TIER 2

ENVIRONMENTAL RISK ASSESSMENT

APPENDIX B

ECOLOGICAL ASSESSMENT

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BIOLOGICAL WATER QUALITY ASSESSMENT OF THE POTTLEBOY STREAM AT COOTEHILL, CO. CAVAN

Aerial of Pottleboy, Cootehill, Co. Cavan

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1 INTRODUCTION

1.1 BACKGROUND

Whitehill Environmental was commissioned by Traynor Environmental Ltd to undertake an ecological assessment of the Pottleboy Stream at Pottleboy, Cootehill, Co. Cavan. This stream is unnamed in current or historical maps of the area, but it will be referred to as the Pottleboy Stream for the purposes of this assessment.

The Pottleboy Stream is a small stream that flows adjacent to an historical landfill site at Pottleboy. This small municipal landfill (approximately 0.5 acres) operated from 1967 until its closure in 1985. Upon closure it was capped with soil and piped to allow the release of gases.

The historic landfill is in the townland of Pottleboy, approximately 0.6km south of Cootehill town centre. It is surrounded by agricultural land to the south, south-east and south-west and by residential areas to the north.

The Pottleboy Stream flows in a southerly direction along the northern and western boundaries of the landfill, before it flows under the road.

The location of the historic landfill can be seen in Figure 1.

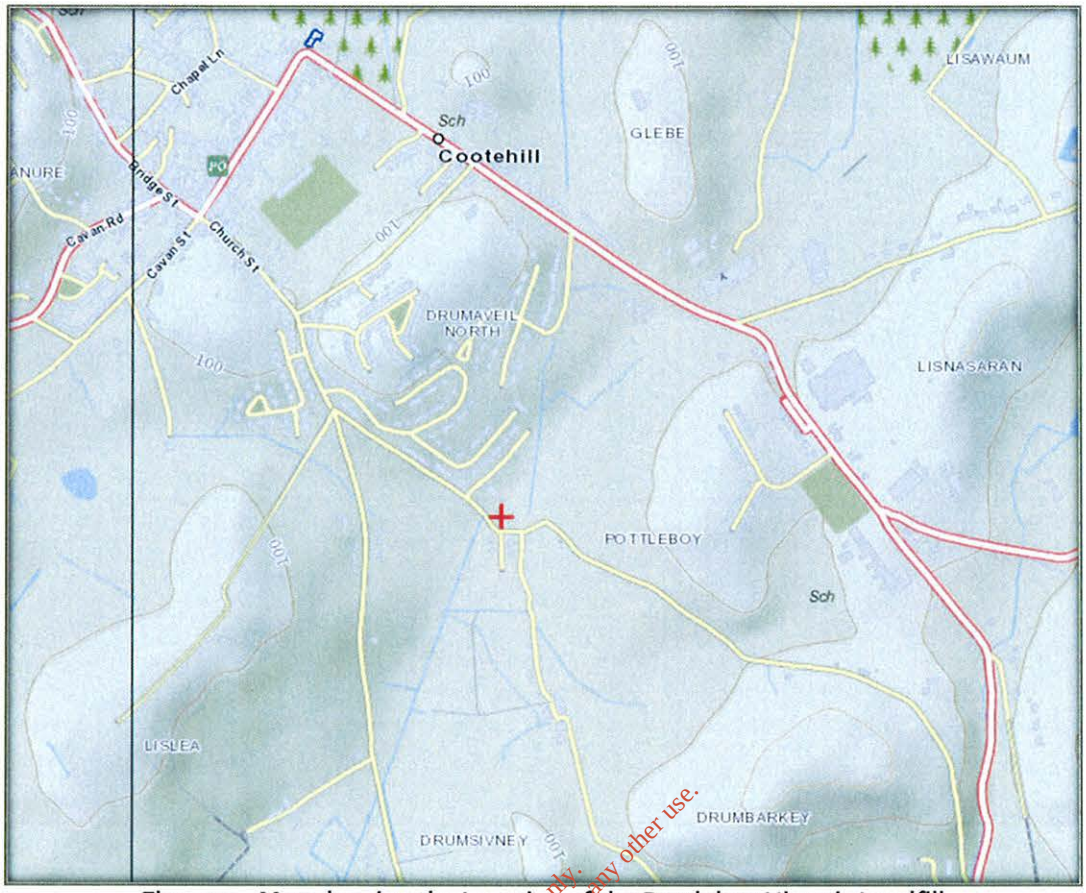

Figure 1 – Map showing the Location of the Pottleboy Historic Landfill (Indicated with a Red Cross)

1.2 THE POTTLEBOY STREAM

From an inspection of the historical maps of the area, it seems that the Pottleboy Stream rises in the townland of Pottleboy, approximately 350m north of the landfill site. It flows mostly through agricultural land in a southerly direction for approximately 1.3km, until it reaches the Annalee River in the townland of Campstown.

The Annalee River flows from Lough Sillan near Shercock in a westerly direction through Lough Tacker and south of Cootehill, until it reaches Butlersbridge. To the west of this village it then flows through a series of lakes, before its confluence with the River Erne.

2 METHODOLOGY

2.1 SAMPLING POINT LOCATIONS

Biological water quality assessment was carried out at two separate locations on the Pottleboy Stream, i.e., upstream and downstream of the landfill site. The sampling locations are described in the Table 1 and illustrated in Figure 1. Fieldwork was carried out on October 31st 2014. The weather on this day was wet.

Station No.	Location	Grid Reference
1	~ 40m downstream of landfill	H 60666 13580
2	~ 18m upstream of landfill	H 60562 13529

Table 1 – Sampling Locations on the Pottleboy Stream

Figure 2 – Sampling Points Along the Pottleboy Stream (Numbered in Red)

2.2 INVERTEBRATE SAMPLING AND WATER QUALITY ASSESSMENT

At each station, the surrounding habitats were noted along with other parameters such as water flow, stream depth and the predominance of vegetation. Where possible, at each station a two minute kick sample was taken with a Freshwater Biological Association approved hand held sweep net with a mesh diameter of 500µm. If a kick sample was not suitable, then a two-minute sweep sample of the in-stream vegetation and was taken instead. The samples were retained in plastic containers at the sampling site. In the laboratory, any mud was removed from each sample by sieving under running water through a 500 µm sieve. The sieved samples were then sorted live in a white sorting tray under a bench lamp. All macro-invertebrates were removed from the samples and preserved in 70% ethanol. They were later counted and identified to an appropriate taxonomic level. Based on the relative abundance of indicator species, a biotic index (Q rating) was determined for the sites in accordance with the biological assessment procedure used by the Environmental Protection Agency (Toner *et al.* 2005). All indicator species are assigned to one of five different groups based on their tolerance to pollution. Group A are the most sensitive invertebrates and Group E are the least sensitive.

In addition to the Q rating, the small stream risk score (SSRS) was also applied. The SSRS is a rapid risk assessment tool based on the presence of certain macro-invertebrate groups. It is designed for first and second order streams and it is at a more basic level than the Q assessment. It is useful however for determining if a certain stream is at risk or not.

A simple diversity index called the Berger-Parker Diversity Index was also calculated for each site. This index has the formulae

$$D = N_{max} / N$$

Where N_{max} is the number of individuals of the most abundant taxon and N is the total abundance of all individuals in the sample. With this diversity index, the value decreases with increased diversity. The reciprocal is therefore used so that an increase in the value of the index accompanies an increase in measured diversity.

3 RESULTS

The results of the biological water quality assessment are described below. A full breakdown of these results and the interpretation of these results is given in Appendix I.

3.1 STATION ONE – DOWNSTREAM OF LANDFILL

The Pottleboy River at Station One, i.e., downstream of the landfill, was approximately 2m wide and 20-30cm deep. There was a dense cover of riparian vegetation, including hawthorn, willow and bramble. The siltation level of the stream at this point was extremely high and the substrate was obviously anoxic, indicting very low dissolved oxygen levels. The water was turbid in colour. Due to the extreme levels of siltation at this point, an in-stream kick sample was not possible; therefore a sample of the macro-invertebrates from the vegetation and substrate was obtained from the bank.

Numbers of macro-invertebrates at the station were high, however diversity was very low. The more sensitive taxa from Group A and B were absent. Group C and D taxa were the only groups represented. Group C taxa were represented by the invasive amphipod *Gammarus pulex* and the gastropod *Potamopyrgus jenkinsi.* Although the genus Gammarus is entirely within Group C, it is likely that this grouping was derived solely for the native amphipod *Gammarus duebeni.* However, in recent years the alien species *Gammarus pulex* has colonised and out-competed *Gammarus duebeni* in many river systems. *Gammarus pulex* is more tolerant of organic pollution and lower DO levels than *Gammarus duebeni* and it is probably more suited within Group D. However, it is unlikely that this genus will be separated into different tolerance groupings in the near future.

Group D were also numerous in this sample and these taxa are quite tolerant of organic pollution and low DO levels. Bivalves from the Sphaeriidae family were the most abundant organism in the sample.

Based on the presence of certain indicator groups, this station (downstream of the landfill) was assigned a Q2/3, indicating poor ecological status. A re-grouping of the Gammarus genus would put this station as a Q2. This is unsatisfactory. In addition, the Small Stream Risk Score puts this stream well within the *At Risk* category.

3.2 STATION TWO – UPSTREAM OF LANDFILL

The Pottleboy Stream upstream of the landfill site was approximately 1.5m wide and 30cm deep. The substrate was stony at this point and siltation levels were relatively low. Flow was moderate and a kick sample was obtained from an oxygenating habitat, just upstream of where the stream flowed into a culvert. The colour of the water here was quite turbid.

The numbers of macro-invertebrates here were relatively high and biodiversity was quite low. Group A taxa were absent and Group B was represented entirely by seven cased caddis from the Limnephilidae family. This taxa is sensitive to organic pollution. Group C taxa dominated the sample and as at the previous station *Gammarus pulex* was recorded in very large numbers. Other Group C taxa included *Potamopyrgus jenkinsi.* Group D taxa were scare and mostly represented by the bivalve Sphaeriidae.

Based on the presence of certain indicator groups, this station (upstream of the landfill) was assigned a Q3, indicating poor ecological status. However, it should be borne in mind that *Gammarus pulex* was the dominant organism in this sample therefore a Q3 could be over-estimating the actual ecological status. Overall, the stream is unsatisfactory at this point and the Small Stream Risk Score puts this stream well within the *At Risk* category.

4 DISCUSSION AND RECOMMENDATIONS

Overall, the Pottleboy Stream is suffering from pollution in the Pottleboy area. The ecological status of the stream downstream of the historical landfill site is worse than the upstream status. This indicates that the landfill is possibly having a negative impact upon the stream. The substrate in the stream is anoxic indicating very low DO levels and siltation is high.

Upstream of the landfill is also poor. Diffuse run-off from agricultural land is probably the main culprit here. Although siltation levels here were lower than that of downstream, the water was quite turbid in appearance. This may have been due to the prolonged spell of heavy rain in the days preceding the survey.

Under the EU Water Framework Directive, all waterbodies in Ireland must achieve good ecological status within a defined time period. At its current status, the Pottleboy Stream is at risk of not achieving this target.

4.1 RECOMMENDATIONS

- An analysis of the water chemistry upstream and downstream of the landfill site should be undertaken in order to obtain a more robust understanding of the reasons for poor ecological status within the Pottleboy Stream;
- There is quite a lot of debris, wood and rubbish in the stream. This is impeding the flow of the water, reducing its attenuation capacity. This should be removed.
- With the agreement of all landowners, soil disturbance close to the Pottleboy Stream should be ceased and a buffer area could be agreed upon.
- In future, any run-off from agricultural works or any areas of exposed soil could be channelled and intercepted at regular intervals for discharge to silt-traps or lagoons with over-flows directed to land rather than the stream.
- Inland Fisheries Ireland could be consulted for advice on re-mediating this river.

5 APPENDIX I- RESULTS OF POTTLEBOY STREAM MONITORING

Station One (Downstream) – Q Value

Indicator Group	Taxon	Number	%
Group A	**Absent**	**0**	**0**
(Very sensitive)			
Group B	**Absent**	**0**	**0**
(Moderately sensitive)			
Group C		**229**	**44.29**
(Moderately tolerant)	**Amphipoda**		
	Gammarus pulex	202	39
	Diptera (True Flies)		
	Chironomidae	3	0.58
	Gastropoda		
	Planorbidae	1	0.19
	Potamopyrgus jenkinsi	19	3.67
	Trichoptera		
	Hydropsychidae	4	0.77
Group D		**253**	**48.9**
(Very tolerant)	**Isopoda (Lice)**		
	Asellus aquaticus	3	0.58
	Hirudinea (Leeches)		
	Glossiphonidae	1	0.19
	Bivalves		
	Sphaeriidae	249	48.2
Group E	**Absent**	**0**	**0**
(Most tolerant)			
Not Assigned to Group		**35**	**6.76**
	Oligochaetes	35	6.76
Total Abundance		**517**	
Diversity		**0.48**	
Q Value		**Q2/3**	
Ecological Status		**Poor**	

Results from the Biological Water Quality Monitoring of Station One (Downstream of Landfill)

Station Two (Upstream) – Q Value

Indicator Group	Taxon	Number	%
Group A	**Absent**	**0**	**0**
(Very sensitive)			
Group B		**7**	**2.1**
(Moderately sensitive)	**Trichoptera**		
	Limnephilidae	7	2.1
Group C			
(Moderately tolerant)	**Amphipoda**		
	Gammarus pulex	227	68.1
	Gastropoda		
	Planorbidae	1	0.3
	Potamopyrgus jenkinsi	85	25.5
	Trichoptera		
	Polycentropodidae	1	0.3
Group D			
(Very tolerant)	**Hirudinea (Leeches)**		
	Glossiphonidae	2	0.6
	Bivalves		
	Sphaeriidae	9	2.7
Group E	**Absent**		
(Most tolerant)			
Not Assigned to Group			
	Oligochaetes	1	0.3
Total Abundance		333	
Diversity			
Q Value		Q3	
Ecological Status		Poor	

Results from the Biological Water Quality Monitoring of Station Two (Downstream of Discharge)

Station One (Downstream) – Small Stream Risk Score

Indicator Group	Taxon	No of Taxa / Abundance	Total Relative Abundance *2	Score
Group 1	**Ephemeroptera** *1	0	0	**0**
Group 2	**Plecoptera**	0	0	**0**
Group 3	**Trichoptera**	**1**	**1**	**2**
	Hydropsychidae	4	1	
Group 4	**Gastropods, Oligochaeta & Diptera**	**58**	**7**	**0**
	Planorbidae	1	1	
	Potamopyrgus jenkinsi	19	2	
	Oligochaetes	35	3	
	Chironomidae	3	1	
Group 5	**Isopods**		**Few (1 – 20 Individuals)**	**2**
	Asellus aquaticus *3		2	
Total Index Score (TIS)				4
Average Index Score (AIS = TIS/5)				0.8
SSR Score (AIS x 2)				1.6
SSRS Category				At Risk

Station Two (Upstream) – Small Stream Risk Score

Indicator Group	Taxon	No of Taxa / Abundance	Total Relative Abundance*2	Score
Group 1	**Ephemeroptera***1	0	0	**0**
Group 2	**Plecoptera**	0	0	**0**
Group 3	**Trichoptera**	**2**	**3**	**4**
	Limnephilidae	7	2	
	Polycentropodidae	1	1	
Group 4	**Gastropods, Oligochaeta & Diptera**	**3**	**6**	**4**
	Planorbidae	1	1	
	Potamopyrgus jenkinsi	85	4	
	Oligochaetes	1	1	
Group 5	**Isopods**		**Absent**	**4**
	*Asellus aquaticus**3		0	
Total Index Score (TIS)				**12**
Average Index Score (AIS = TIS/5)				**2.4**
SSR Score (AIS x 2)				**4.8**
SSRS Category				**At Risk**

Notes

1. As *Baetis rhodani* is one of the most common freshwater macro-invertebrates, it is excluded from the SSRS scoring system. *Gammarus duebeni* is also excluded for this reason.
2. Total Relative Abundance, i.e., where: 1-5 individuals get a score of 1; 6-20 individuals get a score of 2; 21-50 individuals get a score of 3; 51-100 individuals get a score of 4 and 101+ individuals get a score of 5.
3. As *Asellus aquaticus* is the only taxon present in Group 5, it's score is based on its absence or presence, where presence is categorised into few (1-20 individuals) or common (+20 individuals).
4. The stream is assessed the by comparing the final SSR Score calculated with the following categories:

   > 8 = probably not at risk

   6.5 – 8 = probably at risk

   < 6.5 = at risk