Appendix A.10.4

Groundwater Quality Monitoring Report

A.10.4

Galway County Council

N6 Galway City Ring Road

Groundwater Quality Monitoring Report

GCOB-04.04-019_A.10.4

Issue 2 | 26 July 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 233985-00

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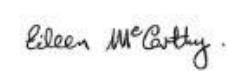
		Signature			
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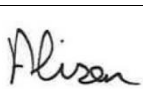
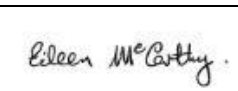
		Signature			
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Contents

1 Introduction

Arup was commissioned by Galway City Council to carry out groundwater quality sampling to investigate groundwater movement throughout the study area for the N6 Galway City Ring Road.

The aim of this work was to collect monthly groundwater quality across the study area to identify groundwater flow paths to and provide an indication of naturally occurring background concentrations for various groundwater quality parameters. The water quality results will also be used to determine the impact of the proposed N6 Galway City Ring Road on groundwater quality, and thereby affect groundwater dependent ecosystems.

This report comprises a factual report presenting the results of the monitoring. Although an extensive suite of analysis was carried out on the samples, the focus of this report is on the flow pathways and the identification of different groundwater types according to groundwater bodies.

2 Groundwater Monitoring Methodology

Groundwater sampling of 17 No. boreholes, two springs, a turlough and a surface water body was carried out by Arup between February 2016 and April 2017.

Field monitoring comprised of:

- Groundwater level
- Borehole depth
- Temperature
- pH
- Electrical conductivity

Analysis included:

- Physio-chemical parameters i.e. Total dissolved solids (TDS), Suspended Solids, Chemical Oxygen Demand, Biochemical oxygen demand (BOD), Electrical conductivity (EC) in the field and in the lab, pH in the field and in the lab, Field and lab temperature, Alkalinity, E. coli and Total Coliforms
- Major groundwater ions i.e. Nitrate, Phosphorus, Sulphate, Calcium, Magnesium, Potassium, Sodium, Ammonia, Chloride, Iron and Manganese
- A suite of metals i.e. Cadmium, Copper, Arsenic, Barium, Chromium, Chromium hexavalent in water, Nickel, Zinc, Lead, Mercury, Antimony, Molybdenum and Selenium and
- Total Petroleum Hydrocarbons (TPH) i.e. PRO Water, MTBE, BTEX, Extractable Hydrocarbons Water and Mineral Oil

Groundwater quality results are appended to this report.

2.1 Sampling Locations

The locations of sampling points are presented in **Figure 1** and summarised in **Table 1**.

Figure 1: Sample locations

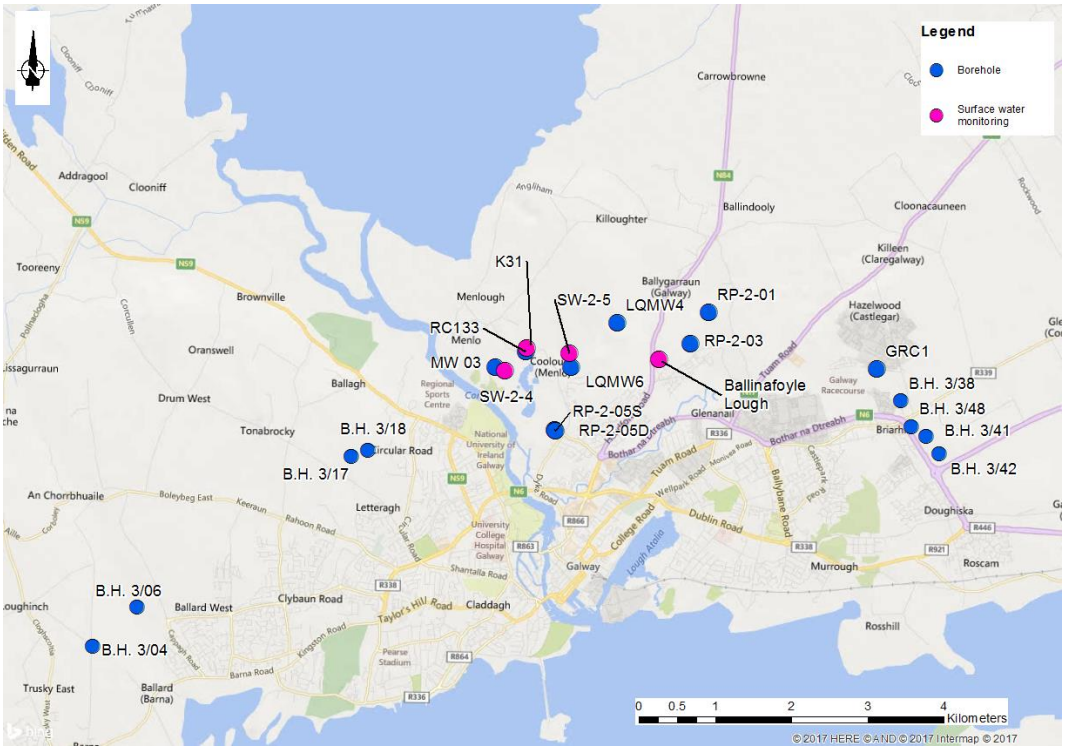

Table 1: Boreholes and surface water sampling record

		2016										2017	
		Feb	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Nov**	**Dec**	**Feb**	**Apr**
Borehole	LQMW4	x								x	x		
	LQMW6	x	x	x	x	x	x	x	x				
	RP-2-01	x	x	x	x	x	x	x	x				
	RP-2-03	x	x	x	x	x	x	x	x				
	RP-2-05D	x	x	x	x	x	x	x	x				
	RP-2-05S	x	x	x	x	x	x	x	x				
	RC133	x	x	x	x	x	x	x	x	x	x		
	MW03	x	x	x	x	x	x	x	x				
	GCR1									x	x		
	BH3-48					x	x	x	x				
	BH3-06							x	x				
	BH3-17							x	x				
	BH3-18									x	x		
	BH3-38									x	x		
	BH3-41									x	x		
	BH3-42									x	x		
	BH3-04									x	x		
Surface water	SW-2-4	x	x	x	x								
	SW-2-5	x	x	x	x	x							
	K31 (turlough)											x	
	Ballinafoyle Lough												x

2.2 Borehole Sampling

Borehole sampling was carried out according to BS 6068-6.11:2009. Prior to sampling the groundwater level was measured using a manual dip meter. The submersible pump was lowered into the borehole, approximately 1m from the bottom. Groundwater level was measured again after the pump was inserted.

The pump flow was controlled using a flow meter. The dip meter was used to measure the water level in the borehole to ensure it did not drop below the pump during pumping.

A water quality Hanna probe was used to measure pH. Temperature and EC of extracted water. Measurements were recorded every five minutes. A sample was taken when three continuous measurements had the same value.

Samples from all locations were collected in plastic bottles provided by Complete Laboratory Solutions (CLS). The sampling method ensured there were little or no air bubbles in the sample before capping to minimise degradation of the sample.

3 Results and discussion

The water quality results are presented in **Annex A**. A summary of the average groundwater and surface water quality results for selected field parameters and major ions are presented in **Table 2**. The samples are grouped according to groundwater body (GWB) and surface water or borehole sources.

The water quality results show a distinct signature difference between the granite and limestone groundwaters. Limestone and granite typically have significantly different signatures as the bedrock mineralogy influences the water chemistry. Limestone contains calcareous type water and contains higher concentrations of calcium and the alkalinity. The granite groundwater is non-calcareous (siliceous) type groundwater and contains typically lower calcium and alkalinity concentrations. These trends are observed in the study results as presented in **Figure 2** and **Table 2** which show that the alkalinity and calcium, and consequently the EC, are notably higher in the limestone boreholes compared to the granite boreholes.

Within the limestone there is also evidence of different groundwater signatures. Lough Corrib Fen 1 (Menlough) has a distinctly lower EC, alkalinity and calcium compared to the other limestone GWBs. This may be a reflection of a lower calcareous content limestone or a slightly different flow regime in the bedrock where faster travel times reduce the time for the dissolution of ions into the water.

Similarly, the surface water bodies have a lower EC, alkalinity and calcium compared to the borehole samples. This is likely to be a reflection of the contribution from direct recharge and overland flow which contain lower ion content.

Figure 2: Average alkalinity and calcium concentrations in the granite and limestone boreholes and limestone surface water bodies

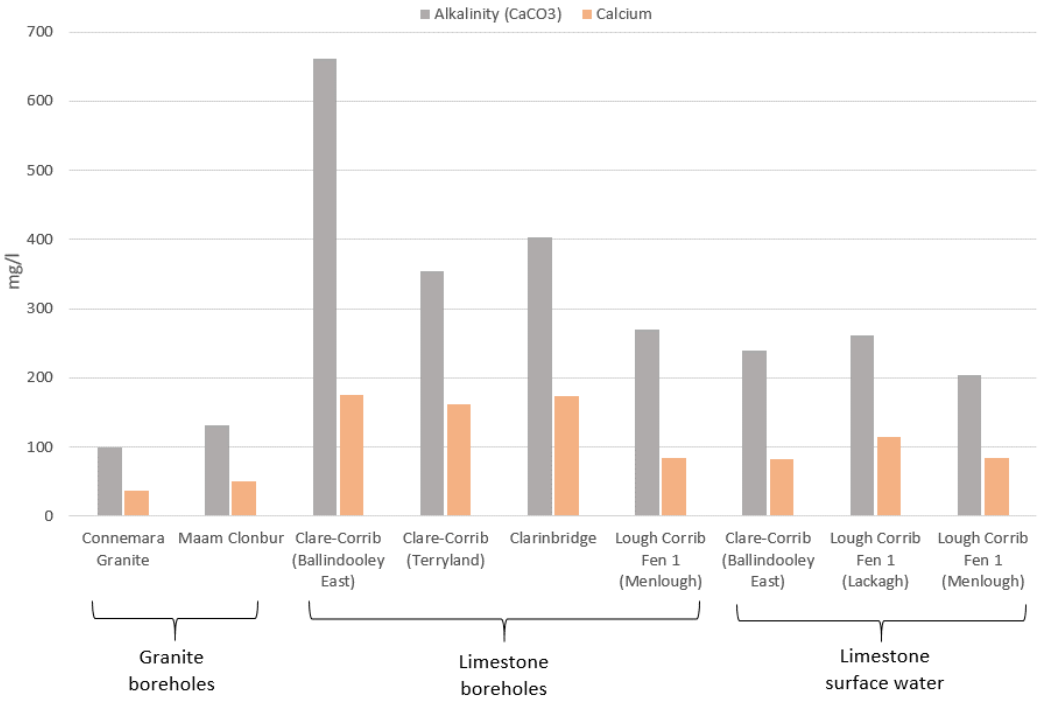

Table 2: Summary of average groundwater and surface water quality results

Geology			**Granite**		**Limestone**				**Limestone**		
Groundwater body			Connemara Granite	Maam Clonbur	Clare-Corrib (Ballindooley East)	Clare-Corrib (Terryland)	Clarinbridge	Lough Corrib Fen 1 (Menlough)	Clare-Corrib (Ballindooley East)	Lough Corrib Fen 1 (Lackagh)	Lough Corrib Fen 1 (Menlough)
Source of water			Boreholes	Boreholes	Boreholes	Boreholes	Boreholes	Boreholes	Surface water	Surface water	Surface water
Number of samples			4	4	16	27	12	18	1	5	5
EC*	mS/cm	average	0.35	0.35	0.72	0.94	0.75	0.57	0.51	n/a	n/a
pH*		average	7.15	6.60	7.79	7.64	7.48	7.73	6.96	n/a	n/a
Alkalinity	mg/l CaCO3	average	99	131	661	354	403	270	239	261	204
Sulphate	mg/l	average	12	19	31	110	23	15	11	51	19
Calcium	mg/l	average	37	50	175	162	174	85	83	114	85
Sodium	mg/l	average	15	18	28	60	26	15	29	15	15
Chloride	mg/l	average	25	28	34	54	35	24	51	26	26

*measured in the field

4 Conclusions

Arup carried out groundwater quality monitoring between February 2016 and April 2017 in boreholes and surface water locations within the study area for the N6 Galway City Ring Road. Monitoring included basic field parameters and laboratory analysis for several parameters including physical parameters, inorganics, metals and hydrocarbons.

The results showed a distinct signature difference between the granite and limestone groundwaters and between the limestone groundwater and surface water bodies. The limestone groundwater contains notably higher calcium, alkalinity and EC concentrations compared to the granite groundwater and limestone surface water bodies. Furthermore, within the limestone Lough Corrib Fen 1 (Menlough) has a distinctly different groundwater signature compared to the other limestone groundwater bodies suggesting a slightly different mineralogy or flow regime.

5 Annex A – Water quality results summary

Table A1: Granite Groundwater

			Connemara Granite			Maam-Clonbur		
		Number of samples	16			27		
Parameter	Units	Detection limit	Max	Min	Average	Max	Min	Average
TDS (gravimetric)	mg/l	n/a	655	74	297	311	151	225
Suspended Solids	mg/l	2	240	90	174	51	7	29
COD	mg/l	10	32	10	17	77	24	46
BOD	mg/l	1	1	1	1	1	1	1
EC (Field)	µS/cm	0.01	0.33	0.29	0.31	0.52	0.21	0.35
pH (Field)	pH Units	0.0	7.8	6.4	7.2	7.5	6.2	6.9
pH (Lab)	pH Units	0.0	6.9	6.6	6.7	6.8	6.4	6.6
Temperature (Field)	°C	n/a	15.3	11.2	13.0	17.8	10.1	13.6
Temperature (Lab)	°C	n/a	17.2	16.2	16.6	16.7	16.1	16.5
Alkalinity	mg/l CaCO3	10	114	81	99	184	79	131
E coli (Filtration) (Environmental Waters)	cfu/100ml	0	68	10	31	28	1	10
Coliforms (Filtration) (Environmental Waters)	cfu/100ml	0	68	10	31	28	1	10
Nitrate as NO3	mg/l	0.44	30.60	2.75	10.06	1.24	0.44	0.75
Phosphorus as PO4-P	mg/l	0.01	0.02	0.01	0.01	0.02	0.01	0.01
Sulphate	mg/l	5.00	17.40	7.38	11.59	40.70	11.40	19.15

			Connemara Granite			Maam-Clonbur		
		Number of samples	16			27		
Parameter	**Units**	**Detection limit**	**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Calcium	mg/l	0.69	44.00	32.00	37.25	61.00	32.00	49.75
Magnesium	mg/l	0.14	3.00	2.00	2.75	4.00	2.00	3.25
Potassium	mg/l	0.09	5.00	2.00	2.75	2.00	1.00	1.75
Sodium	mg/l	0.29	16.00	14.00	15.25	22.00	12.00	17.75
Ammonia as NH3-N	mg/l	0.01	0.10	0.01	0.05	0.19	0.03	0.08
Chloride	mg/l	22.40	29.00	22.40	25.48	32.40	16.40	27.70
Iron	ug/l	10	3308	1504	2481	2990	831	1517
Manganese	ug/l	5	822	425	619	610	264	371
PRO Water	ug/l	10	10	10	10	10	10	10
MTBE	ug/l	10	10	10	10	10	10	10
BTEX	ug/l	10	10	10	10	10	10	10
Extractable Hydrocarbons Water	ug/l	10	0	0		0	0	
Mineral Oil		10	130	65	98	341	65	203
Cadmium	ug/l	0.09	1.00	0.50	0.75	0.50	0.50	0.50
Copper	ug/l	1.00	22.00	15.00	18.50	14.00	1.00	7.50
Arsenic	ug/l	0.50	3.00	1.00	2.00	1.00	0.80	0.90
Barium	ug/l	0.78	228.00	58.00	143.00	463.00	51.00	257.00
Chromium	ug/l	0.50	10.00	5.00	7.50	3.00	1.00	2.00
Chromium hexavalent in water	mg/l	0.00	0.00	0.00	0.00	0.01	0.00	0.00

			Connemara Granite			Maam-Clonbur		
		Number of samples	16			27		
Parameter	**Units**	**Detection limit**	**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Nickel	ug/l	3.00	10.00	6.00	8.00	2.00	1.00	1.50
Zinc	ug/l	5.00	28.00	22.00	25.00	7.00	5.00	6.00
Lead	ug/l	0.12	29.00	0.50	14.75	8.00	4.00	6.00
Mercury	ug/l	0.04	0.10	0.10	0.10	0.10	0.10	0.10
Antimony as Sb	ug/l	1.20	0.50	0.50	0.50	0.50	0.50	0.50
Molybdenum	ug/l	3.00	0.50	0.50	0.50	1.00	0.50	0.75
Selenium	ug/l	0.80	1.00	0.80	0.90	1.00	0.60	0.80

Table A2: Limestone Groundwater

			Clare-Corrib (Ballindooley East)			Clare-Corrib (Terryland)		
		Number of samples	16			27		
Parameter	**Units**	**Detection limit**	**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
TDS (gravimetric)	mg/l	n/a	453	109	335	968	32	492
Suspended Solids	mg/l	2	12963	2	912	2231	3	293
COD	mg/l	10	230	10	26	68	10	18
BOD	mg/l	1	3	1	1	2	1	1
EC (Field)	µS/cm	0.01	0.88	0.54	0.72	1.80	0.24	0.94
pH (Field)	pH Units	0.0	8.1	7.5	7.8	8.2	6.9	7.6
pH (Lab)	pH Units	0.0	7.5	6.9	7.1	8.0	6.8	7.2
Temperature (Field)	°C	n/a	18.8	4.9	12.0	16.0	9.6	12.0
Temperature (Lab)	°C	n/a	19.7	15.3	16.8	19.9	15.4	16.8
Alkalinity	mg/l CaCO3	10	5220	217	661	1000	45	354
E coli (Filtration) (Environmental Waters)	cfu/100ml	0	250	0	52	840	0	79
Coliforms (Filtration) (Environmental Waters)	cfu/100ml	0	250	0	52	840	0	76
Nitrate as NO3	mg/l	0.44	17.10	4.31	10.84	10.60	0.44	5.03
Phosphorus as PO4-P	mg/l	0.01	0.02	0.01	0.01	0.09	0.01	0.02
Sulphate	mg/l	5.00	48.60	22.20	31.06	299.00	11.00	109.88
Calcium	mg/l	0.69	897.00	89.00	174.78	548.00	40.00	162.37
Magnesium	mg/l	0.14	18.20	5.07	7.73	27.60	2.90	10.74
Potassium	mg/l	0.09	4.46	2.00	3.08	4.76	0.60	2.42

			Clare-Corrib (Ballindooley East)			Clare-Corrib (Terryland)		
		Number of samples	**16**			**27**		
Parameter	**Units**	**Detection limit**	**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Sodium	mg/l	0.29	61.00	14.00	28.09	198.00	6.00	59.59
Ammonia as NH3-N	mg/l	0.01	0.03	0.01	0.01	6.44	0.01	0.94
Chloride	mg/l	22.40	47.80	28.30	33.89	212.00	9.08	53.62
Iron	ug/l	10	2566	10	591	38043	5	3059
Manganese	ug/l	5	78	5	22	2298	3	396
PRO Water	ug/l	10	42	10	15	10	10	10
MTBE	ug/l	10	10	10	10	10	10	10
BTEX	ug/l	10	10	10	10	10	10	10
Extractable Hydrocarbons Water	ug/l	10	0	0		0	0	
Mineral Oil		10	67	65	66	82	65	67
Cadmium	ug/l	0.09	0.50	0.50	0.50	4.00	0.50	0.96
Copper	ug/l	1.00	3.00	1.00	1.50	16.00	1.00	4.89
Arsenic	ug/l	0.50	0.50	0.50	0.50	4.00	0.50	1.39
Barium	ug/l	0.78	41.00	15.00	29.00	388.00	14.00	85.84
Chromium	ug/l	0.50	1.00	0.50	0.75	19.00	0.50	5.06
Chromium hexavalent in water	mg/l	0.00	0.01	0.00	0.01	0.01	0.00	0.00
Nickel	ug/l	3.00	4.00	0.50	2.58	35.00	1.00	9.20
Zinc	ug/l	5.00	22.00	5.00	9.00	122.00	5.00	47.38
Lead	ug/l	0.12	7.00	0.50	3.08	233.00	0.17	34.44

			Clare-Corrib (Ballindooley East)			Clare-Corrib (Terryland)		
		Number of samples	16			27		
Parameter	**Units**	**Detection limit**	**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Mercury	ug/l	0.04	0.10	0.04	0.08	0.10	0.04	0.08
Antimony as Sb	ug/l	1.20	2.06	0.50	1.28	2.06	0.60	1.63
Molybdenum	ug/l	3.00	5.00	0.60	3.15	17.10	0.50	4.44
Selenium	ug/l	0.80	3.06	1.00	2.06	6.19	0.50	2.40

Table A3: Limestone Groundwater

			Clarinbridge			Lough Corrib Fen 1 (Menlough)		
		Number of samples	12			18		
Parameter	Units	Detection limit	Max	Min	Average	Max	Min	Average
TDS (gravimetric)	mg/l	n/a	493	98	320	20	15	17
Suspended Solids	mg/l	2	2417	2	596	395	130	270
COD	mg/l	10	90	10	23	89	3	34
BOD	mg/l	1	1	1	1	89	3	34
EC (Field)	µS/cm	0.01	0.95	0.57	0.75	31.60	0.44	6.69
pH (Field)	pH Units	0.0	8.0	6.8	7.5	0.1	0.0	0.0
pH (Lab)	pH Units	0.0	7.5	6.9	7.1	29.8	5.0	14.0
Temperature (Field)	°C	n/a	13.9	11.2	12.4	140.0	68.3	102.4
Temperature (Lab)	°C	n/a	19.9	15.2	16.5	6.0	2.1	4.0
Alkalinity	mg/l CaCO3	10	818	221	403	2	1	2
E coli (Filtration) (Environmental Waters)	cfu/100ml	0	139	0	53	18	12	15
Coliforms (Filtration) (Environmental Waters)	cfu/100ml	0	139	0	53	0	0	0
Nitrate as NO3	mg/l	0.44	39.90	0.58	9.36	28.60	15.30	23.57
Phosphorus as PO4-P	mg/l	0.01	0.20	0.01	0.06	472.00	10.00	96.84
Sulphate	mg/l	5.00	37.20	5.00	18.54	1002.00	2.77	67.27
Calcium	mg/l	0.69	484.00	83.00	174.17	10.00	10.00	10.00
Magnesium	mg/l	0.14	23.00	3.00	8.58	10.00	10.00	10.00
Potassium	mg/l	0.09	23.00	1.00	6.50	10.00	10.00	10.00

			Clarinbridge			Lough Corrib Fen 1 (Menlough)		
		Number of samples	12			18		
Parameter	Units	Detection limit	Max	Min	Average	Max	Min	Average
Sodium	mg/l	0.29	43.00	14.00	26.00	0.00	0.00	#DIV/0!
Ammonia as NH3-N	mg/l	0.01	0.55	0.01	0.06	130.00	65.00	74.57
Chloride	mg/l	22.40	63.60	15.90	35.23	0.50	0.50	0.50
Iron	ug/l	10	18361	12	2491	2	1	1
Manganese	ug/l	5	766	5	202	1	1	1
PRO Water	ug/l	10	10	10	10	17	7	11
MTBE	ug/l	10	10	10	10	3	1	1
BTEX	ug/l	10	10	10	10	0	0	0
Extractable Hydrocarbons Water	ug/l	10	0	0		3	1	1
Mineral Oil		10	130	65	117	5	5	5
Cadmium	ug/l	0.09	2.00	0.50	0.90	6.00	0.12	2.34
Copper	ug/l	1.00	21.00	1.00	10.20	0.10	0.04	0.08
Arsenic	ug/l	0.50	3.00	0.50	1.22	2.06	0.50	1.12
Barium	ug/l	0.78	110.00	16.00	65.60	5.00	0.50	2.30
Chromium	ug/l	0.50	14.00	0.50	5.00	3.19	0.50	1.80
Chromium hexavalent in water	mg/l	0.00	0.01	0.00	0.00	0.01	0.01	0.01
Nickel	ug/l	3.00	44.00	0.60	19.92	3.00	0.50	1.33
Zinc	ug/l	5.00	79.00	5.00	38.60	0.00	0.00	
Lead	ug/l	0.12	21.00	0.50	8.70	3.00	0.26	1.63

			Clarinbridge			Lough Corrib Fen 1 (Menlough)		
		Number of samples	12			18		
Parameter	Units	Detection limit	Max	Min	Average	Max	Min	Average
Mercury	ug/l	0.04	0.20	0.10	0.12	0.00	0.00	
Antimony as Sb	ug/l	1.20	1.00	0.50	0.72	0.00	0.00	
Molybdenum	ug/l	3.00	2.00	0.50	0.82	0.00	0.00	
Selenium	ug/l	0.80	4.00	0.50	1.70	3.19	1.00	2.12

Table A4: Limestone Surface Water

			Clare-Corrib (Ballindooley East)	Lough Corrib Fen 1 (Lackagh)			Lough Corrib Fen 1 (Menlough)		
		Number of samples	1	5			5		
Parameter	**Units**	**Detection limit**		**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
TDS (gravimetric)	mg/l	n/a	274	500	126	275	290	66	199
Suspended Solids	mg/l	2	2	20	2	7	7	2	3
COD	mg/l	10	16	32	10	14	10	10	10
BOD	mg/l	1	<1	1	1	1	1	1	1
EC (Field)	µS/cm	0.01	0.51	0.00	0.00		0.00	0.00	
pH (Field)	pH Units	0.0	7.0	0.0	0.0		0.0	0.0	
pH (Lab)	pH Units	0.0	7.8	7.4	7.0	7.2	7.6	7.2	7.3
Temperature (Field)	°C	n/a	12.1	0.0	0.0		0.0	0.0	
Temperature (Lab)	°C	n/a	16.4	19.6	15.3	16.8	16.6	16.1	16.4
Alkalinity	mg/l CaCO3	10	239	283	225	261	235	176	204
E coli (Filtration) (Environmental Waters)	cfu/100ml	0	0	98	45	74	68	41	53
Coliforms (Filtration) (Environmental Waters)	cfu/100ml	0	0	98	45	74	68	41	53
Nitrate as NO3	mg/l	0.44	<0.44	3.22	0.71	2.31	8.22	4.17	6.37
Phosphorus as PO4-P	mg/l	0.01	0.03	0.03	0.01	0.01	0.06	0.03	0.04

			Clare-Corrib (Ballindooley East)	Lough Corrib Fen 1 (Lackagh)			Lough Corrib Fen 1 (Menlough)		
		Number of samples	1	5			5		
Parameter	**Units**	**Detection limit**		**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Sulphate	mg/l	5.00	11.20	54.80	48.50	50.74	21.90	15.50	19.28
Calcium	mg/l	0.69	83.00	117.00	108.00	114.40	95.50	80.00	84.56
Magnesium	mg/l	0.14	3.00	4.00	3.30	3.62	3.32	2.70	2.96
Potassium	mg/l	0.09	2.00	2.07	1.51	1.80	2.99	2.00	2.32
Sodium	mg/l	0.29	29.00	16.70	14.20	15.36	16.30	13.40	15.12
Ammonia as NH3-N	mg/l	0.01	0.07	0.08	0.01	0.04	0.04	0.01	0.02
Chloride	mg/l	22.40	51.10	31.20	21.40	25.70	30.10	22.20	25.74
Iron	ug/l	10	53	434	45	186	88	10	40
Manganese	ug/l	5	9	9	4	6	5	2	4
PRO Water	ug/l	10	<10	10	10	10	10	10	10
MTBE	ug/l	10	<10	10	10	10	10	10	10
BTEX	ug/l	10	<10	10	10	10	10	10	10
Extractable Hydrocarbons Water	ug/l	10	160	0	0		144	144	144
Mineral Oil		10	<130	66	65	66	97	65	76
Cadmium	ug/l	0.09	<0.5	0.50	0.10	0.30	0.50	0.02	0.34
Copper	ug/l	1.00	<1	3.00	1.00	2.00	6.00	1.00	3.33

			Clare-Corrib (Ballindooley East)	Lough Corrib Fen 1 (Lackagh)			Lough Corrib Fen 1 (Menlough)		
		Number of samples	1	5			5		
Parameter	**Units**	**Detection limit**		**Max**	**Min**	**Average**	**Max**	**Min**	**Average**
Arsenic	ug/l	0.50	<0.5	0.50	0.50	0.50	0.50	0.50	0.50
Barium	ug/l	0.78	16.00	7.90	6.00	6.95	129.00	6.00	47.67
Chromium	ug/l	0.50	<0.5	0.90	0.80	0.85	1.00	0.50	0.67
Chromium hexavalent in water	mg/l	0.00	<0.003	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	ug/l	3.00	<0.5	2.00	1.00	1.50	1.00	0.50	0.67
Zinc	ug/l	5.00	<5	5.00	5.00	5.00	5.00	5.00	5.00
Lead	ug/l	0.12	<0.5	6.00	0.12	3.06	6.00	0.12	2.21
Mercury	ug/l	0.04	0.03	0.10	0.04	0.07	0.10	0.04	0.08
Antimony as Sb	ug/l	1.20	<0.5	2.06	2.06	2.06	2.06	0.50	1.28
Molybdenum	ug/l	3.00	0.50	5.00	5.00	5.00	5.00	0.60	2.80
Selenium	ug/l	0.80	<0.5	2.81	1.45	2.13	2.58	0.87	1.45

6 Annex B – Water quality results

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286056
Date of Receipt : 09/02/2016
Start Date of Analysis : 09/02/2016
Date of Report : 17/02/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652521	LQMW4 9/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	18	mg/l
		COD	R	<10	mg/l
		pH	R	8.0	pH Units
		Alkalinity, total	R	93	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.024	mg/l
		Chloride	R	31.3	mg/l
		Nitrate as NO3	R	1.54	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	161	ug/l
		Potassium, total (in water)	S	0.6	mg/l
		Sulphate	R	28.1	mg/l
		TDS (gravimetric)	R	156	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Sodium, total (potable water)	S	14.2	mg/l
		Calcium, total (in water)	S	50.3	mg/l
		Magnesium, total (in water)	S	2.9	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652521	LQMW4 9/02/16	Good condition	08/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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Dublin 4

Report No. : 286197
Date of Receipt : 10/02/2016
Start Date of Analysis : 10/02/2016
Date of Report : 08/03/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652787	LQMW6 10/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	211	mg/l
		COD	R	20	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	45	mg/l CaCO3
		Ammonia as NH3-N	R	0.623	mg/l
		Phosphorus as PO4-P	R	0.032	mg/l
		Chloride	R	30.8	mg/l
		Nitrate as NO3	R	4.31	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	7	ug/l
		Potassium, total (in water)	S	1.81	mg/l
		Sulphate	R	292	mg/l
		TDS (gravimetric)	R	149	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	200	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	200	cfu/100ml
		Sodium, total (potable water)	S	16.6	mg/l
		Calcium, total (in water)	S	252	mg/l
		Magnesium, total (in water)	S	4.7	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652787	LQMW6 10/02/16	Good condition	09/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
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Dublin 4

Report No. : 286057
Date of Receipt : 09/02/2016
Start Date of Analysis : 09/02/2016
Date of Report : 17/02/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652522	MW03 9/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	324	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.054	mg/l
		Chloride	R	27	mg/l
		Nitrate as NO3	R	4	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	229	ug/l
		Potassium, total (in water)	S	1.28	mg/l
		Sulphate	R	5.92	mg/l
		TDS (gravimetric)	R	345	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	3	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	3	cfu/100ml
		Sodium, total (potable water)	S	17.3	mg/l
		Calcium, total (in water)	S	134	mg/l
		Magnesium, total (in water)	S	4.9	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652522	MW03 9/02/16	Good condition	08/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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Dublin 4

Report No. : 286055
Date of Receipt : 09/02/2016
Start Date of Analysis : 09/02/2016
Date of Report : 17/02/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652520	RC133 9/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	4	mg/l
		COD	R	<10	mg/l
		pH	R	7.5	pH Units
		Alkalinity, total	R	149	mg/l CaCO3
		Ammonia as NH3-N	R	0.014	mg/l
		Phosphorus as PO4-P	R	0.063	mg/l
		Chloride	R	24.7	mg/l
		Nitrate as NO3	R	4.32	mg/l
		Temperature	R	16.8 @ lab	C
		Iron, total	R	450	ug/l
		Potassium, total (in water)	S	1.57	mg/l
		Sulphate	R	9.95	mg/l
		TDS (gravimetric)	R	237	mg/l
		Manganese, total	R	1002	ug/l
		E coli (Filtration) (Environmental Waters)	R	38	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	38	cfu/100ml
		Sodium, total (potable water)	S	12.8	mg/l
		Calcium, total (in water)	S	68.3	mg/l
		Magnesium, total (in water)	S	2.1	mg/l

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Approved by: Barbara Lee

Barbara Lee
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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652520	RC133 9/02/16	Good condition	08/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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Report No. : 286195
Date of Receipt : 10/02/2016
Start Date of Analysis : 10/02/2016
Date of Report : 08/03/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652785	RP-2-01 10/02/16	BOD	R	3	mg/l
		Suspended Solids	R	12963	mg/l
		COD	R	230	mg/l
		pH	R	7.1	pH Units
		Alkalinity, total	R	5220	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.012	mg/l
		Chloride	R	31.2	mg/l
		Nitrate as NO3	R	17.1	mg/l
		Temperature	R	16.6 @ lab	C
		Iron, total	R	<10	ug/l
		Potassium, total (in water)	S	3.81	mg/l
		Sulphate	R	31.2	mg/l
		TDS (gravimetric)	R	247	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Sodium, total (potable water)	S	16.6	mg/l
		Calcium, total (in water)	S	897	mg/l
		Magnesium, total (in water)	S	18.2	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652785	RP-2-01 10/02/16	Good condition	09/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286198
Date of Receipt : 10/02/2016
Start Date of Analysis : 10/02/2016
Date of Report : 08/03/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652788	RP-2-05S 10/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	1463	mg/l
		COD	R	68	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	1000	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.023	mg/l
		Chloride	R	212	mg/l
		Nitrate as NO3	R	10.6	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	<10	ug/l
		Potassium, total (in water)	S	4.76	mg/l
		Sulphate	R	170	mg/l
		TDS (gravimetric)	R	968	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	30	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	30	cfu/100ml
		Sodium, total (potable water)	S	198	mg/l
		Calcium, total (in water)	S	290	mg/l
		Magnesium, total (in water)	S	16.2	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652788	RP-2-05S 10/02/16	Good condition	09/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286196
Date of Receipt : 10/02/2016
Start Date of Analysis : 10/02/2016
Date of Report : 08/03/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652786	RP-2-03 10/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	849	mg/l
		COD	R	32	mg/l
		pH	R	6.9	pH Units
		Alkalinity, total	R	1200	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	43.5	mg/l
		Nitrate as NO3	R	8.13	mg/l
		Temperature	R	16.8 @ lab	C
		Iron, total	R	2040	ug/l
		Potassium, total (in water)	S	4.39	mg/l
		Sulphate	R	32.3	mg/l
		TDS (gravimetric)	R	449	mg/l
		Manganese, total	R	78	ug/l
		E coli (Filtration) (Environmental Waters)	R	120	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	120	cfu/100ml
		Sodium, total (potable water)	S	40.2	mg/l
		Calcium, total (in water)	S	286	mg/l
		Magnesium, total (in water)	S	8.3	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652786	RP-2-03 10/02/16	Good condition	09/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286199
Date of Receipt : 10/02/2016
Start Date of Analysis : 10/02/2016
Date of Report : 08/03/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652789	RC-2-05D 10/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	59	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Alkalinity, total	R	252	mg/l CaCO3
		Ammonia as NH3-N	R	0.011	mg/l
		Phosphorus as PO4-P	R	0.022	mg/l
		Chloride	R	33.4	mg/l
		Nitrate as NO3	R	2.75	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	676	ug/l
		Potassium, total (in water)	S	1.88	mg/l
		Sulphate	R	18.1	mg/l
		TDS (gravimetric)	R	266	mg/l
		Manganese, total	R	31	ug/l
		E coli (Filtration) (Environmental Waters)	R	420	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	420	cfu/100ml
		Sodium, total (potable water)	S	16.5	mg/l
		Calcium, total (in water)	S	86.5	mg/l
		Magnesium, total (in water)	S	16.2	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652789	RC-2-05D 10/02/16	Good condition	09/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286051
Date of Receipt : 09/02/2016
Start Date of Analysis : 09/02/2016
Date of Report : 17/02/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652516	SW-2-4 9/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total	R	176	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.057	mg/l
		Chloride	R	22.2	mg/l
		Nitrate as NO3	R	6.49	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	88	ug/l
		Potassium, total (in water)	S	2.28	mg/l
		Sulphate	R	18.7	mg/l
		TDS (gravimetric)	R	290	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	53	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	53	cfu/100ml
		Sodium, total (potable water)	S	13.4	mg/l
		Calcium, total (in water)	S	80	mg/l
		Magnesium, total (in water)	S	2.7	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652516	SW-2-4 9/02/16	Good condition	08/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 286053
Date of Receipt : 09/02/2016
Start Date of Analysis : 09/02/2016
Date of Report : 17/02/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
652518	SW-2-5 9/02/16	BOD	R	<1	mg/l
		Suspended Solids	R	2	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Alkalinity, total	R	258	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.031	mg/l
		Chloride	R	31.2	mg/l
		Nitrate as NO3	R	3.22	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	152	ug/l
		Potassium, total (in water)	S	1.78	mg/l
		Sulphate	R	52	mg/l
		TDS (gravimetric)	R	230	mg/l
		Manganese, total	R	<5	ug/l
		E coli (Filtration) (Environmental Waters)	R	98	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	98	cfu/100ml
		Sodium, total (potable water)	S	16.2	mg/l
		Calcium, total (in water)	S	115	mg/l
		Magnesium, total (in water)	S	3.4	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Sodium, total (potable water	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
652518	SW-2-5 9/02/16	Good condition	08/02/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 288418
Date of Receipt : 04/03/2016
Start Date of Analysis : 04/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
657908	SW-2-5 2/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total (obsolete)	R	275	mg/l CaCO3
		Ammonia as NH3-N	R	0.018	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	3	ug/l
		Chloride	R	27.4	mg/l
		Nitrate as NO3	R	2.99	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	45	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	1.45	ug/l
		Potassium, total (in water)	S	1.51	mg/l
		Sulphate	R	49.8	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	126	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.9	ug/l
		Nickel, total	R	2	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	45	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	45	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	132 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	14.2	mg/l
		Calcium, total (in water)	S	117	mg/l
		Lead, total (in water)	S	<6	ug/l
		Magnesium, total (in water)	S	3.3	mg/l
		Mercury, total (in water)	S	<0.10	ug/l
		Cadmium Total 10 days	S	0.097	ug/l
		Barium Total 10 days	S	7.90	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total	CLS 196 GC-GC-FID	No	No	Yes	No	No

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Aliphatics C8-C44)						
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Cadmium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Barium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
657908	SW-2-5 2/03/16	Good condition	02/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 288415
Date of Receipt : 04/03/2016
Start Date of Analysis : 04/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
657905	LQMW 6. 02/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	4	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total (obsolete)	R	260	mg/l CaCO3
		Ammonia as NH3-N	R	0.622	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	2	ug/l
		Chloride	R	32.9	mg/l
		Nitrate as NO3	R	8	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	81	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	1.11	ug/l
		Potassium, total (in water)	S	2	mg/l
		Sulphate	R	299	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	733	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	211	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	8	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	88 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	20.2	mg/l
		Calcium, total (in water)	S	232	mg/l
		Lead, total (in water)	S	<6	ug/l
		Magnesium, total (in water)	S	4.7	mg/l
		Mercury, total (in water)	S	<0.10	ug/l
		Cadmium Total 10 days	S	<0.09	ug/l
		Barium Total 10 days	S	17.4	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

Barbara Lee
Environmental

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Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No

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Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Cadmium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Barium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
657905	LQMW 6. 02/03/16	Good condition	02/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 289288
Date of Receipt : 11/03/2016
Start Date of Analysis : 11/03/2016
Date of Report : 26/04/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
659759	MW03 09/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	22	mg/l
		COD	R	<10	mg/l
		pH	R	6.9	pH Units
		Alkalinity, total	R	316	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	2	ug/l
		Chloride	R	28.5	mg/l
		Nitrate as NO3	R	1.31	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	69	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	<0.80	ug/l
		Potassium, total (in water)	S	1.19	mg/l
		Sulphate	R	5.29	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0003	mg/l
		TDS (gravimetric)	R	389	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	8	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	1	ug/l
		Nickel, total	R	0.9	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	17	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	6	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	6	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	62 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	16.5	mg/l
		Calcium, total (in water)	S	131	mg/l
		Lead, total (in water)	S	<0.006	mg/l
		Magnesium, total (in water)	S	5	mg/l
		Mercury, total (in water)	S	<0.10	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

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Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, DSW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No

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Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
659759	MW03 09/03/16	Good condition	09/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 289289
Date of Receipt : 11/03/2016
Start Date of Analysis : 11/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
659761	RC133 09/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Alkalinity, total (obsolete)	R	130	mg/l CaCO3
		Ammonia as NH3-N	R	0.025	mg/l
		Phosphorus as PO4-P	R	0.047	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	25.3	mg/l
		Nitrate as NO3	R	3.72	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	15	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	<0.80	ug/l
		Potassium, total (in water)	S	1.63	mg/l
		Sulphate	R	14.2	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	189	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.5	ug/l
		Nickel, total	R	0.9	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	9	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	40	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	40	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	52 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	13.3	mg/l
		Calcium, total (in water)	S	72.5	mg/l
		Lead, total (in water)	S	<6	ug/l
		Magnesium, total (in water)	S	2.3	mg/l
		Mercury, total (in water)	S	<0.10	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

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Approved by: Barbara Lee

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range	CLS 147	Yes	No	Yes	No	No

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and Lube Oil) by GC-FID						
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
659761	RC133 09/03/16	Good condition	09/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 289285
Date of Receipt : 11/03/2016
Start Date of Analysis : 11/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
659756	RP-2-01 09/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	21	mg/l
		COD	R	16	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total (obsolete)	R	377	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	28.8	mg/l
		Nitrate as NO3	R	10.9	mg/l
		Temperature	R	16.5 @ lab	°C
		Iron, total	R	117	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	1.65	ug/l
		Potassium, total (in water)	S	2.9	mg/l
		Sulphate	R	29.4	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	0
		TDS (gravimetric)	R	310	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	10	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.9	ug/l
		Nickel, total	R	2	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	27	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	67	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	67	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	31 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	14.9	mg/l
		Calcium, total (in water)	S	169	mg/l
		Lead, total (in water)	S	7	ug/l
		Magnesium, total (in water)	S	7.9	mg/l
		Mercury, total (in water)	S	<0.10	ug/l

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Approved by: Barbara Lee

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range	CLS 147	Yes	No	Yes	No	No

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and Lube Oil) by GC-FID						
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
659756	RP-2-01 09/03/16	Good condition	09/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 289290
Date of Receipt : 11/03/2016
Start Date of Analysis : 11/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
659764	RP-2-05D 09/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	215	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Alkalinity, total (obsolete)	R	244	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	31	mg/l
		Nitrate as NO3	R	9.96	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	5	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	<0.80	ug/l
		Potassium, total (in water)	S	1.09	mg/l
		Sulphate	R	12	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	144	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	1	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	24	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	72 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	16.3	mg/l
		Calcium, total (in water)	S	141	mg/l
		Lead, total (in water)	S	7	ug/l
		Magnesium, total (in water)	S	13.1	mg/l
		Mercury, total (in water)	S	<0.10	ug/l

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range	CLS 147	Yes	No	Yes	No	No

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and Lube Oil) by GC-FID						
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
659764	RP-2-05D 09/03/16	Good condition	09/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 288416
Date of Receipt : 04/03/2016
Start Date of Analysis : 04/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
657906	RP-2-05S 02/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	461	mg/l
		COD	R	29	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total (obsolete)	R	561	mg/l CaCO3
		Ammonia as NH3-N	R	0.008	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	4	ug/l
		Chloride	R	111	mg/l
		Nitrate as NO3	R	8.9	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	1280	ug/l
		Lead, total (potable water)	S	0.008	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	3.61	ug/l
		Potassium, total (in water)	S	4.01	mg/l
		Sulphate	R	97.9	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	745	mg/l
		Arsenic, total	R	0.8	ug/l
		Manganese, total	R	52	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	5	ug/l
		Nickel, total	R	4	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	84 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	82	ug/l
		Sodium, total (potable water)	S	103	mg/l
		Calcium, total (in water)	S	166	mg/l
		Magnesium, total (in water)	S	11.5	mg/l
		Mercury, total (in water)	S	<0.10	ug/l
		Cadmium Total 10 days	S	0.70	ug/l
		Barium Total 10 days	S	158.0	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

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Approved by: Barbara Lee

Barbara Lee
Environmental

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Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range	CLS 147	Yes	No	Yes	No	No

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and Lube Oil) by GC-FID						
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Cadmium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Barium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
657906	RP-2-05S 02/03/16	Good condition	02/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 289286
Date of Receipt : 11/03/2016
Start Date of Analysis : 11/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
659757	RP-2-03 09/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	122	mg/l
		COD	R	16	mg/l
		pH	R	6.9	pH Units
		Alkalinity, total (obsolete)	R	272	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	1	ug/l
		Chloride	R	40.4	mg/l
		Nitrate as NO3	R	4.31	mg/l
		Temperature	R	16.6 @ lab	C
		Iron, total	R	53	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	1.65	ug/l
		Potassium, total (in water)	S	4.46	mg/l
		Sulphate	R	31.1	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	321	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.6	ug/l
		Nickel, total	R	3	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	41	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	35	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	35	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	58 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	67	ug/l
		Sodium, total (potable water)	S	14.9	mg/l
		Calcium, total (in water)	S	147	mg/l
		Lead, total (in water)	S	6	ug/l
		Magnesium, total (in water)	S	7.3	mg/l
		Mercury, total (in water)	S	<0.10	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

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Approved by: Barbara Lee

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Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No

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Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
659757	RP-2-03 09/03/16	Good condition	09/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist

Arup
50 Ringsend Road
Dublin 4

Supplement to Report No. : 288417
Date of Receipt : 04/03/2016
Start Date of Analysis : 04/03/2016
Date of Report : 29/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
657907	SW-2-4 02/03/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total (obsolete)	R	203	mg/l CaCO3
		Ammonia as NH3-N	R	0.037	mg/l
		Phosphorus as PO4-P	R	0.042	mg/l
		Copper, total	R	3	ug/l
		Chloride	R	30.1	mg/l
		Nitrate as NO3	R	5.33	mg/l
		Temperature	R	16.6 @ lab	C
		Iron, total	R	34	ug/l
		Antimony, total as Sb (potable water)	S	<1.2	ug/l
		Selenium, total (potable water)	S	0.87	ug/l
		Potassium, total (in water)	S	2.12	mg/l
		Sulphate	R	21.9	mg/l
		Molybdenum, total (potable water)	S	<3.00	ug/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	66	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	1	ug/l
		Nickel, total	R	1	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	112 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<66	ug/l
		Sodium, total (potable water)	S	14.1	mg/l
		Calcium, total (in water)	S	81.7	mg/l
		Lead, total (in water)	S	<6	ug/l
		Magnesium, total (in water)	S	2.8	mg/l
		Mercury, total (in water)	S	<0.10	ug/l
		Cadmium Total 10 days	S	0.023	ug/l
		Barium Total 10 days	S	129.0	ug/l

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Approved by: Barbara Lee

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Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total (obsolete)	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Antimony, total as Sb (potable water)	ICP-MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Selenium, total (potable water)	ICPMS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Potassium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Molybdenum, total (potable water)	ICP MS, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range	CLS 147	Yes	No	Yes	No	No

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and Lube Oil) by GC-FID						
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Sodium, total (potable water)	ICP AES, (Accredited in GW, SW, DW)	N/A	N/A	N/A	Yes	Yes
Calcium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Lead, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Magnesium, total (in water)	ICP OES, WAS049, (Accredited in GW, Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Cadmium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Barium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
657907	SW-2-4 02/03/16	Good condition	02/03/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291884
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666245	LQMW6. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	7	mg/l
		COD	R	<10	mg/l
		pH	R	6.9	pH Units
		Alkalinity, total	R	311	mg/l CaCO3
		Ammonia as NH3-N	R	1.49	mg/l
		Phosphorus as PO4-P	R	0.016	mg/l
		Chloride	R	35.2	mg/l
		Nitrate as NO3	R	6.6	mg/l
		Temperature	R	16.7 @ lab	C
		Sulphate	R	269	mg/l
		TDS (gravimetric)	R	745	mg/l
		E coli (Filtration) (Environmental Waters)	R	4	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	4	cfu/100ml
		Iron Total 10 days TAT10	S	87.1	ug/l
		Manganese Total 10 days TAT	S	220	ug/l
		Magnesium Total 10 days	S	8.04	mg/l
		Sodium Total 10 days	S	86.2	mg/l
		Potassium Total 10 days	S	3.52	mg/l
		Calcium Total 10 days	S	198	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666245	LQMW6. 06/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291887
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666248	MW03. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	7	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	361	mg/l CaCO3
		Ammonia as NH3-N	R	0.011	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	28.6	mg/l
		Nitrate as NO3	R	2.27	mg/l
		Temperature	R	16.3 @ lab	C
		Sulphate	R	5.75	mg/l
		TDS (gravimetric)	R	360	mg/l
		E coli (Filtration) (Environmental Waters)	R	16	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	16	cfu/100ml
		Iron Total 10 days TAT10	S	53.4	ug/l
		Manganese Total 10 days TAT	S	3.11	ug/l
		Magnesium Total 10 days	S	5.56	mg/l
		Sodium Total 10 days	S	18.3	mg/l
		Potassium Total 10 days	S	1.08	mg/l
		Calcium Total 10 days	S	131	mg/l

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666248	MW03. 06/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291888
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666249	RC133. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total	R	214	mg/l CaCO3
		Ammonia as NH3-N	R	0.012	mg/l
		Phosphorus as PO4-P	R	0.059	mg/l
		Chloride	R	26	mg/l
		Nitrate as NO3	R	5.28	mg/l
		Temperature	R	16.2 @ lab	C
		Sulphate	R	16.1	mg/l
		TDS (gravimetric)	R	225	mg/l
		E coli (Filtration) (Environmental Waters)	R	89	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	89	cfu/100ml
		Iron Total 10 days TAT10	S	33.7	ug/l
		Manganese Total 10 days TAT	S	2.77	ug/l
		Magnesium Total 10 days	S	2.66	mg/l
		Sodium Total 10 days	S	16.8	mg/l
		Potassium Total 10 days	S	1.87	mg/l
		Calcium Total 10 days	S	78.2	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666249	RC133. 06/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291875
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 05/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666230	RP-2-01. 07/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	128	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total	R	257	mg/l CaCO3
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	29.7	mg/l
		Nitrate as NO3	R	15.3	mg/l
		Temperature	R	16.3 @ lab	C
		Sulphate	R	27.8	mg/l
		TDS (gravimetric)	R	290	mg/l
		E coli (Filtration) (Environmental Waters)	R	14	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	14	cfu/100ml
		Iron Total 10 days TAT10	S	942	ug/l
		Manganese Total 10 days TAT	S	49.7	ug/l
		Magnesium Total 10 days	S	7.76	mg/l
		Sodium Total 10 days	S	18.5	mg/l
		Potassium Total 10 days	S	2.98	mg/l
		Calcium Total 10 days	S	129	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666230	RP-2-01. 07/04/16	Good condition	07/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291885
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666246	RP-2-05D. 07/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	11	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Alkalinity, total	R	205	mg/l CaCO3
		Ammonia as NH3-N	R	0.049	mg/l
		Phosphorus as PO4-P	R	0.012	mg/l
		Chloride	R	31.9	mg/l
		Nitrate as NO3	R	4.13	mg/l
		Temperature	R	16.5 @ lab	C
		Sulphate	R	13.7	mg/l
		TDS (gravimetric)	R	253	mg/l
		E coli (Filtration) (Environmental Waters)	R	11	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	11	cfu/100ml
		Iron Total 10 days TAT10	S	33.9	ug/l
		Manganese Total 10 days TAT	S	3.07	ug/l
		Magnesium Total 10 days	S	14.8	mg/l
		Sodium Total 10 days	S	19.1	mg/l
		Potassium Total 10 days	S	0.93	mg/l
		Calcium Total 10 days	S	94.6	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666246	RP-2-05D. 07/04/16	Good condition	07/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291886
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 27/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666247	RP-2-05S. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	2231	mg/l
		COD	R	45	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	700	mg/l CaCO3
		Ammonia as NH3-N	R	0.025	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	113	mg/l
		Nitrate as NO3	R	7.48	mg/l
		Temperature	R	15.8 @ lab	C
		Iron, total	R	14010	ug/l
		Sulphate	R	104	mg/l
		TDS (gravimetric)	R	328	mg/l
		Manganese, total	R	2125	ug/l
		E coli (Filtration) (Environmental Waters)	R	17	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	17	cfu/100ml
		Magnesium Total 10 days	S	21.3	mg/l
		Sodium Total 10 days	S	176	mg/l
		Potassium Total 10 days	S	2.86	mg/l
		Calcium Total 10 days	S	548	mg/l

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666247	RP-2-05S. 07/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291883
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666244	RP-2-03. 07/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	81	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	299	mg/l CaCO3
		Ammonia as NH3-N	R	0.025	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	47.8	mg/l
		Nitrate as NO3	R	9.12	mg/l
		Temperature	R	15.6 @ lab	C
		Sulphate	R	48.6	mg/l
		TDS (gravimetric)	R	391	mg/l
		E coli (Filtration) (Environmental Waters)	R	21	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	21	cfu/100ml
		Iron Total 10 days TAT10	S	299	ug/l
		Manganese Total 10 days TAT	S	39.3	ug/l
		Magnesium Total 10 days	S	5.07	mg/l
		Sodium Total 10 days	S	26.1	mg/l
		Potassium Total 10 days	S	2.24	mg/l
		Calcium Total 10 days	S	93.3	0

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666244	RP-2-03. 06/04/16	Good condition	07/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291889
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666250	SW-2-4. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Alkalinity, total	R	189	mg/l CaCO3
		Ammonia as NH3-N	R	0.012	mg/l
		Phosphorus as PO4-P	R	0.028	mg/l
		Chloride	R	26.1	mg/l
		Nitrate as NO3	R	4.17	mg/l
		Temperature	R	16.5 @ lab	C
		Sulphate	R	21.7	mg/l
		TDS (gravimetric)	R	225	mg/l
		E coli (Filtration) (Environmental Waters)	R	41	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	41	cfu/100ml
		Iron Total 10 days TAT10	S	59.7	ug/l
		Manganese Total 10 days TAT	S	1.7	ug/l
		Magnesium Total 10 days	S	3.0	mg/l
		Sodium Total 10 days	S	16.3	mg/l
		Potassium Total 10 days	S	2.23	mg/l
		Calcium Total 10 days	S	81.6	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666250	SW-2-4. 06/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 291890
Date of Receipt : 08/04/2016
Start Date of Analysis : 08/04/2016
Date of Report : 06/05/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
666251	SW-2-5. 06/04/16	BOD	R	<1	mg/l
		Suspended Solids	R	2	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Alkalinity, total	R	225	mg/l CaCO3
		Ammonia as NH3-N	R	0.03	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Chloride	R	25.7	mg/l
		Nitrate as NO3	R	2.46	mg/l
		Temperature	R	15.3 @ lab	C
		Sulphate	R	48.6	mg/l
		TDS (gravimetric)	R	145	mg/l
		E coli (Filtration) (Environmental Waters)	R	73	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	73	cfu/100ml
		Iron Total 10 days TAT10	S	54.7	ug/l
		Manganese Total 10 days TAT	S	3.56	ug/l
		Magnesium Total 10 days	S	3.78	mg/l
		Sodium Total 10 days	S	16.7	mg/l
		Potassium Total 10 days	S	1.66	mg/l
		Calcium Total 10 days	S	117	mg/l

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Alkalinity, total	CLS 54	No	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Iron Total 10 days TAT10	177, ICP-MS, (UKAS Accredited in DW, GW, SW and effluent.)	N/A	N/A	N/A	Yes	Yes
Manganese Total 10 days TAT	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
666251	SW-2-5. 06/04/16	Good condition	06/04/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294982
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674077	LQMW6. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	13	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	1.84	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	20.9	mg/l
		Nitrate as NO3	R	3.30	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	81	ug/l
		Sulphate	R	229	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	602	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	213	ug/l
		Zinc, total	R	67	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	4	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	24	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	12	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	12	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	154 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	328	mg/l CaCO3
		Lead Total	S	0.363	ug/l
		Magnesium Total 10 days	S	4.67	mg/l
		Potassium Total 10 days	S	2.71	mg/l
		Calcium Total 10 days	S	205	mg/l
		Molybdenum Total 5 days	S	17.1	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	<2.12	ug/l
		Sodium Total 10 days	S	25.3	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5	177, ICP-MS	N/A	N/A	N/A	Yes	No

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days						
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674077	LQMW6. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294985
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674080	MW03. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Ammonia as NH3-N	R	0.021	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	24.9	mg/l
		Nitrate as NO3	R	3.11	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	11	ug/l
		Sulphate	R	<5	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	355	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	14	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	142 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	354	mg/l CaCO3
		Lead Total	S	<0.12	ug/l
		Magnesium Total 10 days	S	5.71	mg/l
		Potassium Total 10 days	S	1.13	mg/l
		Calcium Total 10 days	S	119	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	2.29	ug/l
		Sodium Total 10 days	S	16.2	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5	177, ICP-MS	N/A	N/A	N/A	Yes	No

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days						
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674080	MW03. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294984
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674079	RC133. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	7	mg/l
		COD	R	<10	mg/l
		pH	R	7.5	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.082	mg/l
		Copper, total	R	1	ug/l
		Chloride	R	22	mg/l
		Nitrate as NO3	R	12.5	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	76	ug/l
		Sulphate	R	18.8	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	171	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	6	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	7	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	42	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	42	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	102 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	195	mg/l CaCO3
		Lead Total	S	0.26	ug/l
		Magnesium Total 10 days	S	2.6	mg/l
		Potassium Total 10 days	S	2.22	mg/l
		Calcium Total 10 days	S	82	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	3.19	ug/l
		Sodium Total 10 days	S	16.3	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674079	RC133. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294987
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 04/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674082	RP-2-01. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	85	mg/l
		COD	R	<10	mg/l
		pH	R	7.5	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	2	ug/l
		Chloride	R	28.3	mg/l
		Nitrate as NO3	R	13.4	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	2,566	ug/l
		Sulphate	R	22.2	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	232	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	19	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	1	ug/l
		Nickel, total	R	4	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	25	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	40	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	40	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	117 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	268	mg/l CaCO3
		Lead Total	S	0.948	ug/l
		Magnesium Total 10 days	S	7.19	mg/l
		Potassium Total 10 days	S	2.78	mg/l
		Calcium Total 10 days	S	96.1	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	2.97	ug/l
		Sodium Total 10 days	S	17.0	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

Barbara Lee
Environmental

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Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674082	RP-2-01. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294979
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674074	RP-2-05D. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	3	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	0.013	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	28.2	mg/l
		Nitrate as NO3	R	4.74	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	11	ug/l
		Sulphate	R	11.9	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	243	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	1	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	16	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	100	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	100	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	134 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	258	mg/l CaCO3
		Lead Total	S	0.173	ug/l
		Magnesium Total 10 days	S	13.4	mg/l
		Potassium Total 10 days	S	1.09	mg/l
		Calcium Total 10 days	S	90.1	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	2.53	ug/l
		Sodium Total 10 days	S	17.4	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5	177, ICP-MS	N/A	N/A	N/A	Yes	No

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days						
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674074	RP-2-05D. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294981
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 12/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674076	RP-2-05S. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	1656	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	0.047	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	16	ug/l
		Chloride	R	30.6	mg/l
		Nitrate as NO3	R	8.75	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	38043	ug/l
		Sulphate	R	126	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	627	mg/l
		Arsenic, total	R	2	ug/l
		Manganese, total	R	2298	ug/l
		Zinc, total	R	96	ug/l
		Chromium, total	R	19	ug/l
		Nickel, total	R	35	ug/l
		Cadmium, total	R	4	ug/l
		Barium, total	R	388	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	35	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	35	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	145 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	752	mg/l CaCO3
		Lead Total	S	233	ug/l
		Magnesium Total 10 days	S	27.6	mg/l
		Potassium Total 10 days	S	3.31	mg/l
		Calcium Total 10 days	S	1196	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	6.19	ug/l
		Sodium Total 10 days	S	130	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

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ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674076	RP-2-05S. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294988
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674083	RP-2-03. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	86	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	3	ug/l
		Chloride	R	34.4	mg/l
		Nitrate as NO3	R	8.13	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	431	ug/l
		Sulphate	R	27.6	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	109	mg/l
		Arsenic, total	R	0.5	ug/l
		Manganese, total	R	50	ug/l
		Zinc, total	R	12	ug/l
		Chromium, total	R	1	ug/l
		Nickel, total	R	4	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	30	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	129 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	354	mg/l CaCO3
		Lead Total	S	3.56	ug/l
		Magnesium Total 10 days	S	7.91	mg/l
		Potassium Total 10 days	S	3.64	mg/l
		Calcium Total 10 days	S	137	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	3.06	ug/l
		Sodium Total 10 days	S	43.3	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

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ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674083	RP-2-03. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294986
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 30/06/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674081	SW-2-4. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	0.021	mg/l
		Phosphorus as PO4-P	R	0.039	mg/l
		Copper, total	R	1	ug/l
		Chloride	R	23.9	mg/l
		Nitrate as NO3	R	8.22	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	<10	ug/l
		Sulphate	R	18.6	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	150	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Nickel, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	8	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	46	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	46	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	137 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	235	mg/l CaCO3
		Lead Total	S	<0.12	ug/l
		Magnesium Total 10 days	S	3.32	mg/l
		Potassium Total 10 days	S	2.99	mg/l
		Calcium Total 10 days	S	95.5	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	2.58	ug/l
		Sodium Total 10 days	S	15.8	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

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ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

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Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674081	SW-2-4. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 294983
Date of Receipt : 11/05/2016
Start Date of Analysis : 11/05/2016
Date of Report : 06/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
674078	SW-2-5. 10/05/16	BOD	R	<1	mg/l
		Suspended Solids	R	20	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	0.068	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Chloride	R	21.4	mg/l
		Nitrate as NO3	R	2.15	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	434	ug/l
		Sulphate	R	48.5	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	374	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	6	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.8	ug/l
		Nickel, total	R	1	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	6	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	79	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	79	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	217 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Alkalinity Total by Autotitration	R	283	mg/l CaCO3
		Lead Total	S	<0.12	ug/l
		Magnesium Total 10 days	S	3.63	mg/l
		Potassium Total 10 days	S	2.07	mg/l
		Calcium Total 10 days	S	108	mg/l
		Molybdenum Total 5 days	S	<5	ug/l
		Antimony Total 10 days	S	<2.06	ug/l
		Selenium Total 10 days	S	2.81	ug/l
		Sodium Total 10 days	S	14.7	mg/l
		Mercury Total 10 days	S	<0.04	ug/l

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

Barbara Lee
Environmental

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Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No
Lead Total	ICP MS, (UKAS Accredited in GW, SW, DW) SOP 177	N/A	N/A	N/A	Yes	Yes
Magnesium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Potassium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No

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Calcium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Molybdenum Total 5 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Antimony Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Selenium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	Yes
Sodium Total 10 days	177, ICP-MS	N/A	N/A	N/A	Yes	No
Mercury Total 10 days	178, ICP-MS	N/A	N/A	N/A	Yes	Yes

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
674078	SW-2-5. 10/05/16	Good condition	10/05/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298058
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 12/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680825	BH 3/48. 09/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	24	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.02	mg/l
		Sodium, total	R	37	mg/l
		Chloride	R	50	mg/l
		Nitrate as NO3	R	5.56	mg/l
		Temperature	R	19.9 @ lab	C
		Iron, total	R	443	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	37.2	mg/l
		TDS (gravimetric)	R	367	mg/l
		Manganese, total	R	24	ug/l
		Calcium, total	R	94	mg/l
		E coli (Filtration) (Environmental Waters)	R	96	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	96	cfu/100ml
		Alkalinity Total by Autotitration	R	221	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680825	BH 3/48. 09/06/16	Good condition	09/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 298049
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 20/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680812	LQMW6. 08/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	30	mg/l
		COD	R	10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	3.13	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	27	mg/l
		Chloride	R	33.4	mg/l
		Nitrate as NO3	R	0.833	mg/l
		Temperature	R	19.9 @ lab	C
		Iron, total	R	355	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	5	mg/l
		Sulphate	R	218	mg/l
		TDS (gravimetric)	R	678	mg/l
		Manganese, total	R	466	ug/l
		Calcium, total	R	192	mg/l
		E coli (Filtration) (Environmental Waters)	R	7	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	7	cfu/100ml
		Alkalinity Total by Autotitration	R	324	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680812	LQMW6. 08/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298054
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 11/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680820	MW03. 08/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	16	mg/l
		Chloride	R	27	mg/l
		Nitrate as NO3	R	4.34	mg/l
		Temperature	R	19.6 @ lab	C
		Iron, total	R	111	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	6.36	mg/l
		TDS (gravimetric)	R	415	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	127	mg/l
		E coli (Filtration) (Environmental Waters)	R	9	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	9	cfu/100ml
		Alkalinity Total by Autotitration	R	327	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680820	MW03. 08/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298052
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 11/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680815	RC 133. 09/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.019	mg/l
		Sodium, total	R	18	mg/l
		Chloride	R	25.1	mg/l
		Nitrate as NO3	R	17.2	mg/l
		Temperature	R	19.8 @ lab	C
		Iron, total	R	59	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	29.6	mg/l
		TDS (gravimetric)	R	348	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	84	mg/l
		E coli (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Alkalinity Total by Autotitration	R	203	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680815	RC 133. 09/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298057
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 15/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680824	RP-2-01. 09/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	21	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	19	mg/l
		Chloride	R	29	mg/l
		Nitrate as NO3	R	13.8	mg/l
		Temperature	R	19.5 @ lab	C
		Iron, total	R	189	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	8	mg/l
		Sulphate	R	24.9	mg/l
		TDS (gravimetric)	R	367	mg/l
		Manganese, total	R	15	ug/l
		Calcium, total	R	104	mg/l
		E coli (Filtration) (Environmental Waters)	R	24	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	24	cfu/100ml
		Alkalinity Total by Autotitration	R	263	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680824	RP-2-01. 09/06/16	Good condition	09/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298047
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 11/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680810	RP-2-05D. 08/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	17	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	19	mg/l
		Chloride	R	31.4	mg/l
		Nitrate as NO3	R	5.1	mg/l
		Temperature	R	19.5 @ lab	C
		Iron, total	R	184	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	14	mg/l
		Sulphate	R	13.5	mg/l
		TDS (gravimetric)	R	354	mg/l
		Manganese, total	R	7	ug/l
		Calcium, total	R	97	mg/l
		E coli (Filtration) (Environmental Waters)	R	18	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	18	cfu/100ml
		Alkalinity Total by Autotitration	R	242	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680810	RP-2-05D. 08/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298048
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 12/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680811	RP-2-05S. 08/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	474	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	146	mg/l
		Chloride	R	129	mg/l
		Nitrate as NO3	R	8.54	mg/l
		Temperature	R	19.8 @ lab	C
		Iron, total	R	4210	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	16	mg/l
		Sulphate	R	133	mg/l
		TDS (gravimetric)	R	746	mg/l
		Manganese, total	R	225	ug/l
		Calcium, total	R	235	mg/l
		E coli (Filtration) (Environmental Waters)	R	28	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	28	cfu/100ml
		Alkalinity Total by Autotitration	R	425	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680811	RP-2-05S. 08/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 298055
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 11/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680822	RP-2-03. 09/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	14	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	61	mg/l
		Chloride	R	39	mg/l
		Nitrate as NO3	R	10.6	mg/l
		Temperature	R	19.7 @ lab	C
		Iron, total	R	379	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	7	mg/l
		Sulphate	R	41.4	mg/l
		TDS (gravimetric)	R	430	mg/l
		Manganese, total	R	9	ug/l
		Calcium, total	R	113	mg/l
		E coli (Filtration) (Environmental Waters)	R	67	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	67	cfu/100ml
		Alkalinity Total by Autotitration	R	333	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680822	RP-2-03. 09/06/16	Good condition	09/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 298050
Date of Receipt : 10/06/2016
Start Date of Analysis : 10/06/2016
Date of Report : 11/07/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
680813	SW-2-5. 08/06/16	BOD	R	<1	mg/l
		Suspended Solids	R	8	mg/l
		COD	R	32	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	0.079	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	15	mg/l
		Chloride	R	22.8	mg/l
		Nitrate as NO3	R	0.713	mg/l
		Temperature	R	19.6 @ lab	C
		Iron, total	R	242	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	54.8	mg/l
		TDS (gravimetric)	R	500	mg/l
		Manganese, total	R	9	ug/l
		Calcium, total	R	115	mg/l
		E coli (Filtration) (Environmental Waters)	R	73	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	73	cfu/100ml
		Alkalinity Total by Autotitration	R	262	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
680813	SW-2-5. 08/06/16	Good condition	08/06/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 302767
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692271	BH 3/48. 21/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	16	mg/l
		COD	R	<10	mg/l
		pH	R	6.9	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.085	mg/l
		Sodium, total	R	31	mg/l
		Chloride	R	42.8	mg/l
		Nitrate as NO3	R	8.88	mg/l
		Temperature	R	15.2 @ lab	C
		Iron, total	R	12	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	22.4	mg/l
		TDS (gravimetric)	R	461	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	83	mg/l
		E coli (Filtration) (Environmental Waters)	R	137est	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	137est	cfu/100ml
		Alkalinity Total by Autotitration	R	247	mg/l CaCO3

**Note: est means that results obtained were calculated from plates containing greater than 100 colonies

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental
Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692271	BH 3/48. 21/07/16	Good condition	21/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 302763
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692268	LQMW6. 20/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	15	mg/l
		COD	R	<10	mg/l
		pH	R	6.8	pH Units
		Ammonia as NH3-N	R	3.93	mg/l
		Phosphorus as PO4-P	R	0.091	mg/l
		Sodium, total	R	26	mg/l
		Chloride	R	36.5	mg/l
		Nitrate as NO3	R	0.661	mg/l
		Temperature	R	15.5 @ lab	C
		Iron, total	R	635	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	5	mg/l
		Sulphate	R	186	mg/l
		TDS (gravimetric)	R	704	mg/l
		Manganese, total	R	563	ug/l
		Calcium, total	R	178	mg/l
		E coli (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Alkalinity Total by Autotitration	R	371	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692268	LQMW6. 20/07/16	Good condition	20/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 302760
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692266	MW03. 20/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	4	mg/l
		COD	R	<10	mg/l
		pH	R	6.7	pH Units
		Ammonia as NH3-N	R	0.015	mg/l
		Phosphorus as PO4-P	R	0.014	mg/l
		Sodium, total	R	14	mg/l
		Chloride	R	25.7	mg/l
		Nitrate as NO3	R	4.91	mg/l
		Temperature	R	15.3 @ lab	C
		Iron, total	R	38	ug/l
		Potassium, total	R	0.9	mg/l
		Magnesium, total	R	5	mg/l
		Sulphate	R	5.5	mg/l
		TDS (gravimetric)	R	399	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	113	mg/l
		E coli (Filtration) (Environmental Waters)	R	13	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	13	cfu/100ml
		Alkalinity Total by Autotitration	R	378	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692266	MW03. 20/07/16	Good condition	20/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 302761
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692267	RC 133. 20/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.1	mg/l
		Sodium, total	R	16	mg/l
		Chloride	R	19.7	mg/l
		Nitrate as NO3	R	0.484	mg/l
		Temperature	R	15.4 @ lab	C
		Iron, total	R	16	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	20.1	mg/l
		TDS (gravimetric)	R	314	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	79	mg/l
		E coli (Filtration) (Environmental Waters)	R	38	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	38	cfu/100ml
		Alkalinity Total by Autotitration	R	221	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692267	RC 133. 20/07/16	Good condition	20/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 302768
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692272	RP-2-01. 21/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	49	mg/l
		COD	R	<10	mg/l
		pH	R	6.9	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	18	mg/l
		Chloride	R	28.6	mg/l
		Nitrate as NO3	R	14.2	mg/l
		Temperature	R	15.3 @ lab	C
		Iron, total	R	781	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	7	mg/l
		Sulphate	R	27.2	mg/l
		TDS (gravimetric)	R	368	mg/l
		Manganese, total	R	17	ug/l
		Calcium, total	R	100	mg/l
		E coli (Filtration) (Environmental Waters)	R	12	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	12	cfu/100ml
		Alkalinity Total by Autotitration	R	251	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692272	RP-2-01. 21/07/16	Good condition	21/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 302769
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 05/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692273	RP-2-03. 21/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	81	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	0.006	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	44	mg/l
		Chloride	R	37.2	mg/l
		Nitrate as NO3	R	7.52	mg/l
		Temperature	R	15.7 @ lab	C
		Iron, total	R	216	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	7	mg/l
		Sulphate	R	32.6	mg/l
		TDS (gravimetric)	R	241	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	100	mg/l
		E coli (Filtration) (Environmental Waters)	R	2	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	2	cfu/100ml
		Alkalinity Total by Autotitration	R	358	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692273	RP-2-03. 21/07/16	Good condition	21/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 302764
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692269	RP-2-05D. 20/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	21	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Ammonia as NH3-N	R	0.074	mg/l
		Phosphorus as PO4-P	R	0.03	mg/l
		Sodium, total	R	15	mg/l
		Chloride	R	32.8	mg/l
		Nitrate as NO3	R	5.02	mg/l
		Temperature	R	15.4 @ lab	C
		Iron, total	R	15	ug/l
		Potassium, total	R	0.8	mg/l
		Magnesium, total	R	12	mg/l
		Sulphate	R	16.6	mg/l
		TDS (gravimetric)	R	528	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	73	mg/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	24	cfu/100ml
		Alkalinity Total by Autotitration	R	284	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692269	RP-2-05D. 20/07/16	Good condition	20/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 302766
Date of Receipt : 21/07/2016
Start Date of Analysis : 21/07/2016
Date of Report : 03/08/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
692270	RP-2-05S. 20/07/16	BOD	R	<1	mg/l
		Suspended Solids	R	364	mg/l
		COD	R	34	mg/l
		pH	R	6.8	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	160	mg/l
		Chloride	R	112	mg/l
		Nitrate as NO3	R	7.43	mg/l
		Temperature	R	15.6 @ lab	C
		Iron, total	R	313	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	12	mg/l
		Sulphate	R	134	mg/l
		TDS (gravimetric)	R	848	mg/l
		Manganese, total	R	18	ug/l
		Calcium, total	R	123	mg/l
		E coli (Filtration) (Environmental Waters)	R	840	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	840	cfu/100ml
		Alkalinity Total by Autotitration	R	490	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
692270	RP-2-05S. 20/07/16	Good condition	20/07/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306107
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 19/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700859	BH3/06. 24/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	51	mg/l
		COD	R	37	mg/l
		pH	R	6.8	pH Units
		Ammonia as NH3-N	R	0.188	mg/l
		Phosphorus as PO4-P	R	0.023	mg/l
		Copper, total	R	14	ug/l
		Sodium, total	R	16	mg/l
		Chloride	R	32.4	mg/l
		Nitrate as NO3	R	<0.44	mg/l
		Temperature	R	16.7 @ lab	C
		Iron, total	R	831	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	40.7	mg/l
		Chromium hexavalent in water	S	0.005	mg/l
		TDS (gravimetric)	R	311	mg/l
		Arsenic, total	R	0.8	ug/l
		Manganese, total	R	293	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	3	ug/l
		Calcium, total	R	48	mg/l
		Nickel, total	R	2	ug/l
		Lead, total	R	8	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	51	ug/l
		Selenium, total	R	0.6	ug/l
		Molybdenum, total	R	1	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	1	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	1	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	115 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	131	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

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Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date

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700859	BH3/06. 24/08/16	Good condition	24/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306106
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 22/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700858	BH3/17. 24/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	209	mg/l
		COD	R	14	mg/l
		pH	R	6.6	pH Units
		Ammonia as NH3-N	R	0.099	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	22	ug/l
		Sodium, total	R	14	mg/l
		Chloride	R	22.4	mg/l
		Nitrate as NO3	R	2.75	mg/l
		Temperature	R	17.2 @ lab	C
		Iron, total	R	Cannot be reported - unknown matrix interference	ug/l
		Potassium, total	R	5	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	17.4	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	114	mg/l
		Arsenic, total	R	3	ug/l
		Manganese, total	R	447	ug/l
		Zinc, total	R	28	ug/l
		Chromium, total	R	10	ug/l
		Calcium, total	R	32	mg/l
		Nickel, total	R	10	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	228	ug/l
		Selenium, total	R	0.8	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	24	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	24	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	146 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	81.2	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700858	BH3/17. 24/08/16	Good condition	24/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306105
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 14/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700857	BH3/48. 24/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.5	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.095	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	26	mg/l
		Chloride	R	38.8	mg/l
		Nitrate as NO3	R	14.1	mg/l
		Temperature	R	18.0 @ lab	C
		Iron, total	R	43	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	20.4	mg/l
		Chromium hexavalent in water	S	0.007	mg/l
		TDS (gravimetric)	R	414	mg/l
		Arsenic, total	R	0.6	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	0.5	ug/l
		Calcium, total	R	100	mg/l
		Nickel, total	R	0.6	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	0.6	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	16	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	0.6	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	86	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	86	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	113 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	267	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700857	BH3/48. 24/08/16	Good condition	24/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306104
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 14/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700856	LQMW6. 24/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	131	mg/l
		COD	R	26	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	5.02	mg/l
		Phosphorus as PO4-P	R	0.077	mg/l
		Copper, total	R	5	ug/l
		Sodium, total	R	27	mg/l
		Chloride	R	40	mg/l
		Nitrate as NO3	R	<0.44	mg/l
		Temperature	R	17.8 @ lab	C
		Iron, total	R	8073	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	5	mg/l
		Sulphate	R	174	mg/l
		Chromium hexavalent in water	S	0.004	mg/l
		TDS (gravimetric)	R	684	mg/l
		Arsenic, total	R	2	ug/l
		Manganese, total	R	1591	ug/l
		Zinc, total	R	122	ug/l
		Chromium, total	R	5	ug/l
		Calcium, total	R	196	mg/l
		Nickel, total	R	13	ug/l
		Lead, total	R	5	ug/l
		Antimony, total	R	1	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	54	ug/l
		Selenium, total	R	<0.5	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	248 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	372	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700856	LQMW6. 24/08/16	Good condition	24/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306026
Date of Receipt : 24/08/2016
Start Date of Analysis : 24/08/2016
Date of Report : 19/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700475	MW03. 23/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	23	mg/l
		COD	R	10	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.087	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	15	mg/l
		Chloride	R	16.6	mg/l
		Nitrate as NO3	R	<0.44	mg/l
		Temperature	R	18.3 @ lab	C
		Iron, total	R	472	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	16.1	mg/l
		Chromium hexavalent in water	S	0.008	mg/l
		TDS (gravimetric)	R	291	mg/l
		Arsenic, total	R	0.7	ug/l
		Manganese, total	R	129	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	3	ug/l
		Calcium, total	R	103	mg/l
		Nickel, total	R	3	ug/l
		Lead, total	R	3	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	11	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	33	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	33	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	95 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	224	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700475	MW03. 23/08/16	Good condition	23/08/2016

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[Email] services@cls.ie
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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306025
Date of Receipt : 24/08/2016
Start Date of Analysis : 24/08/2016
Date of Report : 12/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700474	RC133. 23/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	6.8	pH Units
		Ammonia as NH3-N	R	0.014	mg/l
		Phosphorus as PO4-P	R	0.025	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	15	mg/l
		Chloride	R	24.5	mg/l
		Nitrate as NO3	R	3.05	mg/l
		Temperature	R	17.2 @ lab	C
		Iron, total	R	41	ug/l
		Potassium, total	R	0.9	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	21.4	mg/l
		Chromium hexavalent in water	S	0.008	mg/l
		TDS (gravimetric)	R	289	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	127	mg/l
		Nickel, total	R	<0.5	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	13	ug/l
		Selenium, total	R	<0.5	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	45	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	45	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	62 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	370	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700474	RC133. 23/08/16	Good condition	23/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 305866
Date of Receipt : 23/08/2016
Start Date of Analysis : 23/08/2016
Date of Report : 12/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700203	RP-2-01. 22/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Ammonia as NH3-N	R	0.02	mg/l
		Phosphorus as PO4-P	R	0.019	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	14	mg/l
		Chloride	R	28.7	mg/l
		Nitrate as NO3	R	15.4	mg/l
		Temperature	R	17.5 @ lab	C
		Iron, total	R	39	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	30.7	mg/l
		Chromium hexavalent in water	S	0.013	mg/l
		TDS (gravimetric)	R	297	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	89	mg/l
		Nickel, total	R	<0.5	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	15	ug/l
		Selenium, total	R	2	ug/l
		Molybdenum, total	R	0.6	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	85 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	217	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700203	RP-2-01. 22/08/16	Good condition	22/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 305867
Date of Receipt : 23/08/2016
Start Date of Analysis : 23/08/2016
Date of Report : 12/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700204	RP-2-03. 22/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	8	mg/l
		COD	R	<10	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	0.034	mg/l
		Phosphorus as PO4-P	R	0.012	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	57	mg/l
		Chloride	R	36.6	mg/l
		Nitrate as NO3	R	8.77	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	21	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	36.8	mg/l
		Chromium hexavalent in water	S	0.009	mg/l
		TDS (gravimetric)	R	453	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	5	ug/l
		Zinc, total	R	22	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	108	mg/l
		Nickel, total	R	2	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	36	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	2	ug/l
		PRO Water (C5-C12) by GC-FID	R	42	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	250	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	250	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	152 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	318	mg/l CaCO3

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ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700204	RP-2-03. 22/08/16	Good condition	22/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306103
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 14/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700855	RP-2-05D. 25/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	108	mg/l
		COD	R	21	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	0.017	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	9	ug/l
		Sodium, total	R	18	mg/l
		Chloride	R	33.8	mg/l
		Nitrate as NO3	R	4.34	mg/l
		Temperature	R	18.7 @ lab	C
		Iron, total	R	1757	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	13	mg/l
		Sulphate	R	11	mg/l
		Chromium hexavalent in water	S	0.003	mg/l
		TDS (gravimetric)	R	339	mg/l
		Arsenic, total	R	0.8	ug/l
		Manganese, total	R	60	ug/l
		Zinc, total	R	55	ug/l
		Chromium, total	R	2	ug/l
		Calcium, total	R	110	mg/l
		Nickel, total	R	3	ug/l
		Lead, total	R	18	ug/l
		Antimony, total	R	2	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	23	ug/l
		Selenium, total	R	<0.5	ug/l
		Molybdenum, total	R	1	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	49 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	269	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700855	RP-2-05D. 25/08/16	Good condition	25/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 306102
Date of Receipt : 25/08/2016
Start Date of Analysis : 25/08/2016
Date of Report : 14/09/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
700854	RP-2-05S. 25/08/16	BOD	R	<1	mg/l
		Suspended Solids	R	163	mg/l
		COD	R	15	mg/l
		pH	R	6.8	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	5	ug/l
		Sodium, total	R	131	mg/l
		Chloride	R	97.7	mg/l
		Nitrate as NO3	R	8.28	mg/l
		Temperature	R	17.1 @ lab	C
		Iron, total	R	10234	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	13	mg/l
		Sulphate	R	115	mg/l
		Chromium hexavalent in water	S	0.006	mg/l
		TDS (gravimetric)	R	805	mg/l
		Arsenic, total	R	4	ug/l
		Manganese, total	R	520	ug/l
		Zinc, total	R	24	ug/l
		Chromium, total	R	8	ug/l
		Calcium, total	R	145	mg/l
		Nickel, total	R	9	ug/l
		Lead, total	R	4	ug/l
		Antimony, total	R	0.6	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	140	ug/l
		Selenium, total	R	3	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	51**Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<65	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	445	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	No	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
700854	RP-2-05S. 25/08/16	Good condition	25/08/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309829
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 17/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710448	BH 3/06. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	41	mg/l
		COD	R	24	mg/l
		pH	R	6.6	pH Units
		Ammonia as NH3-N	R	0.046	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	12	mg/l
		Chloride	R	16.4	mg/l
		Nitrate as NO3	R	1.24	mg/l
		Temperature	R	16.7 @ lab	C
		Iron, total	R	1165	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	2	mg/l
		Sulphate	R	12.8	mg/l
		TDS (gravimetric)	R	170	
		Manganese, total	R	315	ug/l
		Calcium, total	R	32	mg/l
		E coli (Filtration) (Environmental Waters)	R	1	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	1	cfu/100ml
		Alkalinity Total by Autotitration	R	78.7	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710448	BH 3/06. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 309830
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 17/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710450	BH 3/17. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	90	mg/l
		COD	R	32	mg/l
		pH	R	6.9	pH Units
		Ammonia as NH3-N	R	0.088	mg/l
		Phosphorus as PO4-P	R	0.022	mg/l
		Sodium, total	R	16	mg/l
		Chloride	R	29	mg/l
		Nitrate as NO3	R	30.6	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	1504	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	2	mg/l
		Sulphate	R	14	mg/l
		TDS (gravimetric)	R	655	
		Manganese, total	R	425	ug/l
		Calcium, total	R	44	mg/l
		E coli (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	10	cfu/100ml
		Alkalinity Total by Autotitration	R	114	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710450	BH 3/17. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309828
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 14/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710447	BH 3/48. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	17	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.105	mg/l
		Sodium, total	R	23	mg/l
		Chloride	R	36.6	mg/l
		Nitrate as NO3	R	8.84	mg/l
		Temperature	R	16.8 @ lab	C
		Iron, total	R	249	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	18.4	mg/l
		TDS (gravimetric)	R	334	
		Manganese, total	R	23	ug/l
		Calcium, total	R	111	mg/l
		E coli (Filtration) (Environmental Waters)	R	26	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	26	cfu/100ml
		Alkalinity Total by Autotitration	R	295	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710447	BH 3/48. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309826
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 17/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710444	LQMW6. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	17	mg/l
		COD	R	13	mg/l
		pH	R	6.9	pH Units
		Ammonia as NH3-N	R	6.44	mg/l
		Phosphorus as PO4-P	R	0.075	mg/l
		Sodium, total	R	32	mg/l
		Chloride	R	33.4	mg/l
		Nitrate as NO3	R	0.884	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	199	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	119	mg/l
		TDS (gravimetric)	R	622	mg/l
		Manganese, total	R	650	ug/l
		Calcium, total	R	181	mg/l
		E coli (Filtration) (Environmental Waters)	R	31	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	31	cfu/100ml
		Alkalinity Total by Autotitration	R	409	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710444	LQMW6. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309823
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 11/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710441	MW03. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	5	mg/l
		COD	R	14	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	0.02	mg/l
		Phosphorus as PO4-P	R	0.011	mg/l
		Sodium, total	R	13	mg/l
		Chloride	R	22.1	mg/l
		Nitrate as NO3	R	0.879	mg/l
		Temperature	R	15.9 @ lab	C
		Iron, total	R	39	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	5.51	mg/l
		TDS (gravimetric)	R	530	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	140	mg/l
		E coli (Filtration) (Environmental Waters)	R	65	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	65	cfu/100ml
		Alkalinity Total by Autotitration	R	395	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710441	MW03. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 309824
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 11/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710442	RC133. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	14	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.093	mg/l
		Sodium, total	R	12	mg/l
		Chloride	R	15.3	mg/l
		Nitrate as NO3	R	6.99	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	<10	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	12.9	mg/l
		TDS (gravimetric)	R	230	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	81	mg/l
		E coli (Filtration) (Environmental Waters)	R	63	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	63	cfu/100ml
		Alkalinity Total by Autotitration	R	225	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710442	RC133. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
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Dublin 4

Report No. : 309827
Date of Receipt : 30/09/2016
Start Date of Analysis : 30/09/2016
Date of Report : 17/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
710445	RP-2-01. 29/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	66	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	16	mg/l
		Chloride	R	28.9	mg/l
		Nitrate as NO3	R	9.99	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	1240	ug/l
		Potassium, total	R	3	mg/l
		Magnesium, total	R	7	mg/l
		Sulphate	R	27.3	mg/l
		TDS (gravimetric)	R	417	mg/l
		Manganese, total	R	23	ug/l
		Calcium, total	R	110	mg/l
		E coli (Filtration) (Environmental Waters)	R	8	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	8	cfu/100ml
		Alkalinity Total by Autotitration	R	256	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
710445	RP-2-01. 29/09/16	Good condition	29/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309467
Date of Receipt : 28/09/2016
Start Date of Analysis : 28/09/2016
Date of Report : 11/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
709669	RP-2-03. 28/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	11	mg/l
		COD	R	13	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	29	mg/l
		Chloride	R	30.1	mg/l
		Nitrate as NO3	R	6.69	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	136	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	25.8	mg/l
		TDS (gravimetric)	R	443	mg/l
		Manganese, total	R	17	ug/l
		Calcium, total	R	118	mg/l
		E coli (Filtration) (Environmental Waters)	R	158est	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	158est	cfu/100ml
		Alkalinity Total by Autotitration	R	339	mg/l CaCO3

**Note: est means that results obtained were calculated from plates containing greater than 100 colonies

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
709669	RP-2-03. 28/09/16	Good condition	28/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
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50 Ringsend Road
Dublin 4

Report No. : 309469
Date of Receipt : 28/09/2016
Start Date of Analysis : 28/09/2016
Date of Report : 11/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
709671	RP-2-05D. 28/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	25	mg/l
		COD	R	11	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	0.043	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	19	mg/l
		Chloride	R	30.5	mg/l
		Nitrate as NO3	R	2.65	mg/l
		Temperature	R	16.5 @ lab	C
		Iron, total	R	72	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	12	mg/l
		Sulphate	R	12	mg/l
		TDS (gravimetric)	R	32	mg/l
		Manganese, total	R	8	ug/l
		Calcium, total	R	89	mg/l
		E coli (Filtration) (Environmental Waters)	R	150est	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	150est	cfu/100ml
		Alkalinity Total by Autotitration	R	258	mg/l CaCO3

**Note: est means that results obtained were calculated from plates containing greater than 100 colonies

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
709671	RP-2-05D. 28/09/16	Good condition	28/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 309468
Date of Receipt : 28/09/2016
Start Date of Analysis : 28/09/2016
Date of Report : 17/10/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
709670	RP-2-05S. 28/09/16	BOD	R	<1	mg/l
		Suspended Solids	R	162	mg/l
		COD	R	14	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	0.028	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	134	mg/l
		Chloride	R	67.5	mg/l
		Nitrate as NO3	R	3.61	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	1842	ug/l
		Potassium, total	R	4	mg/l
		Magnesium, total	R	11	mg/l
		Sulphate	R	98.2	mg/l
		TDS (gravimetric)	R	664	mg/l
		Manganese, total	R	220	ug/l
		Calcium, total	R	164	mg/l
		E coli (Filtration) (Environmental Waters)	R	99	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	99	cfu/100ml
		Alkalinity Total by Autotitration	R	476	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
709670	RP-2-05S. 28/09/16	Good condition	28/09/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314057
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 24/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719842	BH 3/04. 02/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	18	mg/l
		COD	R	77	mg/l
		pH	R	6.4	pH Units
		Ammonia as NH3-N	R	0.029	mg/l
		Phosphorus as PO4-P	R	0.013	mg/l
		Sodium, total	R	22	mg/l
		Chloride	R	29.6	mg/l
		Nitrate as NO3	R	0.44	mg/l
		Temperature	R	16.1 @ lab	C
		Iron, total	R	1083	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	11.7	mg/l
		TDS (gravimetric)	R	151	mg/l
		Manganese, total	R	264	ug/l
		Calcium, total	R	61	mg/l
		E coli (Filtration) (Environmental Waters)	R	9	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	9	cfu/100ml
		Alkalinity Total by Autotitration	R	184	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719842	BH 3/04. 02/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314058
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 25/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719843	BH 3/18. 03/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	240	mg/l
		COD	R	13	mg/l
		pH	R	6.6	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	16	mg/l
		Chloride	R	24.3	mg/l
		Nitrate as NO3	R	3.92	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	2632	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	7.56	mg/l
		TDS (gravimetric)	R	346	mg/l
		Manganese, total	R	822	ug/l
		Calcium, total	R	36	mg/l
		E coli (Filtration) (Environmental Waters)	R	21	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	21	cfu/100ml
		Alkalinity Total by Autotitration	R	106	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719843	BH 3/18. 03/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314053
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 24/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719838	BH 3/38. 03/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	52	mg/l
		COD	R	33	mg/l
		pH	R	6.9	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.201	mg/l
		Sodium, total	R	38	mg/l
		Chloride	R	45.5	mg/l
		Nitrate as NO3	R	39.9	mg/l
		Temperature	R	16.1 @ lab	C
		Iron, total	R	353	ug/l
		Potassium, total	R	7	mg/l
		Magnesium, total	R	5	mg/l
		Sulphate	R	20.6	mg/l
		TDS (gravimetric)	R	331	mg/l
		Manganese, total	R	100	ug/l
		Calcium, total	R	137	mg/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Alkalinity Total by Autotitration	R	363	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719838	BH 3/38. 03/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314054
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 24/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719839	BH 3/41. 02/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	2417	mg/l
		COD	R	90	mg/l
		pH	R	7.0	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	20	mg/l
		Chloride	R	15.9	mg/l
		Nitrate as NO3	R	4.23	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	586	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	7	mg/l
		Sulphate	R	7.94	mg/l
		TDS (gravimetric)	R	98	mg/l
		Manganese, total	R	172	ug/l
		Calcium, total	R	124	mg/l
		E coli (Filtration) (Environmental Waters)	R	6	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	6	cfu/100ml
		Alkalinity Total by Autotitration	R	818	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719839	BH 3/41. 02/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314055
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 24/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719840	BH 3/42. 02/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	1018	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	24	mg/l
		Chloride	R	34.4	mg/l
		Nitrate as NO3	R	2.46	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	791	ug/l
		Potassium, total	R	23	mg/l
		Magnesium, total	R	23	mg/l
		Sulphate	R	31.4	mg/l
		TDS (gravimetric)	R	181	mg/l
		Manganese, total	R	229	ug/l
		Calcium, total	R	484	mg/l
		E coli (Filtration) (Environmental Waters)	R	36	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	36	cfu/100ml
		Alkalinity Total by Autotitration	R	653	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719840	BH 3/42. 02/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314056
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 24/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719841	GCR1. 03/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	41	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	0.092	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	15	mg/l
		Chloride	R	19	mg/l
		Nitrate as NO3	R	1.06	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	3891	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	12	mg/l
		Sulphate	R	<5	mg/l
		TDS (gravimetric)	R	173	mg/l
		Manganese, total	R	251	ug/l
		Calcium, total	R	99	mg/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Alkalinity Total by Autotitration	R	328	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719841	GCR1. 03/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314052
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 14/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719837	LQMW4. 03/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	15	mg/l
		COD	R	<10	mg/l
		pH	R	7.8	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Sodium, total	R	6	mg/l
		Chloride	R	9.08	mg/l
		Nitrate as NO3	R	5.40	mg/l
		Temperature	R	16.3 @ lab	C
		Iron, total	R	61	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	25.2	mg/l
		TDS (gravimetric)	R	132	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	40	mg/l
		E coli (Filtration) (Environmental Waters)	R	20	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	20	cfu/100ml
		Alkalinity Total by Autotitration	R	89.0	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719837	LQMW4. 03/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 314051
Date of Receipt : 03/11/2016
Start Date of Analysis : 03/11/2016
Date of Report : 14/11/2016
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
719836	RC 133. 03/11/16	BOD	R	<1	mg/l
		Suspended Solids	R	5	mg/l
		COD	R	<10	mg/l
		pH	R	7.2	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.072	mg/l
		Sodium, total	R	15	mg/l
		Chloride	R	17.9	mg/l
		Nitrate as NO3	R	31.6	mg/l
		Temperature	R	16.1 @ lab	C
		Iron, total	R	<10	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	23.3	mg/l
		TDS (gravimetric)	R	708	mg/l
		Manganese, total	R	<5	ug/l
		Calcium, total	R	91	mg/l
		E coli (Filtration) (Environmental Waters)	R	16	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	16	cfu/100ml
		Alkalinity Total by Autotitration	R	241	mg/l CaCO3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
719836	RC 133. 03/11/16	Good condition	03/11/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317062
Date of Receipt : 07/12/2016
Start Date of Analysis : 07/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
727801	BH 3/04. 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	7	mg/l
		COD	R	44	mg/l
		pH	R	6.6	pH Units
		Ammonia as NH3-N	R	0.075	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	21	mg/l
		Chloride	R	32.4	mg/l
		Nitrate as NO3	R	0.889	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	2990	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	4	mg/l
		Sulphate	R	11.4	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	269	mg/l
		Arsenic, total	R	1	ug/l
		Manganese, total	R	610	ug/l
		Zinc, total	R	7	ug/l
		Chromium, total	R	1	ug/l
		Calcium, total	R	58	mg/l
		Nickel, total	R	1	ug/l
		Lead, total	R	4	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	463	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	28	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	28	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	50 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	340.6	ug/l
		Mercury, total (in water)	S	<0.1	ug/l
		Alkalinity Total by Autotitration	R	184	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land	N/A	N/A	N/A	Yes	Yes

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	Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
727801	BH 3/04. 06/12/16	Good condition	06/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
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Report No. : 317063
Date of Receipt : 07/12/2016
Start Date of Analysis : 07/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
727802	BH 3/18. 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	155	mg/l
		COD	R	<10	mg/l
		pH	R	6.7	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.014	mg/l
		Copper, total	R	15	ug/l
		Sodium, total	R	15	mg/l
		Chloride	R	26.2	mg/l
		Nitrate as NO3	R	2.95	mg/l
		Temperature	R	16.6 @ lab	C
		Iron, total	R	3308	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	7.38	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	74	mg/l
		Arsenic, total	R	1	ug/l
		Manganese, total	R	783	ug/l
		Zinc, total	R	22	ug/l
		Chromium, total	R	5	ug/l
		Calcium, total	R	37	mg/l
		Nickel, total	R	6	ug/l
		Lead, total	R	29	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	1	ug/l
		Barium, total	R	58	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	68	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	54 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.1	ug/l
		Alkalinity Total by Autotitration	R	95.6	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED

Approved by: Barbara Lee

Barbara Lee
Environmental

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Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in	CV-AFS, WAS013 ,	N/A	N/A	N/A	Yes	Yes

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water)	(Accredited in Trade Effluent, Sewage, Land Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
727802	BH 3/18. 06/12/16	Good condition	06/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317066
Date of Receipt : 07/12/2016
Start Date of Analysis : 07/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
727805	BH 3/38. 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	246	mg/l
		COD	R	<10	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	0.039	mg/l
		Phosphorus as PO4-P	R	0.18	mg/l
		Copper, total	R	16	ug/l
		Sodium, total	R	43	mg/l
		Chloride	R	63.6	mg/l
		Nitrate as NO3	R	23.7	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	2034	ug/l
		Potassium, total	R	8	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	23.2	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	332	mg/l
		Arsenic, total	R	3	ug/l
		Manganese, total	R	569	ug/l
		Zinc, total	R	26	ug/l
		Chromium, total	R	7	ug/l
		Calcium, total	R	132	mg/l
		Nickel, total	R	44	ug/l
		Lead, total	R	6	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	1	ug/l
		Barium, total	R	40	ug/l
		Selenium, total	R	4	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	96	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	96	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	187 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	0.2	ug/l
		Alkalinity Total by Autotitration	R	360	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land	N/A	N/A	N/A	Yes	Yes

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	Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
727805	BH 3/38. 06/12/16	Good condition	06/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317316
Date of Receipt : 08/12/2016
Start Date of Analysis : 08/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
728553	BH 3/41. 07/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	1962	mg/l
		COD	R	31	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	21	ug/l
		Sodium, total	R	19	mg/l
		Chloride	R	21.9	mg/l
		Nitrate as NO3	R	2.43	mg/l
		Temperature	R	15.6 @ lab	C
		Iron, total	R	18361	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	9	mg/l
		Sulphate	R	<5	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	319	mg/l
		Arsenic, total	R	1	ug/l
		Manganese, total	R	766	ug/l
		Zinc, total	R	79	ug/l
		Chromium, total	R	14	ug/l
		Calcium, total	R	423	mg/l
		Nickel, total	R	43	ug/l
		Lead, total	R	21	ug/l
		Antimony, total	R	1	ug/l
		Cadmium, total	R	2	ug/l
		Barium, total	R	110	ug/l
		Selenium, total	R	2	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	15	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	95 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	504	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

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Environmental Scientist

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See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	No	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land	N/A	N/A	N/A	Yes	Yes

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	Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
728553	BH 3/41. 07/12/16	Good condition	07/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317317
Date of Receipt : 08/12/2016
Start Date of Analysis : 08/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
728554	BH 3/42. 07/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	1345	mg/l
		COD	R	40	mg/l
		pH	R	7.1	pH Units
		Ammonia as NH3-N	R	0.032	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	6	ug/l
		Sodium, total	R	22	mg/l
		Chloride	R	35.2	mg/l
		Nitrate as NO3	R	0.577	mg/l
		Temperature	R	15.8 @ lab	C
		Iron, total	R	1646	ug/l
		Potassium, total	R	20	mg/l
		Magnesium, total	R	15	mg/l
		Sulphate	R	25.9	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	493	mg/l
		Arsenic, total	R	1	ug/l
		Manganese, total	R	134	ug/l
		Zinc, total	R	27	ug/l
		Chromium, total	R	3	ug/l
		Calcium, total	R	210	mg/l
		Nickel, total	R	11	ug/l
		Lead, total	R	4	ug/l
		Antimony, total	R	1	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	86	ug/l
		Selenium, total	R	1	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	139est	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	139est	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	130 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	475	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited
** Note: est means that results obtained were calculated from plates containing greater than 100 colonies

ISO 17025

Approved by: Barbara Lee

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Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No

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Co. Galway

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[web] www.cls.ie

Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
728554	BH 3/42. 07/12/16	Good condition	07/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317318
Date of Receipt : 08/12/2016
Start Date of Analysis : 08/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
728555	GCR1. 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	11	mg/l
		COD	R	<10	mg/l
		pH	R	7.3	pH Units
		Ammonia as NH3-N	R	0.554	mg/l
		Phosphorus as PO4-P	R	0.012	mg/l
		Copper, total	R	7	ug/l
		Sodium, total	R	14	mg/l
		Chloride	R	19.1	mg/l
		Nitrate as NO3	R	0.638	mg/l
		Temperature	R	15.6 @ lab	C
		Iron, total	R	1485	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	11	mg/l
		Sulphate	R	<5	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	333	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	141	ug/l
		Zinc, total	R	56	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	93	mg/l
		Nickel, total	R	1	ug/l
		Lead, total	R	12	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	76	ug/l
		Selenium, total	R	<0.5	ug/l
		Molybdenum, total	R	2	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	158 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.10	ug/l
		Alkalinity Total by Autotitration	R	310	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 108T

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade Effluent, Sewage, Land Leachate)	N/A	N/A	N/A	Yes	Yes

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Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
728555	GCR1. 06/12/16	Good condition	08/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317064
Date of Receipt : 07/12/2016
Start Date of Analysis : 07/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
727803	LQMW4 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	9	mg/l
		COD	R	<10	mg/l
		pH	R	7.9	pH Units
		Ammonia as NH3-N	R	0.137	mg/l
		Phosphorus as PO4-P	R	<0.01	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	10	mg/l
		Chloride	R	18.5	mg/l
		Nitrate as NO3	R	1.47	mg/l
		Temperature	R	16.4 @ lab	C
		Iron, total	R	148	ug/l
		Potassium, total	R	1	mg/l
		Magnesium, total	R	6	mg/l
		Sulphate	R	40.6	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	189	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	7	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	45	mg/l
		Nickel, total	R	14	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	14	ug/l
		Selenium, total	R	2	ug/l
		Molybdenum, total	R	2	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	13	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	117 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.1	ug/l
		Alkalinity Total by Autotitration	R	103	mg/l CaCO3

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ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
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* Location of analysis: R=Ros Muc, M=MedPharma, S=Subcontracted.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade	N/A	N/A	N/A	Yes	Yes

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	Effluent, Sewage, Land Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

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[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
727803	LQMW4 06/12/16	Good condition	06/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 317065
Date of Receipt : 07/12/2016
Start Date of Analysis : 07/12/2016
Date of Report : 09/01/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	*	Result	Units
727804	RC 133 06/12/16	BOD	R	<1	mg/l
		Suspended Solids	R	<2	mg/l
		COD	R	<10	mg/l
		pH	R	7.4	pH Units
		Ammonia as NH3-N	R	<0.005	mg/l
		Phosphorus as PO4-P	R	0.079	mg/l
		Copper, total	R	<1	ug/l
		Sodium, total	R	16	mg/l
		Chloride	R	23.3	mg/l
		Nitrate as NO3	R	14.1	mg/l
		Temperature	R	16.2 @ lab	C
		Iron, total	R	<10	ug/l
		Potassium, total	R	2	mg/l
		Magnesium, total	R	3	mg/l
		Sulphate	R	29.8	mg/l
		Chromium hexavalent in water	S	<0.003	mg/l
		TDS (gravimetric)	R	108	mg/l
		Arsenic, total	R	<0.5	ug/l
		Manganese, total	R	<5	ug/l
		Zinc, total	R	<5	ug/l
		Chromium, total	R	<0.5	ug/l
		Calcium, total	R	83	mg/l
		Nickel, total	R	<0.5	ug/l
		Lead, total	R	<0.5	ug/l
		Antimony, total	R	<0.5	ug/l
		Cadmium, total	R	<0.5	ug/l
		Barium, total	R	7	ug/l
		Selenium, total	R	2	ug/l
		Molybdenum, total	R	<0.5	ug/l
		PRO Water (C5-C12) by GC-FID	R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	R	<10	ug/l
		MTBE by GC-FID	R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	R	63	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	R	63	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	R	95 ** Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S	<0.1	ug/l
		Alkalinity Total by Autotitration	R	224	mg/l CaCO3

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ISO 17025 INAB ACCREDITED TESTING

Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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Test	Specification	CLS 17025 status	GMP/FDA[1]	ISO[2]	Sub[3]	Sub 17025 Status
BOD	CLS 12	Yes	No	Yes	No	No
Suspended Solids	CLS 13	Yes	No	Yes	No	No
COD	CLS 52	Yes	No	Yes	No	No
pH	CLS 26	Yes	No	Yes	No	No
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes	No	No
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes	No	No
Copper, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Sodium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Chloride	Konelab CLS 36	Yes	No	Yes	No	No
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes	No	No
Temperature	Probe	No	No	Yes	No	No
Iron, total	ICP-MS CLS129	Yes	No	Yes	No	No
Potassium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Magnesium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Sulphate	Konelab CLS 88	Yes	No	Yes	No	No
Chromium hexavalent in water	WAS031 Colorimetry (Accredited in trade effluent and land leachate only.)	N/A	N/A	N/A	Yes	No
TDS (gravimetric)	CLS 93	No	No	Yes	No	No
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Manganese, total	ICP-MS CLS129	Yes	No	Yes	No	No
Zinc, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Chromium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Calcium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Nickel, total	ICP-MS CLS129	Yes	No	Yes	No	No
Lead, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Antimony, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes	No	No
Barium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Selenium, total	ICP-MS CLS129	Yes	No	Yes	No	No
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes	No	No
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes	No	No
BTEX (Benzene, Toluene, Ethylbenzene m,p- & o-Xyl	CLS 148	Yes	No	Yes	No	No
MTBE by GC-FID	CLS 148	Yes	No	Yes	No	No
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes	No	No
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes	No	No
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes	No	No
Mercury, total (in water)	CV-AFS, WAS013 , (Accredited in Trade	N/A	N/A	N/A	Yes	Yes

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	Effluent, Sewage, Land Leachate)					
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes	No	No

[1]Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
[2]Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).
[3]Subcontracted.

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
727804	RC 133 06/12/16	Good condition	06/12/2016

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 326542
Date of Receipt : 11/04/2017
Start Date of Analysis : 11/04/2017
Date of Report : 05/05/2017
Order Number :
Sample taken by : Client

Lab No	Sample Description	Test	Ref.	Result	Units
756845	Ballinafoyle Lough. 11/04/17	BOD	I, R	<1	mg/l
		Suspended Solids	I, R	2	mg/l
		COD	I, R	16	mg/l
		pH	I, R	7.8	pH Units
		Ammonia as NH3-N	I, R	0.065	mg/l
		Phosphorus as PO4-P	I, R	0.034	mg/l
		Copper, total	I, R	<1	ug/l
		Sodium, total	I, R	29	mg/l
		Chloride	I, R	51.1	mg/l
		Nitrate as NO3	I, R	<0.44	mg/l
		Temperature	R	16.4 @ Lab	C
		Iron, total	I, R	53	ug/l
		Potassium, total	I, R	2	mg/l
		Magnesium, total	I, R	3	mg/l
		Sulphate	I, R	11.2	mg/l
		Chromium hexavalent in water	S,	<0.003	mg/l
		TDS (gravimetric)	R	274	mg/l
		Arsenic, total	I, R	<0.5	ug/l
		Manganese, total	I, R	9	ug/l
		Zinc, total	I, R	<5	ug/l
		Chromium, total	I, R	<0.5	ug/l
		Calcium, total	I, R	83	mg/l
		Nickel, total	I, R	<0.5	ug/l
		Lead, total	I, R	<0.5	ug/l
		Antimony, total	I, R	<0.5	ug/l
		Cadmium, total	I, R	<0.5	ug/l
		Barium, total	I, R	16	ug/l
		Selenium, total	I, R	<0.5	ug/l
		Molybdenum, total	I, R	0.5	ug/l
		PRO Water (C5-C12) by GC-FID	I, R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	I, R	<10	ug/l
		MTBE by GC-FID	I, R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	I, R	0	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	I, R	0	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	I, R	160 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	<130	ug/l
		Mercury, total (in water)	S,	0.03	ug/l
		Alkalinity Total by Autotitration	I, R	239	mg/l CaCO3

** Note: The comment expressed here is an interpretation and is not INAB accredited

ISO 17025

Approved by: Barbara Lee

Complete Laboratory Solutions,
Ros Muc, Connemara,
Co. Galway

Complete Laboratory Solutions,
MedPharma Division,
Unit 3a, Small Business Park, Mervue, Galway

Symbol Reference - I:17025 accredited; S:Subcontracted; R:Analysis carried out in Ros Muc; M:Analysis carried out in MedPharma

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Barbara Lee
Environmental Scientist

See below for test specifications and accreditation status.
This report only relates to items tested and shall not be reproduced but in full with the permission of CLS.
It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

In-House Test	Specification	17025	GMP/FDA*	ISO**
BOD	CLS 12	Yes	No	Yes
Suspended Solids	CLS 13	Yes	No	Yes
COD	CLS 52	Yes	No	Yes
pH	CLS 26	Yes	No	Yes
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes
Copper, total	ICP-MS CLS 129	Yes	No	Yes
Sodium, total	ICP-MS CLS129	Yes	No	Yes
Chloride	Konelab CLS 36	Yes	No	Yes
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes
Temperature	Probe	No	No	Yes
Iron, total	ICP-MS CLS129	Yes	No	Yes
Potassium, total	ICP-MS CLS129	Yes	No	Yes
Magnesium, total	ICP-MS CLS129	Yes	No	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes
TDS (gravimetric)	CLS 93	No	No	Yes
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes
Manganese, total	ICP-MS CLS129	Yes	No	Yes
Zinc, total	ICP-MS CLS 129	Yes	No	Yes
Chromium, total	ICP-MS CLS129	Yes	No	Yes
Calcium, total	ICP-MS CLS129	Yes	No	Yes
Nickel, total	ICP-MS CLS129	Yes	No	Yes
Lead, total	ICP-MS CLS 129	Yes	No	Yes
Antimony, total	ICP-MS CLS 129	Yes	No	Yes
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes
Barium, total	ICP-MS CLS129	Yes	No	Yes
Selenium, total	ICP-MS CLS129	Yes	No	Yes
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes
MTBE by GC-FID	CLS 148	Yes	No	Yes
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes

*Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
**Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date
756845	Ballinafoyle Lough. 11/04/17	Good condition	11/04/2017

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CERTIFICATE OF ANALYSIS

Client : Dr. Les Brown, Senior Hydrogeologist
Arup
50 Ringsend Road
Dublin 4

Report No. : 322778
Date of Receipt : 27/02/2017
Start Date of Analysis : 27/02/2017
Date of Report : 16/03/2017
Order Number : SC004704
Sample taken by : Client

Lab No	Sample Description	Test	Ref.	Result	Units
745665	K31. 27/02/17	BOD	I, R	<1	mg/l
		Suspended Solids	I, R	7	mg/l
		COD	I, R	10	mg/l
		pH	I, R	7.6	pH Units
		Ammonia as NH3-N	I, R	0.005	mg/l
		Phosphorus as PO4-P	I, R	0.056	mg/l
		Copper, total	I, R	6	ug/l
		Sodium, total	I, R	16	mg/l
		Chloride	I, R	26.4	mg/l
		Nitrate as NO3	I, R	7.64	mg/l
		Temperature	R	16.1 @ lab	C
		Iron, total	I, R	<10	ug/l
		Potassium, total	I, R	2	mg/l
		Magnesium, total	I, R	3	mg/l
		Sulphate	I, R	15.5	mg/l
		Chromium hexavalent in water	S,	<0.003	mg/l
		TDS (gravimetric)	R	264	mg/l
		Arsenic, total	I, R	<0.5	ug/l
		Manganese, total	I, R	<5	ug/l
		Zinc, total	I, R	<5	ug/l
		Chromium, total	I, R	<0.5	ug/l
		Calcium, total	I, R	84	mg/l
		Nickel, total	I, R	<0.5	ug/l
		Lead, total	I, R	<0.5	ug/l
		Antimony, total	I, R	<0.5	ug/l
		Cadmium, total	I, R	<0.5	ug/l
		Barium, total	I, R	6	ug/l
		Selenium, total	I, R	0.9	ug/l
		Molybdenum, total	I, R	0.6	ug/l
		PRO Water (C5-C12) by GC-FID	I, R	<10	ug/l
		BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	I, R	<10	ug/l
		MTBE by GC-FID	I, R	<10	ug/l
		E coli (Filtration) (Environmental Waters)	I, R	58	cfu/100ml
		Total Coliforms (Filtration) (Environmental Waters)	I, R	58	cfu/100ml
		Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	I, R	144 **Unknown Pattern	ug/l
		Mineral Oil (Total Aliphatics C8-C44)	R	96.9	ug/l
		Mercury, total (in water)	S,	<0.1	ug/l
		Alkalinity Total by Autotitration	I, R	218	mg/l CaCO3

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Approved by: Barbara Lee

Barbara Lee
Environmental Scientist

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It is recommended that water samples requiring microbiological analysis should be tested within 24 hours of sampling.

In-House Test	Specification	17025	GMP/FDA*	ISO**
BOD	CLS 12	Yes	No	Yes
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COD	CLS 52	Yes	No	Yes
pH	CLS 26	Yes	No	Yes
Ammonia as NH3-N	Konelab CLS 40	Yes	No	Yes
Phosphorus as PO4-P	Konelab CLS 35	Yes	No	Yes
Copper, total	ICP-MS CLS 129	Yes	No	Yes
Sodium, total	ICP-MS CLS129	Yes	No	Yes
Chloride	Konelab CLS 36	Yes	No	Yes
Nitrate as NO3	Konelab CLS 39	Yes	No	Yes
Temperature	Probe	No	No	Yes
Iron, total	ICP-MS CLS129	Yes	No	Yes
Potassium, total	ICP-MS CLS129	Yes	No	Yes
Magnesium, total	ICP-MS CLS129	Yes	No	Yes
Sulphate	Konelab CLS 88	Yes	No	Yes
TDS (gravimetric)	CLS 93	No	No	Yes
Arsenic, total	ICP-MS CLS 129	Yes	No	Yes
Manganese, total	ICP-MS CLS129	Yes	No	Yes
Zinc, total	ICP-MS CLS 129	Yes	No	Yes
Chromium, total	ICP-MS CLS129	Yes	No	Yes
Calcium, total	ICP-MS CLS129	Yes	No	Yes
Nickel, total	ICP-MS CLS129	Yes	No	Yes
Lead, total	ICP-MS CLS 129	Yes	No	Yes
Antimony, total	ICP-MS CLS 129	Yes	No	Yes
Cadmium, total	ICP-MS CLS 129	Yes	No	Yes
Barium, total	ICP-MS CLS129	Yes	No	Yes
Selenium, total	ICP-MS CLS129	Yes	No	Yes
Molybdenum, total	ICP-MS CLS129	Yes	No	Yes
PRO Water (C5-C12) by GC-FID	CLS 148	Yes	No	Yes
BTEX (Benzene, Toluene, Ethylbenzene, m,p- & o-Xyl	CLS 148	Yes	No	Yes
MTBE by GC-FID	CLS 148	Yes	No	Yes
E coli (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes
Total Coliforms (Filtration) (Environmental Waters)	CLS 16	Yes	No	Yes
Extractable Hydrocarbons Water (C8-C40, Diesel Range and Lube Oil) by GC-FID	CLS 147	Yes	No	Yes
Mineral Oil (Total Aliphatics C8-C44)	CLS 196 GC-GC-FID	No	No	Yes
Alkalinity Total by Autotitration	CLS 195	Yes	No	Yes

*Analysis carried out in a GMP approved, FDA inspected facility (MedPharma site only).
**Laboratory Analysis, Sampling, Technical Backup, Training, Food Safety Program Auditing and Monitoring are all ISO 9001:2008 certified (Ros Muc site only).

Lab No	Sample ID	Sample Condition on Receipt	Sampling Date

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745665	K31. 27/02/17	Good condition	27/02/2017

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