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CLIENT
 Chartered Land Ltd.

DETAILS

Figure No.
 4.1

TITLE
 Sample Locations and Areas of Risk

SCALE	REV.
NTS	REV

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4.3 Soil

4.3.1 Sampling

The purpose of the soil sampling was to establish the presence or absence of contamination and to characterise the fill and subsoils. The samples were collected in accordance with OCM soil sampling protocol, a copy of which is included in Appendix 3.

4.3.2 Laboratory Analysis

All samples were sent to the STL laboratory in Blanchardstown, Dublin for analysis. The range of parameters tested was based on the nature of the historical site activities. In addition selected samples were tested for a range of parameters specified in the EU Council Decision establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

The Decision specifies Waste Acceptance Criteria (WAC) for a range of inorganic and organic parameters that define whether a waste is suitable for disposal to an inert, non-hazardous or hazardous waste landfill. Materials that comply with the inert WAC are deemed to be essentially inert and present a minimal environmental risk.

Three (3) samples of the fill material from BH-7, 9 and 10 were analysed for Total Petroleum Hydrocarbons (TPH), BETX (benzene, toluene, ethylbenzene and xylene), PAH (polycyclic aromatic hydrocarbons) and metals (arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, tin, selenium and zinc).

Nineteen (19) samples, of the fill and natural ground from, BH-7, 9, 10, 12, 14, 15, RC-8 and W-2, were tested for the WAC, which included Total Organic Carbon (TOC), BETX, PCBs (polychlorinated biphenyls, 7 congeners), Mineral Oil (C10 to C40) and PAH sum of 17. They were also subjected to leach testing at a liquid to solid ratio of 10:1 and the leachate analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, tin, selenium, zinc, chloride, fluoride, sulphate, phenols, dissolved organic carbon and total dissolved solids.

Details of the sample points, sample depth, nature of the sample and analytical tests are presented in Table 4.1

Table 4.1

Summary of Soils Samples				
Borehole Name	Sample Type	Sample Type	Sample Depth	Type of Subsoil
BH-7	Fill Material	Soil	0.5-1 m	
	Natural Ground	WAC	4-5 m	Gravel
	Natural Ground	WAC	12-13m	Gravel
BH-9	Fill Material	Soil	0.4-0.8m	
	Natural Ground	WAC	4-5m	Gravel
BH-10	Fill Material	Soil	1.7.2.5m	
BH-12	Fill Material	WAC	0.5-1m	
	Fill Material	WAC	3-4m	
	Natural Ground	WAC	4-5m	Clay
	Natural Ground	WAC	8-10m	Clay
BH-14	Fill Material	WAC	0.5-1m	
	Fill Material	WAC	1-2m	
	Fill Material	WAC	2-3m	
	Natural Ground	WAC	3-4m	Clay
	Natural Ground	WAC	8-10m	Gravel
RC-8	Fill Material	WAC	0.5-1m	
	Fill Material	WAC	1-2m	
W-2	Fill Material	WAC	0.5-1m	
	Fill Material	WAC	1-2m	

4.3.3 Results

The results of analysis of three solid samples of the fill material are shown in Table 4.2. The Table includes, for comparative purposes, the EU Council Decision WAC and the Dutch Government Soil Quality Standards commonly referred to as the Dutch List. These guidelines specify two categories, a target level (D) and an intervention level (I). The (D) level is considered representative of background conditions. The (I) level is one at or above which remedial action may be considered necessary depending on the potential environmental exposure risk. Many Irish Local Authorities use these standards to assess the potential for contamination. These samples were also compared with the EPA typical range for non-polluted soils for major elements and trace elements.

TPH was detected in BH-7 (180 mg/kg) and in BH-9 (150 mg/kg). Although this is above the Dutch D limit of 50 mg/kg they are considerably below the Dutch I limit of 5000 mg/kg and also below the inert WAC of 500 mg/kg.

Cadmium was detected in BH-9 and BH-10 at levels of 1.2 mg/kg and 1.6 mg/kg respectively. These are slightly above the Dutch D limit of 0.8 mg/kg, but below the I limit of 12 mg/kg. In BH-9, the mercury level (0.34 mg/kg) is marginally above the Dutch D limit of 0.3 mg/kg. All the remaining heavy metals were below the Dutch D limit and within the EPA range for non-polluted soils.

Table 4.2 Soil Results Dublin Centre 2008

Parameter	Sample ID	BH-7	BH-9	BH-10	EPA Range for Non- polluted Soils	Dutch D Values	Dutch I values	EU limits for Inert landfill
	Sample Depth	0.5-1m	0.4-0.8m	1.7-2.5m				
	Units							
Antimony	mg/kg	1.6	1.6	1.7	0.2-3	3	15	0.06
Arsenic	mg/kg	16	12	13	1.0-50	29	55	0.5
Barium	mg/kg	150	72	79	NE	160	625	20
Cadmium	mg/kg	0.65	1.2	1.6	0.1-1	0.8	12	0.04
Chromium	mg/kg	11	14	14	5-250	100	380	0.5
Copper	mg/kg	19	28	30	2-100	36	190	2
Iron	mg/kg	8900	20000	25000	10000-50000	-	-	-
Lead	mg/kg	42	79	59	2.0-80	85	530	0.5
Manganese	mg/kg	830	1100	1500	20-3000	NE	NE	-
Mercury	mg/kg	<0.25	0.34	<0.25	0.3-0.8	0.3	10	0.01
Nickel	mg/kg	24	31	37	0.5-100	35	210	0.4
Tin	mg/kg	<2.0	3.5	3.7	1.0-40	NE	900	-
Zinc	mg/kg	68	86	94	10-200	140	720	4
TPH C6-C40	mg/kg	180	150	<50	NE	50*	5000*	500
BTEX	mg/kg	<0.2	<0.2	<0.2	NE	NE	100	6
PAHs (sum of 10)	mg/kg	17.3	2.9	0.3	NE	1	40	-
PAHs (sum of 16)	mg/kg	23.0	3.7	<1.0	NE	NE	-	100

*Denotes limit for mineral oil

In BH-7 and BH-9 PAHs (sum of 10) the PAH, 17.3 mg/kg and 2.9 mg/kg respectively, exceeded the D value of 1 mg/kg, but are well below the 100 mg/kg limit applied at Irish inert waste disposal landfills.

Waste Acceptance Criteria (WAC) Testing

The results of the WAC testing of the fill material and the natural subsoils are shown in Table 4.3 and 4.4 respectively. The Tables include the WAC for inert and non-inert landfills. The EU Council Decision does not include a WAC for PAH, but allows individual member states to apply their own limits. The limit used in this assessment is derived from the Waste Licence issued by the EPA for an inert landfill in County Dublin.

TPH was detected above the inert WAC (500 mg/kg) in four of the fill material samples- RC-8 (510 mg/kg and 1800 mg/kg); BH-12 (640 mg/kg), and W-2 (5000 mg/kg).

Antimony exceeded the inert WAC of 0.06 mg/kg in the upper fill sample of OW2 (0.36 mg/kg), but was less than the non-hazardous WAC (0.7 mg/kg). The chromium level in BH-14 (0.53 mg/kg) was slightly above the inert WAC of 0.5 mg/kg, but well below the non-hazardous WAC of 10 mg/kg.

Mercury was detected in samples of the fill taken in BH-12 (0.5-1m) and BH-14 (2-3m) and the natural ground (BH 7 (4-5m) marginally above the inert WAC of 0.01 mg/kg, but below the non-hazardous WAC of 0.2 mg/kg.

PAH levels greater than the inert WAC (100 mg/kg) were detected in both samples from OW-2, 230 mg/kg and 570 mg/kg respectively and the lower sample from RC-8 (280 mg/kg). There is no non-hazardous WAC for PAH.

PCBs were only detected in one sample at RC-8 (0.5-1m) at 0.028 mg/kg. This is considerably below the EU limit of 1 mg/kg.

Sulphate levels exceeded the inert WAC (1000 mg/kg) in two samples from RC-8, however the levels -15000 mg/kg (0.5-1m) and 14000 mg/kg (1-2m) respectively- were less than the non-hazardous WAC of 20,000 mg/kg. The TDS of both samples from RC-8 exceeded the inert WAC, but were less than the non-hazardous WAC.

Table 4.3 Fill Material WAC Dublin Centre 2008

Parameter	Sample I.D.	BH-12	BH-12	BH-14	BH-14	EU Limits for Inert Landfill	EU Limits for Non-Hazardous Landfill
	Depth (m)	0.5-1m	3-4 m	0.5-1m	1-2m		
	Unit						
Arsenic	mg/kg	<0.50	<0.50	<0.50	<0.50	0.5	2
Barium	mg/kg	0.19	0.033	0.12	0.097	20	100
Cadmium	mg/kg	<0.001	<0.001	<0.001	<0.001	0.04	1
Chromium	mg/kg	0.33	<0.10	0.53	0.48	0.5	10
Copper	mg/kg	<0.10	<0.10	0.24	0.44	2	50
Mercury	mg/kg	0.016	<0.003	0.0051	0.0068	0.01	0.2
Molybdenum	mg/kg	0.084	0.31	0.27	0.43	0.5	10
Nickel	mg/kg	<0.10	<0.10	<0.10	<0.10	0.4	10
Lead	mg/kg	<0.10	<0.10	<0.10	<0.10	0.5	10
Antimony	mg/kg	<0.30	<0.30	<0.30	<0.30	0.06	0.7
Selenium	mg/kg	<0.060	<0.060	<0.060	<0.060	0.1	0.5
Zinc	mg/kg	<0.10	<0.10	<0.10	<0.10	4	50
Chloride	mg/kg	<25	<25	<25	29	800	15000
Fluoride	mg/kg	3	2.3	<2	2	10	150
Sulphate	mg/kg	910	300	190	820	1,000	20000
Phenols	mg/kg	<0.50	<0.50	<0.50	<0.50	1	-
Dissolved Organic Carbon	mg/kg	26	22	58	69	500	800
Total Dissolved Solids	mg/kg	3200	<2000	2900	<2000	4000	60000
Total Organic Carbon	%	5.3	3	4.4	3.8	3*	-
BTEX	mg/kg	<0.5	<0.5	<0.5	<0.5	6	-
PCBs	mg/kg	<0.01	<0.01	<0.01	<0.01	1	-
TPH	mg/kg	640	170	99	180	500**	-
PAH (16)	mg/kg	6.6	<1.0	8.1	8.3	-	-
PAH (17).	mg/kg	6.6	<1.0	8.1	8.3	Murphy's 100mg/kg	-

*If DOC is less than 500 then a higher limit can be accepted

** Limit is for Mineral Oil

Table 4.3 continued Fill Material WAC Dublin Centre 2008

Parameter	Sample I.D.	BH-14	BH-15	BH-15	BH-8	EU Limits for Inert Landfill	EU Limits for Non-Hazardous Landfill
	Depth (m)	2-3m	0.5-1	1.0-2.0	0.5-1		
	Unit						
Arsenic	mg/kg	<0.50	<0.5	<0.5	<0.5	0.5	2
Barium	mg/kg	0.13	0.06	0.055	0.21	20	100
Cadmium	mg/kg	<0.001	<0.001	<0.001	<0.001	0.04	1
Chromium	mg/kg	0.17	0.18	<0.1	<1	0.5	10
Copper	mg/kg	0.47	0.36	0.28	<1	2	50
Mercury	mg/kg	0.012	0.0035	0.0049	<0.003	0.01	0.2
Molybdenum	mg/kg	0.34	0.16	0.13	0.1	0.5	10
Nickel	mg/kg	0.12	0.15	0.14	<1	0.4	10
Lead	mg/kg	<0.10	0.42	0.43	<1	0.5	10
Antimony	mg/kg	<0.30	<0.3	<0.3	<0.3	0.06	0.7
Selenium	mg/kg	<0.060	<0.06	<0.06	<0.06	0.1	0.5
Zinc	mg/kg	<0.10	<0.1	0.13	<1	4	50
Chloride	mg/kg	54	<25	<25	43	800	15000
Fluoride	mg/kg	<2	2.3	<2	<2	10	150
Sulphate	mg/kg	140	500	190	15000	1,000	20000
Phenols	mg/kg	<0.50	<0.5	<0.5	<0.5	1	-
Dissolved Organic Carbon	mg/kg	82	62	36	52	500	800
Total Dissolved Solids	mg/kg	<2000	4200	<2000	24000	4000	60000
Total Organic Carbon	%	3.6	3.6	5.2	3.1	3.33%	-
BTEX	mg/kg	<0.5	<0.5	<0.5	<0.5	6	-
PCBs	mg/kg	<0.01	<0.01	<0.01	0.028	1	-
Mineral Oil	mg/kg	<50	120	86	510	500	-
PAH (16)	mg/kg	<1.0	4.2	1.4	44	-	-
PAH (17).	mg/kg	<1.0	4.2	1.4	44	Murphy's 100mg/kg	-

*If DOC is less than 500 then a higher limit can be accepted

** Limit is for Mineral Oil

Table 4.3 continued Fill Material WAC Dublin Centre 2008

Parameter	Sample I.D.	BH-8	W-2	W-2	EU Limits for Inert Landfill	EU Limits for Non-Hazardous Landfill
	Depth (m)	1.0-2.0	0.5-1	1.0-2.0		
	Unit					
Arsenic	mg/kg	<0.5	<0.5	<0.5	0.5	2
Barium	mg/kg	0.25	0.24	0.18	20	100
Cadmium	mg/kg	<0.001	<0.001	<0.001	0.04	1
Chromium	mg/kg	<1	0.21	<1	0.5	10
Copper	mg/kg	<1	0.34	<1	2	50
Mercury	mg/kg	<0.003	<0.003	<0.003	0.01	0.2
Molybdenum	mg/kg	0.095	0.066	0.081	0.5	10
Nickel	mg/kg	<1	0.13	<1	0.4	10
Lead	mg/kg	<1	0.43	<1	0.5	10
Antimony	mg/kg	<0.3	0.36	<0.3	0.06	0.7
Selenium	mg/kg	<0.06	<0.06	<0.06	0.1	0.5
Zinc	mg/kg	<1	0.11	<1	4	50
Chloride	mg/kg	58	27	140	800	15000
Fluoride	mg/kg	<2	4.1	<2	10	150
Sulphate	mg/kg	14000	440	1600	1,000	20000
Phenols	mg/kg	<0.5	<0.5	<0.5	1	-
Dissolved Organic Carbon	mg/kg	73	45	60	500	800
Total Dissolved Solids	mg/kg	24000	2100	4200	4000	60000
Total Organic Carbon	%	3	5.6	5.4	3.33%	-
BTEX	mg/kg	<0.5	<0.5	<0.5	6	-
PCBs	mg/kg	<0.01	<0.01	<0.01	1	-
Mineral Oil	mg/kg	1800	150	5000	500	-
PAH (16)	mg/kg	272	228.5	566	-	-
PAH (17).	mg/kg	280	230	570	Murphy's 100mg/kg	-

*If DOC is less than 500 then a higher limit can be accepted

** Limit is for Mineral Oil

Table 4.4 Natural Ground WAC Dublin Centre 2008

Parameter	Sample I.D.	BH-7	BH-7	BH-9	BH-12	EU Limits for Inert Landfill	EU Limits for Non-Hazardous Landfill
	Depth (m)	4-5 m	13-14 m	4-5 m	4-5 m		
	Unit						
Arsenic	mg/kg	<0.50	<0.5	<0.50	<0.50	0.5	2
Barium	mg/kg	0.084	0.14	0.076	0.068	20	100
Cadmium	mg/kg	<0.001	<0.001	<0.001	<0.001	0.04	1
Chromium	mg/kg	<0.10	<0.1	<0.10	<0.10	0.5	10
Copper	mg/kg	<0.10	<0.1	<0.10	<0.10	2	50
Mercury	mg/kg	0.012	0.0038	0.0078	<0.003	0.01	0.2
Molybdenum	mg/kg	<0.03	0.085	0.056	0.2	0.5	10
Nickel	mg/kg	<0.10	<0.1	<0.10	<0.10	0.4	10
Lead	mg/kg	<0.10	<0.1	<0.10	<0.10	0.5	10
Antimony	mg/kg	<0.30	<0.3	<0.30	<0.30	0.06	0.7
Selenium	mg/kg	<0.060	<0.06	<0.060	<0.060	0.1	0.5
Zinc	mg/kg	<0.10	<0.1	<0.10	<0.10	4	50
Chloride	mg/kg	<25	71	<25	<25	800	15000
Fluoride	mg/kg	3	4.2	2.7	2.9	10	150
Sulphate	mg/kg	<110	<110	<110	<110	1,000	20000
Phenols	mg/kg	<0.50	<0.5	<0.50	<0.50	1	-
Dissolved Organic Carbon	mg/kg	13	39	14	19	500	800
Total Dissolved Solids	mg/kg	<2000	<2000	<2000	<2000	4000	60000
Total Organic Carbon	%	3.1	0.52	2.8	2.4	3%*	-
BTEX	mg/kg	<0.5	<0.5	<0.5	<0.5	6	-
PCBs	mg/kg	<0.01	<0.01	<0.01	<0.01	1	-
TPH	mg/kg	<50	<50	<50	57	500**	-
PAH (16)	mg/kg	<1.0	<1.0	<1.0	<1.0	-	-
PAH (17)	mg/kg	<1.0	<1.0	<1.0	<1.0	Murphy's 100mg/kg	-

*If DOC is less than 500 then a higher limit can be accepted

** Limit is for Mineral Oil

Table 4.4 continued Natural Ground WAC Dublin Centre 2008

Parameter	Sample I.D.	BH-12	BH-14	BH-14	BH-15	EU Limits for Inert Landfill	EU Limits for Non-Hazardous Landfill
	Depth (m)	8-10m	3-4m	8-10m	12.0-13.0		
	Unit						
Arsenic	mg/kg	<0.50	<0.50	<0.50	<0.5	0.5	2
Barium	mg/kg	0.17	0.046	0.27	0.17	20	100
Cadmium	mg/kg	<0.001	<0.001	<0.001	<0.001	0.04	1
Chromium	mg/kg	<0.10	<0.10	<0.10	<0.1	0.5	10
Copper	mg/kg	<0.10	<0.10	<0.10	0.15	2	50
Mercury	mg/kg	0.0047	0.0039	0.0036	<0.003	0.01	0.2
Molybdenum	mg/kg	0.1	0.18	0.15	0.046	0.5	10
Nickel	mg/kg	<0.10	<0.10	<0.10	0.14	0.4	10
Lead	mg/kg	<0.10	<0.10	<0.10	0.41	0.5	10
Antimony	mg/kg	<0.30	<0.30	<0.30	<0.3	0.06	0.7
Selenium	mg/kg	0.079	<0.060	<0.060	<0.06	0.1	0.5
Zinc	mg/kg	0.19	<0.10	<0.10	<0.1	4	50
Chloride	mg/kg	41	<25	35	100	800	15000
Fluoride	mg/kg	2.7	2.3	2.4	4.7	10	150
Sulphate	mg/kg	250	<110	420	130	1,000	20000
Phenols	mg/kg	<0.50	<0.50	<0.50	<0.5	1	-
Dissolved Organic Carbon	mg/kg	19	27	23	37	500	800
Total Dissolved Solids	mg/kg	<2000	<2000	<2000	<2000	4000	60000
Total Organic Carbon	%	1.4	3.5	1.4	0.34	3%*	-
BTEX	mg/kg	<0.5	<0.5	<0.5	<0.5	6	-
PCBs	mg/kg	<0.01	<0.01	<0.01	<0.01	1	-
TPH	mg/kg	<50	<50	<50	<50	500**	-
PAH (16)	mg/kg	<1.0	<1.0	<1.0	<1.0	-	-
PAH (17)	mg/kg	<1.0	<1.0	<1.0	<1.0	Murphy's 100mg/kg	-

*If DOC is less than 500 then a higher limit can be accepted

** Limit is for Mineral Oil

4.4 Groundwater

Samples were collected from four groundwater monitoring wells, OW-1 Subsoils (OW-1 S) and OW-1 Bedrock (OW-1 B) and RC-16 Subsoils (RC-16 S) and RC-16 Bedrock (RC-16 B). The samples were collected in accordance with OCM's Groundwater Sampling Protocol, a copy of which is included in Appendix 5.

All the samples were sent to the STL laboratory in Santry for analysis. The range of parameters tested was based on the nature of the historical site activities and included dissolved metals (arsenic, antimony, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, tin and zinc.), sodium, chloride, potassium, magnesium, sulphate, sulphide, total hardness, bicarbonate, TPH, BTEX and PAH.

The laboratory test report is included in Appendix 5 and the results are shown in Table 4.5. The results are compared for discussion purposes with the EPA Interim Guideline Values (IGVs). The IGVs are not statutory guidelines but have been prepared by the EPA to assist in the assessment of impacts on groundwater quality.

TPH was only detected in one well-RC-16- at a level of 8 mg/l, which is above the IGV of 0.01 mg/l. Iron, manganese and potassium exceeded their respective IGVs in both the subsoil and bedrock samples from RC -16. Barium, sodium and copper exceeded the IGV in the bedrock sample from RC-16 and PAH exceeded the IGV in the bedrock sample from RC-16.

PAHs exceeded the IGV in the subsoil and bedrock samples from RC-16 Subsoil and the bedrock sample in OW-1.

Chloride exceeded the IGV of 30 mg/l in both subsoil and bedrock samples from RC-16 and OW-1. The sulphate level in the bedrock sample marginally exceeded the IGV and hardness also exceeded the IGV in the subsoil sample from OW-1 and both subsoil and bedrock samples from RC-16.

Table 4.5 Groundwater Results Dublin Centre December 2008

Sample I.D.	Units	Subsoil Wells		Bedrock Wells		IGV
		RC-16 Subsoil	OW-1 Subsoil	RC-16 Bedrock	OW-1 Bedrock	
Antimony	mg/l	0.00048	0.00017	0.0023	0.00015	-
Arsenic	mg/l	0.0069	<0.0001	0.0059	<0.0001	0.01
Barium	mg/l	0.056	0.015	0.12	0.018	0.1
Cadmium	mg/l	<0.0001	0.00014	0.00024	<0.0001	0.005
Chromium	mg/l	<0.03	<0.03	<0.03	<0.03	0.03
Copper	mg/l	0.025	<0.007	0.096	<0.007	0.03
Iron	mg/l	0.41	0.045	0.55	0.041	0.2
Lead	mg/l	0.0033	<0.0005	0.00081	<0.0005	0.01
Manganese	mg/l	0.17	0.022	0.07	<0.01	0.05
Mercury	mg/l	<0.0003	<0.00030	0.00074	<0.00030	0.001
Nickel	mg/l	0.006	<0.0005	0.0039	0.0005	0.02
Tin	mg/l	<0.01	<0.01	<0.01	<0.01	-
Zinc	mg/l	0.053	<0.005	0.016	0.005	0.1
Magnesium	mg/l	6.6	8.8	28	8.4	50
Potassium	mg/l	60	11	7.6	10	5
Sodium	mg/l	100	35	680	35	150
Hardness (as CaCO ₃)	mg/l	100	360	210	360	200
Bicarbonate as CaCO ₃	mg/l	710	200	350	200	-
Chloride as Cl	mg/l	150	39	860	41	30
Sulphate as SO ₄	mg/l	<11	150	230	160	200
Sulphide as S	mg/l	0.14	<0.010	0.011	<0.010	-
TPH	mg/l	8	<0.1	<0.1	<0.1	0.01
PAH Total (Sum of 16)	µg/l	16	<0.10	0.25	1.7	0.1
Benzene	µg/l	<10	<10	<10	<10	1
Toluene	µg/l	<10	<10	<10	<10	10
Ethylbenzene	µg/l	<10	<10	<10	<10	10
p & m xylene	µg/l	<20	<20	<20	<20	10
o-Xylene	µg/l	<10	<10	<10	<10	10

5. DISCUSSION

DDC PLAN NO 5432/22
RECEIVED: 13/12/2022

5.1 Discussion

The purpose of environmental site investigation was to establish if there was contamination in the subsoils or groundwater associated with the historical use of the site. It was also undertaken to establish the nature of the fill material and underlying subsoils in terms of off-site management options for such materials that will have to be removed during site development.

The majority of the Dublin Centre area has been in use as shops, offices, stores and houses since the late 1700's. The 2006 assessment concluded that, given the nature of these historic landuses, the potential for subsurface soil or groundwater contamination is considered to be low. However, the assessment identified areas where there was potential for subsurface contamination. These included the Royal Dublin Hotel; car parking area for Dr. Quirke's Emporium; 5-11 Moore Lane, and 4-8 Henry Place.

The environmental investigation, in so far as the ground conditions allowed, targeted those risk areas identified in the 2006 assessment. Boreholes RC-8 and W-2 were installed in 48A-50 O' Connell Street, which had been designated at moderate risk. It is presently used as an unpaved car park and storage area for Dr. Quirke's Emporium.

5.2 Soils

In RC-8 and W-2, the levels of sulphate, total dissolved solids, TPH and PAHs exceeded the inert waste WAC. However all of the levels were less than the non-hazardous WAC.

In BH-12, which was located on the southeast perimeter of the site TPH and mercury were detected above the inert waste WAC in the upper fill sample; however the levels of these parameters in the underlying fill and natural ground were less than the inert WAC.

There was no evidence of significant contamination in any of the other samples and the tested parameters, where detected, are at levels generally below the inert WAC.

5.3 Groundwater

TPH and PAHs above the IGV limits were detected in the well installed in the subsoil in RC-16. A strong hydrocarbon odour was noted during sampling. No TPH or PAH was detected in the bedrock well. RC-16 is located immediately to the south and not within the portion of the site where deep excavation will occur. It is possible therefore that the hydrocarbons detected in this well originate from an off-site location and not from within the development site.

Low levels of PAH were detected in the subsoil and bedrock wells at OW-1 in the centre of the site. While the levels detected are above the IGV limits, they are not indicative of significant pollution.

The elevated iron and manganese levels detected in the subsoil and bedrock wells and are most likely naturally occurring. The copper level detected in OW-1, while slightly above the IGV is less than the drinking water standard for this parameter (2mg/L) and this detection is not therefore considered to be significant.

Elevated potassium and chloride levels were detected in both wells with higher chloride levels detected in RC-16, which is closest to the River Liffey. The levels detected are not indicative of significant contamination from historical site activities and it is possible that there is link via the gravels beneath the site and the brackish waters in the River Liffey.

OCM understand that pumping tests have been carried out to estimate the dewatering rate that will be necessary during the deep excavation and construction of the basement. While the volumes of groundwater in the fill, subsoil and bedrock, higher volumes may be expected from the gravels where present in significant thickness.

The groundwater quality monitoring data indicates that while low levels of PAH are present, the water should be suitable for discharge to sewer. Dublin City Council are likely to require on-site settlement to treat suspended solids and possibly pH control during any concrete forming or piling works.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The subsurface comprises made ground ranging in thickness from 2 – 5.2 m, which contains mainly grey brown gravelly clay fill with red brick. This is underlain by natural ground of between 11.1 m and 23.3 m in thickness, that comprises gravels underlain by clay. The minimum depth to bedrock is 12.6 m while the maximum is 27.3 m.

The bedrock ranges from interbedded argillaceous limestone, siliceous limestone and black fossiliferous shale which are part of the Calp Limestone formation. The bedrock is considered to be a Locally Important Aquifer (LI), which is moderately productive only in local zones. Aquifer vulnerability is considered to be moderate to low.

The investigation has established that the fill material and the underlying subsoils can generally be categorised as inert and suitable either for disposal at inert landfill or for use in land reclamation projects. There are localised zones in the fill such as at BH-12, RC-8 and W-2, where the contaminant levels exceed the inert category limits. However in these cases the materials fall into the non-hazardous waste category.

Elevated PAH levels were detected in the groundwater wells immediately to the south but not within the portion of the site where deep excavation will occur. It is possible therefore that these from an off-site location and not from within the development site. Low levels of PAH were detected in the subsoil and bedrock wells in the centre of the site. While the levels are above the IGV limits they are not indicative of significant pollution and the water should be suitable for discharge to sewer during the dewatering programme.

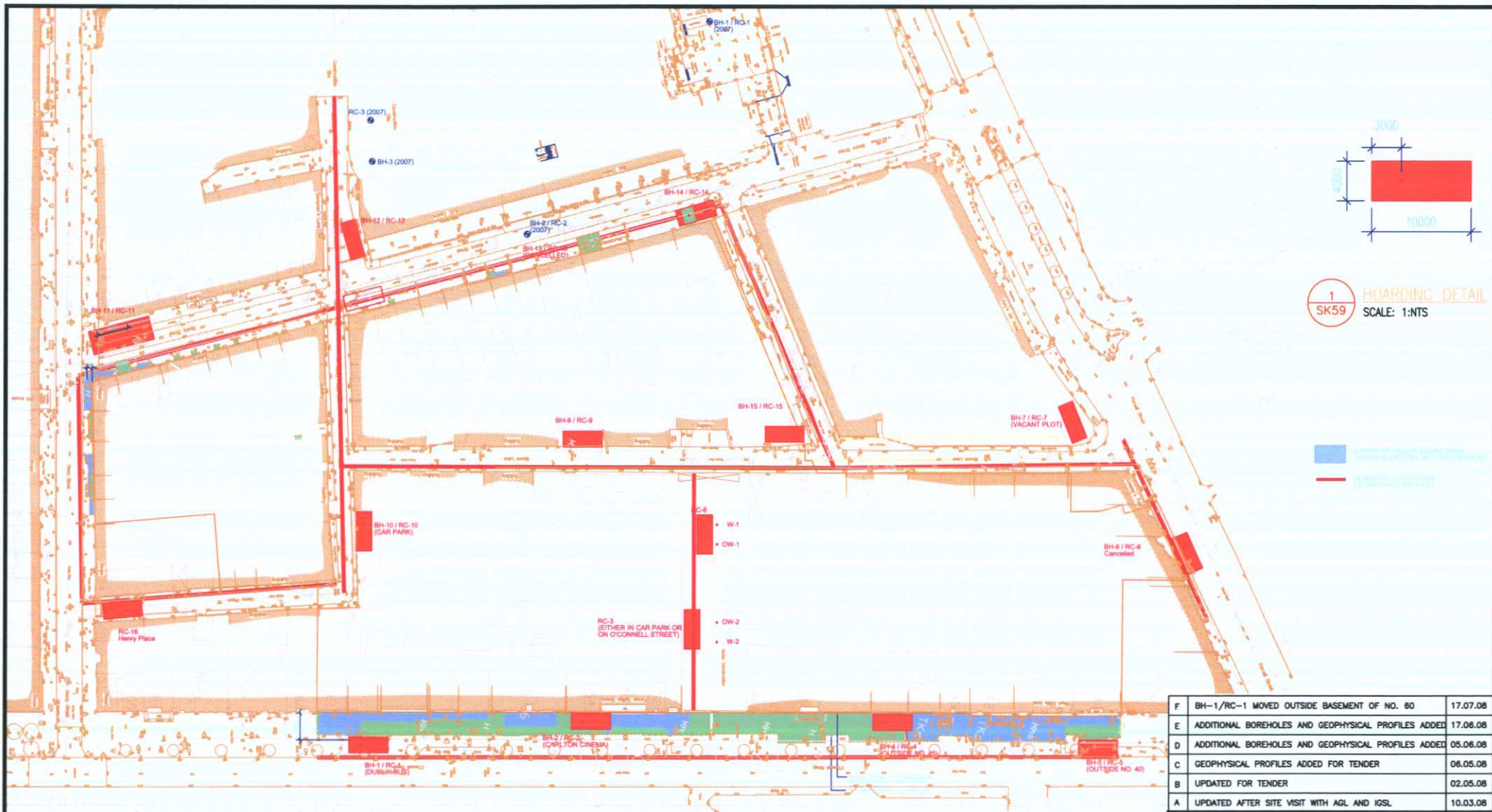
6.2 Recommendations

OCM recommend that following site clearance and as part of the bulk excavation samples of the fill and subsoil excavated in the vicinity of BH-12, W-2 and RC-8 be tested to confirm the waste characterisation i.e. inert or non-hazardous.

OCM recommend that all material excavated and removed from the site be disposed of in accordance with Dublin City Council Waste Management Regulations to suitably permitted or licensed waste management facilities.

APPENDIX 1

Site Map



1 SK59 HOARDING DETAIL
SCALE: 1:NTS

AMENDMENT DETAILS	DATE	
F	BH-1/RC-1 MOVED OUTSIDE BASEMENT OF NO. 60	17.07.08
E	ADDITIONAL BOREHOLES AND GEOPHYSICAL PROFILES ADDED	17.06.08
D	ADDITIONAL BOREHOLES AND GEOPHYSICAL PROFILES ADDED	05.06.08
C	GEOPHYSICAL PROFILES ADDED FOR TENDER	06.05.08
B	UPDATED FOR TENDER	02.05.08
A	UPDATED AFTER SITE VISIT WITH AGL AND IGSL	10.03.08

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Tel: 295 2321 Fax: 295 4541

PROJECT: DUBLIN CENTRAL PROJECT

CLIENT: CHARTERED LAND

DRAWING TITLE: BOREHOLE LOCATIONS

SCALE: 1:500 JOB NO: NO: DATE: 17.07.08 DRAWN BY: DD 2643 SK59 F

APPENDIX 2

Borehole Logs



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH7
CO-ORDINATES		SHEET Sheet 1 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 150	DATE STARTED 05/08/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 12/08/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 16.00	BORED BY J. O'Hara
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 16.00	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of concrete.									
0.30	MADE GROUND consisting of brown grey sandy slightly gravelly clay with some cobbles and red brick.									
1.50-1.50					AF4959	B	1.50-1.50	N = 7 (1, 1, 1, 2, 2, 2)		
2.70-2.70					AF4960	B	2.70-2.70	N = 57 (5, 7, 15, 13, 11, 18)		
3.60-3.60					AF4961	B	3.60-3.60	N = 63 (6, 5, 9, 13, 17, 24)		
4.20	Dense grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.							N = 100/225 mm (9, 20, 33, 38, 29)		
4.50-4.50					AF4962	B	4.50-4.50	N = 26 (7, 7, 6, 7, 6, 7)		
5.50-5.50					AF4963	B	5.50-5.50			
6.30-6.30					AF4964	B	6.30-6.30	N = 31 (2, 4, 6, 8, 8, 9)		
7.30-7.30					AF4965	B	7.30-7.30	N = 13 (5, 3, 3, 3, 3, 4)		
8.30-8.30					AF4966	B	8.30-8.30	N = 21 (1, 1, 3, 5, 5, 8)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4	4.2	0.5	Boulder	5.00	5.00	No	5.00	20	Moderate
5.6	9	8	Hard Strata Boring						
9	12.6	8	Hard Strata Boring						
12.5	13.5	4	Hard Strata Boring						
13.5	16	7	Hard Strata Boring						
16	16	2	Boulder						
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
12-08-08	15.00	13.00	15.00	50mm SP	01-08-08	2.00	2.00	-	End of shift
					05-08-08	2.00	2.00	-	Start of shift
					05-08-08	5.60	6.00	5.10	End of shift
					06-08-08	5.00	6.00	4.80	Start of shift
					06-08-08	8.60	9.00	5.40	End of shift
					07-08-08	8.60	9.00	5.00	Start of shift
REMARKS Hand dug inspection pit excavated to 1.20m. Blowing gravels from 5.6m bgl to base of hole. Falling and rising head test completed.									

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH7
CO-ORDINATES		SHEET Sheet 2 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 150	DATE STARTED 05/08/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 12/08/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 16.00	BORED BY J. O'Hara
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 16.00	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Dense grey slightly clayey/silty sandy GRAVEL with many cobbles and lenses of brown slightly sandy gravelly clay. Gravel is fine to coarse and subrounded to subangular of limestone. Very dense grey slightly sandy GRAVEL with some cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			10.00	AF4967	B	10.20-10.20		N = 25 (8, 7, 7, 6, 6, 6)	
10.40										
11					AF4968	B	11.00-11.00		N = 100 (12, 15, 16, 21, 25, 38)	
12					AF4969	B	12.00-12.00		N = 100/225 mm (11, 20, 26, 33, 41)	
13					AF4970	B	13.00-13.00		N = 100/90 mm (25, 44, 56)	
14					AF4971	B	14.00-14.00		N = 100/185 mm (8, 11, 33, 48, 19)	
15					AF4972	B	15.00-15.00		N = 100/150 mm (17, 27, 39, 61)	
16	Hard brown slightly sandy gravelly CLAY with some cobbles. Obstruction - possible boulder End of Borehole at 16.00 m			15.80 16.00	AF4973 AF4974	B B	15.90-15.90 16.00-16.00		N = 100/90 mm (25, 40, 60)	

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4	4.2	0.5	Boulder						
5.6	9	8	Hard Strata Boring						
9	12.6	8	Hard Strata Boring						
12.5	13.5	4	Hard Strata Boring						
13.5	16	7	Hard Strata Boring						
16	16	2	Boulder						

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments
07-08-08	12.50	12.50	7.70	End of shift
08-08-08	12.50	12.50	6.40	Start of shift
08-08-08	13.50	13.50	2.70	End of shift
11-08-08	13.50	13.50	6.20	Start of shift
11-08-08	16.00	16.00	4.80	End of shift
12-08-08	16.00	16.00	5.20	Start of shift
12-08-08	16.00	16.00	8.80	End of shift

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type
12-08-08	15.00	13.00	15.00	50mm SP

REMARKS Hand dug inspection pit excavated to 1.20m. Blowing gravels from 5.6m bgl to base of hole. Falling and rising head test completed.

BH LOG DCD 13696.GPJ IGSL_GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH9
CO-ORDINATES		SHEET Sheet 1 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 150	DATE STARTED 15/07/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 23/07/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 17.50	BORED BY J. McDonnell
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 17.50	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of reinforced concrete.									
0	MADE GROUND consisting of brown grey sandy slightly gravelly clay with some cobbles and red brick.			0.20						
1					AF1908	B	1.00-1.00		N = 7 (2, 2, 2, 1, 1, 3)	
2	Very dense grey brown slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			2.00	AF1909	B	2.10-2.10		N = 36 (4, 6, 7, 2, 10, 17)	
					AF1910	B	2.50-2.50			
					AF1911	B	3.00-3.00		N = 39 (7, 9, 8, 10, 10, 11)	
					AF1912	B	4.00-4.00		N = 28 (2, 3, 6, 7, 8, 7)	
					AF1913	B	5.00-5.00		N = 34 (3, 4, 7, 7, 9, 11)	
					AF1914	B	6.00-6.00		N = 27 (3, 3, 4, 8, 8, 7)	
					AF1915	B	7.00-7.00		N = 77 (7, 18, 20, 25, 20, 12)	
					AF1916	B	8.00-8.00		N = 69 (6, 12, 16, 20, 20, 13)	
					AF1917	B	9.00-9.00		N = 18 (6, 6, 5, 5, 5, 3)	

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
16.2	16.5	1	Boulder	5.50	5.50	No	3.10	5	Rapid
17	17.5	2	Boulder						
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
22-07-08	13.50	12.00	13.50	50mm SP	15-07-08	2.00	2.00	-	End of shift
					16-07-08	2.00	2.00	-	Start of shift
					16-07-08	7.00	7.00	4.50	End of shift
					17-07-08	7.00	7.00	4.50	Start of shift
REMARKS Hand dug inspection pit excavated to 1.20m. Falling and rising head tests completed. Standing from 24th to 28th July - No access									

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft

BOREHOLE NO. BH9

SHEET Sheet 2 of 2

CO-ORDINATES

RIG TYPE Dando 150

GROUND LEVEL (m AOD)

BOREHOLE DIAMETER (mm) 200

DATE STARTED 15/07/2008

DATE COMPLETED 23/07/2008

CLIENT Dublin Central Developments Ltd

BOREHOLE DEPTH (m) 17.50

BORED BY J. McDonnell

ENGINEER AGL Consulting Ltd

CASING DEPTH (m) 17.50

PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details					
					Ref. Number	Sample Type	Depth (m)	Recovery							
10	Very dense grey brown slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone. <i>(continued)</i> No CPT as gravel blowing up casing				AF1918	B	10.00-10.00	0% rec 100 blows	N = 41 (11, 13, 11, 10, 10, 10)						
11					AF1919	B	11.00-11.00				N = 43 (7, 5, 8, 8, 13, 14)				
12					AF1920	B	12.00-12.00				N = 78 (6, 6, 10, 18, 25, 25)				
13					AF1921	B	13.00-13.00				N = 68 (6, 11, 15, 17, 19, 17)				
13.50															
14					Hard dark brown slightly sandy gravelly CLAY with occasional cobbles.										
14.20															
14.50					Very dense grey brown slightly sandy GRAVEL with some cobbles. Gravel is medium to coarse and subrounded to subangular of limestone.										
15					Hard dark brown slightly sandy gravelly CLAY with occasional cobbles.										
15.90															
16	Very dense grey brown slightly sandy GRAVEL with some cobbles. Gravel is medium to coarse and subrounded to subangular of limestone.														
16.50	Hard black slightly sandy gravelly CLAY with occasional cobbles.														
17	Obstuction - possible boulder														
17.00															
17.50	End of Borehole at 17.50 m														

HARD STRATA BORING/CHISELLING

WATER STRIKE DETAILS

From (m)	To (m)	Time (h)	Comments
16.2	16.5	1	Boulder
17	17.5	2	Boulder

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
17-07-08	13.00	13.00	5.00	End of shift
18-07-08	13.00	13.00	4.60	Start of shift
18-07-08	16.50	16.50	5.80	End of shift
21-07-08	16.50	16.50	4.65	Start of shift

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
22-07-08	13.50	12.00	13.50	50mm SP

REMARKS Hand dug inspection pit excavated to 1.20m. Falling and rising head tests completed. Standing from 24th to 28th July - No access

BH LOG DCD 13696.GPJ IGSL.GDT 11/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH10
CO-ORDINATES		SHEET Sheet 1 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 150	DATE STARTED 30/07/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 13/08/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 15.45	BORED BY J. McDonnell
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 15.45	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of concrete. MADE GROUND consisting of brown grey sandy slightly gravelly clay with some cobbles and red brick.			0.10						
1					AF1830	B	1.00-1.00			
2					AF1831	B	2.00-2.00	N = 6 (1, 1, 2, 1, 1, 2)		
3	Very dense grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			3.00	AF1832	B	3.00-3.00	N = 51 (8, 18, 16, 11, 17, 7)		
4					AF1833	B	4.00-4.00	N = 30 (3, 5, 7, 7, 8, 8)		
5					AF1834	B	5.00-5.00	N = 50 (8, 8, 14, 14, 12, 10)		
6	Dense grey slightly clayey/silty sandy GRAVEL with many cobbles. GRAVEL is fine to coarse and subrounded to subangular of limestone.			5.50	AF1835	B	6.00-6.00	N = 28 (4, 6, 6, 7, 7, 8)		
7	Very stiff black slightly sandy gravelly CLAY with occasional cobbles			6.80	AF1836	B	7.00-7.00	N = 56 (3, 15, 18, 12, 11, 15)		
8	Very dense grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			7.50	AF1837	B	8.00-8.00	N = 100/225 mm (15, 24, 25, 30, 45)		
9					AF1838	B	9.00-9.00	N = 52 (7, 9, 14, 15, 13, 10)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8	11	8	Hard Strata Boring	8.00	8.00	No	6.50	20	Moderate
11	14.5	8	Hard Strata Boring						
15.4	15.45	2	Boulder						

GROUNDWATER DETAILS					
Date	Hole Depth	Casing Depth	Depth to Water	Comments	
30-07-08	6.00	6.00	4.80	End of shift	
08-08-08	6.00	6.00	4.80	Start of shift	
08-08-08	8.00	8.00	6.10	End of shift	
11-08-08	8.00	8.00	4.55	Start of shift	

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.0m to aid drilling. Blowing gravels from 9.5m to 10.5m and 11.5m to 12.0m bgl. Falling and rising head test completed. Standing 5.5 days - stopped by Client due to Landowner request.

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft

BOREHOLE NO. BH10

SHEET Sheet 2 of 2

CO-ORDINATES

RIG TYPE Dando 150

GROUND LEVEL (m AOD)

BOREHOLE DIAMETER (mm) 200

DATE STARTED 30/07/2008

DATE COMPLETED 13/08/2008

CLIENT Dublin Central Developments Ltd

BOREHOLE DEPTH (m) 15.45

BORED BY J. McDonnell

ENGINEER AGL Consulting Ltd

CASING DEPTH (m) 15.45

PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details	
					Ref. Number	Sample Type	Depth (m)	Recovery			
10	Very dense grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is fine to coarse and subrounded to subangular of limestone. <i>(continued)</i>				AF1839	B	10.00-10.00		N = 76 (9, 13, 16, 24, 19, 17)		
11					AF1840	B	11.00-11.00				N = 100/160 mm (13, 39, 50, 40, 10)
12					AF1841	B	12.00-12.00				N = 100/170 mm (12, 30, 40, 45, 15)
13					AF1842	B	13.00-13.00				N = 100/125 mm (12, 23, 62, 38)
14					AF1843	B	14.00-14.00				N = 100/230 mm (4, 10, 20, 35, 40, 5)
15	Hard black slightly sandy gravelly CLAY with occasional cobbles.			13.80	AF1844	B	15.00-15.00		N = 100/75 mm (12, 43, 100)		
15.40					AF1845	B	15.45-15.45				
15.45	Obstruction - possible boulder End of Borehole at 15.45 m			15.45							

HARD STRATA BORING/CHISELLING

WATER STRIKE DETAILS

From (m)	To (m)	Time (h)	Comments
8	11	8	Hard Strata Boring
11	14.5	8	Hard Strata Boring
15.4	15.45	2	Boulder

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-08-08	11.00	11.00	4.90	End of shift
12-08-08	11.00	11.00	4.60	Start of shift
12-08-08	14.50	14.50	5.60	End of shift
13-08-08	14.50	14.50	4.50	Start of shift
13-08-08	15.45	15.45	5.60	End of shift

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.0m to aid drilling. Blowing gravels from 9.5m to 10.5m and 11.5m to 12.0m bgl. Falling and rising head test completed. Standing 5.5 days - stopped by Client due to Landowner request.

BH LOG DCD 13696.GPJ IGSL.GDT 11/10/08

GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH12
CO-ORDINATES		SHEET Sheet 1 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 2000	DATE STARTED 12/10/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 16/10/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 13.60	BORED BY J. McDonnell
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 13.60	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of brown slightly sandy gravelly clay with some red brick and concrete.									
1					AF4857	B	1.00-1.00		N = 14 (2, 2, 3, 3, 4, 4)	
2					AF4858	B	2.00-2.00		N = 11 (2, 2, 2, 3, 3, 3)	
3					AF4859	B	3.00-3.00		N = 30 (4, 8, 10, 8, 6, 6)	
4	Firm becoming stiff brown slightly sandy gravelly CLAY with occasional cobbles.		3.40		AF4860	B	4.00-4.00		N = 17 (4, 3, 4, 4, 4, 5)	
5					AF4861	B	5.00-5.00		N = 34 (4, 6, 8, 8, 9, 9)	
6	Very stiff becoming hard black slightly sandy gravelly CLAY with occasional cobbles		6.00		AF4862	B	6.00-6.00		N = 49 (6, 6, 9, 10, 12, 18)	
7					AF4863	B	7.00-7.00		N = 100/200 mm (14, 20, 35, 35, 30)	
8					AF4864	B	8.00-8.00		N = 54 (6, 8, 12, 12, 14, 16)	
9					AF4865	B	9.00-9.00		N = 55 (7, 8, 11, 14, 14, 16)	

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
7.1	7.5	1	Boulder						

GROUNDWATER DETAILS					
Date	Hole Depth	Casing Depth	Depth to Water	Comments	
12-10-08	1.20	1.20	-	End of shift	
13-10-08	1.20	1.20	-	Start of shift	
14-10-08	7.00	7.00	-	End of shift	
14-10-08	7.00	7.00	6.70	Start of shift	

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type
16-10-08	13.60	11.50	13.60	50mm SP

REMARKS Hand dug inspection pit excavated to 1.20m. Night work - shift started at 1800hrs.

BH LOG DCD 13696.GPJ IGSL GDT 5/11/08

GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft

BOREHOLE NO. BH12

SHEET Sheet 2 of 2

CO-ORDINATES

RIG TYPE Dando 2000

GROUND LEVEL (m AOD)

BOREHOLE DIAMETER (mm) 200

DATE STARTED 12/10/2008

DATE COMPLETED 16/10/2008

CLIENT Dublin Central Developments Ltd



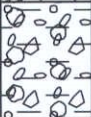
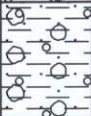
BOREHOLE DEPTH (m) 13.60

BORED BY J. McDonnell

ENGINEER AGL Consulting Ltd

CASING DEPTH (m) 13.60

PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very stiff becoming hard black slightly sandy gravelly CLAY with occasional cobbles <i>(continued)</i>				AF4866	B	10.00-10.00		N = 100/50 mm (8, 42, 100)	
11					AF4867	B	11.00-11.00		N = 100/90 mm (10, 38, 80, 20)	
12	Very dense grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			11.50	AF4868	B	12.00-12.00		N = 68 (9, 11, 15, 16, 18, 19)	
13	Hard black slightly sandy gravelly CLAY with occasional cobbles			12.50	AF4869	B	13.00-13.00		N = 100/150 mm (22, 35, 40, 60)	
13.50	Obstruction - possible boulder			13.50						
13.60	End of Borehole at 13.60 m			13.60						

HARD STRATA BORING/CHISELLING

WATER STRIKE DETAILS

From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
13.5	13.6	2	Boulder	11.50	11.50	No	10.50	20	Moderate

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
15-10-08	12.50	12.50	11.50	End of shift
15-10-08	12.50	12.50	11.50	Start of shift
16-10-08	13.60	13.60	13.00	End of shift

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
16-10-08	13.60	11.50	13.60	50mm SP

REMARKS Hand dug inspection pit excavated to 1.20m. Night work - shift started at 1800hrs.

BH LOG DCD 13696.GPJ IGSL_GDT 5/11/08

GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. W2
CO-ORDINATES		SHEET Sheet 1 of 3
GROUND LEVEL (m AOD)	RIG TYPE Dando 3000	DATE STARTED 25/09/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DIAMETER (mm)	DATE COMPLETED 10/10/2008
ENGINEER AGL Consulting Ltd	BOREHOLE DEPTH (m) 21.40	BORED BY J. Edwards / J. McDonnell
	CASING DEPTH (m)	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of brown slightly sandy gravelly clay with some red brick and concrete.									
	MADE GROUND consisting of concrete.			0.60	AG3601	B	0.50-0.50			
1	MADE GROUND consisting of brown slightly sandy gravelly clay with some red brick and concrete.			0.90	AG3602	B	1.00-1.00			
2					AG3603	B	2.00-2.00			
3					AG3604	B	3.00-3.00			
4				AG3605	B	4.00-4.00				
4.20	Grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			4.20						
5					AG3606	B	5.00-5.00			
6					AG3607	B	6.00-6.00			
6.50	Grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is medium to coarse and subrounded to subangular of limestone.				6.50					
7				AG3608	B	7.00-7.00				
8				AG3609	B	8.00-8.00				
9				AG3610	B	9.00-9.00				

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.7	1.8	1	Made Ground Obstruction	4.80	4.80	No	4.30	20	Moderate
2.1	2.2	1	Made Ground Obstruction						
3.1	3.2	0.75	Made Ground Obstruction						
4.8	4.9	1	Boulder						
5.2	5.3	1	Boulder						
5.7	5.8	1	Boulder						
6	8	10	6.5hrs Chiselling 3.5hrs Hard Strata Boring						
8	9	10	7hrs Chiselling 3hrs Hard Strata Boring						
9	11	10	7.5hrs Chiselling 2.5hrs Hard Strata Boring						
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					25-09-08	2.00	2.00	-	End of shift
					26-09-08	2.00	2.00	-	Start of shift
					26-09-08	6.00	6.00	5.50	End of shift
					27-09-08	6.00	6.00	5.40	Start of shift
					27-09-08	8.00	8.00	5.00	End of shift
					28-09-08	8.00	8.00	4.20	Start of shift
					28-09-08	9.00	9.00	4.80	End of shift
					29-09-08	9.00	9.00	4.50	Start of shift
REMARKS				Hand dug inspection pit excavated to 1.20m. Water added from 3.0m to aid drilling. Blowing gravels from 4.9m to 6m bgl. Casing size reduced from 300mm to 250mm diameter at 14.0m bgl. Casing left in borehole to allow rotary follow on. Re set up rig on 09/10/08 to advance hole after rotary rig advanced to rockhead and gravel falling in behind hammer.					

BH LOG DCD 13696 GFJ IGSL GDT 5/11/08

GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. W2
CO-ORDINATES		SHEET Sheet 2 of 3
GROUND LEVEL (m AOD)	RIG TYPE Dando 3000	DATE STARTED 25/09/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DIAMETER (mm)	DATE COMPLETED 10/10/2008
ENGINEER AGL Consulting Ltd	BOREHOLE DEPTH (m) 21.40	BORED BY J. Edwards / J. McDonnell
	CASING DEPTH (m)	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is medium to coarse and subrounded to subangular of limestone. <i>(continued)</i>				AG3611	B	10.00-10.00			
11	Grey slightly clayey/silty sandy GRAVEL with many cobbles and bands of dark grey clay. Gravel is medium to coarse and subrounded to subangular of limestone.			11.20	AG3612	B	11.00-11.00			
			11.40							
12	Grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is medium to coarse and subrounded to subangular of limestone.					AG3613	B	12.00-12.00		
13						AG3614	B	13.00-13.00		
14						AG3615	B	14.00-14.00		
15						AG3616	B	15.00-15.00		
16	Brown slightly sandy gravelly CLAY with occasional cobbles			15.50						
17	Black slightly sandy gravelly CLAY with occasional cobbles Re-set up rig after rotary rig advanced to rockhead - gravel falling behind hammer so must be cased off.			16.40		AG3617	B	16.00-16.00		
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
11	12.2	10	7hrs Chiselling 3hrs Hard Strata Boring						
12.2	14	10	7hrs Chiselling 3hrs Hard Strata Boring						
14	16	10	6hrs Chiselling 4hrs Hard Strata Boring						
16	16.2	2	Hard Strata Boring						
16.2	16.4	3	Boulder						
16.4	19.5	8	1hr Chiselling 7hrs Hard Strata Boring						
19.5	21.4	8	2hrs Chiselling 6hrs Hard Strata Boring						
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					29-09-08	11.00	11.00	4.80	End of shift
					30-09-08	11.00	11.00	4.50	Start of shift
					30-09-08	12.20	12.20	4.80	End of shift
					01-10-08	12.20	12.20	4.80	Start of shift
					01-10-08	14.00	14.00	5.00	End of shift
					02-10-08	14.00	14.00	4.50	Start of shift
					02-10-08	16.00	16.00	5.00	End of shift
					03-10-08	16.00	16.00	4.50	Start of shift
					03-10-08	16.40	16.40	4.90	End of shift
					09-10-08	16.40	16.40	4.80	Start of shift
					09-10-08	19.50	19.50	5.10	End of shift
					10-10-08	19.50	19.50	4.90	Start of shift

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.0m to aid drilling. Blowing gravels from 4.9m to 6m bgl. Casing size reduced from 300mm to 250mm diameter at 14.0m bgl. Casing left in borehole to allow rotary follow on. Re-set up rig on 09/10/08 to advance hole after rotary rig advanced to rockhead and gravel falling in behind hammer.

BH LOG DCD 13696.GPJ IGSL GDT 5/11/08

GEOTECHNICAL BORING RECORD	REPORT NUMBER 13696
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CONTRACT Dublin Central Development - Draft		BOREHOLE NO. W2
CO-ORDINATES		SHEET Sheet 3 of 3
GROUND LEVEL (m AOD)	RIG TYPE Dando 3000	DATE STARTED 25/09/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DIAMETER (mm)	DATE COMPLETED 10/10/2008
ENGINEER AGL Consulting Ltd	BOREHOLE DEPTH (m) 21.40	BORED BY J. Edwards / J. McDonnell
	CASING DEPTH (m)	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
20	Grey slightly clayey/silty sandy GRAVEL with many cobbles. Gravel is medium to coarse and subrounded to subangular of limestone.			20.00						
21	Obstruction - rockhead End of Borehole at 21.40 m			21.30 21.40						
22										
23										
24										
25										
26										
27										
28										
29										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments
10-10-08	21.40	21.40	5.00	End of shift

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.0m to aid drilling. Blowing gravels from 4.9m to 6m bgl. Casing size reduced from 300mm to 250mm diameter at 14.0m bgl. Casing left in borehole to allow rotary follow on. ~~Re set up rig on 09/10/08 to advance hole after rotary rig advanced to rockhead and gravel falling in behind hammer.~~

BH LOG DCD 13696.GPJ IGSL.GDT 5/11/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH14	
CO-ORDINATES()		SHEET Sheet 1 of 2	
GROUND LEVEL (m AOD)		DATE STARTED 09/11/2008	
CLIENT Dublin Central Developments Ltd		DATE COMPLETED 13/11/2008	
ENGINEER AGL Consulting Ltd		BORED BY J. McDonnell	
RIG TYPE Dando 2000		PROCESSED BY S. Letch	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 12.00			
CASING DEPTH (m) 12.00			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of granite cobblelock.			0.10						
	MADE GROUND consisting of concrete.			0.20						
0	MADE GROUND consisting of brown slightly sandy gravelly clay with some red brick and concrete.				AF4832	ENV B	1.00-1.00 1.00-1.00		N = 18 (3, 3, 5, 5, 4, 4)	
1					AF4833	ENV B	2.00-2.00 2.00-2.00		N = 12 (2, 2, 3, 3, 3, 3)	
2					AF4834	ENV B	3.00-3.00 3.00-3.00		N = 11 (2, 2, 2, 3, 3, 3)	
3	Stiff brown slightly sandy gravelly CLAY.			3.20	AF4835	ENV B	4.00-4.00 4.00-4.00		N = 22 (3, 3, 5, 5, 6, 6)	
4					AF4836	B	5.00-5.00		N = 57 (8, 14, 16, 16, 15, 10)	
5	Very stiff brown slightly sandy very gravelly CLAY.			5.00	AF4837	B	6.00-6.00		N = 84 (14, 20, 20, 24, 20, 20)	
6					AF4838	B	7.00-7.00		N = 84 (9, 14, 15, 19, 20, 30)	
7	Very dense grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			6.50	AF4839	B	8.00-8.00		N = 100/225 mm (14, 21, 30, 30, 40)	
8					AF4840	B	9.00-9.00		N = 100/275 mm (12, 16, 20, 20, 32, 28)	
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.1	8.3	1	Boulder	6.60	6.60	No	5.00	5	Moderate
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					10-11-08	6.50	6.50	-	End of shift
					11-11-08	6.50	6.50	6.00	Start of shift
					12-11-08	9.70	9.70	5.60	End of shift
					13-11-08	9.70	9.70	5.40	Start of shift
REMARKS									
Hand dug inspection pit excavated to 1.20m. Night work - shift started at 1800hrs to accommodate Moore Street traders. Shift finished at 2300hrs due to T2 licence restrictions. Standing 5 hours each day totalling 20 hours standing. 2 No. Falling and 1 No. Rising head test completed. Casing left in borehole to allow rotary follow on.									

BH LOG DCD 13696.GPJ IGSL GDT 26/11/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH14
CO-ORDINATES()		SHEET Sheet 2 of 2
GROUND LEVEL (m AOD)	RIG TYPE Dando 2000	DATE STARTED 09/11/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 13/11/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 12.00	BORED BY J. McDonnell
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 12.00	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very dense grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone. <i>(continued)</i>				AF4841	B	10.00-10.00		N = 82 (9, 13, 16, 19, 22, 25)	
11					AF4842	B	11.00-11.00			
12	End of Borehole at 12.00 m			12.00						
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
11.9	12	1.25	Boulder						
INSTALLATION DETAILS				GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					13-11-08	12.00	12.00	5.50	End of shift
REMARKS									
Hand dug inspection pit excavated to 1.20m. Night work - shift started at 1800hrs to accommodate Moore Street traders. Shift finished at 2300hrs due to T2 licence restrictions. Standing 5 hours each day totalling 20 hours standing. 2 No. Falling and 1 No. Rising head test completed. Casing left in borehole to allow rotary follow on.									

BH LOG DCD 13696.GPJ IGSL.GDT 26/11/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft

BOREHOLE NO. BH15

SHEET Sheet 1 of 3

CO-ORDINATES

RIG TYPE Dando 150

GROUND LEVEL (m AOD)

BOREHOLE DIAMETER (mm) 200

DATE STARTED 15/09/2008

DATE COMPLETED 24/09/2008

CLIENT Dublin Central Developments Ltd

BOREHOLE DEPTH (m) 21.20

BORED BY J. McDonnell

ENGINEER AGL Consulting Ltd

CASING DEPTH (m) 21.20

PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	MADE GROUND consisting of tarmacadam.									
0	MADE GROUND consisting of brown slightly sandy gravelly clay with some red brick, ash and concrete.			0.20						
1					AF4821	B	1.20-1.20		N = 4 (1, 1, 1, 1, 1, 1)	
2					AF4822	B	2.00-2.00		N = 7 (1, 2, 2, 2, 1, 2)	
3					AF4823	B	3.00-3.00		N = 17 (4, 4, 4, 3, 2, 8)	
4	Very dense grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone.			3.50	AF4824	B	4.00-4.00		N = 111 (12, 16, 25, 30, 27, 29)	
5					AF4825	B	5.00-5.00		N = 100/150 mm (35, 48, 52)	
6					AF4826	B	6.00-6.00		N = 119 (15, 22, 30, 29, 27, 33)	
7					AF4827	B	7.00-7.00		N = 17 (4, 6, 4, 5, 4, 4)	
8					AF4828	B	8.00-8.00		N = 56 (6, 9, 11, 16, 15, 14)	
9					AF4829	B	9.00-9.00		N = 87 (9, 11, 16, 25, 20, 26)	

HARD STRATA BORING/CHISELLING

WATER STRIKE DETAILS

From (m)	To (m)	Time (h)	Comments
3.5	3.8	0.5	Boulder
3.9	4	0.5	Boulder
4.8	5	1	Boulder
5.8	6	0.5	Boulder
11	14.4	8	Hard Strata Boring
14.4	16.7	8	Hard Strata Boring
16.7	18.5	8	Hard Strata Boring
18.5	21	6	Hard Strata Boring
21	21.2	2	Boulder

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6.00	6.00	No	4.70	5	Moderate

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
15-09-08	3.50	3.50	-	End of shift
16-09-08	3.50	3.50	-	Start of shift
16-09-08	6.00	6.00	-	End of shift
17-09-08	6.00	6.00	-	Start of shift

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.5m to aid drilling.

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13696

CONTRACT Dublin Central Development - Draft		BOREHOLE NO. BH15
CO-ORDINATES		SHEET Sheet 2 of 3
GROUND LEVEL (m AOD)	RIG TYPE Dando 150	DATE STARTED 15/09/2008
	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 24/09/2008
CLIENT Dublin Central Developments Ltd	BOREHOLE DEPTH (m) 21.20	BORED BY J. McDonnell
ENGINEER AGL Consulting Ltd	CASING DEPTH (m) 21.20	PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details	
					Ref. Number	Sample Type	Depth (m)	Recovery			
10	Very dense grey slightly clayey/silty sandy GRAVEL with occasional cobbles. Gravel is fine to coarse and subrounded to subangular of limestone. (continued)				AF4830	B	10.00-10.00		N = 54 (7, 10, 11, 11, 17, 15)		
11					AF4831	B	11.00-11.00				N = 47 (3, 5, 9, 9, 14, 15)
12					AF4832	B	12.00-12.00				N = 69 (5, 7, 20, 15, 16, 18)
13					AF4833	B	13.00-13.00				N = 100/150 mm (3, 11, 26, 74)
14	Hard black slightly sandy gravelly CLAY with occasional cobbles			14.40	AF4834	B	14.00-14.00				
15					AF4835	U	14.50-14.50	1% rec 150 blows			
16					AF4836	B	15.50-15.50		N = 100/240 mm (11, 15, 20, 25, 45, 10)		
17					AF4837	B	16.50-16.50		N = 100 (10, 15, 19, 24, 30, 27)		
18					AF4838	B	17.50-17.50		N = 100/150 mm (20, 29, 40, 60)		
19					AF4839	B	18.50-18.50		N = 100/210 mm (12, 26, 34, 37, 29)		
					AF4840	B	19.50-19.50		N = 100/180 mm (12, 30, 36, 44, 20)		

HARD STRATA BORING/CHISELLING

WATER STRIKE DETAILS

From (m)	To (m)	Time (h)	Comments
3.5	3.8	0.5	Boulder
3.9	4	0.5	Boulder
4.8	5	1	Boulder
5.8	6	0.5	Boulder
11	14.4	8	Hard Strata Boring
14.4	16.7	8	Hard Strata Boring
16.7	18.5	8	Hard Strata Boring
18.5	21	6	Hard Strata Boring
21	21.2	2	Boulder

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
17-09-08	11.00	11.00	5.50	End of shift
18-09-08	11.00	11.00	5.50	Start of shift
18-09-08	14.40	14.40	5.80	End of shift
19-09-08	14.40	14.40	5.80	Start of shift
19-09-08	16.70	16.70	6.40	End of shift
22-09-08	16.70	16.70	6.10	Start of shift
22-09-08	18.50	18.50	6.50	End of shift
23-09-08	18.50	18.50	6.40	Start of shift

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.5m to aid drilling.

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL BORING RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft

BOREHOLE NO. **BH15**
SHEET Sheet 3 of 3

CO-ORDINATES RIG TYPE Dando 150

GROUND LEVEL (m AOD) BOREHOLE DIAMETER (mm) 200

DATE STARTED 15/09/2008
DATE COMPLETED 24/09/2008

CLIENT Dublin Central Developments Ltd BOREHOLE DEPTH (m) 21.20

ENGINEER AGL Consulting Ltd CASING DEPTH (m) 21.20

BORED BY J. McDonnell
PROCESSED BY S. Letch

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
20	Hard black slightly sandy gravelly CLAY with occasional cobbles (<i>continued</i>)				AF4841	B	20.50-20.50		N = 100/175 mm (13, 29, 35, 42, 23)	
21	End of Borehole at 21.20 m			21.20						
22										
23										
24										
25										
26										
27										
28										
29										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.5	3.8	0.5	Boulder						
3.9	4	0.5	Boulder						
4.8	5	1	Boulder						
5.8	6	0.5	Boulder						
11	14.4	8	Hard Strata Boring						
14.4	16.7	8	Hard Strata Boring						
16.7	18.5	8	Hard Strata Boring						
18.5	21	6	Hard Strata Boring						
21	21.2	2	Boulder						

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments
23-09-08	21.20	21.20	6.00	End of shift

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit excavated to 1.20m. Water added from 3.5m to aid drilling.

BH LOG DCD 13696.GPJ IGSL.GDT 1/10/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft

DRILLHOLE NO OW1
SHEET Sheet 1 of 4

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm)

DATE STARTED 15/09/2008
DATE COMPLETED 16/09/2008

CLIENT ENGINEER Dublin Central Developments Ltd.
AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0 1 2 3 4 5 6 7 8 9								Inspection Pit - observed by driller as made ground consisting of gravel and cobbles. SYMMETRIX OPEN HOLE DRILLING: Observed by driller as made ground consisting of brick, wood and clay. SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel	1.20 4.20	DDC PLAN NO 5432/2 RECEIVED: 13/12/2022			

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
16-09-08	13.50	10.50	13.50	50mm SP					
16-09-08	33.00	27.00	33.00	50mm SP					

IGSL RC NEWLOG 10M PER PG. 13696 GPJ IGSL GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO OW1
	SHEET Sheet 2 of 4
CO-ORDINATES(_)	GROUND LEVEL (m)
	CORE DIAMETER (mm)
CLIENT Dublin Central Developments Ltd.	INCLINATION -90
ENGINEER AGL Consulting Engineers	FLUSH Polymer Gel
	DATE STARTED 15/09/2008
	DATE COMPLETED 16/09/2008
	DRILLED BY Millennium
	LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel <i>(continued)</i>					
11													
12													
13									13.20				
14								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of clay and gravel					
15													
16									16.20				
17								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of clay					
18													
19									19.20				

REMARKS					INSTALLATION REMARKS					
Hand dug inspection pit to 1.2m.					Headworks.					
					GROUNDWATER DETAILS					
Date	Hole Depth	Casing Depth	Depth to Water	Comments						
INSTALLATION DETAILS										
Date	Tip Depth	RZ Top	RZ Base	Type						
16-09-08	13.50	10.50	13.50	50mm SP						
16-09-08	33.00	27.00	33.00	50mm SP						

IGSL RC NEWLOG 10M PER PG 13696.GPJ IGSL GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft

DRILLHOLE NO OW1
SHEET Sheet 3 of 4

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm)
INCLINATION -90
FLUSH Polymer Gel

DATE STARTED 15/09/2008
DATE COMPLETED 16/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
20					0 250 500			SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of clay and gravel (<i>continued</i>)	20.70				
21								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel and cobbles.	21.50				
22								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of weathered rock	22.00				
23								OPEN HOLE DRILLING: No recovery, observed by driller as returns of rock.					
24													
25													
26													
27													
28													
29													

REMARKS

Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS

Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
16-09-08	13.50	10.50	13.50	50mm SP
16-09-08	33.00	27.00	33.00	50mm SP

IGSL RC NEW LOG 10M PER PG 13696 GPJ IGSL GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft

DRILLHOLE NO OW1
SHEET Sheet 4 of 4

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm)

DATE STARTED 15/09/2008
DATE COMPLETED 16/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
30 31 32 33 34 35 36 37 38 39								OPEN HOLE DRILLING: No recovery, observed by driller as returns of rock. (continued)	33.00				
								End of Corehole at 33 (m)					

REMARKS
Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS
Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
16-09-08	13.50	10.50	13.50	50mm SP
16-09-08	33.00	27.00	33.00	50mm SP

IGSL RC NEWLOG 10M PER PG 13696.GPJ IGSL.GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft		DRILLHOLE NO RC08
		SHEET Sheet 1 of 33
CO-ORDINATES(_)		DATE STARTED 13/09/2008
		DATE COMPLETED 14/09/2008
CLIENT Dublin Central Developments Ltd.		DRILLED BY Millennium
ENGINEER AGL Consulting Engineers		LOGGED BY A. Mahony
		GROUND LEVEL (m)
		CORE DIAMETER (mm) 102
		INCLINATION -90
		FLUSH Polymer Gel

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Inspection Pit - observed by driller as made ground consisting of gravel, sand, brick and timber.					

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL.GDT 11/11/08

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
		Date	Hole Depth	Casing Depth	Depth to Water	Comments			
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					



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CONTRACT Dublin Central Development - Draft

DRILLHOLE NO RC08
SHEET Sheet 2 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102
INCLINATION -90
FLUSH Polymer Gel

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008
DRILLED BY Millennium
LOGGED BY A. Mahony

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
1								Inspection Pit - observed by driller as made ground consisting of gravel, sand, brick and timber. <i>(continued)</i> SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay with cobbles	1.20				

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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DRILLHOLE NO RC08
SHEET Sheet 3 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT ENGINEER Dublin Central Developments Ltd.
AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
2								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay with cobbles (continued)					
								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay	2.70				

REMARKS

Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS

Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
	SHEET Sheet 4 of 33
CO-ORDINATES(_)	GROUND LEVEL (m)
	CORE DIAMETER (mm) 102
	INCLINATION -90
CLIENT Dublin Central Developments Ltd.	FLUSH Polymer Gel
ENGINEER AGL Consulting Engineers	DRILLED BY Millennium
	LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
3								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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DRILLHOLE NO RC08
SHEET Sheet 5 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)	
4					0 250 500		Non-intact zones (shaded)	SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay <i>(continued)</i>	4.20			Elevation	Standpipe Details	SPT (N Value)
								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel.						

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL.GDT 11/11/08

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
	SHEET Sheet 6 of 33
CO-ORDINATES(_)	GROUND LEVEL (m)
	CORE DIAMETER (mm) 102
CLIENT Dublin Central Developments Ltd.	INCLINATION -90
ENGINEER AGL Consulting Engineers	FLUSH Polymer Gel
	DATE STARTED 13/09/2008
	DATE COMPLETED 14/09/2008
	DRILLED BY Millennium
	LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
5								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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CONTRACT Dublin Central Development - Draft

DRILLHOLE NO RC08
SHEET Sheet 7 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
6								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

REMARKS

Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS

Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
	SHEET Sheet 8 of 33
CO-ORDINATES(_)	DATE STARTED 13/09/2008
	DATE COMPLETED 14/09/2008
CLIENT Dublin Central Developments Ltd.	DRILLED BY Millennium
ENGINEER AGL Consulting Engineers	LOGGED BY A. Mahony
GROUND LEVEL (m)	FLUSH Polymer Gel
CORE DIAMETER (mm) 102	
INCLINATION -90	

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
7								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
CO-ORDINATES(_)	SHEET Sheet 9 of 33
CLIENT Dublin Central Developments Ltd. ENGINEER AGL Consulting Engineers	DATE STARTED 13/09/2008 DATE COMPLETED 14/09/2008
GROUND LEVEL (m) CORE DIAMETER (mm) 102 INCLINATION -90 FLUSH Polymer Gel	DRILLED BY Millennium LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL GDT 11/11/08



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
	SHEET Sheet 10 of 33
CO-ORDINATES(_)	GROUND LEVEL (m)
	CORE DIAMETER (mm) 102
	INCLINATION -90
CLIENT Dublin Central Developments Ltd.	FLUSH Polymer Gel
ENGINEER AGL Consulting Engineers	DRILLED BY Millennium
	LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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REPORT NUMBER

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DRILLHOLE NO RC08
SHEET Sheet 11 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL.GDT 11/11/08

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					



GEOTECHNICAL CORE LOG RECORD

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CONTRACT Dublin Central Development - Draft	DRILLHOLE NO RC08
	SHEET Sheet 12 of 33
CO-ORDINATES(_)	GROUND LEVEL (m)
	CORE DIAMETER (mm) 102
CLIENT Dublin Central Developments Ltd.	INCLINATION -90
ENGINEER AGL Consulting Engineers	FLUSH Polymer Gel
	DATE STARTED 13/09/2008
	DATE COMPLETED 14/09/2008
	DRILLED BY Millennium
	LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
11								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravel. <i>(continued)</i>					
								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay.	11.70				

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments					
INSTALLATION DETAILS									
Date	Tip Depth	RZ Top	RZ Base	Type					
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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CONTRACT Dublin Central Development - Draft		DRILLHOLE NO RC08
CO-ORDINATES(_)		SHEET Sheet 13 of 33
CLIENT Dublin Central Developments Ltd. ENGINEER AGL Consulting Engineers		DATE STARTED 13/09/2008 DATE COMPLETED 14/09/2008
GROUND LEVEL (m)		DRILLED BY Millennium
CORE DIAMETER (mm) 102		LOGGED BY A. Mahony
INCLINATION -90		
FLUSH Polymer Gel		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
12								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay. <i>(continued)</i>					

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL.GDT 11/11/08



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DRILLHOLE NO RC08
SHEET Sheet 14 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
13								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay. <i>(continued)</i>					

REMARKS
Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS
Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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CONTRACT Dublin Central Development - Draft		DRILLHOLE NO RC08
		SHEET Sheet 15 of 33
CO-ORDINATES(_)		DATE STARTED 13/09/2008
		DATE COMPLETED 14/09/2008
CLIENT Dublin Central Developments Ltd.		DRILLED BY Millennium
ENGINEER AGL Consulting Engineers		LOGGED BY A. Mahony
		GROUND LEVEL (m)
		CORE DIAMETER (mm) 102
		INCLINATION -90
		FLUSH Polymer Gel

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
14								SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay. <i>(continued)</i>		DDC PLAN NO 5432/22 DATED: 13/12/2002			

REMARKS					INSTALLATION REMARKS				
Hand dug inspection pit to 1.2m.					Headworks.				
					GROUNDWATER DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
14-09-08	13.00	6.00	13.00	50mm SP					
14-09-08	32.50	26.50	32.50	50mm SP					

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL.GDT 11/11/08



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DRILLHOLE NO RC08
SHEET Sheet 16 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102
INCLINATION -90
FLUSH Polymer Gel

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008
DRILLED BY Millennium
LOGGED BY A. Mahony

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
15	15.00							SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of gravelly clay. <i>(continued)</i>	16.00				

REMARKS
Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS
Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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DRILLHOLE NO RC08
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CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT ENGINEER Dublin Central Developments Ltd.
AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
16	16.00				0 250 500	0 0 0	0 0 0	Stiff brown sandy gravelly CLAY (gravel is predominantly fine, angular to sub-rounded)				N = 100/80 mm (10, 15, 30, 60, 10)	

REMARKS

Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS

Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEW LOG 1M PER PG 13696.GPJ IGSL_GDT_11/11/08



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DRILLHOLE NO RC08
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CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
17	17.00	100	0	0				Stiff brown sandy gravelly CLAY (gravel is predominantly fine, angular to sub-rounded and locally rounded)	17.05				N = 55/31 mm (25, 45, 55)

REMARKS
Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS
Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

IGSL RC NEWLOG 1M PER PG 13696.GPJ IGSL_GDT 11/11/08



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DRILLHOLE NO RC08
SHEET Sheet 19 of 33

CO-ORDINATES(_)

GROUND LEVEL (m)
CORE DIAMETER (mm) 102

DATE STARTED 13/09/2008
DATE COMPLETED 14/09/2008

CLIENT Dublin Central Developments Ltd.
ENGINEER AGL Consulting Engineers

INCLINATION -90
FLUSH Polymer Gel

DRILLED BY Millennium
LOGGED BY A. Mahony

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Description	Depth (m)	Discontinuities	Elevation	Standpipe Details	SPT (N Value)
18	18.00	100	0	0	0 250 500	[Symbol]		Stiff brown sandy gravelly CLAY (gravel is predominantly fine, angular to sub-rounded and locally rounded) <i>(continued)</i>				N = 50/20 mm (25, 50, 50)	
	18.50					[Symbol]							

REMARKS

Hand dug inspection pit to 1.2m.

INSTALLATION REMARKS

Headworks.

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
14-09-08	13.00	6.00	13.00	50mm SP
14-09-08	32.50	26.50	32.50	50mm SP

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