


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

Signed: 

Dated: 17 October 2018



OFFICE OF ENVIRONMENTAL SUSTAINABILITY

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

TO:	Eimear Cotter, Director, OES
FROM:	Magnus Amajirionwu, Inspector, Environmental Licensing Programme
DATE:	17 October 2018
RE:	Application by Westmeath County Council for a Certificate of Authorisation for a closed landfill at Moate, County Westmeath. Certificate of Authorisation Register Number H0456-01.

1. Application details

Type of facility:	Closed landfill as defined in the Regulations ¹
Original site ownership	Westmeath County Council
Current site ownership	Westmeath County Council
Operator of closed landfill	Westmeath County Council
Proposed use post remedial works	The development of the site for sport/recreational use including a public amenity facility and green field area.
Risk category of closed landfill	High risk (class A) <ul style="list-style-type: none">Reasons: pollutant linkages:<ul style="list-style-type: none">Leachate migration to ground and surface water,Human receptors from landfill gas migration.
Section 22 register number	S22-02412
Application received	26/09/2013

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

AA screening determination	11/09/2018 Screened out.
Regulation 7(4) notice	11/09/2018
Additional information received	13/09/2018
Name of Qualified Person:	Sean Moran (MSc, Eur. Geol., P. Geol.) of O'Callaghan Moran & Associates Credentials provided by Institute of Geologists of Ireland
EPA site inspection	None required

2. Information on the closed landfill

Location of facility	<p>The site is located in the townland of Killeenyboylegan, on the southern outskirts of Moate, as shown on Figure 1. The National Grid Reference is 219161: 238151. It is accessed from the N80 Moate to Clara National Secondary Road.</p> <p>The site was a quarry void prior to being used as a landfill. The original ground comprised peat overlying gravels. Peat and, possibly, part of the underlying gravel were excavated from across most of the site.</p>
Period of landfilling	Approximately 1970 – 1990
Surrounding area	<p>The landfill is bordered to the north by a stone wall, to the east by a roadway and to the west and south by hedgerows. A stream runs along the southern site boundary. The source of the stream is suggested to be a spring that rises to the east of the site and flows to the west. A field drain along the western boundary confluences with the stream to the south west of the site (see Figure 2).</p> <p>The original topography of the site sloped from north to south but this has been altered by the waste deposition. There is a high point near the south-central part of the fill with shallow falls in all directions.</p> <p>There are houses immediately to the north and within 10 metres of the site boundary, and a farm building to the east. The lands to the south, east and west of the site are agricultural. The Council's waste water treatment plant is approximately 500m to the south.</p>
Area of the closed landfill	The site occupies an area of 3.4 ha, as shown on Figure 2.
Quantity of waste at the facility	61,000 m ³ estimated.
Characterisation of waste deposited	<p>Site investigations turned up construction and demolition waste, domestic waste, commercial waste and industrial waste including car parts and fragments of steel.</p> <p>The testing of representative samples recovered from trial pits confirmed the field observations that the waste comprises well degraded municipal waste.</p>

3. Site investigations

<p>Current condition and appearance of closed landfill</p>	<p>The site of the former landfill is currently being used as a playground, civic amenity and green field area. A portion of the site is also used for storing road planings. It is proposed by Westmeath County Council to retain the site as a playground, civic amenity and green field.</p> <p>There was a change in the land use in 2009 with the provision of a playground and civic amenity area. The civic amenity (bring bank centre) is to the north of the playground and contains bottle, aluminium cans and clothes banks.</p> <p>The construction of the playground involved the placement of 600mm of Clause 804 aggregate on a geotextile layer which was then covered with approximately 324m² of soft asphalt. The hard core extends beyond the asphalted area. The playground is surrounded by a 1.2m high railing. Drainage from the play area is directed to the stream along the southern boundary. Condition 3 of the recommended certificate of authorisation requires the appropriate management of surface water runoff emanating from the site.</p> <p>The area to the south of the playground is used to temporarily store road planings.</p> <p>In the undeveloped part of the site, the waste has been covered with thin layer of topsoil, which is underlain by a gravelly clay, ranging from 0.2 to 1.2m across the site, being thickest in the central area.</p>
<p>Site investigations</p>	<p>The site investigations were carried out in two stages. The Preliminary stage involved the excavation of trial pits and trenches, and the collection and testing of waste samples to establish the nature and extent of the waste. The Detailed stage comprised the installation of leachate, landfill gas and groundwater monitoring wells, the collection and analysis of leachate, groundwater and surface water samples and landfill gas monitoring.</p> <p>Intrusive site investigations, 2007:</p> <ul style="list-style-type: none"> • 13 trial pits to depth 2.5 – 4.6 metres below ground; • 10 trenches were then excavated within the waste body; • 5 pits were excavated in the undisturbed ground north of the deposition area to establish natural ground conditions; • 3 combined leachate and landfill gas monitoring wells inside the body of the waste; • 4 combined groundwater and landfill gas wells outside the waste; <p>In addition, two locations were used for surface water samples at the stream at the southern boundary of the site.</p> <p>Samples of soil, groundwater, leachate and surface water were dispatched for analysis.</p> <p>Landfill gas monitoring took place <i>in situ</i> on 23 occasions between 2007 and 2018.</p>
<p>Monitoring and analysis of samples (water, gas, waste)</p>	<p>For the risk assessment, monitoring carried out between 2007 and 2018 was as follows:</p> <ul style="list-style-type: none"> • 29 rounds of gas sampling were done at 7 locations. • Leachate samples were taken at 3 locations. • Eluate testing was carried out on 7 waste samples.

	<ul style="list-style-type: none"> • Surface water was sampled in 2 locations. • Groundwater was sampled in 1 location. • Soil was sampled in 4 locations.
Hydrology	<p>The waste fill area of the site is domed and slopes from the centre of the site to the north, east, west and south. As stated earlier, there is a stream along the southern site boundary. It is probable, based on site observations, that the flow in the stream is affected by seasonal conditions.</p> <p>The water level in the stream is approximately 2m below the ground level at the southern site boundary. There is an open drain running along the western site boundary, which is a tributary of the stream. The stream flows to the south and is a tributary of the Cloghatanny River, which flows to the south east to join the River Brosna.</p>
Hydrogeology	<p>The site is underlain by the Waulsortian Limestone Formation, which is described as a massive pale grey limestone. The formation is classified by the GSI as a locally important aquifer (LI), being moderately productive only in local zones. In 2007, the bedrock aquifer vulnerability was classified by the GSI as ranging High to Low (HL). Based on the topographic gradient it is estimated that groundwater flow is from north to south.</p> <p>There is no record of any groundwater wells in the vicinity of the site.</p>
Leachate and water quality	<p>Leachate results indicate a very low strength leachate, with all parameters either at the lower end or less than the range in EPA's Landfill Design Manual. This is consistent with an aged, predominantly non-hazardous waste mass that has undergone significant biodegradation. The analyses included total suspended solids, alkalinity, BOD, ammoniacal nitrogen, COD, electrical conductivity, pH, chloride and total hardness.</p> <p>The stream at the southern site boundary is approximately 2m from the southern edge of the waste. Given the assumed direction of groundwater flow from north to south and the fact that the source of the stream is a spring at the south-eastern site boundary, there is the potential for leachate to enter the stream either via contaminated groundwater, or seepage through the stream banks. The flow in the stream is from east to west. Surface water samples were taken in the stream at two locations (SW-1 and SW-2) on the 15th June 2007. SW-1 is at the south-eastern site boundary and is upstream of the fill area. SW-2 is at the south-western site boundary, downstream of the fill area and the confluence with a tributary drain. The samples were analysed for a range of organic and inorganic parameters that included indicators of general water quality and leachate contamination: pH, electrical conductivity, dissolved oxygen, ammonia, hardness, COD, BOD, orthophosphate, nitrate, total suspended solids and chloride. All the parameters, except for the BOD, were below the relevant environmental quality standards (EQS). A decrease in concentration was noted in COD, nitrate, chloride and suspended solids levels between the upstream and downstream. The water quality at SW-2 was good, with no evidence of leachate contamination.</p>
Landfill gas	<p>The ongoing generation of landfill gas at the landfill and the close proximity of buildings and the presence of a playground means that landfill gas migration poses a risk to property and people.</p> <p>Monitoring results were compared to guideline limits from the Department of the Environment (DOE) publication on the 'Protection of New Buildings and Occupants from Landfill Gas' (1994). The guidelines stipulate that, where carbon dioxide or methane are present in a landfill at 0.5% v/v and</p>

	<p>1% v/v respectively, then housing should not be erected within 50m of the landfill and private gardens should not be allowed within 10m.</p> <p>In 2007, persistent elevated methane (up to 7.9% v/v) were detected in MW-1 and MW-2 (located in the waste body), but was not detected in MW-3 (also located in the waste body). The carbon dioxide levels in both MW-2 (9.8% v/v) and MW-3 (6.7% v/v) persistently exceeded the DOE limit.</p> <p>Methane was not detected in MW-4 to MW-7 (located outside the waste body). Carbon dioxide was detected in these monitoring wells: MW-4 (4.5% v/v), MW5 (4.4% v/v), MW-6 (4.2% v/v) and MW-7 (3.6% v/v).</p> <p>In 2018, methane was detected in MW-1 (up to 3.8% v/v) and MW-2 (up to 2.4% v/v). Carbon dioxide levels (up to 10% v/v) remain above the DOE limit in all the wells within the waste body. No methane was detected in any of the monitoring wells (MW-4 to MW-7) outside the waste body. Carbon dioxide levels in these wells (ranging from 2.8% to 5.6% v/v) remain above the DOE limits.</p> <p>Given the distance to the existing residences from the edge of the fill area (approximately 10m to the north of the northern site boundary) and the measured gas concentrations, it is considered that landfill gas generated by the waste does not present a significant risk to these dwellings. However, the gas does present a risk to the children’s playground and civic amenity area although, at present, the risk to users of both the playground and civic amenity area is negligible, given the absence of enclosed spaces in which landfill gases can accumulate.</p> <p>Landfill gas generation and migration is the focus of the risk assessment and proposed remedial actions submitted by Westmeath County Council.</p>
Conceptual site model	<p>The conceptual site model developed in 2007 and provided with the original application identified the following pollutant linkages:</p> <ul style="list-style-type: none"> • human health exposure due to landfill gas; • migration of leachate into the surface water body south of the waste body; and • migration of leachate into the underlying aquifer. <p>The conceptual site model is shown in Figure 4. The source, pathways and receptors can be described as follows:</p> <p>Source:</p> <ul style="list-style-type: none"> – Rainfall on the landfill will preferentially percolate through the cap and into the waste. – Leachate is generated in the waste albeit at low strength. – Gas is generated at the landfill. <p>Pathway:</p> <ul style="list-style-type: none"> – Leachate can migrate through the base of the landfill into underlying aquifer beneath. – Seeps of leachate discharge into the surface water body south of the site. – Gas migration can occur through the permeable cap and into bedrock aquifer beneath the waste. – Gas migration beyond the site boundary through field drains. <p>Receptors:</p> <ul style="list-style-type: none"> – Existing houses in close proximity to the site and users of the public amenity and children’s playground on site. – The bedrock aquifer beneath the site.

	- The surface water south of the site.
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4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only)</p>	<p>Leachate migration through surface water pathway SPR 8, Receptor = surface water body.</p> <p>Landfill gas migration through lateral and vertical pathway SPR 10, Receptor = Human SPR 11, Receptor = Human</p> <p>Summary: Upon the review of the updated monitoring data;</p> <ul style="list-style-type: none"> - the impact of leachate migrating from the site is considered not significant on the receiving water quality. - remedial action is warranted to address the risk of offsite migration of landfill gas from the site particularly across the northern boundary and the risk of gas percolation through the existing cap into publicly used areas.
<p>Proposed remedial actions</p>	<p>The risk assessment and remedial actions are based on the current use at the closed landfill – i.e. undeveloped (green field) except for a civic amenity area and children’s playground inside the site boundary. According to the risk assessment, the thickness of the waste ranged from 2.5 to 4.6m, with an average thickness of 3.3m.</p> <p>The risk assessment recommends further remedial works if in future it is decided by the County Council to construct new dwellings on lands adjacent to the waste deposition area or if planning permission is granted for the recreational use of the site. It also recommends that no buildings or enclosed spaces be constructed or provided at either the playground or civic amenity area.</p> <p>The standard certificate of authorisation Condition 1.5 will ensure that future developments are not unnecessarily restricted. However, the construction of new structures on a continually gassing landfill will need a revision of the risk assessment should development proposals come forward, for example via applications for planning permission. It is therefore recommended to insert a new Condition 1.6 to ensure that the construction of any buildings will only take place following:</p> <ul style="list-style-type: none"> • consideration by the EPA of a revised risk assessment, and • the grant of a revised certificate of authorisation for the closed landfill. <p>No further capping is proposed in the application and risk assessment, though there is varying thickness of capping across the landfill. As stated earlier in Section 3, the undeveloped part of the site has the waste covered with thin layer of topsoil, which is underlain by a low permeability gravelly clay, ranging from 0.2 to 1.2m, being thickest in the central area. Condition 3 of the recommended certificate of authorisation specifies additional capping in the undeveloped (green field) areas of the site in line with EPA Landfill Manuals – Landfill Restoration and Aftercare (1999).</p> <p>The remedial measures proposed include the installation of a landfill gas migration barrier north of the northern edge of the waste between it and the residential area. The barrier would extend the full length of the</p>

	<p>northern edge and will comprise a trench excavated to approximately 3m below ground level, with a flexible membrane liner (such as High Density Polyethylene) placed against the northern face and the trench backfilled with granular material. Consequently, and in view of the recorded concentration levels (above the DOE limits) of methane and carbon dioxide in some locations of the landfill, Condition 3 of the recommended Certificate of Authorisation requires Westmeath County Council to carry out specified remedial works including capping and gas remediation measures.</p> <p>It is intended to break the SPR linkages by:</p> <ul style="list-style-type: none"> • preventing potential migration of landfill gas to offsite locations, and • to vent the gas in a controlled manner to the atmosphere. <p>Estimated cost: €136,000.</p> <p>Condition 3.15 of the recommended certificate of authorisation provides for a communications programme directed at the occupiers of properties north of the site and users of the public amenity and children’s playground on the site. The communications programme will inform these residents of what they should be doing to protect their property.</p>
Proposed aftercare monitoring and assessment	<p>Monitoring as specified in Condition 3.5 of the recommended certificate of authorisation.</p> <p>Validation report to be submitted within 30 months.</p>
Adequacy of risk assessment	<p>Regulation 7(7) of the Regulations states that the EPA must be satisfied with the risk assessment before proposing to grant a certificate of authorisation. The risk assessment is adequate for the following reasons:</p> <ul style="list-style-type: none"> • It has identified, assessed and adequately addressed the associated risks inherent with the landfill site. • An Appropriate Assessment screening was also completed to evaluate the potential risk to the European sites associated with the adjoining receiving waters • Report of Tier 2 intrusive investigation show that municipal waste deposited in the landfill was relatively low in biodegradable waste. Therefore, the waste deposits in the “closed landfill” will present relatively low risks of ongoing leachate and gas generation.

5. Appropriate assessment

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the proposed activity, individually or in combination with other plans or projects is likely to have a significant effect on any European Site. In this context, particular attention was paid to the European Site at the Clara Bog [SAC 000572].

The assessment is documented in Part III of the recommended certificate of authorisation.

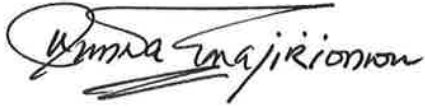
6. Consultation

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

7. Recommendation

I recommend granting the certificate of authorisation as proposed.

Signed

A handwritten signature in black ink, appearing to read 'Magnus Amajirionwu', with a stylized flourish above the name.

Magnus Amajirionwu

17/10/2018

Date

Procedural Note

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

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

Figure 1 Location of Moate landfill (yellow boundary) as originally delineated in the section 22 register



Figure 2 Boundaries at the closed landfill.

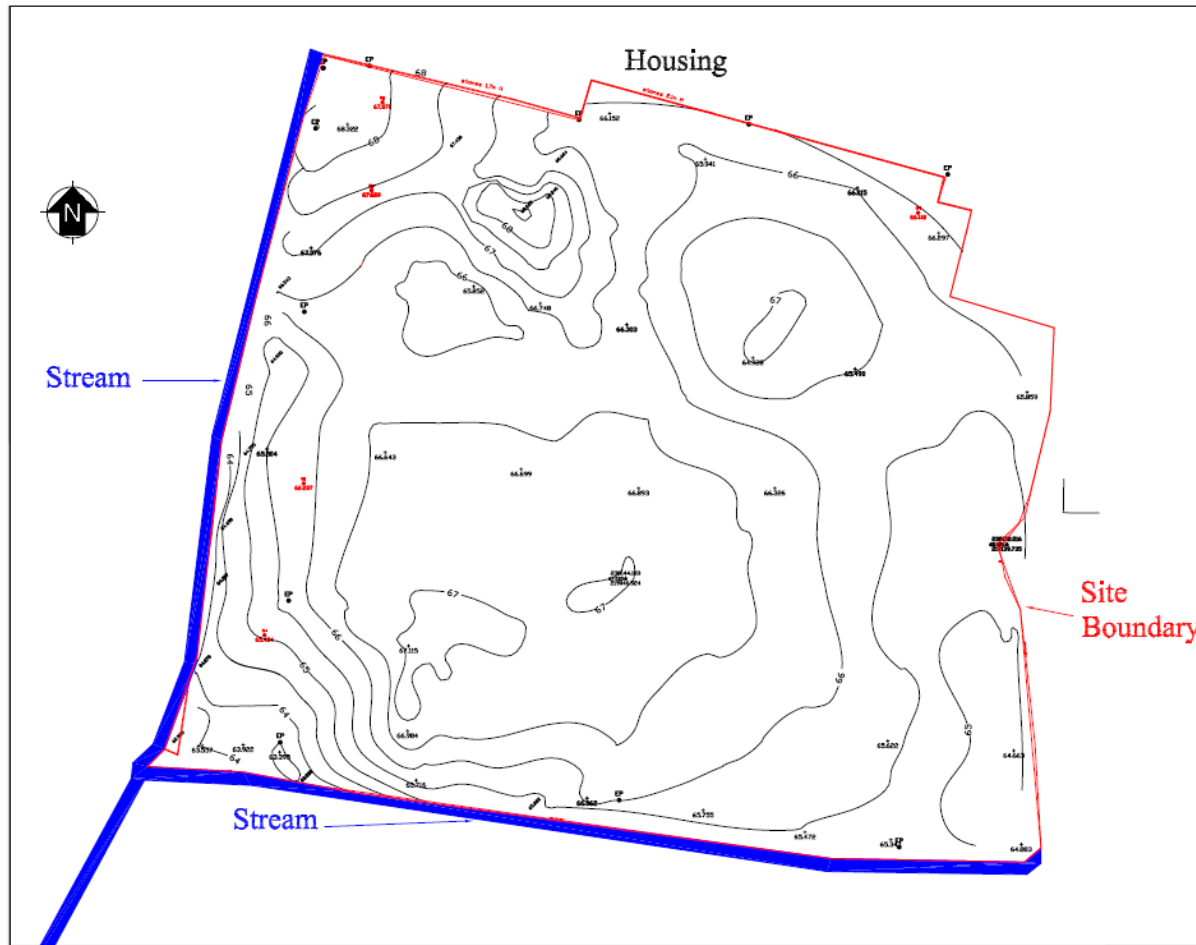


Figure 3 Ordnance survey map 1942 showing the area of the landfill prior to waste deposition

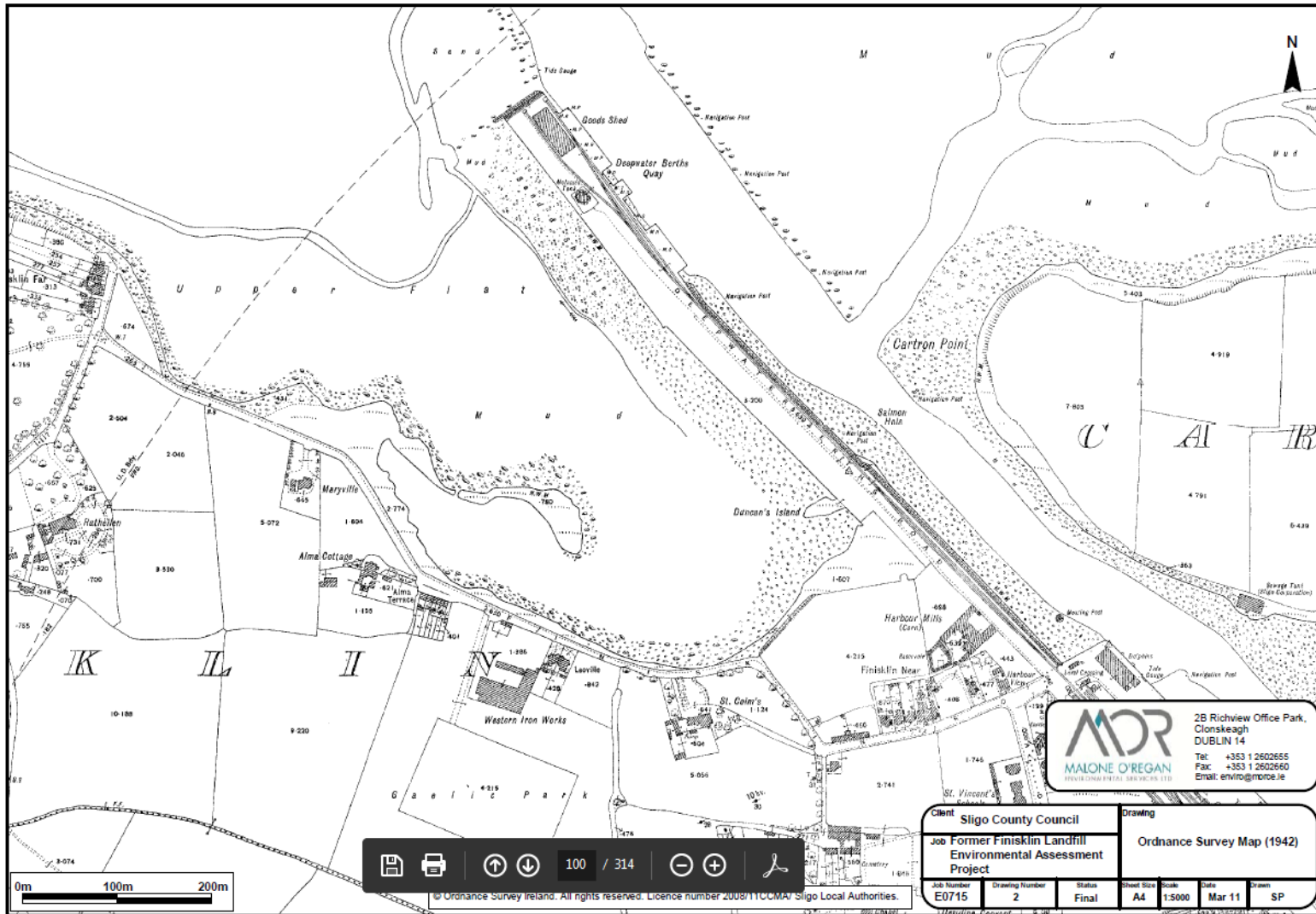


Figure 4 Conceptual site model

