

Figure 7.1 Soils Map

7.3.4 Quaternary Deposits

- 7.20 The Quaternary Period is the final stage of the geological time scale. This period includes the start of the Ice Age (approximately 1.6 million years ago), known as the Pleistocene Epoch right through to the postglacial period, known as the Holocene Epoch, which began 10,000 years ago and extends from the Pleistocene to the present day.
- 7.21 The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate and was characterised by alternating extended periods of very cold conditions, during which time much of the country was covered by an ice sheet. These colder periods were interspaced with warmer periods, known as interglacials, which lasted for approximately 10,000 years at a time.
- 7.22 The GSI subsoil map ([Map Series \(arcgis.com\)](http://Map Series (arcgis.com))) indicates that the majority of the site and surrounding area is underlain Made Ground. Figure 7.2 shows the subsoils underlying the site.

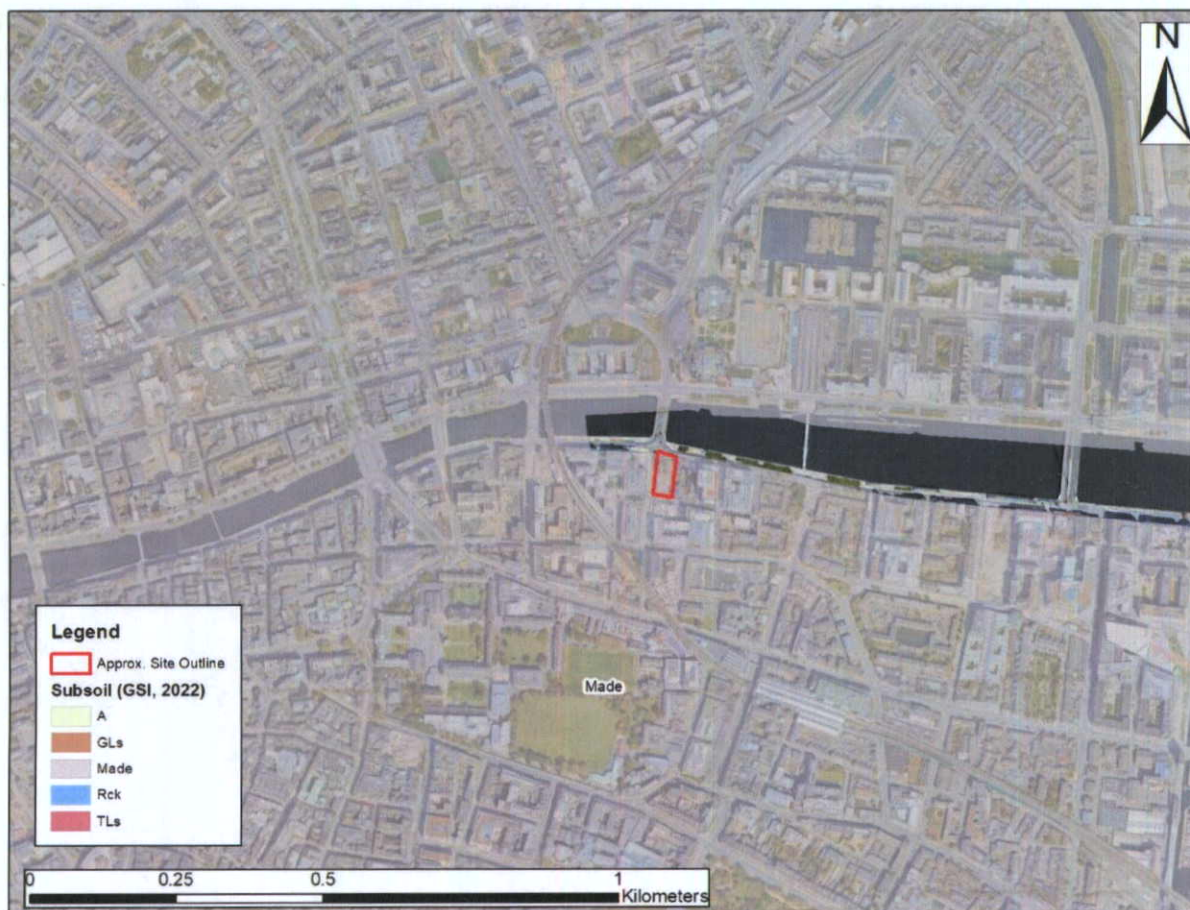


Figure 7.2 Subsoils Map

7.3.5 Site Investigations

7.23 Site investigations were carried out in January 2020 by Site Investigations Limited (SIL). The fieldworks comprised the use of a cable percussive borehole. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. Laboratory testing has been performed on representative soil samples recovered from the boreholes and these were completed in accordance of BS1377: 1990. The fieldworks comprised of the following:

- Three (3) no. cable percussive boreholes

7.24 Cable percussion boring was undertaken at 3 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. Prior to drilling commencing, a hand dug inspection pit was excavated to check for underground services. The boreholes terminated at similar depths from 8.90mbgl (metres below ground level) to 9.10mbgl when obstructions were encountered. Bulk disturbed samples were recovered at regular intervals and returned to SIL for laboratory testing.

7.25 Borehole logs are available as Appendix 7.2 at the end of this report.

7.26 A second round of site investigations were carried out in April and May 2022 by Ground Investigations Ireland (GII). The purpose of these site investigations was to investigate subsurface conditions utilising a variety of investigative methods in accordance with

the project specification. The scope of the works for the April and May investigations undertaken for this project included the following and these are in addition to January 2020 investigations:

- Visit project site to observe existing conditions
- Carry out 3 No. Rotary Core Boreholes to a maximum depth of 12.30m BGL
- Installation of 3 No. Groundwater monitoring wells
- Installation of 3 No. Groundwater data loggers and 1 No. Barologger
- Groundwater laboratory testing

7.3.5.1 Ground Conditions

- 7.27 According to the SIL investigations, the site ground conditions show MADE GROUND encountered to 2.80mbgl and 2.90mbgl. This was logged as clay soils overlying gravel soils with red brick and concrete fragments running through them.
- 7.28 Underlying the fill material is granular SAND and GRAVEL soils with cohesive CLAY and SILT soils underlying these with the boundaries between 4.80mbgl and 5.60mbgl. BH02 recorded further granular soils at 5.60mbgl whereas the two holes closer to the river recorded cohesive soils until termination.
- 7.29 According to the GII investigations, the following ground conditions were encountered:
- Surfacing
 - Made Ground
 - Granular Deposits
 - Cohesive Deposits
 - Bedrock

SURFACING: Concrete surfacing was present to a depth of between 0.05m and 0.15m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Surfacing and were present to a relatively consistent depth of between 3.50m and 3.80m BGL, with Possible Made Ground noted in BH03 to a maximum depth of 5.30m BGL. These deposits were described generally as *brown/grey clayey gravelly Sand with frequent red brick and concrete fragments onto greyish brown sandy gravelly Clay with red brick and mortar fragments onto greyish dark brown slightly silty slightly sandy gravelly Clay with organic matter*. In BH03 *grey angular coarse gravel FILL* was noted beneath the Surfacing to a depth of 0.30m BGL, overlying Made Ground deposits following the descriptions outlined above.

GRANULAR DEPOSITS: Granular deposits were encountered beneath the Made Ground in BH01 and BH03 and were typically described as *grey slightly clayey slightly sandy subrounded to rounded fine to coarse GRAVEL*. In BH02 there was no recovery from 3.80m to 5.30m BGL, but the driller noted a Sandy deposit. The secondary sand/gravel and silt/clay constituents were relatively consistent across the site but varied with depth. There was no cobble or boulder content recorded.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Granular Deposits and were described typically as *grey sandy gravelly CLAY*, with silt and shells also noted as a secondary constituent in BH01 and BH03. The secondary sand and gravel constituents varied across the site and with depth. The strength of the cohesive deposits varied across the site and with depth, but was typically stiff below 3.80m BGL in most of the exploratory holes.

BEDROCK: The rotary core boreholes recovered *Weak to Medium Strong to Strong thinly laminated grey fine to medium grained LIMESTONE interbedded with weak to Medium Strong thinly laminated fine-grained Mudstone*. This is typical of the Lucan Formation, which is noted on the geological mapping at the proposed site.

- 7.30 The depth to rock varies from 8.30mbgl in BH03 to a maximum of 9.80mbgl in BH01 and 8.60mbgl in BH02. Borehole logs are available as Appendix 7.2 at the end of this report.
- 7.31 As per Chapter 12 of this EIA Report, there is potential for a section of a disused underground stream called the 'Gallows Stream' to cross the proposed development area. Documentary sources refer to the stream as rising near Leeson Lane, off Leeson Street, and flowing close to Government Buildings (Oram 2004; Sweeney 2017). However, based on the available site investigations it was not encountered.

7.3.5.2 Soil Quality

- 7.32 Soil samples were collected during the SIL investigations. Environmental testing was carried out on three samples from the investigation and the results are shown in Appendix 7.3. For material to be removed from site, Rilta Suite testing was carried out to determine if the material is hazardous or non-hazardous and then the leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as '*inert material*' by an Irish landfill.
- 7.33 The Waste Classification report created using HazWasteOnline™ software shows that the material tested has to be classified as *hazardous* material. All three samples recorded elevated levels of lead with BH01 and BH03 recording elevated levels of zinc.
- 7.34 A trace sample of chrysotile (white asbestos) was recorded in the sample from BH02 and further analysis of possible asbestos on site should be included within the Environmental Engineer's investigation.
- 7.35 Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils prior to removal from site.

7.3.5.3 Groundwater Conditions

- 7.36 Groundwater details in the borehole during the fieldworks are noted on the log in Appendix 7.2. Two groundwater ingresses were noted during the drilling process but were recorded at depths of 4.80mbgl or greater. The initial strike was sealed off by the borehole casings and then a second strike was recorded as the borehole progressed. At the end of drilling, the highest water level was recorded at 3.00mbgl.
- 7.37 According to the GII site investigations, no groundwater was noted however it was pointed out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels that would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in each of the three boreholes to allow the equilibrium groundwater level to be determined.
- 7.38 However, three (3) no. continuous data loggers were installed as part of these investigations. These data loggers measure the groundwater elevations in each of the three (3) no. groundwater monitoring wells. The loggers were set at 1-hour intervals and were left in-situ for approximately 1 month.

7.39 Based on the available groundwater level data, groundwater levels across the site are generally 3.29 mbgl (-0.20mOD, BH02) to 3.78 mbgl (-0.63mOD, BH01). There appears to be no tidal influence on the groundwater levels at the site. All boreholes are screened within the underlying bedrock.

7.3.5.4 Groundwater Quality

7.40 During the GII investigations, three (3) no. groundwater monitoring wells were installed to examine the underlying groundwater quality at the site by GII under the supervision of Byrne Looby. No groundwater monitoring wells were installed as part of the 2020 SIL investigations.

7.41 Groundwater samples were collected from each of the groundwater monitoring wells that was installed within the proposed development site. Therefore, three (3) no. groundwater samples were collected in total.

Metals

7.42 Overall, all metals are below the available Groundwater Threshold values (GTVs, S.I. No. 9/2010 & S.I. No. 366/2016). Refer to Table 7.1 below.

Sample ID	Details				Groundwater		
					BH01	BH02	BH03
Laboratory					Element	Element	Element
Sample Type					Ground Water	Ground Water	Ground Water
Location					Onsite	Onsite	Onsite
Sample Date					11/05/2022		
Parameters	Units	MDL	GTV (Groundwater)	IGV (Groundwater)			
Aluminium	mg/l	0.02	0.15	0.2	-	-	-
Antimony	mg/l	0.002	<i>nv</i>	<i>nv</i>	-	-	-
Arsenic	mg/l	0.0025	0.0075	0.01	-	-	-
Cadmium	mg/l	0.0005	0.00375	0.005	-	-	-
Chromium	mg/l	0.0015	0.0375	0.03	-	-	-
Cobalt	mg/l	0.002	<i>nv</i>	<i>nv</i>	-	-	-
Copper	mg/l	0.007	1.5	0.03	-	-	-
Total Iron	mg/l	0.02	<i>nv</i>	0.2	0.058	-	-
Lead	mg/l	0.005	0.01875	0.01	-	-	-
Manganese	mg/l	0.002	<i>nv</i>	0.05	0.004	0.552	0.552
Mercury	mg/l	0.001	0.00075	0.001	-	-	-
Nickel	mg/l	0.002	0.015	0.02	-	0.003	0.009
Selenium	mg/l	0.003	<i>nv</i>	<i>nv</i>	-	-	-
Zinc	mg/l	0.003	0.075	0.1	0.058	0.017	0.068

Key	Value exceeds the Threshold Value (Groundwater)
GTV	Groundwater Threshold Value
IGV	Interim Guideline Value
MDL	Method Detection Limit
-	Less than the MDL
<i>nv</i>	No Value
<i>nt</i>	Not tested

Table 7.1 Metals Suite Table Compared to the Available Standards and Guidelines.

General Suite (Major Ions and Cations)

7.43 Overall, the majority of the general suite analytes are below the available Groundwater Threshold values (GTVs, S.I. No. 9/2010 & S.I. No. 366/2016). Refer to Table 7.2 below. However, there is elevated concentrations of chloride, sodium and sulphate at BH2 & BH3. These elevated concentrations with a high concentration of electrical conductivity indicates that there is some tidal influence due to the close proximity of the River Liffey and Dublin Bay (c. 1.50km east from the site).

Sample ID	Details				Groundwater		
					BH01	BH02	BH03
Laboratory					Element	Element	Element
Sample Type					Ground Water	Ground Water	Ground Water
Location					Onsite	Onsite	Onsite
Sample Date					11/05/2022		
Parameters	Units	MDL	GTV (Groundwater)	IGV (Groundwater)			
Anions & Cations							
Calcium	mg/l	0.2	nv	200	24.9	448.5	370.2
Chloride as Cl	mg/l	0.3	187.5	30	80.9	<u>6,956.20</u>	<u>216.4</u>
Magnesium	mg/l	0.1	nv	50	5.6	492	54.1
Potassium	mg/l	0.1	nv	5	2.8	<u>144.6</u>	<u>31.1</u>
Sodium	mg/l	0.1	150	150	46.3	<u>4074.3</u>	136.4
Sulphate as SO ₄	mg/l	0.05	187.5	200	32.7	993.7	623.4
Nutrients							
Nitrite as NO ₂	mg/l	0.02	nv	nv	-	-	0.98
Nitrate as NO ₃	mg/l	0.2	nv	nv	3.5	-	19
Total Alkalinity as CaCO ₃	mg/l	1	nv	No abnormal change	58	238	470
Total Ammonia as NH ₃	mg/l	0.03	nv	nv	0.12	2.55	7.6
Electrical Conductivity @25C	uS/cm	<2	(800 or 1875) ^(note 1)	1000	427	<u>21,677</u>	<u>2,501</u>
pH	pH units	<0.01	nv	≥6.5 and ≤9.5	6.96	7.77	7.8
COD	NTU	7	nv	nv	37	201	29
Key							
Value exceeds the Threshold Value (Groundwater) Note 1 Different GW Thresholds apply to different status classification tests							
GTV Groundwater Threshold Value							
IGV Interim Guideline Value <u>Underlined</u> = IGV Threshold values exceeded							
MDL Method Detection Limit							
- Less than the MDL							
nv No Value nt Not tested							

Table 7.2 General Suite Table Compared to the Available Standards and Guidelines.

Hydrocarbons

7.44 Table 7.3 below at the end of this report summaries the results of hydrocarbon testing. In summary, there were no detections above the available groundwater threshold values with the majority of analytes being below the respective laboratory’s detection limit, across the hydrocarbon suite in all three of the groundwater samples, except for one (1) groundwater well location – BH1.

7.45 At BH1, EPH (C8-C40) recorded a concentration of 3,330 ug/l which exceeds the available GTV concentration of 7.5 ug/l.

Sample ID	Details				Groundwater		
					BH01	BH02	BH03
Laboratory					Element	Element	Element
Sample Type					Ground Water	Ground Water	Ground Water
Location					Onsite	Onsite	Onsite
Sample Date					11/05/2022		
Parameters	Units	MDL	GTV (Groundwater)	IGV (Groundwater)			
PAH MS							
Naphthalene	ug/l	<0.1	75	10	-	-	-
Acenaphthylene	ug/l	<0.005			-	-	-
Acenaphthene	ug/l	<0.005			-	-	0.006
Fluorene	ug/l	<0.005			-	-	-
Phenanthrene	ug/l	<0.005			-	-	0.036
Anthracene	ug/l	<0.005			-	-	-
Fluoranthene	ug/l	<0.005			-	-	0.015
Pyrene	ug/l	<0.005			-	-	0.025
Benzo(a)anthracene	ug/l	<0.005			-	-	0.086
Benzo(b)anthracene	ug/l	<0.005			-	-	0.074
Chrysene	ug/l	<0.005			-	-	0.027
Benzo(k)fluoranthene	ug/l	<0.008			-	-	0.035
Benzo(a)pyrene	ug/l	<0.005			-	-	0.051
Indeno(1,2,3-cd)pyrene	ug/l	<0.005			-	-	0.028
Dibenzo(a,h)anthracene	ug/l	<0.005			-	-	0.018
Benzo(ghi)perylene	ug/l	<0.005			-	-	-
PAH 16 Total	ug/l	<0.173			-	-	0.14
Benzo(b)fluoranthene	ug/l	<0.008	-	-	0.375		
Benzo(k)fluoranthene	ug/l	<0.008	-	-	0.037		
					0.014		
VOC TICs	None		nv	nv	ND	ND	ND
Methyl Tertiary Butyl Ether	ug/l	<0.1	10		-	-	-
Benzene	ug/l	<0.5	0.75	0.1	-	-	-
Toluene	ug/l	<5	525	10	-	-	-
Ethylbenzene	ug/l	<1	nv	10	-	-	-
m/p-Xylene	ug/l	<2	nv	10	-	-	-
o-Xylene	ug/l	<1	nv	10	-	-	-
GRO (>C4-C8)	ug/l	<10			-	-	-
GRO (>C8-C12)	ug/l	<10	nv	nv	102	-	-
GRO (>C4-C12)	ug/l	<10			102	-	-
PAH Surrogate % Recovery	%	0	nv	nv	52	59	47
EPH (C8-C40)	ug/l	0.01	7.5	nv	3,330	-	-

Key	
BOLD	Value exceeds the Groundwater Threshold Value (GTV)
<u>Underlined</u>	Value exceeds the EPA Interim Guideline Values (IGV)
	nv of MDL -
Notes:	GTV Groundwater Threshold Value (S.I. No. 9, 2010 Groundwater Regulations) Groundwater Threshold Value (S.I. No. 366, 2016 Groundwater (Amendment) Regulations) IGV Interim Guideline Values (EPA, 2003)
	Note 1: Sum of Total Petroleum Hydrocarbons (TPH) including the volatile petroleum hydrocarbons (VPH) range and extractable petroleum hydrocarbons (EPH) range hydrocarbons C2-C5 and hydrocarbons C6-C40 respectively (S.I. 366 of 2016). The IGV value is a 'catch-all' and includes for analysis of TPH, MTBE, as well as Toluene, Ethylbenzene, m,p-Xylene, and o-Xylene
	Note 2: For reference, IGV for Ammonia (as ammonium) is 0.15mg/l

Table 7.3 Hydrocarbon Table Compared to the Available Standards and Guidelines.

Volatile Organic Compounds (VOCs)

7.46 Tables 7.4 below summaries the results of VOCs testing. In summary, there were no exceedances reported for VOCs in any of the groundwater samples collected at the subject site. All concentrations were below the respective laboratory's limit of detection (LOD).

Sample ID	Details				Groundwater		
					BH01	BH02	BH03
					Element	Element	Element
					Ground Water	Ground Water	Ground Water
					Onsite	Onsite	Onsite
Table 5f Laboratory							
Sample Type							
Location							
Sample Date					11/05/2022		
Parameters	Units	MDL	GTV (Groundwater)	IGV (Groundwater)			
Dichlorodifluoromethane	ug/l	<2		nv	-	-	
Methyl Tertiary Butyl Ether	ug/l	<0.1	nv	30	-	-	
Chloromethane	ug/l	<3			-	-	
Vinyl Chloride	ug/l	<0.1	0.375		-	-	
Bromomethane	ug/l	<1			-	-	
Chloroethane	ug/l	<3		nv	-	-	
Trichlorofluoromethane	ug/l	<3			-	-	
1,1-Dichloroethane (1,1 DCE)	ug/l	<3			-	-	
Dichloromethane (DCM)	ug/l	<3			-	-	
trans-1-2-Dichloroethane	ug/l	<3			-	-	
1,1-Dichloroethane	ug/l	<3		3	-	-	
cis-1-2-Dichloroethane	ug/l	<3	nv		-	-	
2,2-Dichloropropane	ug/l	<1		nv	-	-	
Bromochloromethane	ug/l	<2			-	-	
Chloroform	ug/l	<2		12	-	-	
1,1,1-Trichloroethane	ug/l	<2		500	-	-	
1,1-Dichloropropene	ug/l	<3		nv	-	-	
Carbon tetrachloride	ug/l	<2			-	-	
1,2-Dichloroethane	ug/l	<2	2.25	3	-	-	
Benzene	ug/l	<0.5	0.75	nv	-	-	
Trichloroethane (TCE)	ug/l	<3	7.5	10	-	-	
1,2-Dichloropropane	ug/l	<2			-	-	
Dibromomethane	ug/l	<3		nv	-	-	
Bromodichloromethane	ug/l	<2			-	-	
cis-1-3-Dichloropropene	ug/l	<2	nv		-	-	
Toluene	ug/l	<0.5		10	-	-	
trans-1-3-Dichloropropene	ug/l	<2		nv	-	-	
1,1,2-Trichloroethane	ug/l	<2			-	-	
Tetrachloroethane (PCE)	ug/l	<3	7.5	10	-	-	
1,3-Dichloropropane	ug/l	<2			-	-	
Dibromochloromethane	ug/l	<2		nv	-	-	
1,2-Dibromoethane	ug/l	<2			-	-	
Chlorobenzene	ug/l	<2		1	-	-	
1,1,1,2-Tetrachloroethane	ug/l	<2		nv	-	-	
Ethylbenzene	ug/l	<0.5		10	-	-	
m/p-Xylene	ug/l	<1			-	-	
o-Xylene	ug/l	<0.5		10	-	-	
Styrene	ug/l	<2			-	-	
Bromoform	ug/l	<2			-	-	
Isopropylbenzene	ug/l	<3			-	-	
1,1,2,2-Tetrachloroethane	ug/l	<4			-	-	
Bromobenzene	ug/l	<2			-	-	
1,2,3-Trichloropropane	ug/l	<3			-	-	
Propylbenzene	ug/l	<3			-	-	
2-Chlorotoluene	ug/l	<3	nv		-	-	
1,3,5-Trimethylbenzene	ug/l	<3		nv	-	-	
4-Chlorotoluene	ug/l	<3			-	-	
tert-Butylbenzene	ug/l	<3			-	-	
1,2,4-Trimethylbenzene	ug/l	<3			-	-	
sec-Butylbenzene	ug/l	<3			-	-	
4-Isopropyltoluene	ug/l	<3			-	-	
1,3-Dichlorobenzene	ug/l	<3			-	-	
1,4-Dichlorobenzene	ug/l	<3			-	-	
n-Butylbenzene	ug/l	<3			-	-	
1,2-Dichlorobenzene	ug/l	<3		10	-	-	
1,2-Dibromo-3-chloropropane	ug/l	<2		nv	-	-	
1,2,4-Trichlorobenzene	ug/l	<3		0.4	-	-	
Hexachlorobutadiene	ug/l	<3		0.1	-	-	
Naphthalene	ug/l	<2		1	-	-	
1,2,3-Trichlorobenzene	ug/l	<3		nv	-	-	

Key

BOLD Value exceeds the Groundwater Guideline Value (Groundwater)

GTV Groundwater Threshold Value

IGV Interim Guideline Value

MDL Method Detection Limit

- Less than the MDL

Underlined exceeds the EPA IGV

nv no criteria value available

- MDL above available guideline value

Table 7.4 VOCs Table Compared to the Available Standards and Guidelines.

7.3.6 Conceptual Site Model (CSM)

- 7.47 The site ground conditions show MADE GROUND encountered to 2.80mbgl (metres below ground level) and 2.90mbgl. This was logged as clay soils overlying gravel soils with red brick and concrete fragments running through them.
- 7.48 Underlying the fill material is granular SAND and GRAVEL soils with cohesive CLAY and SILT soils underlying these with the boundaries between 4.80mbgl and 5.60mbgl. BH02 recorded further granular soils at 5.60mbgl whereas the two holes closer to the river recorded cohesive soils until termination (approx. 9 metres below ground level).
- 7.49 Bedrock was encountered during the site investigations in 2020 by SIL. The three (3) no. boreholes were drilled to a maximum depth of 9.10 metres below ground level (mbgl). Therefore, the depth to bedrock is greater than 9 metres at the proposed development site.
- 7.50 The bedrock geology of the site is classified as Calp formation which is described as dark grey to black limestone & shale of Lower Carboniferous age. The National Draft Gravel Aquifer Map has been researched and does note a gravel aquifer under the site or in the study area. The aquifer underlying the site is considered a locally important gravel aquifer (Lg).
- 7.51 Two groundwater ingresses were noted during the drilling process but were recorded at depths of 4.80mbgl or greater. The initial strike was sealed off by the borehole casings and then a second strike was recorded as the borehole progressed. At the end of drilling, the highest water level was recorded at 3.00mbgl.
- 7.52 Three (3) no. continuous data loggers were installed as part of the most recent site investigations (GII, 2022). These data loggers measure the groundwater elevations in each of the three (3) no. groundwater monitoring wells. The loggers were set at 1-hour intervals and were left in-situ for approximately 1 month. Based on the available groundwater level data, groundwater levels across the site are generally 3.29 mbgl (-0.20mOD, BH02) to 3.78 mbgl (-0.63mOD, BH01). There appears to be no tidal influence on the groundwater levels at the site. All boreholes are screened within the underlying bedrock.
- 7.53 In addition, no groundwater source protection zones, which are zones defined by the GSI within which development is limited in order to protect groundwater from potential pollution, are identified by the GSI under the site or in the immediate vicinity. There are no karst features in the area.
- 7.54 Reference to the GSI Vulnerability data indicates that the aquifer vulnerability is considered 'Low' which indicates that there is greater than 10 metres of subsoil thickness which was confirmed in the recent site investigations.
- 7.55 It is proposed that the basement excavation will extend to approx. -5.50m OD, a depth of 9.5m below the highest ground floor level.
- 7.56 A cross section of the site geology has been undertaken (see Figure 7.3 below).

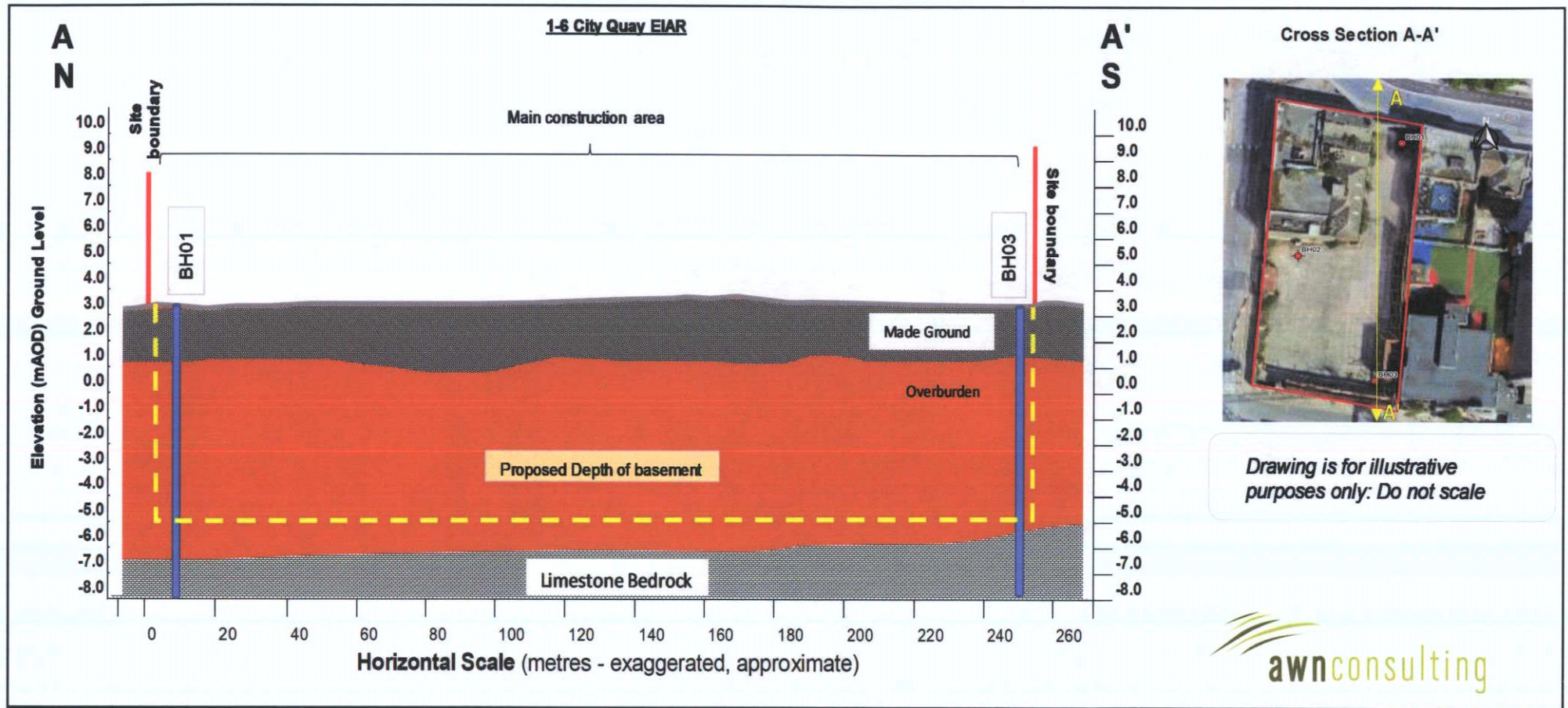


Figure 7.3 Schematic Cross Section (N-S) of the Proposed Development site.

7.3.7 Groundwater Wells

- 7.57 The GSI Well Card Index ([Map Series \(arcgis.com\)](http://Map Series (arcgis.com))) is a record of wells drilled in Ireland. This Index shows a number of wells in the vicinity of the site. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area.
- 7.58 There are no mapped GSI wells in close vicinity of the proposed development site.

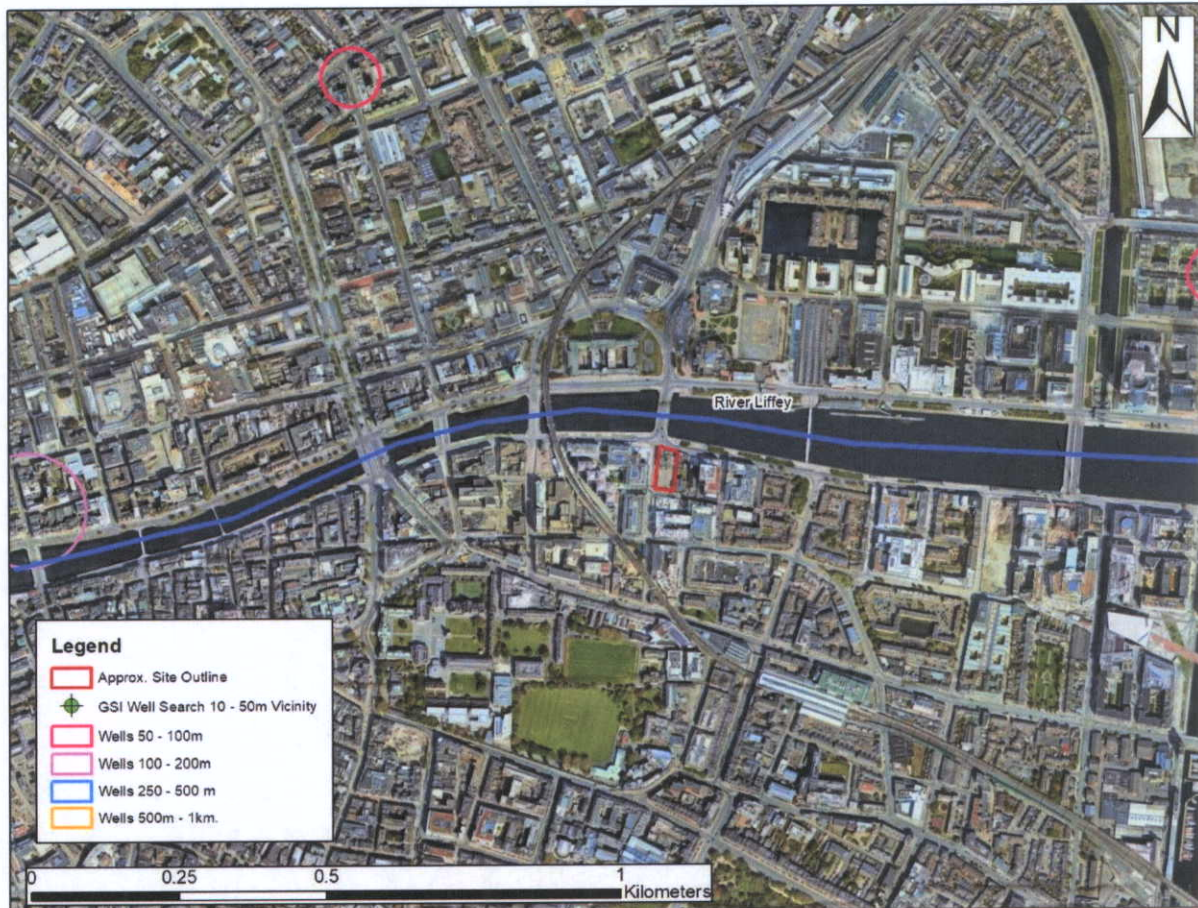


Figure 7.4 GSI Well Locations

7.3.8 Geology (Bedrock)

- 7.59 The bedrock geology of the site ([Map Series \(arcgis.com\)](http://Map Series (arcgis.com))) is classified as Calp formation which is described as dark grey to black limestone & shale of Lower Carboniferous age. See Figure 7.5.
- 7.60 Bedrock was encountered during the site investigations in 2020 by SIL. The three (3) no. boreholes were drilled to a maximum depth of 9.10 metres below ground level (mbgl). Therefore, the depth to bedrock is greater than 9 metres at the proposed development site.

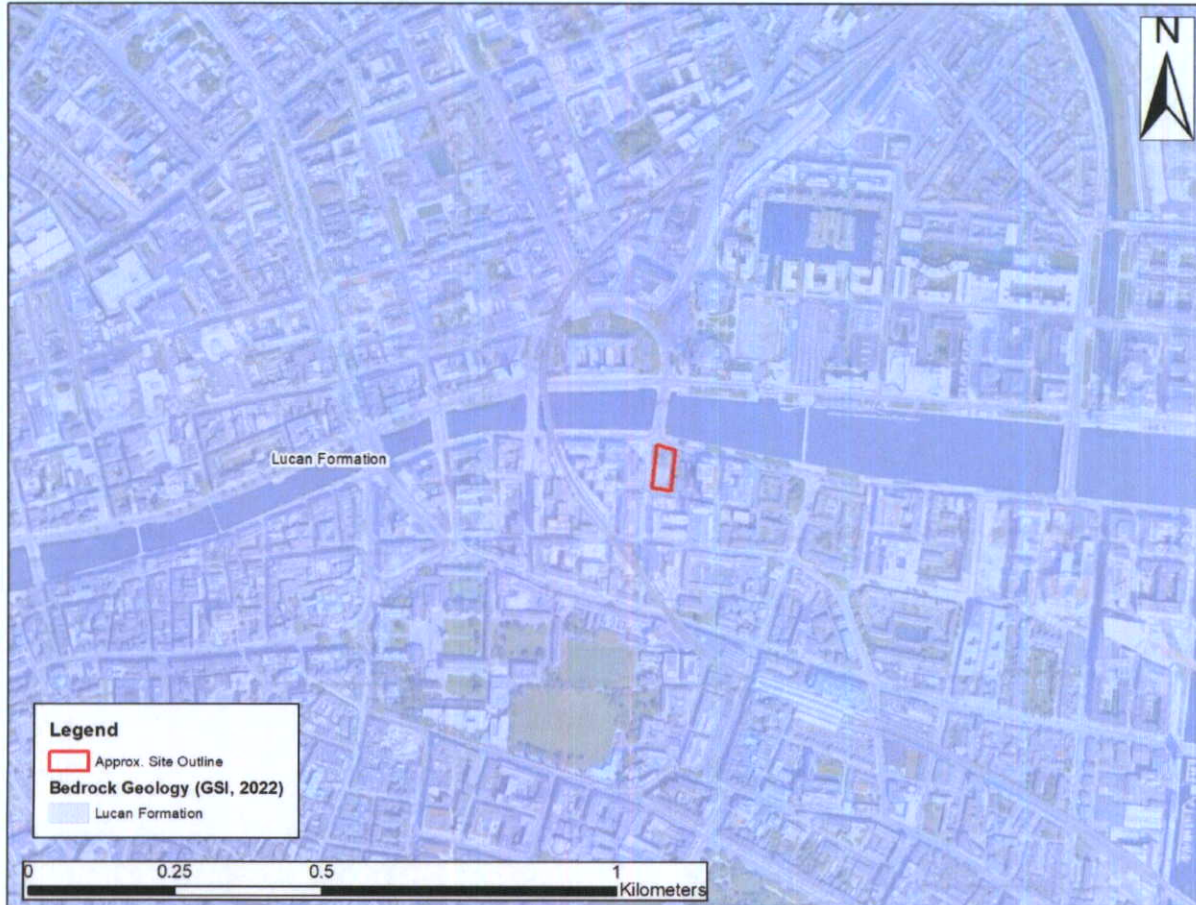


Figure 7.5 Bedrock Geology.

- 7.61 There are no sites of geological heritage within the vicinity of the site. The closest site of geological heritage is located approximately 0.39km to the south of the site and consists of museum building of Trinity College Dublin, especially the original interior, completed in 1857 (Museum Building, Trinity College).

7.3.9 Aquifer Classification and Water Body Status

- 7.62 Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. Aquifers are rocks or deposits that contain sufficient void spaces, and which are permeable enough, to allow water to flow through them in significant quantities. The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability.
- 7.63 Intergranular permeability is found in sediments, sands, gravels and clays and fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes, and solution openings. The aquifer underlying the study area is a bedrock aquifer and therefore the primary characteristic of this aquifer is defined by fissure permeability as opposed to intergranular permeability which would apply in the case of a quaternary aquifer.
- 7.64 The major bedrock aquifer underlying the site has been classified by the GSI ([Map Series \(arcgis.com\)](http://arcgis.com)) as a Locally Important (Lg) Gravel Aquifer which is moderately productive in local zones only (refer to Figure 7.6). One area included which may have high salinity.

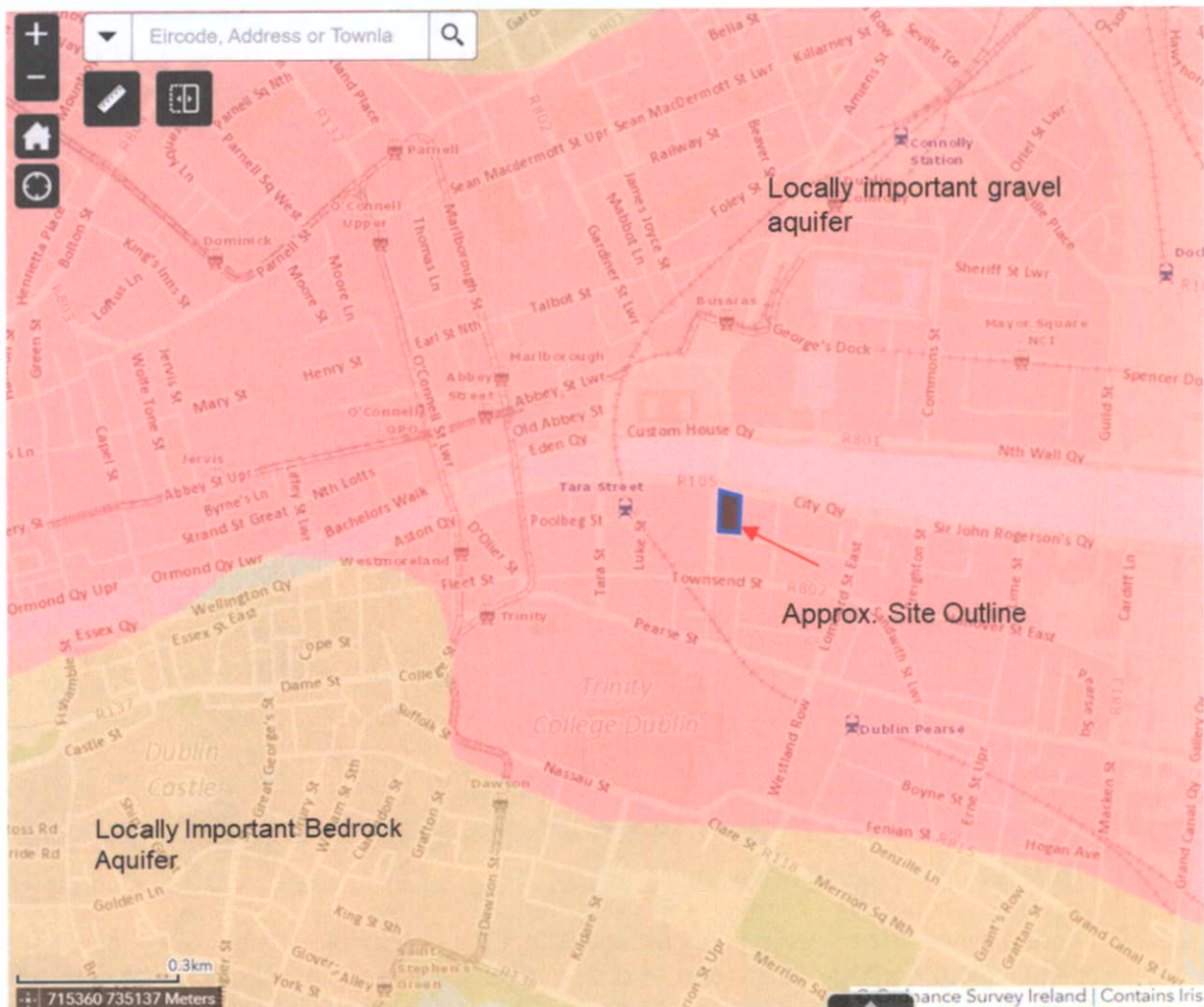


Figure 7.6 Bedrock Aquifer Map

- 7.65 The National Draft Gravel Aquifer Map has been researched and does note a gravel aquifer under the site or in the study area. The aquifer underlying the site is considered a locally important gravel aquifer (Lg).
- 7.66 The European Communities Directive 2000/60/EC established a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]). The WFD required 'Good Water Status' for all European waters by December 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'Good Ecological Status' and 'Good Chemical Status'.
- 7.67 Based on the most recent data (www.epa.ie) the Dublin groundwater body (IE_EA_G_008) within which the Proposed Development has a "Good" status (2018) and is "under review" (2015).
- 7.68 In addition, no groundwater source protection zones, which are zones defined by the GSI within which development is limited in order to protect groundwater from potential pollution, are identified by the GSI under the site or in the immediate vicinity. There are no karst features in the area.

7.3.10 Aquifer Vulnerability

- 7.69 The GSI, EPA, and the Department of Environment, Heritage and Local Government (DoEHLG) have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland, and in some cases improving groundwater quality, by applying a risk assessment approach to groundwater protection and sustainable development.
- 7.70 As part of this scheme, the GSI have mapped ([Map Series \(arcgis.com\)](http://Map Series (arcgis.com))) the vulnerability of the country's aquifers. Reference to the GSI Vulnerability data indicates that the aquifer vulnerability is considered 'Low' which indicates that there is greater than 10 metres of subsoil thickness which was confirmed in the recent site investigations. A small portion (south-eastern corner) of the proposed development site is underlain by 'Moderate' aquifer vulnerability which indicates a subsoil thickness of 5.0 to 10.0 metres. However, based on recent site investigations by SIL bedrock was not encountered in the top 8.90 metres at this location as BH02 is located within the south-eastern corner of the site.

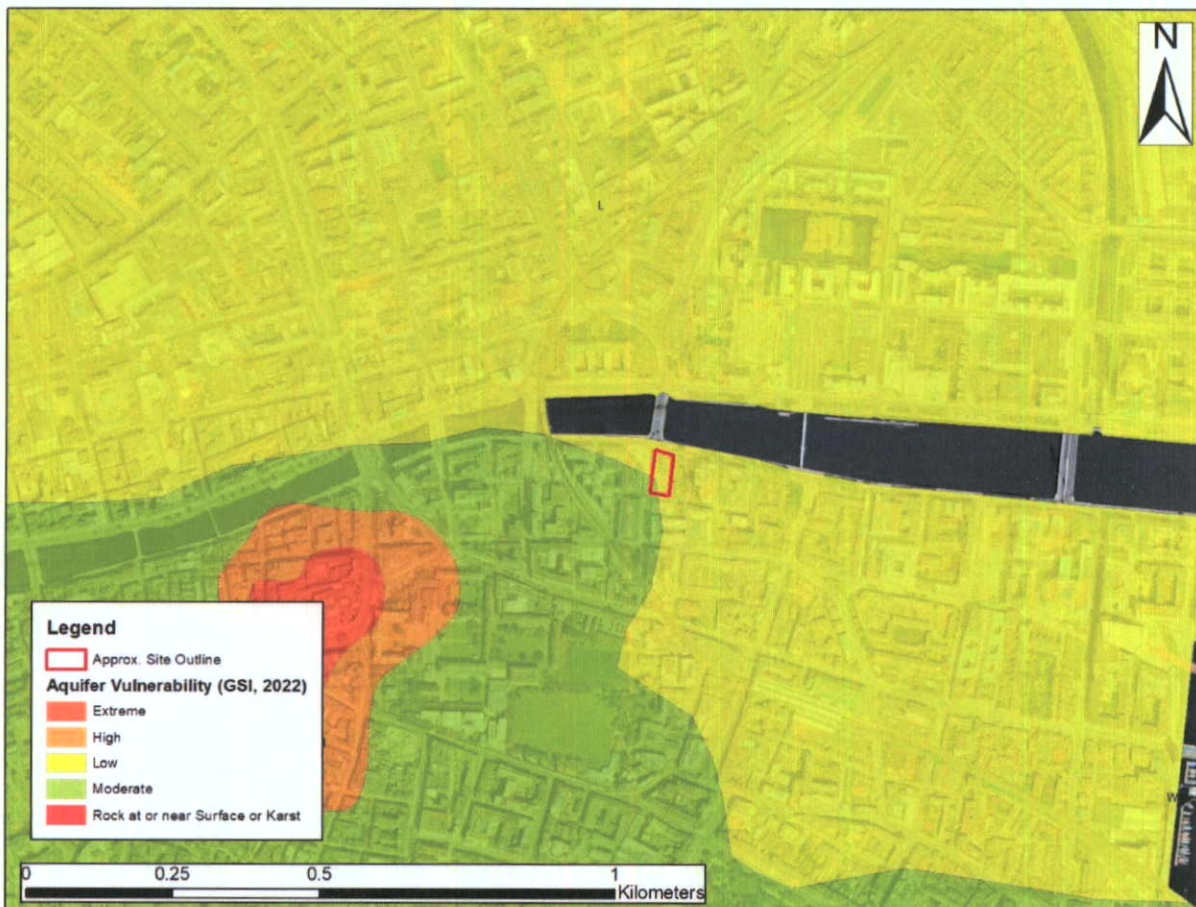


Figure 7.7 Groundwater Vulnerability

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	> 3.0m	3.0 - 10.0m	3.0 - 5.0m	> 3.0m	N/A
Moderate (M)	N/A	> 10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	> 10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
 (2) Precise permeability values cannot be given at present.
 (3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Table 7.5 Vulnerability Mapping Guidelines

7.3.11 Geo-Hazards

- 7.71 In general, Ireland suffers few landslides. Landslides are more common in unconsolidated material than in bedrock, and where the sea constantly erodes the material at the base of a cliff landslides and falls lead to recession of the cliffs. Landslides have also occurred in Ireland in recent years in upland peat areas due to disturbance of peat associated with construction activities.
- 7.72 Based on the GSI spatial map viewer ([Map Series \(arcgis.com\)](http://Map Series (arcgis.com))), the proposed development site is not in an area susceptible to landslides. This is consistent with the topography and the geology across the site. There are no active volcanoes in Ireland

7.3.12 Rating of site importance of the geological and hydrogeological features

- 7.73 Based on the NRA/IGI methodology, the criteria for rating the importance of geological features, the importance of the geological features at this site is rated as **Low Importance**.
- 7.74 Based on the NRA/IGI methodology, the criteria for rating the importance of hydrogeological features, the importance of the hydrogeological features at this site is rated as **Medium Importance**.
- 7.75 This is based on the assessment that the attribute has a medium quality significance or value on a local scale. The aquifer is a *locally important* (Lg) gravel aquifer over part of the site and is not used for public water supply or widely used for potable use. In addition, it does not host any groundwater dependent ecosystems (SACs/NHAs).

7.3.13 Landfills

- 7.76 Dublin City Council was contacted to carry out a search of current and historical landfills in the vicinity of the site. There were no illegal landfills identified in the immediate surrounding area.

7.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

- 7.77 The proposed building extends to 24 floors above ground floor and also contains 2 No. basement levels.
- 7.78 The building structure is reinforced concrete columns with flat-slab post-tensioned floors on a piled and rafted foundation.
- 7.79 There are 2 basement levels, the lower of which provides 11 car parking spaces including 2 disabled accessible spaces and 20 motorbike spaces.
- 7.80 The Proposed Development is described in further detail in Chapter 2 (Description of the Proposed Development). The characteristics of the proposed development with regard to the land, soil, geological and hydrogeological environment are outlined below.

7.4.1 Construction Activities

- Additional removal of shallow made ground and superficial deposits for foundations and civil engineering works.
- Excavation for two (2) no. basement levels.
- Infilling with engineering fill and landscaping will be undertaken.
- Site clearance and enabling works
- Temporary storage of fuel will be required on site for construction traffic.
- Small localised accidental releases of hydrocarbons have the potential to occur from construction traffic operating on site.
- Dewatering is anticipated to be required for construction as excavation into underlying subsoil (water bearing strata) will be required for the basement.

7.4.2 Operational Activities

- There will be no direct discharges to ground required for operation of the facility.
- Water supply will be supplied from public mains and effluent discharge will be to public sewer.
- No increased hard stand area.

7.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

- 7.81 An analysis of the potential impacts of the proposed development on the land, soils, geology and hydrogeological environment during the construction and operation is outlined below. Due to the inter-relationship between land, soils, geology, and hydrogeology and Hydrology the following impacts discussed will be considered applicable to Chapter 8 of the EIAR. Waste Management (Chapter 15) is also considered an interaction.

7.5.1 Construction Phase

- 7.82 Potential impacts considered during construction are as follows:

Excavation and Infilling

- 7.83 Excavation and infilling of soil and subsoil will be required for levelling of the site to render it suitable for building the building platform. The volume of material to be excavated has been estimated by the project engineers to be approximately 25,000m³ of material. Any suitable excavated material will be temporarily stockpiled for reuse as fill (although this is considered minimal due to the extents of the proposed development across the site footprint), where possible, with remaining soil to be removed off-site for appropriate reuse, recovery and / or disposal. These estimates will be refined prior to commencement of construction. If the material that requires removal from site is deemed to be a waste, removal and reuse/recycling/recovery/disposal of the material will be carried out in accordance with the 'Waste Management Act 1996' (as amended), the 'Waste Management (Collection Permit) Regulations 2007' as amended, and the 'Waste Management (Facility Permit & Registration) Regulations 2007' as amended.
- 7.84 It is currently anticipated that some excavated material will be taken off site. When this material is removed off-site it could be reused as a by-product (and not as a waste), if this is done, it will be done in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011. Article 27 requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. It is however anticipated that all excavated material being removed off this site will be removed as a waste and not as a by-product under article 27.
- 7.85 In order to establish the appropriate reuse, recovery and/or disposal route for the soils and stones to be removed off-site, it will first need to be classified. Waste material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication 'Waste Classification – List of Waste and Determining If Waste is Hazardous or Non-Hazardous'. Environmental soil analysis will be carried out prior to removal of the material on a number of the soil samples in accordance with the requirements for the acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values on landfills for acceptance of waste material based on properties of the waste including potential pollutant concentrations and leachability. It is likely that the surplus of material will be suitable for acceptance at either inert or non-hazardous soil recovery facilities/landfills in Ireland or, in the unlikely event of hazardous material being encountered, be transported for treatment/recovery or exported abroad for disposal in suitable facilities. However, more soil sampling will be required as part of the construction program to know the extent of the asbestos material. The asbestos material will be appropriately segregated and disposed off to a licenced hazardous landfill by a licenced contractor.

Basement Construction

- 7.86 The Basement Development Policy document (DCC, January 2020) explains the historical context which created the need for a new policy to be put in place. It also presents existing Planning and Legislative background relating to the matter and describes the implementation process of this new policy.
- 7.87 The Basement Development Guidance document (DCC, January 2020) presents a methodology where the impact of basement on the surrounding ground and groundwater is assessed on a site-specific basis. This policy sets out the requirements to complete this risk-based impact assessment with regard to hydrology, hydrogeology and land stability.
- 7.88 An impact assessment (refer to Section 7.7.1 below) was undertaken to assess the likely impact on the existing water regime during and post construction of a basement

within the proposed development. The objective is to ensure that the basement development:

- Protects and enhances where possible the groundwater quality, quantity and classification.
- Provides evidence that the construction of the basement shall not place groundwater at undue risk.
- Provides evidence that the structural stability of adjoining or neighbouring buildings and land areas are not put at risk.
- Provides a management plan for any demolition works and for the construction of the basement.
- Does not have an adverse effect on existing patterns of surface water drainage.
- Shall not significantly impact on groundwater or surface water flows to the extent that this is likely to increase the risk of flooding.
- Ensures appropriate handling and dealing with waste removal.
- Conserves and where possible enhances the biodiversity value of the site.
- Generally, complies with the relevant regulations such as the Basement Development Policy and the Basement Development Guidance.

7.89 A full site investigation was carried out by SIL in 2020 and then by GII in 2022. A specialist ground works contractor (piling contractor) will be appointed to carry out the excavation. There will be no rock breaking due to the depth of the bedrock being greater than 10 metres below ground level. The appointed specialist contractor will carry out a full risk assessment prior to the commencement of work.

7.90 A ground works operation will be carried out in order to ensure that material removed from the ground is taken away at regular intervals in order to reduce the amount of material that will be stored on site. Excavated material will be reused on site where possible subject to the WAC (Waste Acceptance Criteria) analysis.

7.91 The site level will be graded to a uniform level following demolition and removal of the building foundations and redundant services. The temporary site level shall be lower than external footpath levels to prevent any outward migration of water runoff.

7.92 The main construction works following demolition shall be installation of an embedded pile retaining wall to facilitate the excavation and construction of the proposed basement. The following is a high-level sequence of works expected.

- A suitably designed piling platform shall be installed to support the piling rig and prevent rutting and softening of surface soils on site.
- The embedded pile retaining wall will be constructed around the site boundary, to facilitate deep excavation. This will involve the installation of augered or bored piles. The augering of the piles will generate spoil that must be disposed at an appropriate licensed facility off-site. The spoil shall be stockpiled on site ahead of disposal.
- Waste Acceptability Classification testing will be carried out on all stockpiled spoil prior to the material leaving the site. This will ensure that it is disposed of in line with legislative requirements and local requirements.
- The concrete operations associated with the pile wall construction will require concrete and steel reinforcement deliveries to site which will be managed in accordance with the Contractors Construction Management Plan. Pile reinforcement cages can be stored on site and concrete deliveries managed within the site footprint.
- Following installation of the pile wall, excavation of the basement will commence. This excavation phase shall be informed by a detailed phase of

site investigation and chemical testing of the soils to develop a phased dig plan for the site. Any contamination identified during the investigation phase and subsequently the excavation phase will be segregated, removed and disposed in an appropriate registered facility. Any Made Ground excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils prior to removal from site

- 7.93 Localised sump pumps will be installed to remove the water through settlement tanks and after appropriate treatment into the local drainage network infrastructure for discharge. Drainage channels beside construction areas will flow into settlement sumps in series to allow primary and secondary settlement of sediment. Each sump series will have an outfall directly downstream in which final settlement can take place and the outflow to the existing network can be monitored. Outfall manholes will be regularly emptied of sediment during periods of heavy rainfall. These measures will prevent run-off from the site and total suspended solid levels in all discharge shall be in compliance with the Quality of Salmonid Water Regulations(SI 293:1988).
- 7.94 On completion of the excavation works to the formation level of the basement slab, this will be blinded to the final design levels. Any below ground services will be installed and tested below the basement slab. Prior to construction of the foundations and suspended slab at the lower basement level, a proprietary basement tanking system and water bar will be installed at all construction joints. A typical basement slab construction is as follows:
- The installation of male and female piles prior to the main excavation of the basement. Once piles are set, concrete will be poured to fill the space between the piles with a dual-proof T membrane. Once this is complete, the main excavation will commence to target floor depth of the basement.
 - Trim & grade to slab formation with suitable well compacted capping material.
 - Cast mass concrete blinding to form a surface for applying waterproof membrane and tanking.
 - Apply continuous waterproof tanking material and seal all laps (and along perimeter of secant wall/slab junction).
 - Install slab reinforcement to slab area (including any columns and wall starters) Formwork to perimeter and any box-outs necessary (around raking props).
 - Clean & inspect slab pour prior to concrete operations.
 - Note: The placement of large volumes of concrete such as the deep foundations will be carried out by a mobile or static concrete pump. The above process will repeat until the foundation raft is constructed.
- 7.95 When a sufficient area of basement slab is constructed, the vertical elements will be constructed to allow the upper level; basement slabs to be constructed.
- 7.96 Once piling is installed, there will be limited groundwater to dewater due to the enclosing of potential water bearing strata.
- 7.97 The potential impacts of the basement construction include:
- During construction, a very localised impact may occur during early stages of excavation until the piling wall is in place. Once these are installed into the low permeability clay (made ground and clays/silts), any horizontal flow from the water bearing gravel layer (or other strata) will be cut off and minimal inflows from the base of construction (along with any collected rainwater) will occur until the floor is constructed. In the event that perched water is encountered during excavation

works, based on the construction design and average hydraulic conductivity for this type of overburden, the zone of influence would be expected to be within or close to the extent of the excavation and will not extend past the excavation due to the presence of the pile wall enclosure.

- The regional water table within bedrock will not be affected by the planned basement construction. The effect on the shallow water table will at most be temporary. The basement is estimated to be completed within approximately 12-16 weeks.
- The proposed development will result in no increase in hardstanding area. Therefore, groundwater recharge and groundwater regime will not be affected.
- The proposed basement construction, which would involve c. 8-metre-deep excavations has the potential to cause minor ground movements inside the excavated area as a result of changes in vertical load on the ground. The construction sequence was developed to control any potential movement to within acceptable limits. Due to the presence of the piling wall surrounding the excavation there is no potential ground movements outside the excavation area.
- There is no source-pathway-receptor hydrogeological connection between the subject site and Dublin Bay through the Dublin aquifer as vertical migration to the underlying limestone bedrock is minimised due to the thickness of overburden ('Low' vulnerability) present at the site providing a high level of aquifer protection from any potential source. Therefore, no likely impact on the status of the aquifer is expected due to natural attenuation within overburden and reducing potential for off-site migration.

Accidental Spills and Leaks

7.98 During construction of the development, there is a risk of accidental pollution incidences from the following sources if not adequately mitigated:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement during pad foundation construction.

7.5.2 Operation Phase

7.99 There will be no direct discharges to the water or soil environment during the operational phase.

7.100 Any accidental emissions during storage, transfer, or delivery or leakage in the car parks could cause localised contamination if the emissions enter the soil and groundwater environment. without adequate mitigation. However, it is noted that any accidental discharge will more likely impact stormwater drainage due to the hardstand and drainage infrastructure proposed.

7.101 There is no increase in hardstanding as the site is already fully hardstanding. The use of SUDs techniques will have a minor effect on local recharge to ground; however, the impact on the overall groundwater regime will be insignificant as the site was already covered in hardstand. It is proposed that the surface water drainage will be upgraded to facilitate the proposed development, refer to Chapter 8 Hydrology for further information on the drainage system.

7.102 There will no loss of amenity/agricultural land as a result of the proposed development.

7.6 DO NOTHING SCENARIO

- 7.103 Should the proposed development not take place, the land, soils, geology and hydrogeology will remain in their current state. The site will remain as a brownfield development.

7.7 REMEDIAL AND MITIGATION MEASURES

- 7.104 The design has taken account of the potential impacts of the development on the land, soils, geology, and hydrogeology environment local to the area where construction is taking place. Measures have been incorporated in the design, and CEMP during construction, to mitigate the potential effects on the surrounding land, soils, geology, and hydrogeology. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.
- 7.105 Due to the inter-relationship between land, soils, geology and hydrogeology and water (hydrology) the following mitigation measures discussed will be considered applicable to both.

7.7.1 Construction Phase

Construction Environmental Management Plan

- 7.106 A project-specific Outline Construction and Environmental Management Plan (CEMP) has been established by Byrne Looby and is submitted as part of this planning application. Prior to commencement of construction this CEMP will be updated and will be maintained by the contractors during the construction and operational phases. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

Soil handling, Removal and Compaction

- 7.107 Soil sampling (three samples) was carried out at the site and the soil was considered hazardous due to elevated concentrations of lead and zinc. Further soil sampling and testing will be required should any soils be required to be removed from site. Any soils to be removed from site will be disposed of by a licenced contractor to a licenced facility.
- 7.108 Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.

Basement Assessment

- 7.109 The following mitigation measures will be included in the design to protect water quality:
- 7.110 Any minor ingress of groundwater and collected rainfall in the excavation will be pumped out during construction. It is proposed that the water be discharged via the existing stormwater sewer network. The use of slit traps and an oil interceptor (if

- required) will be adopted if monitoring indicates the requirements for the same with no silt or contaminated water permitted to discharge to the sewer.
- 7.111 Site investigation has not identified any significant water bearing gravels within the basement footprint. However, if water bearing gravels are encountered then the design should facilitate discharge around the basement structure.
- 7.112 To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas; these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container.
- 7.113 Where feasible all ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.
- 7.114 An Outline Construction and Environmental Management Plan (CEMP) has been prepared by Byrne Looby Engineers as part of the planning application. Prior to commencement of construction the appropriate contractor will produce a detailed CEMP which will include management of any collected water.
- 7.115 Due to the potential for minor ground movements during excavation works at locations where movements are of critical importance, appropriate instrumentation will be installed, and the wall and ground movements monitored accordingly. The predictions of ground movement based on the ground movement analysis should be checked by monitoring the basement wall. The monitoring will include the installation of inclinometers in the basement wall elements so the pattern of wall behaviour can be reviewed with predicted values and due to the presence of residential dwellings and protected structures close to the site boundary. From this understanding, the designer will carry out back analysis of the observed (monitored) wall behaviour and recalibrate the analytical model in terms of the excavation geometry and the behaviour of the ground and the structural elements with appropriate modifications or contingencies applied as required.
- 7.116 It is recommended that movement monitoring should be undertaken with surveying points set up prior to commencement of the works and readings be undertaken at weekly intervals. It is recommended that trigger values for monitoring are based on the predicted ground movements to ensure conservatism and that they are agreed under the Party Wall Act. In cases where vibration from construction methods could potentially damage sensitive neighbouring buildings and structures vibration monitors are to be installed. The precise monitoring strategy will be developed at a later stage, and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.
- 7.117 Based on ground water monitoring on the adjacent site, it is considered that there is a low risk of inflow during construction works due to the installation of piles prior to excavation works on the basement.

- 7.118 The proposed basement will have no long-term impact on water levels in the overburden or underlying aquifer and no impact on the current water body status. The bedrock water table will not be affected by the excavation works. Temporary dewatering of the perched water table within the clayey deposits to facilitate excavation works is expected to be minor and it will have a temporary local impact only.
- 7.119 The basement will need to be fully waterproofed to ensure no groundwater enters the finished basement. Site investigation has not identified any significant water bearing gravels within the basement footprint. However, if water bearing gravels encountered then the design should facilitate discharge around the basement structure.
- 7.120 Management of any collected rainwater and any groundwater seepage during basement excavations will be pumped to existing sewers (following appropriate treatment) in agreement with the regulatory authority.

Fuel and Chemical Handling

- 7.121 To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, and paints used during construction will be stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.
- 7.122 Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (or where possible off the site) which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001) will be complied with.
- 7.123 All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. The pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.
- 7.124 In the case of drummed fuel or other chemical which may be used during construction containers will be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

7.7.2 Operational Phase

- 7.125 During operation measures there is no requirement for bulk fuels. There is also no requirement for discharge to ground and no requirement for abstraction of groundwater.

- 7.126 An environmental management plan will apply to the development during the operational phase incorporating mitigation measures and emergency response measures.

7.7.2.1 Management of Surface water during Operation

- 7.127 The proposed development will provide full attenuation for the hardstand areas in compliance with the requirements of the Greater Dublin Strategic Drainage Study. The proposed surface water drainage service to the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage Systems (SuDS) elements. The proposed surface water drainage was designed in accordance with the SuDS Manual 2015. This is further detailed in Chapter 8 Hydrology of this EIA Report.

7.8 RESIDUAL IMPACT OF THE PROPOSED DEVELOPMENT

- 7.128 There are no likely significant impacts on the land, geological or hydrogeological environment associated with the proposed operational development of the site with mitigation in place.
- 7.129 The appropriate mitigation measures set out in see Section 7.6 reduce the potential for any impact of accidental discharges to ground during the construction phase. Overall, the construction phase is considered to have a **short term, imperceptible significance**, with a **neutral** impact on quality.
- 7.130 During operations the predicted impact during operation is considered to be **long term**, neutral in terms of quality and of an **imperceptible** significance as a result of this proposed development on the surrounding land, soils, geology and hydrogeological environment.

7.9 MONITORING OR REINSTATEMENT

7.9.1 Construction Phase

- 7.131 Regular inspection of surface water run-off and sediments controls e.g. silt traps will be carried during the construction phase. Soil sampling to confirm disposal options for excavated soils. Regular inspection of construction/mitigation measures will be undertaken e.g. concrete pouring, refuelling etc.

7.9.2 Operational Phase

- 7.132 There is no monitoring required during the operational phase.

7.10 CUMULATIVE IMPACTS OF THE PROPOSED DEVELOPMENT

- 7.133 The cumulative impact of the Proposed Development with any/all relevant other planned or permitted developments are discussed below. Related and permitted, concurrent, and future developments are listed in Chapter 2 (Description of the Proposed Development).

7.10.1 Construction Phase

7.134 In relation to the potential cumulative impact on the geological or hydrogeological environment during the construction phases, those key engineering works which would have additional impacts above are:

Run-off containing large amounts of silt could cause damage to surface water systems and receiving watercourses. Run-off for the development and the other permitted developments will therefore need to be managed using similar methods described for the Proposed Development.

Contamination of soils and groundwater underlying the site from accidental spillage and leakage from construction traffic and construction materials may occur unless project-specific Construction Environmental Management Plans (CEMPs) are put in place and complied with. It is proposed that project-specific CEMP's will be put in place for the Proposed Development and any future proposed developments.

7.135 The proposed development does require dewatering and with standard mitigation in place (as outlined in Section 7.6) for management of construction water, accidental discharges, the effect due to construction in this area is considered to be **neutral** on groundwater and soil quality and an **imperceptible** significance.

7.136 Contractors for the proposed development will be contractually required to operate in compliance with a CEMP which will include the mitigation measures outlined in this EIA report. Other developments will also have to incorporate measures to protect soil and water quality in compliance with legislative standards for receiving water quality. As a result, there will be no cumulative potential for change in soil quality or the natural groundwater regime. The cumulative impact is considered to be **neutral and imperceptible**.

7.10.2 Operational Phase

7.137 In relation to the potential cumulative impacts from the operational stages, the following would apply:

7.138 Overall, there will no change in recharge pattern as there is no increase in hardstand from the proposed development and surrounding planned or permitted developments. Therefore, there will be no overall change on the groundwater body status. There is no requirement for bulk fuel storage at the proposed development.

7.139 Localised accidental discharge of hydrocarbons could occur in car parking areas and along roads unless diverted to surface water drainage system with petrol interceptors. However, all developments are required to ensure they do not have an impact on the receiving water environment in accordance with the relevant legislation (primarily the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) as amended by S.I. No. 366/2016) such that they would be required to manage runoff and fuel leakages.

7.140 As such there will be no cumulative impact to groundwater quality. The cumulative impact is concluded to have a **long-term, imperceptible** significance with a **neutral** impact on soil and water quality.

- 7.141 The land is commercial, and the development is considered commercial therefore the cumulative impact on the land is considered to be **long-term, imperceptible** significance *with a neutral* impact.

7.11 DIFFICULTIES ENCOUNTERED IN COMPILING INFORMATION

- 7.142 There were no difficulties encountered during the writing of this EIAR chapter.

7.12 REFERENCES

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APPENDIX 7.1
METHODOLOGY FOR ASSESSMENT OF THE IMPACTS

Impact Ratings and Assessment Criteria (Soils, Geology and Hydrogeology)

The NRA criteria for rating the magnitude and significance of impacts at EIA stage on the geological related attributes are also relevant in determining impact assessment and area presented in Table 2 below.

Table 7.1 Criteria for rating site importance of Geological Features (NRA)

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying route is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or high fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying route is small on a local scale	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

Table 7.2 Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on soil / geology attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

The NRA criteria for estimation of the importance of hydrogeological attributes at the site during the EIA stage are summarised below.

Table 7.3 Criteria for rating Site Attributes - Estimation of Importance of Hydrogeology Attributes (NRA)

Magnitude of Impact	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Table 7.4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeology Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

Table 7.5: Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

Table 7.6: Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on hydrology attributes (NRA, 2009)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and/ or quality and integrity of attribute	Loss or extensive change to a water body or water dependent habitat
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Calculated risk of serious pollution incident >1% annually ²
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm ¹
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level ¹
Minor Beneficial	Results in minor improvement of attribute quality	Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually ²
Moderate Beneficial	Results in moderate improvement of attribute quality	Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually ²
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm ¹

Additional examples are provided in the NRA Guidance Document

¹ Refer to Annex 1, Methods E and F, Annex 1 of HA216/06

² Refer to Appendix B3 / Annex 1, Method D, Annex 1 of HA216/06

Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)


Table 7.7 Criteria for Rating Impact Significance of Hydrological Attributes (NRA, 2009)


Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people


Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)

APPENDIX 7.2
AVAILABLE BOREHOLE LOGS (SIL, 2020 & GII, 2022)

Contract No: 5686		Cable Percussion Borehole Log						Borehole No: BH01				
Contract:		City Quay		Easting:		716399.437		Date Started:		28/01/2020		
Location:		City Quay, Dublin 2		Northing:		734389.391		Date Completed:		29/01/2020		
Client:		City Arts and City Quay Partnership		Elevation:		2.97		Drilled By:		J. O'Toole		
Engineer:		-		Borehole Diameter:		200mm		Status:		FINAL		
Depth (m)		Stratum Description		Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill	
Scale	Depth				Scale	Depth	Depth	Type	Result			
	0.20	MADE GROUND: concrete.				2.77						
0.5		MADE GROUND: brown grey slightly sandy slightly gravelly silty clay with much red brick and concrete content.			2.5	0.50		ES	JOT01			
1.0					2.0	1.00		B	JOT02			
1.5	1.50	MADE GROUND: grey silty sandy gravel with much red brick and concrete content.			1.5	1.20		C	N=5 (0,1/1,1,1,2)			
2.0					1.0	2.00		B	JOT03			
2.5					0.5	2.00		C	N=7 (0,0/1,2,2,2)			
3.0	2.80	Medium dense silty very gravelly SAND with low cobble content.			0.0	0.17		B	JOT04			
3.5					-0.5	3.00		C	N=10 (1,1/2,2,3,3)			
4.0					-1.0	4.00		B	JOT05			
4.5					-1.5	4.00		C	N=14 (2,2/3,3,4,4)			
5.0					-2.0	5.00		B	JOT06			
5.5	5.60	Firm grey sandy slightly gravelly clayey SILT.			-2.5	-2.63		C	N=19 (2,3/4,5,5,5)			
6.0					-3.0	6.00		B	JOT07			
6.5					-3.5	6.00		C	N=12 (2,2/3,3,3,3)			
7.0	7.00	Stiff grey slightly sandy slightly gravelly silty CLAY with low cobble content.			-4.0	-4.03		B	JOT08			
7.5					-4.5	7.00		C	N=24 (2,4/5,5,7,7)			
8.0	7.80	Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			-5.0	-4.83		B	JOT09			
8.5					-5.5	8.00		C	N=33 (4,5/6,7,9,11)			
9.0	8.50	Grey slightly sandy gravelly silty CLAY with high cobble content.			-5.5	-5.53						
9.5	8.90	Obstruction - possible boulders.			-6.0	-5.93		C	50 (25 for 5mm/50 for 0mm)			
	9.00	End of Borehole at 9.00m			-6.0	-6.03						
					-6.5							

	Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:		Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
	From:	To:	Time:	Strike:	Rose:	Depth Sealed:	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Hand dug inspection pit to 1.20mbgl. Borehole terminated due to obstruction.		
	1.60	1.80	00:45	4.80	4.10	NS	28/01	5.00	4.80				0.00	9.00	Arisings			
7.80	7.90	00:45	8.00	4.70	NS	29/01	5.00	4.60										
8.90	9.00	01:00				29/01	9.00	3.00										

Contract No: 5686		Cable Percussion Borehole Log						Borehole No: BH02										
Contract:		City Quay		Easting:		716398.885		Date Started:		29/01/2020								
Location:		City Quay, Dublin 2		Northing:		734359.594		Date Completed:		30/01/2020								
Client:		City Arts and City Quay Partnership		Elevation:		3.04		Drilled By:		J. O'Toole								
Engineer:		-		Borehole Diameter:		200mm		Status:		FINAL								
Depth (m)		Stratum Description		Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill							
Scale	Depth				Scale	Depth	Depth	Type	Result									
	0.20	MADE GROUND: concrete.				2.84												
0.5		MADE GROUND: brown grey slightly sandy slightly gravelly silty clay with much red brick and concrete content.			2.5	0.50		ES	JOT10									
1.0					2.0	1.00		B	JOT11									
1.5	1.10	MADE GROUND: grey silty sandy gravel with much red brick and concrete content.			1.5	1.20		C	N=18 (2,4/5,6,3,4)									
2.0					1.0	2.00		B	JOT12									
2.5					0.5	2.00		C	N=15 (2,2/3,3,4,5)									
3.0	2.80	Loose becoming medium dense slightly silty very sandy fine to coarse GRAVEL with low cobble content.			0.0	3.00		B	JOT13									
3.5					-0.5	3.00		C	N=7 (1,1/1,2,2,2)									
4.0					-1.0	4.00		B	JOT14									
4.5					-1.5	4.00		C	N=24 (2,4/5,5,7,7)									
5.0	4.80	Firm grey slightly sandy slightly gravelly clayey SILT.			-2.0	5.00		B	JOT15									
5.5					-2.5	5.00		C	N=10 (1,2/2,2,3,3)									
6.0	5.60	Dense brown silty very sandy GRAVEL with low cobble content.			-3.0	6.00		B	JOT16									
6.5					-3.5	6.00		C	N=34 (4,7/7,9,8,10)									
7.0					-4.0	7.00		B	JOT17									
7.5					-4.5	7.00		C	50 (8,17/50 for 100mm)									
8.0					-5.0	8.00		B	JOT18									
8.5					-5.5	8.00		C	50 (10,15/50 for 125mm)									
9.0	8.80	Obstruction - possible boulders.			-6.0	8.90		C	50 (25 for 5mm/50 for 0mm)									
9.5	8.90	End of Borehole at 8.90m			-6.5	-5.86												
		Chiselling:		Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:		Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
		From:	To:	Time:	Strike:	Rose:	Depth Sealed:	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Hand dug inspection pit to 1.20m bgl. Borehole terminated due to obstruction.	
		2.70	2.80	00:45	5.60	5.10	NS	29/01	3.00					0.00	8.90	Arisings		
		7.30	7.40	00:45	6.50	5.50	NS	30/01	3.00	Dry								
	8.80	01:00				30/01	8.90	3.80										

Contract No: 5686		Cable Percussion Borehole Log						Borehole No: BH03										
Contract:		City Quay		Easting:		716419.553		Date Started:		31/01/2020								
Location:		City Quay, Dublin 2		Northing:		734407.078		Date Completed:		31/01/2020								
Client:		City Arts and City Quay Partnership		Elevation:		3.01		Drilled By:		J. O'Toole								
Engineer:		-		Borehole Diameter:		200mm		Status:		FINAL								
Depth (m)		Stratum Description		Legend	Level (mOD)		Samples and Insitu Tests				Water Strike	Backfill						
Scale	Depth				Scale	Depth	Depth	Type	Result									
	0.20	MADE GROUND: concrete.				2.81												
0.5		MADE GROUND: brown grey slightly sandy slightly gravelly silty clay with much red brick and concrete content.			2.5		0.50	ES	JOT19									
1.0					2.0		1.00	B	JOT20									
1.5					1.5	1.41	1.20	C	N=13 (2,3/3,4,3,3)									
2.0	1.60	MADE GROUND: grey silty sandy gravel with much red brick and concrete content.			1.0		2.00	B	JOT21									
2.5					0.5		2.00	C	N=20 (1,2/4,7,5,4)									
3.0	2.90	Medium dense silty very gravelly SAND with low cobble content.			0.0	0.11	3.00	B	JOT22									
3.5					-0.5		3.00	C	N=11 (1,2/2,3,3,3)									
4.0					-1.0		4.00	B	JOT23									
4.5					-1.5		4.00	C	N=16 (1,3/4,3,4,5)									
5.0					-2.0		5.00	B	JOT24									
5.5	5.50	Stiff grey slightly sandy slightly gravelly silty CLAY with low cobble content.			-2.5	-2.49	5.00	C	N=12 (2,2/2,2,4,4)									
6.0					-3.0		6.00	B	JOT25									
6.5					-3.5		6.00	C	N=16 (2,2/3,4,5,4)									
7.0	7.10	Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			-4.0	-4.09	7.00	B	JOT26									
7.5					-4.5		7.00	C	N=39 (6,7/39 for 90mm)									
8.0					-5.0		8.00	B	JOT27									
8.5	8.50	Grey slightly sandy slightly gravelly silty CLAY with high cobble content.			-5.5	-5.49	8.00	C	50 (10,15/50 for 105mm)									
9.0	9.00	Obstruction - possible boulders.			-6.0	-5.99	9.00	C	50 (25 for 10mm/50 for 5mm)									
9.5	9.10	End of Borehole at 9.10m			-6.09	-6.09												
					-6.5													
		Chiselling:		Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:		Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
		From:	To:	Time:	Strike:	Rose:	Depth Sealed:	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Hand dug inspection pit to 1.20mbgl. Borehole terminated due to obstruction.	
		1.80	1.90	00:45	4.80	4.10	NS	31/01	9.10	3.00				0.00	9.10	Arisings		



Machine : Berretta T44 Flush : Polymer Core Dia: 102 mm Method : Rotary Cored	Casing Diameter 146mm cased to 12.80m	Ground Level (mOD) 2.89	Client Ventaway Ltd	Job Number 11789-04-22
	Location 716425.8 E 734418.5 N	Dates 27/04/2022-03/05/2022	Engineer Byrne Looby Partners	Sheet 1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
2.84							0.05	Concrete			
1.20	-	-					(1.15)	MADE GROUND: Brown/grey clayey gravelly Sand with frequent red brick and pieces of concrete			
	73	-					1.20	MADE GROUND: Greyish brown sandy gravelly slightly silty Clay with silt lenses and red brick fragments			
							1.09	MADE GROUND: Greyish dark brown sandy gravelly slightly silty Clay			
2.30 2.30-2.75					3,2/4,4,4,4 SPT(C) N=16		(2.00)				
	67	-									
3.80 3.80-4.25					3,5/5,6,7,6 SPT(C) N=24	-0.91	3.80	Medium dense grey clayey sandy subrounded to rounded fine to coarse GRAVEL with sand and clay lenses			
	47	-					(2.75)				
5.30 5.30-5.75					2,3/4,4,3,4 SPT(C) N=15						
	37	-									
6.80 6.80-7.25					1,2/2,2,2,3 SPT(C) N=9	-3.66	6.55	Firm brownish grey slightly sandy silty CLAY			
	100	-					(3.25)				
8.30 8.30-8.75					2,2/1,2,3,3 SPT(C) N=9						
	97	-									
9.80 9.80-9.95					18,25/50 SPT(C) 50/0	-6.91	9.80	Medium strong to strong thinly laminated grey fine			

Remarks Inspection pit dug to 1.20m BGL No groundwater encountered Slotted standpipe with flush cover installed for groundwater monitoring	Scale (approx) 1:50	Logged By M. Sheehan
	Figure No. 11789-04-22.BH01	



Machine : Berretta T44
Flush : Polymer
Core Dia: 102 mm
Method : Rotary Cored

Casing Diameter
146mm cased to 12.80m

Ground Level (mOD)
2.89

Client
Ventaway Ltd

Job
Number
11789-04-22

Location
716425.8 E 734418.5 N

Dates
27/04/2022-
03/05/2022

Engineer
Byrne Looby Partners

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.30	100	15		NI		-8.01	(1.10)	to medium grained LIMESTONE interbedded with weak to medium strong thinly laminated fine grained MUDSTONE. Partially weathered Non intact 1 fracture set. F1: Dipping 10-30 degrees very close spacing stepped rough with clay infill Non intact			
10.70				11							
11.00				NI							
11.30	100	73	34	6		-9.91	(1.90)	Strong thinly laminated grey fine to medium grained LIMESTONE interbedded with weak to medium strong thinly laminated fine grained MUDSTONE. Distinctly weathered 1 fracture set. F1: Dipping 10-30 degrees very close to close spacing stepped smooth with clay smearing Non intact 1 fracture set. F1: Dipping 10-30 degrees very close to close spacing stepped smooth with clay smearing			
11.70				NI							
11.90				7							
12.80							12.80	Complete at 12.80m			

Remarks

Scale (approx)

1:50

Logged By

M.Sheehan

Figure No.

11789-04-22.BH01



Machine : Berretta T44 Flush : Polymer Core Dia: 102 mm Method : Rotary Cored	Casing Diameter 146mm cased to 11.30m	Ground Level (mOD) 3.10	Client Ventaway Ltd	Job Number 11789-04-22
	Location 716410.4 E 734386.8 N	Dates 26/04/2022- 27/04/2022	Engineer Byrne Looby Partners	Sheet 1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
2.95							(0.15) 0.15	Concrete			
							(1.05)	Grey/brown fine to coarse clayey gravelly Sand with occasional red brick and concrete			
1.20	59	-					1.20 (1.10)	MADE GROUND: Greyish dark brown sandy gravelly Clay with red brick and mortar fragments			
2.30 2.30-2.75					1,1/2,1,2,2 SPT(C) N=7		0.80 2.30 (1.50)	MADE GROUND: Greyish dark brown slightly sandy gravelly slightly silty Clay with organic matter			
3.80 3.80-4.25					5,6/8,7,8,7 SPT(C) N=30		-0.70 3.80 (1.50)	No recovery. Driller notes Sand (Dense)			
5.30 5.30-5.75					3,4/4,5,7,6 SPT(C) N=22		-2.20 5.30 (0.90)	Stiff grey sandy gravelly CLAY. Driller notes Sand onto Clay			
6.80 6.80-7.25					2,2/3,2,3,4 SPT(C) N=12		-3.10 6.20 (2.40)	Residual Soil: Stiff grey slightly sandy gravelly CLAY			
8.30 8.30-8.75 8.60					6,7/9,8,10,13 SPT(C) N=40		-5.50 8.60 (1.20)	Weak to medium strong thinly laminated grey fine to medium grained LIMESTONE interbedded with weak to medium strong thinly laminated fine grained MUDSTONE. Distinctly weathered 1 fracture set. F1: Dipping 20-40 degrees very close to close spacing stepped rough with clay infill			
9.60 9.80							-6.70 9.80	Recovery consisting of strong thinly laminated			

Remarks
Inspection pit carried out to 1.20m BGL
No groundwater encountered
Slotted standpipe with flush cover installed for groundwater monitoring

Scale (approx)
1:50
Logged By
M.Sheehan

Figure No.
11789-04-22.BH02



Machine : Berretta T44
Flush : Polymer
Core Dia: 102 mm
Method : Rotary Cored

Casing Diameter
146mm cased to 11.30m

Ground Level (mOD)
3.10

Client
Ventaway Ltd

Job
Number
11789-04-22

Location
716410.4 E 734386.8 N

Dates
26/04/2022-
27/04/2022

Engineer
Byrne Looby Partners

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.60	100	51	11	14		-8.20	(1.50)	grey fine to medium grained LIMESTONE interbedded with weak to medium strong thinly laminated fine grained MUDSTONE. Partially weathered			
				12							
11.20 11.30				NI							
								Non intact Complete at 11.30m			

Remarks

Scale (approx)	Logged By
1:50	M. Sheehan
Figure No. 11789-04-22.BH02	



Machine : Berretta T44 Flush : Polymer Core Dia: 103 mm Method : Rotary Cored	Casing Diameter 146mm cased to 11.30m	Ground Level (mOD) 3.15	Client Ventaway Ltd	Job Number 11789-04-22
	Location 716413.3 E 734361.3 N	Dates 25/04/2022-26/04/2022	Engineer Byrne Looby Partners	Sheet 1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						3.05	0.10 (0.20)	Concrete			
						2.85	0.30 (0.50)	Grey fine to coarse angular to subangular crushed rock FILL			
1.20	59	-			1,12/2,1,2,23 SPT(C) N=28	2.35	0.80 (1.70)	MADE GROUND: Brown/grey clayey gravelly SAND with frequent red brick and concrete MADE GROUND: Greyish brown sandy gravelly Clay with red brick fragments			
2.30-2.75	98	-			3,4/4,4,5,4 SPT(C) N=17	0.65	2.50 (1.00)	MADE GROUND: Brownish dark grey slightly sandy slightly gravelly slightly silty slightly peaty Clay with organic matter and red brick fragments			
3.80-4.25	33	-			2,2/4,4,5,4 SPT(C) N=17	-0.35	3.50 (1.80)	POSSIBLE MADE GROUND: Greyish brown sandy gravelly Clay. Driller notes Sand. Driller notes Sand onto gravelly Clay			
5.30-5.75	70	-			4,4/5,7,7,6 SPT(C) N=25	-2.15	5.30 (0.70)	Medium dense grey slightly clayey slightly sandy subrounded to rounded fine to coarse GRAVEL			
6.80-7.25	97	-				-2.85	6.00 (0.80)	Stiff grey slightly gravelly silty CLAY with shell fragments			
8.30-8.45	97	33	0	NI		-3.65	6.80 (0.90)	Medium dense grey subrounded to rounded fine to coarse GRAVEL			
9.30					25,25/50 SPT(C) 50/0	-4.55	7.70 (0.60)	Stiff grey sandy gravelly CLAY			
9.80				15		-5.15	8.30 (1.00)	Recovery consisting of weak to medium strong thinly laminated grey fine to coarse grained LIMESTONE interbedded with MUDSTONE. Distinct weathering Non intact			
						-6.15	9.30	Recovery consisting of medium strong to strong thinly laminated grey fine to medium grained LIMESTONE interbedded with MUDSTONE. Partial weathering 2 fracture sets. F1: Dipping 10-30 degrees			

Remarks Inspection pit carried out to 1.20m BGL No groundwater encountered Slotted standpipe with flush cover installed for groundwater monitoring	Scale (approx) 1:50	Logged By M.Sheehan
	Figure No. 11789-04-22.BH03	



Machine : Berretta T44
Flush : Polymer
Core Dia: 103 mm
Method : Rotary Cored

Casing Diameter
146mm cased to 11.30m

Ground Level (mOD)
3.15

Client
Ventaway Ltd

Job
Number
11789-04-22

Location
716413.3 E 734361.3 N

Dates
25/04/2022-
26/04/2022

Engineer
Byrne Looby Partners

Sheet
2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.30	97		23				(2.00)	close spacing stepped rough with clay smearing. F2: Dipping 60-80 degrees medium to wide spacing stepped rough with clay smearing			
				18							
11.30						-8.15	11.30	Complete at 11.30m			

Remarks

Scale (approx)	Logged By
1:50	M.Sheehan
Figure No. 11789-04-22.BH03	

APPENDIX 7.3
SOIL QUALITY DATA (SIL, 2020)



Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US

Tel: (01244) 528700

Fax: (01244) 528701

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date of report Generation: 18 February 2020
Customer: Site Investigations Ltd
Sample Delivery Group (SDG): 200207-128
Your Reference: 5686
Location: City Quay
Report No: 541754

This report has been revised and directly supersedes 541454 in its entirety.

We received 3 samples on Friday February 07, 2020 and 3 of these samples were scheduled for analysis which was completed on Tuesday February 18, 2020. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
21646510	BH01		0.50	
21646512	BH02		0.50	
21646513	BH03		0.50	

Maximum Sample/Coolbox Temperature (°C) :

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

6

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Results Legend <input checked="" type="checkbox"/> Test <input checked="" type="checkbox"/> No Determination Possible Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SLD - Sludge OTH - Other	Lab Sample No(s)	21646510			21646512			21646513		
	Customer Sample Reference	BH01			BH02			BH03		
	AGS Reference									
	Depth (m)	0.50			0.50			0.50		
	Container	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)
	Sample Type	S	S	S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 3		X	X		X			
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 3		X	X		X			
CEN Readings	All	NDPs: 0 Tests: 3		X	X		X			
Chromium III	All	NDPs: 0 Tests: 3			X		X		X	
Coronene	All	NDPs: 0 Tests: 3			X		X		X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 3		X		X		X		
Elemental Organic/Inorganic Carbon	All	NDPs: 0 Tests: 3		X		X		X		
EPH CWG GC (S)	All	NDPs: 0 Tests: 3			X		X		X	
Fluoride	All	NDPs: 0 Tests: 3		X		X		X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 3				X		X	X	
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 3			X		X		X	
Loss on Ignition in soils	All	NDPs: 0 Tests: 3			X		X		X	
Mercury Dissolved	All	NDPs: 0 Tests: 3		X		X		X		
Metals in solid samples by OES	All	NDPs: 0 Tests: 3			X		X		X	
Mineral Oil	All	NDPs: 0 Tests: 3			X		X		X	



Validated

CERTIFICATE OF ANALYSIS

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Results Legend	Lab Sample No(s)			Customer Sample Reference			AGS Reference			Depth (m)			Container			Sample Type						
	21646510	21646512	21646513	BH01	BH02	BH03				0.50	0.50	0.50	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)	S	S	S	
Results Legend <input checked="" type="checkbox"/> Test <input type="checkbox"/> No Determination Possible Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other																						
PAH by GCMS	All	NDPs: 0 Tests: 3		X		X						X										
PCBs by GCMS	All	NDPs: 0 Tests: 3		X		X						X										
Phenols by HPLC (W)	All	NDPs: 0 Tests: 3	X			X						X										
Sample description	All	NDPs: 0 Tests: 3		X		X						X										
Total Dissolved Solids on Leachates	All	NDPs: 0 Tests: 3	X			X						X										
Total Organic Carbon	All	NDPs: 0 Tests: 3		X		X						X										
TPH CWG GC (S)	All	NDPs: 0 Tests: 3		X		X						X										
VOC MS (S)	All	NDPs: 0 Tests: 3			X							X										X



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
21646510	BH01	0.50	Dark Brown	Loamy Sand	Stones	Brick
21646512	BH02	0.50	Blue	Loamy Sand	Stones	Brick
21646513	BH03	0.50	Dark Brown	Loamy Sand	Stones	Brick

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128 Client Reference: 5686 Report Number: 541754
 Location: City Quay Order Number: 18/AJ18 Superseded Report: 541454

Results Legend		Customer Sample Ref.	BH01	BH02	BH03			
#	ISO17025 accredited.							
#	ncERTIS accredited.							
as	Aqueous / solid sample.							
dis.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-3#	Sample deviation (see appendix)							
		Depth (m)	0.50	0.50	0.50			
		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
		Date Sampled	-	-	-			
		Sample Time	-	-	-			
		Date Received	07/02/2020	07/02/2020	07/02/2020			
		SDG Ref	200207-128	200207-128	200207-128			
		Lab Sample No.(s)	21646510	21646512	21646513			
		AGS Reference						
Component	LOD/Units	Method						
Moisture Content Ratio (% of as received sample)	%	PM024	17	18	16			
			\$	\$	\$			
Loss on ignition	<0.7 %	TM018	11.3	12.8	11.4			
			\$ M	\$ M	\$ M			
Mineral oil >C10-C40	<1 mg/kg	TM061	58.3	27.3	75.4			
			\$	\$	\$			
Organic Carbon, Total	<0.2 %	TM132	6.75	11.5	7.53			
			\$ M	\$ M	\$ M			
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6	0.81	1.05			
			\$ #	\$ #	\$ #			
PCB congener 28	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 52	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 101	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 118	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 138	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 153	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
PCB congener 180	<3 µg/kg	TM168	<3	<15	<3			
			\$ M	\$ M	\$ M			
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	<21	<105	<21			
			\$	\$	\$			
Chromium, Trivalent	<0.9 mg/kg	TM181	5.04	<0.9	<0.9			
			\$	\$	\$			
Antimony	<0.6 mg/kg	TM181	4.91	6.38	12.5			
			\$ #	\$ #	\$ #			
Arsenic	<0.6 mg/kg	TM181	55.1	46.4	56.6			
			\$ M	\$ M	\$ M			
Barium	<0.6 mg/kg	TM181	528	370	459			
			\$ #	\$ #	\$ #			
Cadmium	<0.02 mg/kg	TM181	0.79	0.179	1.29			
			\$ M	\$ M	\$ M			
Chromium	<0.9 mg/kg	TM181	5.04	<0.9	<9			
			\$ M	\$ M	\$ M			
Copper	<1.4 mg/kg	TM181	120	106	147			
			\$ M	\$ M	\$ M			
Lead	<0.7 mg/kg	TM181	2160	1320	1720			
			\$ M	\$ M	\$ M			
Mercury	<0.14 mg/kg	TM181	2.14	2.24	1.71			
			\$ M	\$ M	\$ M			
Molybdenum	<0.1 mg/kg	TM181	2.78	2.47	2.33			
			\$ #	\$ #	\$ #			
Nickel	<0.2 mg/kg	TM181	45.9	47.4	54.4			
			\$ M	\$ M	\$ M			
Selenium	<1 mg/kg	TM181	1.46	<1	<10			
			\$ #	\$ #	\$ #			
Zinc	<1.9 mg/kg	TM181	748	635	942			
			\$ M	\$ M	\$ M			
Coronene	<200 µg/kg	TM410	1020	1120	1650			
			\$	\$	\$			



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

PAH by GCMS

Table with columns: Component, LOD/Units, Method, BH01, BH02, BH03. Rows include Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, and PAH, Total Detected USEPA 16.



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

TPH CWG (S)

Results Legend		Customer Sample Ref.	BH01	BH02	BH03			
#	ISO17025 accredited.							
#	mCERTS accredited.							
#	Aqueous / unfiltered sample.							
#	Dissolved / filtered sample.							
#	Total / unfiltered sample.							
#	Subcontracted - refer to subcontractor report for accreditation status.							
#	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
#	Trigger breach confirmed							
#	Sample deviation (see appendix)							
Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM089	61.9	64.6	58.9			
Aliphatics >C5-C6	<10 µg/kg	TM089	15.6	14.5	30			
Aliphatics >C6-C8	<10 µg/kg	TM089	54	52	91.2			
Aliphatics >C8-C10	<10 µg/kg	TM089	40.8	48.4	102			
Aliphatics >C10-C12	<1000 µg/kg	TM414	2030	1890	2210			
Aliphatics >C12-C16	<1000 µg/kg	TM414	5230	5450	6080			
Aliphatics >C16-C21	<1000 µg/kg	TM414	5790	6040	6150			
Aliphatics >C21-C35	<1000 µg/kg	TM414	14900	13700	11400			
Aliphatics >C35-C44	<1000 µg/kg	TM414	1170	<1000	1310			
Total Aliphatics >C10-C44	<5000 µg/kg	TM414	29100	28000	27100			
Total Aliphatics & Aromatics >C10-C44	<10000 µg/kg	TM414	300000	320000	357000			
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC7-EC8	<10 µg/kg	TM089	10.8	<10	10.8			
Aromatics >EC8-EC10	<10 µg/kg	TM089	27.6	32.7	68.4			
Aromatics > EC10-EC12	<1000 µg/kg	TM414	<1000	1130	1260			
Aromatics > EC12-EC16	<1000 µg/kg	TM414	11300	11100	12500			
Aromatics > EC16-EC21	<1000 µg/kg	TM414	54000	57200	72800			
Aromatics > EC21-EC35	<1000 µg/kg	TM414	180000	197000	214000			
Aromatics >EC35-EC44	<1000 µg/kg	TM414	24100	25900	29600			
Aromatics > EC40-EC44	<1000 µg/kg	TM414	3250	3370	5270			
Total Aromatics > EC10-EC44	<5000 µg/kg	TM414	270000	292000	330000			
Total Aliphatics & Aromatics >C5-C44	<10000 µg/kg	TM414	300000	320000	357000			
GRO >C5-C6	<20 µg/kg	TM089	<20	<20	30			
GRO >C6-C7	<20 µg/kg	TM089	28.8	27.8	50.4			
GRO >C7-C8	<20 µg/kg	TM089	36	31.5	51.6			
GRO >C8-C10	<20 µg/kg	TM089	68.4	79.9	170			
GRO >C10-C12	<20 µg/kg	TM089	107	125	176			
Total Aliphatics >C5-C10	<50 µg/kg	TM089	110	115	223			
Total Aromatics >EC5-EC10	<50 µg/kg	TM089	<50	<50	79.2			
GRO >C5-C10	<20 µg/kg	TM089	110	115	302			



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

VOC MS (S)

Table with columns: Component, LOD/Units, Method, BH01, BH02, BH03. Rows include Dibromofluoromethane, Toluene-d8, 4-Bromofluorobenzene, Methyl Tertiary Butyl Ether, Benzene, Toluene, Ethylbenzene, and o-Xylene.



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Asbestos Identification - Solid Samples

Results Legend

- # ISO17025 accredited.
- M mCERTS accredited.
- * Subcontracted test.
- (F) Trigger breach confirmed
- 1-5Z Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH01 0.50 SOLID 07/02/2020 10:20:00 200207-128 21646510 TM048	18/02/2020	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH02 0.50 SOLID 07/02/2020 10:20:00 200207-128 21646512 TM048	17/02/2020	Marcin Magdziarek	Loose fibres in soil	Not Detected (#)	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH03 0.50 SOLID 07/02/2020 10:20:00 200207-128 21646513 TM048	18/02/2020	Marcin Magdziarek	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	City Quay
Mass Sample taken (kg)	0.109	Natural Moisture Content (%)	20.3
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	83.2
Particle Size <4mm	>95%		

Case		Landfill Waste Acceptance Criteria Limits	
SDG	200207-128		
Lab Sample Number(s)	21646510		
Sampled Date			
Customer Sample Ref.	BH01		
Depth (m)	0.50		

Solid Waste Analysis	Result
Total Organic Carbon (%)	6.75
Loss on Ignition (%)	11.3
Sum of BTEX (mg/kg)	-
Sum of 7 PCBs (mg/kg)	<0.021
Mineral Oil (mg/kg)	58.3
PAH Sum of 17 (mg/kg)	-
pH (pH Units)	-
ANC to pH 6 (mol/kg)	-
ANC to pH 4 (mol/kg)	-

Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
3	5	6
-	-	10
-	-	-
1	-	-
500	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Eluate Analysis	C2 Conc ⁿ in 10:1 eluate (mg/l)		A2 10:1 conc ⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0187	<0.0005	0.187	<0.005	0.5	2	25
Barium	0.0136	<0.0002	0.136	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	0.00524	<0.001	0.0524	<0.01	0.5	10	70
Copper	0.0338	<0.0003	0.338	<0.003	2	50	100
Mercury Dissolved (CVAF)	0.000282	<0.00001	0.000282	<0.0001	0.01	0.2	2
Molybdenum	0.00327	<0.003	0.0327	<0.03	0.5	10	30
Nickel	0.00261	<0.0004	0.0261	<0.004	0.4	10	40
Lead	0.000621	<0.0002	0.00621	<0.002	0.5	10	50
Antimony	0.00223	<0.001	0.0223	<0.01	0.06	0.7	5
Selenium	0.0029	<0.001	0.029	<0.01	0.1	0.5	7
Zinc	0.00107	<0.001	0.0107	<0.01	4	50	200
Chloride	11.7	<2	117	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	16	<2	160	<20	1000	20000	50000
Total Dissolved Solids	148	<10	1480	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	8.07	<3	80.7	<30	500	800	1000

Leach Test Information

Date Prepared	09-Feb-2020
pH (pH Units)	11.12
Conductivity (µS/cm)	293.00
Temperature (°C)	17.60
Volume Leachant (Litres)	0.882

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
 Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
 Mcerts Certification does not apply to leachates
 18/02/2020 08:07:17



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference	200207-128	Site Location	City Quay
Mass Sample taken (kg)	0.109	Natural Moisture Content (%)	19.9
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	83.4
Particle Size <4mm	>95%		

Case

SDG	200207-128
Lab Sample Number(s)	21646512
Sampled Date	
Customer Sample Ref.	BH02
Depth (m)	0.50

Landfill Waste Acceptance Criteria Limits

Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
3	5	6
-	-	10
-	-	-
1	-	-
500	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Solid Waste Analysis

	Result
Total Organic Carbon (%)	11.5
Loss on Ignition (%)	12.8
Sum of BTEX (mg/kg)	-
Sum of 7 PCBs (mg/kg)	<0.105
Mineral Oil (mg/kg)	27.3
PAH Sum of 17 (mg/kg)	-
pH (pH Units)	-
ANC to pH 6 (mol/kg)	-
ANC to pH 4 (mol/kg)	-

Eluate Analysis	C2 Conc ⁿ in 10:1 eluate (mg/l)		A2 10:1 conc ⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0152	<0.0005	0.152	<0.005	0.5	2	25
Barium	0.142	<0.0002	1.42	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	0.00486	<0.001	0.0486	<0.01	0.5	10	70
Copper	0.0265	<0.0003	0.265	<0.003	2	50	100
Mercury Dissolved (CVAF)	0.0000277	<0.00001	0.000277	<0.0001	0.01	0.2	2
Molybdenum	0.00447	<0.003	0.0447	<0.03	0.5	10	30
Nickel	0.00194	<0.0004	0.0194	<0.004	0.4	10	40
Lead	0.000567	<0.0002	0.00567	<0.002	0.5	10	50
Antimony	0.00209	<0.001	0.0209	<0.01	0.06	0.7	5
Selenium	0.00387	<0.001	0.0387	<0.01	0.1	0.5	7
Zinc	0.00236	<0.001	0.0236	<0.01	4	50	200
Chloride	12.6	<2	126	<20	800	15000	25000
Fluoride	0.556	<0.5	5.56	<5	10	150	500
Sulphate (soluble)	16.9	<2	169	<20	1000	20000	50000
Total Dissolved Solids	167	<10	1670	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	7.03	<3	70.3	<30	500	800	1000

Leach Test Information

Date Prepared	09-Feb-2020
pH (pH Units)	10.97
Conductivity (µS/cm)	243.00
Temperature (°C)	17.10
Volume Leachant (Litres)	0.882

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
 Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
 Mcerts Certification does not apply to leachates
 18/02/2020 08:07:17



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	City Quay
Mass Sample taken (kg)	0.110	Natural Moisture Content (%)	21.5
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	82.3
Particle Size <4mm	>95%		

Case	
SDG	200207-128
Lab Sample Number(s)	21646513
Sampled Date	
Customer Sample Ref.	BH03
Depth (m)	0.50

Landfill Waste Acceptance Criteria Limits

Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
3	5	6
-	-	10
-	-	-
1	-	-
500	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Solid Waste Analysis	Result
Total Organic Carbon (%)	7.53
Loss on Ignition (%)	11.4
Sulphur BTEX (mg/kg)	-
Sum of 7 PCBs (mg/kg)	<0.021
Mineral Oil (mg/kg)	75.4
PAH Sum of 17 (mg/kg)	-
pH (pH Units)	-
ANC to pH 6 (mol/kg)	-
ANC to pH 4 (mol/kg)	-

Eluate Analysis	C2 Conc ⁿ in 10:1 eluate (mg/l)		A2 10:1 conc ⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0165	<0.0005	0.165	<0.005	0.5	2	25
Barium	0.00851	<0.0002	0.0851	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	0.00528	<0.001	0.0528	<0.01	0.5	10	70
Copper	0.0247	<0.0003	0.247	<0.003	2	50	100
Mercury Dissolved (CVAF)	0.0000283	<0.00001	0.000283	<0.0001	0.01	0.2	2
Molybdenum	0.00465	<0.003	0.0465	<0.03	0.5	10	30
Nickel	0.00229	<0.0004	0.0229	<0.004	0.4	10	40
Lead	0.0011	<0.0002	0.011	<0.002	0.5	10	50
Antimony	0.00254	<0.001	0.0254	<0.01	0.06	0.7	5
Selenium	0.00268	<0.001	0.0268	<0.01	0.1	0.5	7
Zinc	0.00177	<0.001	0.0177	<0.01	4	50	200
Chloride	9.6	<2	96	<20	800	15000	25000
Fluoride	0.512	<0.5	5.12	<5	10	150	500
Sulphate (soluble)	12.6	<2	126	<20	1000	20000	50000
Total Dissolved Solids	139	<10	1390	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	7.54	<3	75.4	<30	500	800	1000

Leach Test Information

Date Prepared	09-Feb-2020
pH (pH Units)	11.13
Conductivity (µS/cm)	267.00
Temperature (°C)	17.20
Volume Leachant (Litres)	0.880

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
 Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
 Mcerts Certification does not apply to leachates
 18/02/2020 08:07:17

08:06:34 18/02/2020



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM132	In - house Method	ELTRA CS800 Operators Guide
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM410	Shaker extraction-In house coronene method	Determination of Coronene in soils by GCMS
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media - Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 200207-128
Location: City Quay

Client Reference: 5686
Order Number: 18/A/18

Report Number: 541754
Superseded Report: 541454

Test Completion Dates

Lab Sample No(s)	21646510	21646512	21646513
Customer Sample Ref.	BH01	BH02	BH03
AGS Ref.			
Depth	0.50	0.50	0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (w)	12-Feb-2020	12-Feb-2020	12-Feb-2020
Asbestos ID in Solid Samples	18-Feb-2020	17-Feb-2020	18-Feb-2020
CEN 10:1 Leachate (1 Stage)	10-Feb-2020	10-Feb-2020	10-Feb-2020
CEN Readings	12-Feb-2020	12-Feb-2020	12-Feb-2020
Chromium III	13-Feb-2020	14-Feb-2020	14-Feb-2020
Coronene	11-Feb-2020	12-Feb-2020	11-Feb-2020
Dissolved Metals by ICP-MS	13-Feb-2020	12-Feb-2020	13-Feb-2020
Dissolved Organic/Inorganic Carbon	14-Feb-2020	14-Feb-2020	14-Feb-2020
EPH CWG GC (S)	14-Feb-2020	14-Feb-2020	14-Feb-2020
Fluoride	12-Feb-2020	12-Feb-2020	12-Feb-2020
GRO by GC-FID (S)	14-Feb-2020	14-Feb-2020	14-Feb-2020
Hexavalent Chromium (s)	13-Feb-2020	13-Feb-2020	13-Feb-2020
Loss on Ignition in soils	12-Feb-2020	12-Feb-2020	12-Feb-2020
Mercury Dissolved	13-Feb-2020	13-Feb-2020	13-Feb-2020
Metals in solid samples by OES	14-Feb-2020	14-Feb-2020	14-Feb-2020
Mineral Oil	11-Feb-2020	13-Feb-2020	12-Feb-2020
at 105C	09-Feb-2020	09-Feb-2020	09-Feb-2020
PAH by GCMS	11-Feb-2020	13-Feb-2020	13-Feb-2020
PCBs by GCMS	11-Feb-2020	14-Feb-2020	12-Feb-2020
Phenols by HPLC (W)	13-Feb-2020	13-Feb-2020	13-Feb-2020
Sample description	08-Feb-2020	08-Feb-2020	08-Feb-2020
Total Dissolved Solids on Leachates	12-Feb-2020	12-Feb-2020	12-Feb-2020
Total Organic Carbon	13-Feb-2020	14-Feb-2020	14-Feb-2020
TPH CWG GC (S)	14-Feb-2020	14-Feb-2020	14-Feb-2020
VOC MS (S)	13-Feb-2020	13-Feb-2020	13-Feb-2020



CERTIFICATE OF ANALYSIS

SDG:	200207-128	Client Reference:	5686	Report Number:	541754
Location:	City Quay	Order Number:	18/A/18	Superseded Report:	541454

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

19. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2107)*.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



Waste Classification Report



PVH4L-PJ2BF-TAH68

Job name

5686

Description/Comments

Client: City Arts and City Quay Partnership

Project

City Quay

Site

Dublin 2

Related Documents

#	Name	Description
1	200207-128.hwol	.hwol file used to create the Job

Waste Stream Template

Rilta Suite NEW

Classified by

Name: Stephen Letch	Company: Site Investigations Ltd	HazWasteOnline™ Training Record:	
Date: 18 Feb 2020 11:56 GMT	Carhugar, The Grange	Course	Date
Telephone: 353 1 6108 768	12th Lock Road, Lucan	Hazardous Waste Classification	09 Apr 2019
	Dublin	Advanced Hazardous Waste Classification	09 Oct 2019

Report

Created by: Stephen Letch
Created date: 18 Feb 2020 11:56 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	BH01-000000-0.50	0.50	Hazardous	HP 7, HP 14	2
2	BH02-000000-0.50	0.50	Hazardous	HP 7	5
3	BH03-000000-0.50	0.50	Hazardous	HP 7, HP 14	8

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	11
Appendix B: Rationale for selection of metal species	12
Appendix C: Version	13



Classification of sample: BH01-000000--0.50

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name: **BH01-000000--0.50** LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth: **0.50 m** Entry: 17 05 03 * (Soil and stones containing hazardous substances)
Moisture content: **17%**
(wet weight correction)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.179%)

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinands:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.179%)

zinc sulphate: (compound conc.: 0.153%)

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	TPH (C6 to C40) petroleum group				300	mg/kg		300	mg/kg	0.03 %		
			TPH									
2	antimony { antimony trioxide }				4.91	mg/kg	1.197	4.879	mg/kg	0.000488 %	✓	
	051-005-00-X	215-175-0	1309-64-4									
3	arsenic { arsenic pentoxide }				55.1	mg/kg	1.534	70.149	mg/kg	0.00701 %	✓	
	033-004-00-6	215-116-9	1303-28-2									
4	barium { barium sulphide }				528	mg/kg	1.233	540.566	mg/kg	0.0541 %	✓	
	016-002-00-X	244-214-4	21109-95-5									
5	cadmium { cadmium sulfate }				0.79	mg/kg	1.855	1.216	mg/kg	0.000122 %	✓	
	048-009-00-9	233-331-6	10124-36-4									
6	copper { dicopper oxide; copper (I) oxide }				120	mg/kg	1.126	112.138	mg/kg	0.0112 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }			1	2160	mg/kg		1792.8	mg/kg	0.179 %	✓	
	082-001-00-6											



#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
8	mercury { mercury dichloride }				2.14	mg/kg	1.353	2.404	mg/kg	0.00024 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	molybdenum { molybdenum(VI) oxide }				2.78	mg/kg	1.5	3.462	mg/kg	0.000346 %	✓	
	042-001-00-9	215-204-7	1313-27-5									
10	nickel { nickel sulfate }				45.9	mg/kg	2.637	100.45	mg/kg	0.01 %	✓	
	028-009-00-5	232-104-9	7786-81-4									
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				1.46	mg/kg	2.554	3.094	mg/kg	0.000309 %	✓	
	034-002-00-8											
12	zinc { zinc sulphate }				748	mg/kg	2.469	1533.038	mg/kg	0.153 %	✓	
	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]									
13	chromium in chromium(III) compounds { chromium(III) oxide }				5.04	mg/kg	1.462	6.114	mg/kg	0.000611 %	✓	
		215-160-9	1308-38-9									
14	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
15	naphthalene				0.375	mg/kg		0.311	mg/kg	0.0000311 %	✓	
	601-052-00-2	202-049-5	91-20-3									
16	acenaphthylene				0.297	mg/kg		0.247	mg/kg	0.0000247 %	✓	
		205-917-1	208-96-8									
17	acenaphthene				0.444	mg/kg		0.369	mg/kg	0.0000369 %	✓	
		201-469-6	83-32-9									
18	fluorene				0.333	mg/kg		0.276	mg/kg	0.0000276 %	✓	
		201-695-5	86-73-7									
19	phenanthrene				5.6	mg/kg		4.648	mg/kg	0.000465 %	✓	
		201-581-5	85-01-8									
20	anthracene				1.03	mg/kg		0.855	mg/kg	0.0000855 %	✓	
		204-371-1	120-12-7									
21	fluoranthene				9.32	mg/kg		7.736	mg/kg	0.000774 %	✓	
		205-912-4	206-44-0									
22	pyrene				8.4	mg/kg		6.972	mg/kg	0.000697 %	✓	
		204-927-3	129-00-0									
23	benzo[a]anthracene				4.42	mg/kg		3.669	mg/kg	0.000367 %	✓	
	601-033-00-9	200-280-6	56-55-3									
24	chrysene				4.23	mg/kg		3.511	mg/kg	0.000351 %	✓	
	601-048-00-0	205-923-4	218-01-9									
25	benzo[b]fluoranthene				5.7	mg/kg		4.731	mg/kg	0.000473 %	✓	
	601-034-00-4	205-911-9	205-99-2									
26	benzo[k]fluoranthene				1.93	mg/kg		1.602	mg/kg	0.00016 %	✓	
	601-036-00-5	205-916-6	207-08-9									
27	benzo[a]pyrene; benzo[def]chrysene				3.86	mg/kg		3.204	mg/kg	0.00032 %	✓	
	601-032-00-3	200-028-5	50-32-8									
28	indeno[123-cd]pyrene				2.07	mg/kg		1.718	mg/kg	0.000172 %	✓	
		205-893-2	193-39-5									
29	dibenz[a,h]anthracene				0.622	mg/kg		0.516	mg/kg	0.0000516 %	✓	
	601-041-00-2	200-181-8	53-70-3									
30	benzo[ghi]perylene				2.66	mg/kg		2.208	mg/kg	0.000221 %	✓	
		205-883-8	191-24-2									
31	polychlorobiphenyls; PCB				<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		<LOD
	602-039-00-4	215-648-1	1336-36-3									
32	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
	603-181-00-X	216-653-1	1634-04-4									
33	benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
	601-020-00-8	200-753-7	71-43-2									
34	toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
	601-021-00-3	203-625-9	108-88-3									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
35	ethylbenzene				<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
36	coronene				1.02 mg/kg		0.847 mg/kg	0.0000847 %	✓	
		205-881-7	191-07-1							
37	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4 mg/kg		<0.4 mg/kg	<0.00004 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
Total:								0.452 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Hazardous result
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD** Below limit of detection
- ND** Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.03%)



Classification of sample: BH02-000000--0.50

Hazardous Waste
 Classified as **17 05 03 ***
 in the List of Waste

Sample details

Sample Name:	BH02-000000--0.50	LoW Code:	
Sample Depth:	0.50 m	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	18% (wet weight correction)	Entry:	17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.108%)

Determinands

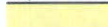

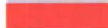


Moisture content: 18% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	TPH (C6 to C40) petroleum group				320	mg/kg		320	mg/kg	0.032 %		
			TPH									
2	antimony { antimony trioxide }				6.38	mg/kg	1.197	6.263	mg/kg	0.000626 %	✓	
	051-005-00-X	215-175-0	1309-64-4									
3	arsenic { arsenic pentoxide }				46.4	mg/kg	1.534	58.361	mg/kg	0.00584 %	✓	
	033-004-00-6	215-116-9	1303-28-2									
4	barium { barium sulphide }				370	mg/kg	1.233	374.242	mg/kg	0.0374 %	✓	
	016-002-00-X	244-214-4	21109-95-5									
5	cadmium { cadmium sulfate }				0.179	mg/kg	1.855	0.272	mg/kg	0.0000272 %	✓	
	048-009-00-9	233-331-6	10124-36-4									
6	copper { dicopper oxide; copper (I) oxide }				106	mg/kg	1.126	97.862	mg/kg	0.00979 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }			1	1320	mg/kg		1082.4	mg/kg	0.108 %	✓	
	082-001-00-6											
8	mercury { mercury dichloride }				2.24	mg/kg	1.353	2.486	mg/kg	0.000249 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	molybdenum { molybdenum(VI) oxide }				2.47	mg/kg	1.5	3.038	mg/kg	0.000304 %	✓	
	042-001-00-9	215-204-7	1313-27-5									
10	nickel { nickel sulfate }				47.4	mg/kg	2.637	102.483	mg/kg	0.0102 %	✓	
	028-009-00-5	232-104-9	7786-81-4									
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
	034-002-00-8											



#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
12	zinc { zinc sulphate }				635	mg/kg	2.469	1285.763	mg/kg	0.129 %	✓	
	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]									
13	chromium in chromium(III) compounds { chromium(III) oxide }				<0.9	mg/kg	1.462	<1.315	mg/kg	<0.000132 %		<LOD
		215-160-9	1308-38-9									
14	chromium in chromium(VI) compounds { chromium(VI) oxide }				0.81	mg/kg	1.923	1.277	mg/kg	0.000128 %	✓	
	024-001-00-0	215-607-8	1333-82-0									
15	naphthalene				0.538	mg/kg		0.441	mg/kg	0.0000441 %	✓	
	601-052-00-2	202-049-5	91-20-3									
16	acenaphthylene				0.243	mg/kg		0.199	mg/kg	0.0000199 %	✓	
		205-917-1	208-96-8									
17	acenaphthene				0.872	mg/kg		0.715	mg/kg	0.0000715 %	✓	
		201-469-6	83-32-9									
18	fluorene				0.634	mg/kg		0.52	mg/kg	0.000052 %	✓	
		201-695-5	86-73-7									
19	phenanthrene				7.52	mg/kg		6.166	mg/kg	0.000617 %	✓	
		201-581-5	85-01-8									
20	anthracene				1.18	mg/kg		0.968	mg/kg	0.0000968 %	✓	
		204-371-1	120-12-7									
21	fluoranthene				9.04	mg/kg		7.413	mg/kg	0.000741 %	✓	
		205-912-4	206-44-0									
22	pyrene				7.91	mg/kg		6.486	mg/kg	0.000649 %	✓	
		204-927-3	129-00-0									
23	benzo[a]anthracene				4.4	mg/kg		3.608	mg/kg	0.000361 %	✓	
	601-033-00-9	200-280-6	56-55-3									
24	chrysene				4.5	mg/kg		3.69	mg/kg	0.000369 %	✓	
	601-048-00-0	205-923-4	218-01-9									
25	benzo[b]fluoranthene				5.41	mg/kg		4.436	mg/kg	0.000444 %	✓	
	601-034-00-4	205-911-9	205-99-2									
26	benzo[k]fluoranthene				2.29	mg/kg		1.878	mg/kg	0.000188 %	✓	
	601-036-00-5	205-916-6	207-08-9									
27	benzo[a]pyrene; benzo[def]chrysene				3.94	mg/kg		3.231	mg/kg	0.000323 %	✓	
	601-032-00-3	200-028-5	50-32-8									
28	indeno[123-cd]pyrene				2.89	mg/kg		2.37	mg/kg	0.000237 %	✓	
		205-893-2	193-39-5									
29	dibenz[a,h]anthracene				0.588	mg/kg		0.482	mg/kg	0.0000482 %	✓	
	601-041-00-2	200-181-8	53-70-3									
30	benzo[ghi]perylene				2.87	mg/kg		2.353	mg/kg	0.000235 %	✓	
		205-883-8	191-24-2									
31	polychlorobiphenyls; PCB				<0.105	mg/kg		<0.105	mg/kg	<0.0000105 %		<LOD
	602-039-00-4	215-648-1	1336-36-3									
32	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
	603-181-00-X	216-653-1	1634-04-4									
33	benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
	601-020-00-8	200-753-7	71-43-2									
34	toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
	601-021-00-3	203-625-9	108-88-3									
35	ethylbenzene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
	601-023-00-4	202-849-4	100-41-4									
36	coronene				1.12	mg/kg		0.918	mg/kg	0.0000918 %	✓	
		205-881-7	191-07-1									
37	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4	mg/kg		<0.4	mg/kg	<0.00004 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
Total:										0.339 %		

**Key**

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Too low to be oxidising

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00012%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.032%)



Classification of sample: BH03-000000--0.50

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	BH03-000000--0.50	LoW Code:	
Sample Depth:	0.50 m	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	16%	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
(wet weight correction)			

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.144%)

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinands:

lead compounds with the exception of those specified elsewhere in this Annex (worst case): (Note 1 conc.: 0.144%)

zinc sulphate: (compound conc.: 0.195%)

Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	TPH (C6 to C40) petroleum group				357	mg/kg		357	mg/kg	0.0357 %		
			TPH									
2	antimony { antimony trioxide }				12.5	mg/kg	1.197	12.57	mg/kg	0.00126 %	✓	
	051-005-00-X	215-175-0	1309-64-4									
3	arsenic { arsenic pentoxide }				56.6	mg/kg	1.534	72.927	mg/kg	0.00729 %	✓	
	033-004-00-6	215-116-9	1303-28-2									
4	barium { barium sulphide }				459	mg/kg	1.233	475.586	mg/kg	0.0476 %	✓	
	016-002-00-X	244-214-4	21109-95-5									
5	cadmium { cadmium sulfate }				1.29	mg/kg	1.855	2.01	mg/kg	0.000201 %	✓	
	048-009-00-9	233-331-6	10124-36-4									
6	copper { dicopper oxide; copper (I) oxide }				147	mg/kg	1.126	139.025	mg/kg	0.0139 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }			1	1720	mg/kg		1444.8	mg/kg	0.144 %	✓	
	082-001-00-6											



#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	M/C Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
8	mercury { mercury dichloride }				1.71	mg/kg	1.353	1.944	mg/kg	0.000194 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	molybdenum { molybdenum(VI) oxide }				2.33	mg/kg	1.5	2.936	mg/kg	0.000294 %	✓	
	042-001-00-9	215-204-7	1313-27-5									
10	nickel { nickel sulfate }				54.4	mg/kg	2.637	120.486	mg/kg	0.012 %	✓	
	028-009-00-5	232-104-9	7786-81-4									
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<10	mg/kg	2.554	<25.536	mg/kg	<0.00255 %		<LOD
	034-002-00-8											
12	zinc { zinc sulphate }				942	mg/kg	2.469	1953.905	mg/kg	0.195 %	✓	
	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]									
13	chromium in chromium(III) compounds { chromium(III) oxide }				<0.9	mg/kg	1.462	<1.315	mg/kg	<0.000132 %		<LOD
		215-160-9	1308-38-9									
14	chromium in chromium(VI) compounds { chromium(VI) oxide }				1.05	mg/kg	1.923	1.696	mg/kg	0.00017 %	✓	
	024-001-00-0	215-607-8	1333-82-0									
15	naphthalene				0.474	mg/kg		0.398	mg/kg	0.0000398 %	✓	
	601-052-00-2	202-049-5	91-20-3									
16	acenaphthylene				0.525	mg/kg		0.441	mg/kg	0.0000441 %	✓	
		205-917-1	208-96-8									
17	acenaphthene				1.24	mg/kg		1.042	mg/kg	0.000104 %	✓	
		201-469-6	83-32-9									
18	fluorene				0.898	mg/kg		0.754	mg/kg	0.0000754 %	✓	
		201-695-5	86-73-7									
19	phenanthrene				11.7	mg/kg		9.828	mg/kg	0.000983 %	✓	
		201-581-5	85-01-8									
20	anthracene				1.98	mg/kg		1.663	mg/kg	0.000166 %	✓	
		204-371-1	120-12-7									
21	fluoranthene				17	mg/kg		14.28	mg/kg	0.00143 %	✓	
		205-912-4	206-44-0									
22	pyrene				15.2	mg/kg		12.768	mg/kg	0.00128 %	✓	
		204-927-3	129-00-0									
23	benzo[a]anthracene				8.24	mg/kg		6.922	mg/kg	0.000692 %	✓	
	601-033-00-9	200-280-6	56-55-3									
24	chrysene				8.41	mg/kg		7.064	mg/kg	0.000706 %	✓	
	601-048-00-0	205-923-4	218-01-9									
25	benzo[b]fluoranthene				10.4	mg/kg		8.736	mg/kg	0.000874 %	✓	
	601-034-00-4	205-911-9	205-99-2									
26	benzo[k]fluoranthene				3.44	mg/kg		2.89	mg/kg	0.000289 %	✓	
	601-036-00-5	205-916-6	207-08-9									
27	benzo[a]pyrene; benzo[def]chrysene				7.15	mg/kg		6.006	mg/kg	0.000601 %	✓	
	601-032-00-3	200-028-5	50-32-8									
28	indeno[123-cd]pyrene				4.67	mg/kg		3.923	mg/kg	0.000392 %	✓	
		205-893-2	193-39-5									
29	dibenz[a,h]anthracene				1.16	mg/kg		0.974	mg/kg	0.0000974 %	✓	
	601-041-00-2	200-181-8	53-70-3									
30	benzo[ghi]perylene				4.94	mg/kg		4.15	mg/kg	0.000415 %	✓	
		205-883-8	191-24-2									
31	polychlorobiphenyls; PCB				<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		<LOD
	602-039-00-4	215-648-1	1336-36-3									
32	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
	603-181-00-X	216-653-1	1634-04-4									
33	benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
	601-020-00-8	200-753-7	71-43-2									
34	toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
	601-021-00-3	203-625-9	108-88-3									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MIC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
35	ethylbenzene				<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
36	coronene				1.65 mg/kg		1.386 mg/kg	0.000139 %	✓	
		205-881-7	191-07-1							
37	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4 mg/kg		<0.4 mg/kg	<0.00004 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
Total:								0.47 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Hazardous result
- * Determinand defined or amended by HazWasteOnline (see Appendix A)
- * Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Too low to be oxidising

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00017%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0357%)



Appendix A: Classifier defined and non CLP determinands

• TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

• barium sulphide (EC Number: 244-214-4, CAS Number: 21109-95-5)

CLP index number: 016-002-00-X

Description/Comments:

Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)

Additional Hazard Statement(s): EUH031 >= 0.8 %

Reason for additional Hazards Statement(s):

14 Dec 2015 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

• lead compounds with the exception of those specified elsewhere in this Annex (worst case)

CLP index number: 082-001-00-6

Description/Comments: Worst Case: IARC considers lead compounds Group 1; Carcinogenic to humans; Lead REACH Consortium considers some lead compounds Carcinogenic category 1A

Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)

Additional Hazard Statement(s): Carc. 1A H350

Reason for additional Hazards Statement(s):

03 Jun 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

• chromium(III) oxide (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

• acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

• acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

• fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

• phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302