Appendix 1

Soil and Groundwater Baseline Report

2014

The Recycling Village Ltd

Soil & Groundwater Baseline Report 2014

April 2014

WEML
1 Castle Grove
Kilgobbin Wood
Sandyford
Dublin 18

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1.0 INTRODUCTION.

1.1 Background.

Wood Environmental Management Ltd (WEML) was commissioned by The Recycling Village Ltd to carry out a baseline soil and groundwater site investigation at the existing WEEE recycling facility located at Unit 21 Duleek Business Park Commons, Duleek, Co Meath.

The site investigation was carried out on Tuesday 18th March 2014. This report details the work carried out at the site and presents the results, findings and conclusions of the site investigation.

1.2 Scope of Site Investigation.

The aim of the site investigation was to establish the existing soil and shallow groundwater quality/contamination conditions in order to establish the baseline soil and shallow groundwater conditions.

The scope of the site investigation included:

- Coring 3 no. boreholes to a maximum depth of 5 metres at predetermined locations across the site (Figure 1)
- Soil/borehole logs
- Laboratory analysis of soil samples from the top, mid and bottom of each borehole
- Laboratory analysis of shallow (perched) groundwater from each borehole (where encountered)

1.3 Site Investigation Methodology.

The location of each of the 3 boreholes was agreed on site with The Recycling Village Ltd (Figure 1) to reflect the direction of the deep aquifer regional groundwater flow (Figure 2). Borehole 1 was located upstream of the aquifer groundwater flow, boreholes 2 and 3 were located downstream of the aquifer groundwater flow.

Sampling was carried out using a percussion drill rig to obtain core samples at each location up-to a maximum depth of 5 meters below existing ground level where ground conditions allowed. Prior to coring, each location was scanned for underground services or cables.

Soil samples were taken from each of the 3 boreholes at the surface, mid borehole depth and bottom of the borehole and collected into labelled glass containers for analysis by an accredited third party laboratory.

Each soil core was logged and recorded on site by the drilling contractor (Appendix 1).

Upon completion of the borehole, a permanent piezometer was installed to allow for future groundwater sampling and analysis. Where groundwater was encountered, the borehole was bailed out and left to recharge prior to a sample of groundwater being collected into labelled glass containers for analysis by an accredited third party laboratory.

The monitoring boreholes were finished with pea gravel, bentonite seal and capped with a flush, trafficable plate.

2.0 SITE DETAILS

2.1 Site Geology & Hydrogeology

The soil composition in the vicinity of the site is comprised of Limestone till (Carboniferous), lake sediments undifferentiated, shales and sandstones till (Namurian).

The bedrock is classified as marine shelf facies; limestone & calcareous shale from the age bracket Palaeozoic, Carboniferous, Mississippian.

The bedrock aquifer is classified as Regionally Important Aquifer - Karstified (diffuse).

The flow of the aquifer in the area of the site is in a north west to south east direction (Figure 2).

2.2 Site Location and History

The site is a purpose built industrial facility that was constructed in 2005 on a green field site.

The area of the site is approximately 6,313m^2 (1.56 acres). The site is fully covered with concrete and houses one large building measuring approximately 1,700m^2. The site was originally used as a light industrial, steel fabrication facility over the period 2005-2011.

Based on the known recent development and previous use of the site there are no expected or known soil or groundwater contamination issues below the site as a result of historic site activities.

2.3 Existing Site Use

The site is currently occupied by The Recycling Village Ltd and is operated as a waste electronic and electrical equipment (WEEE) recycling facility.

The recycling process is a dry process. No process effluent is produced at the facility.

The storage yard at the facility is covered with concrete to prevent potential soil and groundwater pollution from potential spillages and leaks.

There are no direct emissions to ground or groundwater from the facility.

The site interceptor sump has been emptied and inspected by a third party and declared intact.

Consequently, the existing concrete yard, interceptor sump, site Environmental management system (EMS), emissions monitoring, emergency & spillage procedures will help to protect the soil and groundwater underneath the site from potential pollution from spills and activities taking place at the facility.

There are no known soil or groundwater contamination issues below the site as a result of current site activities.

3.0 SITE INVESTIGATION

3.1 Sampling Locations

The location of each of the 3 sampling boreholes was agreed on site with The Recycling Village Ltd management (Figure 1). One sampling location was chosen in the car park of the facility upstream of the groundwater flow, the other 2 boreholes were located in the main facility yard down-stream of the groundwater flow.

The description, depth and location of each sampling borehole is shown in the table below.

Table 1. Location of Sampling Boreholes & Depth.

Borehole Ref	Location/Area of Site	Depth of Borehole	Samples Taken
1	Car Park (upstream of groundwater flow)	4.0 m	Soil 0m Soil 2.0m Soil 4.0m
2	Mid Site near Interceptor Sump (upstream of groundwater flow)	3.0 m	Soil 0m Soil 1.5m Soil 3.0m Groundwater
3	NE Site Boundary (upstream of groundwater flow)	5.3 m	Soil 0m Soil 2.5m Soil 5.0m Groundwater

3.2 Sampling Procedures

Each sampling location was cored by JS Drilling Ltd using a RGS 150 tracked window sampling percussion rig, under the supervision of Andrew Wood, WEML. Each soil core was logged and recorded on site by JS Drilling Ltd. Borehole logs are provided in Appendix 1.

Immediately following core removal, each recovered soil sample was observed for signs or evidence of contamination (eg. visual and olfactory). WEML collected a soil sample from the relevant depth of the core and placed it directly into a sealed, labelled glass containers to prevent potential cross contamination.

WEML collected soil samples from each borehole at the surface, mid depth and bottom of the borehole.

The soil samples were dispatch by The Recycling Village Ltd to Fitz Scientific Laboratory, Drogheda, Co Louth for analysis.

Upon completion of the borehole, a permanent piezometer was installed to allow for future groundwater sampling and analysis. Where shallow groundwater was encountered, the borehole was bailed out and left to recharge prior to a sample of groundwater being collected into labelled glass containers for analysis by an accredited third party laboratory.

The monitoring boreholes were finished with pea gravel, bentonite seal and capped with a flush, trafficable plate.

3.3 Laboratory Analysis

A total of 9 soil samples, three each from borehole and 2 groundwater samples (boreholes 2 and 3), were analysed by Fitz Scientific Laboratory.

Groundwater samples were analysed for a range of parameters including;

- Heavy Metals
- Physico parameters
- Inorganic compounds
- Nutrients
- Bacteriological

Soil samples were analysed for a range of parameters including;

- Heavy Metals
- PAH's
- BTEX
- Mineral oil
- PCB's

Leachate tests were also carried out on the soil samples.

Analytical results are summarized below. Full copies of the laboratory results and certificates are presented in Appendix 2.

4.0 RESULTS

The following table presents a summary of the soil and groundwater results. Full analytical results are presented in Appendix 2.

Table 2. Groundwater Results.

Parameter	Unit	Standard (s)	BH 1	BH 2	BH 3
Arsenic	ug/l	60* (7.5[1])	No Sample taken. BH1 was dry.	1.455	1.434
Barium	ug/l	625*		68.97	61.62
Boron	ug/l	750[1]		134.2	173.6
Calcium	ug/l	-		63.97	131.3
Cadmium	ug/l	6* (3.75[1])		0.18	0.141
Chromium	ug/l	30*		5.803	5.377
Copper	ug/l	75* (1,500[1])		23.96	12.58
Cyanide	ug/l	1,500* (37.5[1])		<5	<5
Iron	ug/l	-		682.6	765.1
Lead	ug/l	75* (18.75[1])		12.52	1.479
Magnesium	ug/l	-		3.145	10.01
Manganese	ug/l	-		44.55	60.1
Mercury	ug/l	0.3* (0.75[1])		<0.04	0.045
Nickel	ug/l	75* (15[1])		7.195	3.26
Selenium	ug/l	-		1.726	1.792
Silver	ug/l	-		<0.33	<0.33
Zinc	ug/l	800*		29.25	11.29
Phenols	ug/l	2,000*		<0.10	<0.10
pH	Units			8.4	7.8
Conductivity	uscm@20oC	1875[1]		476	690
Potassium	mg/l			8.422	10.54
Phosphate	mg/l as P			0.028	<0.024
Sodium	mg/l	150[1]		34.68	19.47
Ammonia	mg/l as N			0.42	<0.01
Nitrite	mg/l as N	375,000[1]		0.007	<0.002
Nitrite as NO2	mg/l as NO2			<0.050	<0.050
Nitrate	mg/l as N	37.5[1]		0.990	2.940
Nitrate as NO3	mg/l as NO3			4.384	13.02
Dissolved O2	mg/l			6.5	9.2
Alkalinity	mg/l CaCO3			30	211
TOC	mg/l			5.76	7.04
Nitrogen	mg/l as N			1.00	2.94
Chloride	mg/l	187.5[1]		73.59	24.81
Flouride	mg/l			0.50	0.29
Sulphate	mg/l	187.5[1]		112.82	200.63
F.Coliforms	Cfu/100 ml			0	0
Coliforms	Cfu/100 ml			0	17
Phosphate	mg/l as PO4			0.086	0.067

**Dutch Groundwater Intervention Level as per 'Technical evaluation of the Intervention Values for Soil/sediment and Groundwater Human and ecotoxicological risk assessment and derivation of risk limits for soil, aquatic sediment and groundwater, 2001'.*

[1]EC Environmental Objectives (Groundwater) Regulations, SI 9 of 2010.

Table 3.Soil Results – Borehole 1.

Parameter & Units	Intervention Value*	0m	2.0m	4.0m
PAH (sum) (mg/kg)	40	<0.05	<0.05	<0.05
% Dry Matter (%)	-	77.97	83.35	90.78
TOC (%)	-	2.62	1.534	<1.0
BTEX (mg/kg)	1 (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	1 (Total)	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	5,000	<2.5	<2.5	<2.5
Arsenic (ug/kg)	55,000	3741.7	5540.7	5041.86
Barium (ug/kg)	625,000	49203.6	36572.4	47566.6
Cadmium (ug/kg)	12,000	324.66	<10.00	164.665
Chromium (ug/kg)	380,000	8752.76	16940.2	13644.8
Copper (ug/kg)	190,000	17421.1	15916.8	19565.9
Mercury (ug/kg)	10,000	81.59	31.03	32.91
Molybdenum (ug/kg)	200,000	982.517	267.593	563.765
Nickel (ug/kg)	210,000	17372.5	23265.4	21835
Lead (ug/kg)	530,000	14090.4	7859.38	8198.09
Antimony (ug/kg)	-	1130.27	595.168	630.34
Selenium (ug/kg)	-	2054.42	3064.55	2877.3
Zinc (ug/kg)	720,000	42300.3	36912.5	32737.9
Chloride (mg/kg)	-	11.79	5.91	7.77
Flouride (mg/kg)	-	2.10	2.05	2.29
Sulphate (mg/kg as SO4)	-	<1.39	21.06	3.29

Table 4. Soil Results – Borehole 2.

Parameter & Units	Intervention Value*	0m	1.0m	2.0m
PAH (sum) (mg/kg)	40	<0.05	<0.05	<0.05
% Dry Matter (%)	-	90.09	86.75	81.5
TOC (%)	-	<1.0	3.724	<1.0
BTEX (mg/kg)	1 (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	1 (Total)	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	5,000	3.52	<2.5	<2.5
Arsenic (ug/kg)	55,000	2912.43	5886.82	5160.46
Barium (ug/kg)	625,000	36640.7	266276	96145.3
Cadmium (ug/kg)	12,000	214.277	490.061	293.275
Chromium (ug/kg)	380,000	8696.86	8527.72	16971.3
Copper (ug/kg)	190,000	11871.4	19598.6	19702.4
Mercury (ug/kg)	10,000	9.618	<0.2	<0.2
Molybdenum (ug/kg)	200,000	747.518	478.331	1206.59
Nickel (ug/kg)	210,000	13003.2	23955.7	27264.4
Lead (ug/kg)	530,000	6306.73	7653.02	9024.64
Antimony (ug/kg)	-	<10	474.41	364.859
Selenium (ug/kg)	-	1582.64	3250.53	3605.59
Zinc (ug/kg)	720,000	22248.5	38391.5	47017.5
Chloride (mg/kg)	-	7.85	10.58	22.36
Flouride (mg/kg)	-	1.98	2.07	1.92
Sulphate (mg/kg as SO4)	-	112.32	4.6	15.51

Table 5. Soil Results – Borehole 3.

Parameter & Units	Intervention Value*	0m	2.5m	5.0m
PAH (sum) (mg/kg)	40	<0.05	<0.05	<0.05
% Dry Matter (%)	-	80.72	79.88	83.59
TOC (%)	-	<1.0	<1.0	<1.0
BTEX (mg/kg)	1 (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	1 (Total)	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	5,000	<2.5	6.46	5.55
Arsenic (ug/kg)	55,000	6738.73	4464.46	6594.04
Barium (ug/kg)	625,000	48674.9	51053.7	9635.96
Cadmium (ug/kg)	12,000	471.803	345.309	<10.00
Chromium (ug/kg)	380,000	13175.2	11570.7	1792.88
Copper (ug/kg)	190,000	22633.8	23632.2	19757.4
Mercury (ug/kg)	10,000	49.1	77.09	47.47
Molybdenum (ug/kg)	200,000	730.77	481.31	345.197
Nickel (ug/kg)	210,000	24590.9	29380.9	32632.9
Lead (ug/kg)	530,000	10316.9	12445.6	13362.1
Antimony (ug/kg)	-	498.208	354.06	412.68
Selenium (ug/kg)	-	3217.35	3153.62	1323.5
Zinc (ug/kg)	720,000	38621.4	48259.6	32025.6
Chloride (mg/kg)	-	7.64	8.85	8.69
Flouride (mg/kg)	-	2.61	2.13	2.02
Sulphate (mg/kg as SO4)	-	62.16	<1.39	10.89

**Dutch Soil Intervention Level as per 'Technical evaluation of the Intervention Values for Soil/sediment and Groundwater Human and ecotoxicological risk assessment and derivation of risk limits for soil, aquatic sediment and groundwater, 2001'.*

5.0 DISCUSSION OF RESULTS

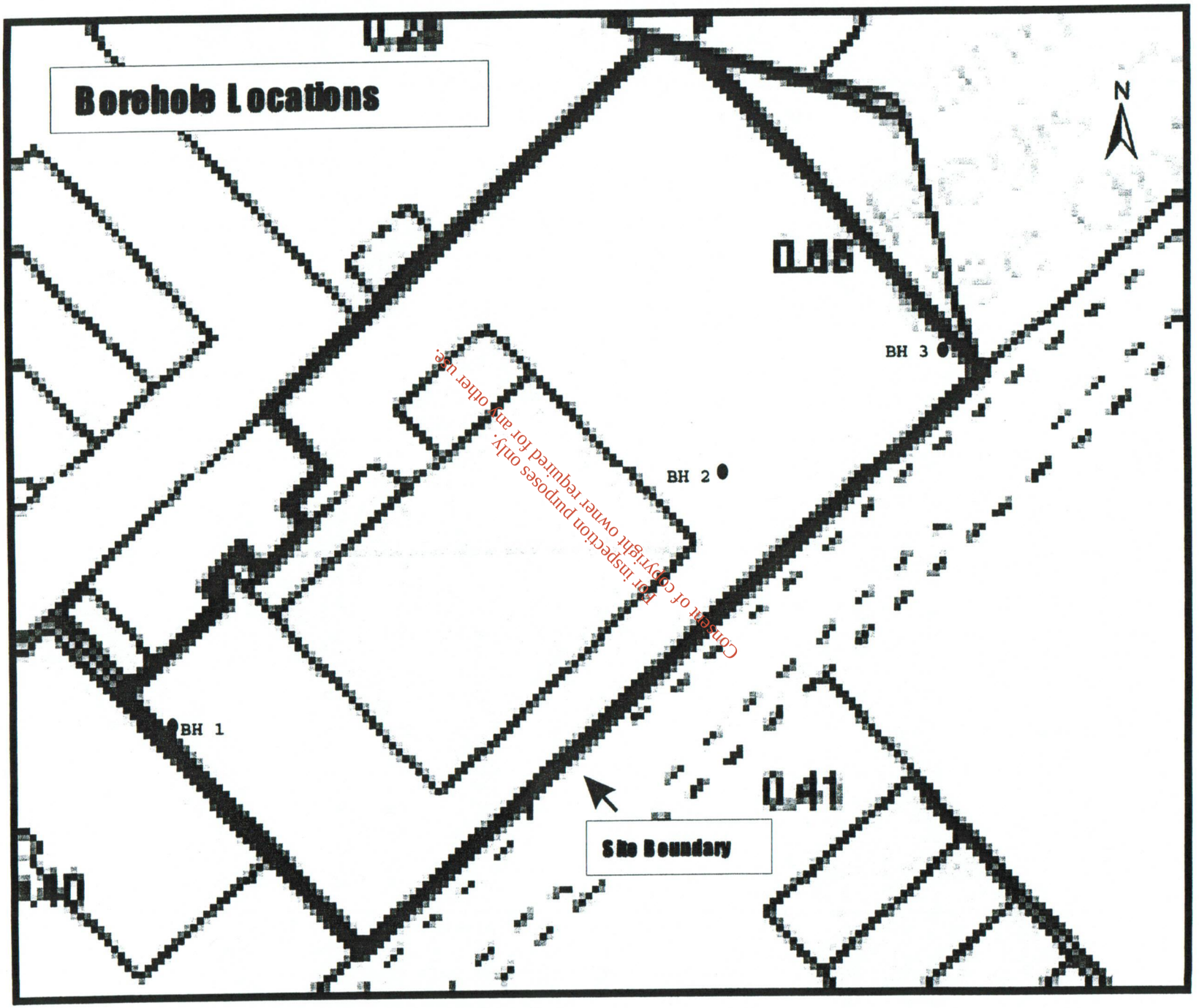
Based on an assessment of the above soil and groundwater laboratory results and comparison to available published environmental quality standards, none of the parameters tested for are above the published standards.

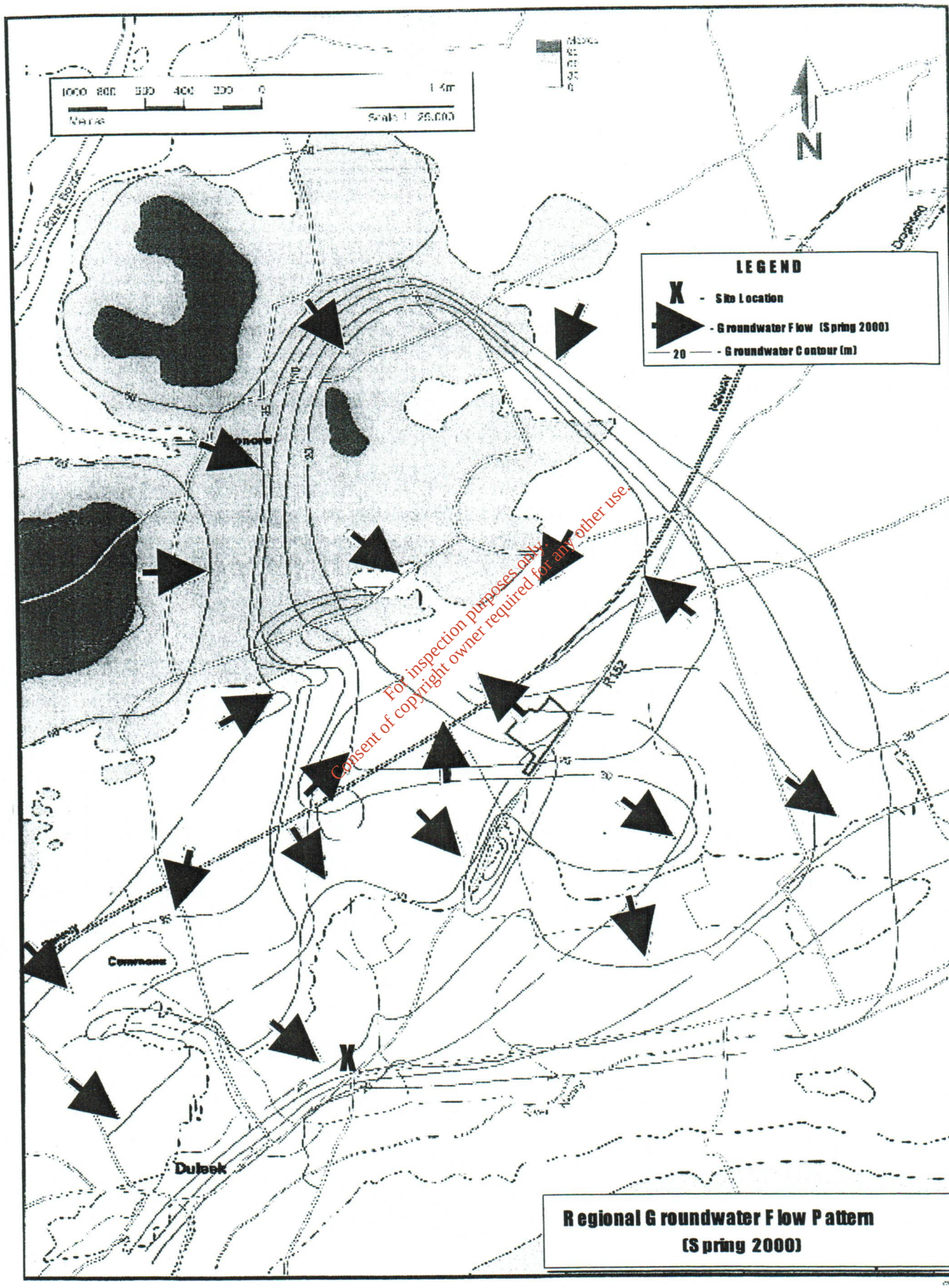
6.0 CONCLUSION

Based on the above site investigation, sampling and analytical results it is concluded that;

- There is no evidence of significant soil or groundwater contamination for the parameters analysed for in the areas tested as part of this investigation.
- This soil and groundwater report provides a useful baseline against which to assess future soil and groundwater quality investigations at the site.

FIGURES





APPENDICES

JS DRILLING
Geological & Environmental Drilling Contractors

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FAX: 0567793887
E-MAIL: jim@jsdrilling.ie
WEBSITE: www.jsdrilling.ie
VAT. NO: IE 6431197 F

JS DRILLING LTD
20 THE BELFRY
CHAPEL LANE
THOMASTOWN
CO. KILKENNY

Borehole Log	
Location: Duleek	Site: Recycling Village
Client: WEML	Borehole No: 1
Date: 18-03-2014	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer: Andy Wood
Weather: Fine / Drizzling	
Rig Type: Window Sampler	

Depth to base of strata (m)	Description of Strata						
	soft firm stiff	loose med.d. dense	colour	claye y silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0.0							
0.8	Remade ground with clays & gravels						
4.0	Black / brown boulder clay.						
4.0	End of days boring						Time

Samples / Tests				
No.	Type	Depth (m) From	Depth (m) To	Remarks

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P. T.

Installations	
63mm	Well Casing Diameter
1.0m	Plain Casing
3.0m	Slotted Casing
3.0m	Geosock
2	End Cap
	Gas Valve
3.0m	Gravel Pack
1.0m	Bentonite Pellets
m	Bentonite Grout
1	Flush Cover – 6"
	Raised Cover
	Padlock

Water Strike	m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased					
Depth of hole					

Drill Casing		
Size (mm)	From (m)	To (m)
90	0.0	4.0

Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Client:

Driller:

JS DRILLING
Geological & Environmental Drilling Contractors

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Borehole Log	
Location: Duleek	Site: Recycling Village
Client: WEML	Borehole No: 2
Date: 18-03-2014	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer: Andy Wood
Weather: Fine / Drizzling	
Rig Type: Window Sampler	

Depth to base of strata (m)	Description of Strata						
	soft firm stiff	loose med.d. dense	colour	clayey silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0.0							
0.25	Concrete.						
0.30	Gravel fill.						
1.5	Backfilled clays & gravels.						
2.2	Dense brown clays & gravels.						
2.4	Sands & gravels.						
3.0	Black / brown boulder clay.						
3.0	Cobbles.						
3.0	End of days boring						Time

Samples / Tests				
No.	Type	Depth (m) From	Depth (m) To	Remarks

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P. T.

Installations	
63mm	Well Casing Diameter
1.0m	Plain Casing
1.3m	Slotted Casing
1.3m	Geosock
2	End Cap
	Gas Valve
2.3m	Gravel Pack
1m	Bentonite Pellets
m	Bentonite Grout
1	Flush Cover – 6"
	Raised Cover
	Padlock

Water Strike	2.2m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased					
Depth of hole					

Drill Casing		
Size (mm)	From (m)	To (m)
90	0.0	3.0

Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Client:

Driller:

JS DRILLING
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Borehole Log

Location: Duleek	Site: Recycling Village
Client: WEML	Borehole No: 3
Date: 18-03-2014	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer: Andy Wood
Weather: Fine / Drizzling	
Rig Type: Window Sampler	

Depth to base of strata (m)	Description of Strata						
	soft firm stiff	loose med.d. dense	colour	clayey silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0.0							
0.25	Concrete.						
0.3	Gravel fill.						
2.6	Dense brown clays with gravels.						
	Changing to boulder clay with depth.						
2.7	Fine sands & gravels.						
5.3	Black / brown boulder clay.						
5.3	End of days boring						Time

Samples / Tests				
No.	Type	Depth (m) From	Depth (m) To	Remarks

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P. T.

Installations	
63mm	Well Casing Diameter
1.0m	Plain Casing
3.0m	Slotted Casing
3.0m	Geosock
2	End Cap
	Gas Valve
3.0m	Gravel Pack
1.0m	Bentonite Pellets
m	Bentonite Grout
1	Flush Cover – 6"
	Raised Cover
	Padlock

Water Strike	0.3m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased					
Depth of hole					

Drill Casing		
Size (mm)	From (m)	To (m)
90	0.0	5.3

Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Client:

Driller: