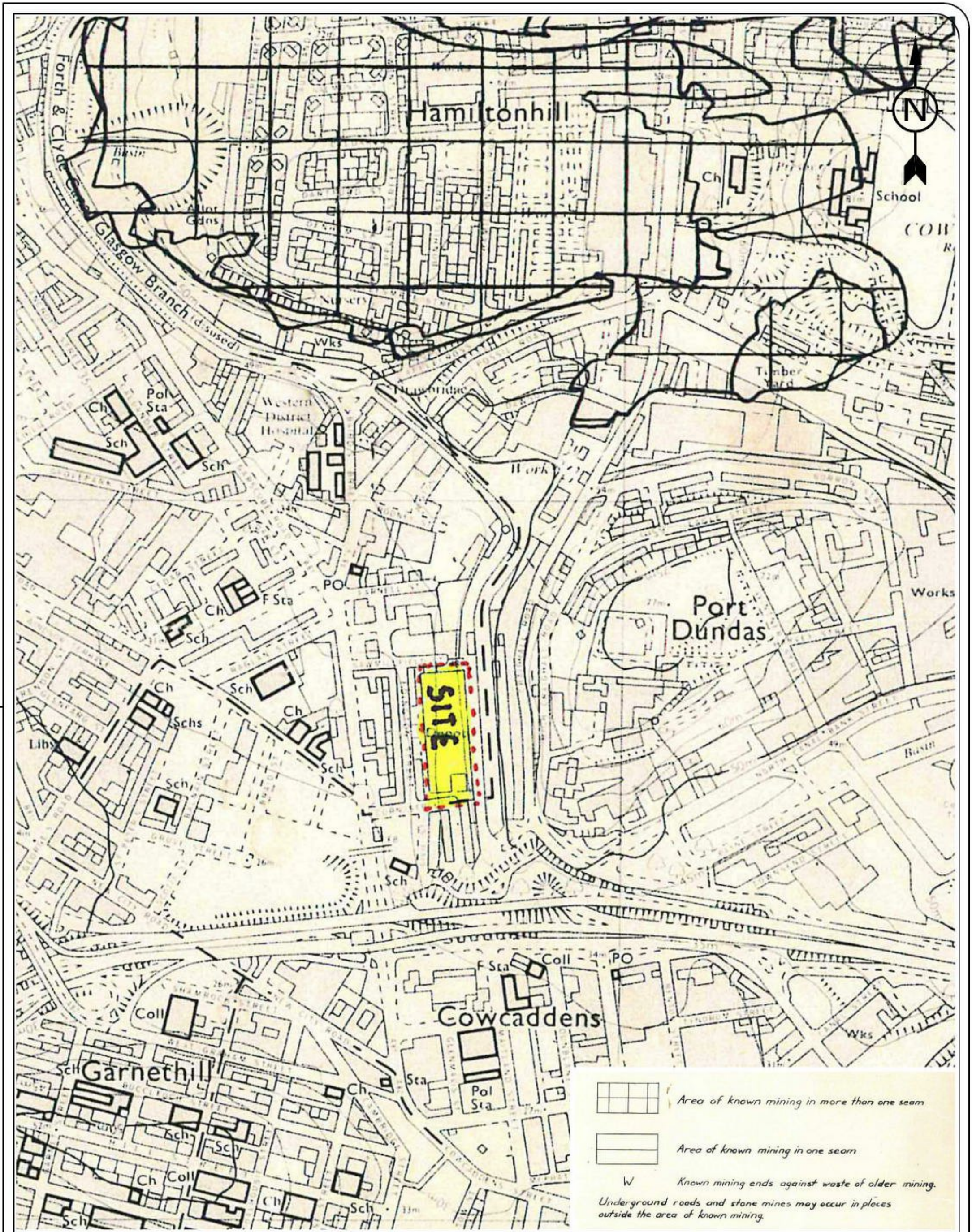


4.4 Mining and Quarrying

- 4.4.1 The Coal Authority Interactive Viewer map (refer to Appendix D) indicated that the site lies within a 'Development High Risk Area' and an area of 'Probable Shallow Coal Workings'.
- 4.4.2 A site-specific Consultants Coal Authority Report (included in Appendix D) stated that there are no records of any past underground mine workings below the site. This is consistent with the BGS mining maps (Drawing Nos. P22/271/DS/R/F/08 and 09) which did not indicate any known records of mining to exist below the site.
- 4.4.3 Importantly however, The Coal Authority did indicate that there was a potential for unrecorded workings at shallow depth (i.e. < 30 m depth) below the site. We consider that any shallow mineral extraction would be associated with The Upper Possil Ironstone or Garscube Wee Coal (0.80 m thick), the Batchie Ironstone or Coal (up to 0.70 m thick) and/or the Upper Possil / Davy Coal (0.70 m thick) which were indicated to exist below the site at shallow depths.
- 4.4.4 The Coal Authority did not record any mine entries within the site or immediate surrounding area. However, it should be highlighted that as in all areas of past mining, unrecorded mine entries could exist.
- 4.4.5 The Coal Authority also did state any known mine gas emissions within 500 m of the site, however it should be noted that any unrecorded mine workings below the site could contribute to mine gas and this will therefore require to be further investigated.
- 4.4.6 The Coal Authority did not record any open cast mines within 500 m from the site boundary. In addition, upon review of the historical maps, no quarrying activity was recorded to be present within the site or the immediate surrounding area.
- 4.4.7 To conclude, we consider the site to be at potential risk of ground instability as a result of unrecorded shallow mine workings at the level of the Upper Possil Ironstone or Garscube Wee Coal (0.80 m thick), the Batchie Ironstone or Coal (up to 0.70 m thick) and/or the Upper Possil / Davy Coal. Therefore, mineral ground investigations would be recommended in order to confirm (or otherwise) the presence of any shallow mine workings to exist below the site.



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The Piazza, 95 Morrison Street, Glasgow, G5 8BE

client details:

SCOTTISH OPERA
39 ELMBANK STREET
GLASGOW, G2 4PT

project title:

ROTTERDAM WHARF

drawing title:

EXTRACT FROM PUBLISHED
GEOLOGICAL SURVEY MAP
(MINING INFORMATION)

project no:
P22/271

drawing no:
P22/271/DS/R/F/08

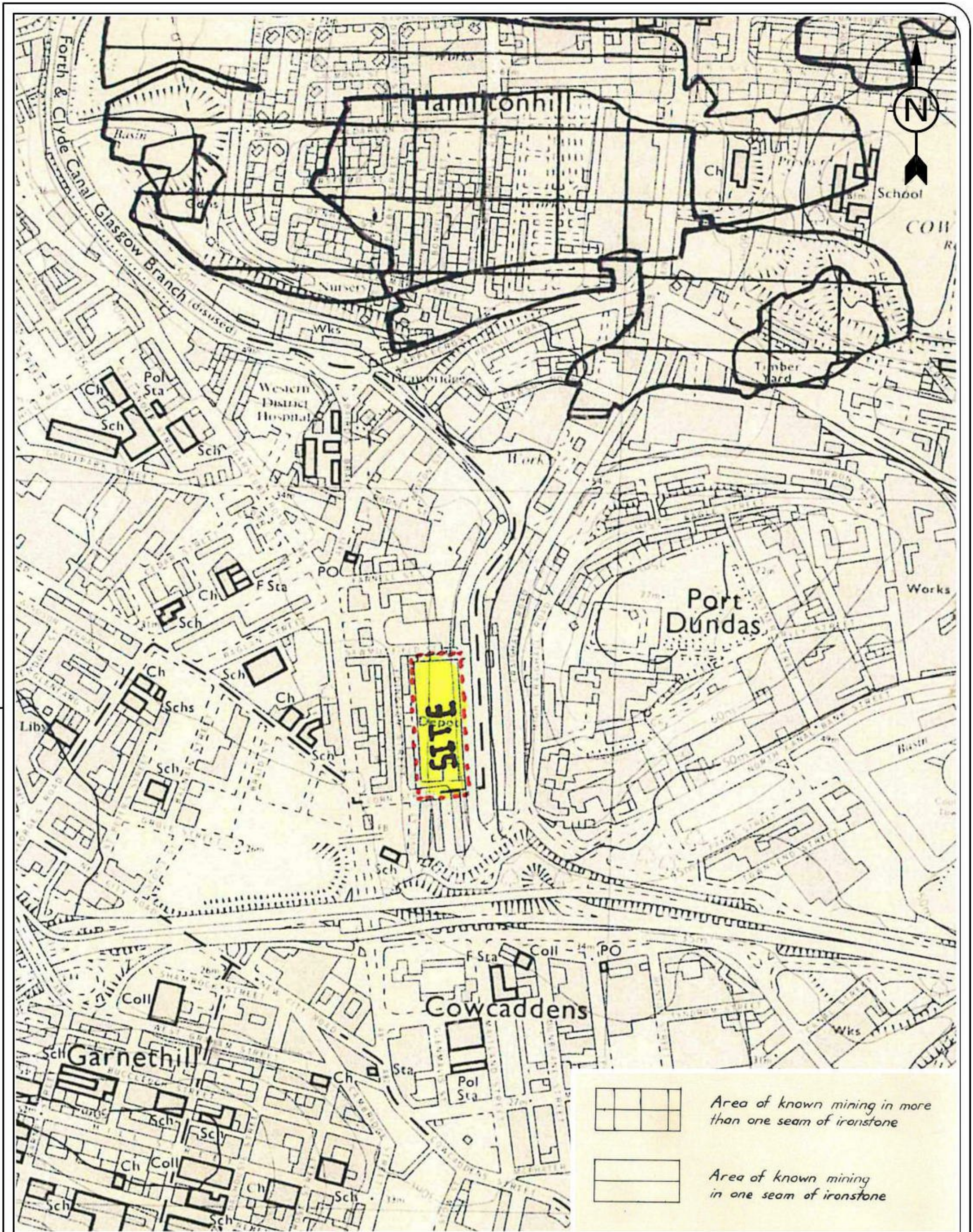
revision:

date:
14.09.23

drawn by:
TR

approved by:
AMcG

scale:
Not to Scale



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39 ELMBANK STREET
GLASGOW, G2 4PT

project title:

ROTTERDAM WHARF

drawing title:

EXTRACT FROM PUBLISHED
GEOLOGICAL SURVEY MAP
(MINING INFO EXCLUDING COAL)

project no:
P22/271

drawing no:
P22/271/DS/R/F/09

revision:

date:
14.09.23

drawn by:
TR

approved by:
AMcG

scale:
Not to Scale

4.5 Hydrology and Hydrogeology

4.5.1 Interpretation of the site hydrogeology required consideration of the general geological conditions. In this instance the available information indicates the ground conditions to be comprised of three geological units: made ground, glacial till and sedimentary bedrock. The typical permeabilities of each of these strata are recorded in Table 03.

Table 03 – Typical Material Permeability

Material	Permeability
Hardstanding (concrete or tarmac)	Low
Made Ground	Variable
Glacial Till	Low
Sedimentary Bedrock	Low to Moderate

4.5.2 At present, surface run-off on the site would be expected to high due to the majority of the site being developed hardstanding ground conditions. As such, surface water infiltration would likely be relatively low as the hardstanding surface conditions (concrete and tarmac) generally have a low permeability.

4.5.3 In areas underlain by made ground, vertical and lateral water movement could be anticipated as these soils have potentially high infiltration and permeability rates if unconsolidated.

4.5.4 The underlying natural soils were indicated to comprise glacial till, which is typically sandy, gravelly CLAY which would likely have a low permeability.

4.5.5 It is considered unlikely that a shallow groundwater body would exist within any glacial till deposits, due to the low permeability range of cohesive deposits. Groundwater may still be encountered within the cohesive soils underlying the site, though will likely be localised and perched, the result of surface water infiltration.

4.5.6 The nearest surface water body to the site was the Forth and Clyde Canal located to the east of the site. Given that the canal is topographically higher than the site and is separated by a significant retaining wall. Furthermore, this canal is a man-made contained body of water which will be lined, and therefore there would be no risk of contaminants from the site entering into this surface water feature. As such, we do not consider this to be a sensitive receptor in relation to the proposed development. No other surface water bodies were recorded within 1km.

4.5.7 SEPA did not indicate an aquifer to exist within the superficial deposits below the site. However, SEPA did record the 'Glasgow and Motherwell' bedrock aquifer to exist below the site (at depth). At this stage, this is considered to be the most sensitive water receptor in relation to the site.

- 4.5.8 In consideration of the available information regarding groundwater, the following general comments could be made.

Table 04 – Surface Water and Groundwater Pathways

Surface water run-off	Surface water run-off is anticipated to be high given that the site was predominantly noted to be surfaced in hardstanding concrete and tarmac. Consequently, the infiltration of surface water would therefore be expected to be low.
Groundwater migration through superficial materials	<p>The underlying made ground deposits could allow vertical and lateral water movement if material constituents have high infiltration and permeability rates.</p> <p>The underlying natural glacial till deposits are expected to be prohibitive to vertical groundwater flow below the site. Consequently we would generally expect groundwater to be localised, perched and of low volume within the cohesive soils.</p>

4.6 Correspondence with Glasgow City Council

- 4.6.1 As part of our desk study researches, we contacted Glasgow City Council's Contaminated Land and Trading Standard departments to obtain any available historical site information, including any knowledge of contaminated land uses and any known buried fuel tanks within the site.

- 4.6.2 In September 2023 the Trading Standards Department responded stating that they hold no records of fuel storage tanks within the specified site area. The Trading Standards Department did however, recorded two storage tanks in the immediate area. A 1x1000 Gallon tank was recorded at 27 Sawmillfield Street approximately 40 m to the west, the tank was recorded to be installed in 1955 and used for diesel storage. Another storage tank was located approximately 40 m to the north-west below Burns Street installed in 1939. Information relating to the current status of these tanks was not indicated.

- 4.6.3 If any further information is received (i.e. historic GI) from the council, we will review and if necessary, update our desk study to incorporate any relevant information.

4.7 Invasive Plant Species

- 4.7.1 An invasive plant species survey has not been carried out as yet, due to access restrictions into certain areas of the site (notably the southern vegetated area of land). However, this should be undertaken once access has been made possible and later incorporated into future site investigation reporting.

5.0 CONCEPTUAL SITE MODEL

5.1 General

5.1.1 In order to fully evaluate the potential presence and impact of contamination at the site, the area must be considered in an environmental context taking account of its geology, topography, past and present land-use. From this review, the current guidance requires the development of a 'Conceptual Site Model' as defined in the R & D Publication CLR10 published by the Department for the Environment and Rural Affairs (DEFRA). The model then forms an integral part of the contamination assessment for the proposed development site, looking at conventional source-pathway-receptor linkages.

5.1.2 The key parameters of the model are the conjectured ground conditions at the site, the potential sources of contamination, migration pathways and possible receptors in the vicinity. During the initial stages of the investigation, a preliminary conceptual model can be developed using information obtained during the desk study phase, prior to site investigations being carried out. This should then be revised during a subsequent phase of investigation.

5.2 Environmental Qualitative Risk Assessment

5.2.1 Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) has created a new regime for the identification and remediation of contaminated land. A revised Statutory Guidance Edition 2 (Paper SE/2006/44) to the Act was published by the Scottish Executive in May 2006.

5.2.2 Both Part IIA and the planning regulations it impacts on, embrace the "suitable for use" approach, with remedial actions only required where there are unacceptable risks to health or the environment, taking into account the current and proposed land uses and its environmental setting.

5.2.3 It is based on the principles of risk assessment, including the concept of a **pollutant linkage** between a **source** contaminant and a **receptor**, by means of a **pathway**. We would highlight that the approach, while perhaps rendering the site suitable for its current use, may prove inappropriate to a change in site designation or specific land use, arising from existing site conditions.

5.2.4 The presence of all three elements identifies a plausible pollutant linkage. An assessment of the potential sources, pathways and receptors constitutes a conceptual model for the site.

5.3 Receptor Characterisation

5.3.1 Potential receptors at the site are defined on the basis of the site proposals, which are understood to include the development of a five-storey extension to the existing Scottish Opera building, plus the development of two separate residential flatted properties (up to 18-storey) within the northern and southern site areas. The location of the site relative to any off site receptors has also been considered. The following receptors are considered relevant to this project:

- Humans – site end users and construction workers (outdoor),
- Humans – site end users (indoor),
- Buildings and services,
- Water Environment (deep bedrock groundwater i.e. 'Glasgow and Motherwell' aquifer),
- Vegetation/fauna.

5.4 Source Characterisation

5.4.1 The potential on-site sources of contamination identified by this desk study are:

- Deposition of contaminated materials associated with made ground deposits.
- Spillage of and leakages of contaminants.
- Generation and accumulation of ground gases associated with made ground.
- Generation and accumulation of mine gas associated with any potential mine workings.

5.4.2 The potential off-site sources of contamination identified by this desk study are:

- Deposition of contaminated materials from the neighbouring developments (commercial units and roads).
- Spillage of and leakages of contaminants.
- Contaminants transported from surface water run-off.
- Generation and accumulation of ground gases associated with made ground.

5.4.3 The following table summarises the typical contaminants which we would anticipate at the site, although any testing schedule should be developed in cognisance of the materials encountered.

Table 05 – Contaminants of Concern

THE SITE	Industrial Activity/ Site Use	Potential Pathways	Associated Potential Contaminants
CURRENT	<ul style="list-style-type: none"> Scottish Opera production studio building. Car park. Sub-station. 	<ul style="list-style-type: none"> Deposition of waste materials. Spillages and leakages of contaminants. Generation of ground gases. 	Metals: As, Cd, Cr, Ni, Zn, Cu, Hg, Pb Organics: Fuel oils, PAH, Phenol Ground Gases: CO ₂ , CH ₄ , H ₂ S Asbestos PCB's
PREVIOUS	<ul style="list-style-type: none"> Timber Yard. Iron Works. Electric Generating Station. Maintenance Depot. 	<ul style="list-style-type: none"> Deposition of waste materials. Spillages and leakages of contaminants. Generation of ground gases. 	Metals: As, Cd, Cr, Ni, Zn, Cu, Hg, Pb Organics: Fuel oils, PAH, Phenol Ground Gases: CO ₂ , CH ₄ , H ₂ S Asbestos PCB's
IMMEDIATE SURROUNDING AREA	Industrial Activity/ Site Use	Potential Pathways	Associated Potential Contaminants
CURRENT	<ul style="list-style-type: none"> Commercial units. Roads. Skatepark. 	<ul style="list-style-type: none"> Deposition of waste materials during development works. Spillages and leakages of contaminants (i.e., fuel spillages onto localised hardstanding areas). Generation of ground gases. 	Metals: As, Cd, Cr, Ni, Zn, Cu, Hg, Pb, V Organics: Fuel oils, PAH, Phenol Ground Gases: CO ₂ , CH ₄ , H ₂ S Asbestos
PREVIOUS	<ul style="list-style-type: none"> Commercial industry units. Roads. Iron Foundry located to the north. 	<ul style="list-style-type: none"> Deposition of waste materials during development works. Spillages and leakages of contaminants. Generation of ground gases. 	Metals: As, Cd, Cr, Ni, Zn, Cu, Hg, Pb, V Organics: Fuel oils, PAH, Phenol Ground Gases: CO ₂ , CH ₄ , H ₂ S Asbestos

5.5 Pathway Characterisation (Pollutant Linkages)

5.5.1 The pathways by which sensitive receptors may be exposed to potential sources of contamination, as determined by the proposed end use for the site are as follows.

1. Humans – site end users and construction workers (outdoor)
 - Dermal (skin) contact with contaminated soil, fugitive dust and the absorption of any contaminants through the skin into the body.
 - Inhalation of fugitive soil dust or vapour.
 - Ingestion of soil by hand to mouth activity
2. Humans – site end users (indoor)
 - Inhalation of any ground gas migrating into buildings.
 - Inhalation of soil derived dust.
3. Buildings
 - Potential soil gas generated in the ground vertically migrating and pooling within the structure.
 - Contact with aggressive or acidic soils will affect the concrete design of the foundations.

4. Services

- Direct contact with contaminated soil or groundwater.
- Leaching of contaminants through the soil.
- Service trenches acting as preferential migration pathways for contamination.
- Permeation of plastic water supply pipes.

5. Water Environment

- Leaching of contaminants from the soil to groundwater.
- Contaminant migration beyond the site boundary.

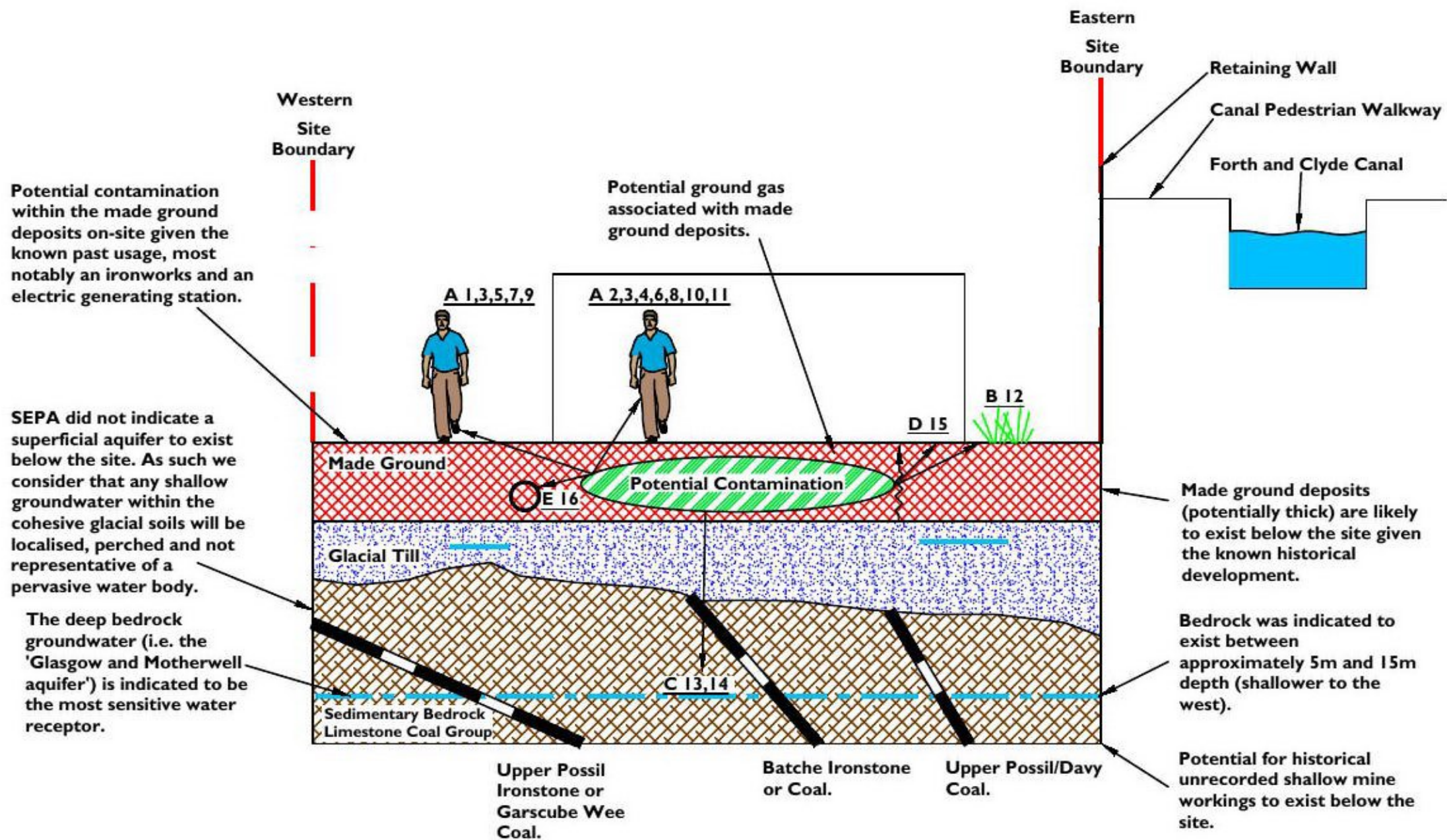
6. Vegetation

- Uptake of contamination in plant roots.
- Direct contact with contaminated soil or groundwater.

5.5.2 On the basis of the above, a qualitative risk assessment is described in Table 06 below and the potential source-pathway-receptor relationships identified at the site, based on the preliminary qualitative risk assessment, are summarised in Drawing No. P22/271/DS/R/F/10 - Preliminary Conceptual Site Model (CSM).

Table 06 – Preliminary Qualitative Risk Assessment – On Site

Source	COCs	Pathway	Receptors (s)	Assessment	Further Investigation Required
On site: MADE GROUND	Metals: As, Cd, Cr, Ni, Zn, Cu, Hg, Pb Organics: Fuel oils, PAH, Phenol Ground Gases: CO ₂ , CH ₄ , H ₂ S Asbestos PCB's	Dermal contact, ingestion, inhalation	Human – site workers	Made ground materials may have been deposited within the site associated with previous development/demolition works in the surrounding area.	Yes
			Humans – end users (outdoor)		
		Leaching through soil or direct migration	The water environment – groundwater (bedrock aquifer)	Contaminants may be leached and potentially mobilised from the soil by the infiltration of rainwater and possibly by shallow groundwater movement.	Yes
		Direct contact, leaching through soil, groundwater migration	Buildings and services	Potential for aggressive chemical environments for concrete due to sulphate and acidic conditions. Presence of contaminants in soil that may permeate water supply pipes.	Yes
		Gas/vapour inhalation, vertical/lateral migration	Buildings and services	Contamination may include gas/vapour producing materials or compounds that could vertically migrate into overlying buildings producing a potentially asphyxiating or explosive environment.	Yes
			Humans – end users (indoor)		
		Migration in the groundwater	The water environment	Contaminated soils/ groundwater within the site could migrate in the groundwater beyond the site boundary.	Yes
Direct Contact/ Plant Uptake	Vegetation	Direct contact with, or uptake of contaminated soils or groundwater could adversely affect plant growth.	Yes		



Potential Source

- Made ground (containing toxic/phytotoxic contaminants and acting as a source of ground gas).
- Mine workings (acting as a source of mine gas).

Potential Exposure Pathways

1. Outdoor ingestion of dust.
2. Indoor ingestion of dust.
3. Consumption of homegrown vegetables.
4. Ingestion of soil attached to vegetables.
5. Skin contact with outdoor soil.
6. Skin contact with indoor dust.
7. Outdoor inhalation of dust.
8. Indoor inhalation of dust.
9. Outdoor inhalation of soil vapour.
10. Indoor inhalation of soil vapour.
11. Inhalation of ground gases.
12. Contaminant uptake by vegetation.
13. Leaching of contaminants to the groundwater.
14. Contaminant migration in the groundwater.
15. Detrimental effects on buried concrete.
16. Permeation of plastic water supply pipes.

Potential Receptors

- A. Site users / construction personnel.
- B. Vegetation / fauna.
- C. Groundwater.
- D. Buried concrete (Service and foundations)
- E. Plastic water supply pipes.

NOTES

- An invasive plant species survey is to be undertaken once access into vegetated areas is made possible.

REV	DATE	DETAILS

SCOTTISH OPERA
39 ELMBANK STREET
GLASGOW
G2 4PT

PROJECT TITLE

ROTTERDAM WHARF

DRAWING TITLE

PRELIMINARY CONCEPTUAL SITE MODEL

DRAWN BY	CHK'D BY	APP'D BY	DATE	SCALES
LD	JW	AMcG	15.09.23	Not to Scale

PROJECT No.	DRAWING No.	REVISION
P22/271	P22/271/DS/R/F/10	

MASON EVANS
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6.0 CONCLUSIONS AND RECOMMENDATION ON DEVELOPMENT

6.1 General

6.1.1 Phase I desk study researches have indicated that there is a potential risk that the site is impacted by soil contamination due to made ground deposits and potential landfill material. This would require detailed evaluation through Phase II investigations, including the testing of soil/water samples, and examining the characterisation of the soils and groundwater beneath the site. In addition, potential gas emissions, sourced from any biodegradable soils, require to be assessed through monitoring. Foundation options for any new development will be influenced by the thickness and condition of any made ground soils as well as the condition of the natural superficial deposits and the underlying bedrock. Finally, the mineral stability of the site will require to be further assessed.

6.2 Current Site Conditions

6.2.1 The site area was predominantly surfaced in hardstanding (concrete or tarmac) with the Scottish Opera production studio building occupying a large proportion of the site.

6.3 Historical Site Usage

6.3.1 Historically the site has been developed since the earliest available OS maps dating back to 1860, including a timber yard until approximately 1870, an iron works until approximately 1895, an electricity generating station until approximately 1970, a maintenance depot until approximately 1990 and a Scottish Opera production studio with associated areas of hardstanding, which remains to the present day.

6.4 Conjectured Ground Conditions

6.4.1 We consider that MADE GROUND deposits will exist below the site associated with previous historical development.

6.4.2 The underlying natural subsoils were indicated to comprise glacial till (i.e. boulder CLAY) deposits, which were indicated to be shallower below the north-west of the site at around 7 m and thicker below the south-east of the site at around 17 m (based on historical borehole records and from the review of BGS drift thickness map).

6.5 Chemical Contamination

6.5.1 The historical appraisal indicated the presence of made ground materials potentially containing extraneous material below the site. Therefore, we consider the possibility that chemical contamination of soils and groundwater may have taken place.

6.5.2 Intrusive site investigations, supplemented by detailed chemical analyses and risk assessments will be required to assess the potential risks to sensitive receptors such as construction workers, site users, vegetation and the water environment.

6.6 Gas Emissions

- 6.6.1 Our researches indicate (potentially thick) made ground to exist beneath the site, and as such, there is significant potential for elevated ground gas emissions to exist below the site. In addition, our researches have indicated the potential for shallow unrecorded mine workings to exist below the site, which could pose a mine gas risk below the site.
- 6.6.2 A detailed ground/mine gas risk assessment, including a programme of gas monitoring from standpipes installed in boreholes, will therefore be required. Any future ground gas risk assessments should be in line with CIRIA C665 and BS 8485 (2015) guidance, whilst mine gas risk assessments should be in line with the CL:AIRE publication entitled; 'Good Practice for Risk Assessment for Coal Mine Gas Emissions, dated October 2021'.
- 6.6.3 The site is not at risk from radon gas.

6.7 Foundations

- 6.7.1 Given the proposed development is for multi-storey buildings with presumed large loading capacities, abnormal foundation solutions (such as piles) would likely be required onto either the glacial soils or the underlying sedimentary bedrock.
- 6.7.2 Investigations are therefore required to determine the depth to, and condition of the underlying natural subsoils and bedrock and confirm a suitable foundation bearing horizon.
- 6.7.3 Investigations should aim to assess the ground conditions by exploratory excavations and in-situ testing, augmented by laboratory testing of samples, to determine a practical and economic foundation solution for the development.

6.8 Flood Risk

- 6.8.1 SEPA indicated that the majority of the site is not at risk of flooding. However, there are localised areas that are at low to medium risk from surface water flooding in the north of the site. If more detail is required, we would recommend a detailed flood risk assessment be undertaken.

6.9 Mining and Quarrying

- 6.9.1 Our desktop researches indicate that unrecorded shallow workings potentially exist beneath the site at the level of the Upper Possil Ironstone or Garscube Wee Coal (0.80 m thick), the Batchie Ironstone or Coal (up to 0.70 m thick) and/or the Upper Possil / Davy Coal. As such, mineral investigations will be required in order to confirm (or otherwise).
- 6.9.2 The Coal Authority did not record any mine entries within the site or immediate surrounding area. However, it should be highlighted that as in all areas of past mining, unrecorded mine entries could exist.

6.9.3 The site is not considered to be at risk of ground instability as a result of historical quarrying activities.

6.10 Development Considerations

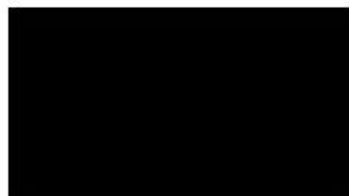
6.10.1 A number of development geo-environmental considerations could arise from the recommended Phase II investigations. These include:

- *Remediation of contaminated land.*
- *Off-site disposal of excess soils.*
- *Requirement for gas preclusion measures.*
- *Mining consolidation works.*
- *Abnormal foundations, which will ultimately be determined by the load requirements, the thickness of any potential made ground deposits and the thickness / condition of the underlying natural subsoils plus the depth and strength of the bedrock.*

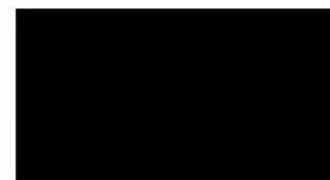
We highlight that these considerations are speculative without the more detailed information that would arise following Phase II investigations, following which the impact of each should be re-assessed. The advised scope of these investigations may include:

- Trial pits to assess the shallow soils and ground conditions.
- Soil boreholes with installations for gas and groundwater monitoring.
- Mineral bores to determine if shallow mine workings exist.
- Rotary bores (including rock coring) to assess the strength and condition of bedrock in relation to future foundations.
- Deep wells within the bedrock to monitor for mine gases and to collect possible bedrock aquifer samples.
- Geo-environmental testing of soil and (possible) groundwater plus rock samples.
- Monitoring of ground gas concentrations and groundwater depths.
- Phase II Geo-environmental Investigation Report.

We trust that this will meet your current requirements. However, should you require any further information, please do not hesitate to contact us.



Scott Armstrong
Principal Geo-Environmental Engineer



Andrew McGuire
Associate

Appendix 02

Invasive Plant Species Survey (Kleerkut Ltd, December 2023)

KLEERKUT

Mason Evans Partnership

Rotterdam Wharf, Edington Street, Glasgow G4 9RD

Job No: S4260

INVASIVE WEEDS SURVEY

Report Date: 07/12/2023



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INVASIVE WEEDS SURVEY INFORMATION	
ROTTERDAM WHARF, EDINGTON STREET, GLASGOW G4 9RD	REF: S4260

S1	FOR THE ATTENTION OF	Scott Armstrong	CLIENT	Mason Evans Partnership
	KLEERKUT SURVEYOR	Jenni Mouat	SURVEY DATE	06/12/2023
	REPORT PRODUCED BY	Tina Griffen Lloyd	REPORT DATE	07/12/2023

S2	SURVEY INFORMATION
-----------	---------------------------

S2A	SEASON	
	Winter	Depending on weather/exposure etc., growth of all species will have generally died back. Dense infestations of some species should still be visible however sporadic and immature growth may be harder to see especially if there is dense leaf litter or snow covering. Horsetail and Himalayan Balsam can be very difficult to find in winter months.

S2B	GENERAL DESCRIPTION	
	The site comprises of a large commercial building with hardstanding parking to the north and loading area to the south, each of these areas have shrubs and trees around the perimeter. Along the east of the building is a paved walkway with shrubs along the fence line. Beyond this to the east the ground level steps up several metres where a hardstanding commercial yard is located. To the south of this yard is an area of unmanaged land with overgrown shrubs and trees.	

S2C	CAVEATS RELEVANT TO THIS SURVEY	
	Horsetail dies back quickly after autumn frosts and often little residue remains outwith the growing season, making it difficult to find in winter months and early spring especially where the growth is sporadic and interspersed among other vegetation. A winter inspection may require a follow up visit during the growing season where it is a risk. Areas of the site are densely overgrown with vegetation which may have restricted our findings at some locations.	

S2D	SURVEY EXPIRY DATE	
	This survey is valid for a period of 6 months from the date of this document. This is based on the site conditions remaining unchanged. Depending on scheduled works, we would recommend keeping the survey up to date.	

S3	SURVEY FINDINGS – CONTROLLED PLANT SPECIES		
	Controlled in Scotland under Schedule 9 of the Wildlife & Countryside (Scotland) Act 1981 since superseded by the Wildlife and Natural Environment (Scotland) Act 2011 (WANE).		

S3A	JAPANESE KNOTWEED (<i>Reynoutria japonica</i>)		
	AREA AFFECTED (m or m²)		GENERAL DESCRIPTION
REF	WITHIN THE SITE	OUTWITH THE SITE	
N/A	-	-	No visible evidence at the time of our inspection.
Additional Information:			
REPORTED SPECIES can be JAPANESE KNOTWEED (<i>Reynoutria japonica</i>), HYBRID KNOTWEED (<i>Reynoutria x bohemica</i>) or GIANT KNOTWEED (<i>Reynoutria sachalinensis</i>) or a combination of varieties. All varieties have the same impact and are managed in the same way.			
Note: Refer to S7 General Survey Notes, Terms & Conditions			

S3B	GIANT HOGWEED (<i>Heracleum mantegazzianum</i>)		
	AREA AFFECTED (m or m²)		GENERAL DESCRIPTION
REF	WITHIN THE SITE	OUTWITH THE SITE	
N/A	-	-	No visible evidence at the time of our inspection.
Additional Information:			
Note: Refer to S7 General Survey Notes, Terms & Conditions			

S3C	HIMALAYAN BALSAM (<i>Impatiens glandulifera</i>)		
	AREA AFFECTED (m or m²)		GENERAL DESCRIPTION
REF	WITHIN THE SITE	OUTWITH THE SITE	
N/A	-	-	No visible evidence at the time of our inspection.
Additional Information:			
Note: Refer to S7 General Survey Notes, Terms & Conditions			

S4A COTONEASTER VARIETIES			
REF	AREA AFFECTED (m or m ²)		GENERAL DESCRIPTION
	WITHIN THE SITE	OUTWITH THE SITE	
CT1	400m ²	-	Prolific well established Cotoneaster small leaved was identified growing over walls and among other shrubs and trees around raised seated garden area. Also spreading across hardstanding in yard area to the east along fence line. Originally part of an ornamental border that has not been managed.
CT2	40m ²	-	Well established Cotoneaster small leaved was identified among other shrubs in border area along the back of the hardstanding yard area. Originally part of an ornamental border that has not been managed.
CT3	120m ²	-	Well established Cotoneaster small leaved was identified among other shrubs in border area next to hardstanding yard area. Originally part of an ornamental border that has not been managed.
<p>Additional Information: At the time of our inspection, there was no evidence of any mechanical (cutting/mowing) or herbicide management of the infestations.</p> <p>CONTROLLED VARIETIES: COTONEASTER (<i>Cotoneaster horizontalis</i>) COTONEASTER ENTIRE-LEAVED (<i>Cotoneaster integrifolius</i>) COTONEASTER HIMALAYAN (<i>Cotoneaster simonsii</i>) COTONEASTER HOLLYBERRY (<i>Cotoneaster bullatus</i>) COTONEASTER SMALL-LEAVED (<i>Cotoneaster microphyllus</i>) All varieties have the same impact and are managed in the same way.</p> <p>Note: Refer to S7 General Survey Notes, Terms & Conditions</p>			

S5	SURVEY FINDINGS – PROBLEMATIC NON-LEGISLATED SPECIES
	Native plant species, not controlled by legislation, however often problematic in the construction industry. Highly invasive, persistent and known to cause damage to infrastructure.
	The area was inspected for other non-legislated species including Himalayan Knotweed and Buddleia. There was no evidence of these species during our inspection.

S5A	HORSETAIL (<i>Equisetum arvense</i>)			
	REF	AREA AFFECTED (m or m²)		GENERAL DESCRIPTION
		WITHIN THE SITE	OUTWITH THE SITE	
	N/A	-	-	No visible evidence at the time of our inspection.
	Additional Information:			
	Caveat for Horsetail Findings			
	<p>While there was no evidence of Horsetail, we would caveat our findings on the basis that rhizomes may be present below ground which only become apparent once site works commence. Horsetail tends to emerge particularly in wet boggy ground once soils have been disturbed, so vigilance should be maintained during development.</p> <p>For new footpath constructions we would recommend you consider a further inspection prior to works in these areas to check for any Horsetail rhizomes.</p> <p>Note: Our survey/management is based on the plant material visible at the time of our inspection. There may be instances where Horsetail was not apparent at the time of our works/survey due to environmental factors, such as it being outwith the growing season, vegetation being cut, maintained with herbicide, or being managed in an agricultural capacity. Similarly, rhizomes may be located below existing infrastructure such as roads, footpaths etc. We cannot guarantee locations which were not apparent at the time of our inspection.</p>			
	Note: Refer to S7 General Survey Notes, Terms & Conditions			

INVASIVE WEEDS SURVEY FINDINGS & RECOMMENDATIONS

ROTTERDAM WHARF, EDINGTON STREET, GLASGOW G4 9RD

REF: S4260

S6A SURVEY FINDINGS

There was no evidence of controlled species, such as Japanese Knotweed, Giant Hogweed & Himalayan Balsam during this survey.

3 large well established Cotoneaster infestations were identified within the survey area.

During our inspection, we could not find any visible evidence of the problematic native species Horsetail, however this is not unexpected at this time of year. You may wish to re-inspect during the next growing season.

S6B SURVEY RECOMMENDATIONS

Recommendations for Site Investigation Contractor

Regarding Cotoneaster we would advise that the risk of spread from these activities is low.

Should there be any concern or queries when carrying out the work, KleerKut can be contacted for guidance.

Recommendations for Developer

Cotoneaster is controlled by legislation in Scotland meaning that enforcement with 'clean up' orders can be put in place by regulatory bodies. This plant can be easily managed as part of a general vegetation clearance by following a few management rules. We recommend that a management programme is put in place and a sign-off for the works obtained.

We recommend that the developer/contractor agrees a suitable remediation strategy with a specialist contractor prior to commencing works on site.

ADDITIONAL INFORMATION

ROTTERDAM WHARF, EDINGTON STREET, GLASGOW G4 9RD

REF: S4260

S7 GENERAL SURVEY NOTES, TERMS & CONDITIONS

Our surveys are based on a visual inspection of the area. The purpose of the survey is to report the invasive weeds encountered during the inspection and appraise the risk to the user/developer. There is a risk that Invasive Species may be present but not evident, such as undergoing herbicide management, seeds or spores only, roots/rhizomes below ground with no visible vegetation and for this reason vigilance should be maintained by the developer at all times.

Our attached "Why Manage" Sheet/s will provide a basic overview of the constraints that you should be aware of.

Any sizes are approximate and based upon growth/evidence visible at the time of inspection. These measurements do not include the overall area affected by the rhizomes/roots and this can extend many metres from the main stands. The extent and depth of rhizomes will vary depending on ground and growing conditions.

Himalayan Balsam and Horsetail dies back quickly after autumn frosts and often little residue remains outwith the growing season, it can be difficult to find in winter months and early spring and may require a follow up inspection during the growing season where it is a risk.

Invasive weeds undergoing herbicide management can be difficult to find, KleerKut should be informed of any management being undertaken.

This report has been undertaken and written on behalf Mason Evans Partnership in the context of the purpose stated above and should not be used in any other context. In the event of any new information, change of legislation or working practice, we reserve the right to alter this report in whole or in part after its submission. In the event of any changes in circumstances or after the expiry of six months from the date of the report, it should be referred to us for reassessment and, if necessary, amendment.

The copyright in this report and accompanying drawings is owned by KleerKut Ltd and may not be reproduced, published, or adapted without our consent. Complete copies may, however, be made and distributed by the client as necessary when dealing with matters directly related to its commission.

S8 ABOUT KLEERKUT

We have specialised in the management of invasive weeds since 2006 and are now one of the UK leaders. We work with the NHS, various Local Authorities and many of the housebuilders and contractors. The success of our company in this area, is due to our understanding of invasive weeds and how they affect the construction industry. Our team includes engineers and project managers with extensive site experience who ensure that the operations side of the business always provides the best practical solution to the client.

We were invited to join the Property Care Association (PCA) where our directors sit on the UK's first Invasive Weeds Control Group. We have also been part of the Invasive Weed Education Strategy Group and examiners for the PCA's Certificated Surveyor of Japanese Knotweed (CSJK) accredited training programme.

Environment, Health and Safety, Quality Control – these are key areas of importance to us – which is why we achieved ISO 9001, 14001 & 18001. KleerKut are accredited members of SMAS Safe Systems in Procurement demonstrating our commitment to working safely in partnership with our clients and sub-

contractors. We are also members of Constructionline currently working on improving our status from Silver to Gold. By being members of the PCA our works are Government endorsed through their Trustmark scheme, allowing us to provide RICS and lender approved solutions and Insurance Backed Guarantees.

S9	SIGN OFF	
	<p>Report Written by: Tina Griffen Lloyd</p> <p>Signature: [REDACTED]</p>	<p>Date: 07/12/2023</p>

Appendices

Appendix A – Survey Location Plan

Appendix B – Survey Photographs

APPENDIX A – SURVEY LOCATION PLAN



Notes

 Cotoneaster

 KleerKut Ltd
 E: Info@kleerkut.co.uk
 T: 0141 319 8210

Client	Mason Evans Partnership	
Job	S4260 Rotterdam Wharf, Edington Street, Glasgow G4 9RD	
Title	Location Plan	
Date	06/12/2023	Rev

APPENDIX B – PHOTOGRAPHS FROM SURVEY



CT1 Cotoneaster



CT1 Cotoneaster



CT2 Cotoneaster



CT2 Cotoneaster



CT3 Cotoneaster



CT3 Cotoneaster

Appendix 03

**Records of Trial Pit Logs
(Mason Evans Partnership, December 2023)**



Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP01

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 1.5m

Ground Level
 40.36

Date
 08-12-23
 08-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258769.3
 N. 666734

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
				40.16	(0.20) 0.20	Concrete with rebar.	
0.40	TJ				(1.40)	MADE GROUND: Blackish brown, sand and gravel with rounded to sub-angular cobbles and gravels with frequent red bricks and metal fragments.	
1.50	TJ			38.76	1.60		

Remarks

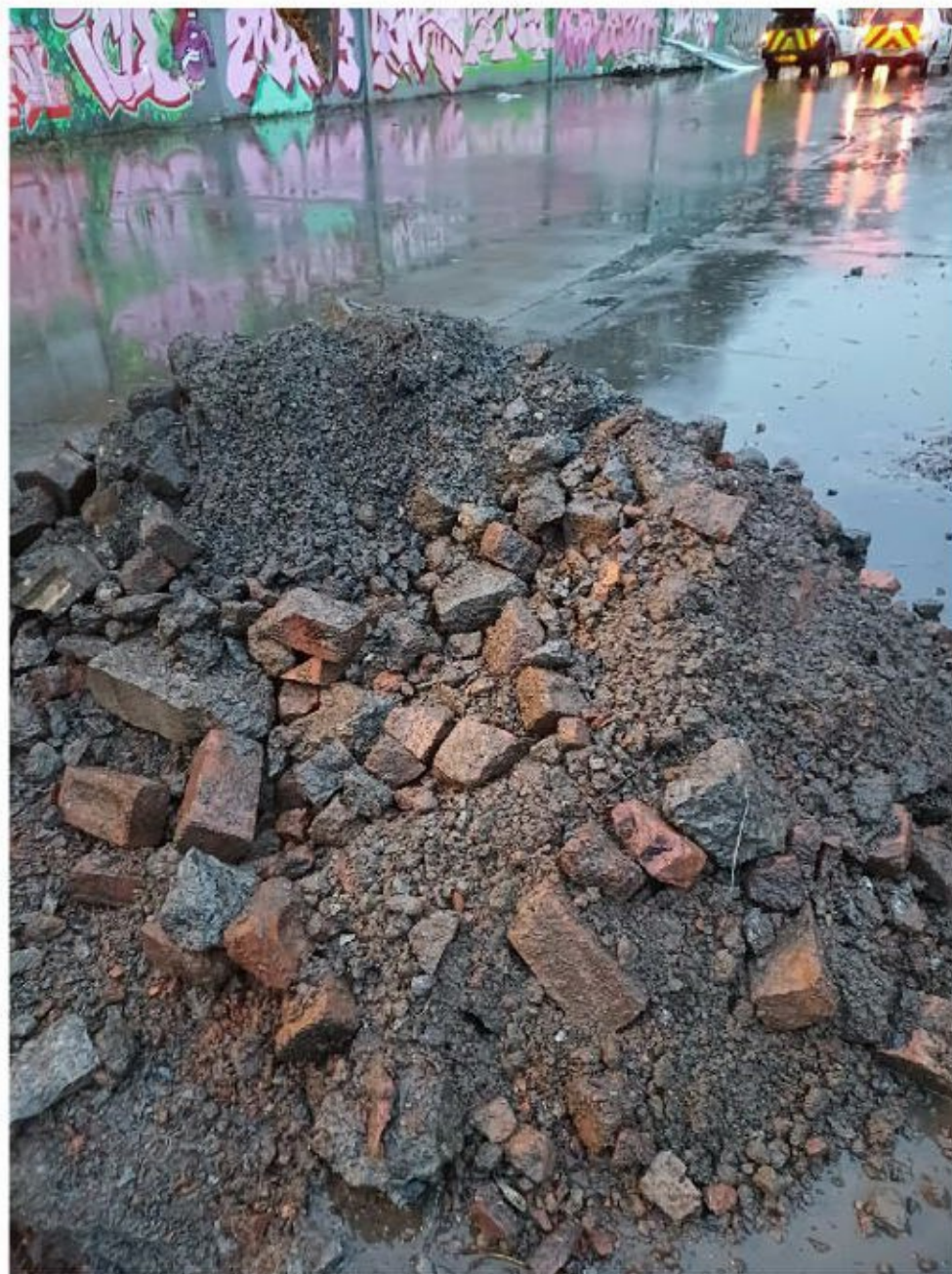
- Strength and density characteristics assessed by on-site engineer only.
- Pit terminated at 1.50 m due to concrete obstruction at base.
- Wall collapse was recorded at 0.6 m, with pit unstable to base
- No groundwater ingress recorded.
- No visual or olfactory evidence of contamination

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP01





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP01A

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 1.5m

Ground Level
 40.33

Date
 08-12-23
 08-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258772.6
 N. 666724.7

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
				40.13	(0.20) 0.20	Concrete with rebar.	
0.40	TJ				(1.40)	MADE GROUND: Brown, medium dense sand and gravel with rounded to sub angular cobbles and gravels with frequent broken red brick, ceramic and metal.	
1.50	TJ			38.73	1.60		

Remarks

1. Strength and density characteristics assessed by onsite engineer only.
2. Pit terminated at 1.50 m due to concrete obstruction at base.
3. Wall collapse recorded at 1.00m, with pit unstable to base.
4. No groundwater ingress recorded.
5. No visual or olfactory evidence of contamination.

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP01A





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP02

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 1.6m

Ground Level
 40.39

Date
 07-12-23
 07-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258776.9
 N. 666683

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ			40.19	(0.20) 0.20	Concrete (Tarmac) with rebar.	
				39.39	(0.80) 1.00	MADE GROUND: Brown, fine to coarse sand and gravel with broken red brick, intact bricks, metal and ceramic fragments.	
1.50	TJ			38.79	(0.60) 1.60	MADE GROUND: Black, fine to coarse sand and gravel with metal and bricks.	

Remarks

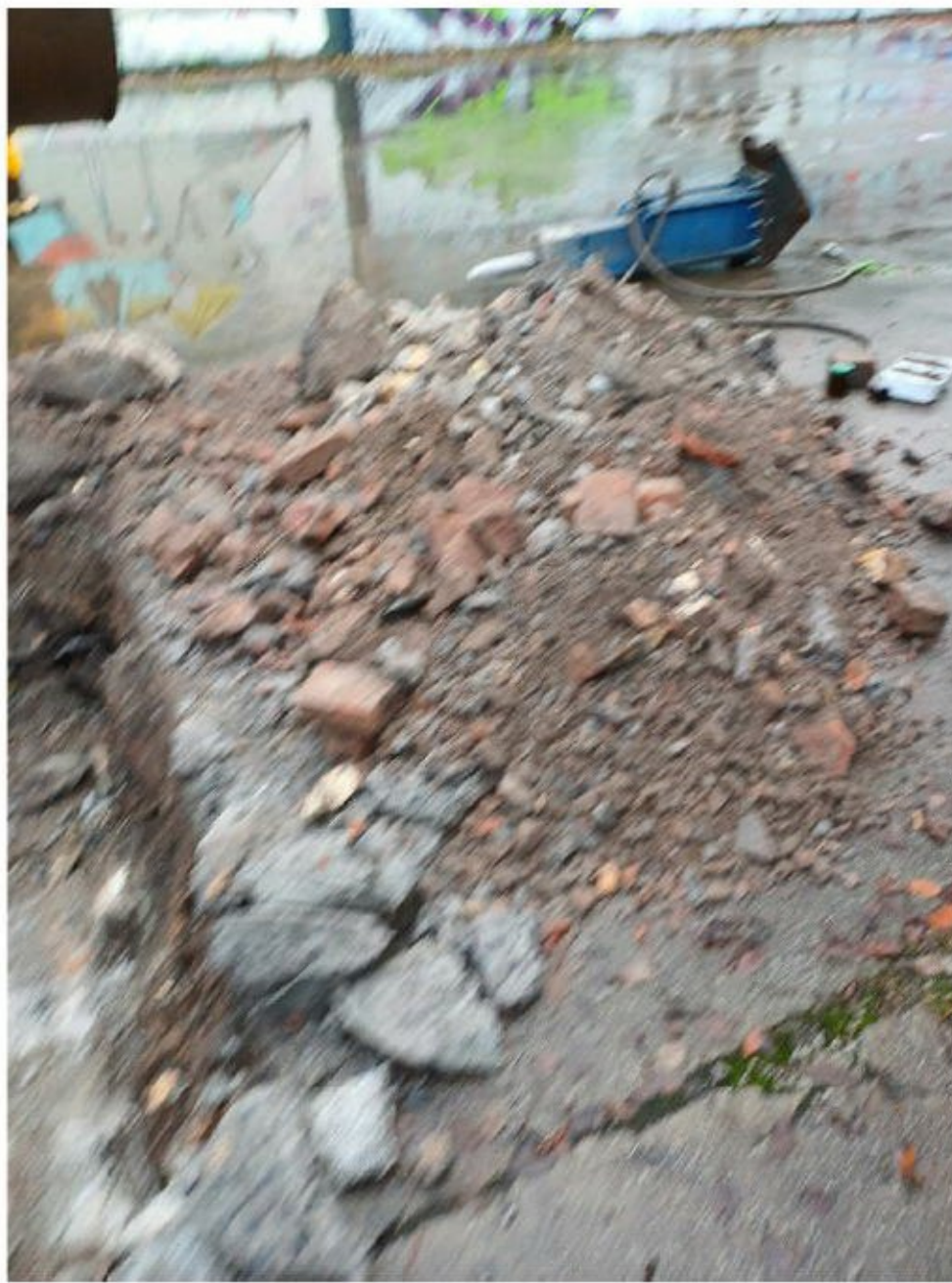
- Strength and density characteristics assessed by onsite engineer only.
- Pit terminated at 1.60 m due to concrete obstruction at base.
- Pit was stable at termination.
- No groundwater ingress recorded.
- No visual or olfactory evidence of contamination

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP02





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP03

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 3.3m

Ground Level
 40.37

Date
 08-12-23
 08-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258774.7
 N. 666642

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ			40.17	(0.20) 0.20	Concrete with rebar.	
				39.87	(0.30) 0.50	MADE GROUND: Brown, medium dense sand and gravel with rounded to sub-angular cobbles and gravels with frequent red brick.	
					(1.00)	MADE GROUND: Black, slightly clayey, gravelly sand with some sub rounded cobbles with plastic, metal and bricks.	
				38.87	1.50	MADE GROUND: Brown, fine sand with frequent broken red bricks.	
1.20	TJ						
2.20	TJ				(1.80)		
				37.07	3.30		

Remarks

- Strength and density characteristics assessed by onsite engineer only.
- Pit was terminated at 3.30 m due to wall collapse.
- Wall collapse recorded at 1.60 m, with pit unstable to base.
- No groundwater ingress recorded.
- No visual or olfactory evidence of contamination.

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP03





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP05

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 2m

Ground Level
 42.17

Date
 07-12-23
 07-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258790.6
 N. 666617.8

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ			41.57	0.60	MADE GROUND: Brown, clayey, gravelly sand with some rounded cobbles and frequent broken red brick, intact bricks, timber and plastic.	
1.00	TJ				(1.40)	MADE GROUND: Loose, blackish brown, sand and gravel with rounded to sub angular cobbles and gravels with ceramic, broken red brick and plastic.	
1.50	TJ			40.17	2.00		

Remarks

- Strength and characteristics assessed by onsite engineer only.
- Pit terminated at 2.00 m due to concrete obstruction at base.
- Slight wall collapse recorded at 2.00 m.
- Slow water ingress recorded at 2.00 m.
- No visual or olfactory evidence of contamination.

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP05





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site Rotterdam Wharf, Glasgow	Trial Pit No TP06			
Client Scottish Opera	Job No P22/271			
Excavation Method JCB 3CX	Trial Pit Dimensions 2m x 0.6m x 3.5m	Ground Level 42.29	Date 07-12-23 07-12-23	Sheet 1 of 1
Contractor Blackwood Plant Hire			Coordinates E. 258784.9 N. 666607.8	

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ				(1.60)	MADE GROUND: Blackish brown, sand and gravel with sub rounded to sub angular gravels and cobbles with broken red brick, broken reinforced concrete, ceramic and plastic.	
1.00	TJ			40.69	1.60		
1.70	TJ				(1.10)	MADE GROUND: Brown clayey, gravelly sand with broken red brick, broken reinforced concrete, ceramic and plastic.	
2.60	TJ			39.59	2.70		
				39.39	(0.20) 2.90	MADE GROUND: Concrete Slab.	
3.50	TJ				(0.80)	Firm blueish grey slightly silty, gravelly CLAY.	
				38.59	3.70		

Remarks 1. Strength and characteristics assessed by onsite engineer only. 2. Pit terminated at 3.5 m under engineers instruction. 3. Wall collapse recorded at 0.60 m. 4. No groundwater ingress was recorded. 5. No visual or olfactory evidence of contamination.	Plan

TP06





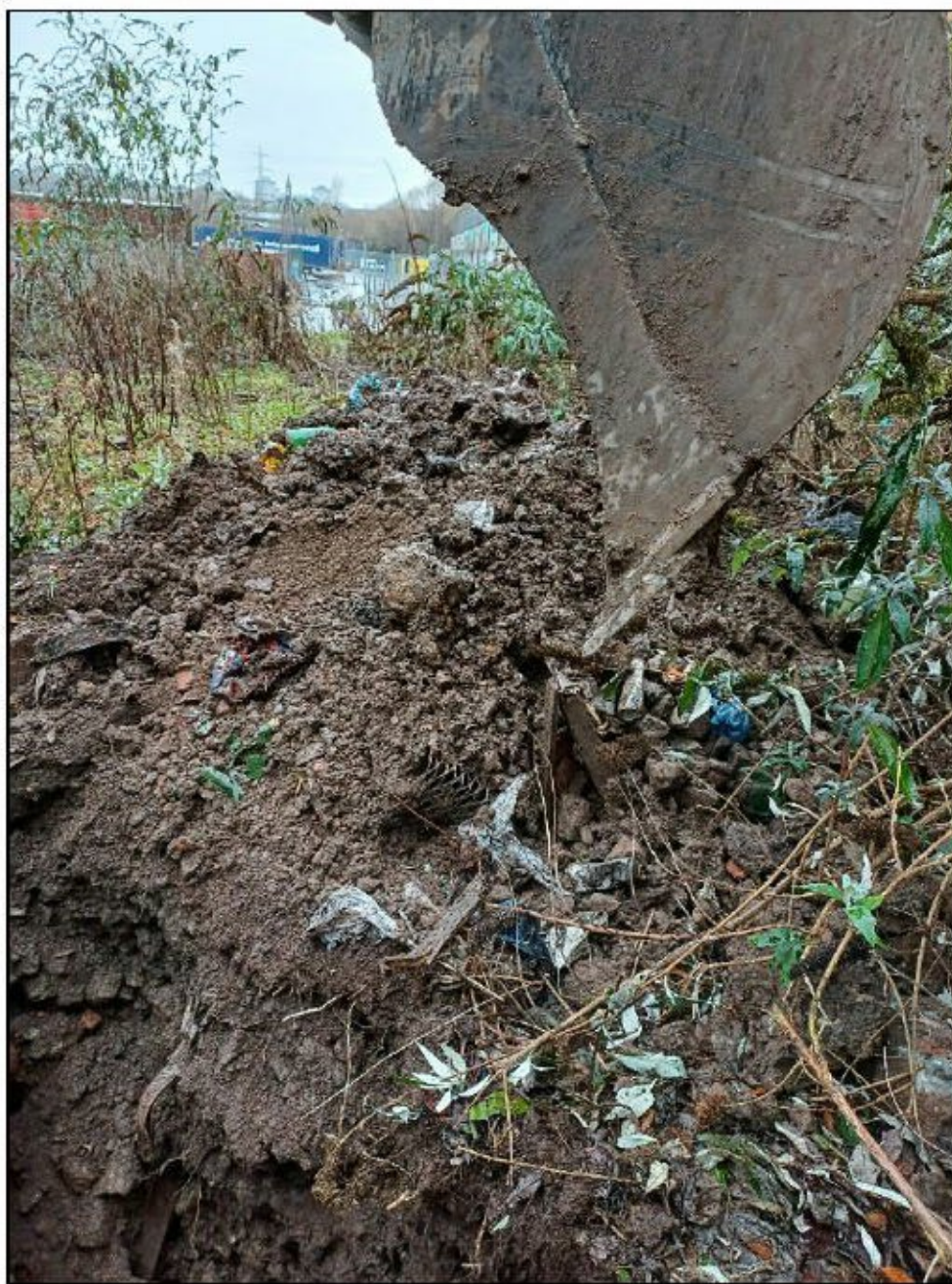
Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site Rotterdam Wharf, Glasgow	Trial Pit No TP07			
Client Scottish Opera	Job No P22/271			
Excavation Method JCB 3CX	Trial Pit Dimensions 2m x 0.6m x 2.7m	Ground Level 42.29	Date 07-12-23 07-12-23	Sheet 1 of 1
Contractor Blackwood Plant Hire			Coordinates E. 258788.9 N. 666605.8	

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ				(2.30)	MADE GROUND: Brown, loose to medium dense, sand and gravel with rounded cobbled and coarse to fine sub angular gravels with metal, glass, red bricks, ceramic fragments and plastic rubbish bags.	
1.50	TJ			39.99	2.30		
2.50	TJ			39.59	(0.40) 2.70	MADE GROUND: Brown, sandy, gravelly clay with broken red brick and ceramic fragments.	

Remarks 1. Strength and characteristics assessed by onsite engineer only. 2. Pit terminated at 2.70 m due to concrete obstruction at base. 3. Wall collapse recorded at 0.60 m. 4. No groundwater ingress recorded. 5. No visual or olfactory evidence of contamination.	Plan

TP07





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site Rotterdam Wharf, Glasgow		Trial Pit No TP08	
Client Scottish Opera		Job No P22/271	
Excavation Method JCB 3CX	Trial Pit Dimensions 2m x 0.6m x 2.3m	Ground Level 42.24	Date 07-12-23 07-12-23
Contractor Blackwood Plant Hire			Coordinates E. 258778.8 N. 666599.6

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
0.40	TJ			41.44	0.80	MADE GROUND: Blackish brown, gravelly sand with broken red brick and ceramic.	
1.10	TJ			39.94	2.30	MADE GROUND: Brown sand and gravel with frequent sub-angular cobbles and gravels with frequent broken red bricks and timber fragments.	

Remarks 1. Strength and characteristics assessed by onsite engineer only. 2. Pit terminated at 2.30 m due to concrete obstruction at base. 3. Pit was stable at termination. 4. No water ingress recorded. 5. No visual or offactory evidence of contamination.	Plan 	
	All dimensions in metres Scale 1:25	Logged By MF

TP08





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP09

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 3.5m

Ground Level
 35.98

Date
 08-12-23
 08-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258708.7
 N. 666752.3

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
				35.78	(0.20) 0.20	Tarmac.	
0.40	TJ			35.28	(0.50) 0.70	MADE GROUND: Greyish purple, gravel with sub angular gravels.	
1.20	TJ			34.48	(0.80) 1.50	Firm yellowish brown, gravelly, silty CLAY with some sub-angular gravels.	
2.00	TJ			32.48	(2.00) 3.50	Soft becoming Firm with depth reddish brown, gravelly, sandy CLAY with some sub-angular gravels.	

Remarks

- Strength and characteristics assessed by onsite engineer only.7
- Pit terminated at 3.50 m under engineers instruction.
- Pit was stable at termination.
- No groundwater ingress recorded.
- No visual or olfactory evidence of contamination.

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP09





Geo-Environmental Consultants
 t: 0141 420 2025 e: masonevans.co.uk
 The Piazza, 95 Morrison Street, Glasgow, G5 8BE

Site
 Rotterdam Wharf, Glasgow

Trial Pit No
TP10

Client
 Scottish Opera

Job No
 P22/271

Excavation Method
 JCB 3CX

Trial Pit Dimensions
 2m x 0.6m x 3.3m

Ground Level
 36.02

Date
 08-12-23
 08-12-23

Sheet
 1 of 1

Contractor
 Blackwood Plant Hire

Coordinates
 E. 258721.8
 N. 666736.2

Depth	Sample/Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend
				35.82	(0.20) 0.20	Tarmac.	
0.40	TJ			35.32	(0.50) 0.70	MADE GROUND: greyish purple gravel with sub-angular gravel.	
				34.52	(0.80) 1.50	Firm yellowish brown, gravelly, slightly silty CLAY with occasional sub-angular gravels.	
1.50	TJ			33.92	(0.60) 2.10	Firm brown, gravelly, silty CLAY with occasional sub-angular gravels.	
2.00	TJ			32.72	(1.20) 3.30	Soft reddish brown, sandy CLAY.	
2.50	TJ						

Remarks

- Strength and characteristics assessed by onsite engineer only.
- Pit was terminated at 3.30 m due to boulder obstruction at base.
- Wall collapse recorded at 2.20 m, with pit unstable to the base.
- No groundwater ingress recorded.
- No visual or olfactory evidence of contamination.

Plan

All dimensions in metres
 Scale 1:25

Logged By
 MF

TP11

