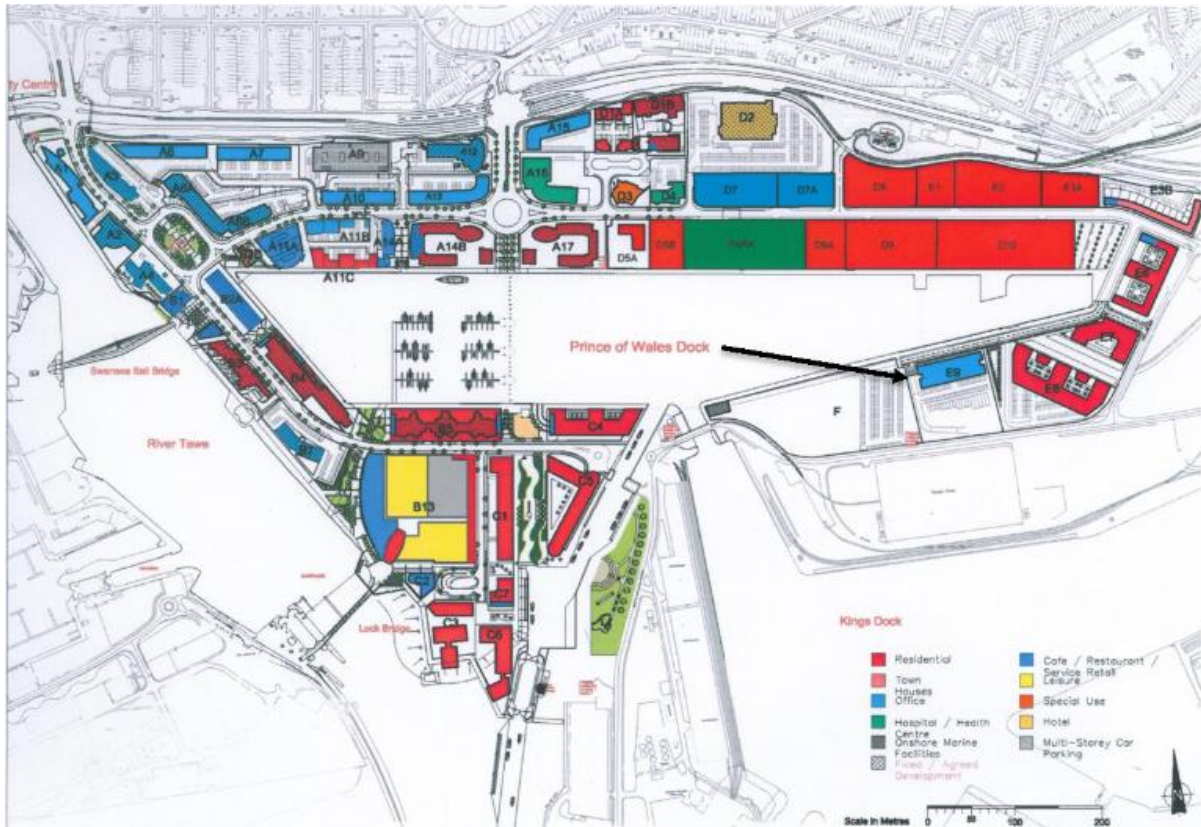




Site Investigation Case Study

Robyn Lewis 2309827

ACBA4001 Fundamentals of Construction Technology

8th January 2024

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Introduction

This preliminary study investigates the proposed development site of the next stage of University of Wales Trinity St Davids (UWTSD) campus development. This desk study aims to plan the scope of the site ground investigation by analysing the site location, the history, past and present uses, as well as the geological, environmental, and archaeological aspects that may cause detriment to the proposed planned development and to determine what foundation type would be suitable to support a substantial sized building on the underlying strata.

Site Details

The proposed site is centred on OS grid ref SS 67215 92800, it sits South of the Prince of Wales Dock and, the area has undergone considerable redevelopment from its time used as a dockland and port and has now become an urban district within the City Centre, known as 'SA1', housing national businesses, a private hospital, hotel, university, and residential homes.

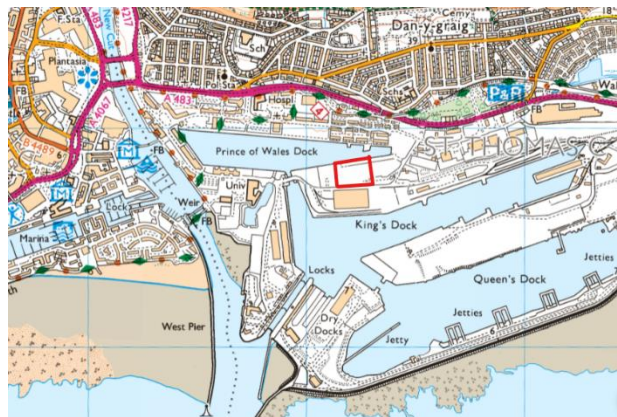


Figure 1 - Ordnance Survey Map with approximate development location edged Red (OSMaps.com, 2023)

Site Location

Bordered by the communities of St Thomas and Port Tenant, the site is situated parallel to Fabian Way, a major transport link for the City of Swansea. The Prince of Wales Dock lies East of the mouth of the river Tawe, in Swansea Bay, opening into the Bristol Channel.

Walkover Survey

A walkover survey conducted on 7th December 2023 shows that the site is currently inaccessible, the area was photographed from the East perimeter. The perimeter is fenced off and the access and security are managed by the Associated British Ports. Some regeneration has occurred on the North perimeter by way of a new highway and a tree lined paved public pathway.

Figure 2, taken on the walkover survey shows that there are no existing structures or buildings in situ, the site is slightly elevated with uneven, overgrown ground. Figure 3, dated 2012, shows remnants of rubble remain on site, which may not have been cleared in recent years. There is no indication on site of overhanging or underlying utilities.



Figure 2 - East perimeter photographed on walkover survey.



Figure 3 - Google Maps image dated 2012 of East perimeter. (GoogleMaps.com, 2023)

Present Land Use

There is currently no known usage of the development land. The land to the south appears occupied with warehouses and a building contractors' yard.

Historical Appraisal

Swansea dockland, once a bustling maritime hub, thrived in its prime with a vibrant shipping industry. Dating back to the 19th century, it facilitated the export of coal and other industrial materials. Sites throughout the docklands were previously owned by Associated British Ports, Great Western Railway, and Swansea Council. (Youle, 2018)

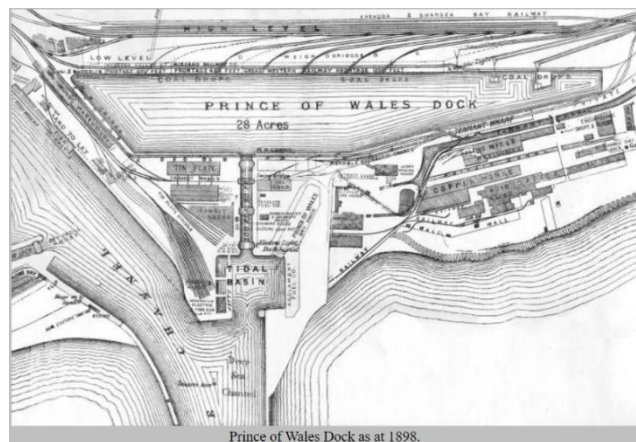


Figure 4 - Map of the Prince of Wales Dock dated 1898. (Swansea Dock, n.d.)

Prince of Wales Dock

The Prince of Wales Dock opened in 1881 (B.A.Malaws, 2013) and was used as a coal exporting port. Historical maps show the site in question over the late 19th and 20th Century; Figure 4 shows the location of the site in 1898. Labelled structures show that there were once Copper works and a Rolling Mill located directly on the site.

Dockland Railways

Figure 5 shows the addition of Kings dock in 1948, as well as the expansion of the railway lines on the Southwest perimeter of the Prince of Wales docks. The development site was covered in multiple railway lines.

These railway lines were prominent in the transport of Anthracite, Copper, Zinc and Iron from the South Wales Valleys to Swansea docklands, to be shipped across the world. (Rogerson, n.d.) The railway lines continued to access the dock until the 1970's. (Figure 6)

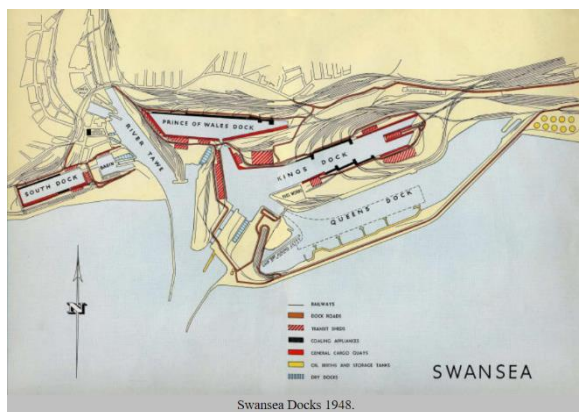


Figure 5 - Map of Swansea Docklands dated 1948. (Swansea Dock, n.d.)

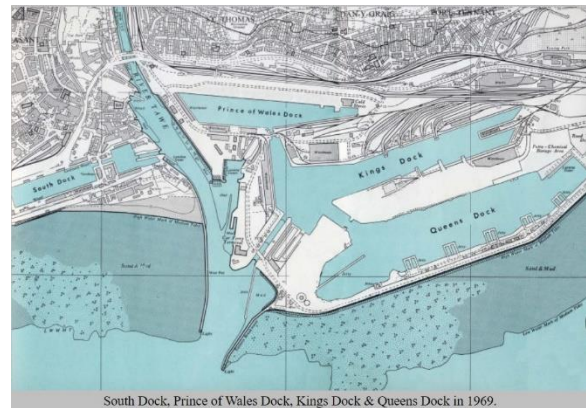


Figure 6 - Map of Swansea Dockland dated 1969. (Swansea Dock, n.d.)

Swansea dockland and WW2

Being a major British port, Swansea experienced a three-day long air raid by the German Luftwaffe, leading to significant damage, including at the docks. (Island Farm Wales, n.d.)

During the air raids on Swansea docks, many high explosive bombs were dropped, and the possibility of unexploded ordnance buried in Swansea dockland could be considered.

Geological Appraisal

Coal Mining

Coal Mining was a thriving industry throughout South Wales during the 19th and early 20th centuries and Swansea docks played a crucial role in the transportation and exporting of coal.

In a Coal Authority Mining Report dated 18th March 2012 (see Appendix 1) for the nearby location of Kings Road, the Coal Authority states that *'The authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.'*

A search using the Coal Authority interactive map viewer shows that the development site is within a coal mining reported area (Figure 7), however the site does not sit in



Figure 7 – Map showing Coal Mining Reported Area (The Coal Authority, n.d.)



Figure 8 – Map Showing areas of developmental risk hatched in Black and site location marked Red. (The Coal Authority, n.d.).

an area of developmental risk. (Figure 8)

Bedrock Geology

Research using the British Geological Survey Geology Viewer shows that the underlying bedrock is made up of Mudstone, Sandstone and Siltstone and quotes that the sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period. The superficial deposits on site are made up of sand and gravel. (British Geological Survey, n.d.)



Figure 9 - Extract map from BGS Geology viewer showing the mix of bedrock underlying the site. (British Geological Survey, n.d.)

Bore hole log report.

A bore hole log obtained from BGS, Reference SS89SE296 (see Appendix 2), was recorded directly on the site, with coordinates E267128, N192827.

The log shows records of 14 test bores, bored to a depth of up to 36feet. This is a shallow test log and further deeper test boring comes highly recommended.

There are layers of 'good hard clays' at a depth of 27ft and 'Blue' clay at a depth of 20ft.

Bore 3 shows 'Hard sandy clay with stones' at depth of 38ft.

Bore 5 shows records of clay and sand at depths of 17.5 ft and 23.5ft.

To obtain a better understanding of the deeper stratification, a bore hole log from nearby Paxton Street is available (see Appendix 3); this log shows that the ground, down to a depth of 7.95 meters, consists of dense sandy layers, with some gravel and traces of sand clay.

From 7.97meters to 18.60meters, the strata is described as stiff grey gravelly boulder clay. Boring continues further to 22m, the stratum at this depth is described by the driller as grey mudstone.

Environmental Appraisal

Potential Contamination

With the past industrial activities of the dock, railway lines, Copper works, and Tinplate rolling mill, the potential for land contamination is high. Improper landfill and waste disposal and contaminants like heavy metals, chemicals and oil residue may persists in the soil.

Risk of contamination are:-

- Human Health Risk – Health risks to nearby residents through pollutants in soil and water.
- Water contamination – contaminants can leach into groundwater, surface water or nearby water bodies, causing pollution and impacting aquatic ecosystems.

- Soil degradation – contaminants can harm soil quality, affecting the fertility and ability to support plant life.
- Ecological impact – contaminants may harm local flora and fauna, disrupting ecosystems and potentially leading to the decline or extinction of certain species.

Environmental Impact of construction

Construction is among the leading industries contributing the largest carbon footprint. (Banu Sizirici, 2021) Construction activities can contribute to carbon dioxide (CO₂) emissions through various processes. The burning of fuels for the energy consumption required of operating machinery, transporting materials and on-site activities released CO₂ into the atmosphere. Encouraging Conscious Construction practices would reduce the carbon footprint of the project.

Potential Ecological Damage

Excessive noise, particularly over a long period of time could become a nuisance to neighbouring residential homes on Langdon Road, north of the Prince of Wales dock. Noise pollution from the site could be caused by heavy machinery, vehicles, and loud voices.

Traffic to the site during construction may also impact the widespread area; The sites surrounding areas of St Thomas, Port Tenant, Jersey Marine, Fabian Way and the City Centre are densely occupied. Whilst the surrounding infrastructure is well equipped, additional traffic during peak times may have an effect on the immediate surrounding areas. Care must be taken when considering transport routes.

Vibrations caused from heavy machinery may also impact neighbouring properties; transmitted vibrations can become annoying for the local residents and could possibly affect surrounding structures. Damage to structures could possibly occur due to vibration induced settlement. (Svinkin, 2017)

Construction dust is a nuisance, but it can also cause ill health. Silica and Wood dust can have a detrimental effect on human health, the main diseases caused by construction dust are lung cancer, silicosis, and asthma. (Health and Safety, n.d.). Care must be taken to reduce dust levels for the benefit of the construction workers and neighbouring residents.

Potential Flood Risk

Prince of Wales Dock sits at the base of Kilvey Hill, a Sub Marilyn and is backed by Swansea Bay. The probability of rainwater flowing down the slopes of Kilvey Hill is likely.

Research via Nations Resource Wales, using the flood risk map, indicates that the left-hand side of the development site is at a high to medium risk of floods caused by surface waters and small watercourses. (Figure 9)

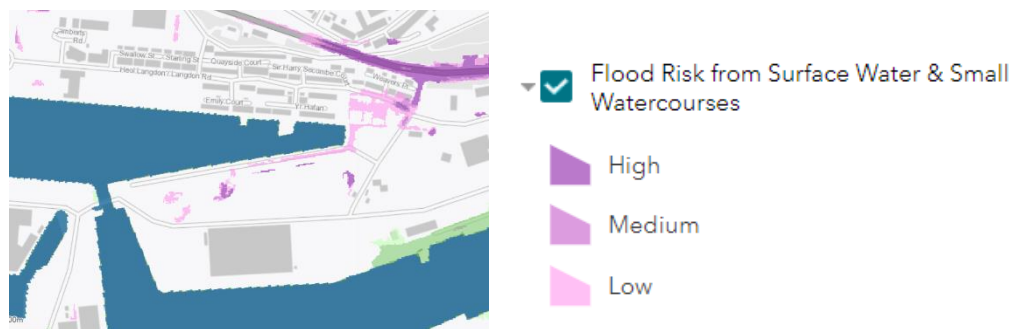


Figure 10 – Flood risk map (National Resource Wales, n.d.)

Potential Subsidence

Layers throughout the bore hole log show a mixture of clays and sandy gravels; Buildings constructed on clay soils are at risk of subsidence. Water tables can drop due to long dry spells, or water is sucked out of the soil by nearby trees. As the clay dries it contracts, pulling the foundations, and can result in a heave, where there is sideways displacement of the land which causes structural damage to the building. Geographically, Swansea is not susceptible to long hot summers, however, this risk would need to be considered.

Sites of Special Scientific Interest (SSSI)

Crymlyn Burrows is situated approximately 2 miles away from the development site. It is a Site of Special Scientific Interest which is managed by Swansea University. It is an important location along the Swansea Bay, which holds special interest in native flora, fauna, and the geological features. SSSI's are protected under the Wildlife and Countryside Act 1981. (The RYA, n.d.)

Archaeology Appraisal

Swansea is rich in archaeology and is home to the oldest human burial sites discovered in Western Europe. (Walker, 2023) Archaeological artefacts have been discovered near the development site in High Street, Castle Street and a Roman cooking pot was found in the alluvium along the edge of the North Dock. (Bowen, 2011). The potential of uncovering post-medieval archaeological findings is possible.

The nearby site of Morfa shopping area and the Swansea.com Stadium, lies on the historic Hafod-Morfa Copper Work, a major copper melting works which at the time, was the largest copper works in the world. (Black Mountains Archaeology, n.d.).

In a bid to regenerate the Kilvey Hill and its surroundings, redevelopment of the area began, back fill was excavated, and the underlying historical site was uncovered. It was discovered that cavities, engine beds, pits had been underlying the site and had not been properly managed, simply filled and covered over. Archaeology teams were



Figure 11 – Ariel view of a the Hafod-Morfa site showing underlying open cavities. (Nantel, 2023)

brought in to locate, map and document the findings; this was a vast site, and uncovering and properly managing the archival discovery took several years, having a significant impact on the timescales of the redevelopment programme. (Nantel, 2023)

Site Investigation Recommendations

Although previous dockland structures and railroad have been demolished, and the development site has been cleared and levelled, SA1 has been through many stages of regeneration, and surrounding site investigations have found remains of concrete and wooden post structures (Shobbrook, 2018). When also taking the nearby archaeological works at the Landore Copper works into consideration, it is possible that historical materials or structures may be present in the made ground in situ. It would be recommended for watching brief to occur during topsoil stripping, in line with BS7913:2013. (Chartered Institute for Archaeologists, 2014)

It is recommended to control surface water flooding in accordance with BS EN 752 and the Flood and Water Management Act 2012 (British Standard, n.d.). Upon further site investigations, soil permeability tests in line with BS 1377-5:1990 should be conducted to guide the designs of effective drainage systems as well as foundation design. (abg-geosynthetics.com, n.d.).

Inspection via an Inspection Pit would be recommended to locate the presence of buried utilities, in line with the guidance of HGS47. (Nantel, 2023)

Soil and groundwater sampling in accordance with the guidelines in BS 10175:2011 is recommended to investigate the potential of contaminated land on the site (Smith, 2021). When the sites heavy historical industry use is considered, the land could be contaminated by the spreading or burial of waste, the importation of contaminated material or spilled chemicals, this waste would require special treatment, outlined in BS 10175 and BS 8576. (Nantel, 2023)

Given the date of the Bore Hole Logs on the exact location of the site, it would be recommended for further investigations by way of updated boring tests to be carried out. It is established that there has been substantial activity on the site since 1880, by way of industrial locomotives, works, WW2 bombings and regeneration. Updated testing bore hole logs would indicate if any of these activities have had a detrimental effect on the proposed development site. Boring should be carried out in line with the guidance stipulated in BS 5930:2015. (The British Standard Institution, 2015)

Summary - Foundation recommendation

UWTSD intends to build a substantial building to house 10 lecture rooms and 4 lecture theatres, the size and weight of the building is going to have an impact on the choice of foundations; in this instance, piling foundations would be recommend for the scale of the building. Reinforcing the pile with Steel rebar will enhance the structural capacity of the pile, allowing it to hold a heavier load (Nantel, 2023)

After analysing the data in the bore hole logs, the land on site is considered 'made' anthropogenic ground, with loose sands and clay; Friction piles would be recommended to mitigate the risks of subsidence that come with bearing on the dense layer of clay and loose sandy soil. Friction piles are also considered suitable when harder layers are too deep (Nantel, 2023).

By distributing the load to the surrounding soil along the length of the piles, friction piles help minimise any settlement issues in compressible soils like clay whilst offering adequate shear resistance. By transmitting the load along the length of the pile instead of the base, this in return, is reducing the 'bulb of pressure' (Nantel, 2023)

Replacement piles would be suitable as we are working with loose grainy soils. It is recommended to cast reinforced concrete piles in situ in clusters. Continuous Flight Augured (CFA) piles would be recommended to minimise construction timescales and costs. Cast in place concrete piles may be constructed in supported or unsupported borings. BS 8004:2015. (geotechnicaldesign.info, n.d.) The loose subsoils would call for casing to support the boring walls to prevent the possibility of collapse.

Clusters of piles would need to be 'capped' with pile caps; The pile caps 'tie' the bored piles together which helps to equally distribute the load of the building and keep the piles vertical. (Nantel, 2023).

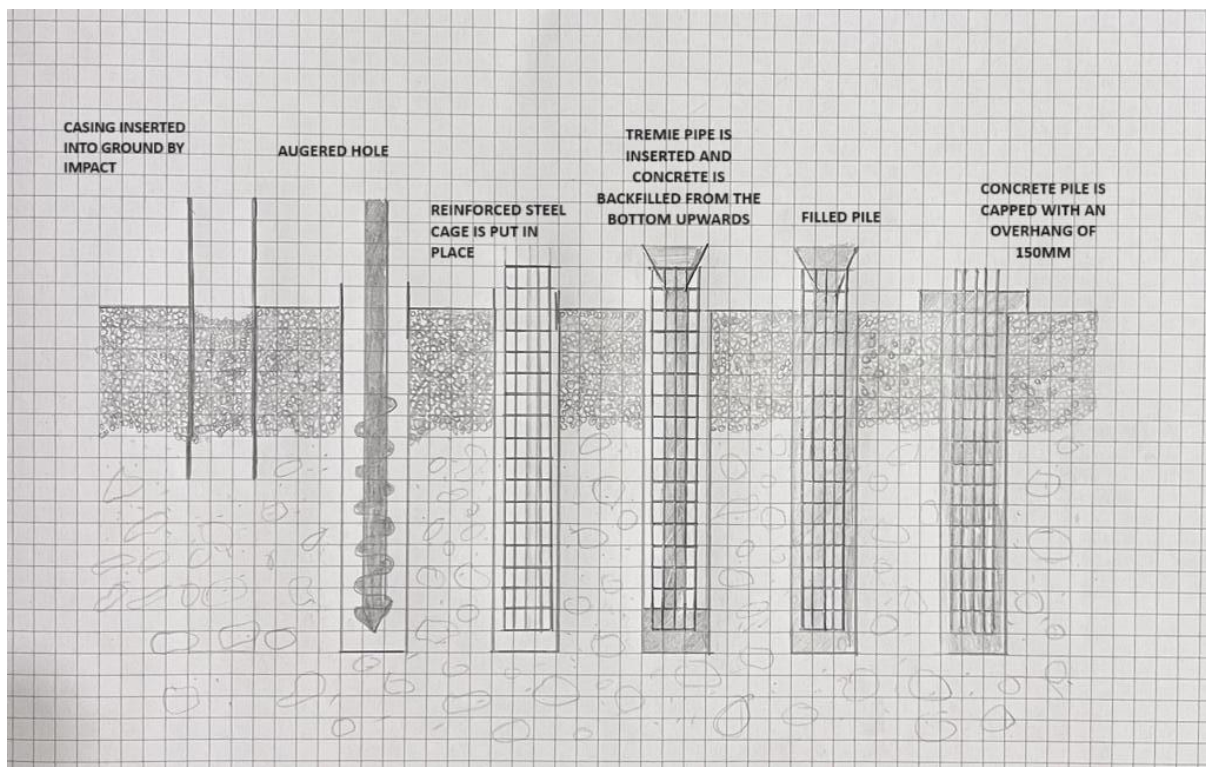


Figure 12 Hand drawn diagram of the recommended concrete foundation piles.

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Figure 2 - East perimeter photographed on walkover survey.

Figure 3 - Google Maps image dated 2012 of East perimeter. (GoogleMaps.com, 2023)

Figure 4 - Map of the Prince of Wales Dock dated 1898. (Swansea Dock, n.d.)

Figure 5 - Map of Swansea Docklands dated 1948. (Swansea Dock, n.d.)

Figure 6 - Map of Swansea Dockland dated 1969. (Swansea Dock, n.d.)

Figure 7 – Map showing Coal Mining Reported Area (The Coal Authority, n.d.)

Figure 8 – Map Showing areas of developmental risk hatched in Black and site location marked Red. (The Coal Authority, n.d.).

Figure 9 - Extract map from BGS Geology viewer showing the mix of bedrock underlying the site. (British Geological Survey, n.d.)



The Coal
Authority

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848 DX 716176 MANSFIELD 5

HYDER CONSULTING LTD
3 KEW COURT
PYNES HILL
EXETER
EX2 5AZ

Our reference: **51000806742001**
Your reference:
Date of your enquiry: **18 March 2015**
Date we received your enquiry: **18 March 2015**
Date of issue: **18 March 2015**

This report is for the property described in the address below and the attached plan.

Non-Residential Coal Authority Mining Report

APARTMENT 100, SOUTH QUAY, KINGS ROAD, SWANSEA, SA1 8AL

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Coal mining	See comments below
Brine Compensation District	No

Information from the Coal Authority

Underground coal mining

Past

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground workings.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.



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Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional Remarks

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006.

The Coal Authority owns the copyright in this report. The information we have used to write this report is protected by our database right. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

Issued by:	The Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG
Tax Point Date:	18 March 2015
Issued to:	HYDER CONSULTING LTD 3 KEW COURT PYNES HILL EXETER EX2 5AZ
Property Search for:	APARTMENT 100, SOUTH QUAY, KINGS ROAD, SWANSEA, SA1 8AL
Reference Number:	51000806742001
Date of Issue:	18 March 2015
Cost:	£59.00
VAT @ 20%:	£11.80
Total Received:	£70.80
VAT Registration	598 5850 68

Map images are being sent under separate cover



*11012) W1.50370/0370 10,000 0/39 A & B.W.Ltd. Gp.685

RECORD OF ~~SHAFT OR~~ ^{TRIAL} BORES FOR MINERALS

and Number of Shaft or Bore given by Geological Survey:

~~Swansea Harbour, East Docks~~ ^{Swansea Harbour, East Docks}

Name and Number given by owner (if different from above):

Swansea Harbour, East Docks

Town or Village SWANSEA Date of sinking

Exact site see tracing

Purpose for which made location of foundations for lock with etc.

Level at which bore commenced relative to O.D. 267.179 If not down bore, state if horizontal or up

Made by for Messrs

Information from M.A. Schenk (Resident Engineer) Date received 1930

Specimens for Dip of strata for

GEOLOGICAL CLASSIFICATION	DESCRIPTION	Thickness	Depth
~~SS69SE 292~~	<u>NO.1 Bore</u> <u>83.0 A.D.</u> <u>small running gravel</u> <u>66469 92921</u>	<u>4.0</u>	<u>4</u>
	<u>dirty sand</u>	<u>8.50</u>	<u>12.50</u>
	<u>coarse sand with stones</u>	<u>9.50</u>	<u>22.00</u>
~~SS69SE 293~~	<u>NO.2 Bore</u> <u>85.97 A.D.</u> <u>mid s. gravel</u> <u>66635 92984</u>	<u>6.00</u>	<u>6.00</u>
	<u>gravel</u>	<u>6.00</u>	<u>12.00</u>
	<u>clay</u>	<u>3.00</u>	<u>15.00</u>
	<u>gravel</u>	<u>1.50</u>	<u>16.50</u>
	<u>coarse sand & stones</u>	<u>7.00</u>	<u>24.00</u>
~~SS69SE 294~~	<u>NO.3 Bore</u> <u>100.37 A.D.</u> <u>sand & stones</u> <u>66959 92950</u>	<u>10.00</u>	<u>10.00</u>
	<u>peat & clay</u>	<u>3.00</u>	<u>13.00</u>
	<u>fine gravel</u>	<u>13.00</u>	<u>26.00</u>
	<u>clay</u>	<u>3.00</u>	<u>29.00</u>
	<u>gravelly sand</u>	<u>5.00</u>	<u>34.00</u>
	<u>hard sandy clay with some stones</u>	<u>4.00</u>	<u>38.00</u>
~~SS69SE 295~~	<u>NO.4 Bore</u> <u>104.11 A.D.</u> <u>lipped ashes from works</u> <u>67179 92834</u>	<u>7.00</u>	<u>7.00</u>
	<u>peat & sand</u>	<u>12.00</u>	<u>19.00</u>
	<u>hard sandy clay</u>	<u>1.00</u>	<u>20.00</u>
~~SS69SE 296~~	<u>NO.5 Bore</u> <u>99.64 A.D.</u> <u>chalk & cinders</u> <u>67128 92827</u>	<u>1.50</u>	<u>1.50</u>
	<u>cinders</u>	<u>2.00</u>	<u>3.50</u>
	<u>small gravel</u>	<u>2.00</u>	<u>5.50</u>
	<u>peat</u>	<u>7.50</u>	<u>13.00</u>
	<u>sand & blue clay</u>	<u>1.50</u>	<u>14.50</u>
	<u>clay & sand with some stones</u>	<u>6.00</u>	<u>20.50</u>
	<u>fine gravel</u>	<u>5.00</u>	<u>25.50</u>
	<u>clay & fine gravel</u>	<u>2.00</u>	<u>27.50</u>
	<u>clay & small gravel</u>	<u>2.00</u>	<u>29.50</u>
	<u>gravel</u>	<u>4.00</u>	<u>33.50</u>

GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.

G.S.M. Office
File No.

Site marked
on 6" Map by

Site marked
on 1" Map by

(*11332) WL30370,0370 10,000 0/30 A & R.W.Ltd. Gp. 683		N.G.R. 667 926		SS 69 SE/4 292-305	
Name and Number of ~~Sheet~~ Bore given by Geological Survey				County Glamorgan	
Prince of Wales Dock, Swansea Trial Bore				6" Quarter Sheet 24 NW, 30	
GEOLOGICAL CLASSIFICATION	DESCRIPTION	THICKNESS	DEPTH	THICKNESS	DEPTH
		feet			
	Nº 6 Bore ^{local} 79.82 ^{add} 66891 92810				
	clay	4.00	4.00		
	peat	5.00	9.00		
	blue clay	8.00	17.00		
	clay & sand with stones	10.00	27.00		
	Nº 7 Bore ^{local} 84.60 ^{add} 66741 92809				
	clay	7.50	7.50		
	sand & gravel	1.50	9.00		
	gravel	3.00	12.00		
	sand & gravel	2.00	14.00		
	clay & sand with stones	10.00	24.00		
	coarse sand with some stones	6.00	30.00		
	Nº 8 Bore ^{local} 82.60 ^{add} 66731 92684				
	clay	4.00	4.00		
	clay & sand	4.00	8.00		
	sand & gravel	1.00	9.00		
	blue clay	3.00	12.00		
	gravel	3.00	15.00		
	sand & gravel	5.00	20.00		
	coarse sand with some stones	10.00	30.00		
	Nº 9 Bore ^{local} 81.12 ^{add} 66643 92595				
	clay	5.00	5.00		
	gravel	6.00	11.00		
	sand	3.50	14.50		
	sand & gravel	12.50	27.00		
	Nº 10 Bore ^{local} 84.60 ^{add} 66822 92578				
	clay	5.00	5.00		
	gravel	7.60	12.60		
	sand & some gravel	14.40	27.00		
	Nº 11 Bore ^{local} 77.54 ^{add} 66717 92481				
	sand & gravel	2.00	2.00		
	sand with fine gravel	11.00	13.00		
	gravel with some sand	2.00	15.00		
	sand & gravel	2.00	17.00		
	blue clay	1.00	20.00		
	coarse sand with some stones	8.00	28.00		
	Nº 12 Bore ^{local} 76.47 ^{add} 66712 92455				
	coarse gravel	5.00	5.00		
	crumbling sand	2.00	7.00		
	gravel	8.00	15.00		
	coarse sand & clay with stones	4.50	19.50		
	sand & fine gravel	3.50	23.00		
	good hard sandy clay	4.00	27.00		



SS69SE 292-305
County Glamorgan
Quarter Sheet 24 EW

24

DESCRIPTION

THICKNESS	DEPTH
feet	feet
local No. 13 Bore 74.68 66757 92375	1.00
	7.00
	9.00
	2.00
	1.00
	6.00
fine grey sand with some small stones	26.00
local No. 14 Bore 72.56 66740 92314	1.00
fine brown sand	7.00
gravel	3.00
blue clay	2.50
gravel	1.00
running sand	6.00
shingle, sand and gravel	2.50
beacon sandy clay	2.00
sand and fine gravel	

~~SS69SE/4~~ 292-305

247/68

(copy)

Prince of Wales Dock, SWANSEA

East docks, Swansea.

24 NW
SS-69-SE

(dated 1880) from Mr. Schenk.

~~292~~
N°1 Bore 83.0 OD
small running gravel 4.0 4.0
dirty sd. 9.80 12.80
case sd. w stt. 9.50 22.00

~~SS69SE/4~~
N°2 Bore 85.97 OD
med. gravel 6.0 6.0
gravel 6.0 12.0
clay 3.0 15.0
gravel 1.50 16.50
case. sd. w stt. 7.50 24.0

~~293~~
N°3 Bore 100.37 OD
sd. w stt. 10.0 10.0
peat & clay 3.0 13.0
fine gravel 13.0 26.0
clay 3.0 29.0
gravelly sd 5.0 34.0
hardy clay w some stt. 4.0 38.0

~~294~~
N°4 Bore 104.11 OD 10.411 OD
tipped ash 7.0 7.0
peat & sd 12.0 19.0
hardy clay 1.0 20.0

~~295~~
N°5 Bore 99.64 OD 9.964 OD
chalk & cinders } Made Ground 1.50 1.5
cinders 5.0 6.5
small gravel 2.0 8.5
peat 7.50 16.0
sd & blue clay 1.5 17.5
clay & sd w some stt. 6.00 23.5
fine gravel 5.00 28.0
clay & fine gravel 2.0 30.0
clay & small gravel 2.0 32.0
gravel 4.0 36.0

~~296~~
N°6 Bore 79.82 OD 7.982 OD
clay 4.0 4.0
peat 5.0 9.0
blue clay 8.0 17.0
clay & sd w stt. 10.0 27.0

~~297~~
N°7 Bore 84.60 OD 8.460 OD
clay 7.50 7.50
sd & gravel 1.5 9.0
gravel 3.0 12.0
sd & gravel 2.0 14.0
clay & sd w stt. 10.0 24.0
case sd w some stt. 6.0 30.0

~~298~~
N°8 Bore 82.60 OD 8.260 OD
clay 4.0 4.0
clay & sd 4.0 8.0
sand & gravel 1.0 9.0
blue clay 3.0 12.0
gravel 3.0 15.0
sd & gravel 5.0 20.0
case. sd w some stt. 10.0 30.0

~~299~~
N°9 Bore 81.13 OD 8.113 OD
clay 5.0 5.0
gravel 6.0 11.0
sand 3.5 14.5
sd & gravel 12.5 27.0

~~300~~
N°10 Bore 84.60 OD 8.460 OD
clay 5.0 5.0
gravel 7.6 12.6
sd & some gravel 14.4 27.0

~~301~~
N°11 Bore 77.54 OD 7.754 OD
sd & gravel 4.0 4.0
sd & fine gravel 11.0 15.0
gravel w some sd. 2.0 17.0
sd & gravel 2.0 19.0
blue clay 1.0 20.0
case sd w some stt. 8.0 28.0

~~302~~
N°12 Bore 76.47 OD 7.647 OD
case gravel 5.0 5.0
running sd. 2.0 7.0
gravel 8.0 15.0
case sd & clay w stt. 4.5 19.5
sd & fine gravel 3.5 23.0
good hardy clay 4.0 27.0

SS69SE/4
292-305

Prince of Wales Dock, Swansea (continued)

No. 13 Bore 74.68 OD.

? 7.468 OD.

sd
gravel
running sd
fine gravel
sd
see dirty sd is a few small stt.

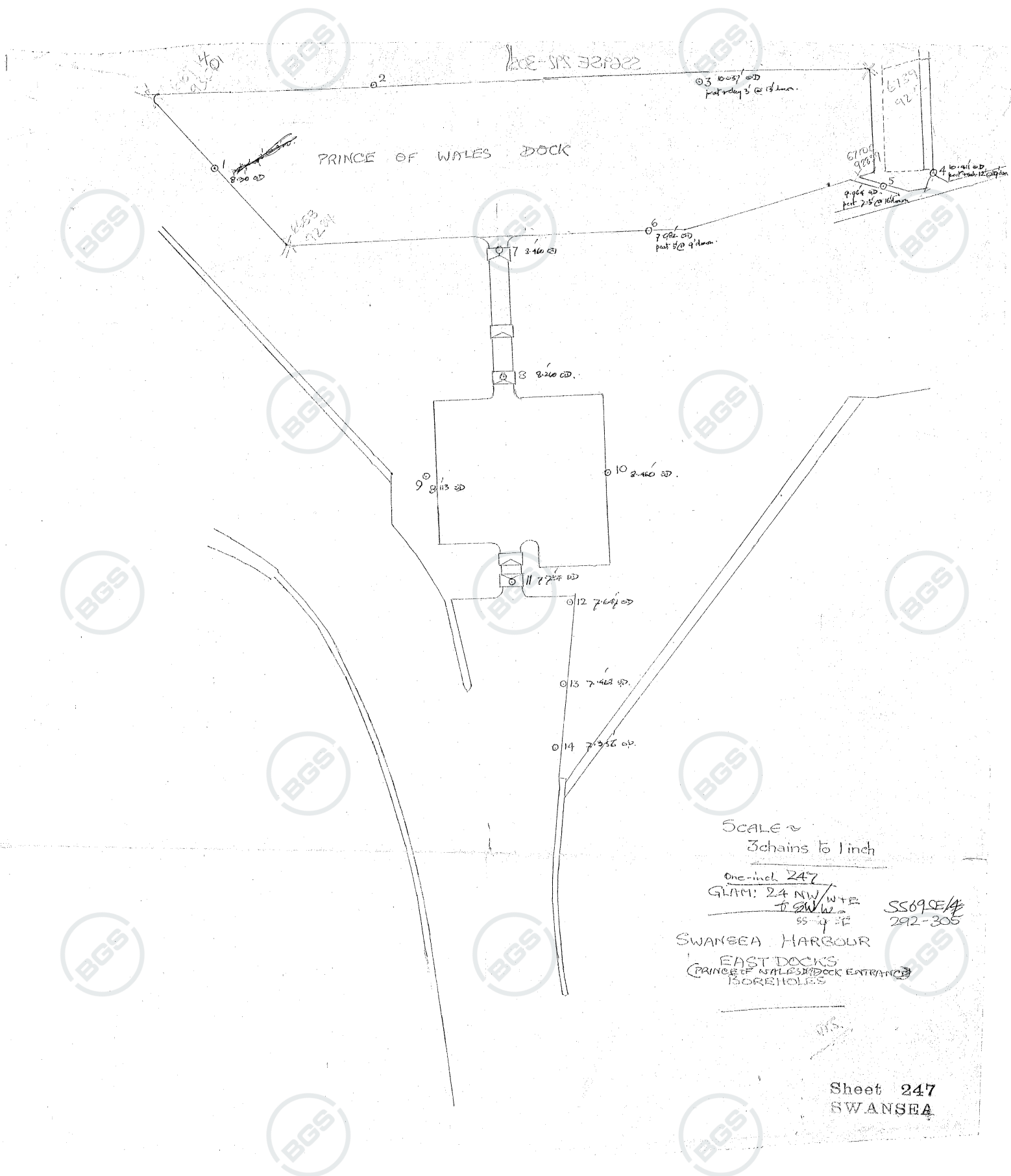
1.0	1.0
7.0	8.0
9.0	17.0
2.0	19.0
1.0	20.0
6.0	26.0

No. 14 Bore 73.56 OD

? 7.366 OD.

see bore sd
gravel
blue clay
gravel
running sd
shingle, sd & gravel
brown sd & clay
sd & fine gravel

1.0	1.0
6.0	7.0
3.0	10.0
2.5	12.5
1.0	13.5
6.0	19.5
2.5	22.0
2.0	24.0







(S1932) Wt.30370/0370 10,000 9/39 A & E.W.Ltd. Cp.685

RECORD OF ~~SHAFT OR~~ TRIAL BORES FOR MINERALS ①

and Number of Shaft or Bore given by Geological Survey:
~~Swansea Harbour, East Docks~~ **Prince of Wales Dock**
Swansea

Name and Number given by owner (if different from above):
Swansea Harbour, East Docks

Town or Village **SWANSEA** Date of sinking _____

Exact site **See trapping**
SS - 66/67, 92

Purpose for which made **location of foundations for dock walls etc.**

Level at which bore commenced relative to O.D. **26.50** If not down bore, state if horizontal or up _____

Made by _____ for Messrs. _____

Information from **Mr. A. Schenk (Resident Engineer)** Date received **1980**

Specimens _____ Dip of strata _____

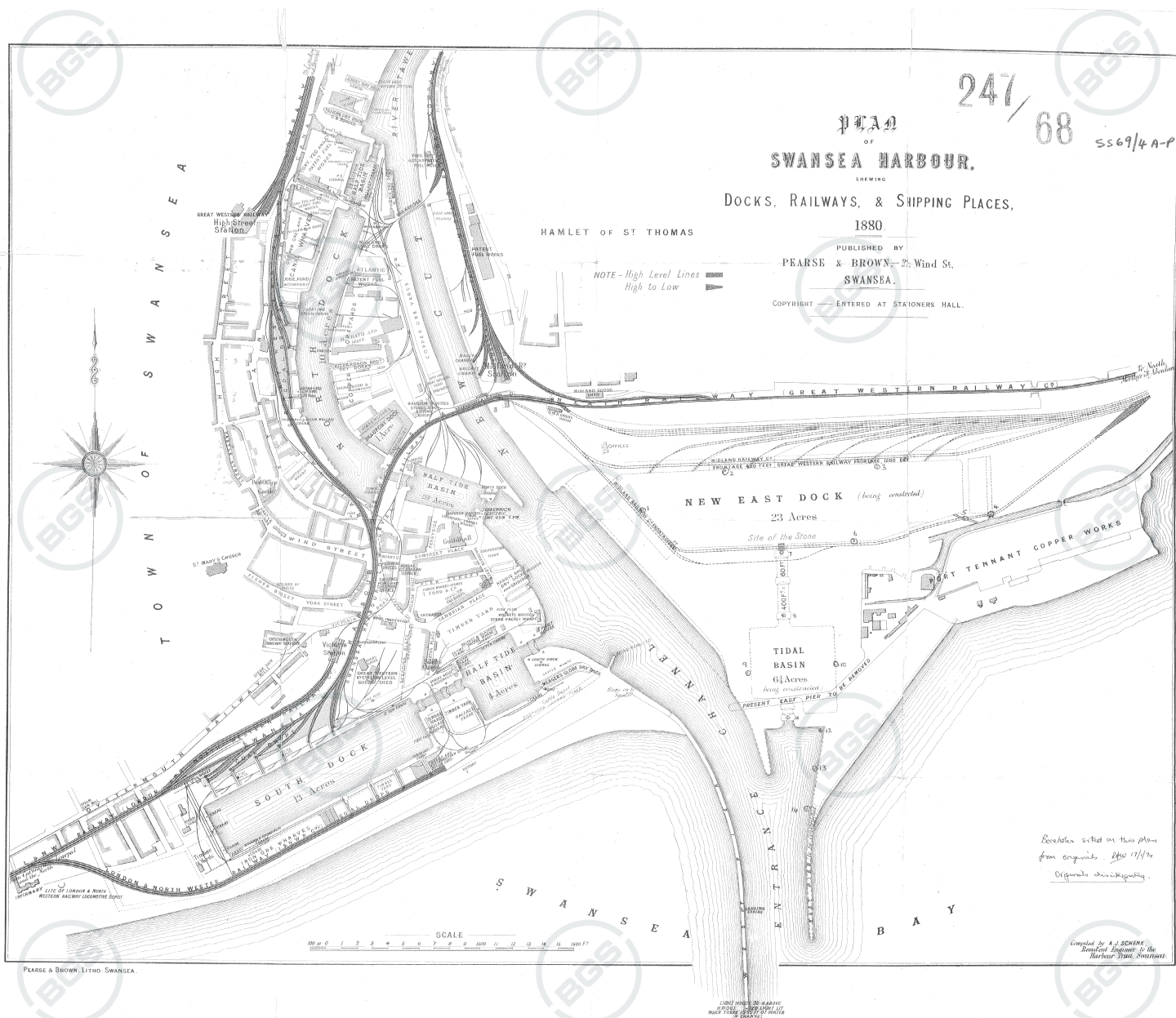
County **Glamorgan**
6" Quarter Sheet **24/NEW**
1" N.S. Geol. Map **247**
1" O.S. Geol. Map _____
Whether Confidential **No**

A sketch-map or tracing from a large-scale map is desirable.

GEOLOGICAL CLASSIFICATION	DESCRIPTION	THICKNESS		DEPTH	
		ft	m	ft	m
SS6647 9294	A. No. 1 Bore 83.0 AD local small running gravel dirty sand coarse sand with stones	4.0	—	4	—
		8.50		12.50	
		9.50		22.00	
SS6675 9299	B. No. 2 Bore 85.97 AD local mud & gravel gravel clay gravel coarse sand & stones	6.00		6.00	
		6.00		12.00	
		3.00		15.00	
		1.50		16.50	
		7.50		24.00	
SS6716 9296	C. No. 3 Bore 100.37 AD local sand & stones peat & clay fine gravel clay gravelly sand hard sandy clay with some stones	10.00		10.00	
		3.00		13.00	
		13.00		26.00	
		3.00		29.00	
		5.00		34.00	
		4.00		38.00	
SS6736 9289	D. No. 4 Bore 104.11 AD local tipped ashes from works peat & sand hard sandy clay	7.00		7.00	
		12.00		19.00	
		1.00		20.00	
SS6732 9288	E. No. 5 Bore 99.64 AD local chalk & cinders cinders small gravel peat sand & blue clay clay & sand with some stones fine gravel clay & fine gravel clay & small gravel gravel	1.50		1.50	
		5.00		6.50	
		2.00		8.50	
		7.50		16.00	
		1.50		17.50	
		6.00		23.50	
		5.00		28.50	
		2.00		30.50	
		2.00		32.50	
		4.00		36.50	

GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.

G.S.M. Office File No.	Site marked on 6" Map by	Site marked on 1" Map by
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SS69/0
A-P

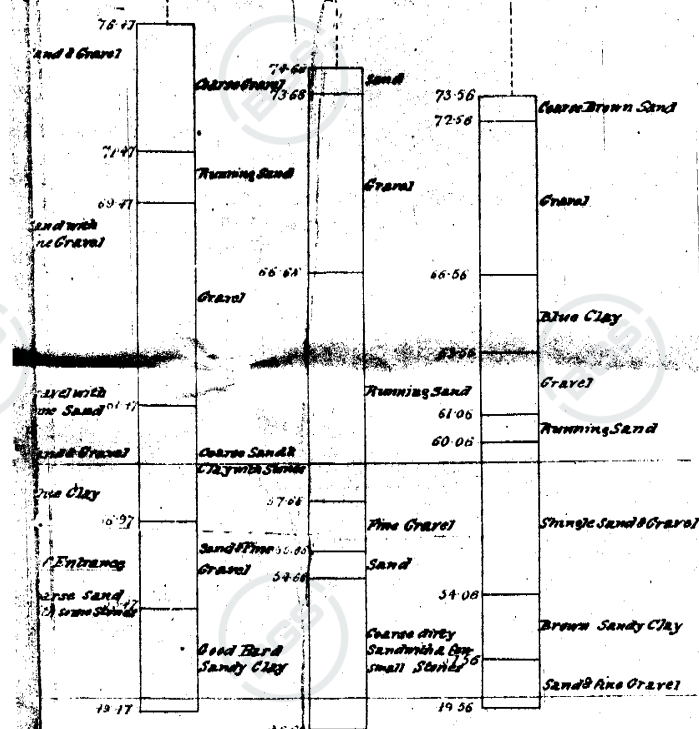
247
98
OLES

Communicated by Mr. H. Schenk
(Resident Engineer) 1880.
Wichita

12

13

14



These Xeroxed copies
have been kept due
to the deterioration
of originals.

SS69/18
A-P

90

90

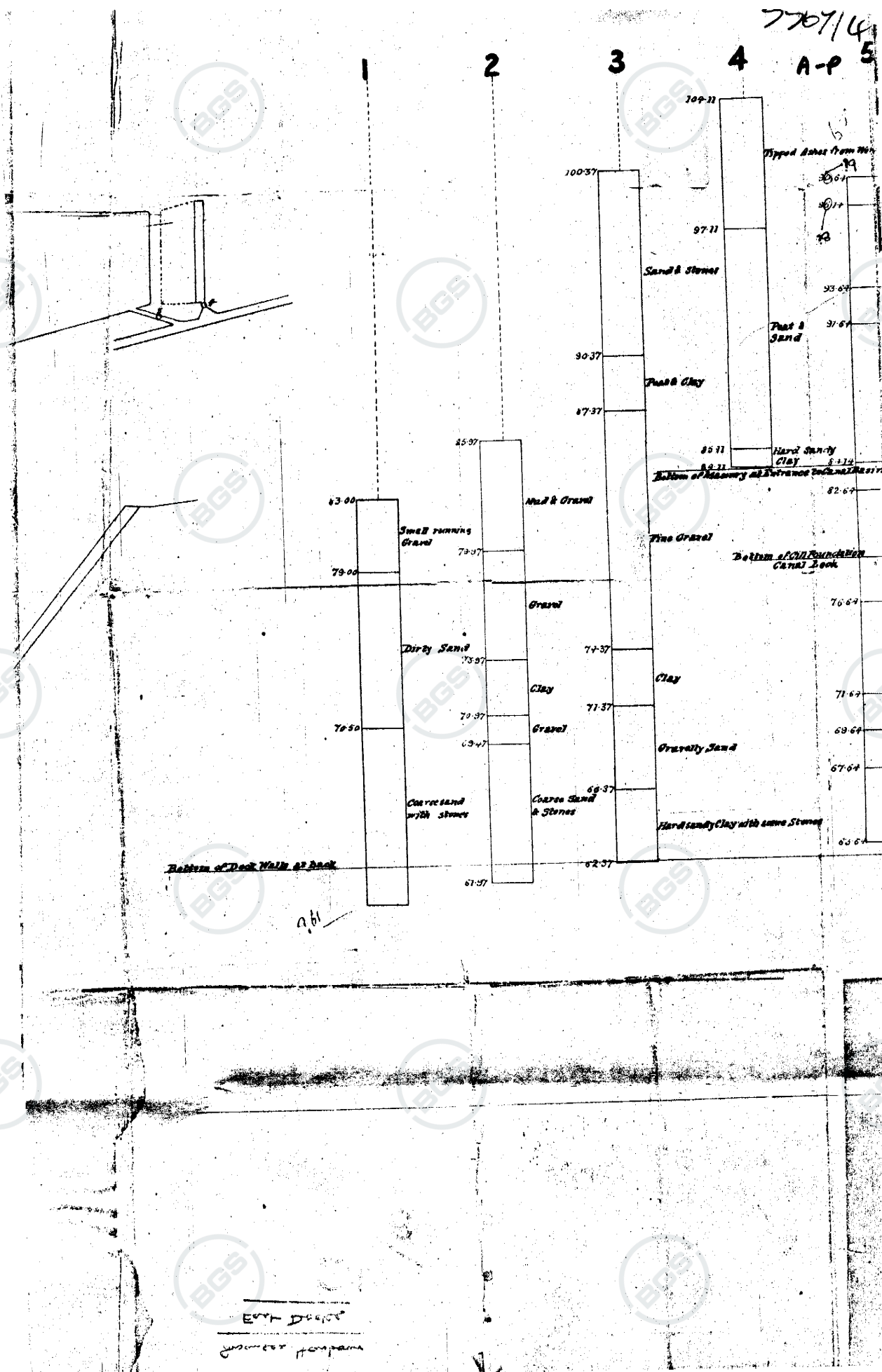
912

913

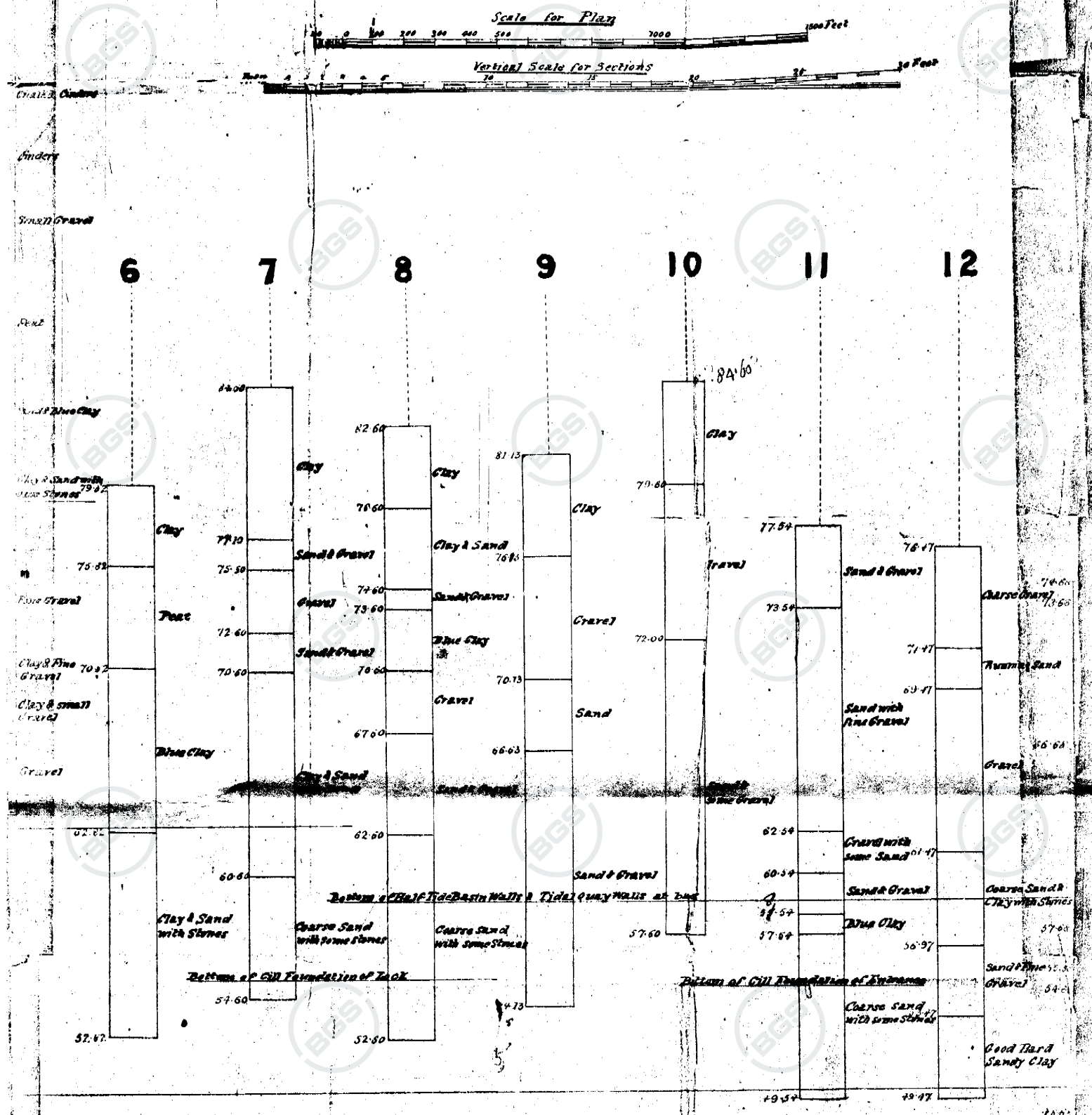
914

Bottom of Deck 112

These Xeroxed copies
Kept due to deteriorated
originals copies



SWANSEA HARBOUR
EAST DOCKS
PLAN & SECTIONS OF BOREHOLES



DRILLING METHOD Percussion 200 mm dia. to 15.0 m "Open hole" rotary drilling From 15.0 m to 22.0 m		GROUND LEVEL + 9.18 m O.D.		BRITISH GEOLOGICAL SURVEY / GRID REFERENCE SS 6399228 SS69SE 345		BOREHOLE NUMBER 2	
MACHINE Dando "Investigator"		CORE BARREL AND BIT DESIGN		ORIENTATION Vertical		SITE PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA	
SOIL SAMPLES DEPTH AND TYPES	DRILLING AND CASING PROGRESS	WATER RECOVERY % AND Q.M. LEVEL	R. Q. D.	CORE RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS m	O.D. LEVEL m
1.00 P N = 8 1.50 P N = 6 3.00 P N = 9 4.00 P N = 75 for 150 mm 5.00 P N = 105 for 225 mm 6.00 P N = 75 for 150 mm 7.00 P N = 77 8.00 P N = 34 9.00 P N = 67 10.00 P N = 63	5.2.75 5.2.75 6.2.75	6.2.75 7.2.75 10.2.75 11.2.75 ▼ 5.7			a.l. MADE GROUND consisting of ashes. 0.50 MADE GROUND consisting of loose, light grey fine-medium sand. 1.50 MADE GROUND consisting of grey sand with layers of soft sandy clay 2.55 MADE GROUND consisting of soft red-brown sand clay with brick shale. 3.50 MADE GROUND consisting of dense bricks, ashes, sand and clay. 4.95 Very dense brown sandy GRAVEL with traces of sandy clay 2.05 7.00 Very dense brown SAND with some gravel. 0.95 7.95 Stiff grey-brown gravelly BOULDER CLAY 3.05	5.18 8.68 7.68 6.63 5.68 4.23 2.18 1.23	
REMARKS Borehole drilled by STRATA SURVEYS Ltd Cheshire. Scale 1:50 Sheet 1 of 3 P = Standard Penetration Test N = Number of blows for 300 mm (unless otherwise stated) ▼ = Water a.m. level Borehole chiselled from 4.0 m to 15.0 m Borehole continued to 22.0 m							
WEST GLAMORGAN COUNTY COUNCIL				COUNTY ENGINEER AND SURVEYOR'S DEPT.			

BGS ID: 370246 : BGS Reference: SS69SE345

SITE PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA					SHEET 2 OF 3 BOREHOLE NUMBER 556956 345 2			
SOIL SAMPLES DEPTH AND TYPES	DRILLING AND CASING PROGRESS	WATER RECOVERY % AND O.M. LEVEL	R.Q.D.	CORE RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS	O.D. LEVEL	SYMBOLIC LOG
11-00 P N=75 for 150 mm	6-2-75 7-2-75				11-00 Very stiff grey gravelly BOULDER CLAY		-1-82	
12-00 P N=75 for 150 mm	7-2-75 10-2-75							
13-00 P N=75 for 150 mm								
14-00 CP N=75 for 75 mm								
15-00 CP N=105 for 150 mm	10-2-75 11-2-75					7-60		
16-50 CP N=75 for 150 mm								
18-00 CP N=75 for 150 mm								
18-00 CP N=75 for 150 mm	11-2-75 12-2-75				18-60 Grey MUDSTONE (Driller's description)		-9-42	
"Open hole" drilling due to pebbles falling in hole - coring not possible.						3-40 (penetrated)		
Borehole continued to 22-00 m								
REMARKS P= Standard Penetration Test CP= Standard Penetration Test - solid cone N= Number of blows for 300 mm (unless otherwise stated)								
WEST GLAMORGAN COUNTY COUNCIL COUNTY ENGINEER AND SURVEYOR'S DEPT.								

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