 49341630 DURP0004/KJR/KJR dated 15 September 2008

## 1.4 Scope of Works

The scope of works completed was developed with reference to the EPA code of practice (COP) for the assessment of unregulated waste disposal sites. It comprised three main tasks:

- Task 1 – Desk Study and Document Review;
- Task 2 – Site Walkover; and
- Task 3 – Datagap Identification and Tier 1 Reporting.

### 1.4.1 Task 1 – Desktop Study

AECOM understands that LCC has very little data on the former landfill apart from its location and that it was capped in the early 1990s with material excavated during the construction of the N4 bypass of Longford Town. Therefore, the document review focussed on information collected for the previous Tier 1 assessment in the context of any updated public sources of information.

Public sources of information were also consulted, including:

- Ordnance Survey of Ireland (OSI), [www.osi.ie](http://www.osi.ie)
- Geological Survey of Ireland (GSI), [www.gsi.ie](http://www.gsi.ie)
- EPA, <http://gis.epa.ie/Envision>
- Office of Public Works (OPW), <http://www.opw.ie/hydro/index.asp?mpg=main.asp> and <http://www.floodmaps.ie/View/Default.aspx>
- Water Maps, <http://watermaps.wfdireland.ie/>
- EPA Hydrometric Data System, <http://193.1.208.39/HydroTool/Default.aspx>
- National Parks and Wildlife Services (NPWS), <http://webgis.npws.ie/npwsviewer/>
- National Monuments Service, <http://webgis.archaeology.ie/historicenvironment/>

### 1.4.2 Task 2 – Site Walkover

A site walkover was conducted on 13 October 2017 by an AECOM Environmental Consultant in the presence of LCC personnel. During the walkover, the following tasks were undertaken:

- Visually inspect the site setting and adjacent land-use;
- Photograph relevant site features;
- Inspect accessible gas monitoring points;
- Inspect surrounding drains/streams for evidence of environmental stress resulting from leachate discharge from the landfill; and
- Examine waste exposures, if present, to assess the types of waste buried at the site.

Observations were also made regarding access constraints in case of a requirement for a Tier 2 intrusive site investigation.

### 1.4.3 Task 3 – Datagap Identification and Tier 1 Reporting

On completion of Tasks 1 and 2, AECOM has prepared this Tier 1 report outlining the findings of the document review and site walkover including any identified datagaps. Based on these findings, a CSM has been completed in line with the EPA's COP developed under the following headings:

- Contaminant sources;
- Groundwater vulnerability, flow regime and aquifer category;
- Potential leachate and landfill gas migration pathways; and
- Receptors (human and environmental).

On completion of the CSM, risk screening and site prioritisation has been carried out using the scoring system outlined in Chapter 4 of the EPA COP and the site has been categorised according to the following risk classes:

- Highest Risk (Class A);
- Moderate Risk (Class B); and
- Lowest Risk (Class C).

This report also identifies whether the previous assessment of viable SPR linkages remains valid and if the high 'A' classification assigned continues to be appropriate for the identified risks.

The report also recommends whether a Tier 2 Assessment, incorporating site investigation and testing, is required in order for LCC to be in a position to submit an application to the EPA for a Certificate of Authorisation.

## 2. Desktop Study

### 2.1 Site Setting

**Location** The site is located in Cartron Big townland, approximately 3.5 km east of Longford town centre and 600 m southwest of the Carrig Glas housing development on the L1071 road (see Appendix A Figure 1). The Carrickglass Demesne is located north of the site. The site is situated at the junction of the L1071 and L3538 roads, i.e. to the south of the L1071 and on the eastern side of the L3538 roadway. The site encompasses 4 ha in area.

**Surrounding Landuse** The area immediately surrounding the site is predominantly agricultural with some low density residential housing (one-off housing developments). The closest residential house to the site is 100 m to the south, on the opposite side of the L3538. The next closest dwelling is 150 m east of the site on the L1071. There are an additional three dwellings within 400 m of the site.

Carrickglass Demesne is to the north of the site, on the opposite side of the L1071, and contains land that is a proposed Natural Heritage Area (NHA), according to the NPWS website, NHA site code 001822.

Agricultural land immediately adjoins the site to the east (beyond a stream), south and west (beyond the L3538).

**Surface Water** The nearest surface water body to the site is the Clooncoose stream, which flows along the eastern site boundary from southeast to northwest. The EPA has water quality stations on this stream and data from these stations are as follows:

- Cartron Bridge (RS26C200300) adjacent to the northeastern corner of the site. Status at this point is listed as *Good* (Q4) by the EPA, based on data collated between 2004 and 2016.
- R194 Road Bridge (RS26C200500) located approximately 2.5 km downstream of the site to the northwest at the point where the Clooncoose Stream flows under the R194 near its junction with the N4 and N5 routes. This location is approximately 900 m southeast (upstream) of the Clooncoose stream confluence with the Camlin River. Water quality status at this point is also *Good* (Q4), according to the EPA's river quality data from 2004 to 2016.
- The Mall Bridge Longford (RS26C010800) this location is situated on the River Camlin on the northern outskirts of Longford town and is downstream and to the south of its confluence with the Clooncoose Stream. Water quality status is *Good* (Q4) according to the EPA's river quality data from 2004 to 2016.

The Camlin River is not used for public water supply purposes downstream of the site.

There are records of recurring, small scale, flood events at Cartron Bridge.

**Topography** The countryside surrounding the site is gently undulating. There is a gentle gradient across the site from southeast to the north/northwest toward the channel of the Clooncoose stream. The site is at an elevation of between 60 m and 70 m above Ordnance Datum (OD).



**Geology** Bedrock beneath the site is mapped as argillaceous limestone and shale (Visean stage of the Carboniferous) consisting of dark, fine grained, bedded fossiliferous limestones and shales with chert; within the bedrock are thin but distinct bands of volcanic ash. This bedrock is usually seen overlying Waulsortian limestones but it may directly succeed the Ballysteen Formation in the absence of these.

Bedrock outcrop has been mapped along the western site boundary with the L3538 roadway and also along the northern boundary, close to Clooncoose stream in the northeastern corner.

Where bedrock does not outcrop at the site, it is overlain by till (subsoils). The subsoils across most of the site is mapped as till derived from cherts, with the subsoils in the northwestern corner mapped as till derived from Lower Palaeozoic sandstones and shales. Localised deposits of alluvium are noted along the channel of the Clooncoose stream to the north of the site, within Carrickglass Demesne, and also to the southeast, upstream of the site.

**Hydrogeology** Bedrock is classified as a locally important aquifer which is moderately productive in local zones. Vulnerability of groundwater to contamination is classified as extreme to high, given the presence of bedrock outcrop at the site and thin overburden cover.

According to the GSI website, a County Council public water supply borehole is located approximately 1 km to the east of the site. The well record indicates that the well was installed in 1963 and was drilled to a depth of 36.6 m below ground level with a 0.9 m depth to bedrock. The yield is specified as being moderate, 98.1 m<sup>3</sup>/d. It is not known whether the well remains in use or not; however, no inner or outer source protection zones have been defined for it, indicating that it is unlikely to be in active use.

There are two other wells mapped within a 2.0 km radius of the site. One is recorded south of the site in the townland of Cooleeney. The well record indicates it was installed for agricultural and domestic use. Reported yield of the well is poor, and bedrock was encountered at 0.9 m below ground level (bgl). The second well is located to the east, with a depth to bedrock of 3.1 m bgl. Yield of this well is recorded as moderate (53.4 m<sup>3</sup>/d), it is not reported whether this well is to supply domestic, agricultural or industrial needs. Both well records date from 1899, and it is not known if the wells remain in use.

Based on the topography and surface water features in the area, the direction of groundwater flow is considered to be to the north/northwest, towards Clooncoose stream.

Groundwater beneath the site and in the general area is classified as being of good status and being a protected area for drinking water supply.

**SAC/SPA** There are no Special Areas of Conservation or Special Protection Areas within a 5 km radius of the site. Carrickglass Demesne is a proposed NHA. There are a number of national monuments in the vicinity of the site, such as a number of raths and the entrance gates to Carrickglass Demesne, but none are within the site boundary.

**Licensed Sites** A licensed IPPC facility is situated approximately 2 km southwest of the site at Glennon Brothers Timber Limited, The Sawmills, Dublin Road, Longford, Ireland.

## 2.2 Historical Development

The earliest historical map available on the OSI website dates from 1837-1842. The majority of the site appears to have been in agricultural use with a small wood stretching south from the north-western corner of the site along the western boundary with the L3538. One the eastern edge of this forested zone is marked the location of a quarry. Dwellings are illustrated to the south and east, at the same locations where dwellings are present today. In addition, there appears to be a small dwelling on the western side of the cross roads at the north-western corner of the site and also on the opposite side of the L1071 to the north of the site. There is no evidence for the presence of either dwelling in the present day. The gate lodges to Carrickglass Demesne are present to the east of the site.

The next historic map dates from 1888-1913, the small dwellings to the north and north-west no longer appear to be present. The quarry doesn't appear to be active but a steep escarpment appears to be present close to the western site boundary, indicating that the quarry has not been infilled. The

site appears to be in agricultural use with no forested area along the western site boundary. The land to the north of the site, within Carrickglass Demesne, is mapped as bog or marsh.

It was previously reported by LCC that the landfill accepted waste throughout the 1970s and 1980s, ceasing in 1989. Waste accepted is understood to have included municipal and industrial waste. It is understood that the quarry was excavated to 18 m bgl when it was active. Waste was backfilled into the quarry to 1 m above ground level. Following closure, the gas vents were installed and the landfill was subsequently capped. It was reported by LCC during the site walkover that the landfill was capped with a layer of pine bark from a local wood mill. On top of this was placed a layer of shale gravel with a final covering of topsoil. It was not known how thick each of the capping layers is.

Aerial photographs are available for the years 1995, 2000, 2005 and the period 2005-2012. In the earliest aerial photograph it appears that there is activity on site, possibly related to capping of the waste. In all subsequent aerial photographs the site appears to be grassed and used for agricultural purposes – grazing.

### 2.3 Monitoring Results

It is understood that the gas vents are not equipped with sampling taps, so no landfill gas monitoring data are available for the site. In addition, it does not appear that any groundwater or leachate monitoring points have been installed within or around the waste body.

As noted above, the Clooncoose stream, which forms the eastern boundary of the site, is monitored by the EPA at Cartron Bridge at the north-eastern corner of the site. The EPA continues to undertake biological monitoring of the stream at Cartron Bridge but chemical monitoring is understood to have ceased in 2006.

A summary of available chemical data for Clooncoose stream at Cartron Bridge is tabulated below. In addition, summaries of available data for the downstream monitoring station (RS26C200500, monitored until 2006) and the upstream monitoring station (RS26C200200, monitored until 2003) are also tabulated.

**Table 1. Surface Water Monitoring Summary**

Parameter	Unit of Measurement	Max.	Min.	Average
<b>Upstream Monitoring Point, Bridge Southwest of Corboy: RS26C200200</b>				
Ammonia as N	mg/L	0.846	0.002	0.102
Nitrite as N	mg/L	0.149	0.005	0.021
Ortho-Phosphate MRP	mg/L	0.395	0.009	0.057
pH	pH units	8.52	7.59	8.13
Biological Oxygen Demand	mg/L	7.6	0.6	1.8
Conductivity @ 20°C	µS/cm	646	287	547
Dissolved Oxygen % Saturation	%	119	78	97
Suspended Solids	mg/L	42.0	0.3	6.3
Total Phosphorus as P	mg/L	0.647	0.022	0.108
Total Oxidised Nitrogen as N	mg/L	2.53	0.444	1.20
<b>Onsite Monitoring Point, Cartron Bridge: RS26C200300</b>				
Ammonia as N	mg/L	0.792	0.020	0.171
Nitrite as N	mg/L	0.080	0.003	0.012
Ortho-Phosphate MRP	mg/L	0.128	0.004	0.031
pH	pH units	8.46	7.65	8.13
Biological Oxygen Demand	mg/L	6.4	0.7	1.8
Conductivity @ 20°C	µS/cm	640	277	534
Dissolved Oxygen % Saturation	%	117	77	98
Suspended Solids	mg/L	26.7	0.3	4.5
Total Phosphorus as P	mg/L	0.312	0.021	0.067

Parameter	Unit of Measurement	Max.	Min.	Average
Total Oxidised Nitrogen as N	mg/L	2.02	0.16	0.98
<b>Downstream Monitoring Point, Bridge on R194 Upstream of Camlin Confluence: RS26C200500</b>				
Ammonia N	mg/L	0.987	0.010	0.080
Nitrite N	mg/L	0.037	0.005	0.016
Ortho-Phosphate MRP	mg/L	0.219	0.022	0.054
pH	pH units	8.46	7.52	8.08
Biological Oxygen Demand	mg/L	4.6	0.9	1.7
Conductivity @ 20°C	µS/cm	614	274	507
Dissolved Oxygen % Saturation	%	113	73	94
Suspended Solids	mg/L	24.3	0.7	5.7
Total Phosphorus P	mg/L	0.289	0.046	0.103
Total Oxidised Nitrogen N	mg/L	2.14	0.37	0.96

Source: Longford County Council

For most parameters, the highest average results tend to have been reported for the upstream monitoring point. Only the average result for ammonia was highest at the Cartron Bridge monitoring point, at 0.171 mg/L as nitrogen, compared to 0.102 mg/L and 0.080 mg/L in the upstream and downstream monitoring points, respectively. The ammonia concentration decreased downstream of the site. Based on the above results, it does not appear that the landfill adjacent to the Clooncoose stream was having an adverse impact on surface water quality during the period for which EPA chemical monitoring data are available (1998 to 2006).

### 3. Site Walkover

A photographic log from the site walkover is included in Appendix B.

Access to the site is through a locked gate on the eastern side of the L3538 roadway, there is a second smaller entrance from the L3538 in the southwestern corner of the site. The site consists of a large field with two small derelict buildings and an area of hardstanding close to the entrance. The day of the walkover was very wet, with the ground water logged and some parts of the site were inaccessible.

The walkover survey checklist is summarised below.

**Table 2. Site Walkover Checklist**

Information	Checked	Comment
What is the current landuse?	Yes	The site is understood to be leased to a local farmer and used for grazing. No livestock was on site during the walkover.
What are the neighbouring landuses?	Yes	Predominantly low intensity agriculture, with some one-off housing within 400 m of the site. The closest house is 100 m to the south of the site. There is deciduous woodland within the Carrickglass Demesne to the north.
What is the size of the site?	Yes	4 ha in total; it's not clear how much of the site is occupied by the waste body. Based on dimensions provided for the quarry, the waste was backfilled into the 18 m deep quarry to a height of 1 m above ground level, giving a waste body of up to 19 m in thickness.
What is the topography?	Yes	The topographic gradient of the area as a whole is gently undulating. As can be seen in Appendix B, the site itself is quite flat with a gentle gradient from southeast to the north/northwest. Within the site, localised subsidence has occurred where the waste has settled over time. See Appendix B Photos 9 and 10.
Are there potential receptors?	Yes	
	Houses	Residence 100 m south, across-gradient

Information	Checked	Comment
		Residence 150 m east, across -gradient Residences 400 m west, across-gradient
Surface water features		Clooncoose stream forms the eastern site boundary. The site is very waterlogged and runoff of surface water and leachate into the stream was observed during the site visit. See Appendix B Photos 14 to 19.
Wetland or protected areas		The site is waterlogged and land to the north also appears to be poorly drained, but it is not a protected wetland. While land within Carrickglass Demesne to the north of the site is a proposed NHA, this does not include the poorly drained land to the north of the site.
Public water supplies		There is no confirmed, active, public water supply within 1 km of the site. A public supply well, located 1 km to the east is noted in GSI well records but there are no source protection zones mapped for the well, indicating that it is unlikely to be in use currently.
Private water supplies		Potentially; well records indicate wells from the nineteenth century located within 2 km of the site to the south and east; it is not known if they are still in use.
Services		There are overhead electricity/telecom cables along the L3538 roadway but no connection to the site is apparent.
Other buildings		To the south of the main entrance to the site there is a derelict single story building with a galvanised roof. To the north of this building is a concrete pad with a low brick wall on one side. See Appendix B Photos 2 and 5. By the smaller site entrance in the south-western corner there is a small hut with a galvanised roof. See Appendix B Photos 7 and 8.
Any potential sources of contamination?	Yes	
Surface waste		Apart from a small number of plastic bags of waste at the concrete pad, there was no exposure of waste observed across the site, even in areas where subsidence was apparent.
Surface ponding of leachate		The site is waterlogged in many places and ponded leachate was observed at the surface. See Appendix B Photos 1, 2, 8 and 17 to 19.
Leachate seepage		Leachate seepage into the Clooncoose stream along the eastern site boundary was observed. See Appendix B Photos 15 and 16.
Landfill gas odours		None observed.
Any outfalls to the surface water?	Yes	Leachate seepage into the Clooncoose stream along the eastern site boundary was observed. It is not known if the landfill has a perimeter drain around the waste body, or if drains were incorporated into the cap when it was constructed.
Are there any signs of impact on the environment?	Yes	
Vegetation die off, bare ground		No sign of vegetative stress across the site. However, it was noted that vegetation has a different colour and with more reeds present, where leachate seepage was apparent. See Appendix B Photo 18.
Leachate seepages		As noted above.
Odours		None observed.
Litter		Some farmyard manure and plastic bags of rubbish were present by the concrete pad, as were some old wooden pallets. However, it does not appear that fly-tipping is a major issue at the site. See Appendix B Photos 1 to 4.
Gas bubbling through		None observed.

Information	Checked	Comment
water		
Signs of settlement, subsidence, water logged areas		Signs of settlement and subsidence were evident, in particular close to the southern site boundary. See Appendix B Photos 9 and 10. Waterlogged areas were present across the site, preventing access to certain areas.
Drainage or hydraulic issues		A water logged site with leachate seepage to the Clooncoose stream.
Downstream water quality appears poorer than upstream water quality		Surface water biological quality is monitored at the north-eastern site corner – Cartron Bridge – by the EPA and its status is classified as <i>Good</i> . It is also classified as <i>Good</i> at the next monitoring point 2.5 km downstream.
Are there any indications of remedial measures?	Yes	
Capping		The waste body is reported to have been capped with bark, shale and a soil cap. It is not known how thick the capping layers are.
Landfill gas collection		There are a series of landfill gas vents across the site which appear to be passive. See Appendix B Photo 13. There does not appear to be a landfill gas collection system in place.
Leachate collection		There does not appear to be a leachate collection system in place.
Describe fences and security features?	Yes	The eastern site boundary is formed by the Clooncoose stream, with brambles and small beech trees on the opposite bank. See Appendix B Photo 14. Along the northern site boundary with the L1071 the site boundary is formed by an open hedgerow of small trees and brambles with a drainage ditch running from west to east toward the Clooncoose stream. See Appendix B Photos 20 and 21. The western site boundary with the L3538 roadway is dense bramble, elder and hawthorn hedge. Access gates from the L3538 are padlocked. Along the southern site boundary is a 2 m chain link fence with concrete posts. See Appendix B Photos 10 to 12.

## 4. Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) identifies the possible sources (S), pathways (P) and receptors (R). Based on the available information, the following preliminary CSM has been derived from information obtained during the desk study, site walkover and information provided by LCC.

The possible SPR combinations have been assigned numbers, SPR1 to SPR11, as outlined in the COP and these SPR numbers are highlighted in the preliminary CSM summary table below. A schematic diagram of the CSM is presented in Appendix A Figure 2.

**Table 3. Preliminary Conceptual Site Model**

Sources	Pathways	Receptors
<b>Leachate</b>	Migration vertically downwards through subsoil into the aquifer, then migration horizontally (flow regime / direction) and discharges to the local drainage system.	<b>Surface Water Body SPR1</b> The Clooncoose stream forms the eastern site boundary, seepage of leachate into the stream was observed. <i>Protected Area (Surface Water Dependent Terrestrial Ecosystem SWDTE) SPR2</i> The Clooncoose stream is not a designated NHA, SPA or SAC.
	Migration vertically downwards and horizontally through bedrock.	<b>Human Presence (Private Well) SPR3</b> There are houses within 200 m across-gradient of the landfill. <i>Protected Area (Groundwater Dependent Terrestrial Ecosystem GWDTE) SPR4</i> N/A No GWDTE within a 1 km radius of the site.

Sources	Pathways	Receptors
		<p><b>Aquifer Category SPR5</b> Bedrock Aquifer is classified as a locally important aquifer which is moderately productive and highly to extremely vulnerable to contamination.</p> <p><i>Public Supply (Well) SPR6</i> N/A No confirmed public supply well within a 1 km radius of the site.</p> <p><b>Surface Water Body SPR7</b> The Clooncoose stream forms the eastern site boundary.</p>
	Direct runoff to surface water drainage	<p><b>Surface Water Body SPR8</b> The Clooncoose stream forms the eastern site boundary; surface runoff can enter the stream.</p> <p><i>Protected Area (SWDTE) SPR9</i> N/A No SWDTE with a 1 km radius of the site.</p>
<b>Landfill Gas</b>	Lateral migration via subsoil, bedrock, underground services or infrastructure	<b>Human Presence SPR10</b> There are houses between 100 m and 150 m from the site.
	Vertical migration via subsoil, bedrock, underground services or infrastructure	<i>Human Presence SPR11</i> N/A No occupied building built above the waste body.

## 5. Risk Assessment

### 5.1 Risk Screening and Prioritisation

Based on the risk assessment methodology outlined in the COP, AECOM has developed a scoring matrix to classify the site according to low, medium and high risk. This will determine what, if any, further steps are required to manage potential environmental impacts at the site.

The potential risk of leachate and gas migration is assessed in the screening process which considers: waste type and quantity; five key potential pathways; and six key potential receptors.

Individual scores are assigned for each and used in appropriate equations to determine a total score for each SPR linkage, see Table 17. The overall site score is the maximum of the individual normalised SPR scores, and this can be used to place the facility into an appropriate Risk Category as follows:

- High Risk Score  $\geq 70\%$
- Medium Risk Score = 40% to 70%
- Low Risk Score  $\leq 40\%$

Once this has been completed, the site can then proceed through the relevant steps of the COP that are considered appropriate for that Risk Category.

### 5.2 Source Risk Screening

The composition, size and age of the waste body are taken into account in assessing its significance as a source of leachate and landfill gas. As a worst case scenario, the highest score is taken into account.

**Table 4. Leachate Source/Hazard Scoring Matrix – 1a**

Waste Type	Waste Footprint			Comments
	$\leq 1$ ha	$> 1$ ha to $\leq 5$ ha	$> 5$ ha	
Construction and demolition (C&D)	0.5	1	1.5	The site occupies 4 ha in total. While the proportion occupied by the waste body is not known, it would likely occupy more than 25% of the site.
Municipal	5	7	10	
Industrial	5	7	10	



Waste Type	Waste Footprint			Comments
	1	2	3	
Pre-1977				Waste accepted included municipal and industrial waste from the 1970s through to the late-1980s.
<b>1a Score</b>				<b>7</b>

**Table 5. Landfill Gas Source/Hazard Scoring Matrix – 1b**

Waste Type	Waste Footprint			Comments
	≤1 ha	>1 ha to ≤5 ha	>5 ha	
Construction and demolition (C&D)	0.5	0.75	1	The site occupies 4 ha in total. While the proportion occupied by the waste body is not known, it would likely occupy more than 25% of the site.
Municipal	5	7	10	
Industrial	3	5	7	
Pre-1977	0.5	0.75	1	Waste accepted included municipal and industrial waste from the 1970s through to the late-1980s.
<b>1b Score</b>				<b>7</b>

### 5.3 Pathway Risk Screening

Five migration pathways are considered:

- Two related to the migration of leachate to groundwater, horizontal and vertical pathways
- One related to the migration of leachate to surface water
- Two related to landfill gas migration, horizontal and vertical

**Table 6. Leachate Migration Pathways – 2a**

Groundwater Vulnerability (vertical)	Points	Comments
Vulnerability rating - extreme	3	Vulnerability of groundwater to contamination is classified as extreme to high.
Vulnerability rating - high	2	
Vulnerability rating - moderate	1	The site is a former quarry, it is understood that there is no liner between the waste and the bedrock at the base of the quarry. Quarry base and majority of waste body is below the water table
Vulnerability rating - low	0.5	
High to low vulnerability	2	
<b>2a Score</b>		<b>3</b>

**Table 7. Leachate Migration Pathways – 2b**

Groundwater Flow Regime (horizontal)	Points	Comments
Karstified groundwater body (Rk)	5	Bedrock beneath the site is classified as a locally important aquifer which is moderately productive only in local zones (LI).
Productive fissured groundwater body (Rf and Lm)	3	
Gravel groundwater body (Rg and Lg)	2	
Poorly productive bedrock groundwater Body (LI, PI and Pu)	1	

Groundwater Flow Regime (horizontal)	Points	Comments
	<b>2b Score</b>	<b>1</b>

**Table 8. Leachate Migration Pathways – 2c**

Surface Water Drainage	Points	Comments
Direct connection between drainage ditches associated with the waste body and adjacent surface water body	2	There appears to be no drainage on the site. Ground surface is waterlogged and there is a direct pathway for surface runoff to enter the Clooncoose stream.
No direct connection	0	
	<b>2c Score</b>	<b>2</b>

**Table 9. Landfill Gas Migration Pathways – 2d**

Landfill Gas Lateral Migration	Points	Comments
Sand and gravel; made ground; urban; karst	3	Soil in the area is till derived either from cherts or from Lower Palaeozoic sandstones and shales.
Bedrock	2	
All other tills (limestone, sandstone etc. – moderate permeability)	1.5	
All Namurian or Irish Sea tills (low permeability)		
Clay, alluvium, peat	1	
	<b>2d Score</b>	<b>1.5</b>

**Table 10. Landfill Gas Migration Pathways – 2e**

Landfill Gas Vertical (Upwards) Migration	Points	Comments
Sand and gravel; made ground; urban; karst	5	There is no occupied building or enclosed structure above the waste.
Bedrock	3	
All other tills (limestone, sandstone etc. – moderate permeability)	2	
All Namurian or Irish Sea tills (low permeability)	1	
Clay, alluvium, peat	1	
	<b>2e Score</b>	<b>0</b>

## 5.4 Receptor Risk Screening

Five receptors are considered in relation to leachate migration and one in relation to landfill gas migration.

**Table 11. Leachate Migration Receptors – 3a**

Human Presence	Points	Comments
On, or within 50 m of the waste body	3	Nearest dwelling is 100 m from the site, and several residences are present within 400 m of the site.
Greater than 50 m but less than 250 m	2	
Greater than 250 m but less than 1 km	1	
Greater than 1 km from the waste body	0	
	<b>3a Score</b>	<b>2</b>



**Table 12. Leachate Migration Receptors – 3b**

Protected Areas	Points	Comments
Within 50 m of the waste body	3	There is no designated area within a 1 km radius of the site.
Greater than 50 m but less than 250 m	2	
Greater than 250 m but less than 1 km	1	
Greater than 1 km from the waste body	0	Carrickglass Demesne is a proposed NHA.
Undesignated site within 50 m from waste body	1	
Undesignated site greater than 50 m but less than 250 m	0.5	
Undesignated site greater than 250 m from waste body	0	
<b>3b Score</b>	<b>1</b>	

**Table 13. Leachate Migration Receptors – 3c**

Aquifer Category	Points	Comments
Regionally important aquifer (Rk, Rf and Rg)	5	Bedrock beneath the site is classified as a locally important aquifer which is moderately productive only in local zones (LI).
Locally important aquifer (LI, Lm and Lg)	3	
Poor aquifers (PI and Pu)	1	
<b>3c Score</b>	<b>3</b>	

**Table 14. Leachate Migration Receptors – 3d**

Public Water Supplies (other than private wells)	Points	Comments
Within 100 m of site boundary	7	There are no confirmed groundwater sourced public water supplies within a 1 km radius of the site.
Greater than 100 m but less than 300 m, or within an inner source protection area for a groundwater supply	5	
Greater than 300 m but less than 1 km, or within an outer source protection area for a groundwater supply	3	The bedrock aquifer is not karstic.
Greater than 1 km (karst aquifer)	3	
Greater than 1 km (no karst aquifer)	0	
<b>3d Score</b>	<b>0</b>	

**Table 15. Leachate Migration Receptors – 3e**

Surface Water Category	Points	Comments
Within 50 m of site boundary	3	The Clooncoose stream forms the eastern site boundary.
Greater than 50 m but less than 250 m	2	
Greater than 250 m but less than 1 km	1	
Greater than 1 km	0	
<b>3e Score</b>	<b>3</b>	

**Table 16. Landfill Gas Migration Receptors – 3f**

Human Presence	Points	Comments
On site or within 50 m of site boundary	5	Nearest dwelling is 100 m from the site.
Greater than 50 m or less than 150 m	3	
Greater than 150 m but less than 250 m	1	
Greater than 250 m	0.5	
<b>3f Score</b>		<b>3</b>

## 5.5 SPR Risk Scores

Each individual SPR Score is derived by applying appropriate equations from the EPA COP, as outlined in Table 17 below.

The individual SPR scores are normalised by dividing the individual SPR score by the maximum possible score for that SPR linkage and multiplying by 100. The overall site score is considered to be the maximum of the individual normalised SPR linkage scores.

**Note:** The table below represents the Tier 1 risk rating for viable SPR linkages identified in the preliminary CSM outlined in Table 3 for this site. SPR1 to SPR9 represent the leachate risk scores. SPR10 and SPR11 represent Landfill Gas risks. The migration pathways are colour coded as follows:

Leachate: Groundwater and Surface Water	Leachate: Groundwater Only	Leachate: Surface Water Only	Landfill Gas: Lateral and Vertical Migration
---	----------------------------	------------------------------	--

**Table 17. SPR Risk Scores**

SPR	SPR Equation and Linkages	Score	Max Score	% Max SPR
SPR1	1a x (2a + 2b + 2c) x 3e Leachate → Groundwater and Surface Water → Surface Water Body	126	300	42%
SPR3	1a x (2a + 2b) x 3a Leachate → Groundwater → Human Presence	56	240	23%
SPR5	1a x (2a + 2b) x 3c Leachate → Groundwater → Aquifer	63	400	16%
SPR7	1a x (2a + 2b) x 3e Leachate → Groundwater → Surface Water Body	84	240	35%
SPR8	1a x 2c x 3e Leachate → Surface Water → Surface Water Body	42	60	70%
SPR10	1b x 2d x 3f Gas → Lateral Migration → Human Presence	31.5	150	21%
<b>Overall Risk Score</b>			<b>70%</b>	

## 5.6 Risk Classification

The overall risk score outlined in Section 5.5 can be used to place the site into an appropriate Risk Classification as outlined in Table 18.

**Table 18. Risk Classification**

Risk Classification	Overall Risk Score	Action Required
High Risk – Class A	≥70%	Commence site investigations as soon as possible. Apply for a waste regularisation permit/licence.
Moderate Risk – Class B	40% to 70%	Complete site investigations to verify risk. Apply for a waste regularisation permit/licence.
Low Risk – Class C	≤40%	No action necessary unless there is a change in land use. In this circumstance a reappraisal of risk, based on detailed site investigations is required.

## 6. Discussion and Datagaps

The classification on record with the EPA for the Cartron Big landfill is Class A – High Risk.

From the above assessment, the majority of SPR linkages are low risk. However, the presence of surface water – Clooncoose stream - along the eastern site boundary, into which leachate was seen to discharge, continues to justify a High Risk ranking.

Results for chemical surface water monitoring carried out up to 2006 indicate that the quality of surface water in the north-eastern site corner at Cartron Bridge is not adversely affected by the presence of the landfill. Continued biological monitoring by the EPA classifies the Clooncoose stream as being of *Good* status at Cartron Bridge, based on data collated between 2004 and 2016.

The EPA's matrix for the completion of Tier 2 assessments includes for the excavation of trial pits/trenches and determination of waste type as mandatory exploratory investigation and sampling tasks. The waterlogged surface of the landfill may hamper the completion of intrusive investigations at the site, in particular during wet periods of the year. On this basis intrusive investigations should be completed at the site, particularly in light of the apparent lack of adequate capping, leachate collection and drainage, and also the presence of zones of subsidence.

## 7. Recommendations

Given that the above assessment indicates that the most sensitive SPR linkage is high risk, due to the seepage of leachate to the adjacent surface water stream, the apparent lack of adequate capping, leachate collection and drainage, and the presence of zones of subsidence, AECOM recommends:

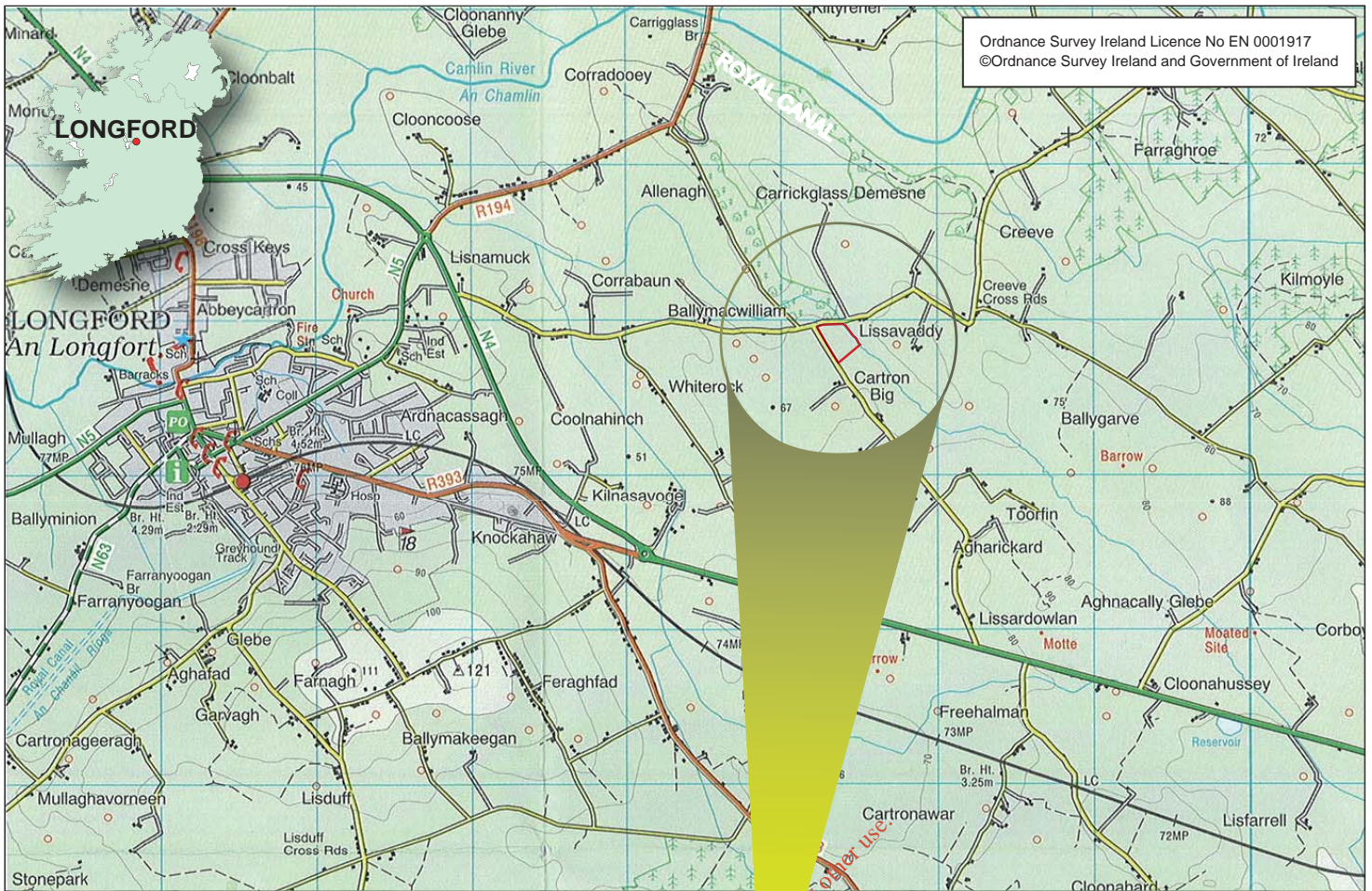
1. that detailed intrusive site investigation should be planned and undertaken at a time when the ground surface is less waterlogged than it was during the site walkover; and
2. following the site investigation, the risk screening exercise should be re-run to reassess the risk status and determine whether sufficient data is available to submit an application for a *Certification of Authorisation (COA)*, to demonstrate compliance with the regulations.

## Appendix A - Figures

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CLIENT  
 LONGFORD COUNTY COUNCIL

PROJECT  
 CARTRON BIG, LONGFORD

DRAWING TITLE  
 FIGURE 1 - SITE LOCATION PLAN

**AECOM**

4th Floor, Adelphi Plaza, Adelphi Centre, George's Street Upper, Dun Laoghaire, Co. Dublin, Ireland  
 T +353 (0)1 238 3100 F +353 (0)1 238 3199 www.aecom.com

DRAWN SML	ILLUSTRATED EO'H	CHECKED CG	APPROVED CG	DATE NOV 2017
SCALE N.T.S	Job No. <b>60549441</b>			REV. 0



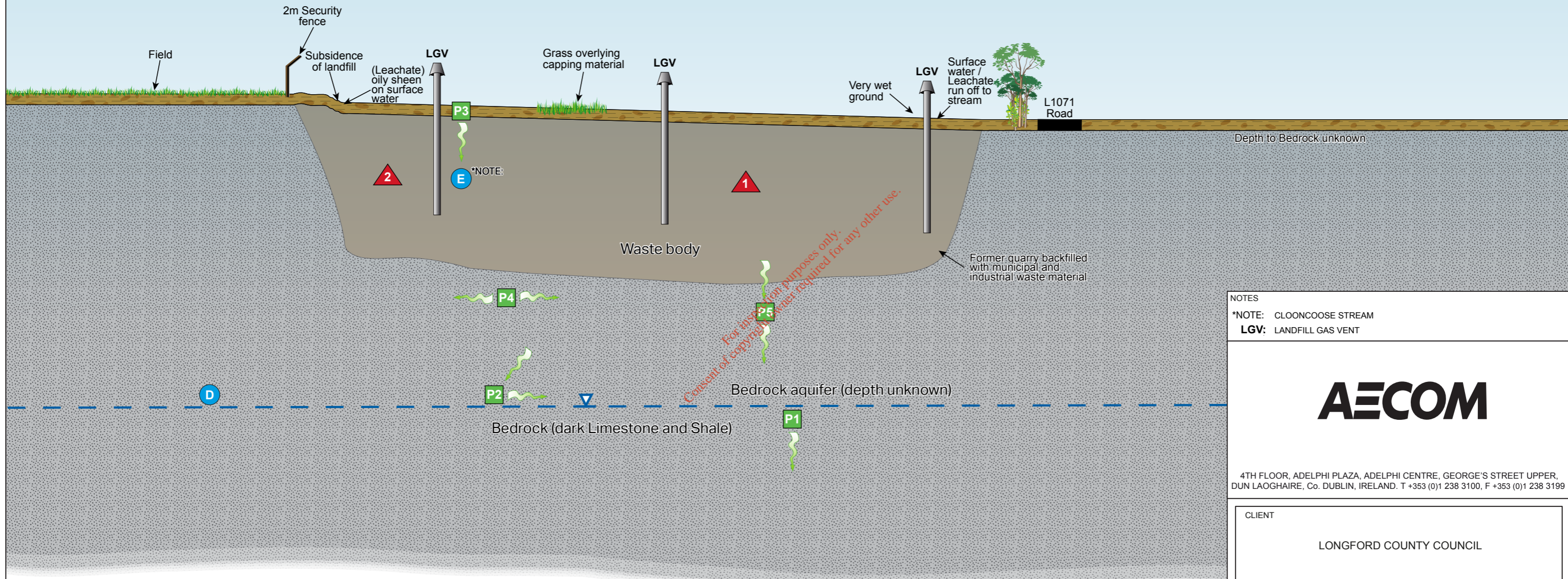
South East

North West

Residential dwelling within 100m South **A**

Public water supply 1.5 km **C**

**B** Proposed NHA within 1km



NOTES  
 \*NOTE: CLOONCOOSE STREAM  
 LGV: LANDFILL GAS VENT



4TH FLOOR, ADELPHI PLAZA, ADELPHI CENTRE, GEORGE'S STREET UPPER,  
 DUN LAOGHAIRE, Co. DUBLIN, IRELAND. T +353 (0)1 238 3100, F +353 (0)1 238 3199

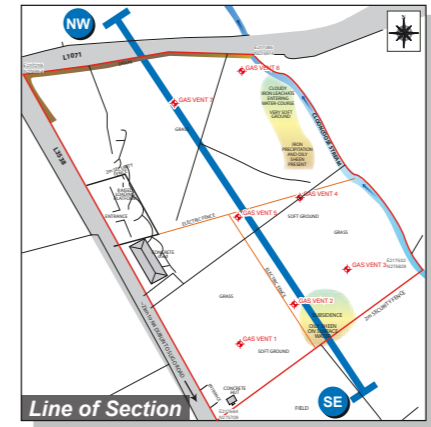
CLIENT  
 LONGFORD COUNTY COUNCIL

PROJECT  
 CARTRON BIG, CO. LONGFORD

DRAWING TITLE  
**FIGURE 2 - CONCEPTUAL SITE MODEL (SCHEMATIC DIAGRAM)**

DRAWN SML	TRACED	CHECKED EO'H	APPROVED CG	DATE NOV 17
SCALE AS SHOWN	DRG NO. <b>60549441</b>			REV

SOURCES	PATHWAYS	RECEPTORS	GEOLOGY KEY
<b>1</b> LEACHATE	<b>P1</b> GROUNDWATER VERTICAL (VULNERABILITY)	<b>A</b> RESIDENTIAL DWELLING WITHIN 100M SOUTH	WASTE BODY
<b>2</b> LANDFILL GAS	<b>P2</b> GROUNDWATER HORIZONTAL (GROUNDWATER FLOW REGIME)	<b>B</b> PROPOSED NHA WITHIN 100M NORTH	SUBSOIL
	<b>P3</b> SURFACE WATER DRAINAGE/RUNOFF	<b>C</b> POSSIBLE PUBLIC WATER SUPPLY, 1.5KM EAST	BEDROCK
	<b>P4</b> LATERAL MIGRATION (SUBSOIL)	<b>D</b> AQUIFER	NOTIONAL GROUNDWATER LEVEL
	<b>P5</b> VERTICAL MIGRATION (SUBSOIL)	<b>E</b> SURFACE WATER BODY	



## Appendix B - Site Walkover Photographs

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## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

1

13/10/2017

**Description:**

Main access gate to site from L3538 roadway.



**Photo No.**

**Date:**

2

13/10/2017

**Description:**

Concrete hardstand adjacent to main entrance gate, with surface ponding and farmyard manure.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

3

13/10/2017

**Description:**

Debris and old wooden pallets adjacent to concrete hardstand.



**Photo No.**

**Date:**

4

13/10/2017

**Description:**

Rubbish bags adjacent to concrete hardstand.





<b>AECOM</b>	<b>PHOTOGRAPHIC LOG</b>
--------------	-------------------------

<b>Client Name:</b> Longford County Council	<b>Site Location:</b> Cartron Big Landfill, Longford	<b>Project Number:</b> 60549441
---	--	---------------------------------

<b>Photo No.</b> 5	<b>Date:</b> 13/10/2017
-----------------------	----------------------------

**Description:**  
Derelict building adjacent to main entrance.



<b>Photo No.</b> 6	<b>Date:</b> 13/10/2017
-----------------------	----------------------------

**Description:**  
Internal access gate from concrete hardstand to the field.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

7

13/10/2017

**Description:**

Derelict shed by second entrance in south-western corner.



**Photo No.**

**Date:**

8

13/10/2017

**Description:**

Entrance in south-western corner from L3538.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

9

13/10/2017

**Description:**

Evidence of subsidence along southern site boundary.



**Photo No.**

**Date:**

10

13/10/2017

**Description:**

Evidence of subsidence along southern site boundary, 2 m high chainlink boundary fence.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

11

13/10/2017

**Description:**

View of south-eastern corner of field and southern site boundary.



**Photo No.**

**Date:**

12

13/10/2017

**Description:**

View along southern boundary.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

13

13/10/2017

**Description:**

View across site from the east with landfill gas vent pipes visible.



**Photo No.**

**Date:**

14

13/10/2017

**Description:**

Clooncoose stream flowing along eastern boundary from south-east corner of site.





<b>AECOM</b>	<b>PHOTOGRAPHIC LOG</b>
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<b>Client Name:</b> Longford County Council	<b>Site Location:</b> Cartron Big Landfill, Longford	<b>Project Number:</b> 60549441
---	--	---------------------------------

<b>Photo No.</b> 15	<b>Date:</b> 13/10/2017
------------------------	----------------------------

**Description:**  
Leachate entering the stream, evidence of iron precipitate forming.



<b>Photo No.</b> 16	<b>Date:</b> 13/10/2017
------------------------	----------------------------

**Description:**  
Leachate entering the stream, evidence of iron precipitate forming.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

17

13/10/2017

**Description:**

Waterlogged ground.



**Photo No.**

**Date:**

18

13/10/2017

**Description:**

Change in vegetation where ground is waterlogged and leachate enters the stream.







## PHOTOGRAPHIC LOG

**Client Name:** Longford County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

19

13/10/2017

**Description:**

Waterlogged and boggy ground with leachate.



**Photo No.**

**Date:**

20

13/10/2017

**Description:**

Drain along northern site boundary, low flow, and milky water.







## PHOTOGRAPHIC LOG

**Client Name:** Longford  
County Council

**Site Location:** Cartron Big Landfill, Longford

**Project Number:** 60549441

**Photo No.**

**Date:**

21

13/10/2017

**Description:**

Boggy ditch in north-west  
corner of site.



**Photo No.**

**Date:**

22

13/10/2017

**Description:**

View of site from north-west  
corner.





<b>AECOM</b>		<b>PHOTOGRAPHIC LOG</b>
<b>Client Name:</b> Longford County Council		<b>Site Location:</b> Cartron Big Landfill, Longford
		<b>Project Number:</b> 60549441
<b>Photo No.</b> 23	<b>Date:</b> 13/10/2017	
<b>Description:</b> Panorama of site from southeastern corner.		

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