

DixonBrosnan
environmental consultants

**Biological Assessment of the watercourses
surrounding Ballynagran Landfill site,
Ballynagran, Co. Wicklow 2021**

On Behalf of
O'Callaghan Moran & Associates
January 2022

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Project	Biological Assessment of the watercourses surrounding Ballynagran landfill site, Ballynagran, Co. Wicklow 2021	
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1. Introduction

1.1 Background

Dixon.Brosnan were commissioned by O'Callaghan Moran & Associates to carry out an aquatic survey of the streams surrounding the Ballynagran Landfill Ltd site, Ballynagran, Co. Wicklow. This facility operates under Waste Licence W0165-02 issued by the Environmental Protection Agency (EPA) and this assessment was undertaken as per Schedule D of the licence. Surface water runoff from the facility is discharged to several streams, which all join the Three Mile Water River.

1.2 Aim of Report

The survey, which consisted of biological analyses at nine sampling stations was carried out to assess the current water quality of the streams at these stations. The results are compared to those obtained during previous surveys. This report has been prepared with regard to the following guidance documents, where relevant.

1.3 Authors of Report

This report was prepared by Carl Dixon MSc. (Ecological Monitoring) and Cian Gill MSc. (Ecological Monitoring)

Carl Dixon MSc (Ecology) is a senior ecologist who has over 20 years' experience in ecological and water quality assessments with particular expertise in freshwater ecology. He also has experience in mammal surveys, invasive species surveys and ecological supervision of large-scale projects. Projects in recent years include the Waste to Energy Facility Ringaskiddy, Shannon LNG Project, supervision of the Fermoy Flood Relief Scheme, Skibbereen Flood Relief Scheme, Upgrade of Mallow WWTP Scheme, Douglas Flood Relief Scheme, Great Island Gas Pipeline etc. He has carried out ecological surveys and prepared AA/NIS reports for a range of projects.

Cian Gill MSc (Ecology) is a qualified ecologist with ten years' experience working with wildlife and ecology-based NGOs and public bodies in Ireland, the UK and the US. Past projects include invasive species planning for the city of Rosemount, Minnesota, and the Under The Sea project for Essex Wildlife Trust. Recent projects include ecological reports for a range of projects including housing, quarries and industrial developments.

2. Location

Eight of the sampling locations were identified in previous biological assessment reports undertaken by Golder Associates Ireland (GAI), and for the purposes of consistency, these sampling locations were also used for the 2021 survey. An additional station (10) has been included since 2011 due to site upgrading works. Station 9 was not utilised on this occasion as a result of the site becoming inaccessible due to changes at the site. Seven of the monitoring stations are located on three internal streams within the development site, and the remaining two monitoring stations are located downstream of the site on the Three Mile Water river. The survey locations were chosen to illustrate the effect, if any, of the landfill on the surrounding watercourses. All nine sampling locations are shown on Figure 1 and Figure 2.

Construction of a new motorway has led to alterations to sampling stations SW5 and SW6. SW6 remains in the same location; however, it is now in a more exposed location and less shaded. Stream bed alterations have caused it to become a shallow riffle. SW5 was moved 50m downstream as the original location is now culverted. The new location is not shaded and is dominated by shallow pool and glide. Works in the fields either side of SW8 have also changed the shade and flow of the stream slightly. In 2017, SW4 was moved approximately 10m upstream of its previous location due to recent works in the stream by the landowner and SW3 was relocated to the opposite side of the road due to access issues. None of these slight changes in location would be expected to impact on results.

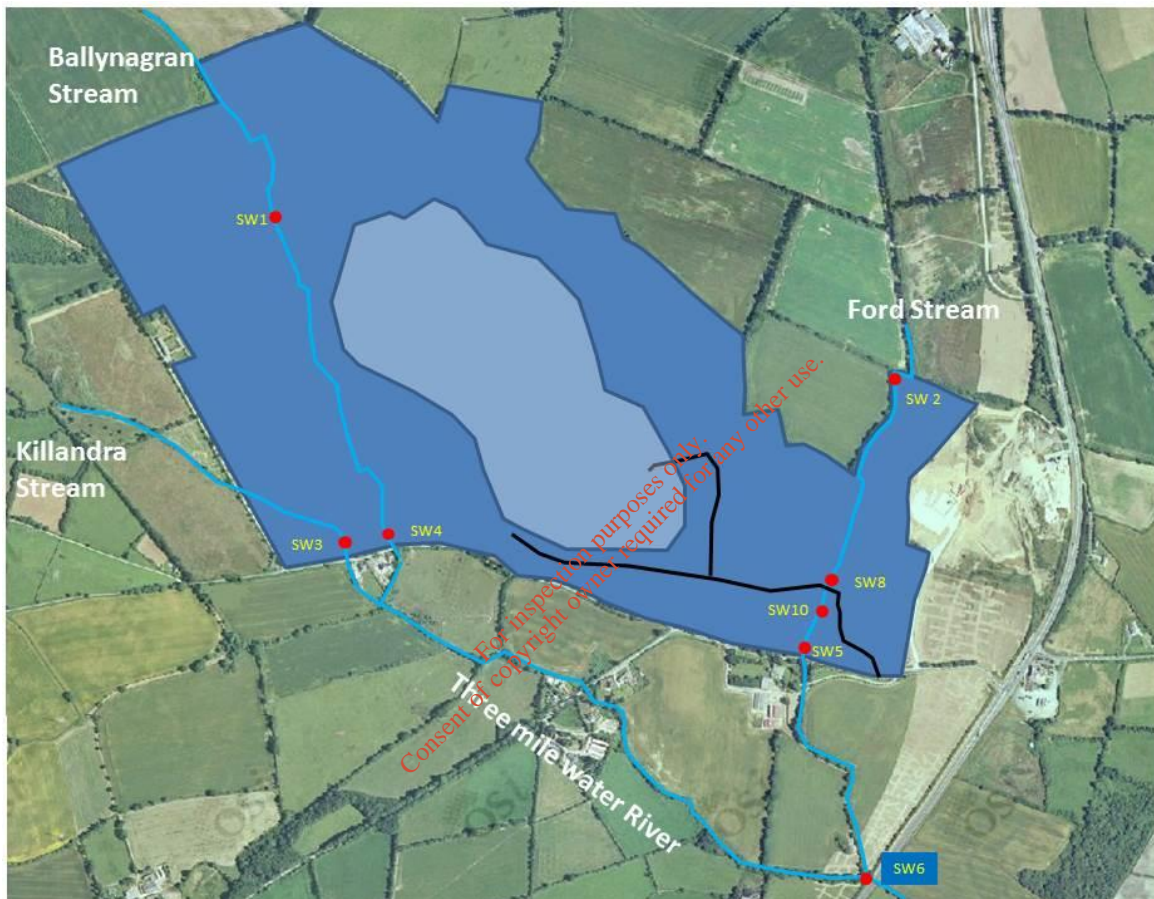


Figure 1. Ballynagran biological sampling locations.



Figure 2. Ballynagran biological sampling locations continued.

3. Survey Methodology

The field survey was undertaken on 12th October 2021. Biological sampling was carried out at each station using the kick-sampling technique as described by the EPA (1999). The kick-sampling technique involved using a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged in a fast-flowing area of the river bed with its mouth directed upstream. Where available, riffle habitat was utilised. The substrate immediately upstream of the net was kicked for two minutes to dislodge invertebrates. Stone washings were also undertaken to ensure a representative sample of the fauna present at each site is collected. Samples are transferred to plastic containers and preserved using 70% alcohol. Samples are subsequently sieved and sorted using a white sorting tray. Identification was undertaken in the laboratory using a high-powered binocular microscope and using standard identification keys.

To establish the water quality of the two samples the EPA protocol for calculating Q values was utilised (Toner *et al*, 2005). This biotic index is used by the EPA and allows river quality to be compared under standardized guidelines. This method divides macro-invertebrates into five groups, depending on their sensitivity to pollution as presented in **Table 1**.

Table 1. Macroinvertebrate Sensitivity Classes

Group	Sensitivity
A	Sensitive
B	Less Sensitive
C	Tolerant
D	Very tolerant
E	Most tolerant

Having determined the relative proportions of the various organisms in a sample, water quality can be inferred by a comparison of this data with that which might be expected from unpolluted habitats of the type under investigation. The Q-value determined using the fauna collected at each station therefore provides an indication of the quality of the water at that station. The relationship between Q values and water quality is set out in **Table 2** below. The relationship between the Q-rating system and the Water Framework Directive classification as defined by the Surface Waters) Regulations 2009 (S.I. 272 of 2009) is shown in **Table 3**.

Table 2. Q-value and water quality

Q-value	Water quality	Status
5	Good	Satisfactory
4	Fair	Satisfactory
3	Doubtful	Unsatisfactory
2	Poor	Unsatisfactory
1	Bad	Unsatisfactory

Table 3. Correlation between the WFD classification and Q values

Ecological status WFD	Q Values
High	Q5, Q4-5
Good	Q4
Moderate	Q3-4
Poor	Q3, Q2-3
Bad	Q2, Q1

4. Characteristics of Sampling Stations

Table 4. Characteristics of Sampling Stations

Site	Stream name	Stream characteristics at monitoring location	Instream vegetation	Riparian vegetation	Flow type	Flow width m	channel depth cm	% Shade
SW1	Ballynagran stream	10% boulders, 30% cobbles, 40% gravel, 20% sand	None	Oak, cherry, bramble, willowherb, gorse, ferns, mosses.	Glide	0.30	<10	70
SW2	Ford stream	20% cobbles, 50% gravel, 30% sand	None	Willow, ash, bramble, nettle	Riffle	1.1 – 3.0	15 - 30	85
SW3	Killandra stream	5% boulders, 40% cobbles, 40% gravel; 5% sand & mud	Brooklime, Fool's watercress	Alder, holly, hawthorn, bramble, nettle, rose.	Riffle	1.5 - 2.0	10 - 20	95
SW4	Ballynagran stream	5% cobbles, 55% gravel, 40% sand	None	Sycamore, holly, oak, nettle, montbertia.	Glide	0.7	<10	85-90
SW5	Ford stream	53% cobbles, 65% gravel, 5% sand & mud	Limited amount of Fool's watercress	Alder, gorse, pheasant bush, bramble, nettle, Willowherbs, hemlock water dropwort	Pool and glide	1.2	20	40
SW6	Three mile water River	20% cobbles, 35% gravel, 40% sand & mud, 5% boulders	Fools Watercress, Common Waterstarwort	Sycamore, alder, willow, ash, ivy, on roadside. Very open	Glide	3.5	20 - 50	15
SW7	Three mile water River	10% boulders, 30% cobbles, 40% gravel, 20% sand & mud	Limited fools watercress	Sycamore, ash, alder, oak, bramble, hogweed, nettle	Glide to riffle	3.3 – 4.0	20 - 40	85
SW8	Ford stream	40% cobbles, 45% gravel, 15% sand & mud	Fools watercress, Rosebay Willowherb	Alder, birch, Willow	Glide to pool	1.9	15	<5
SW10	Ford Stream	60% cobbles, 20% gravel, 20% sand & mud	Fools Watercress, <i>Cladophora sp.</i>	Gorse, Beech. Very shaded.	Riffle	2m	15	80

5. Results – Biological Survey 2021

Macro-invertebrates found at each site were identified down to the lowest taxon required for the determination of Q value, using the rating systems described in section 3. The results of the biological survey are presented in **Table 5**.

Table 5. Macroinvertebrates Identification and Q Values

Taxa	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW10
Group A									
<i>Amphinemura sp.</i>									
<i>Rhithrogena semicolorata</i>									
GROUP B									
Leuctridae	C10				F5		C5	C6	
Glossosomatidae									
Limnephilidae	P1								
Sercostomatidae									
Odontoceridae									
Goeridae									
GROUP C									
<i>Caenis sp.</i>					P2		F4		N10
<i>Baetis rhodani</i>							C10		F3
<i>Ephemerella ignita</i>									
<i>Rhyacophila dorsalis</i>									
<i>Hydropsyche sp.</i>							P1		
<i>Plectroemia sp.</i>									
<i>Polycentropus sp.</i>									
Elminthidae									
Helodidae									
Dryopidae									
<i>Gammarus duebeni</i>				C6		P2	D17	N9	P2
<i>Potamopyrgus jenkinsi</i>									
<i>Ancylus fluviatilis</i>				F3					

Taxa	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW10
Simuliidae				C6					P1
Tipulidae/Tabanidae	P1	P1							
Chironomidae	F5	F5					P2	P2	
GROUP D									
Hirudinea				F4	C4				
<i>Lymnea peregra</i>									
<i>Asellus aquaticus</i>					F3	P2	F5	P1	F4
Group E									
<i>Tubificidae sp.</i>	F4	F3	F3						
<i>Chironomous sp.</i>					P2				
OTHER									
Oligochaeta									
<i>Gordius spp</i>			P2	C10	C10	C6	P2		
Acari		N20	N15			C9			
Number of families identified	5	4	3	5	6	4	8	4	4
Q values	3	3	2-3	3	3	3	3	3	3

6. Results Summary

A summation of the 2021 assessment is given in **Table 6**. **Table 7** shows the 2021 results in relation to previous results.

Table 6. Macroinvertebrates Identification and Q Values

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW10
Q-value	3	3	2-3	3	3	3	3	3	3
Diversity (no. of families)	5	4	3	5	6	4	8	3	4
Rating	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted	Moderately Polluted
Quality Class	Class C	Class C	Class C	Class C	Class C	Class C	Class C	Class C	Class C
WFD status	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor

Table 7. Comparison with results from 2008-2021

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW10
2021 Q Value	Q3	Q3	Q2-3	Q3	Q3	Q3	Q3	Q3	Q3
2020 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2019 Q value	DRY	Q3	Q3	DRY	Q3	Q3	Q3	Q3	DRY
2018 Q value	DRY	Q3	Q3	DRY	Q3	Q3	Q3	Q3	DRY
2017 Q Value	Q3	Q3	Q3	Q3	Q3	Q3	Q3-4	Q3	Q3
2016 Q value	Q3	Q3	Q3	Q3	Q3	Q3-4	Q3	Q3	Q3
2015 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2014 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2013 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2012 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2011 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3
2010 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	DRY
2009 Q value	Q3-4	Q3	Q3	Q3	Q3	Q3	Q3	Q3	DRY
2008 Q value	Q3	Q3	Q3	Q3	Q3	Q3	Q3-4	Q3	DRY

7. Discussion & Conclusions

SW9 was inaccessible for sampling, but otherwise all watercourses had flows sufficient for sampling. A Q-value of 3 was assigned to all sites with the exception of SW3 and the results were generally consistent with the results from previous years. A Q value of 2-3 was assigned to site SW3 due to the absence of Group B and C species and low biodiversity. This site is located upgradient of the landfill.

The most sensitive, Group A species were not recorded at any of the surveyed sites. Small numbers of *Leuctra sp.* stonefly were recorded at sites SW1, SW5, SW7 and SW8. The only other Group B species recorded was limnephilid cased caddis at site SW1. The Group C species *Gammarus duebeni*, which is a moderately tolerant species, was generally the dominant taxa and was recorded at sites SW4, SW6, SW7, SW8 and SW10. Other Group C species recorded included *Caenis* and *Baetis* species which were patchily distributed. The Group D species *Asellus aquaticus* was recorded at SW5, SW6, SW7, SW8 and SW10. Leech (Hirudinea) was recorded at SW4 and SW5 respectively.

The Q values assigned in 2021 were the same as those awarded in 2019, with the exception of SW3 and only slight differences in Q values have been recorded since 2008. A Q value of 3-4 was recorded at sites SW1 and SW7 in 2009 and at SW3 and SW6 in 2008, and at SW6 in 2017.

There were no significant differences in results from the sites which can be considered up gradient of the landfill (SW1-SW3) and those considered down-gradient of the landfill (SW5-SW8). As noted above site SW9 was inaccessible. There are no indications that the landfill is having any impact on water quality in the surrounding watercourses.

8. References

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