

**Aberdeen Market  
Desk Study Report  
October 2021**



**FAIRHURST**

## CONTROL SHEET

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## Executive Summary

Fairhurst were commissioned to carry out a geo-environmental desk study on behalf of Aberdeen City Council, in order to establish potential environmental and geotechnical constraints associated with the proposed redevelopment of the site.

The following potential constraints were identified by the **environmental** assessment:

- Historical redevelopment of the site may have resulted in the presence of Made Ground
- The Made Ground may present a potential risk of harm to site end users if it is generating ground gases
- A potential risk of harm to buildings and services has been identified from the Made Ground
- An asbestos survey has identified the presence of ACMs within the former British Homes Stores retail unit
- The site is not indicated to be located within an area affected by radon.

The following key **geotechnical** constraints have been identified:

- The natural superficial deposits beneath the site are indicated to be glacial outwash Sands and Gravels.
- The superficial deposits are indicated to be underlain by interbedded sandstone and conglomerate.
- It is anticipated that made ground will cover the majority of the site, associated with historic development of the site. Made ground is not a suitable founding stratum.
- There is the potential for disturbed soils to a significant depth associated with the removal of existing piled foundations.
- Shallow bedrock may exist beneath the site, however nearby historical boreholes to the west of the site indicate that the rock is weak to a significant depth.
- There is potential for shallow groundwater to exist and as such dewatering of excavations should be anticipated.
- A medium risk of river flooding has been identified within the site and nearby surrounding area.
- It is unknown if the historic Putachie Burn still exists, and if so, if it has been culverted. The exact location of the burn is also unknown, and could therefore exist within or nearby to the site.
- The potential risk of Unexploded Ordnance within the site is considered to be low.

Based on the findings of the Desk Study, the following recommendations have been made:

- Post demolition, a full geo-environmental site investigation should be carried out across the site to determine the ground conditions to inform foundation design, and to investigate potential sources of contamination.
  - UKWIR (UK Water Industry Research) testing will be required along the route of any proposed new water services once designs have been finalised, to aid in pipe material selection.
  - California Bearing Ratio (CBR) testing to inform pavement design should be undertaken in any areas of car parking or roads if proposed.
  - An asbestos survey of the entire building should be undertaken. Any ACMs identified should be removed by a specialist contractor prior to demolition.
  - Archaeological investigations are likely to be required following demolition of the existing building.
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## 1.0 Introduction

Fairhurst were commissioned by Aberdeen City Council (the Client), to carry out a geo-environmental desk study for the proposed redevelopment of the Aberdeen Market site. The location is shown on **Drawing 102256/9500**.

### 1.1 Aims

The aims of the desk study were to undertake a Phase 1 investigation in accordance with British Standard 10175:2011 "Investigation of Potentially Contaminated Sites" (BSI, 2011).

## 2.0 Sources of Information

### 2.1 Internet Sources

The following internet sources were consulted for further information concerning the site:

- Aberdeen City planning website: <https://upa.aberdeenshire.gov.uk/online-applications/>
- British Geological Survey (BGS) online resources: [www.bgs.ac.uk](http://www.bgs.ac.uk)
- National Library of Scotland (NLS) Historical Maps: <http://maps.nls.uk>
- Scottish Environmental Protection Agency (SEPA): [www.sepa.org.uk](http://www.sepa.org.uk)
- Historic Environment Scotland: <http://portal.historicenvironment.scot/>
- Aberdeen City Sites and Monuments Record (SMR) service: <https://online.aberdeenshire.gov.uk/smrpub/master/default.aspx?Authority=AberdeenUKRadon>
- n Interactive Radon Map <http://www.ukradon.org/information/ukmaps>
- FindIT! Mapping detailed radon map (**Appendix 1**)

Information from these websites is incorporated into this desk study where relevant.

### 2.2 Envirocheck

A range of historical maps from Envirocheck and the NLS were obtained and reviewed. These are referenced in Table 1 below. Envirocheck maps are included in **Appendix 2**, however the maps reviewed from the NLS could not be included due to copyright. These can be viewed on the NLS website referenced above.

**Table 1: List of Historical Maps Consulted**

Sheet	Scale	Date
Gordon James Map (NLS Website)	-	1661
G & W Patterson (NLS Website)	-	1746
Plan of the Cities of Aberdeen - J. Wood (NLS Website)	-	1809
Map of the district around Aberdeen - A. Gibb (NLS Website)	-	1804-1867
Map of New and Old Aberdeen - Town Plans (NLS Website)	-	1847
Aberdeen – J. Rapkin (NLS Website)	-	1854
Aberdeen, Sheet LXXV (NLS Website)	OS large scale Scottish town plans	1866-1867

Kincardineshire	1:2,500	1867
Kincardineshire	1:10,560	1868
Aberdeenshire, Sheet LXXV (NLS Website)	Six-inch 1 <sup>st</sup> edition	1869
Plan of the City of Aberdeen – Town Plans (NLS Website)	-	1871; 1883
Aberdeenshire	1:2,500	1899; 1902; 1926
Aberdeenshire	1:10,560	1869; 1902; 1928; 1938
Ordnance Survey Plan	1:1,250	1954-1955; 1968-1973; 1989-1991
Ordnance Survey Plan	1:2,500	1955; 1970-1971
Ordnance Survey Plan	1:10,000	1959; 1965-1968; 1967; 1972-1974; 1981-1984; 1989; 1990-1991
10K Raster Mapping	1:10,000	2000
Additional SIMs	1:1,250	1977-1981; 1981-1993; 1984-1993; 1987
Large-Scale National Grid Data	1:1,250	1993; 1994-1995; 1994; 1995; 1996; 1996

### 2.3 British Geological Survey

Details of the British Geological Survey (BGS) maps referenced for the desk study are listed in **Table 3**. Records of historic BGS Boreholes are included in **Appendix 3**.

**Table 3: List of BGS Maps Consulted.**

Sheet	Scale	Date
77 Aberdeen – Superficial	1:50,000	2004
77 Aberdeen – Solid	1:50,000	1984

Records of the following BGS Boreholes were obtained from the online BGS GeoIndex interactive map (records included in **Appendix 3**):

- NJ90NW72 (Boots the Chemist - 1974)
- NJ90NW73 (Boots the Chemist - 1974)
- NJ90NW74 (Boots the Chemist - 1974)
- NJ90NW75 (Boots the Chemist - 1974)
- NJ90NW76 (Boots the Chemist - 1974)

## 2.4 Consultations

**Table 4: List of Consultations undertaken**

Organisation	Date Of Enquiry	Date Of Reply
Aberdeen City Council Contaminated Land	14 <sup>th</sup> November 2018	15 <sup>th</sup> November 2018
Aberdeen City Council Archaeology Service	21 <sup>st</sup> November 2018	23 <sup>rd</sup> November 2018
Aberdeenshire Council Petroleum Officer	21 <sup>st</sup> November 2018	27 <sup>th</sup> November 2018

## 2.5 Site Walkover

A site walkover was conducted on the **23<sup>rd</sup> November 2018** by a Fairhurst Engineer and is detailed further in this report. The full site walkover report along with photographs taken during the survey can be found in **Appendix 4**.

## 3.0 Site Description

### 3.1 Location

The site is located in Aberdeen City Centre at approximate National Grid Reference (NGR) 941 394. The location of the site is shown on **Drawing No. 102256/9102-**. The site is currently occupied by the existing Aberdeen Market building, and is bound to the north by East Green with Union Street further to the north, to the east by Market Street, to the south by Hadden Street and to the west by The Green.

There are two main entrances to the existing building. The first is from Market Street to the east which leads to Aberdeen Market on the lower ground floor. The second entrance is via a connecting annex from Union Street (to the north), which leads over East Green to the former British Home Stores on the first floor.

### 3.2 Topography

The topography of the site is likely to have been heavily modified by the historic development of Aberdeen City Centre and is unlikely to represent the original geomorphology of the area. Based on topographic survey of the site and surrounding area undertaken by Granite City Surveys Ltd (included in **Appendix 5**), the site is indicated to slope gently towards the south west.

East Green, at the northern boundary of the site, slopes towards the east from approximately 8.5 mAOD down to 6.2 mAOD below Market Street. From here vaults beneath Market Street are accessed which slope to the south, to 5.3 mAOD. Market Street slopes from approximately 13.5 mAOD at the north eastern corner of the site to approximately 11 mAOD at the south eastern corner of the site.

The eastern side of Hadden Street (at the southern site boundary) joins Market Street at 11 mAOD. Hadden Street slopes towards the south/south west, down to approximately 7.5m AOD at the western side of the site.

### 3.3 Site Walkover Summary

A site walkover survey was conducted on 23<sup>rd</sup> November 2018. The walkover survey report and photographs are included in **Appendix 4** and are summarised below.

### 3.3.1 Access

The site is accessible from Market Street, The Green and surrounding streets. The current Market building covers the entirety of the site. The main accesses into the building are from Market Street, leading to the Aberdeen Market on the ground floor, and from Union Street leading to the former British Home Stores on the first floor. Further entrances exist from The Green and Hadden Street. At the northern side of the site off East Green, there is a large loading bay set into the ground floor of the building.

### 3.3.2 Surrounding Land Uses

The site is located within Aberdeen's 'Merchant Quarter', with the surrounding land uses generally commercial, and including shops, restaurants, hotels, and residential flats above commercial units.

### 3.3.3 Site Surface

Surrounding the existing building which covers the entirety of the site, the streets are cobbled or paved.

### 3.3.4 Surface Water

No surface water courses were noted in proximity to the site during the site walkover survey (November 2018).

## 3.4 Anecdotal Information

Internet searches for the site and surrounding area highlighted 'The Doric Columns' website which states that the original Aberdeen Market buildings were constructed in 1842, designed by Archibald Simpson. This original building was burnt down in 1884, and rebuilt in 1892 with a wrought iron roof. This was subsequently demolished and replaced by the current building in 1971.

## 4.0 Historical Development of the Site

The historical development of the site and its immediate surrounding area was established from the examination of existing historical Ordnance Survey maps. The findings are summarised in **Table 5** and extracts from historic maps obtained from Envirocheck are reproduced in **Appendix 2**. The NLS maps reviewed are not appended due to copyright.



**Table 5: Historical Data From Maps & Air Photos**

Date	Notable Features	Potential Sources of Contamination
1661 (Gordon James Map)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ The approximate area of the site populated by a triangular block of buildings where the Green branches into two roads.</li> <li>▪ A burn is shown to run from north to south through the eastern side of the triangle of buildings. Historical researches suggest that this was named the 'Putachie Burn' and would have been in the approximate position of the present day Market Street. As the exact location of the Burn is unknown, there is a possibility that it flowed within the site. The Burn was shown to be fed from a marsh to the north east of Aberdeen known as 'The Loch'.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ The configuration of the city is very different to present day. However, the Green can be seen to the south of St. Nicholas church, noted on this map as 'Great Church'.</li> <li>▪ To the south the original route of the River Dee Estuary is noted, which was later re-routed to the south to form the Docks.</li> </ul>	
1746 (G & W Patterson)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ The triangular block of buildings can still be seen, however a small lane is shown to run through them from north to south. The burn</li> <li>▪ to the east of the site appears to have been culverted.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ The layout of the city is noted to be generally unchanged.</li> </ul>	
1908 (J. Wood)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ The buildings of the western side of the small lane are no longer noted.</li> </ul>	Made ground associated with demolition of former buildings within site.

Date	Notable Features	Potential Sources of Contamination
	<ul style="list-style-type: none"> <li>▪ The burn to the east of the site is no longer shown.</li> </ul> <p><u>OFF SITE</u></p> <ul style="list-style-type: none"> <li>▪ Union Street is noted to exist to the north of the site. A street noted as ‘Intended Street’ is shown to run through the site from north to south. The name suggests that it was a proposed road and hadn’t yet been constructed.</li> <li>▪ To the east of the site, terraces of buildings had been constructed. The buildings along the now named ‘Ship Row’ appear to be the same configuration as the earlier map.</li> <li>▪ To the south-east, the River Dee is noted to have been re-routed to the south, and the original river channel noted as ‘Intended Wet Dock’.</li> <li>▪ Terraced buildings are also noted to the south and west of the site.</li> <li>▪ To the west, the Den Burn is shown to flow beneath Union Bridge (at the approximate present day position of the railway line) and then branches into two. The first branch flows into the ‘Intended Wet Dock’, and the second into the River Dee.</li> </ul>	<p>Made ground associated with development of Market Street and surrounding developments.</p>
1804 - 1867 (A. Gibb)	<p><u>ON SITE</u></p> <ul style="list-style-type: none"> <li>▪ The triangular block of buildings are no longer noted, and the New Aberdeen Market building noted to have been built is the same footprint as the current existing building.</li> <li>▪ The Market buildings are bound to the north and west by ‘Green’, to the east by ‘Market Street’, and to the south by ‘Hadden Street’.</li> <li>▪ The Market building is shown to be connected to buildings to the north at two points.</li> </ul> <p><u>OFF SITE</u></p> <ul style="list-style-type: none"> <li>▪ A railway line leading to a railway station is noted approx. 145m to the south of the site.</li> <li>▪ The Dock and harbour are noted to have been constructed to the south-east of the site.</li> </ul>	<p>Made Ground associated with development of the site as the ‘New Aberdeen Market’.</p> <p>Railway Station and Railway Line</p>

Date	Notable Features	Potential Sources of Contamination
	<ul style="list-style-type: none"> <li>▪ Market Street is now noted adjacent to the eastern site boundary.</li> </ul>	
1847	<u>ON SITE</u> No significant changes.	
	<u>OFFSITE</u> <ul style="list-style-type: none"> <li>▪ The streets to the south of the site are over marked with a railway terminal and railway line leading to it from the south. This may have been a proposal at the time.</li> <li>▪ A new branch of railway line is also over marked approx. 160m to the west of the site, running northwards parallel with the Den Burn.</li> <li>▪ The railway station recorded on the previous map is not shown, with this area and the area to the east marked at 'Ground for Building'.</li> <li>▪ A gas works is indicated to exist approximately 180m to the south of the site.</li> </ul>	Possible redevelopment of the Railway Terminal Railway Line (west of site) Gas Works
1854 (J. Rapkin)	<u>ON SITE</u> No significant changes.	
	<u>OFFSITE</u> <ul style="list-style-type: none"> <li>▪ The proposed railway terminal appears to have been built to the south of the site, and the railway line leading to it as well as the railway branch to the west.</li> <li>▪ The gas works is no longer noted, however the buildings are still present and the adjacent street is named Gas Street.</li> <li>▪ New buildings are shown 145m to the south around the boundaries of the area previously marked as 'Ground for Building'.</li> </ul>	Railway terminal and railway lines
1866 – 1867 (OS Town Plans – NLS Website)	<u>ON SITE</u> Market buildings shown with details of interior such as staircases indicating more than one storey, pillars and a fountain.	
	<u>OFFSITE</u> <ul style="list-style-type: none"> <li>▪ A well is noted in the Green to the west of the site.</li> </ul>	Burial ground

Date	Notable Features	Potential Sources of Contamination
	<ul style="list-style-type: none"> <li>▪ 'Hadden's Factory (Woollen &amp; Carpets)' is shown to have existed approx. 80m to the south-west.</li> <li>▪ The former site of a Monastery, known as the 'Trinity Friars Monastery' is indicated approx. 100m to the south-east of the site.</li> <li>▪ The street bounding the site to the north is noted at 'East Green'.</li> <li>▪ The former railway terminal adjacent to the south of the site is no longer shown. In its place Exchange Street and Exchange Lane are shown with terraced buildings, including a Saw Mill approx. 35m to the south of the site.</li> <li>▪ Two wood yards are shown approx. 35m to the south-west.</li> <li>▪ A Railway station and Goods Yard had been constructed approximately 145m to the south of the site.</li> <li>▪ Another railway station is recorded approximately 200 m southwest of the site</li> <li>▪ Slate and wood yards are also shown to the east of the Railway station (approx. 150m south of the site).</li> <li>▪ The railway line to the west of the site is noted as 'Great North of Scotland Railway'.</li> <li>▪ A Dye Works is shown approx. 164m to the south (just to the west of the Railway Station).</li> </ul>	<p>Hadden's Factory</p> <p>Wood Yards x 2</p> <p>Saw Mill</p> <p>Dye Works</p> <p>Slate and Wood Yards</p> <p>Guild Street Railway Station</p> <p>Slate Yards</p>
1869 (1:10,560)	No significant changes on site or in the surrounding area.	
1871 (Keith & Gibb)	No significant changes on site or in the surrounding area.	
1883 (OS Town Plans – NLS Website)	No significant changes on site or in the surrounding area.	
1899 (1:2,500)	No significant changes on site or in the surrounding area.	
1902 (1:2,500 & 1:10,560)	<u>ON SITE</u>	
	<p>No significant changes.</p> <p><u>OFF SITE</u></p> <ul style="list-style-type: none"> <li>▪ Saw Mill and two wood yards near to the site are no longer noted, having been replaced by new buildings.</li> </ul>	

Date	Notable Features	Potential Sources of Contamination
	<ul style="list-style-type: none"> <li>▪ The wood yard to the east of the station is no longer noted.</li> <li>▪ The Dye works is no longer shown.</li> </ul>	
1926 (1:2,500) & 1928 (1:10,560)	<u>ON SITE</u> No significant changes on site.	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ Hadden's Factory is no longer noted, with some of the factory buildings replaced by railway sidings and Station Hotel.</li> <li>▪ The railway Goods Station has expanded</li> <li>▪ Marischal College is noted to have expanded (approx. 200m to the north east of the site).</li> </ul>	Redevelopment of Marischal College (poss. Made Ground)  New railway sidings in place of Hadden's Factory
1938 (10:10,560)	No significant changes on site or in surrounding area.	
1954 – 1955 (1:2,500)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>• A 'Lav' is noted in the south eastern corner of the market building.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ Several warehouses are shown to the south-east, south, south-west and west of the site (between approx. 30 – 90m).</li> <li>▪ A garage is noted approx. 90m to the west of the site.</li> <li>▪ The site of a 'Carmelite Monastery' is noted approx. 90m to the west/south-west of the site.</li> <li>▪ Furniture works are noted approx. 115m to the south-west of the site.</li> <li>▪ A printing works is shown to the north-west of the site.</li> </ul>	Warehouses x 9 Garage Furniture Works Printing Works
1955 (1:2,500) & 1959 (1:10,560)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ No significant changes on site.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ No significant changes to building and street layout. Text is illegible due to low resolution of map.</li> </ul>	

Date	Notable Features	Potential Sources of Contamination
1965-1968 (10,000)	No significant changes on site or in surrounding area.	
1968 – 1973 (1:1,250)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ Outline of Market Buildings are in dashed line although a building is not indicated suggesting that the former Market building had been demolished.</li> </ul>	Made Ground (associated with the demolition of Market Building)
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ The well in The Green is no longer noted.</li> <li>▪ A building adjacent to the north of the site on Union Street is also shown as blank suggesting that this too had been demolished.</li> <li>▪ An electrical Substation is noted approx. 90m to the south-west of the site.</li> <li>▪ A bus station is now noted at the railway station (approx. 160m to the south).</li> </ul>	Electrical Substation Bus station
1977-1981 (1:1,250) & 1981-1982 (1:10,000)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ A building is shown within the site noted as 'Market'. The building adjacent to the north on Union Street had been replaced with a new rectangular annex which connects the Market building to Union Street.</li> </ul>	Made Ground (associated with development of existing building)
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ Atholl House had been constructed over the railway lines to the south-west of the site.</li> <li>▪ The garage to the west of the site is no longer shown.</li> </ul>	Made ground associated with development on GuildStreet
1981-1993 (1:1,250)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ No significant changes.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ The printing works to the north-west is no longer noted.</li> <li>▪ The furniture works is no longer shown.</li> <li>▪ Only four warehouses remain to the south and south-west of the site.</li> <li>▪ Buildings between 70-200m to the north of the site had been demolished and the area redeveloped as the St. Nicholas shopping centre.</li> </ul>	Made Ground associated with development of St. Nicholas shopping centre and Trinity shopping centre

Date	Notable Features	Potential Sources of Contamination
	<ul style="list-style-type: none"> <li>▪ The Trinity shopping centre is shown to have been constructed over the railway line to the west of the site (approx. 80m).</li> </ul>	
1984 – 1983 (1:1,250)	<u>ON SITE</u> <ul style="list-style-type: none"> <li>▪ No significant changes.</li> </ul>	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>▪ A large area of buildings approx. 230m to the north/north west had been demolished and the area developed as the Bon Accord shopping centre.</li> <li>▪ One of the warehouses to the south west is no longer shown.</li> </ul>	Made Ground associated with demolition of buildings and development of Bon Accord Shopping centre
1994-1995 (1:1,250)	<u>ON SITE</u> No significant changes.	
	<u>OFF SITE</u> Denburn Road was shown to connect to Rennies Wynd via Wapping Street, approx. 80m to the south west of the site.	
1996 (1:1,250)	<u>ON SITE</u> No significant changes.	
	<u>OFF SITE</u> <ul style="list-style-type: none"> <li>• Only two warehouses remain to the south of the site.</li> <li>• A new electrical substation is noted to the south-west of the site on Carmelite Street.</li> </ul>	
2000 (1:10,000)	No significant changes on site or in surrounding area.	
2018 (1:10,000)	No significant changes on site or in surrounding area.	

## 5.0 Consultation Response

### 5.1 Contaminated Land Unit

The Aberdeen City Council Contaminated Land Unit provided a response on 22<sup>nd</sup> November 2018 (a copy of the response is included in **Appendix 6**). The service provided the following information relating to the site:

- The earliest available map dated 1899 shows an 'Aberdeen Market' building of similar configuration as the existing building.
- The 1973 map shows the site to be vacant, however the existing building is shown on a 1988 aerial photograph.
- They believe that the existing building is the third Market Building to have existed on the site.
- The service does not hold any records of ground investigations undertaken at the site during the development of the existing building in 1970s.
- There are no private water abstractions in the city centre.

### 5.2 Petroleum Officer

A response from the Petroleum Officer of Aberdeen City Council was received on the 27<sup>th</sup> November 2018. Aberdeen City Council do not have any records of underground fuel storage tanks within the site; however, it is noted that these records relate only to tanks used for the storage of petroleum spirit. A copy of the response is included in **Appendix 6**.

### 5.3 Archaeology & Historic Environment Scotland

A search was made for information on archaeological sites in the surrounding area using the Historic Environment Scotland online database which identified several sites within and close to the site. A search was also made of the Aberdeen City Council (ACC) Sites and Monuments Record (SMR) which identified several records for locations in close proximity to the site. These are detailed in **Table 6** below.

**Table 6: Summary of historical / archaeological sites on or close to the site**

Location	ACC SMR Reference Number	Description	Distance from site (Direction)
On Site	NJ90NW1334	Site of the original market building designed by Archibald Simpson, 1842-82 (destroyed).	On Site
Carmelite Lane	NJ90NW0660	A sandstone buttress found during building work at 12 Carmelite Lane in 1891, probably a church associated with the Carmelite Friary.	0m (SW)
Hadden Street	NJ90NW2696	Sections of wall recorded between August 2009 and November 2010	0m (S)
The Green	NJ90NW1234	Temporary site of a fountain known as 'The Mannie on the Green', a former wellhead, now relocated back to Castle Street	10m (W)



East Green	NJ90NW0788	Site of a meal and malt mill (destroyed).	10m (N)
Carmelite Friary	NJ90NW0006	Site of a Carmelite friary which was founded circa 1273 and destroyed at the time of the Reformation.	10m (S)
Carmelite Lane	NJ90NW0661	Burials found in 1891 during building works southeast of 12 Carmelite Lane. Probably associated with the Carmelite Friary	15m (S)
12 Martins Lane	NJ90NW0107	Remains of the medieval Carmelite Friary.	15m (SW)
Stirling Street	NJ90NW0805	Imperial Hotel designed by James Souttar 1869, with additions by William Henderson 1885	25m (S)
10 Carmelite Street	NJ90NW0658	Human leg bone found outside 10 Carmelite Street in 1924 (within the Carmelite friary graveyard).	30m (SW)
Exchange Street	NJ90NW0789	Site of a meal, malt and saw mill (destroyed)	40m (SE)
Carmelite Street	NJ90NW0659	Human burials found during cellar reconstruction in 1904.	50m (SW)
The Green	NJ90NW0161	Site of a town house known as 'Andrew Aedies Lodging' which was demolished in 1914.	60m (W)
67-71 Green	NJ90NW0004	Excavation in 1977 recorded evidence of Mesolithic activity in the form of about 40 pieces of flint, including a core, a notched flake, waste material and a barbed-and-tanged arrowhead.	65m (W)

The Aberdeenshire Archaeological Service provided a response on 23<sup>rd</sup> November 2018 (**Appendix 6**). The received response stated that it is likely that archaeological mitigation will be required. The specific scope of these works will be dependent on the development proposals. Once these have been confirmed, it is recommended that the service is consulted further.

## 5.4 Services Information

Service information was obtained as part of this desk study and is contained within **Appendix 7**.

### 5.4.1 Electricity

The SSE plan shows multiple underground electricity cables running around the boundaries of the site. Several cables enter the site at the southern boundary.

An SSE electrical substation was noted at the northern boundary within the site (East Green s/s 500 kVA), as shown on the walkover survey plan included in **Appendix 4**, and SSE Service Plan (Appendix 7). A further 3 substations are located in proximity to the site:

1. Frasers s/s 1000 kVA (North East of the site in Carnegies Brae)
2. Sainsburys Putachieside s/s 500 kVA (North East of the site in Carnegies Brae)
3. Peterkins s/s 500 kVA (north of the site on Union Street).

#### 5.4.2 Gas

A plan acquired from Scotia Gas Networks indicates gas services are present to the west (in the Green) and to the south (along Hadden Street). No gas services are shown within the site.

#### 5.4.3 Water

Scottish Water plans indicate a waste water pipe runs along East Green to the north of the site. Three connections from this enter the site from the northern boundary. A waste water pipe is also shown to run along Market Street to the east of the site.

Fresh water services are shown to run around all sides of the site, however none are indicated to enter the site.

#### 5.4.4 BT

CityFibre and Vodafone plans show an underground service to the south west of the site, running from the Green and down Stirling Street.

BT plans show underground cables running along the northern and southern boundaries of the site.

## 6.0 Geology & Hydrogeology

### 6.1 Geology

#### 6.1.1 Superficial Geology

The 1:50,000 BGS (Drift edition) indicates that the natural superficial deposits beneath the site are outwash sand and gravel deposits of the Lochton Sand and Gravel Formation of. However, it is anticipated that these natural deposits are overlain by made ground across the majority of the site as a result of the site's development history.

Historical BGS Boreholes located approximately 80m to the west of the site encountered Made Ground (described as 'FILL') consisting of sand, gravel and cobbles mixed with rubble, bricks and metal to depths ranging from 1 – 2.3 mbgl. These deposits were underlain by sand and gravel with varying amounts of silt, cobbles and boulders.

#### 6.1.2 Solid Geology

The 1:50,000 BGS (Solid edition) records the site to be underlain by the Brig O'Balgownie Formation which consists of interbedded sandstone and conglomerate. The Aberdeen Pluton is shown to exist further to the west and south west of the site.

The historical BGS Boreholes recorded weak, highly weathered CONGOLMERATIC SANDSTONE was encountered from between 3.95 mbgl and 8.20 mbgl. The boreholes continued through weak to moderately weak bedrock to between 7.45 mbgl to 18.45 mbgl.

### 6.2 Hydrogeology

#### 6.2.1 Superficial Aquifer

The SEPA online Water Environment Hub indicates that the site is underlain by the 'Lower Dee Sand and Gravel' (ID: 150777) which is indicated to have 'good' water quality, water flows and levels. The historical maps recorded a well in The Green, adjacent to the west of the site, which may also suggest that the groundwater body beneath the site is productive.

Groundwater was encountered in the historic BGS boreholes to the west of the site at depths of between 1.50 mbgl and 3.00 mbgl.

#### 6.2.2 Bedrock Aquifer

The Hydrogeological Map of Scotland indicates that the site is in an area underlain by a moderately productive aquifer in which flow is predominantly through fractures and other discontinuities.

### 6.2.3 Groundwater Vulnerability

As the superficial deposits beneath the site and in the surrounding area are indicated to be granular in nature, there is the possibility for groundwater flow through these soils. As such, groundwater is likely to be vulnerable to leaching of contaminants.

However, as the proposed development plan of the site and the surrounding area is covered by buildings or hardstanding, infiltration of water through any contaminated soils will be limited, thereby reducing this risk.

## 6.3 Mineral Extraction

### 6.3.1 Mineworkings

The site is not within an area where underground mineral extraction has taken place in the past which could have affected the site.

### 6.3.2 Quarrying

The site is not indicated to be in an area where quarrying has occurred in the past.

## 7.0 Radon

The F!ND Radon Map (**Appendix 1**) indicates that the site is located in an area that is not affected by radon.

## 8.0 Hydrology & Flooding

### 8.1 Hydrology

#### *Den Burn*

The SEPA Water Environment Hub shows the Den Burn (ID:23243) is culverted approximately 230m (at its closest point) to the west of the site, and is the closest water body to the site. The Burn runs from north/north-west to south/south-east, turning towards the north east below the railway station to the south of the site, and discharges into the Victoria Dock.

#### *Putachie Burn (or Millburn)*

Historical researches indicate that a burn existed very close to the east of the site, flowing from north to south. This can be seen on the earliest available map (Parson Gordons Map of 1661). The burn is shown to have been fed by a marsh (or 'Marritch' as referred to on the map) known as the 'Loch'. The exact location of the burn is unknown.

The Doric Columns website describes a burn known as the 'Millburn' or the 'Putachie Burn' which was fed from the Loch and flowed through Putachieside (the area of the site). It is likely that this is the same burn as shown on the 1661 map.

The burn is not shown on the next available map (dated 1746), suggesting that it had been culverted. The Doric Columns website states that the Putachie Burn was culverted beneath Flourmill Lane (approx. 100m north-east of the site). In another page of the website, it goes on to describe the burn to have branched, with the western branch '*passing under No 95 and the West end of the Market*', further adding to the uncertainty of the exact location of the burn. The Doric Columns pages are referenced in Section 16.0

Historical researches indicate that the Loch feeding the burn was drained and is now covered by George Street and surrounding streets.

#### *Dee Estuary*

The Dee (Aberdeen) Estuary (ID: 200103) which includes the Aberdeen Harbour, exists approximately 160m to the south-east of the site, at its closest point. This water body has been classified by SEPA as having an overall condition of 'good', when last assessed in 2014. Historical

Maps indicate that that Victoria Dock was the original route of the River Dee which was rerouted to the south with the original estuary formed as the Victoria Dock.

## 8.2 Flooding

The online SEPA Flood Management Map indicates that the site is within an area that is at medium risk of river flooding. The map also shows that an area close to the west and south west of the site (railway station area) is at high risk of Surface Water Flooding.

## 9.0 Unexploded Ordnance (UXO)

Due to the city centre location of the site, there is potential for unexploded ordnance (UXO) to exist within the site. Historic maps show that the site was covered by the former Aberdeen Market building throughout the Second World War. It is therefore considered unlikely that any UXO may have penetrated the soils within the site at this time. Furthermore, it is likely that any existing UXO would have been detected when the site was redeveloped in the early 1970s.

The risk of UXO existing within the site is therefore considered to be low.

## 10.0 Previous Reports

No relevant previous reports were available for review at the time of preparing this Desk Study.

## 11.0 Development Proposals

Development plans are under development at the time of writing. It is understood the development will include a replacement market with public and retail space.

## 12.0 Preliminary Conceptual Model & Qualitative Risk Assessment

A preliminary site conceptual model has been formulated based on all of the data recovered as part of this desk study. The conceptual model presents the viable source, pathway, receptor contamination linkage for the site and is set out in the following sections. The principles of environmental risk assessment are presented in **Appendix 8**. The significance of the viable linkages elements has been evaluated by carrying out a qualitative risk assessment.

### 12.1 Source Characterisation

The following potential sources of contamination have been identified.

**Table 7: Identified Potential Sources of Contamination**

Source	Distance (m)	Compass Direction	Identified by:
Made Ground within the site and nearby surrounding area	On Site & 0-100	-	Historic OS Maps
Electrical Substation	On-Site	-	Site Walkover Survey
Warehouses x 9	20	S	Historic OS Maps
	35	S	
	65	WSW	
	85	SW	
	85	S	
	85	S	
	90	S	
	125	SE	
	150	S	

Wood Yards x 3	35 150	SW S	Historic OS Maps
Saw Mill	35	S	Historic OS Maps
Former Railway Terminal	40	S	Historic OS Maps
Hadden's Factory	80	SW	Historic OS Maps
Garage	90	W	Historic OS Maps
Electrical Substations x 2	90	SW	Historic OS Maps
Furniture Works	115	SW	Historic OS Maps
Printing Works	115	NW	Historic OS Maps
Railway Station & Goods Shed	145	S	Historic OS Maps
Slate and Wood Yards	150	S	Historic OS Maps
Bus station	160	S	Historic OS Maps
Railway Line & sidings (west of site)	160	W	Historic OS Maps
Dye Works	164	S	Historic OS Maps
Gas Works	180	S	Historic OS Maps
Slate Yards	150	S	Historic OS Maps

Sources discounted from further consideration, along with the reasons for these sources being discounted are detailed in **Table 8** below.

**Table 8: Sources Discounted from Further Consideration**

Source	Reason for Discounting
Electrical Substation (on site)	There is the potential for localised PCB contamination to have occurred associated with the electrical substation, however, it is understood that the site will be covered in hardstanding, removing any potential pathways to site end-users. In addition, PCBs are known to be relatively immobile, and are unlikely to have leached into groundwater.
Warehouses	These sources are no longer shown to exist and have been redeveloped for other use. The hydraulic gradient is likely to be towards the harbour and River Dee to the south east and south of the site, respectively. It is therefore unlikely that contaminants from these sources may have leached into the site via groundwater. In addition, it is understood that the proposed development is for buildings or hardstanding and no areas of soft landscaping. There is therefore no risk to Human Health.
Wood Yards	
Saw Mill	
Former Railway Terminal	
Hadden's Factory	
Garages	
Electrical Substations (off- site)	It is understood that the site will be covered in hardstanding, removing any potential pathways to site end-users. PCBs are known to be relatively immobile and it is therefore unlikely that they will have migrated to the soils within the site.
Furniture Works	Distance from the site is greater than 100m and as such it is considered that contaminant transfer is unlikely.
Printing Works	
Railway Station & Goods Shed	
Slate and Wood Yards	
Bus station	

Railway Line (west of site)	
Dye Works	
Gas Works	
Slate Yards	

The remaining source identified is **Made Ground**. As the proposed development is for the site to be covered by buildings or hardstanding, this source is not considered to present a risk to Human Health via direct contact or ingestion. Furthermore, as the site is within the city centre, it is unlikely that the proposed development will further impact the Local Water Environment. However, there is the potential for Made Ground to be a source of ground gas, and to be a potential risk to below ground concrete and services. As such this source is carried forward to the Qualitative Risk Assessment.

Contaminants of concern associated with made ground are listed in **Table 10**.

**Table 10: Contaminants of Concern (CoC)**

CONTAMINANTS OF CONCERN											
SOURCE	Metals	TPH	PAH	Ammonia	Sulphate	pH	Ground Gas	SVOCs / VOCs	PCBs	Asbestos	Cyanide
Made Ground	X	X	X		X	X	X			X	

## 12.2 Pathway Characterisation

The potential pathways by which receptors might be exposed to contaminants (sources) at the site can vary depending on the proposed or current land use (e.g. residential properties, public open space, retail). The key pathways are identified below.

### 12.2.1 Human Health

For humans, the three possible significant routes of exposure to contaminants in Scotland are considered to be:

- inhalation of ground gas or volatile chemicals;
- ingestion of dusts or soil either by hand-to-mouth activity or by eating plants grown in contaminated soils; and
- dermal (skin) contact with contaminated soils and waters and transfer of contaminants through the skin into the body.

For the Aberdeen Market site only the inhalation of ground gas is considered to be a viable pathway. The potential risk from ingestion or dermal contact are therefore not considered further.

### 12.2.2 Buildings, Properties & Services

Buildings and services can also be affected by contaminants in the following ways:

- build up of methane (ground gas) resulting in an explosion risk;
- by direct contact of building fabric with contaminated soils / aggressive soils;
- permeation of water supply pipes.

### 12.2.3 The Local Water Environment

For the Water Environment the following pathways may be present:

- leaching of contaminants from the soil into groundwater under the site;
- chemical spillages entering groundwater under the site;
- run-off from the site surface entering surface water courses near the site; and
- migration of contaminated groundwater into surface water bodies

Due to the site's city centre location, it is unlikely that the proposed development will further impact the Local Water Environment and as such the potential risk via these pathways is not considered further.

### **12.3 Receptor Characterisation**

The receptors are the elements in the pollutant linkage that can potentially be harmed by the contaminants. For the Aberdeen Market site these are as follows:

- Humans: site workers and end users (inhalation of ground gases only);
- Buildings: building fabric and services

### **12.4 Pollutant Linkages**

The significance of potential pollutant linkages at the site is now qualitatively assessed by considering the magnitude of the hazard and the possibility of the linkages occurring based on the observations made, as shown in **Table 11**.



**Table 11: Preliminary Qualitative Risk Assessment for Identified Sources of Contamination**

Source	Potential contaminants	Potential Pathways	Potential Receptors	Assessment	Potential Severity	Potential Probability	Risk Class	Investigation required?
Made Ground within the site and nearby surrounding area	Metals TPH PAH Sulphate pH Asbestos	Direct contact with foundations and services	Building fabric and services	There is the potential for contaminated made ground to exist within the site and nearby surrounding area which could pose a risk to buildings and services.	High	High	High	Yes
	Ground Gas	Build up of carbon dioxide within structures – inhalation risk	Human health	If significant thicknesses of Made Ground are present it may be a source of ground gas which could present a risk of harm to site end users and to buildings.	High	Low	Medium	Yes
		Build up of methane within structures – explosion risk	Buildings		High	Low	Medium	Yes

## **12.5 Asbestos**

An Asbestos Refurbishment and Demolition Survey of the former British Homes Stores retail unit on the upper floors of the existing building was undertaken by Astec Consultants Ltd in June 2017 (**Appendix 9**). The survey located and identified several asbestos containing materials (ACMs) within the building.

It is recommended that a similar survey is undertaken to cover the entire building.

Any ACMs identified should be removed by a specialist contractor prior to demolition. Any risk posed to site end-users will therefore be removed. In addition, the proposed development will be capped by either hardstanding or new buildings, thus breaking any potential pathway between asbestos contaminated soils and site-end users.

## **13.0 Geotechnical Considerations**

### **13.1 Foundations**

It is understood that the foundations of the existing building are piled, and as such it is likely that the soils beneath the site will be disturbed to a significant depth once these are removed. In addition, it is expected that Made Ground will be present across site to potentially significant thicknesses. Made Ground is not a suitable founding stratum and its presence may necessitate the use of abnormal foundations.

The BGS boreholes to the west of the site encountered shallow rockhead, which was described as weak or weak to moderately weak to a maximum depth of 18.45 mbgl. It is understood that the proposed building will be ten storeys and will result in significant loading. Piled foundations are likely to be required to reach deeper, more competent, solid strata.

### **13.2 Earthworks**

Earthworks are not considered necessary for re-development of the site.

### **13.3 Groundwater**

The following features indicate that a shallow groundwater body may exist beneath the site:

- The former well in the Green nearby to the west of the site.
- The Den Burn approximately 230m to the west of the site (culverted)
- Historical map evidence of a burn close to the east of the site.

Should this be the case, deep excavations are likely to require dewatering.

### **13.4 Flooding Risk**

As previously discussed in Section 8.2, the site is shown to be at medium risk of river flooding.

## 14.0 Conclusions

Available information has been gathered and reviewed to assess the potential geotechnical and environmental constraints associated with re-development of the Aberdeen Market site. The conclusions are summarised below.

### 14.1 Environmental Conclusions

- Historical redevelopment of the site may have resulted in the presence of Made Ground
- The Made Ground may present a potential risk of harm to site end users if it is generating ground gases
- A potential risk of harm to buildings and services has been identified from the Made Ground
- An asbestos survey has identified the presence of ACMs within the former British Homes Stores retail unit
- The site is not indicated to be located within an area affected by radon.

### 14.2 Geotechnical Conclusions

- The natural superficial deposits beneath the site are indicated to be glacial outwash Sands and Gravels.
- The superficial deposits are indicated to be underlain by interbedded sandstone and conglomerate.
- It is anticipated that made ground will cover the majority of the site, associated with historic development of the site. Made ground is not a suitable founding stratum.
- There is the potential for disturbed soils to a significant depth associated with the removal of existing piled foundations.
- Shallow weak bedrock may exist beneath the site extending to significant depth. As such piled foundations may be required to significant depth.
- There is potential for shallow groundwater to exist and as such dewatering of excavations should be anticipated.
- A medium risk of river flooding has been identified within the site and nearby surrounding area.
- The exact location of the Putachie burn is unknown, although from historic records it could exist within or nearby to the site; it may have been culverted.
- Radon protection measures will not be required.
- The potential risk of Unexploded Ordnance (UXO) to exist within the site is considered to be low.

## 15.0 Recommendations

- It is recommended that post demolition, a full geo-environmental site investigation is carried out across the site. This ground investigation will determine the ground conditions to inform foundation design, and to investigate potential sources of contamination.
- UKWIR (UK Water Industry Research) testing will be required along the route of any proposed new water services once designs have been finalised, to aid in pipe material selection.
- California Bearing Ratio (CBR) testing to inform pavement design should be undertaken in any areas of car parking or roads if proposed.

- It is recommended that an asbestos survey of the entire building is undertaken. Any ACMs identified should be removed by a specialist contractor prior to demolition.
- Archaeological investigations are likely to be required following demolition of the existing building.

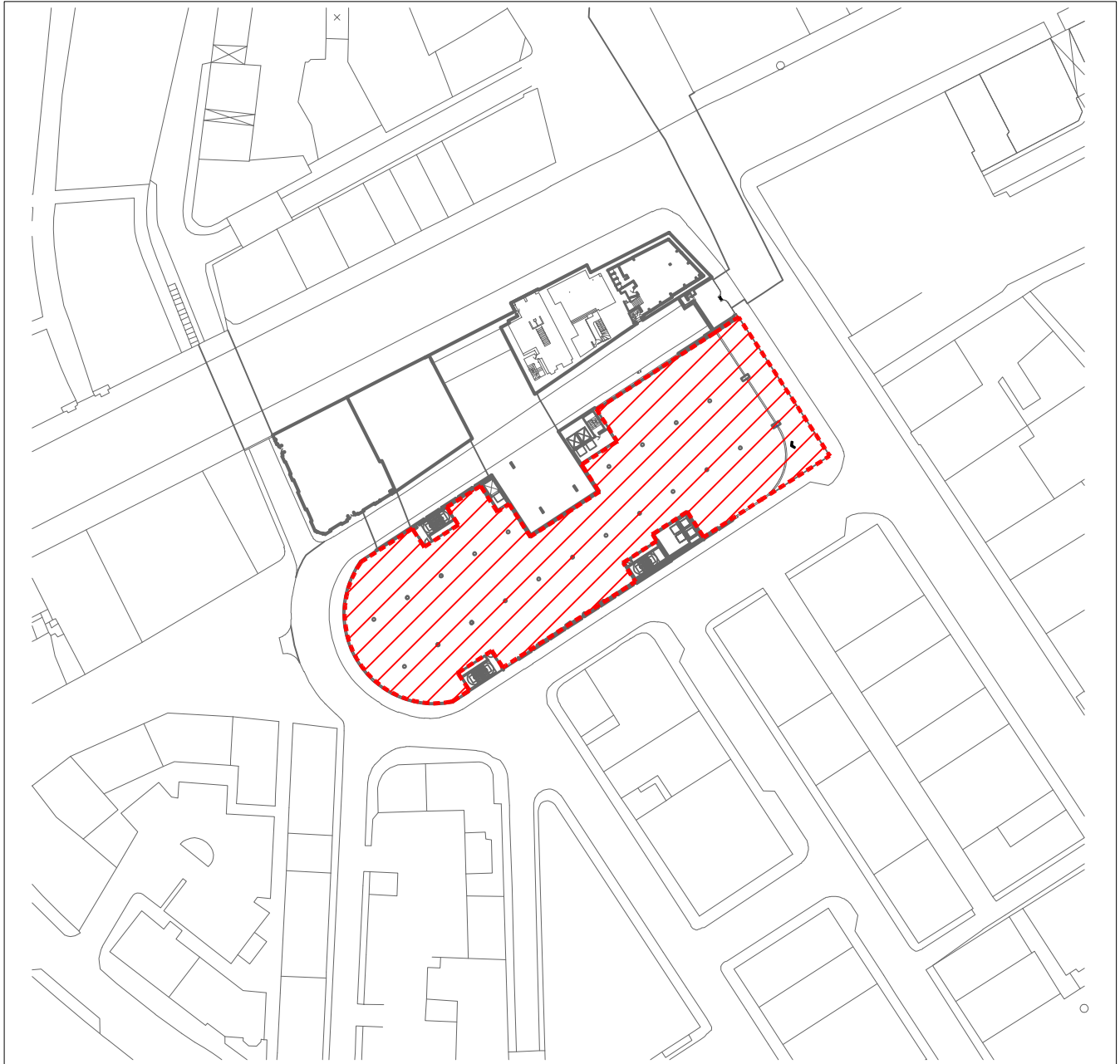
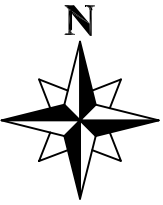
## 16.0 References

The Doric Columns website holds extensive information on the history of Aberdeen which was utilised in our review of the history of the site. The following pages were reviewed:

- 14<sup>th</sup>-16<sup>th</sup> Century Water Supply, The Doric Columns, 2013, accessed December 2018, <<http://www.mcjazz.f2s.com/14thCentWaterSupply.htm>>
- 17<sup>th</sup> Century Water Supply, The Doric Columns, 2013, accessed December 2018, <<http://www.mcjazz.f2s.com/17thCentWaterSupply.htm>>
- Putachieside, The Doric Columns, 2013, accessed December 2018, <<http://www.mcjazz.f2s.com/Putachieside.htm>>
- Green, The Doric Columns, 2013, accessed December 2018, <<http://www.mcjazz.f2s.com/Green.htm>>
- The Covered New Market 1842~1971, The Doric Columns, 2013, accessed December 2018, <<http://www.mcjazz.f2s.com/Market.htm>>

## Drawings

102256/9500	Site Location Plan
102256/9102-	Site Walkover Plan



**OS GRID REFERENCE - NJ9419206167**

Rev.	Date	Description	Drawn	Checked	Approved
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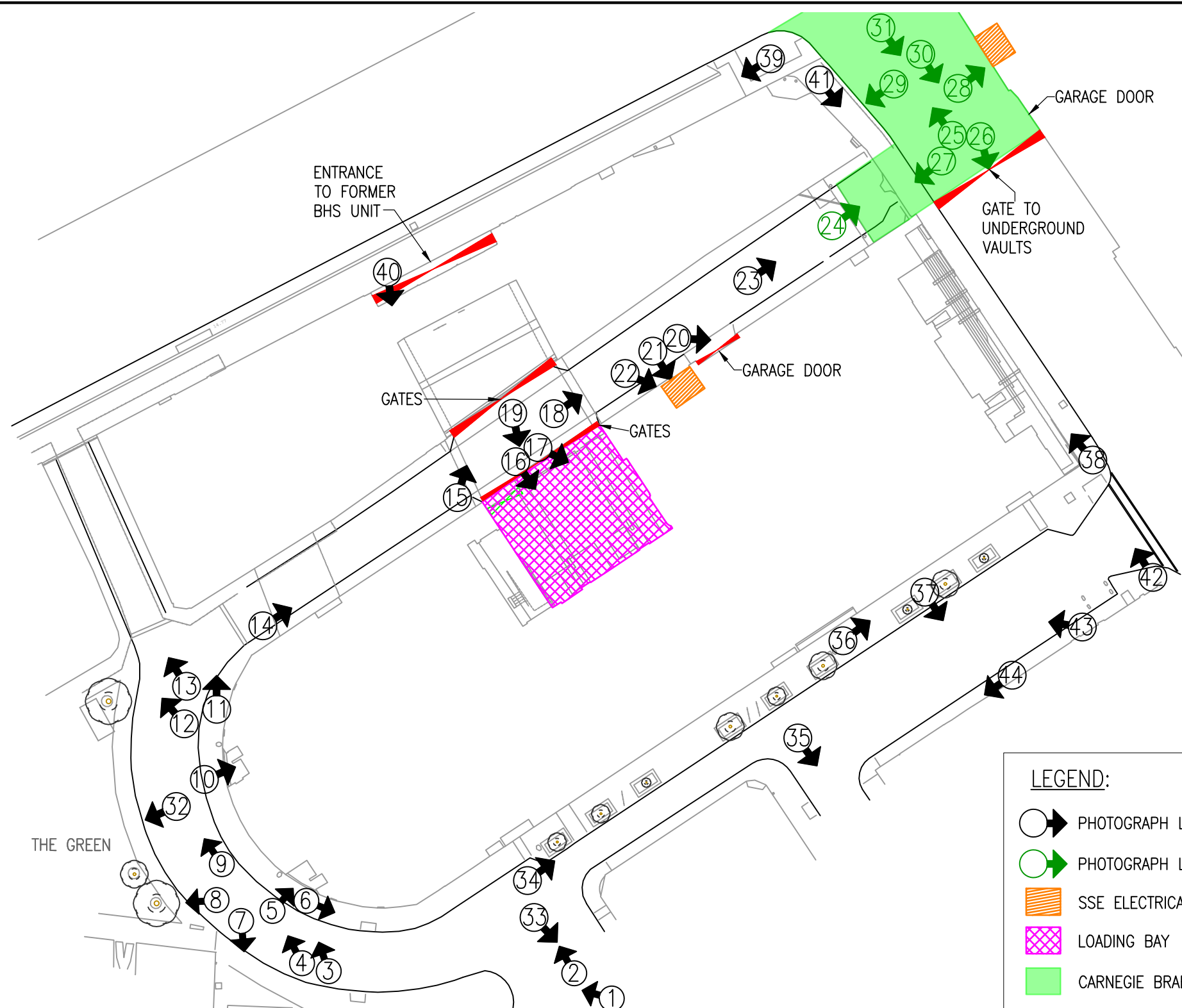
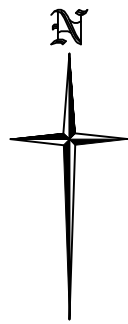
Project Title:  
**ABERDEEN MARKET,  
 MARKET STREET**

Drawing Title:  
**LOCATION PLAN**

**FAIRHURST**

88 Queens Road,  
 ABERDEEN, AB15 4YQ  
 Tel: 01224 321 222 Fax: 01224 323 201

Scale at A4: NTS	Status: For Information	
Drawn: AG	Checked: KT	Approved: ASK
Date: 27/07/18	Date: 27/07/18	Date: 27/07/18
Drawing No.: 102256/9500		Revision: -



**LEGEND:**

- PHOTOGRAPH LOCATOR (STREET LEVEL)
- PHOTOGRAPH LOCATOR (LOWER LEVEL – CARNegie BRAE)
- SSE ELECTRICAL SUBSTATION
- LOADING BAY
- CARNegie BRAE (LOWER STREET LEVEL)

Rev.	Date	Description	Drawn	Checked	Approved

Notes: \_\_\_\_\_

Client: \_\_\_\_\_

Project Title:  
**ABERDEEN MARKET,  
 MARKET STREET, ABERDEEN**

Drawing Title:  
**SITE WALKOVER SURVEY PLAN**

<b>FAIRHURST</b>		
<small>88 Queens Road, ABERDEEN, AB15 4YQ Tel: 01224 321 222 Fax: 01224 323 201</small>		
Scale at A3: 1:500	Status: For Information	
Drawn: RD	Checked: LM	Approved: LY
Date: 10/12/18	Date: 12/12/18	Date: 14/12/18
Drawing No.: 102256/9102		Revision: -

## Appendix 1

### F!ND Radon Map



## Appendix 2

### Historic OS Maps

## **Appendix 3**

### **Historic BGS Borehole Records (Boots the Chemist, 1974)**

## **Appendix 4**

### **Site Walkover Survey (Fairhurst, November 2018)**

## **Appendix 5**

### **Topographical Surveys (Granite City Surveys Ltd, May & August 2018)**

## **Appendix 6**

### **Consultation Responses (ACC, November 2018)**

## **Appendix 7**

### **Existing Services**

## **Appendix 8**

# **Principles of Environmental Risk Assessment**

## Principles of Environmental Risk Assessment

The Environmental Protection Act (1990), Part II A Contaminated Land (Section 57 of the Environment Act 1995), revised by Scottish Statutory Instrument No.658 (2005), and the Contaminated Land Regulations (1999) provide a basis on which to determine the risks and liabilities presented by a contaminated site. Contaminated Land is defined within Annex 3, Chapter A Part 1- Scope of Chapter and in all those Sections mentioned as:

*“Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that:*

- (a) Significant harm is being caused or there is significant possibility of such harm being caused; or*
- (b) Significant pollution of the water environment is being caused or there is a significant possibility of such pollution being caused.”*

Section 57 of the Environment Act 1995 requires that any site identified as being “contaminated” by the Local Authority will be registered by them and remediation will be required to render the site fit for use.

The presence of contamination is not the sole factor for deciding whether a site is contaminated. Relevant parties should identify site-specific risks and provide objective, cost-effective methods to manage the contamination in a manner that satisfies the proposed end-use.

A risk-based approach, which takes both technical and non-technical aspects into consideration when making decisions on contamination resulting from past, present or future human activities, is advocated. The assessment of environmental risks generally relies on the identification of three principal elements forming a ‘pollutant linkage’:

**SOURCE:** the contaminant

**PATHWAY:** the route through which the contaminant can migrate, and

**RECEPTOR:** any human, animal, plant, water environment or property that may be adversely affected (harmed) by the contaminant

In the absence of any one of these elements, on any given site, there is no risk. Where all three elements are present, risk assessment is required to determine the significance of the harm that is being or may be caused. As outlined above, the terms of the Contaminated Land regime specify that remediation need only be implemented where a site is causing, or there is a significant possibility that it will cause, significant harm, or significant pollution to the water environment.

Development of contaminated land is usually addressed through the application of planning and development legislation and guidance (i.e. Planning Advice Note 33). The suitable for use approach is seen as the most appropriate to deal with contaminated land, taking account of environmental, social and economic objectives. The assessment is made in the context of the proposed land use (i.e. residential, retail, open-space and tourist developments).



## **Appendix 9**

### **Asbestos Survey**

**(Astec Consultants Ltd, June 2017)**

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