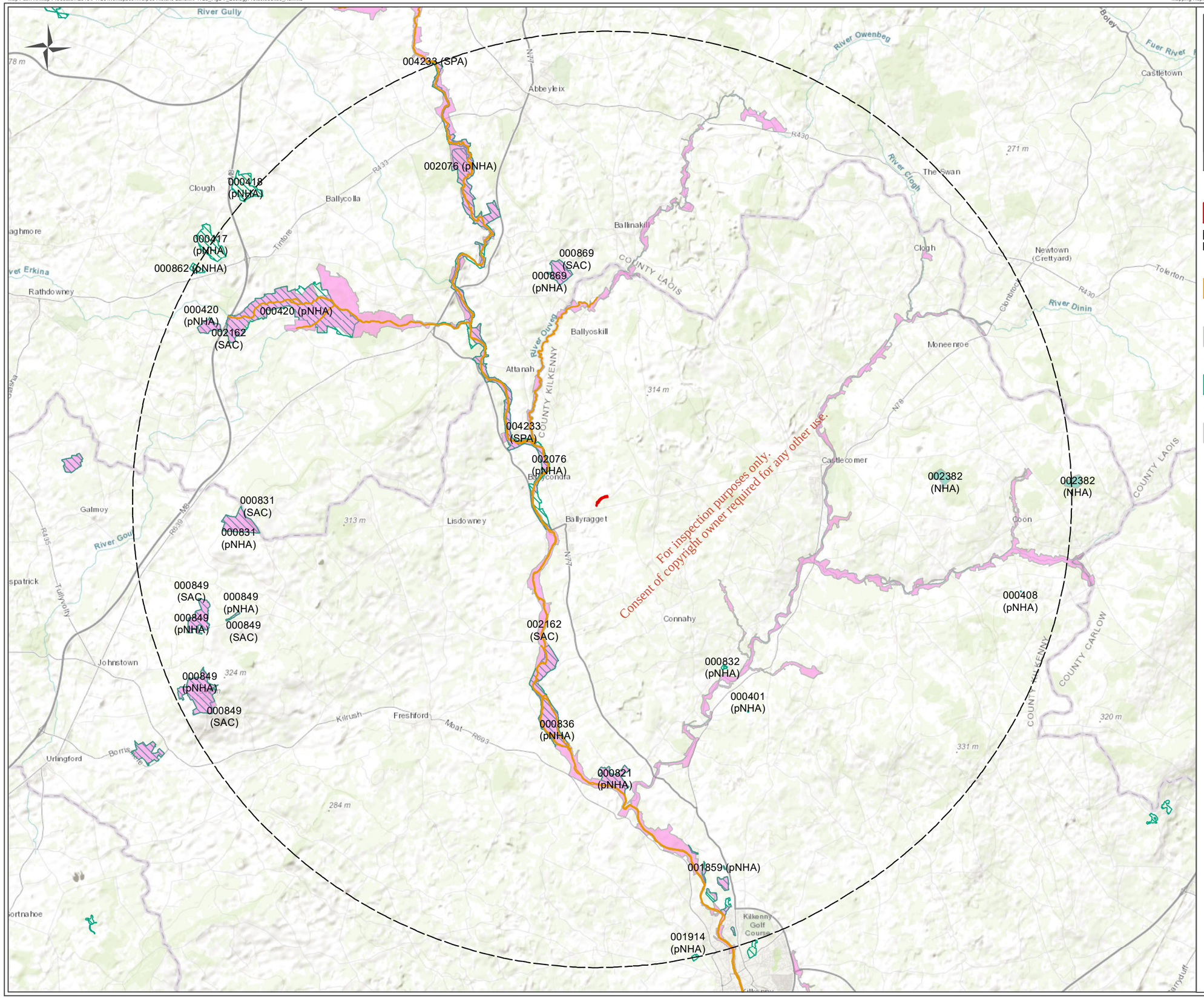
Map Path: R:\Map Production\2018\P1723\Workspace\Thorpes Historic Landfill\P1723_Fig2-7_EcologyProtectedSites_A3.mxd



Legend

- Site Boundary
- 15km Distance from Site Boundary

Special Protection Area (SPA)

- Closest Site: 1.7km

Special Area of Conservation (SAC)

- Closest Site: 1.6km

Proposed Natural Heritage Area (pNHA)

- Closest Site: 1.7km

Natural Heritage Area (NHA)

- Closest Site: 10.5km

Figure Title
Ecology: Protected Sites

Figure No. 2.7

Project
Historical Landfills: Thorpes

Client
Kilkenny County Council

Scale 1:120,000 **Page Size** A3

Revision A **Date** 28/01/2021

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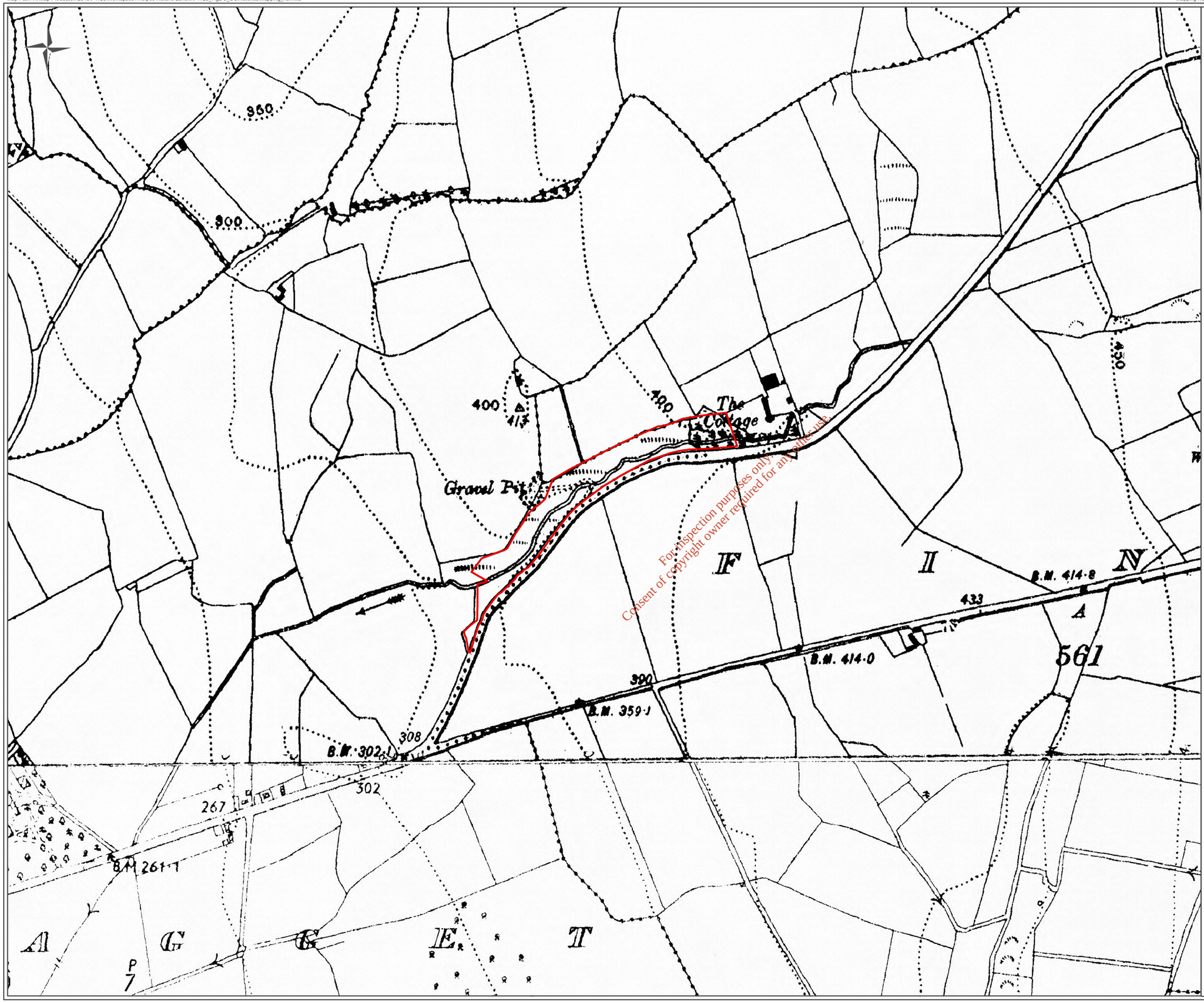
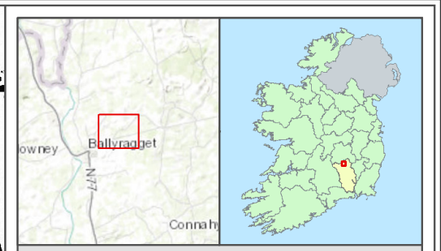
Map Path: R:\Map Production\2018\P1723\Workspace\Thorpes Historic Landfill\P1723_Fig2-8_OSiHistoricalMapping_A3.mxd



Meters
0 50 100 200



Co. Kilkenny

Legend

Site Boundary

Figure Title	OSi Historical Mapping
Figure No.	2.8
Project	Historical Landfills: Thorpes
Client	Kilkenny County Council
Scale	1:5,000
Page Size	A3
Revision	A
Date	28/01/2021

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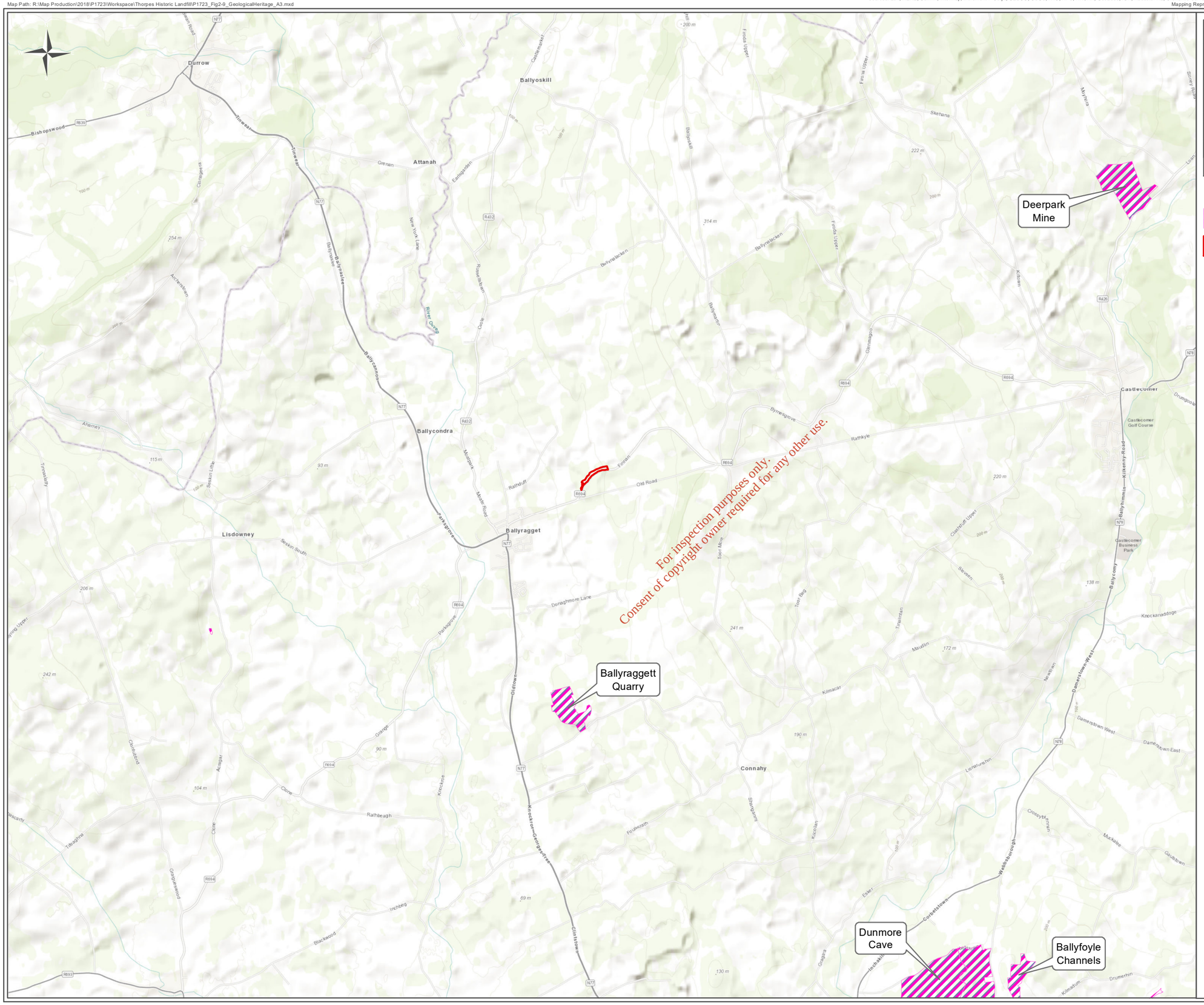

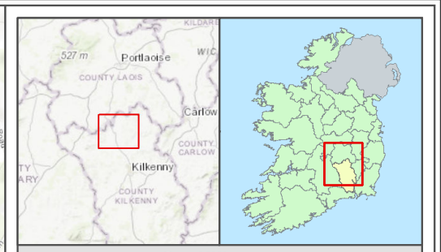

Legend

- Geological Heritage Sites
- Site Boundary

Kilometers
0 0.5 1 2

Figure Title	Geological Heritage
Figure No.	2.9
Project	Historical Landfills: Thorpes
Client	Kilkenny County Council
Scale	1:50,000
Page Size	A3
Revision	A
Date	28/01/2021

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3 TIER 2 SITE INVESTIGATION

3.1 Site Investigation Works

A site investigation rationale was devised based on findings of the Tier 1 Site, a site walkover, historical aerial photography and the preliminary risk assessment which formed part of that report.

The scope of site investigation works included:

- One round of surface water monitoring upstream and downstream of the site
- Factual reporting

The locations of the surface water sampling locations at the site are presented in Figure 3.1.

The site investigation included the review of the following literature sources and websites:

- EPA 2003, Landfill Manuals: Landfill Monitoring (2nd Edition)
- CLR Report No. 4 1994 – Sampling Strategies for Contaminated Land, DoE, Contaminated Land Research (CLR) Report
- BS 6068 Water Quality: Sampling (parts 6.1-6.6 and 6.11-6.12, 6.14)

3.1.1 Site Walkover

A site walkover was conducted by KCC and FT prior to site investigation works. During the site walkover the scope of the investigative works were evaluated based on the findings in the Tier I assessment.

The site walkover confirmed the presence of dense vegetation overgrowth across the landfill and assessed the feasibility for intrusive works on that basis. Due to the dense tree cover and steep banks, it was not possible to conduct intrusion investigation.

A site walkover checklist and photo log are included in Appendix 2.

3.1.2 Evidence of Contamination

The site walkover noted the presence of discarded waste within and along the banks of the Ballyragget stream within the site as can be seen in Figure 3.1 below.

Figure 3-1: Loose discarded non-putrescible waste material

Most of the waste encountered comprised of fragments of waste typical of non-putrescible commercial and industrial type waste e.g., tyres, plastic bottles, glass, car parts, timber, rubber, etc. No visual or olfactory evidence of putrescible / biodegradable waste was noted by FT during the site walkover.

3.1.3 Waste Delineation

The findings of the site walkover suggest the waste material is deposited in a single infill area tending east to west, extending to maximum dimensions 210m in length and 40m in width.

Based on this interpretation, the maximum waste footprint is calculated to be approximately 0.84 hectares. The maximum anticipated waste footprint is presented in Figure 3-2.

Legend

- Site Boundary
- Maximum Anticipated Waste Footprint

Figure Title
Maximum Anticipated Waste Footprint

Figure No. 3.2

Project
Historical Landfills: Thorpes

Client
Kilkenny County Council

Scale	1:2,500	**Page Size**	A3
Revision	A	**Date**	28/01/2021

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Meters
0 50 100 200

4 ENVIRONMENTAL ASSESSMENT

The following section presents the results of environmental monitoring conducted at the site.

4.1 Chemical Assessment Criteria

- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations, 2012 (S.I. No. 327 of 2012)
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I No. 272 of 2009)

The results of the environmental assessment at the Thorpes Historic Landfill site are presented in the following sections.

4.2 Surface Water Monitoring

4.2.1 Monitoring Locations

The surface water monitoring locations were selected upstream and downstream of the landfill footprint, as shown on Figure 4-1. Monitoring location SW1 was selected as the furthest downstream location and samples the Ballyragget Stream to the west of the landfill. Monitoring location SW2 is located at a concrete culverted bridge to the east of the landfill and samples upstream of the landfill.

One surface water monitoring round was carried out on the 19th September 2018.

4.2.2 Monitoring Parameters

The results of surface water sampling analysed from the 2 No. sampling locations (SW1 and SW2) at the site have been assessed against the Maximum Admissible Concentration (MAC) Regulations (1989) and the Environmental Quality Standard (EQS) for Surface Waters Regulations (2009) assessment criteria.

A summary of the values reported for each parameter from the monitoring round is outlined in Table 4.1, while the laboratory reports are presented in Appendix 3.

Table 4-1: Surface Water Sampling Results

Parameter	Units	MAC [1]/EQS [2]	19th September 2018	
			SW1 Downstream	SW2 Upstream
pH (Laboratory)	pH Units	6.0<pH<9.0[2]	8.08	8.08
Dissolved Oxygen	mg/l	<9 – 6 [1]	10.1	10.3

Parameter	Units	MAC [1]/EQS [2]	19th September 2018	
			SW1 Downstream	SW2 Upstream
Conductivity	µS/cm	1 [1]	0.560	0.543
BOD, unfiltered	mg/l	≤2.6 (95%ile)[2]	<1	<1
Sulphate	mg/l	200 [1]	13.6	14.4
Chloride	mg/l	250 [1]	21.1	23.6
Ammoniacal Nitrogen as N	mg/l	≤0.140(95%ile) [2]	<0.2	<0.2
Potassium	mg/l	--	3.51	3.45
Sodium	mg/l	200 [1]	19.7	17.4

Notes:

[1] Maximum Admissible Concentration (MAC), as classified by European Communities (Quality of Surface Water intended for abstraction of drinking water) Regulations 1989 (S.I No. 294 of 1989)

[2] Environmental Quality Standard (EQS), European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I No. 272 of 2009)

4.2.3 Surface Water Analysis Discussion

The results of the surface water monitoring from SW1 and SW2 as presented in Table 4.1, when assessed against the MAC (1989) and EQS (2009) quality standards were found to be below the guideline values in all assessments.

Map Path: R:\Map Production\2018\P1723\Workspace\Thorpes Historic Landfill\P1723_Fig4-1_SurfaceWaterSamplingLocations_A3.mxd

Legend

- Surface Water Sampling Locations
- Rivers
- Site Boundary

Meters
0 50 100 200

Figure Title
Surface Water Sampling Locations

Figure No. 4.1

Project
Historical Landfills: Thorpes

Client
Kilkenny County Council

Scale 1:2,500 **Page Size** A3

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5 RISK ASSESSMENT

5.1 Introduction

Risk assessment considers the likelihood of occurrence and the consequence of occurrence of an event (Royal Society, 1992[1]). ERA (Environmental Risk Assessment) is based on the development of a Conceptual Site Model (CSM) which is used to determine the potential exposure of a vulnerable receptor to a contaminant. The CSM is used as the basis for the risk assessment. It is used to identify all possible sources (S), pathways (P) and receptors (R) as well as the processes that are likely to occur along each of the source-pathway-receptor (S-P-R) linkages and uncertainties.

Based on the desktop investigation and completed site investigation, this CSM assumes the source to be the made ground containing waste deposit, the pathway to involve the migration of landfill gas, surface water and groundwater and the ultimate receptors to be the surface water features, groundwater, groundwater abstraction well and all human presence near the waste material.

5.2 Potential Pathways and Receptors

A pathway is a mechanism or route by which a contaminant encounters, or otherwise affects, a receptor. Contaminants associated with deposited waste may include leachate generated from groundwater/rainwater infiltration into the waste material and/or the generation of landfill gas from the degradation of the biodegradable fraction of deposited waste.

The potential pathways associated with the Thorpes site are:

- Groundwater migration;
- Surface water infiltration; and

5.2.1 Groundwater/Leachate Migration

According to the EPA CoP, there are three main pathways for leachate migration. These are:

- Vertically to the water table or top of an aquifer, where groundwater is the receptor
- Vertically to an aquifer and then horizontally in the aquifer to a receptor such as a well, spring or stream
- Horizontally at the ground surface or at shallow depth to a surface receptor

The migration and attenuation of leachate from the site depends on the permeability and thickness of subsoil and on both the bedrock permeability value and type. These elements are encompassed in groundwater vulnerability, groundwater flow regime and surface water drainage. The main receptors to leachate migration from this site are:

- Aquifer;
- Surface water features; and
- Human presence on or nearby the site

[1] Royal Society 1992, Risk: Analysis, Perception and Management. The Royal Society, London (ISBN 0-85403-467-6).

5.3 Conceptual Site Model

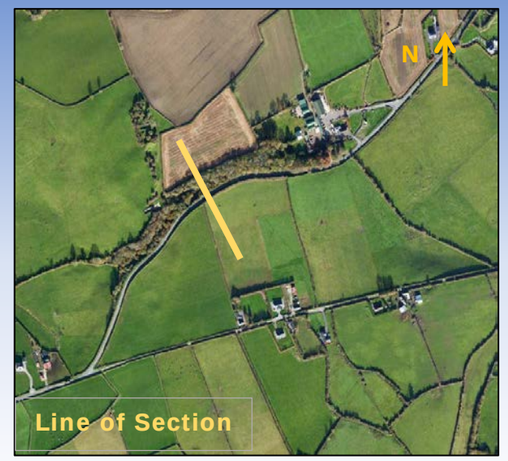
Based on the desktop investigation and site investigation works undertaken for Thorpes Historic Landfill, an assessment of the risk is made to confirm the source – pathway – receptor (S-P-R) linkages identified in the preliminary investigation. The results and analysis of the investigation has enabled a basic conceptual model to be produced for the site, which is presented in Figure 5.1, overleaf.

LANDFILL GAS

LEACHATE MIGRATION

ASSUMED INDUSTRIAL AND COMMERCIAL WASTE

GROUNDWATER LEVEL



DENSE TREE & VEGETATION COVER

R694 ROAD

EXPOSED WASTE STREAM BANK

FLY TIPPING WASTE BODY

GROUNDWATER (Assumed)

BALLYRAGGET STREAM

GLACIOFLUVIAL SANDS & GRAVELS

(West)

GROUNDWATER

Poor Bedrock Aquifer

Vulnerability Medium - High

SHALLOW & DEEP WELL DRAINED MINERAL SOILS

(East)

LIMESTONE BEDROCK

(West)

SW FLOW DIRECTION

West South-West

MUDDY SILTSTONE AND SILTY MUDSTONE BEDROCK

(East)

CROSS SECTION NORTH-WEST / SOUTH-EAST

FIGURE 5.1 THORPES HISTORIC LANDFILL

CONCEPTUAL SITE MODEL

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5.4 Risk Prioritisation

Risk prioritisation enables resources to be prioritised on the highest risk facilities and on the highest source – pathway – receptor linkage potential.

The risk prioritisation process assigns a score to each linkage and the overall score is the maximum of the individual linkages for the site. The higher the score a site/linkage receives the higher the risk.

To classify the risk, scores will be applied to the information obtained during the site investigation of Thorpes Historic Landfill. Where there is insufficient information available (i.e., where there is a high degree of uncertainty) the highest score is assumed.

In accordance with the EPA CoP (2007) the scoring matrices are as follows:

- Leachate: Source/hazard scoring matrix, based on waste footprint
- Landfill gas: Source/hazard scoring matrix based on waste footprint
- Leachate migration: Pathway (Vertical)
- Leachate migration: Pathway (Horizontal)
- Leachate migration: Pathway (Surface water drainage)
- Landfill gas: Pathway (Lateral migration potential)
- Landfill gas: Pathway (Upwards migration potential)
- Leachate migration: Receptor (Surface water drainage)
- Leachate migration: Receptor (Human presence)
- Leachate migration: Receptor (Protected areas – SWDTE or GWDTE) (Surface water/groundwater dependent terrestrial ecosystems)
- Leachate migration: Receptor (Aquifer category – Resource potential)
- Leachate migration: Receptor (Public water supplies – other than private wells)
- Leachate migration: Receptor (Surface water bodies)
- Landfill gas: Receptor (Human presence)

Table 5.1 calculates the points awarded to each of the headings listed above.

Table 5-1: Risk Classification Calculation – Thorpes Landfill

EPA Ref	Risk	Points	Rationale
1a	Leachate; source/hazard scoring matrix, based on waste footprint.	2.5	Based on a waste footprint of ≤1ha and the assumption that the waste observed is non-putrescible commercial and industrial type waste.
1b	Landfill gas; source/hazard scoring matrix, based on waste footprint.	2.5	Based on a waste footprint of ≤1ha and the assumption that the waste observed is non-putrescible commercial and industrial type waste.

EPA Ref	Risk	Points	Rationale
2a	Leachate migration: Pathway (Vertical)	2	Given the GSI describes the groundwater vulnerability as Low for the central and eastern areas and High within the western portion of the site, the score is 2.
2b	Leachate migration: Pathway (Horizontal)	1	The bedrock underlying the site is classified by the GSI as a Poor Aquifer – generally unproductive except for Local Zones.
2c	Leachate migration: Pathway (Surface water drainage)	2	Direct connection between the waste and surface Ballyragget stream along south and south-western site boundary.
2d	Landfill gas: Pathway (Lateral migration potential)	3	The sub-soils of the area are primarily described as 'glaciofluvial sands and gravels' in the western section of the site (as per GSI online mapping).
2e	Landfill gas: Pathway (Upwards migration potential)	0	No buildings or enclosed spaces above waste body
3a	Leachate migration: Receptor (Human presence)	2	Residential dwellings located within 250m south-west of the waste body.
3b	Leachate migration: Receptor (Protected areas – SWDTE or GWDTE) (Surface water/ groundwater dependent terrestrial ecosystems)	0	The nearest SAC/NHA (River Nore / Abbeyleix Woods Complex) is located greater than 1km from the waste body.
3c	Leachate migration: Receptor (Aquifer category – Resource potential)	1	The bedrock underlying the site is classified by the GSI as a Poor Aquifer – generally unproductive except for Local Zones.
3d	Leachate migration: Receptor (Public water supplies – other than private wells)	3	No public water supply within 1km of the site (Karst aquifer adjacent to site).
3e	Leachate migration: Receptor (Surface water bodies)	2	Direct connection between the waste and surface Ballyragget stream along south and south western site boundary.
3f	Landfill Gas: Receptor (Human presence)	1	Residential dwellings located within 250m south-west of the waste body.

Table 5-2: Normalised Score of S-P-R Linkage

Calculator		S-P-R Values	Maximum Score	Linkage	Normalised Score
Leachate migration through combined groundwater and surface water pathways					
SPR1	1a x (2a + 2b + 2c) x 3e	2.5 x (2+1+2) x 2 = 25	300	Leachate => surface water	8%
SPR2	1a x (2a + 2b + 2c) x 3b	2.5 x (2+1+2) x 0 = 0	300	Leachate => SWDTE	0%
Leachate migration through groundwater pathway					
SPR3	1a x (2a + 2b) x 3a	2.5 x (2+1) x 2 = 15	240	Leachate => human presence	6%
SPR4	1a x (2a + 2b) x 3b	2.5 x (2+1) x 0 = 0	240	Leachate => GWDTE	0%
SPR5	1a x (2a + 2b) x 3c	2.5 x (2+1) x 1 = 7.5	400	Leachate => Aquifer	2%
SPR6	1a x (2a + 2b) x 3d	2.5 x (2+1) x 3 = 22.5	560	Leachate => Surface Water	4%
SPR7	1a x (2a + 2b) x 3e	2.5 x (2+1) x 2 = 15	240	Leachate => SWDTE	6%
Calculator		**S-P-R Values**	**Maximum Score**	**Linkage**	**Normalised Score**
Leachate migration through surface water pathway					
SPR8	1a x 2c x 3e	2.5 x 2 x 2 = 10	60	Leachate => Surface Water	17%
SPR9	1a x 2c x 3b	2.5 x 2 x 0 = **0**	60	Leachate => SWDTE	0%
Landfill gas migration pathway (lateral & vertical)					
SPR10	1b x 2d x 3f	2.5 x 3 x 1 = **7.5**	150	Landfill Gas => Human Presence	5%
SPR11	1b x 2e x 3f	2.5 x 0 x 1 = **0**	250	Landfill Gas => Human Presence	0%
Site maximum S-P-R Score					**17%**
Risk Classification					**C – Low Risk**

Table 5.2 shows the maximum S-P-R scoring for the site is **17%.**

The following are the risk classifications applied:

- Highest Risk (Class A) Greater than 70 for any individual SPR linkage
- Moderate Risk (Class B) 41-69 for any individual SPR linkage
- Lowest Risk (Class C) Less than 40 for any individual SPR linkage

Based on this, the site can be classified as a **Low Risk Classification (Class C)**. The highest risk identified within the Low Risk Classification is the migration of leachate from the site to the Ballyragget Stream surface water receptor. The decision to declassify the risk from Moderate Risk Class B (as per Tier 1 assessment) to a Low Risk Class C is based on the age of the waste mass and the non-putrescible constituents identified during the site walkover. Further, surface water monitoring undertaken indicates no measurable effect on surface water quality downstream of the site.

For a low risk site, the CoP directs that the site will have to apply for a certificate of authorisation to certify compliance with Regulation 7(7) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008.

6 CONCLUSIONS & RECOMMENDATIONS

A Tier 2 study was conducted by FT in accordance with the EPA CoP for Thorpes Historic Landfill. The study consisted of a desktop study, site walkover survey and surface water sampling. These works informed the development of the CSM and risk screening model.

Prior to the environmental monitoring at Thorpes, the topography (steep slopes), presence of dense vegetation overgrowth across the waste tipping areas and limited access points restricted the ability to conduct intrusive works at the site. Due to the dense tree cover, it was decided to reduce the scope of the investigative works to assess the surface water quality upstream and downstream of the site.

Analysis of surface water samples SW1 (downstream) and SW2 (upstream) when assessed against the MAC (1989) and EQS (2009) quality standards were found to be below the guideline values in all assessments.

The results of the Tier 2 assessment and risk model indicate that the site is a **Low Risk Classification (Class B)**. The principal risk identified on the site is the migration of leachate from the site to the Ballyragget Stream surface water receptor. Surface water monitoring undertaken indicates no measurable effect on surface water quality downstream of the site.

The reclassification of the overall risk from Moderate Risk Class B (as per Tier 1 assessment) to a Low Risk Class C is based on the age of the waste mass and the non-putrescible constituents identified during the site walkover.

6.1 Recommendations

It is recommended that Kilkenny County Council proceeds to apply for a Certificate of Authorisation for this site subject to further monitoring as outlined below.

It is recommended that surface water monitoring be undertaken at both monitoring locations, SW1 and SW2, monthly for three months prior to the Certificate of Authorisation application.

In the event that the results continue to indicate (as per the finding of this report) that this site is: “not considered to pose a significant risk to environment or human health”, for a low-risk site, the CoP directs that the site will have to apply for a certificate of authorisation to certify compliance with Regulation 7(7) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008.

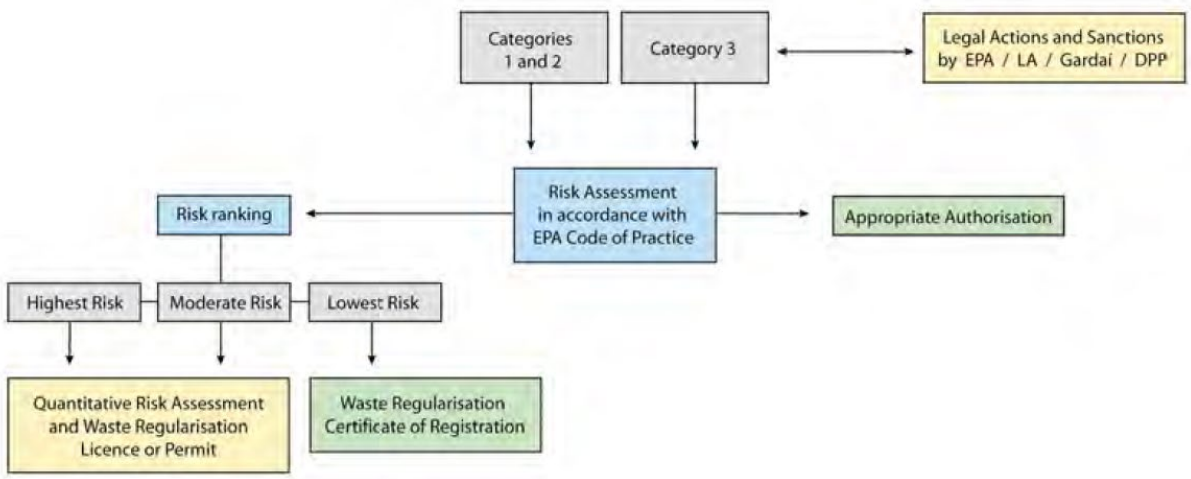


Figure 6-1: Extract from Section 1.3 of the EPA Code of Practice

Appendix 1

Tier 1 Study

RISK SCREENING **SITE:** Thorpes, Ballyragget

TABLE		SCORE	RATIONALE
Leachate Hazard	1a	5	0.2 ha Municipal.
Landfill Gas Hazard	1b	5	0.2 ha Municipal.
Leachate Migration – Ground Water Vulnerability	2a	3	extreme vulnerability
Leachate Migration – Ground Water Flow Regime	2b	5	Regionally Important Karstified Aquifer
Leachate Migration – Surface Water Drainage	2c	2	stream adjacent.
Landfill Gas – Lateral Migration	2d	1.5 3	Limestone hills.
Landfill Gas – Vertical Migration	2e	0	no receptor above source.
Leachate Migration – Human Presence	3a	2	house 180m from site.
Leachate Migration – Protected Areas	3b	0	none in. locality
Leachate Migration – Aquifer Category	3c	5	Regionally Important Aquifer.
Leachate Migration – Public Water Supplies	3d	3 0	Greater than 1km Karst Aquifer.
Leachate Migration – Surface Water Bodies	3e	3	Surface water body adjacent to site.
Landfill Gas – Human Presence	3f	1	Human presence >150, <250m.

	SPR LINKAGE SCORE		MAX LINKAGE SCORE	NORMALISED SCORE
SPR 1	1a X (2a + 2b + 2c) X 3e 5 (3+5+2) 3	150	300 (GW → SW)	Surface water 50 %
SPR 2	1a X (2a + 2b + 2c) X 3b (SWDTE) 5 (3+5+2) 0	0	300	0 %
SPR 3	1a X (2a + 2b) X 3a 5 (3+5) 2	80	240	33 1/3 %
SPR 4	1a X (2a + 2b) X 3b 5 (3 + 5) 0	0	240	0 %
SPR 5	1a X (2a + 2b) X 3c 5 (3 + 5) 5	200	400 (GW → GW)	50 %
SPR 6	1a X (2a + 2b) X 3d 5 (3 +5) 3	120	560	21.4 %
SPR 7	1a X (2a + 2b) X 3e 5 (3 + 5) 3	120	240 (GW → SW)	50 %
SPR 8	1a X 2c X 3e 5 (2) 3	30	60 (SW → SW)	50 %
SPR 9	1a X 2c X 3b (SWDTE) 5 (2) 0	0	60	0 %
SPR 10	1b X 2d X 3f 5 (1.5) 1	7.5	150	5 %
SPR 11	1b X 2e X 3f 5 (0) 1	0	250	0 %

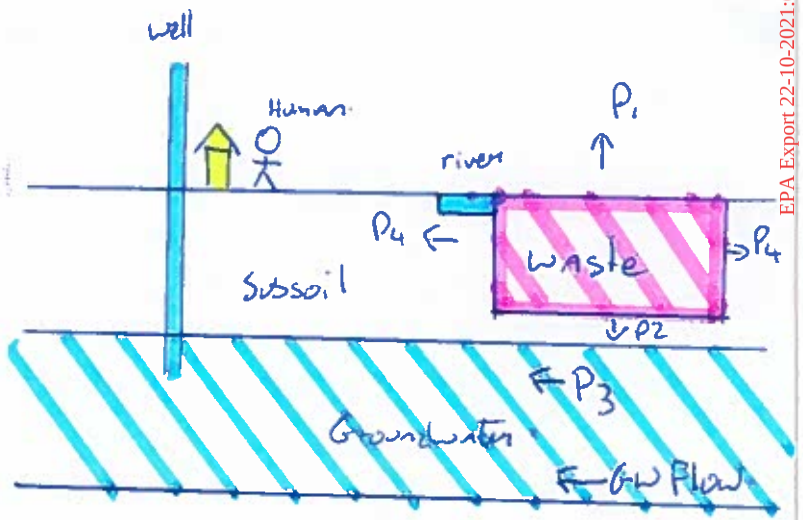
SPR 1 - 50 - Adjacent stream, vulnerable Karst Reg Aquifer.
SPR 5 - 50 - Aquifer
SPR 7 - 50 - ~~river adjacent stream~~ public water supply.
SPR 8 - 50 - river adjacent stream

APPENDIX 2: Walkover Survey Checklist

Walkover Survey Checklist		
Information	Checked	Comment (include distances from site boundary)
1. What is current Land Use?	✓	not in use.
2. What are the neighbouring Land Uses?	✓	Agriculture
3. What is the size of the site?	✓	0.2 ha.
4. What is the topography?	✓	slope down towards river.
5. Are there potential receptors (if yes, give details)?		
Houses	✓	188 m to nearest house.
Surface water features (if yes, distance and direction of flow)	✓	river adjacent site.
Any wetland or protected areas	✓	none.
Public Water Supplies	✓	700 m
Private Wells	✓	17am
Services	✓	not mapped
Other buildings	✓	house is closest.
Other		
6. Are there any potential sources of contamination (if yes, give details)?		
Surface waste (if yes, what type?)	–	none noted.
Surface ponding of leachate	–	none noted.
Leachate seepage	–	none noted.
Landfill gas odours	–	none noted.
7. *Are there any outfalls to surface water?* (If yes, are there discharges and what is the nature of the discharge?)	–	none noted.
8. Are there any signs of impact on the environment? (If yes, take photographic evidence)	–	no,
Vegetation die off, bare ground	–	no
Leachate seepages	–	no
Odours	–	no.
Litter	–	no
Gas bubbling through water	–	no
Signs of settlement,	–	no.

subsidence, water logged areas	–	no
Drainage or hydraulic issues	–	no.
Downstream water quality appears poorer than upstream water quality	–	not checked.
9. Are there any indications of remedial measures? (Provide details)		
Capping	–	subsoil
Landfill gas collection	–	no
Leachate collection	–	no.
10. Describe fences and security features (if any)	–	no.
Any other relevant information?		

Plan



P_1 - landfill gas - vertical migration

P_2 - leachate migration - unsaturated zone.

P_3 - leachate migration - saturated zone.

P_4 - landfill gas - horizontal migration

Cross Section

area

Kilkenny Local Authorities Interactive Mapping

Ordnance Survey Ireland

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

NOTES:

7267m²

0.7 ha.

conservative estimate

Note: Map Scalebar is an approximate result

Aquifer

Kilkenny Local Authorities Interactive Mapping

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

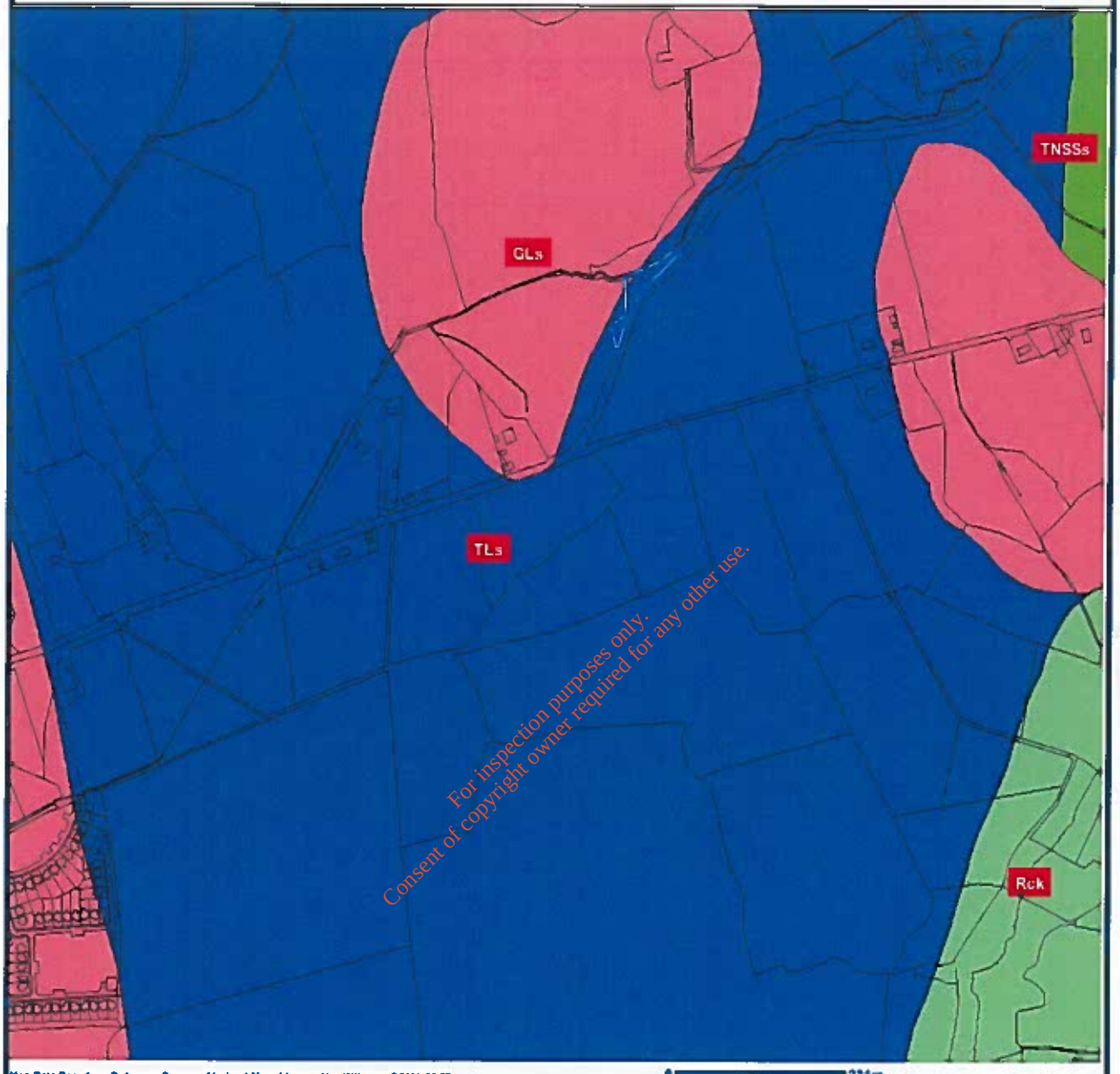
NOTES:

Pl - Gen unproductive except local zones.
Rkd - Regionally Important Karstified.

→ Regionally Important Karstified.

Note: Map Scalebar is an approximate result

subsoils



Kilkenny Local Authorities Interactive Mapping

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

NOTES:

Limestone hills TLs

Note: Map Scalebar is an approximate result

Vulnerability

Kilkenny Local Authorities Interactive Mapping

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

NOTES:

extreme vulnerability.

Note: Map Scalebar is an approximate result

GW flow

Kilkenny Local Authorities Interactive Mapping

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

NOTES: GW Flow.

Note: Map Scalebar is an approximate result

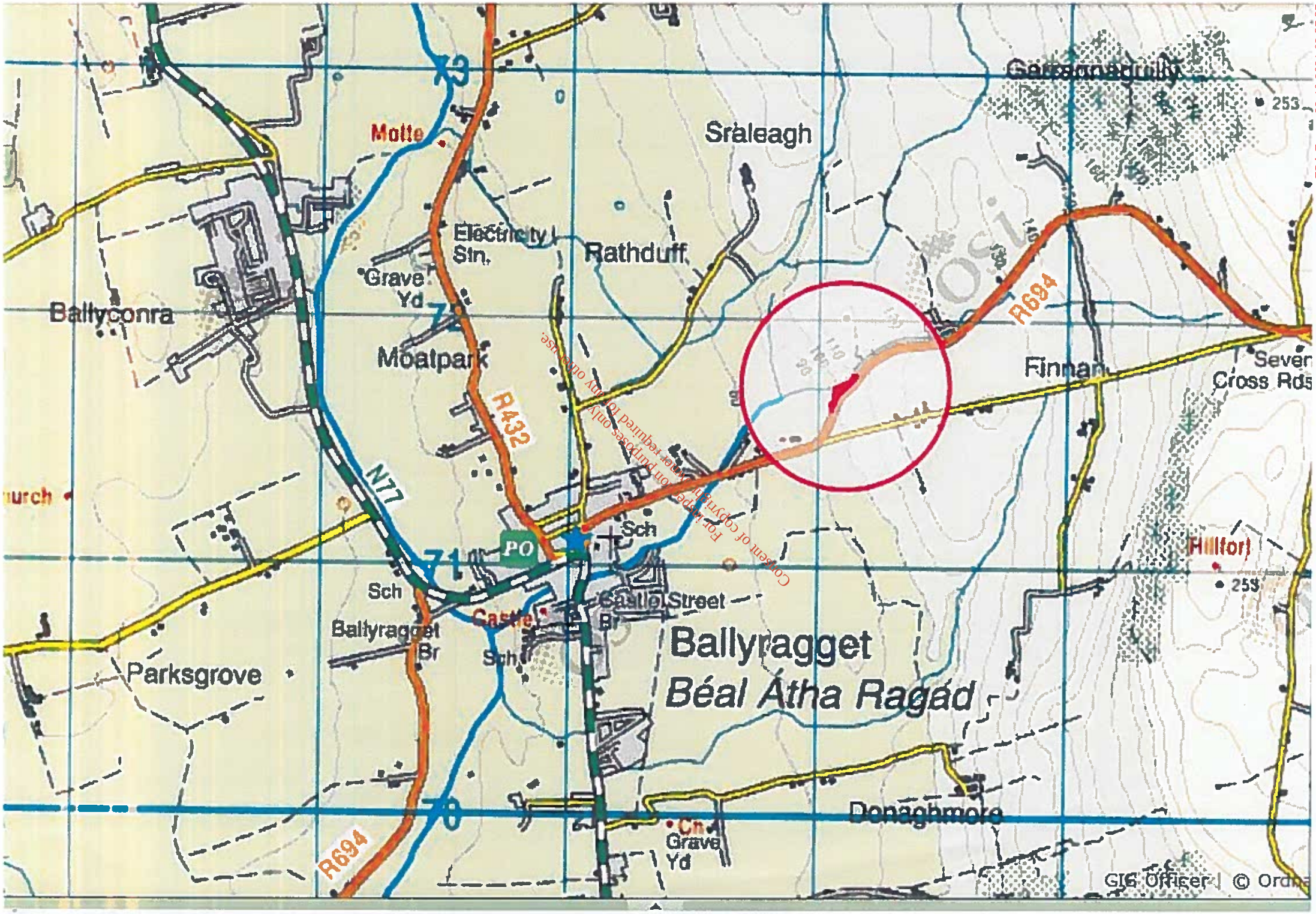
aerial picture

Kilkenny Local Authorities Interactive Mapping

Based on Ordnance Survey of Ireland Map, Licence No.: "Kilkenny CCMA 2003-2007

NOTES:

Note: Map Scalebar is an approximate result



Appendix 2

Site Walkover Checklist and Photo Log

Appendix II

Site Walkover Photographs

Prepared for: Kilkenny County Council

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Thorpes, Ballyragget, Co. Kilkenny	Project Number: P1723

Photo No.1	Date: 21/08/2018

Description:

Thorpes access road

Photo No.2	Date: 21/08/2018

Description:

Access to site by foot, sloping north west to south east

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Thorpes, Ballyragget, Co. Kilkenny	Project Number: P1723

Photo No.3 | **Date:** 21/08/2018

Description:

Large metal items dump on slope face sloping from road adjacent to the southern site boundary down to the stream within the site

Photo No.4 | **Date:** 21/08/2018

Description:

Large waste items on slope adjacent to road and in stream

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Thorpes, Ballyragget, Co. Kilkenny	Project Number: P1723

Photo No.5	Date: 21/08/2018

Description:

Waste in stream running through site

Photo No.6	Date: 21/08/2018

Description:

Plastic litter in stream, upstream of main waste deposits

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Thorpes, Ballyragget, Co. Kilkenny	Project Number: P1723

Photo No.7	Date: 21/08/2018

Description:

Slope up to road adjacent to southern sit boundary with stream at base of slope

Photo No. 8	Date: 21/08/2018

Description:

Vegetation on slope up to road adjacent to southern site boundary

Walkover Survey Checklist

Thorpe Historic Landfill Co. Kilkenny

Walkover Survey Checklist		
Information	**Checked**	**Comment (include distances from Site Boundary)**
1. What is the current land use?	✓	Unregistered Land
2. What are the neighbouring land uses?	✓	Agricultural
3. What is the size of the site?	✓	0.2 ha
4. What is the topography?	✓	The site comprises a small valley, which falls from the road adjacent to the southern site boundary to meet a stream at the base of the valley, and then raise to the north on the far side of the stream. The site is well vegetated with trees and ground is uneven.
5. Are there potential receptors (if yes, give details)?	✓	Stream on site
Houses	✓	There are dwellings approximately 200 m to the south east and south west of the site boundary
Surface water features (if yes, distance and direction of flow)?	✓	Yes, a stream runs from north east to south west through the site
Any wetland or protected areas?	✓	River Barrow and River Nore (approximately 1.5 km west of the site and approximately 4.0 km to the southeast of the site)
Public water supplies?	✓	Groundwater drinking water protection area 2.5km west of site boundary
Private wells?	✓	Nearest domestic borehole recorded at 0.5 km from site boundary.
Services?	✓	No
Other buildings?	✓	No
Other?		
6. Are there any potential sources of contamination (if yes, give details)?		
Surface waste (if yes, what type)?	✓	Yes, stream running north east to south west through site
Surface ponding of leachate	✓	No
Leachate seepage	✓	No
Landfill gas odours	✓	No
7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)	✓	No
8. Are there any signs of impact on the environment? (if yes, take photographic evidence)	✓	Large metal waste items on slope falling from road to meet the stream
Vegetation die off, bare ground	✓	No

Walkover Survey Checklist

Thorpe Historic Landfill Co. Kilkenny

Leachate seepages	✓	No
Odours	✓	No
Litter	✓	Large waste items visible as well as smaller plastics littered on site
Gas bubbling through water	✓	No
Signs of settlement	✓	No
Subsidence, water logged areas	✓	No
Drainage or hydraulic issues	✓	No
Downstream water quality appears poorer than upstream water quality	✓	Not tested
9. Are there any indications of remedial measures? (Provide details)		
Capping	✓	Possibly fly tipping site, cannot determine if capped
Landfill gas collection	✓	No
Leachate collection	✓	No
10. Describe fences and security features (if any)	✓	Site fenced with hedgerows along road boundary, fenced with agricultural electric fence on remaining boundaries
Any other relevant information?		

Appendix 3

Surface Water Laboratory Results

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Daniel Hayden

CERTIFICATE OF ANALYSIS

Date:	28 September 2018
Customer:	D_FTIM_DUB
Sample Delivery Group (SDG):	180920-159
Your Reference:	Surface Water
Location:	Thorpes
Report No:	474401

This report has been revised and directly supersedes 474266 in its entirety.

We received 2 samples on Thursday September 20, 2018 and 2 of these samples were scheduled for analysis which was completed on Friday September 28, 2018. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	180920-159	**Client Reference:**	Surface Water	**Report Number:**	474401
Location:	Thorpes	**Order Number:**	Z1237	**Superseded Report:**	474266

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
18372401	SW1		0.00 - 0.00	19/09/2018
18379843	SW2		0.00 - 0.00	19/09/2018

Maximum Sample/Coolbox Temperature (°C) :

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

12.2

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	180920-159	**Client Reference:**	Surface Water	**Report Number:**	474401
Location:	Thorpes	**Order Number:**	Z1237	**Superseded Report:**	474266

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)					18372401				18379843	
Customer Sample Reference					SW1				SW2	
AGS Reference										
Depth (m)					0.00 - 0.00				0.00 - 0.00	
Container					250ml BOD (ALE212)	500ml Plastic (ALE208)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)	250ml BOD (ALE212)	500ml Plastic (ALE208)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)
Sample Type					SW	SW	SW	SW	SW	SW	SW	SW
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 2					X				X	
Anions by Kone (w)	All	NDPs: 0 Tests: 2				X				X		
BOD True Total	All	NDPs: 0 Tests: 2			X				X			
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 2				X				X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2						X				X
Dissolved Oxygen by Probe	All	NDPs: 0 Tests: 2				X				X		
pH Value	All	NDPs: 0 Tests: 2				X				X		

Validated

CERTIFICATE OF ANALYSIS

SDG:	180920-159	**Client Reference:**	Surface Water	**Report Number:**	474401
Location:	Thorpes	**Order Number:**	Z1237	**Superseded Report:**	474266

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	SW1	SW2				
			Depth (m)	0.00 - 0.00	0.00 - 0.00				
			Sample Type	Surface Water (SW)	Surface Water (SW)				
			Date Sampled	19/09/2018	19/09/2018				
			Sample Time	.	.				
			Date Received	20/09/2018	20/09/2018				
			SDG Ref	180920-159	180920-159				
			Lab Sample No.(s)	18372401	18379843				
			AGS Reference						
BOD, unfiltered	<1 mg/l	TM045		<1 #	<1 #				
Oxygen, dissolved	<0.3 mg/l	TM046		10.1	10.3				
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099		<0.2 #	<0.2 #				
Conductivity @ 20 deg.C	<0.005 mS/cm	TM120		0.56 #	0.543 #				
Sodium (Dis.Filt)	<0.076 mg/l	TM152		19.7 #	17.4 #				
Potassium (Dis.Filt)	<0.2 mg/l	TM152		3.51 #	3.45 #				
Sulphate	<2 mg/l	TM184		13.6 #	14.4 #				
Chloride	<2 mg/l	TM184		21.1 #	23.6 #				
pH	<1 pH Units	TM256		8.08 #	8.08 #				

CERTIFICATE OF ANALYSIS

SDG:	180920-159	**Client Reference:**	Surface Water	**Report Number:**	474401
Location:	Thorpes	**Order Number:**	Z1237	**Superseded Report:**	474266

Table of Results - Appendix

Method No	Reference	Description
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method 5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	Determination of BOD5 (ATU) Filtered by Oxygen Meter on liquids
TM046	Method 4500G, AWWA/APHA, 20th Ed., 1999	Measurement of Dissolved Oxygen by Oxygen Meter
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	180920-159	**Client Reference:**	Surface Water	**Report Number:**	474401
Location:	Thorpes	**Order Number:**	Z1237	**Superseded Report:**	474266

Test Completion Dates

Lab Sample No(s)	18372401	18379843
Customer Sample Ref.	SW1	SW2
AGS Ref.		
Depth	0.00 - 0.00	0.00 - 0.00
Type	Surface Water	Surface Water
Ammoniacal Nitrogen	27-Sep-2018	26-Sep-2018
Anions by Kone (w)	28-Sep-2018	27-Sep-2018
BOD True Total	26-Sep-2018	26-Sep-2018
Conductivity (at 20 deg.C)	27-Sep-2018	25-Sep-2018
Dissolved Metals by ICP-MS	28-Sep-2018	27-Sep-2018
Dissolved Oxygen by Probe	22-Sep-2018	21-Sep-2018
pH Value	28-Sep-2018	25-Sep-2018

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.