



Large-Scale National Grid Data

Published 1992

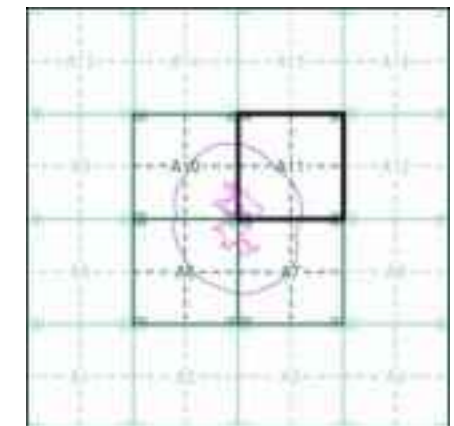
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8990NW	SJ8990NE
1992	1992
1:1,250	1:1,250
SJ8990SW	SJ8990SE
1992	1992
1:1,250	1:1,250

Historical Map - Segment A11



Order Details

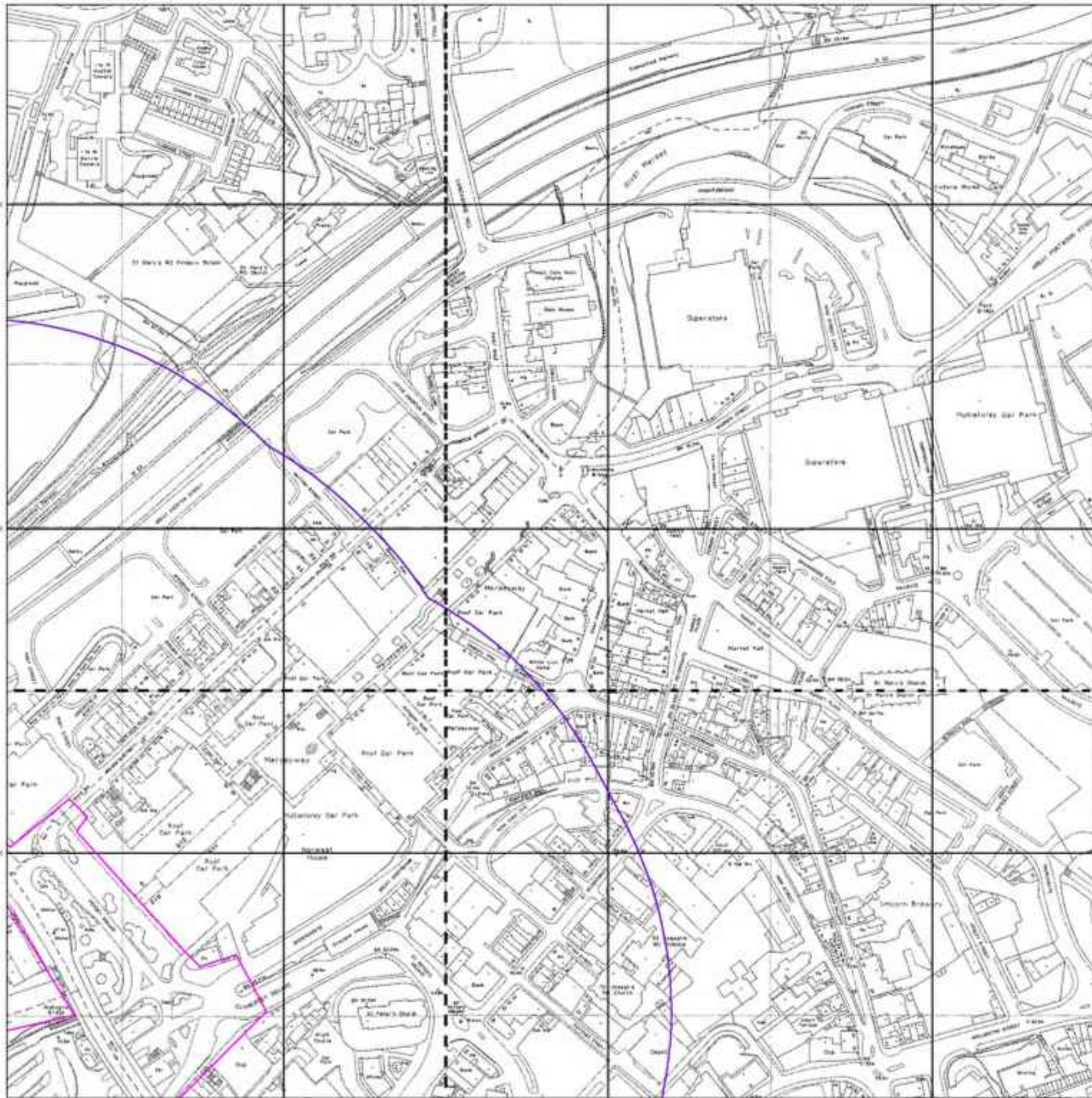
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk





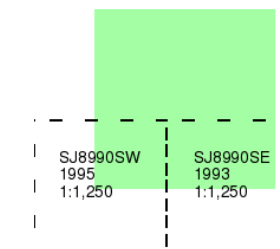
Large-Scale National Grid Data

Published 1993 - 1995

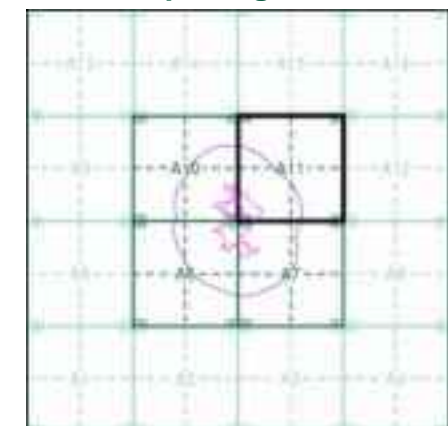
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

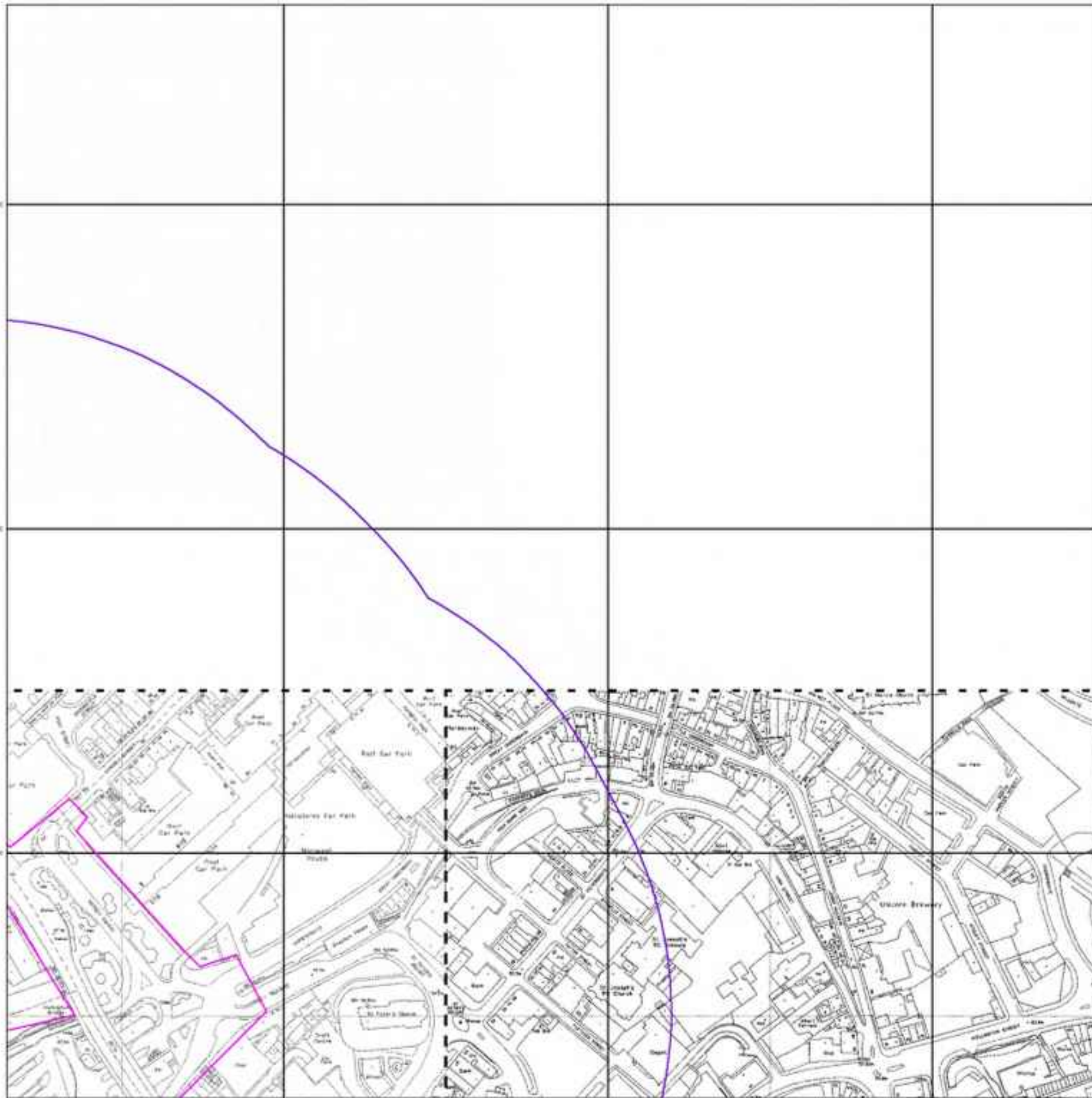
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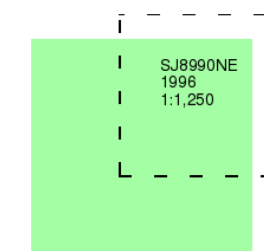
Large-Scale National Grid Data

Published 1996

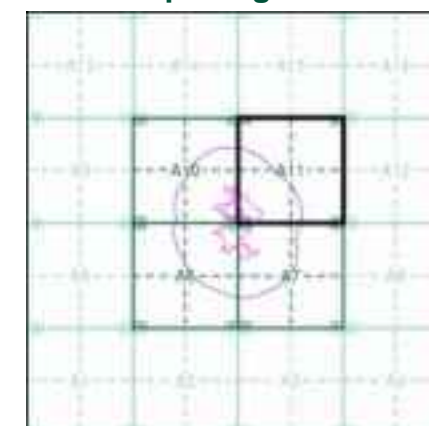
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A11



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Cheshire

Published 1874 - 1875

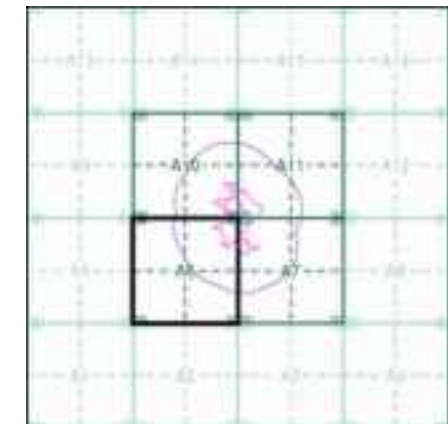
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1874	1:2,500
019_03	1875	1:2,500

Historical Map - Segment A6

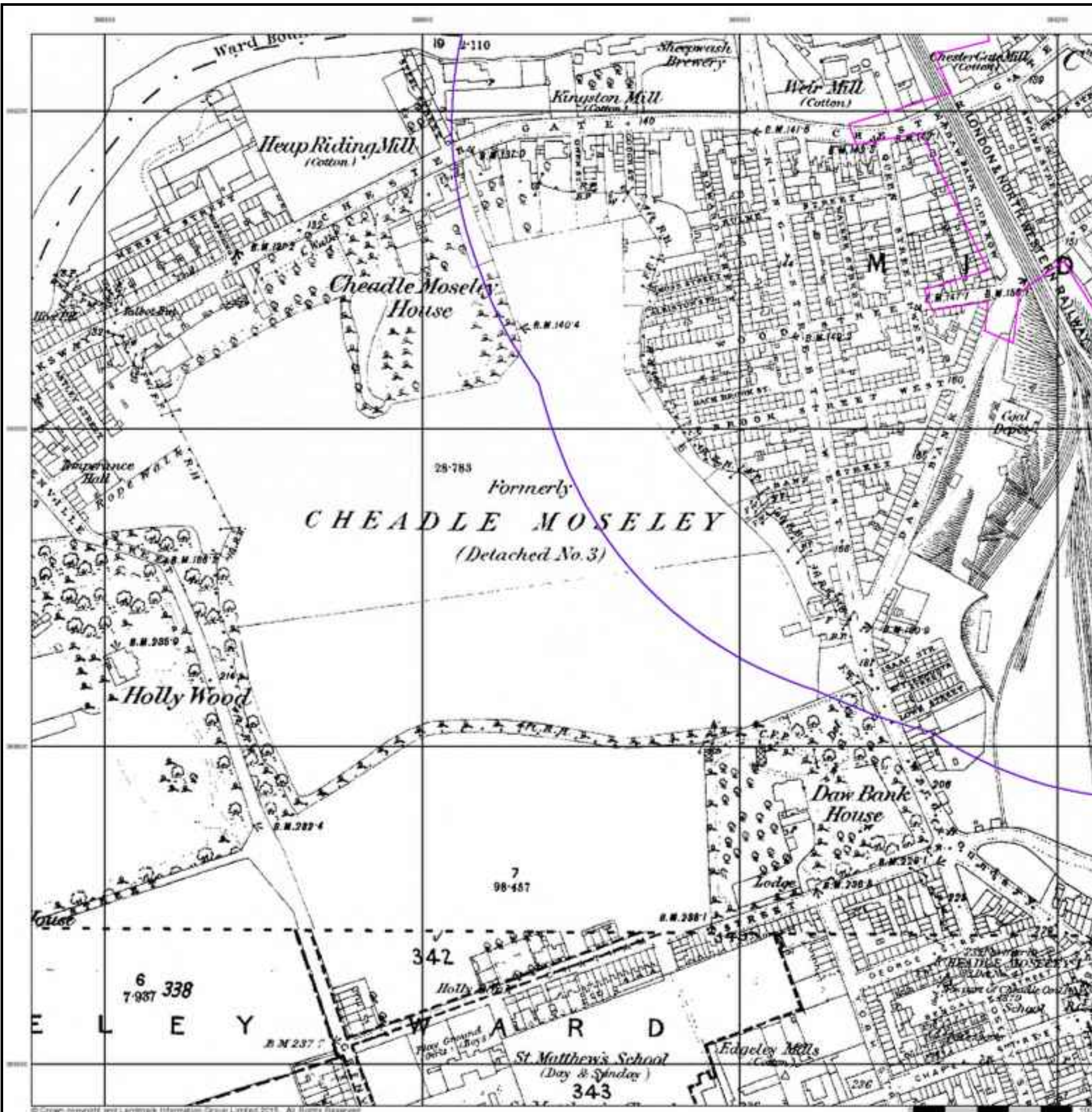


Order Details

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Site Details

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Lancashire And Furness

Published 1895

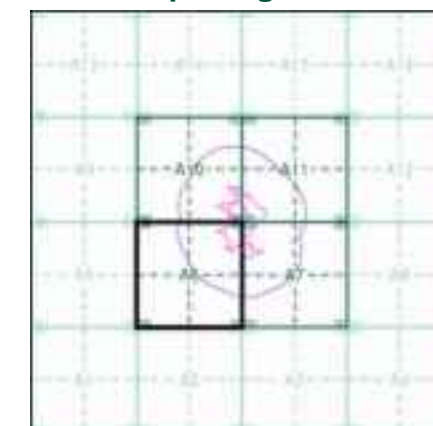
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

111_12 1895 1:2,500	112_09 1895 1:2,500
	112_13 1895 1:2,500

Historical Map - Segment A6



Order Details

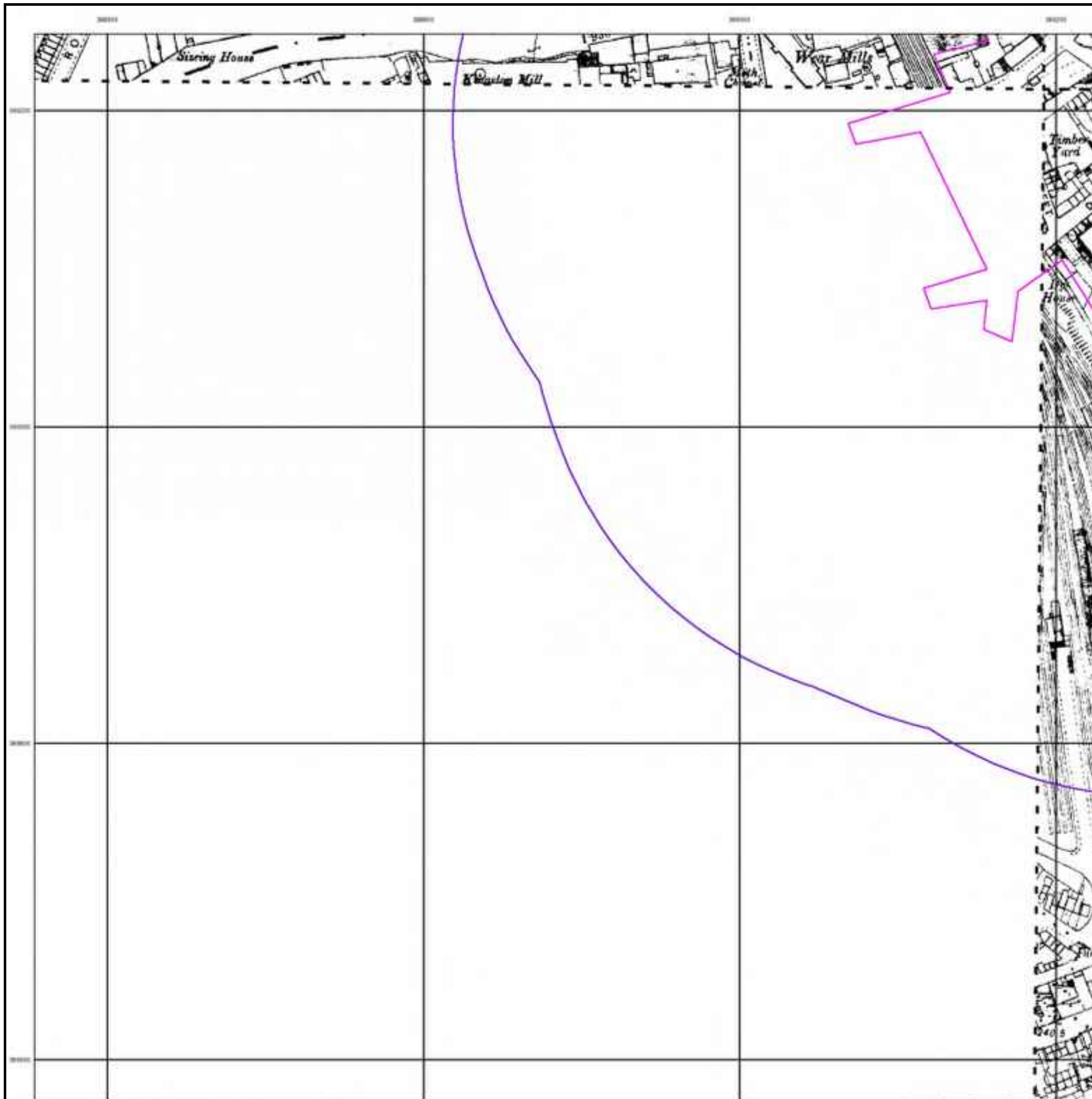
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Cheshire

Published 1898

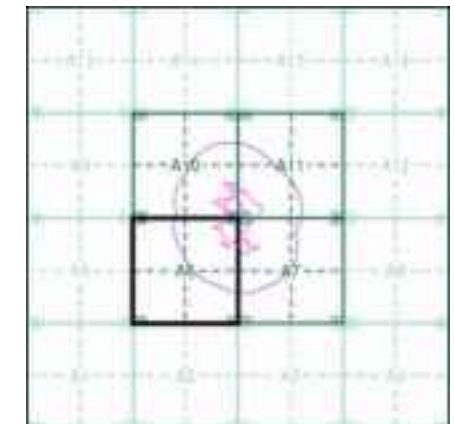
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1898	1:2,500
019_03	1898	1:2,500

Historical Map - Segment A6

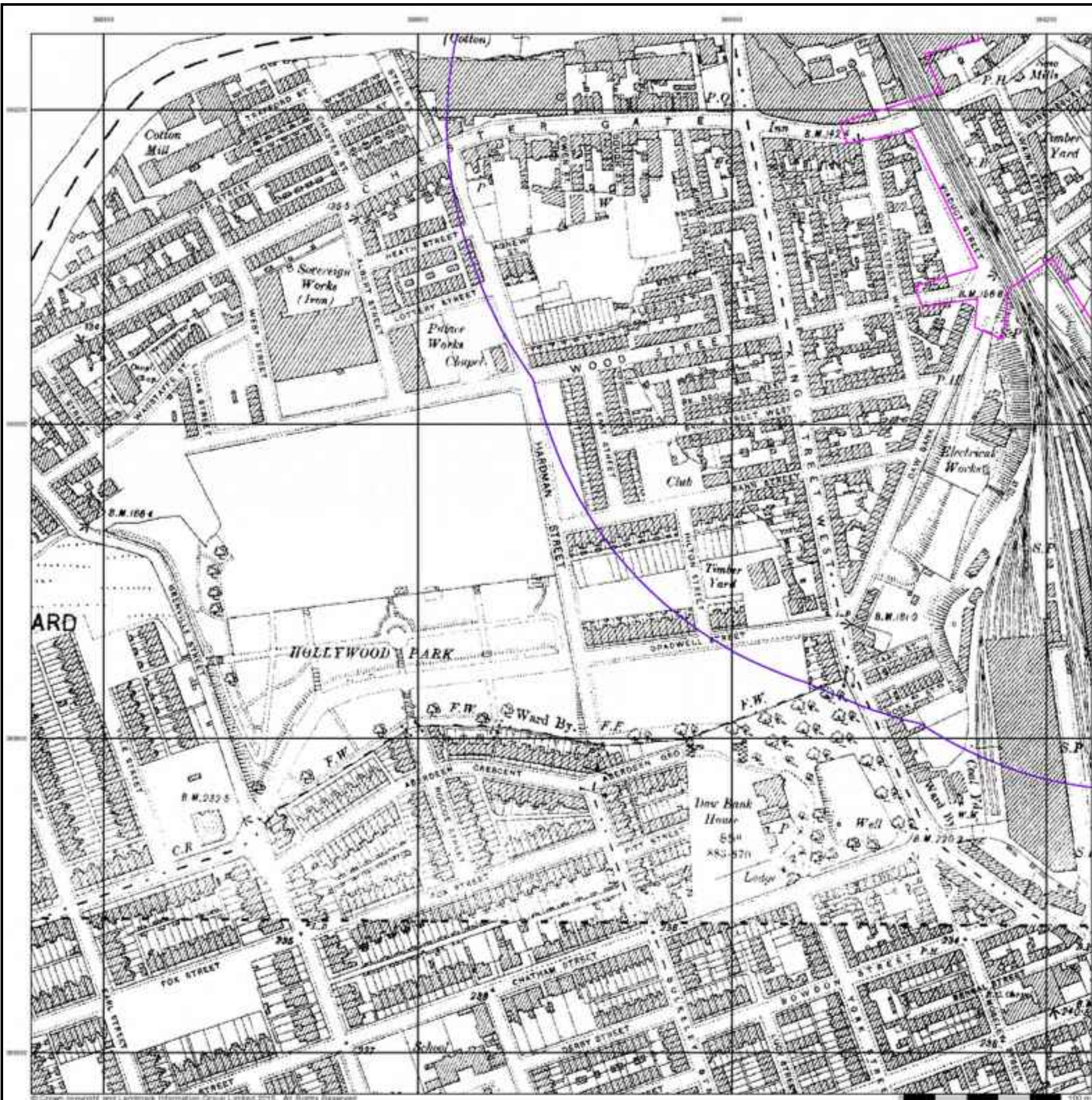


Order Details

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 Customer Ref: 60340298
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 Site Area (Ha): 5.77
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Lancashire And Furness

Published 1907

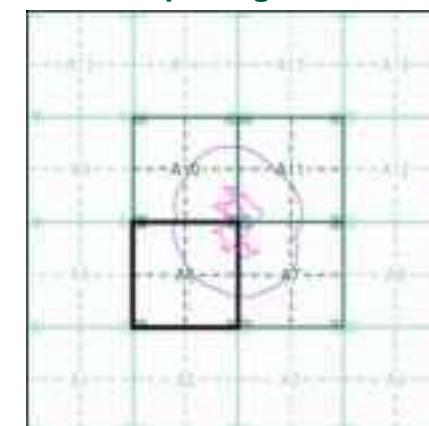
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

111_12 1907 1:2,500	112_09 1907 1:2,500
111_16 1907 1:2,500	

Historical Map - Segment A6



Order Details

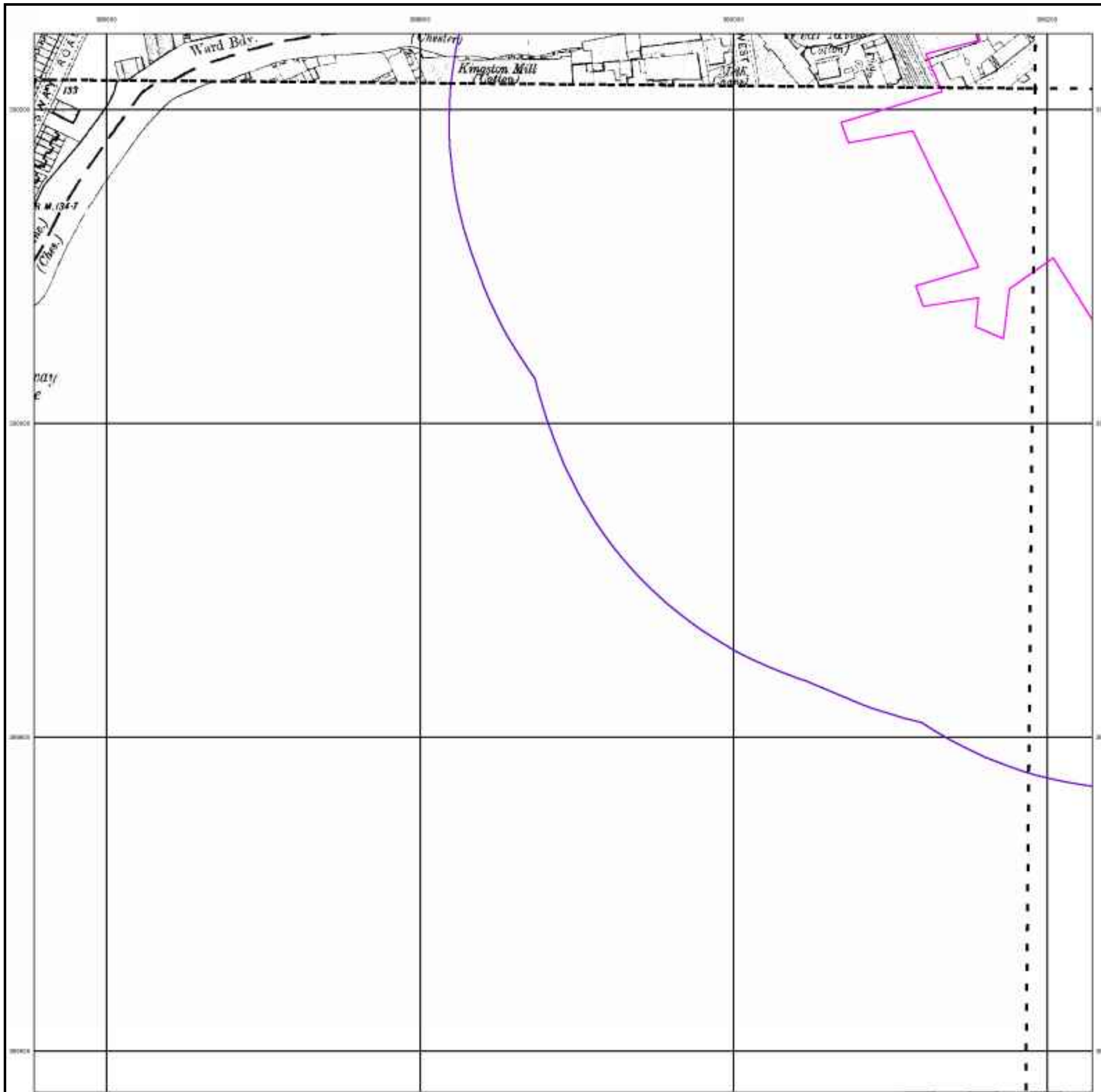
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Cheshire

Published 1910

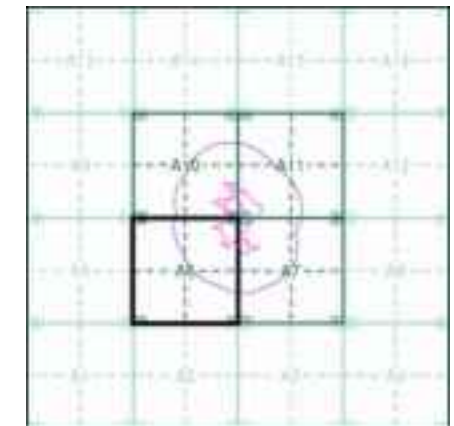
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1910	1:2,500
019_03	1910	1:2,500

Historical Map - Segment A6



Order Details

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Lancashire And Furness

Published 1922

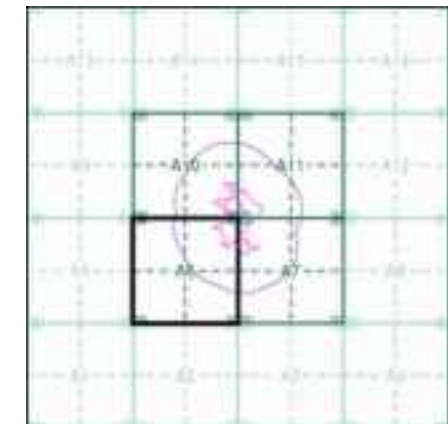
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

111_12 1922 1:2,500	112_09 1922 1:2,500
111_16 1922 1:2,500	112_13 1922 1:2,500

Historical Map - Segment A6



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Lancashire And Furness

Published 1934

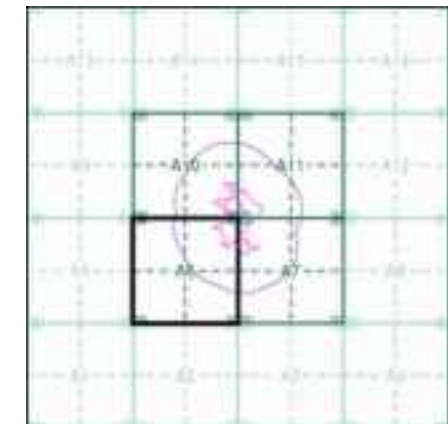
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

111_12 1934 1:2,500	112_09 1934 1:2,500
111_16 1934 1:2,500	112_13 1934 1:2,500

Historical Map - Segment A6



Order Details

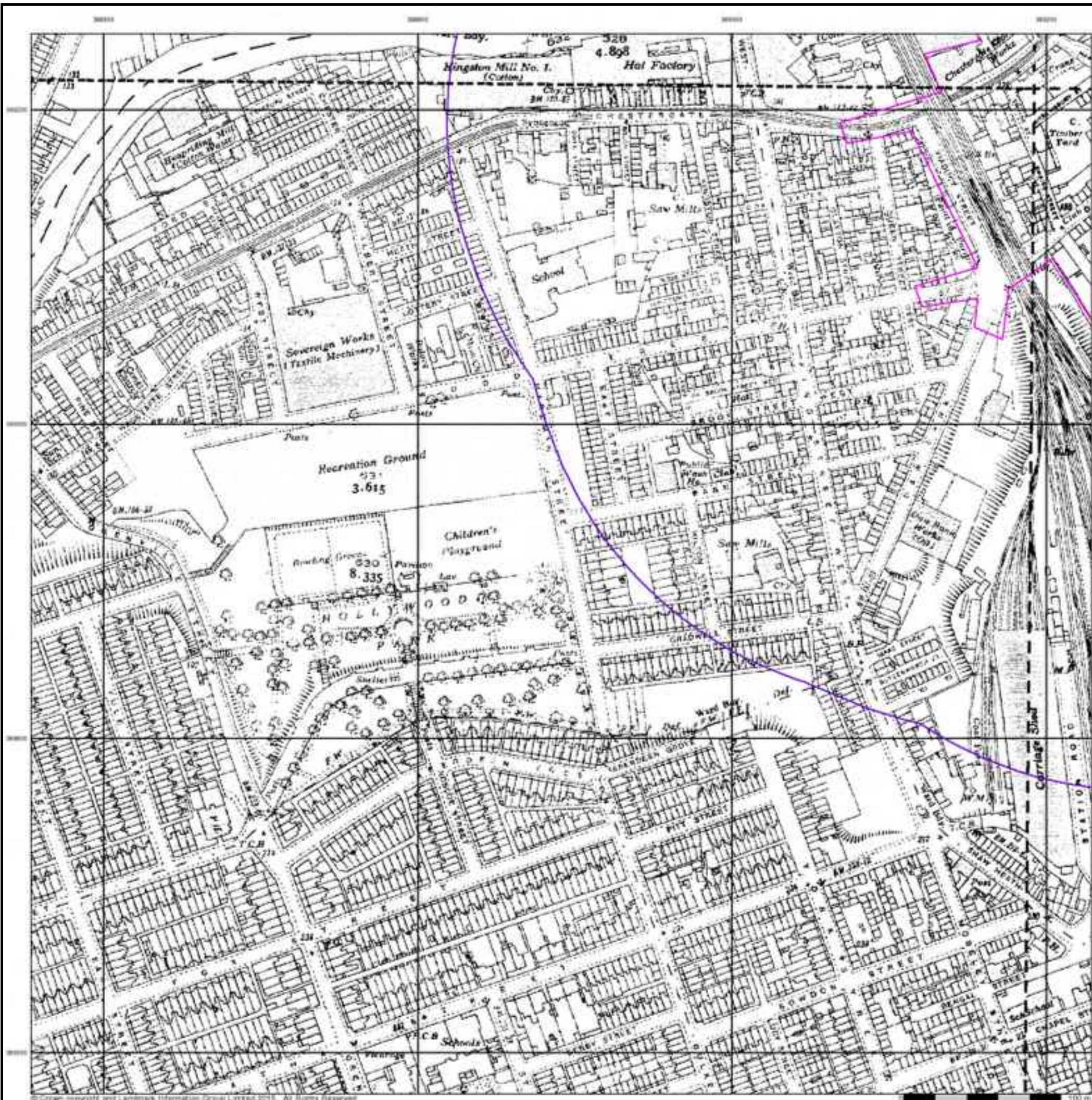
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Ordnance Survey Plan

Published 1959 - 1960

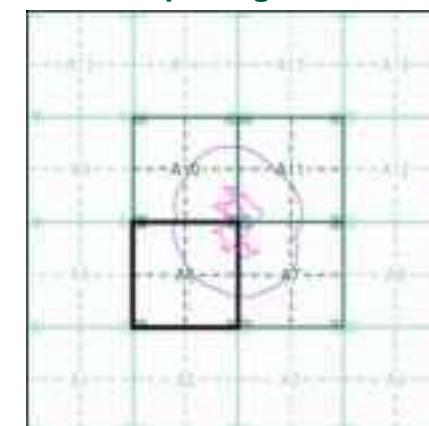
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ8890SE	SJ8990SW
1959	1959
1:1,250	1:1,250
SJ8889NE	SJ8989NW
1959	1960
1:1,250	1:1,250

Historical Map - Segment A6



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Additional SIMs

Published 1959 - 1982

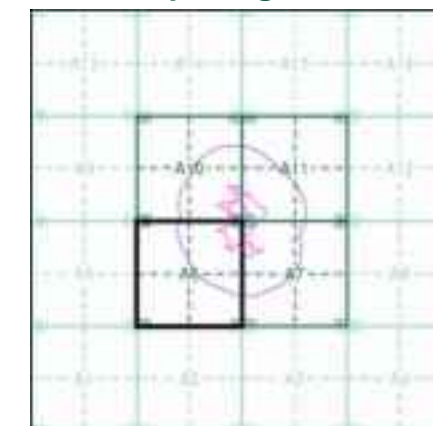
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8890SE	SJ8990SW
1982	1978
1:1,250	1:1,250
SJ8889NE	SJ8989NW
1959	1981
1:1,250	1:1,250

Historical Map - Segment A6



Order Details

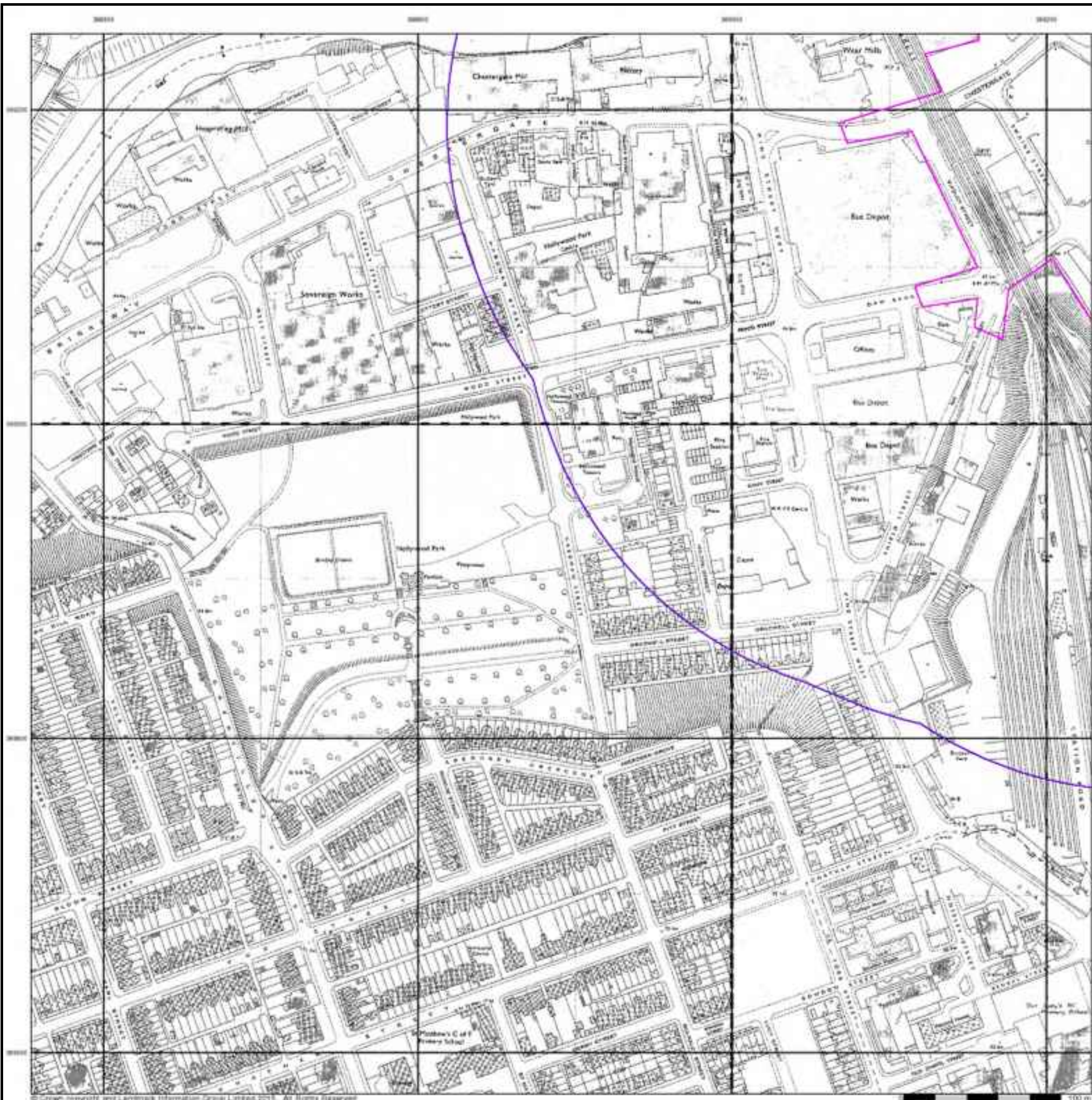
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Ordnance Survey Plan

Published 1960

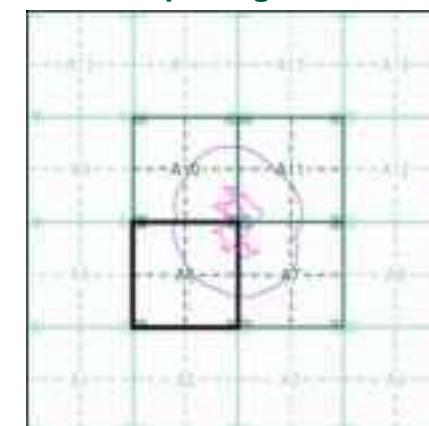
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ8890	SJ8990
1960	1960
12,500	12,500
-	
SJ8889	SJ8989
1960	1960
12,500	12,500

Historical Map - Segment A6



Order Details

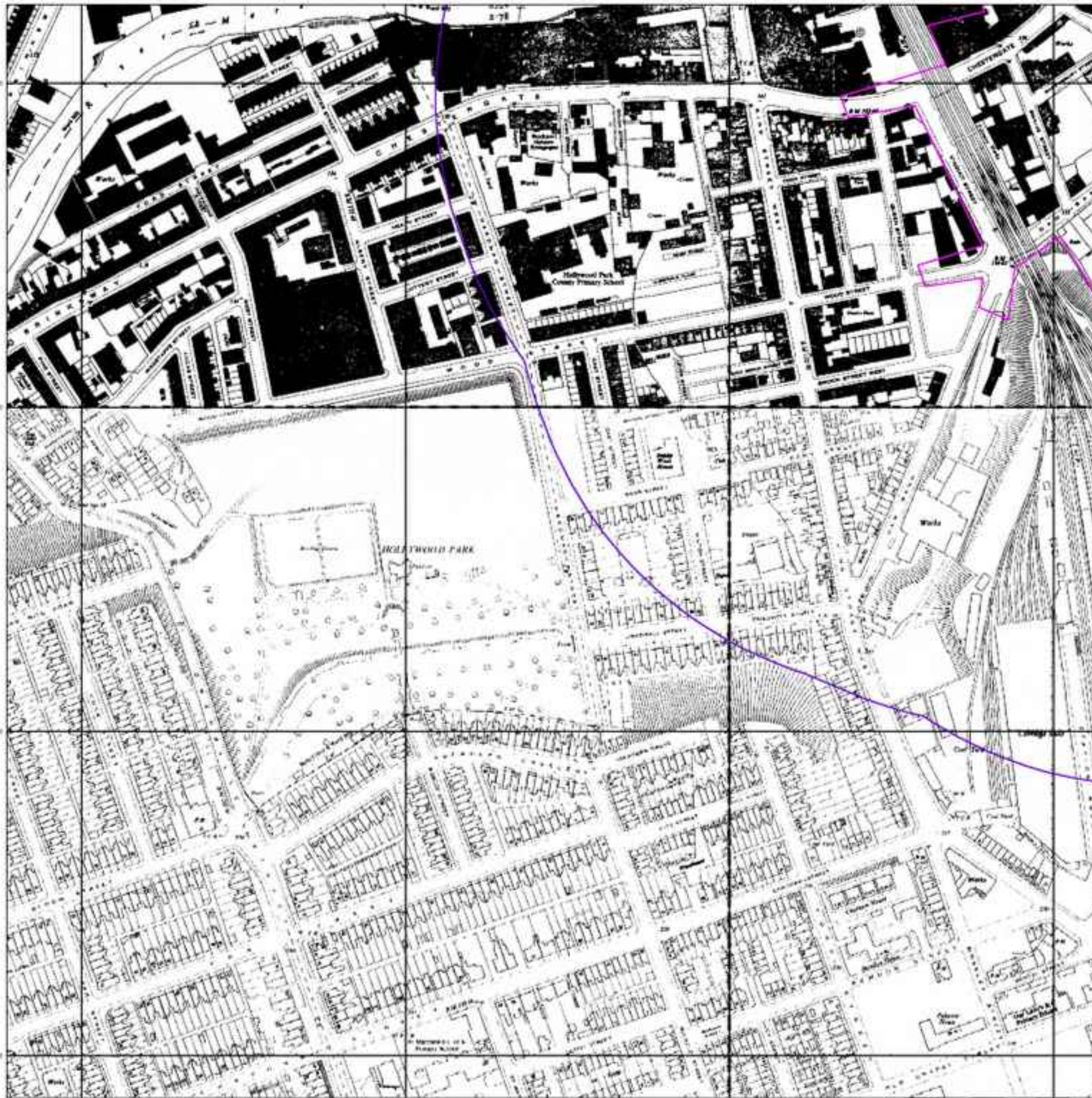
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Ordnance Survey Plan

Published 1971 - 1973

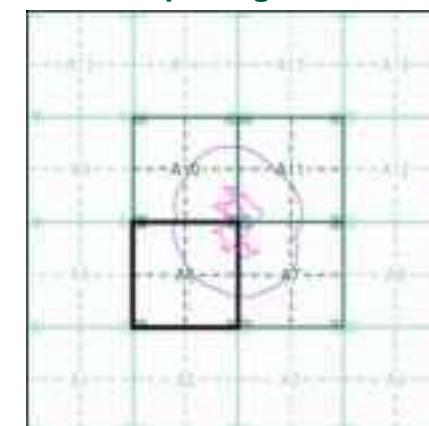
Source map scale - 1:1,250

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Map Name(s) and Date(s)

SJ8890SE	SJ8890SW
1973	1971
1:1,250	1:1,250
	SJ8889NW
	1972
	1:1,250

Historical Map - Segment A6



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Supply of Unpublished Survey Information

Published 1973 - 1974

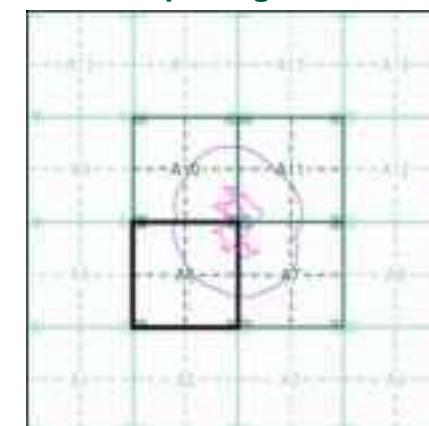
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8890SE
1974
1:1,250
SJ8889NE
1973
1:1,250

Historical Map - Segment A6



Order Details

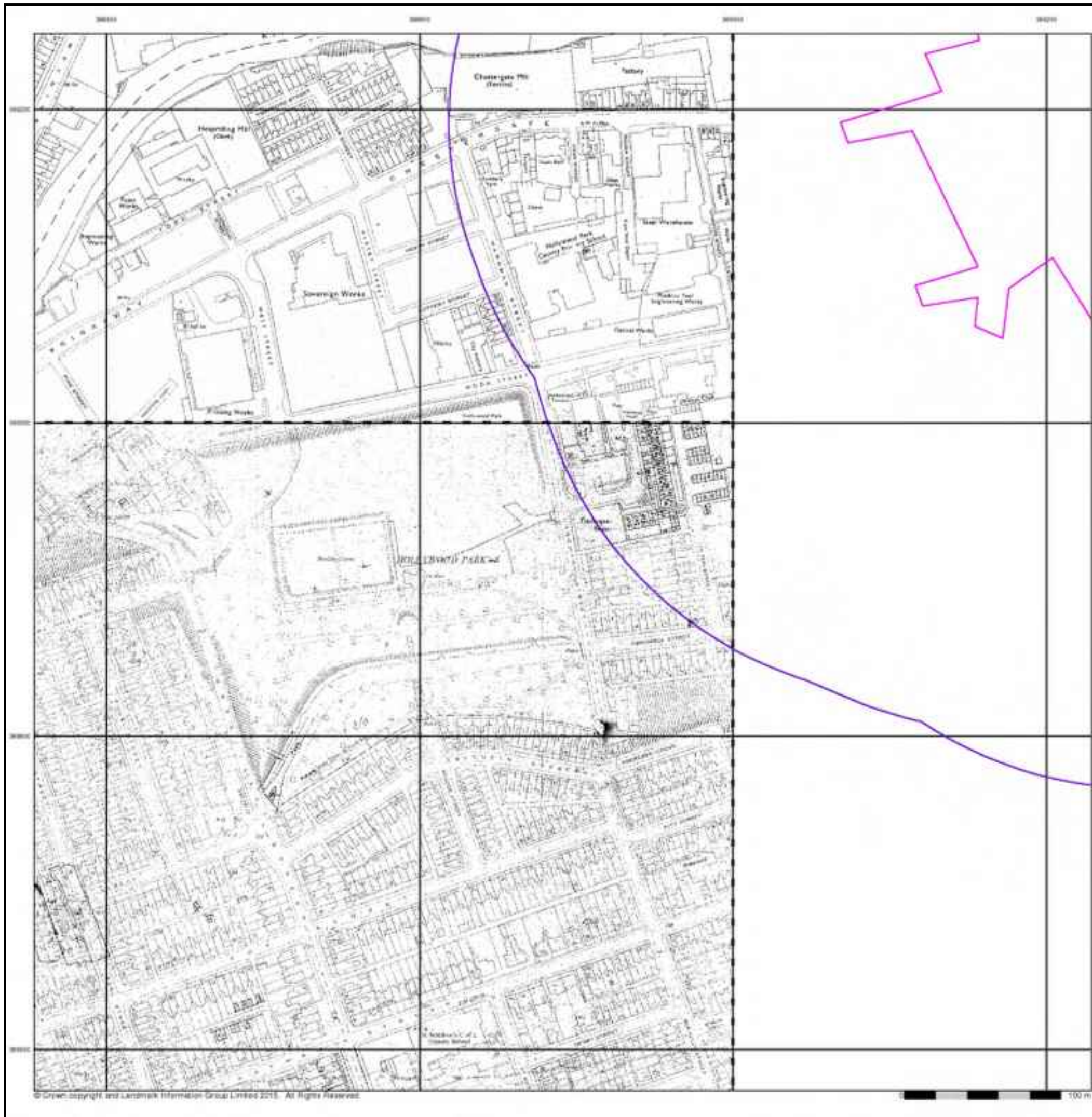
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Additional SIMs

Published 1984 - 1991

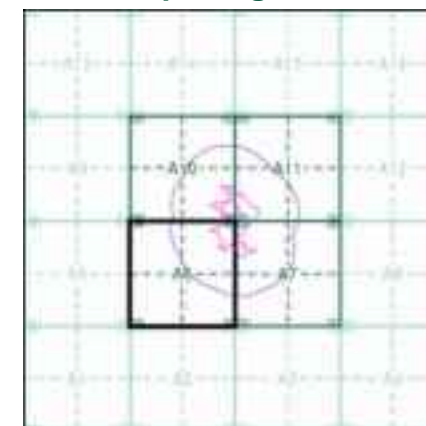
Source map scale - 1:1,250

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Map Name(s) and Date(s)

SJ8890SE	SJ8990SW
1987	1991
1:1,250	1:1,250
SJ8889NE	SJ8989NW
1984	1991
1:1,250	1:1,250

Historical Map - Segment A6



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Ordnance Survey Plan

Published 1986 - 1987

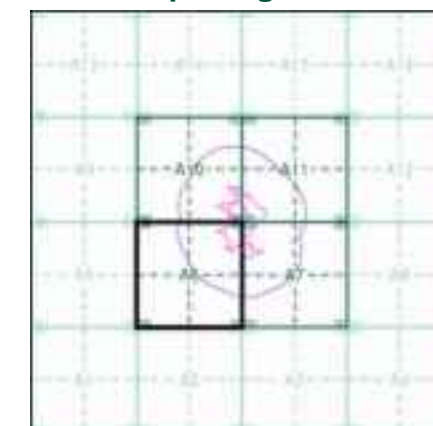
Source map scale - 1:1,250

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Map Name(s) and Date(s)

SJ8890SE	SJ8990SW
1987	1986
1:1,250	1:1,250

Historical Map - Segment A6



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Large-Scale National Grid Data

Published 1992

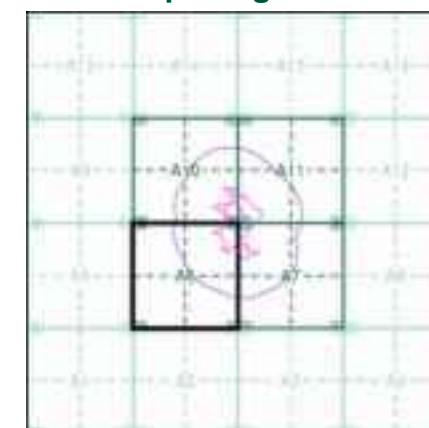
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Map Name(s) and Date(s)

SJ8890SE	SJ8990SW
1992	1992
1:1,250	1:1,250
SJ8889NE	SJ8989NW
1992	1992
1:1,250	1:1,250

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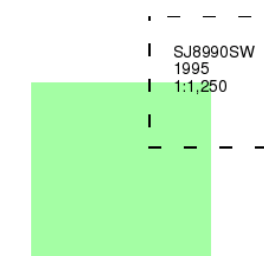
Large-Scale National Grid Data

Published 1995

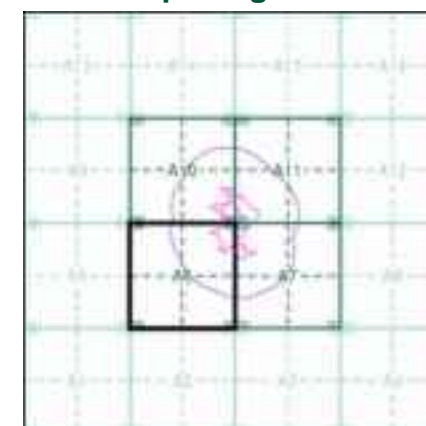
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A6



Order Details

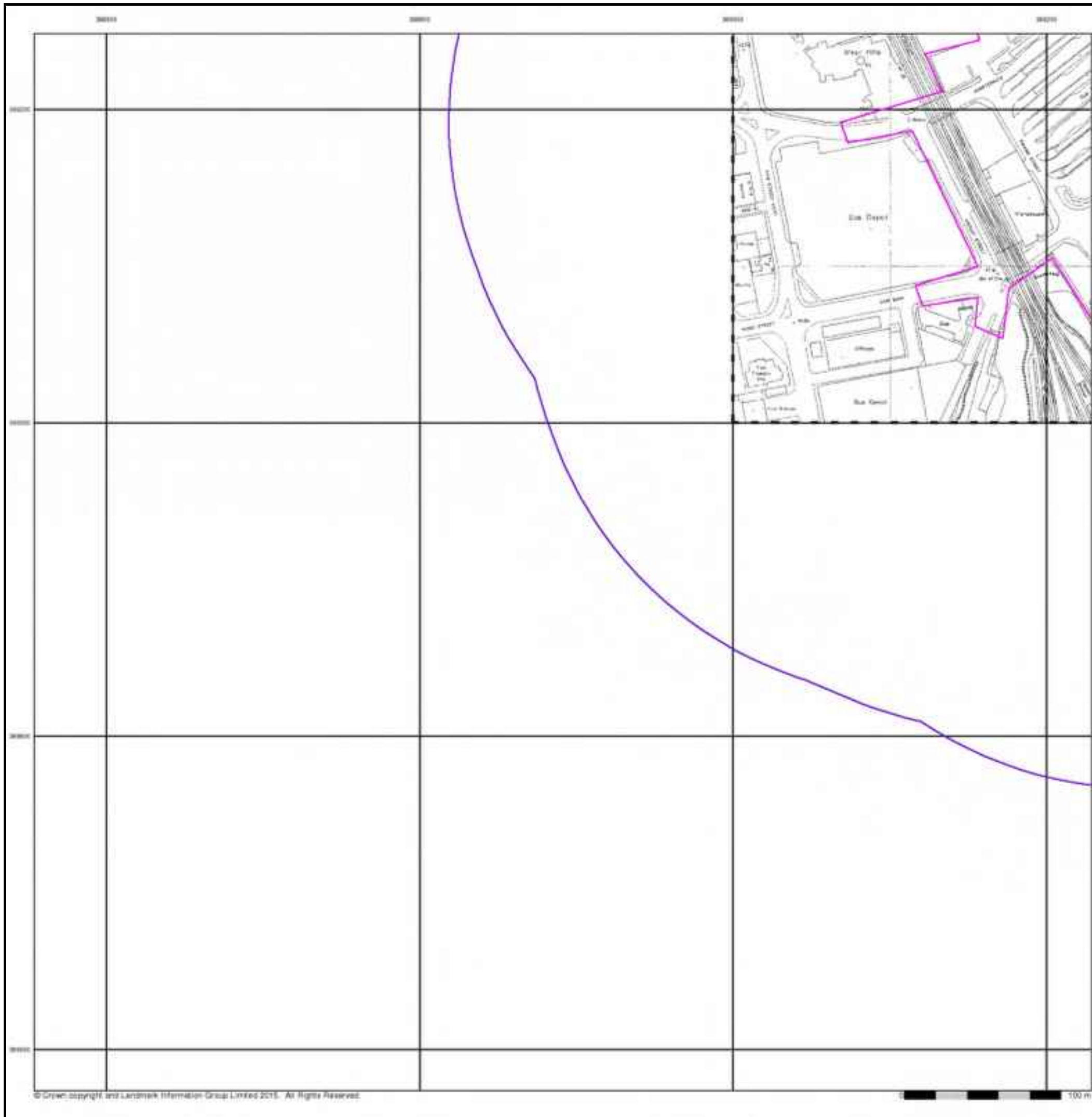
Order Number:	66053144_1_1
Customer Ref:	60340298
National Grid Reference:	389220, 390250
Slice:	A
Site Area (Ha):	5.77
Search Buffer (m):	250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



Tel:	0844 844 9952
Fax:	0844 844 9951
Web:	www.envirocheck.co.uk



Cheshire

Published 1874 - 1875

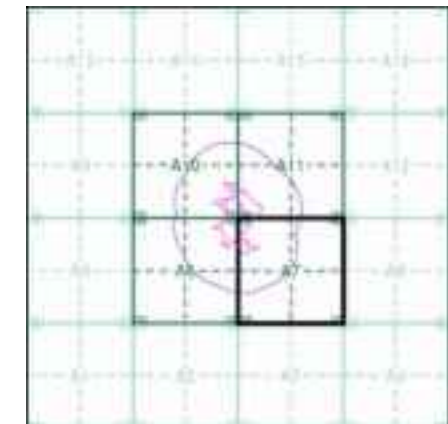
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1874	1:2,500
019_03	1875	1:2,500

Historical Map - Segment A7

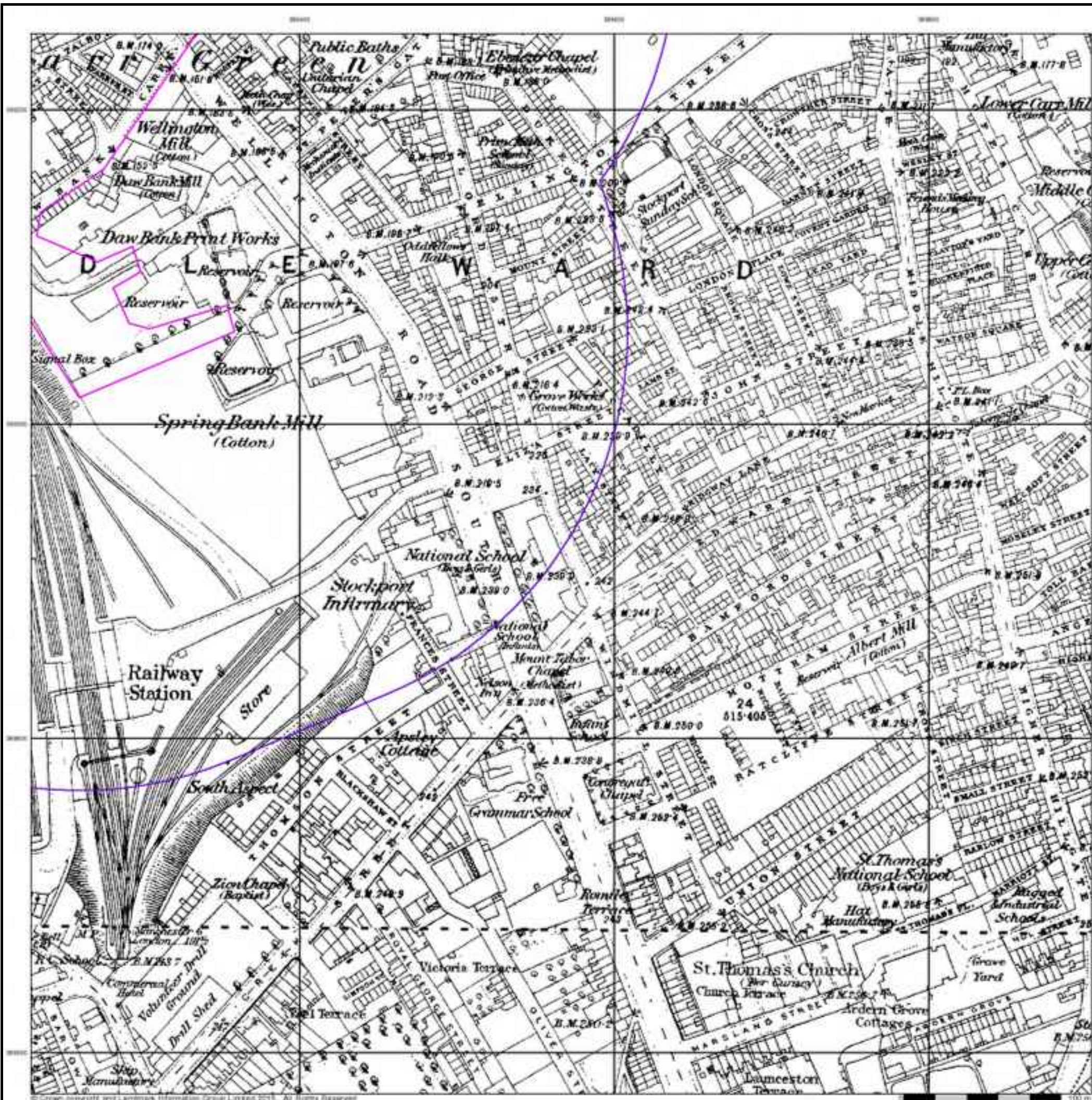


Order Details

Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU





Lancashire And Furness

Published 1895

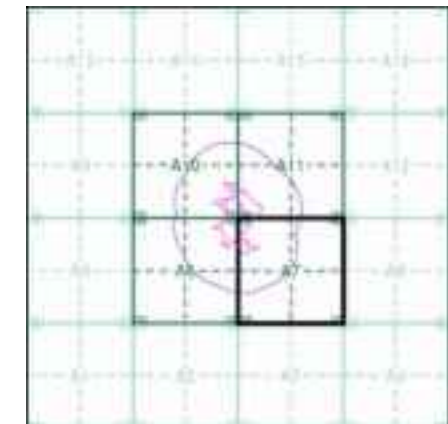
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

112_09
1895
1:2,500
112_13
1895
1:2,500

Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

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Cheshire

Published 1898

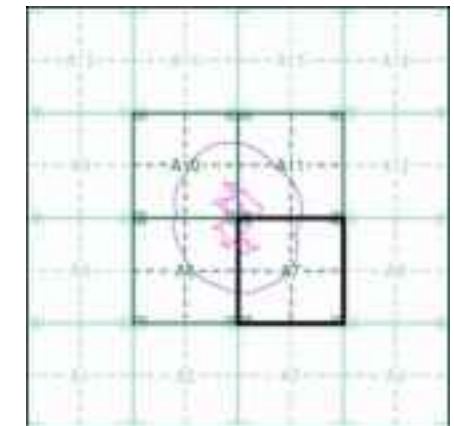
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1898	1:2,500
019_03	1898	1:2,500

Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU





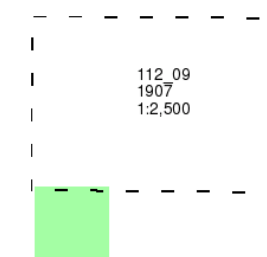
Lancashire And Furness

Published 1907

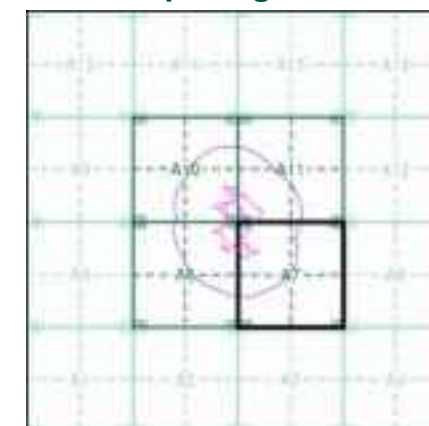
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

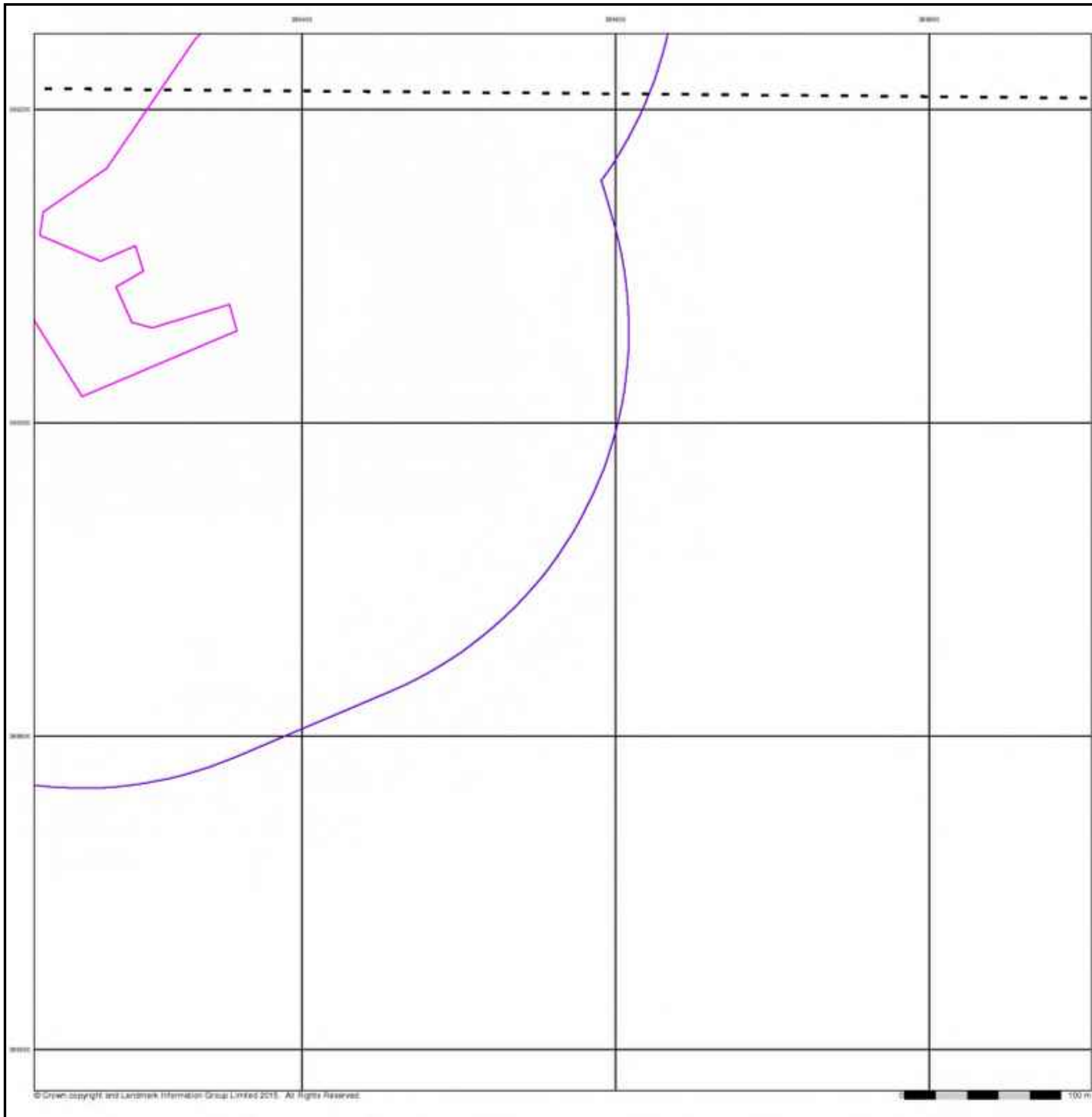
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

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Cheshire

Published 1910

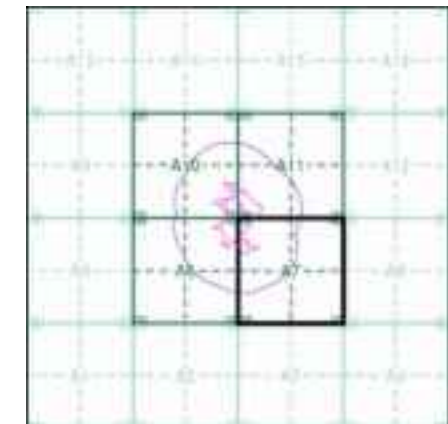
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

010_15	1910	1:2,500
019_03	1910	1:2,500

Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU





Lancashire And Furness

Published 1922

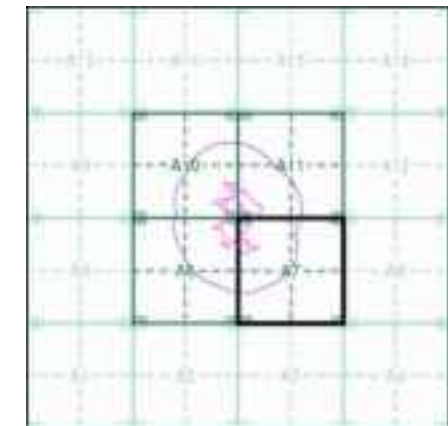
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

112_09	1922	1:2,500
112_13	1922	1:2,500

Historical Map - Segment A7



Order Details

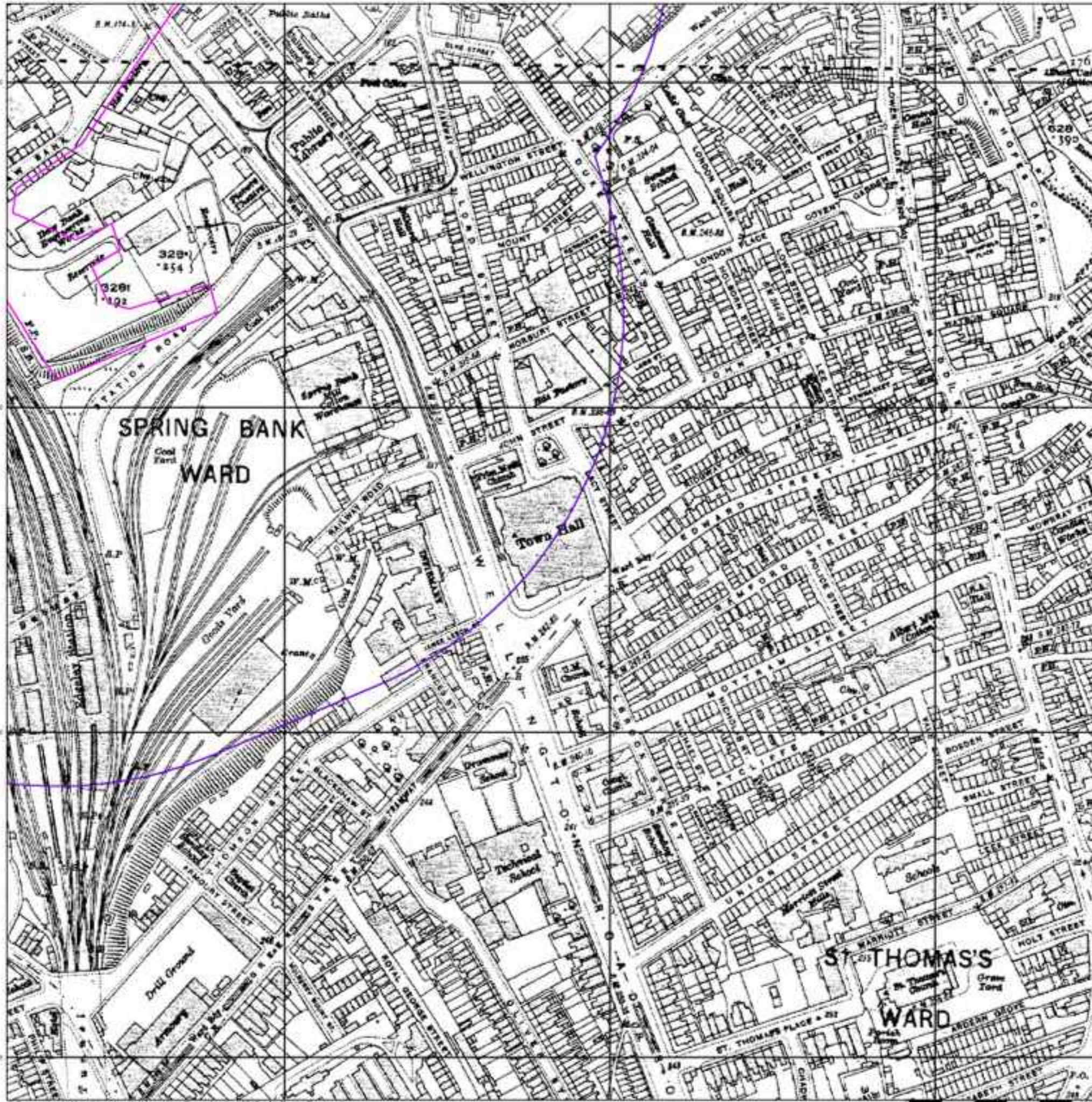
Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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Lancashire And Furness

Published 1934

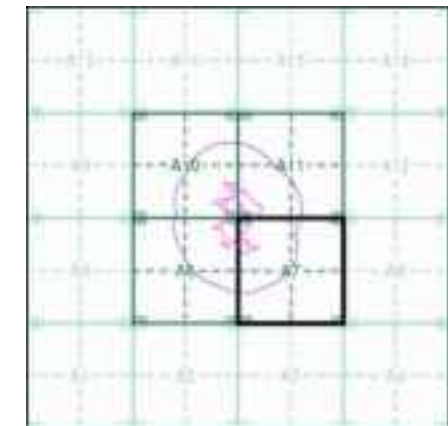
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

112_09	1934	1:2,500
112_13	1934	1:2,500

Historical Map - Segment A7

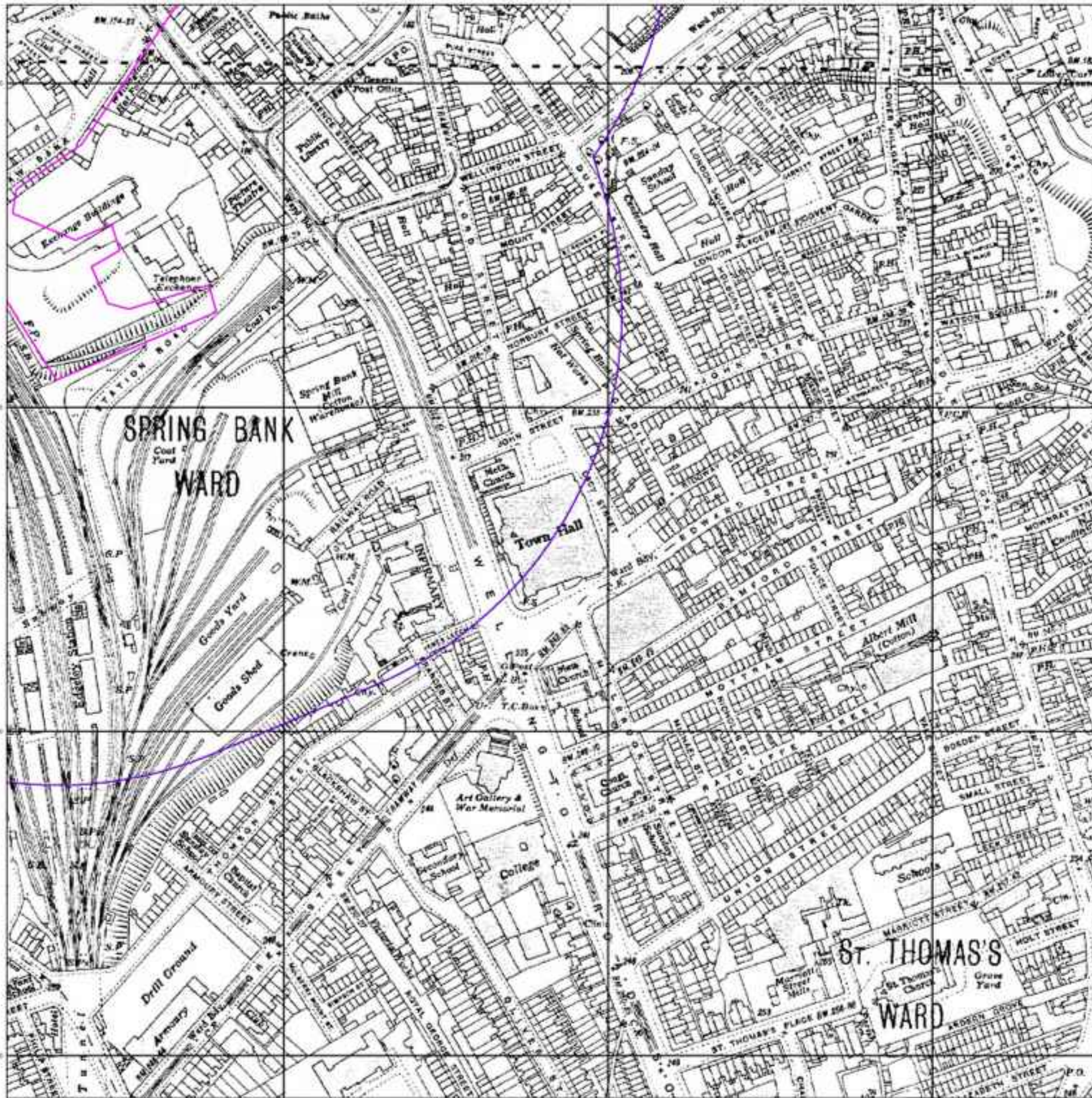


Order Details

Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU





Ordnance Survey Plan

Published 1959 - 1960

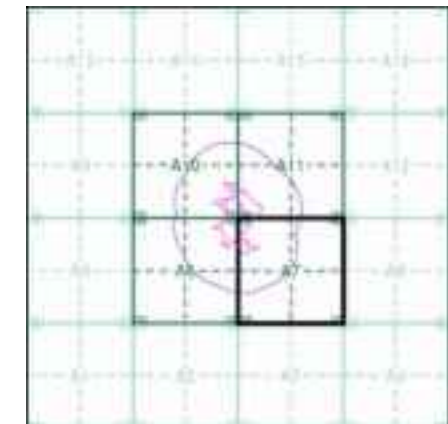
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ8990SW	SJ8990SE
1959	1959
1:1,250	1:1,250
SJ8989NW	SJ8989NE
1960	1960
1:1,250	1:1,250

Historical Map - Segment A7



Order Details

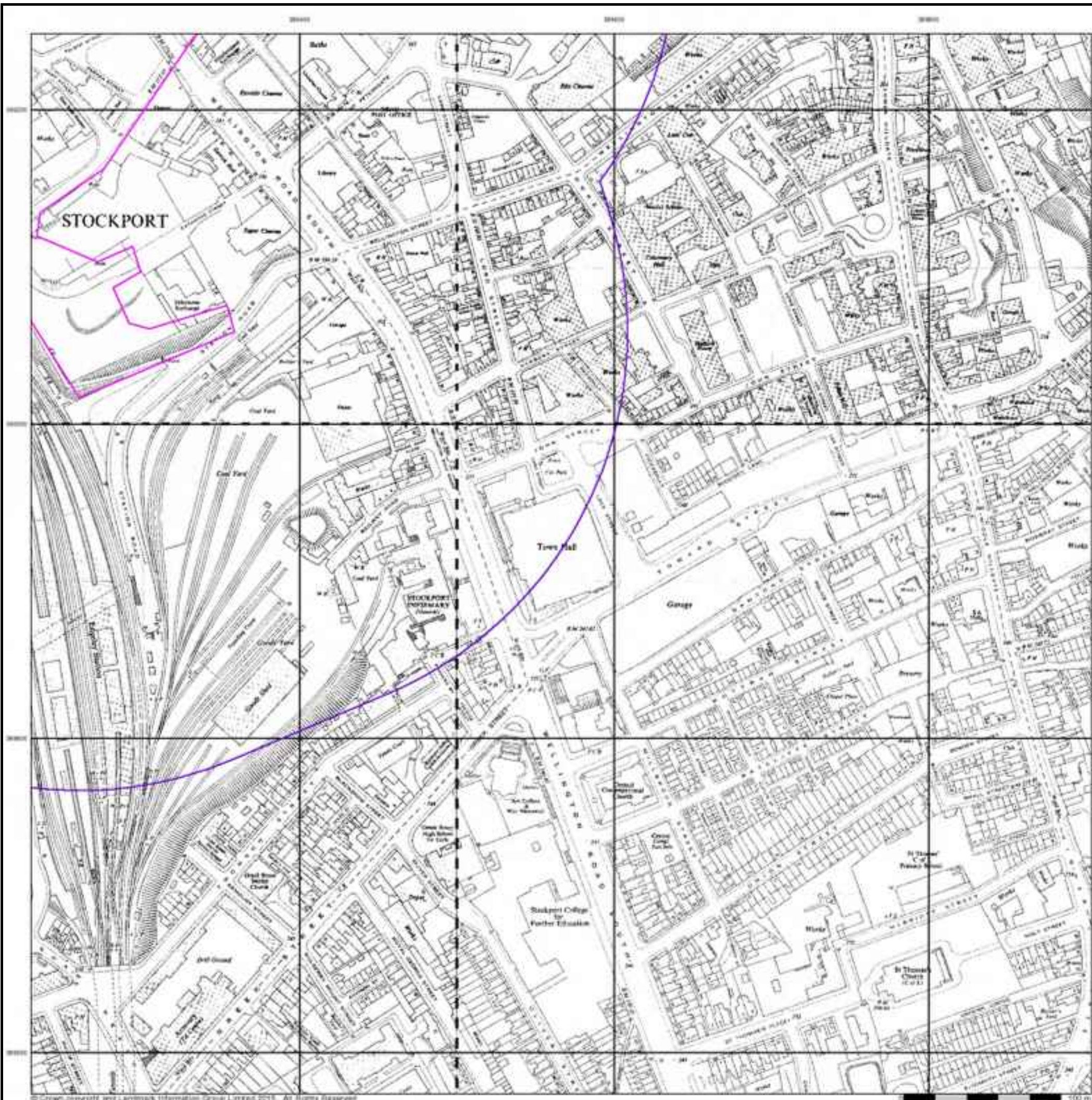
Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

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Ordnance Survey Plan

Published 1960

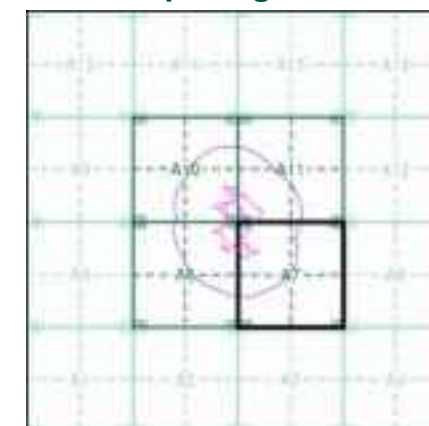
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ8990
1960
1:2,500
SJ8989
1960
1:2,500

Historical Map - Segment A7



Order Details

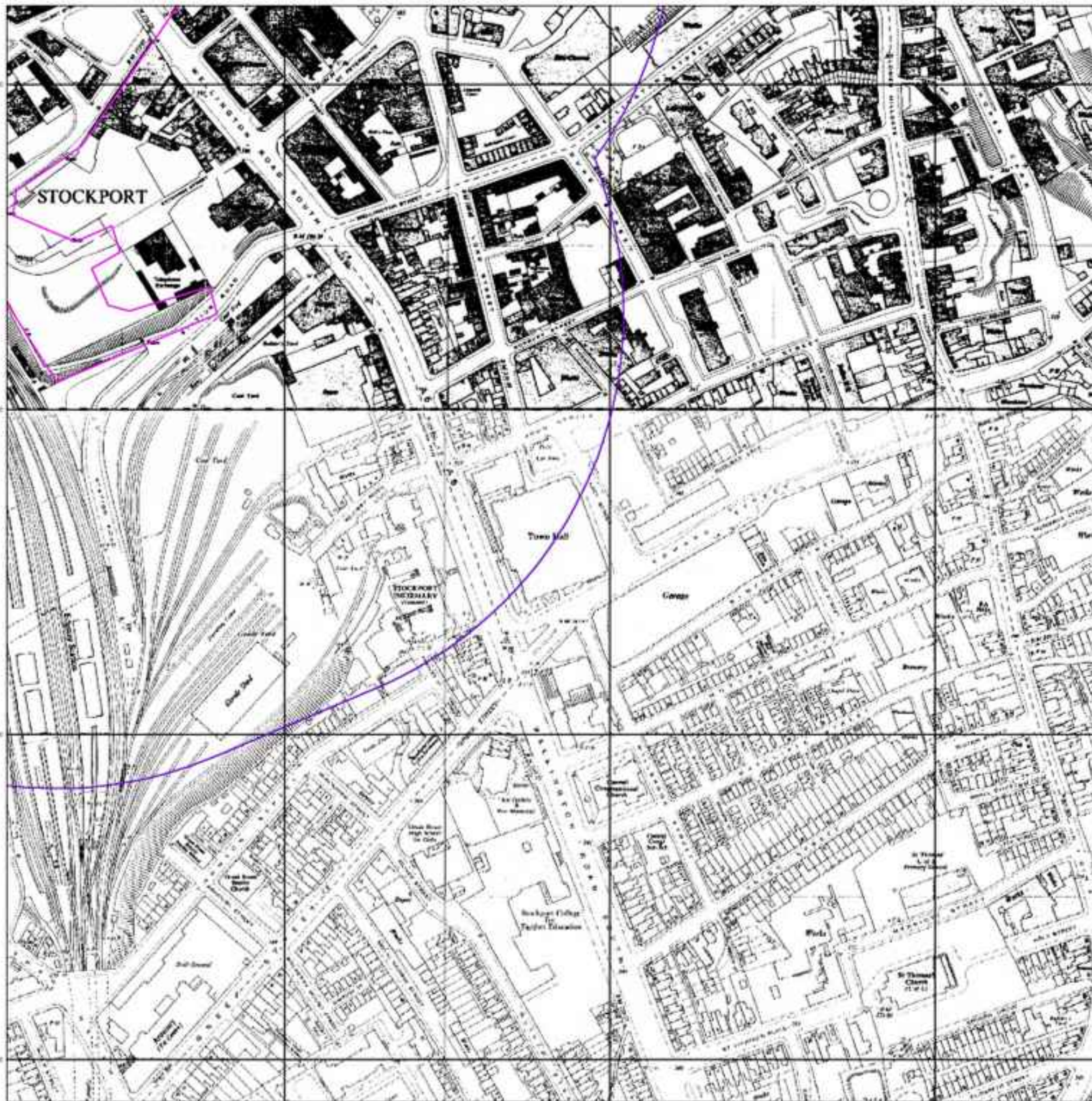
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

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Ordnance Survey Plan

Published 1967 - 1972

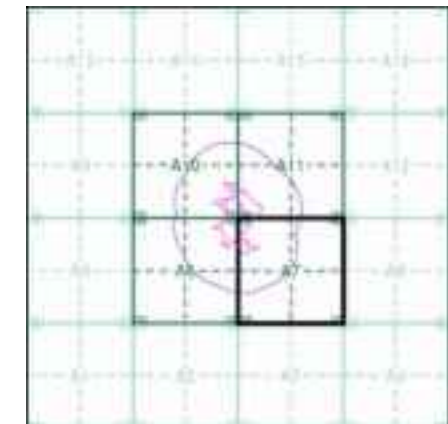
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SJ8990SW	SJ8990SE
1971	1972
1:1,250	1:1,250
SJ8989NW	SJ8989NE
1972	1967
1:1,250	1:1,250

Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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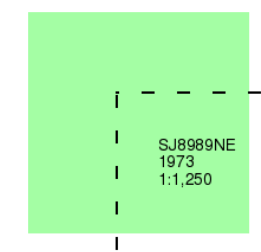
Supply of Unpublished Survey Information

Published 1973

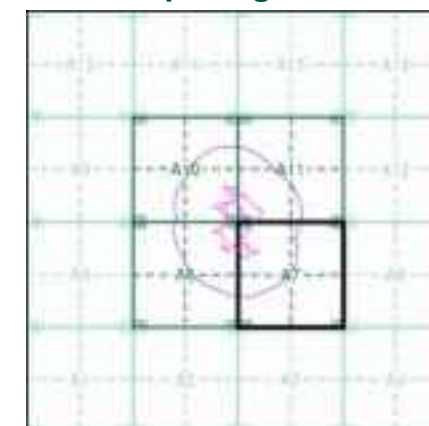
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

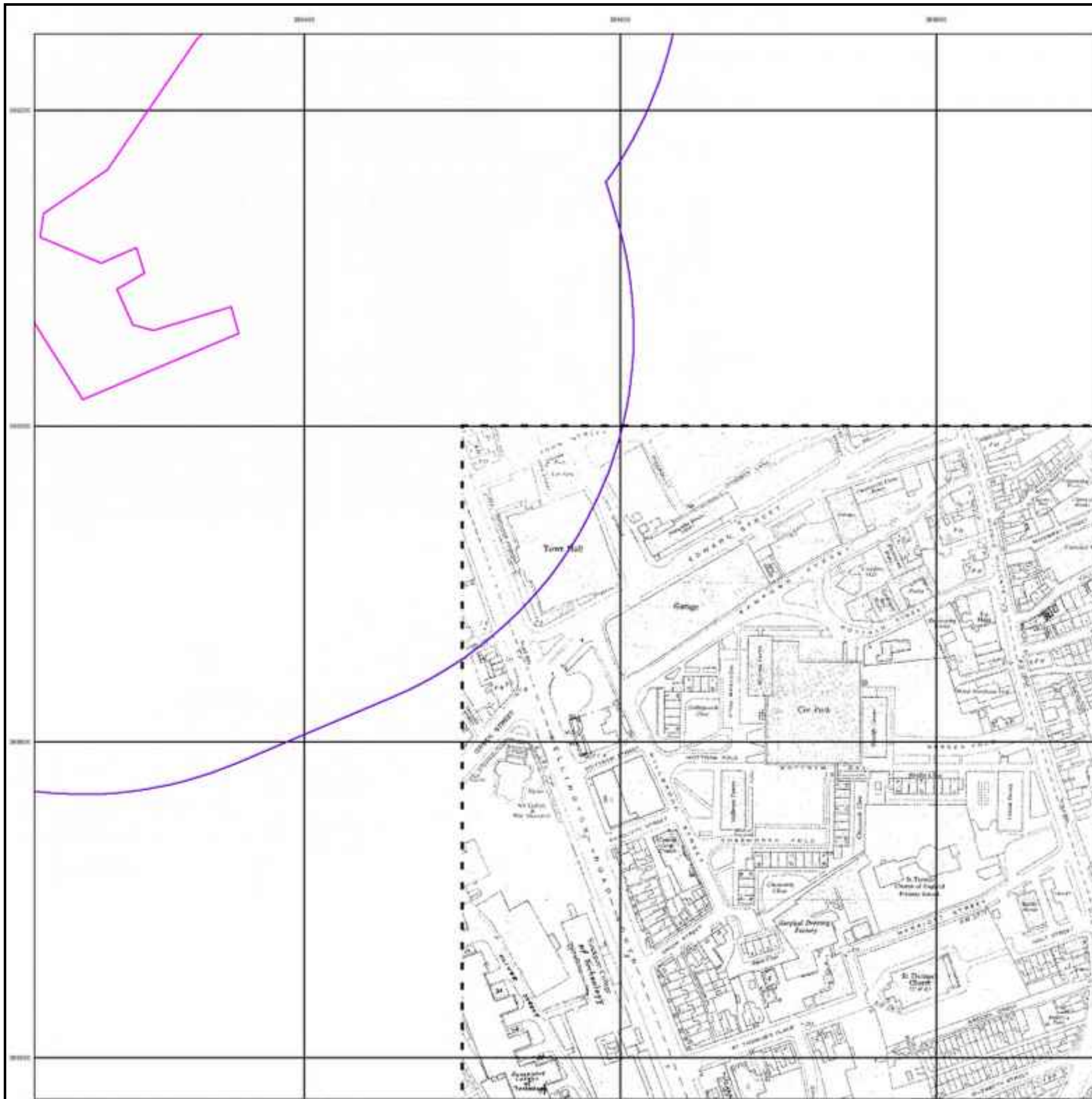
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk





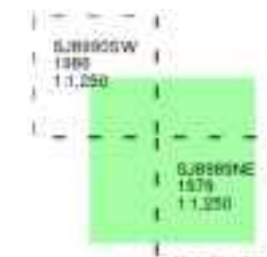
Ordnance Survey Plan

Published 1976 - 1986

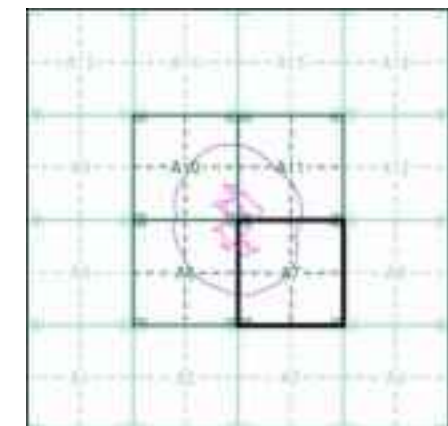
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

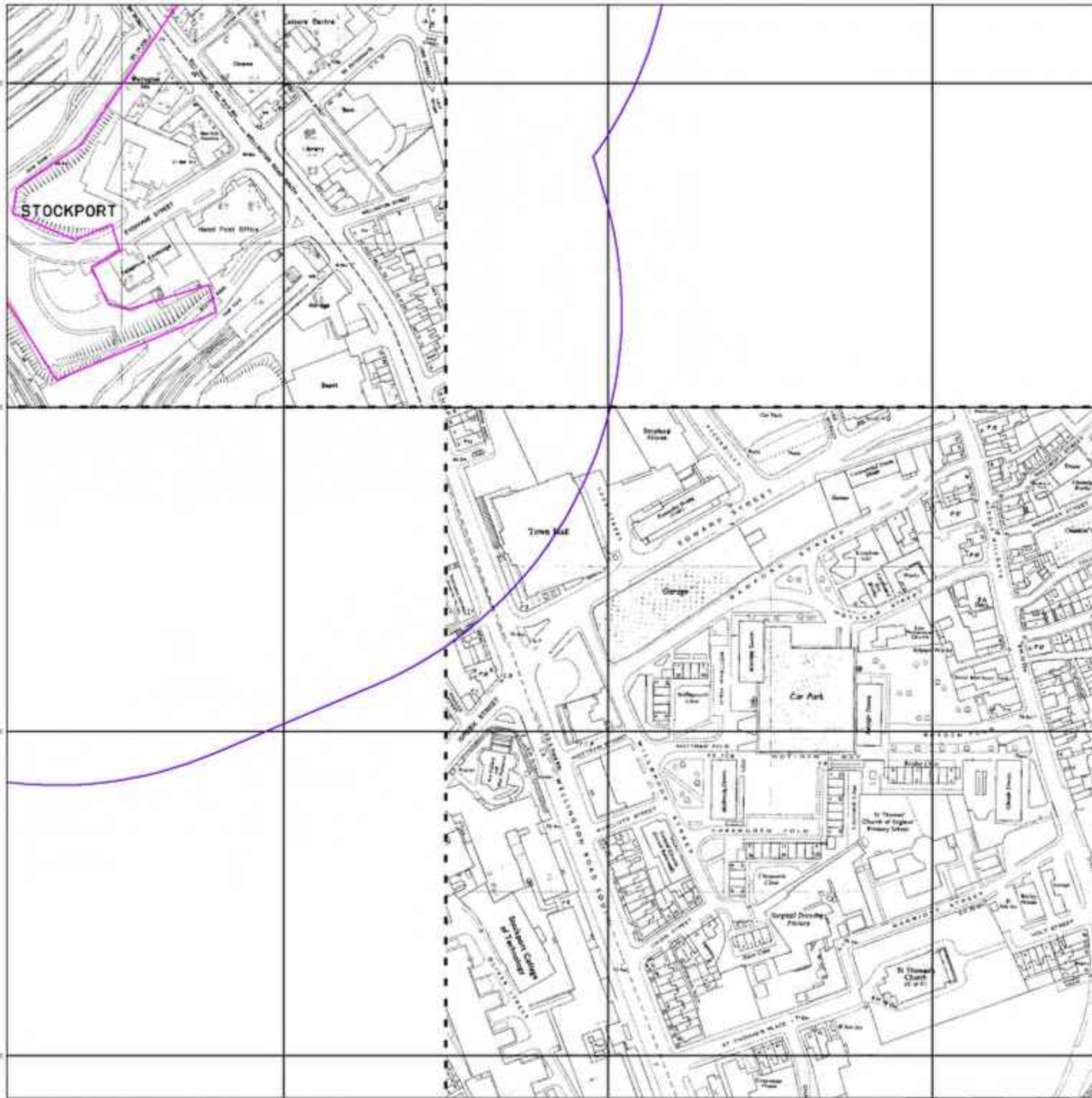
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

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Additional SIMs

Published 1978 - 1983

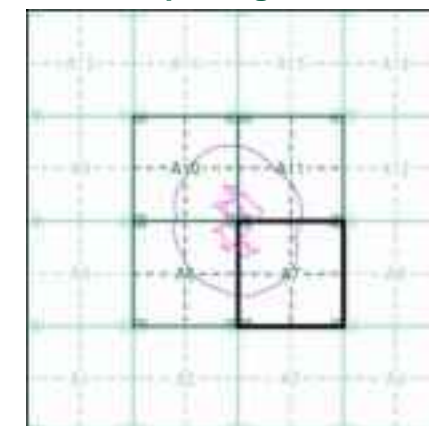
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8990SW 1978 1:1,250	SJ8990SE 1979 1:1,250
SJ8989NW 1981 1:1,250	SJ8989NE 1983 1:1,250

Historical Map - Segment A7



Order Details

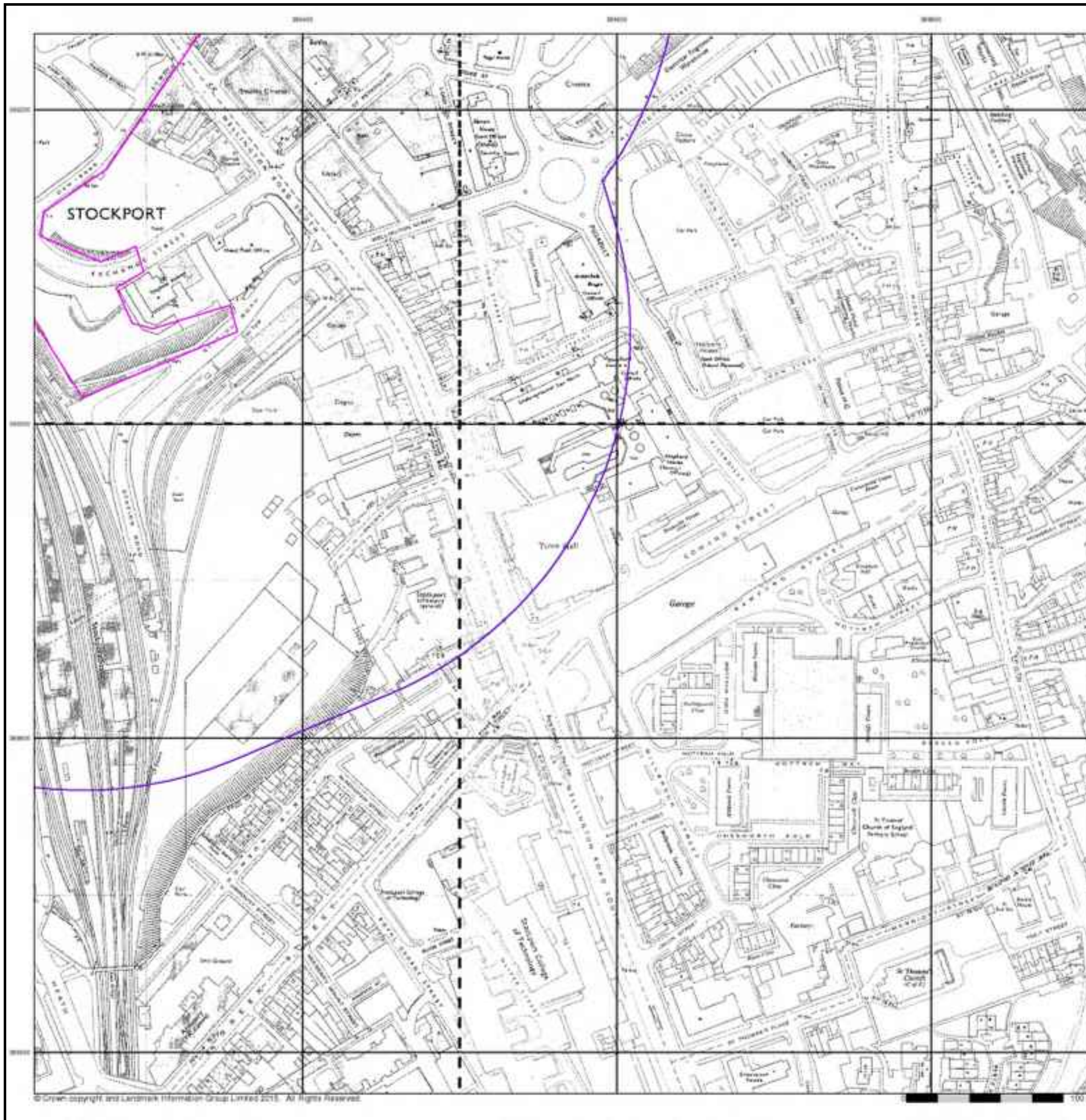
Order Number: 66053144_1_1
 Customer Ref: 60340298
 National Grid Reference: 389220, 390250
 Slice: A
 Site Area (Ha): 5.77
 Search Buffer (m): 250

Site Details

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Additional SIMs

Published 1984 - 1991

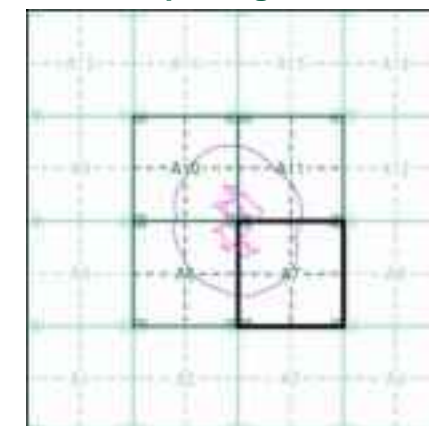
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8990SW	SJ8990SE
1991	1984
1:1,250	1:1,250
SJ8989NW	
1991	
1:1,250	

Historical Map - Segment A7



Order Details

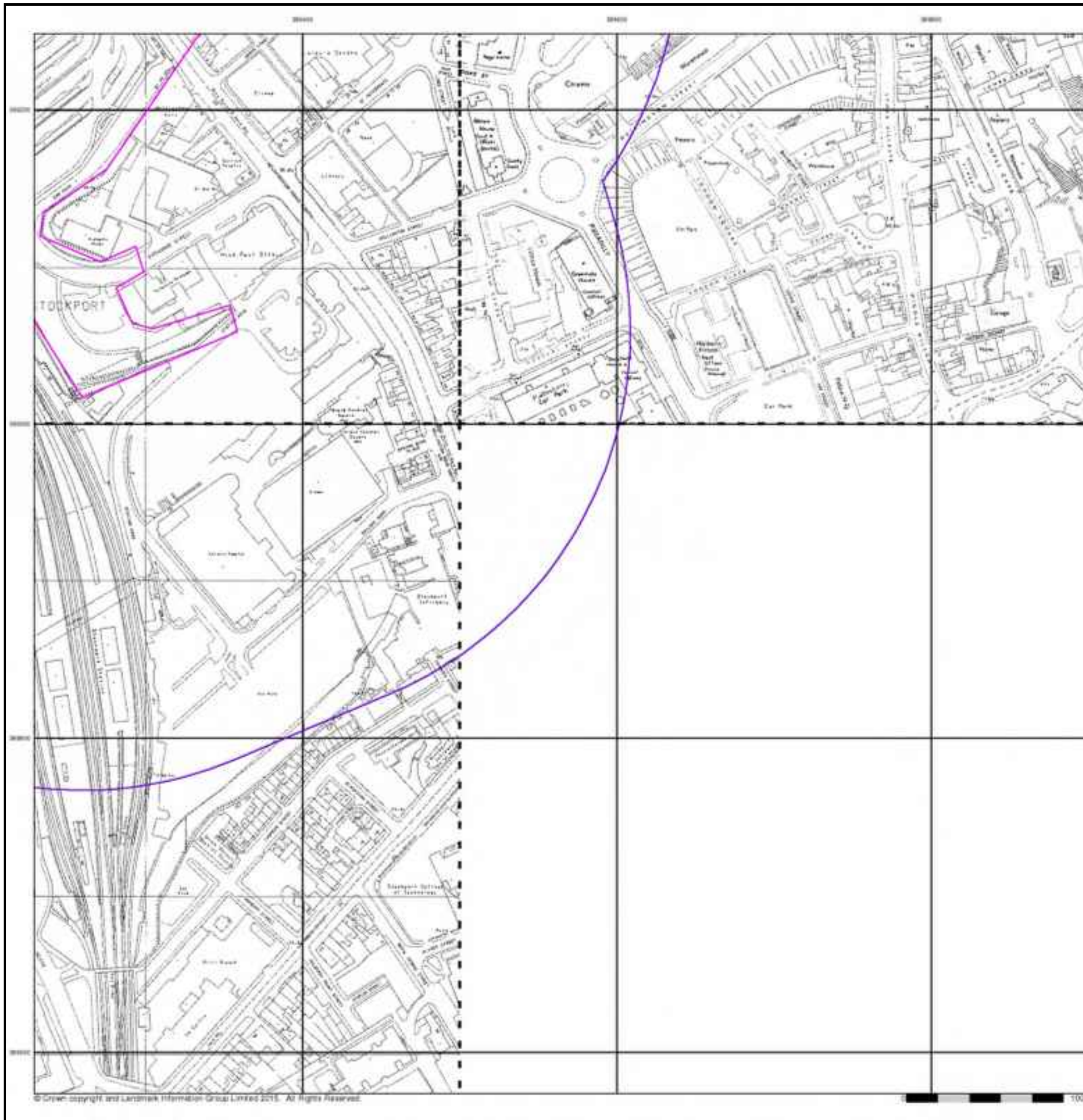
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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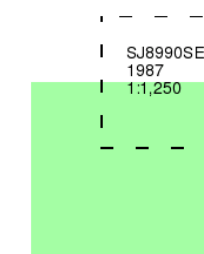
Additional SIMs

Published 1987

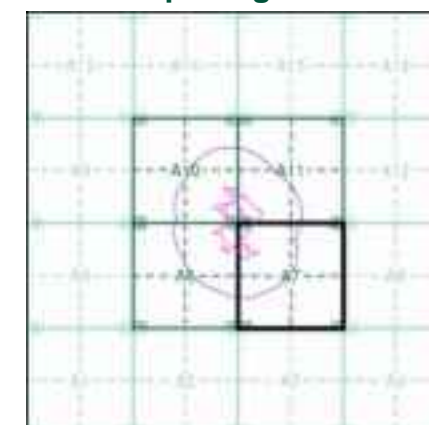
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

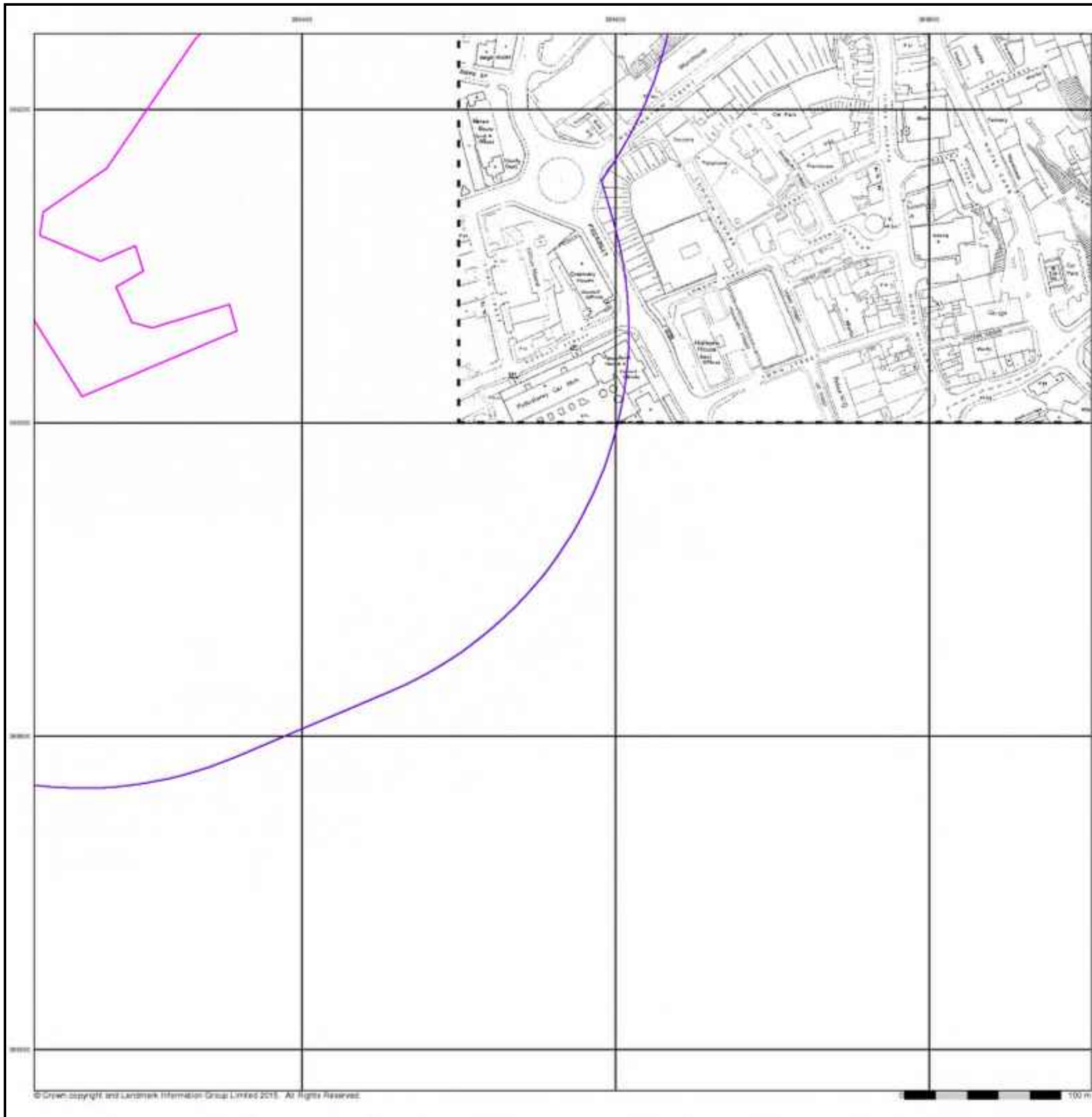
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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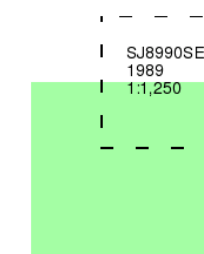
Additional SIMs

Published 1989

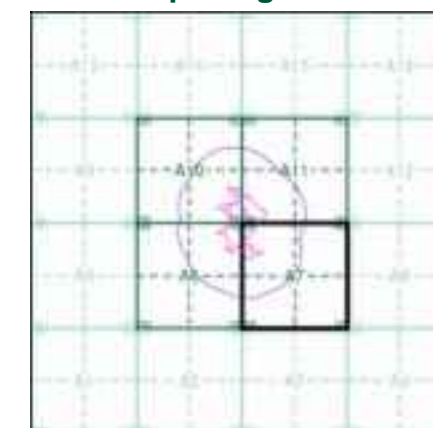
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

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Large-Scale National Grid Data

Published 1992

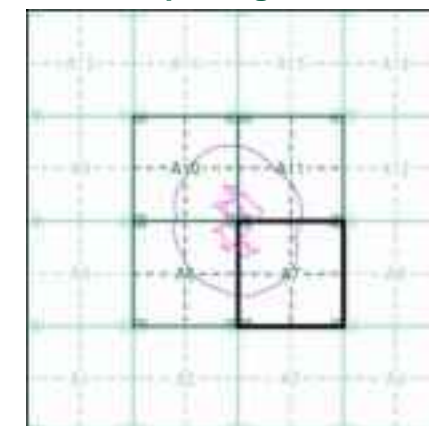
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8990SW	SJ8990SE
1992	1992
1:1,250	1:1,250
SJ8989NW	SJ8989NE
1992	1992
1:1,250	1:1,250

Historical Map - Segment A7



Order Details

Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



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Large-Scale National Grid Data

Published 1993 - 1995

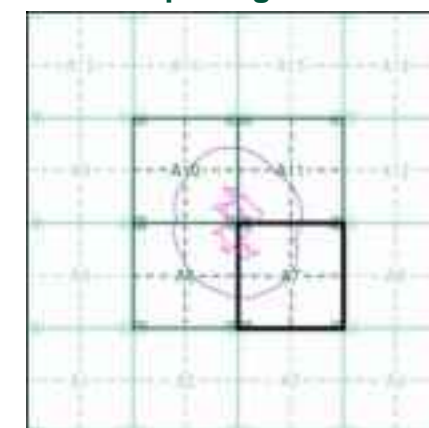
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SJ8990SW	SJ8990SE
1995	1993
1:1,250	1:1,250

Historical Map - Segment A7



Order Details

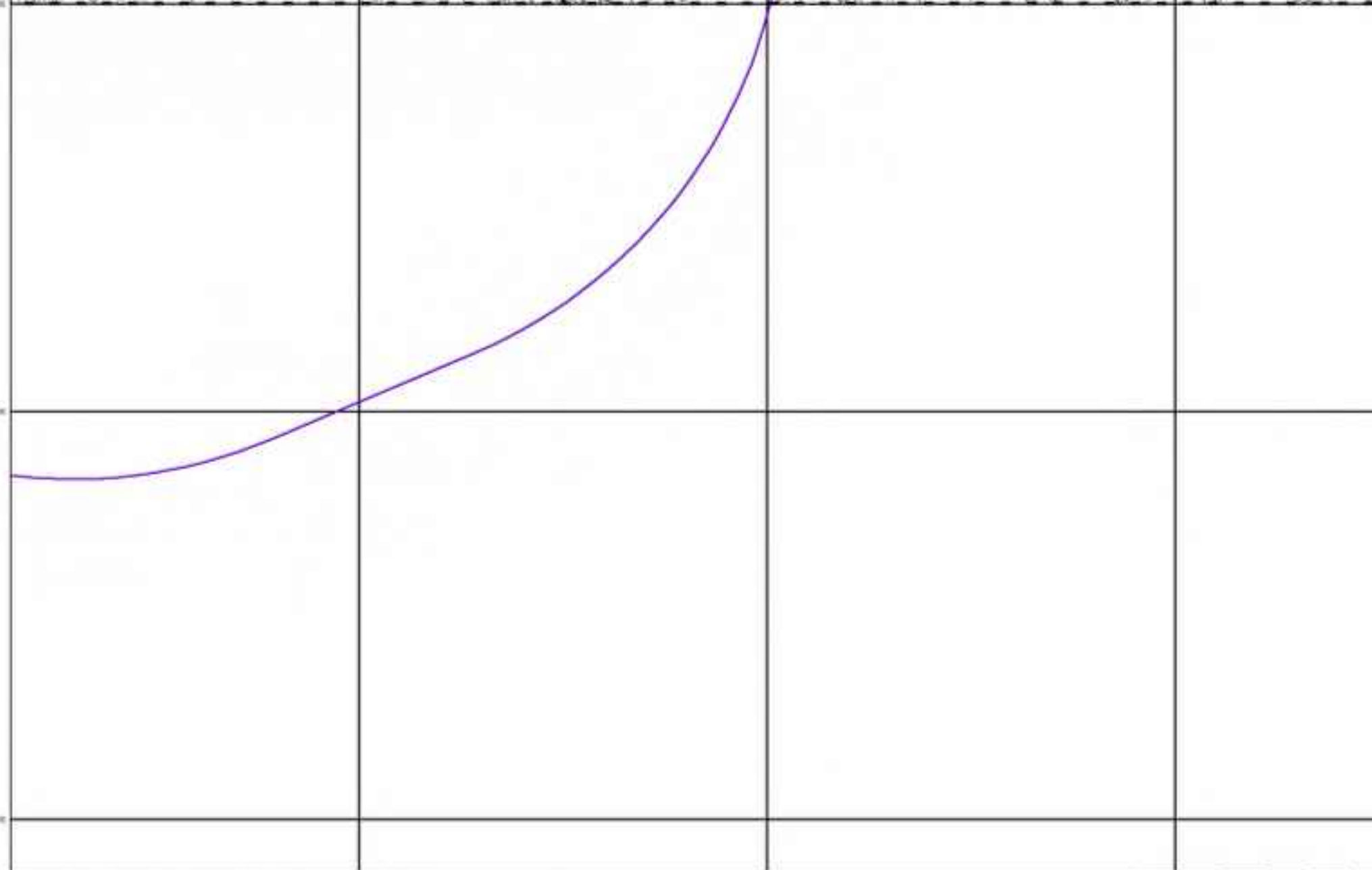
Order Number: 66053144_1_1
Customer Ref: 60340298
National Grid Reference: 389220, 390250
Slice: A
Site Area (Ha): 5.77
Search Buffer (m): 250

Site Details

Stockport Bus Station, Mersey Square, Stockport, SK1 1NU



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Appendix D: Statutory Consultee Responses

Gibson, Jennifer

From: Lisa Allott <lisa.allott@stockport.gov.uk>
Sent: 20 April 2015 12:03
To: Gibson, Jennifer
Subject: RE: information for Stockport Bus Station

Hi Jennifer

I write in response to the information you require regarding Stockport Bus Station.

The site has been identified for further investigation under Part IIA of the Environmental Protection Act 1990.

The site is not currently declared as Statutorily Contaminated Land or as a Special Site, nor is there any information placed upon this authorities Contaminated Land register relating to this site.

This Department does not hold any information with respect to site investigations/remediation work at the subject site or surrounding sites.

It is also unknown at this time whether any intrusive investigation work will be required or what priority any investigation would take.

The identification of a site being potentially contaminated does **not confirm** that the site **actually is contaminated** and would only be designated as contaminated as result of criteria defined under Part IIA EPA 1990 being met.

There have been no notices served under Part 2a of the Environmental Protection 1990

There are no known landfills within 250m of the search site.

There have been no enforcement notices served on the search site for nuisance issues such as odour, smoke etc.

Please note that this information has been supplied as a matter of courtesy and the Council accepts no liability for the use of this information. No warranty is given or intended with regard to this situation, present or future, and the Council makes no comment on the interpretation of the information nor accepts liability for any interpretation others may put on such information.

Kind Regards

Lisa

From: Lisa Allott On Behalf Of Land Water
Sent: 15 April 2015 13:27
To: Lisa Allott
Subject: FW: information for Stockport Bus Station

From: Gibson, Jennifer [<mailto:Jennifer.Gibson@aecom.com>]
Sent: 15 April 2015 12:45
To: Land Water
Subject: information for Stockport Bus Station

Dear Sir/Madam

AECOM is undertaking environmental reviews of Stockport Bus Station. We would be very grateful if you could provide us with information from your records on the following topics:

1. Status, including any Enforcement Notices, under Part IIA EPA
2. Any known records of landfilling or remediation on or in the vicinity of the site
3. Any correspondence or Enforcement Notices connected to the site with regard to nuisance issues (odours, dust, smoke, vermin etc.)

The site information is as follows:

Stockport Bus Station
Mersey Square
Stockport
SK1

NGR: Easting: 389231 Northing: 390226

Site boundary is attached to this email.

If there is a charge for the provision of your services if you could quote us in advance of carrying out any work it would be much appreciated.

Please note that any documentation attached to this email is confidential in nature and should be treated as such.

Kind Regards,
Jennifer

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Gibson, Jennifer

From: GMMC Info Requests [Inforequests.gmmc@environment-agency.gov.uk]
Sent: 14 April 2015 15:17
To: Gibson, Jennifer
Subject: GMMC4619KE - Stockport bus station
Attachments: Standard_Notice[1].pdf

Dear Jennifer

Thank you for your enquiry which was received on 02 April 2015

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

I enclose

Regarding the enquiry for a site located at Stockport Bus Station and based on the site boundary map provided, the following applies:

Site Setting

The site is situated in a sensitive location with respect to Controlled Waters (surface water & groundwater), therefore the minimum amount of information we would require to assess the potential risks to controlled waters is a Phase 1 Preliminary Risk Assessment (Desk Top Study Report). Further works including Phase 2 Quantitative Risk Assessment and remedial works may also be required to be undertaken.

Records of Land Contamination

The site & surrounding land is situated in an area where historically potentially contaminative industries were present. Some of these include railway land (to the East), Mills (to the West and East/Southeast), a telephone exchange (to south/southeast), two bus depots, a vehicle servicing garage and other industrial buildings. Gas Street is located adjacent to the site which indicates the presence of a historic gas works north of Heaton Lane. *Additional potentially contaminative industries and activities may also be present.* Therefore there is potential for contamination to be present on the site.

Due to the size of the site, the amount of adjacent land in proximity and the potentially historic industries present, we suggest that the customer engages the services of a third part data provider to provide detailed collated desk study information on the site from all available data sources.

Customer to Contact Local Authority

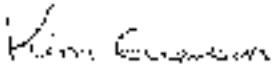
Please note that Local Authorities are the lead regulators for contaminated land with respect to Human Health and are the data custodians for Human Health and planning records. They hold historic records/reports on potential sources of land contamination within their boroughs. *We recommend that you contact the council Environmental Health Department /Contaminated Land Officer of Stockport Council to see if they hold the requested information regarding the subject site and any associated human health risks.*

There are no waste management permits in place for this site. As far as we are aware there is no requirement for any permit from us. Transport for Manchester are registered as Hazardous waste producers at this bus station (SK1 1NK).

I have attached our Standard Notice or licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us

to review the information we have sent.
Regards,



Kim Everson
Customer Engagement Officer
Richard Fairclough House,
Knutsford Road,
Warrington
WA4 1HT

Greater Manchester, Merseyside and Cheshire
Direct line: 01925 542915
Direct: Inforequests.GMMC@environment-agency.gov.uk

Kim Everson | Customers and Engagement Officer
Customers and Engagement Team | Cumbria and Lancashire + Greater Manchester, Merseyside and Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Warrington WA4 1HT
Contact | 01925 542980 | Internal: 721 2980



www.gov.uk/government/organisations/environment-agency

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Appendix E: Zetica UXB Map and Pre Desk Study Assessment

Gibson, Jennifer

From: Kelly Lehmann [kelly@zetica.com]
Sent: 07 April 2015 17:51
To: Gibson, Jennifer
Cc: Quotes
Subject: E5259-15 Zetica UXO Desk Study Stockport 070415
Attachments: E5259-15 Zetica UXO Desk Study Stockport 070415.pdf

Jennifer,

Please find below our Pre Desk Study Assessment and (as an attachment) our proposal as per your request.

	
Pre-Desk Study Assessment	
Site:	Stockport Bus Station, Greater Manchester
Client:	Aecom
Contact:	Jennifer Gibson
Date:	2 nd April 2015
Pre-WWI military activity on or affecting the Site	None identified.
WWI military history on or affecting the Site	None identified.
WWI strategic targets (within 5km of Site)	The following strategic targets were located within the vicinity of the Site: <ul style="list-style-type: none"> ■ Major transport infrastructure, including goods stations and sidings. ■ Gas works. ■ Foundries, mills and timber yards.
WWI bombing	None identified on the Site.
Interwar military history on or affecting the Site	None identified.
WWII military history on or affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: <ul style="list-style-type: none"> ■ Major transport infrastructure, including goods stations and sidings. ■ Gas works. ■ Industries important to the war effort, including engineering, chemical and aircraft manufacturing works.
WWII Decoys (within 5km of Site)	1No. approximately 4km from the Site.
WWII Bombing	During WWII the Site was located in the County Borough (CB) of Stockport, which officially recorded 76No. High Explosive (HE) bombs with a low regional bombing density of 10 bombs per 405 hectares (ha). No readily available records have been found indicating that HE bombs fell on or in close proximity to the Site. Bombs are recorded falling approximately 0.5km from the Site.
Post-WWII Military Activity on or affecting the Site	None identified.

Recommendation

No readily available records have been found indicating that bombs fell on the Site, which is located in a region with a low WWII bombing density. No other significant sources of Unexploded Ordnance (UXO) hazard on the Site have been identified.

Given this, it is considered that the Site is likely to have a low UXO hazard level. A detailed desk study, whilst always prudent, is likely to do no more than confirm a low UXO hazard level for the Site.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It is possible that further research may change the level of identified hazard.

If you need anything further, please do not hesitate to get in touch.

Best regards

Kelly

Kelly Lehmann
Estimator
Zetica Limited



T. +44 (0) 1993 886 682 | E. Kelly@zetica.com | W. www.zetica.com | T. [@ZeticaLtd](https://www.zetica.com)

Appendix F: BGS Exploratory Hole Records

County Law

6-in. Map 11827

BORE ~~30-32~~ Brimley, Kellogg

Lower, Stoughton

OSM

(Continued)

Surface level O.D. One-inch Map

Communicated by

Date of sinking Hole#

Specimens

Description	THICKNESS		DEPTH	
	Feet	Inches	Feet	Inches
30 <u>Boring No. 7</u> <u>In Brimley east of Kelly St. corner</u>				<u>11.00</u>
<u>132 ft. o.d.</u> <u>No. 59</u> <u>(12d)</u> <u>Sand gravel</u>	12	-	12	- 3.65
<u>Red sandstone rock</u>	15	-	27	- 8.27
<u>Boring No. 8</u> <u>Corner of Kellogg & Woodman St.</u>				
31 <u>136 ft. o.d.</u> <u>No. 60</u> <u>(12d)</u> <u>hard ground</u>	1	-	1	- 0.30
<u>Sandy clay</u>	8	-	9	- 2.74
<u>Sand gravel</u>	7	-	18	- 5.48
<u>Red sandstone</u>	11	-	29	- 8.93
<u>Boring No. 9</u> <u>In Kellogg above Sumner St. corner</u>				
32 <u>140 ft. o.d.</u> <u>No. 61</u> <u>(12d)</u> <u>hard ground</u>	1	-	1	- 0.30
<u>Red sand</u>	3	-	4	- 1.21
<u>Grey sand</u>	3	-	7	- 2.13
<u>Gravel</u>	5	-	12	- 3.65
<u>Red sandstone rock</u>	19	-	31	- 9.44

STRATA SURVEYS LTD.,
 HOLMES CHAPEL ROAD,
 MIDDLEWICH, CHESHIRE. CW10 0JB
 Telephone: 0606 84 6637 Fax: 0605 84 6657

Borehole Number : 1
 Sheet 1 of 1.
 Scale 0 to 50 metres
 Date : 31/3/88

Job Number : 4256 Location : Exchange Street, Stockport
 Client : Brian Moorhead and Partners

Site & Drilling Methods
 Light Cable Percussion 8927
 150mm Diameter 9009

Description of Strata	Red. Level	Legend	Trick TORES	Depth	Sample Depth	Sample Type	N Value	Ca	s	Water Level	PSI -20	Soilly Pres.
Medium dense brown clayey silty sandy brick gravel MADE GROUND			(1.00)	0.00	0.50 - 0.85	S _H 1	N 16					
Medium dense reddish brown very silty gravelly SAND (highly weathered sandstone)			(0.50)	1.00	1.00 - 1.45	S _H 2	N 26					
Reddish brown slightly to moderately weathered SANDSTONE weak			(3.00)	1.60	1.80 - 1.75	S _H 3	N 50 / 150					
				2.60	2.60 - 2.67	S _H 4	N 50 / 70					
Soils Completed				3.00						3.00		

Key : In-Situ Tests
 N N Value
 • Sample Sank

Sample Types
 U Undisturbed
 D Disturbed
 S Bulk Disturbed
 W Water
 P Piston
 S SPT

Progress / Water Levels
 — Borehole Depth
 — Casing Depth
 — Water Level
 — Water Strike

General Remarks :

SJ89SE 790

STRATA SURVEYS LTD., HOLMES CHAPEL ROAD, MIDDLEWICH, CHESHIRE. CW10 0JB Telephone: 0696 84 4637 Fax: 0606 84 6657						Borehole Number : 2 Sheet 1 of 1. Scale 0 to 10 metres Date : 1/4/88						
Job Number : 4258 Location : Exchange Street, Stockport Client : Brian Hounthead and Partners				Dia. & Drilling Method Light Cable Percussion 100mm Diameter		892.7 4012						
Description of Strata	Bed. (Ref.)	Legend	Thick. (m)	Depth (m)	Sample Depth	Sample Type	N Value	Di	W	Water Level	Pis. TD	Daily Prog.
Medium dense brown silty brick gravel and cobbles (rubble) MADE BRICK			(2.40)	0.00 0.50 - 0.60 1.00 1.60 - 1.95		S 1 S 1 S 2	N 14 N 14 N 89			1.00m Standing		
Reddish brown slightly to moderately weathered SANDSTONE MASS			(1.25)	2.40 2.50 - 2.72 3.05		S 3 S 4	N 50 N 100 / 150					1/4
Borehole Completed												
Key : In-Situ Tests N N Value + Sampler Size Sample Types U Undisturbed D Disturbed B Bulk Disturbed W Water P Piston SP Spill			Progress / Water Levels — Borehole Depth — Casing Depth I Water Level L Water Strike			General Remarks : the chiselling water strike at 1.00m standing at 1.00m						

SJ89SE 791

STRATA SURVEYS LTD.,
 HOLMES CHAPEL ROAD,
 MIDDLEWICH, CHESHIRE. CW10 0JB
 Telephone: 0606 84 4637 Fax: 0606 84 6657

Borehole Number : 3
 Sheet 1 of 1.
 Scale 0 to 10 metres
 Date : 31-1/4/88

Job Number : 4256 Location : Exchange Street, Stockport
 Client : Brian Moorhead and Partners

Dis. & Drilling Methods
 Light Cable Percussion
 150mm Diameter
 8923
 9012

Description of Strata	Red. Level	Legend	Thick-ness	Depth	Sample Depth	Soils Test	N Value	Cu	u	Water Level	Pie Daily Log
Loose brown brick gravel and cobbles (rubble) MADE BOUND		[Cross-hatch pattern]	(1.30)	0.00 - 1.30	0.50 - 0.95	S ₁ 1	N 9				
Soft brown CLAY		[Horizontal lines]	(0.80)	1.30 - 2.10	1.50 - 1.90	U 1					
Orange to very dense reddish brown very silty sandy GRAVEL moderately to highly weathered sandstone		[x o o x pattern]	(0.90)	2.10 - 3.00	2.00 - 2.45	S ₁ 2	N 34				31/3
Reddish brown slightly to moderately weathered SANDSTONE weak		[Dotted pattern]	(3.30)	3.00 - 6.30	3.00 - 3.20	S ₁ 3	N110 /200				
		[Vertical lines]	(3.30)	3.00 - 6.30	4.50 - 4.55	S ₁ 4	N100 /150				
Borehole Completed		[Vertical lines]	(3.30)	6.30 - 8.10	8.00 - 8.10	S ₁ 6	N100 /100			1.00	1/4

Key :
 In-Situ Tests
 N N Value
 * Sampler Sack
 Progress / Water Levels
 — Borehole Depth
 - - - Casting Depth
 1 Water Level
 2 Water Strike
 3 Piezometer Level

General Remarks :
 Borehole Dry
 4 hrs chiselling

STRATA SURVEYS LTD.,
 HOLMES CHAPEL ROAD,
 MIDDLETON CHESHIRE. CW10 0JB
 Telephone: 0566 84 4537 Fax: 0566 84 6557

Borehole Number : 4
 Sheet 1 of 1.
 Scale 0 to 10 metres
 Dates : 31/3/88

Job Number : 4256 Location : Exchange Street, Stockport
 Client : Brian Moorehead and Partners

Dr. & Drilling Method
 Light Cable Percussion
 150mm Diameter

8923
 9011

Description of Strata	Red. Level	Legend	Thick-ness	Depth #	Sample Depth	Sample Type	N	Qz	#	Water Level	Piezo	Daily Prod.
Loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (small) MADE GROUND			1.20	0.00	0.50 - 0.95	S-1	N 8					
Very loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (small) MADE GROUND with some to occasional of white gravel sized particles with a limey odour possible chemical waste			1.20	1.00	1.50 - 1.95	S-2	N 2					
				2.00	2.50 - 2.95	S-3	N 1					
				3.50 - 3.95	S-4	N 3						
				4.50	4.50 - 4.65	S-5	N100 7100					
Reddish brown slightly to moderately weathered SANDSTONE weak			1.20	6.00 - 6.15	S-6	N100 7150						
				7.50 - 7.62	S-7	N120 7120						
Borehole Completed				7.80						0.5M		31.3

Key :

In-Situ Tests
 R - R Value
 * Sampler Sank

Progress / Water Levels
 — Borehole Depth
 — Coaling Depth
 ~ Water Level
 I - Water Strike

Placerometer Level

General Remarks :
 Borehole dry
 Shm chiselling

Appendix G: Background to Legislation on Contaminated Land

Appendix G: Background to Legislation on Contaminated Land

Legislative Framework

The contaminated land regime in Part 2A of the Environment Protection Act 1990 was introduced to specifically address the historical legacy of land contamination. Part 2A of the Environmental Protection Act 1990 (Amended April 2012) has introduced the following statutory definition for “contaminated land”:

“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 controlled waters is being caused, or there is a significant possibility of such pollution being caused.”*

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment. Enforcing authorities are required to identify and deal with such land but Part 2A is only to be used by the Enforcing Authority where no appropriate alternative solution exists.

The Process of Risk Assessment

The assessment of contaminated land can be seen as a two phase risk based process, comprising:

- (1) A qualitative assessment of the likelihood of plausible contaminant linkages, i.e. there must not only be a source of contamination, but a pathway and a receptor; and
- (2) A quantitative element which will seek to determine the degree of harm and the significance of such harm on a receptor.

A “contaminant” is a substance which is in, on or under the land and which has the potential to cause significant harm to a receptor or to cause significant pollution of controlled waters.

A “pathway” is a route by which a receptor is or might be affected by a contaminant.

A “receptor” is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property or controlled waters.

The term “contaminant linkage” indicates that all three elements (i.e. a contaminant, a pathway and a receptor) have been identified. The term “significant contaminant linkage” means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land (in other words, there is unacceptable risks posed by the land contamination to human health and or the environment). The term “significant contaminant” means the contaminant which forms part of a significant contaminant linkage.

Significant Harm to Human Health

The following health effects constitute significant harm: death, life threatening diseases (cancers), other diseases likely to have a serious impact on health, serious injury, birth defects and impairment of reproductive functions.

Significant Possibility of Significant Harm to Human Health

In deciding whether or not land is contaminated land on the grounds of significant possibility of significant harm to human health, the local authority use the following categorisations:

Category 1: Human Health

Land should be deemed to be a Category 1: Human Health case where:

- (a) the authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or
- (b) the authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom, or elsewhere;

- (c) the authority considers that significant harm may already have been caused by contaminants in, on or under land, and that there is an unacceptable risk that it may continue or occur again if no action is taken.

Category 2: Human Health

Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure have caused harm before, but nonetheless the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis.

Category 3: Human Health

Land should be placed into Category 3 if the authority concludes that the strong case of Category 2 does not exist. Category 3 may include land where risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose.

Category 4: Human Health

The local authority should consider that the following types of land should be placed into Category 4: Human Health:

- (a) Land where no relevant contaminant linkage has been established.
- (b) Land where there are only normal levels of contaminants in the soil.
- (c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed generic assessment criteria.
- (d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

“Normal” Presence of Contaminants

“Normal” levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is particular reason to consider otherwise. “Normal” levels of contaminants in soils may result from:

- (a) The natural presence of contaminants (e.g. caused by underlying geology) at levels that might reasonably be considered typical in an area and have not been shown to pose an unacceptable risk.
- (b) The presence of contaminants caused by low level diffuse pollution, and common human activity. For example, this would include diffuse pollution from historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts and the spreading of domestic ash in gardens that might reasonably be considered typical.

Significant Pollution of Controlled Waters

Pollution of controlled water means the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter. The term “controlled water” is as defined in Part 3 of the Water Resources Act 1991, except that ground waters does not include waters contained in underground strata but above the saturation zone (i.e. perched water).

The following criteria are used to establish whether significant pollution of controlled waters has occurred:

- (a) Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009.
- (b) Inputs resulting in the deterioration of the quality of water abstracted, or intended to be used in the future.
- (c) A breach of a statutory surface water Environmental Quality Standard, either directly or via a groundwater pathway.

- (d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants.

The following categories are adopted in relation to determining the significant possibility of significant pollution of controlled waters.

Category 1: Water

This covers land where the authority considers that there is a strong and compelling case for considering that a significant possibility of significant pollution of controlled waters exists. In particular, this would include cases where there is robust science-based evidence for considering that it is likely that high impact pollution would occur if nothing were done to stop it.

Category 2: Water

This covers land where:

- (a) The authority considers the strength of evidence to put the land into Category 1 does not exist; but
- (b) Nonetheless, on the basis of the available scientific evidence and expert opinion, the authority considers that the risks posed by the land are of sufficient concern that the land should be considered to pose a significant possibility of significant pollution of controlled waters on a precautionary basis, with all that this might involve (e.g. likely remediation requirements, and the benefits, costs and other impacts of regulatory intervention). Among other things, this category might include land where there is a relatively low likelihood that the most serious types of significant pollution might occur.

Category 3: Water

This covers land where the authority concludes that the risks are such that (whilst the authority and others might prefer they did not exist) the tests set out in Categories 1 and 2 are not met, and therefore regulatory intervention under Part 2A is not warranted. This category should include land where the authority considers that it is very unlikely that serious pollution would occur; or where there is a low likelihood that less serious types of significant pollution might occur.

Category 4: Water

This covers land where the authority concludes that there is no risk, or that the level of risk posed is low. In particular, the authority should consider that this is the case where:

- (a) No contaminant linkage has been established in which controlled waters are the receptor in the linkage; or
- (b) the possibility only relates to type of pollution that should not be considered to be significant pollution; or
- (c) The possibility of water pollution similar to that which might be caused by "background" contamination.

Terminology

The term 'Contaminated Land' is used to mean land which meets the Part 2A definition. Other terms, such as 'land affected by contamination' or 'land contamination' are used to describe much broader categories of land where contaminants are present but usually not at sufficient level of risk to be Contaminated Land.

Planning Policy and Land Contamination

The National Planning Policy Framework has replaced Planning Policy Statement PPS23: Planning and Pollution Control. Under the Part 2A Statutory Guidance the planning system is highlighted as one of the other ways in which land contamination can be addressed. The key parts of the policy specifically relating to soils, geology and contamination are summarised below (taken from the Section 11 – Conserving and enhancing the natural environment):

109. *The planning system should contribute to and enhance the natural and local environment by:*
- protecting and enhancing valued landscapes, geological conservation interests and soils;*
 - preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
 - remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*
111. *Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. Local planning authorities may continue to consider the case for setting a locally appropriate target for the use of brownfield land.*
120. *To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.*
121. *Planning policies and decisions should also ensure that:*
- the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
 - after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and*
 - adequate site investigation information*, prepared by a competent person**, is presented.*

For a site undergoing development or redevelopment it should be the case that upon completion of that work the site should sit within Category 4 in respect of all receptors.

*Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 (2011) Code of Practice for the Investigation of Potentially Contaminated Sites). The minimum information that should be provided by an applicant is the report of a desk study and site reconnaissance.

**Competent person (to prepare site investigation information): A person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land stability, and membership of a relevant professional organisation.

Appendix H: Assessment of Plausible Contaminant Linkages

Appendix H: Assessment of Plausible Contaminant Linkages

Classification of Consequence

The classifications of consequence (severity) are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). AECOM has chosen to apply the classifications to a broad range of development scenarios.

It should be noted that the categories of pollution incident have no relation to the categories of significant possibility of significant harm to human health or significant possibility of significant pollution of controlled waters in respect of the Part 2A Statutory Guidance (Appendix D).

Classification	Definition
Severe	<p>Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs.</p> <p>Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.</p> <p>Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.</p> <p>Catastrophic damage to crops, buildings or property.</p>
Medium	<p>Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs.</p> <p>Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.</p> <p>Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.</p> <p>Significant damage to crops, buildings or property.</p>
Mild	<p>Exposure to human health unlikely to lead to "significant harm".</p> <p>Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce.</p> <p>Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.</p> <p>Minor damage to crops, buildings or property.</p>
Minor	<p>No measurable effect on humans.</p> <p>Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.</p> <p>Repairable effects of damage to buildings, structure and services.</p>

Classification of Probability

The classifications of probability are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). AECOM has chosen to apply the classifications to a broad range of development scenarios.

It should be noted that the categories of pollution incident have no relation to the categories of significant possibility of significant harm to human health or significant possibility of significant pollution of controlled waters in respect of the Part 2A Statutory Guidance (Appendix D). Also, in the Part 2A Statutory Guidance “pollutant linkage” is now termed “contaminant linkage”, although it is noted that the terms are effectively synonymous.

Category	Definition
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Categorisation of Risk

		Consequence (Severity)			
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High Likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Description of Risk Levels and Likely Action Required

Term	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action <u>or</u> there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action. Realisation of the risk is likely to present a substantial liability to the site owner or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

Moderate risk	It is possible that without appropriate remediation action, harm would arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from identified hazard. It is likely that, at worst, if any harm was realised any effects would be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low risk	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.
No potential risk	There is no potential risk if no pollutant linkage has been established.

Summary of Definitions

Term	Description
Hazard	A property or situation which in certain circumstances could lead to harm. (The properties of different hazards must be assessed in relation to their potential to affect the various different receptors).
Consequences	The adverse effects (or harm) arising from a defined hazard which impairs the quality of the environment or human health in the short or longer term.
Probability	The mathematical expression of the chance of a particular event in a given period of time (e.g. probability of 0.2 is equivalent to 20% or a 1 in 5 chance).
Likelihood	Probability; the state of face of being likely.
Risk	A combination of the probability or frequency of the occurrences of a defined hazard AND the magnitude of the consequences of that occurrence.
Contaminant linkage	An identified pathway is capable of exposing a receptor to a contaminant and that contaminant is capable of harming the receptor. In the Part 2A Statutory Guidance the terms "contaminant", "pollutant" and "substance" have the same meaning, and some non-statutory technical guidance relevant to land contamination uses alternative terms such as "pollutant", "substance" and associated terms in effect to mean the same thing.


Appendix B

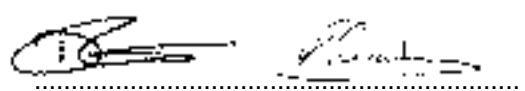


STOCKPORT INTERCHANGE -
GROUND INVESTIGATION REPORT -
AECOM - 2016

Stockport Interchange - Ground Investigation Report



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Stockport Interchange - Ground Investigation Report

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1	For comment – Factual Report incomplete	DCG/DAR	MdeK	11/03/16
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Date Created: February 2016

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Introduction

Capabilities on project:
Environment

1 Introduction

1.1 Background

AECOM has been commissioned on behalf of Transport for Greater Manchester (TfGM) to prepare a Ground Investigation Report (GIR) for the development of the site known as Stockport Interchange.

The details of the proposed development and proposed planning application boundary are provided in the masterplan provided by TfGM (Appendix A). The scheme includes the building of a new interchange, realignment of the current road layout, expansion of Mersey Square and the construction of a bridge across the River Mersey.

1.2 Scope of Work

Based on the findings of the Desk Study ^(Ref. 01) (AECOM, 2015) the objectives of this report are to:

- determine the general ground conditions;
- provide geotechnical information to support preliminary design based on the masterplan;
- investigate the potential for soil and/or groundwater contamination;
- investigate the ground gases on-site and determine their impact on the proposed design; and
- determine the level of remediation required for the proposed end-use.

This GIR will present a description of the ground investigation undertaken, findings and assessment of the site work, conclusions and recommendations.

1.3 Sources of Information

Information was obtained from a number of sources regarding the historical and current condition of the site, these included:

- Landmark Envirocheck Report ^(Ref. 02);
- Environment Agency (EA) Website: www.environment-agency.gov.uk;
- British Geological Survey (BGS) Geological Map Sheet 98 Stockport (Bedrock and Superficial), 1:50,000 scale, 1971 ^(Ref. 03) and 1977 ^(Ref. 04);
- BGS Website - Historical Boreholes: www.bgs.ac.uk/geoindex; and
- Zetica Unexploded Ordnance Risk Desk Study ^(Ref. 05).

Capabilities on project:
Environment

1.4 Parties Involved

The parties involved are as follows:

The Client is:

Transport for Greater Manchester.

The Consulting Engineer for the preparation of this report is:

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1.5 Limitations

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The report has been prepared and appropriate recommendations made on the basis of the proposed works described in the background Information section of this report and shown on the Figures. Should the proposed end use of the study area change it will be necessary to re-interpret the results of the assessment.

The information reviewed should not be considered exhaustive and has been accepted in good faith by AECOM as providing a true description of the study area conditions. However, no liability can be accepted for the accuracy of any of the reports prepared for the client or for third parties, or for any associated errors or omissions.

Any risks identified are perceived and based on information reviewed; actual risks can only be assessed following a physical investigation on site.

The effects of ground and water borne contamination on the environment are constantly under review, and authoritative guidance is subject to change from time to time. The conclusions presented herein are based on the guidance available at the time of writing. No liability can be accepted for the retrospective effects of any changes or amendments to the legislation or guidance.

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Site Details

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2 Site Details

2.1 Introduction

This section provides a summary of relevant information as detailed in the AECOM Desk Study ^(Ref. 01).

2.2 Site Description

The site is an irregular shape and covers approximately 6.5 hectares; the boundary is defined by the red line shown on the masterplan included in Appendix A. The site comprises Stockport bus station, Mersey Square, two surface car parks and associated infrastructure, including the Stockport Viaduct.

Current Ordnance Survey (OS) mapping indicates that the site is located in the mixed commercial, industrial and residential setting of Stockport Town Centre. The River Mersey flows east to west through the site and is culverted under the north eastern section of the site, beneath Mersey Square Road. The northern boundary of the site extends to the M60. Merseyway Shopping Centre forms the eastern site boundary, with Stockport Rail Station forming the southern and south west boundary. The western boundary is the Stockport Rail Viaduct.

Relevant features in the near vicinity of the site are summarised in Table 2.1.

Table 2.1. Features Surrounding the Site.

Direction	Summary
North	River Mersey, commercial buildings, several car parks, M60.
South	Stockport Rail Station, Station Road.
East	Merseyway Shopping Centre, commercial buildings.
West	Stockport Rail Viaduct.

2.3 Site History

The historical Ordnance Survey (OS) maps obtained with the Landmark Envirocheck Report ^(Ref. 02) date between 1848 and 2015. Development that may have occurred between map editions is recorded as occurring on the latter published map, hence there are some limitations to the accuracy to the date of development unless supplementary evidence is available.

The historical maps show that the site included residential properties with some industrial buildings on the first OS edition in 1848. The historical maps show the site and surrounding area to have become more industrialised over time. The current Stockport bus station was built during the late 1970's.

A summary of the historical land uses is presented in Table 2.2.

Capabilities on project:
Environment

Table 2.2. Historical Land Uses.

Year [scale]	Features on-site	Features off site
1848 (1;10,560)	<p>There is general development recorded across the site, including terraced housing and various commercial and industrial developments. The principal features are as follows:</p> <ul style="list-style-type: none"> - Wellington Road South runs through the site approximately north to south. - There is a mill in the north eastern part of the site. - A viaduct runs north to south through the western part of the site. - The River Mersey flow east west through the central section of the site. 	<p>There is significant residential, commercial and industrial development in the area surrounding the site. The principal features are as follows:</p> <ul style="list-style-type: none"> - Stockport Gas Works is located 50m north west of the northern boundary. - A foundry is located 50m north of the site boundary. - There is a timber yard 230m north of the north site boundary. - A possible quarry noted is as a "bar" 250m north of the site. - There is a cutting running along the viaduct 200m north west of the site - There is a mill located 230m east of the eastern site boundary. - St Peters Church and cemetery is located 50m south east of the site. - Spring Banks Mill is located 30m south of the southern site boundary. - There is a coal depot 100m south west of the southern site boundary. - Stockport Station is located 250m south of the southern boundary.
1851 (1;1,056)	<ul style="list-style-type: none"> - Two reservoirs are marked in the centre of the site. - Chester Gate Mill and an associated chimney are located on site. - There is a machine shop recorded in the centre of the site. - Two timber yards are recorded on the northern edge of the site. - There is a print works on the southern part of the site - There a reservoir on the southern boundary of the site. - There is a smithy on the western part of the site. - Part of the Chester Gate Print Works is recorded near the western boundary of the site. A further print works is located in the centre of the site. 	<p>The surrounding land use remains a mix of residential (predominantly terraced), industrial and commercial development. There are numerous mills of varying sizes recorded throughout the surrounding area, they have not been recorded individually here. Other notable development includes the following:</p> <ul style="list-style-type: none"> - A coal yard 250m north of the site. - A dye works adjacent to the north western site boundary - The site noted as "bar" is now called Crowther's Dam - Gasometers are recorded along the north eastern site boundary. With a further a gasometer 100m east of the site. - A pond 50m east of the eastern site boundary. - Four reservoirs are recorded adjacent to the south eastern boundary of the site. - There is a timber yard 70m east of the south eastern site boundary. - A timber yard, smithy and iron foundry are noted 20m, 50m and 100m west of the site respectively.
1873 (1;1,056)	<p>Generally the site development remains unchanged with the exception of the following key features:</p> <ul style="list-style-type: none"> - The timber mill in the northern section of the site has been demolished. - The reservoirs at the centre of the site are now recorded as a timber yard. - The chimney next to Chester Gate Mill is no longer marked on the historical maps. 	<ul style="list-style-type: none"> - The gas works to the north of the site has expanded and the dye works and several houses have been demolished in this area. - The coal depot to the north is now housing. - The gasometer 100m from site is no longer shown on the map. - Crowther's Dam is no long noted on the map. - There are a series of tracks leading to the goods yard 150m north west of the site. - There is a timber yard 10m south of the eastern site boundary adjacent to St Peter's Church. - The pond is no longer recorded and the area is now noted as a bathhouse.

Capabilities on project:
Environment

Year [scale]	Features on-site	Features off site
		<ul style="list-style-type: none"> - The rail tracks to the south now cover a larger area. - There is a mill/works 100m south east of the site.
1874 - 1875 (1;2,500)	The site remains generally unchanged.	The surrounding area remains generally unchanged with the exception of the addition of Stockport infirmary 250m south east of the site.
1895 (1;1,056, 1;2,500, & 1;10,560)	<p>There has been some demolition of residential, commercial and industrial properties. The principal changes to site features during this time are as follows:</p> <ul style="list-style-type: none"> - Wellington Road now has a tramline running north to south - The printing works adjacent to the River Mersey is now noted as a chemical works 	<ul style="list-style-type: none"> - There is now an iron and brass foundry 100m east of the site. - The reservoir on the south eastern boundary is now a coal yard. - The works south east of the site is now a hat works.
1899 (1;2,500 & 1;10,560)	<p>Generally the site remains unchanged with the exception of the following:</p> <ul style="list-style-type: none"> - There is a new bridge crossing the River Mersey in the east of the site. - The timber yard at the centre of the site is no longer marked on the site. - There is now a timber yard adjacent to Wellington road 5m north of the south eastern boundary. 	<ul style="list-style-type: none"> - The coal depot to the south is now noted as an electrical works. - There is now a timber yard 230m south west of the site. - The mills adjacent to the south east site boundary are now a hat factory.
1907 (1;2,500)	<p>Generally the site remains unchanged with the exception of the following:</p> <ul style="list-style-type: none"> - The addition of a tramline in the northern part of the site which leads to a tram depot located just offsite. - There is a fire station located in the north of the site. 	Generally the surrounding land remains unchanged with the exception of a tunnel recorded 50m north of the site which is shown to run west to east.
1910 (1;2,500 & 1;10,560)	Generally the site remains unchanged with the exception of a tin works adjacent to Astley Street.	<p>Generally the surrounding land remains unchanged with the exception of the following:</p> <ul style="list-style-type: none"> - The smithy is no longer marked on the map. - A mechanical works is noted 70m east of the south eastern boundary. - The tanks to the south are no longer marked on the map. - All the timber yards to the west are no longer marked on the map. - There is a clothing works on the western boundary of the site.
1922 (1;2,500)	Generally the site remains unchanged.	<p>Generally the surrounding land remains unchanged with the exception of the following:</p> <ul style="list-style-type: none"> - The foundry to the north of the site is now noted as a brass and copper foundry. - The timber yard adjacent to St Peters Church is no longer evident. - The mechanical works is now a public library.
1934 (1;2,500 & 1;10,560)	<p>Generally the site remains unchanged with the exception of the following:</p> <ul style="list-style-type: none"> - The timber yard at the centre of the site has expanded. - The print works at the southern boundary is now noted as exchange 	<p>Generally the surrounding land remains unchanged with the exception of the following principal observations:</p> <ul style="list-style-type: none"> - The gas works is now a tram and bus depot.

Capabilities on project:
Environment

Year [scale]	Features on-site	Features off site
	building. - The reservoir at the south of the site is no longer evident. - The map indicates a slope at the south of the site. -	- The tram depot has expanded. - The mill on the south eastern boundary has been demolished. - There are two saw mills approximately 150m west and south west of the site. - There is hat factory 150m west of the western site boundary. - There is a works 150m south west of the western site boundary.
1959 (1; 2,500)	Generally the site remains unchanged with the exception of the following: - There is a bus station where the tram lines and fire station were at the northern part of the site. - The exchange building has been demolished. - The timber yard is now noted as a works. - The mill is now noted as a works. - The tramline is no longer evident. - There is a car park adjacent to the bus station. - There is a garage next to the work/mill. -	Generally the surrounding land remains unchanged with the exception of the following - Timber yards to the north are no longer evident. - The tram and bus station is now noted as a bus station. - The hat factory is now noted as a depot. - The mill 50m south east of the site is now recorded a depot. - There is garage 30m east of the south east site boundary. - There are now several works adjacent to the western site boundary. - The electrical works has been demolished. - The foundry is no longer marked on the map. - The saw mills are now depots. - The tram depot is now recorded as a bus depot
1965 - 1973 (1;1,250, 1;2,500 & 1;10,000)	Generally the site remains unchanged with the exception of the following: - Several buildings have been demolished in the centre of the site. - By 1971 it appears the River Mersey has been built over and possibly culverted up to Wellington Road. - The bus station has expanded. -	Generally the surrounding land remains unchanged with the exception of the following: - A lubricants works is recorded 150m south west of the site. - The depot next to the south eastern boundary is now noted as Wellington Mill. - Several houses and works have been demolished to the west of the site and the area is now part of a bus depot. - The saw mill 150m west is now a steel warehouse.
1980 (1;250, 1;10,000)	Stockport Bus Station has been constructed and generally appears in its current configuration. The remainder of the site appears relatively unchanged.	The bus depot at Heaton Lane has been demolished. Generally the surrounding land remains unchanged.
1984 - 1991 (1;1,250)	A car park and stairs /path have been constructed on the slope in the south of the site. Generally the site remains unchanged. -	Generally the surrounding land remains unchanged with the exception of the following: - The baths are now a leisure centre. - The bus depot is now a multi-storey car park. - There is a garage 50m north west of the site. - The sidings and the coal yards south of the site are no longer evident.
1990 - 1995 (1;1,250 & 1;10,00)	Generally the site remains unchanged.	Generally the surrounding land remains unchanged with the exception of the following: - Highgate House and a substation have been built next to the south eastern boundary of the site. - The garage to the south east of the site has been demolished.

Capabilities on project:
Environment

Year [scale]	Features on-site	Features off site
2006 - 2015 (1;10,000)	The site appears to remain relatively unchanged.	- The surrounding area appears to remain relatively unchanged.

Capabilities on project:
Environment

2.4 Geology

The published 1:50,000 scale geological map of the area produced by the British Geological Survey (BGS) (Sheet 98, Stockport, 1971 and 1977) indicates that the site is underlain by the geological strata presented in Table 2.3. Made Ground associated with the historical land uses across the site is anticipated to be present at the surface.

Table 2.3. BGS Geological Strata.

Age	Group	Geological Stratum
Devensian	-	Glacial Till
	Glaciofluvial Deposits	Glaciofluvial Sheet Deposits
Quaternary	-	River Terrace Deposits
Triassic	Sherwood Sandstone Group	Chester Pebble Beds Formation

A summary of the geological strata is given below.

2.4.1 Glacial Till

Glacial Till is unsorted, heterogeneous sediment deposited by glaciers. Glacial Till may contain clays, silts, sands, gravels and boulders. The thickness and continuity of the Glacial Till in the vicinity of the site is unknown.

2.4.2 Glaciofluvial Sheet Deposits

The Glaciofluvial Sheet Deposits are sediment deposited by glacial rivers. The strata may consist of sands and gravels with lenses of silt and clay. The thickness and continuity of the Glaciofluvial Sheet Deposits is not known.

2.4.3 River Terrace Deposits

The River Terrace Deposits is sediment deposited by rivers. The stratum consists of sands and gravels with lenses of silt, clay and peat.

2.4.4 Chester Pebble Beds Formation

The strata consists of fine to coarse grained Sandstone, it is commonly pebbly with conglomerates and sporadic siltstones. Thickness is variable but may be up to 1,500m. The geological maps indicate two fault lines crossing the site both running north west to south east.

2.4.5 Made Ground

The review of historical mapping for the site suggests that in addition to these natural strata Made Ground will present at the surface. Made Ground deposits are likely to be of variable composition, depth, nature and distribution.

A number of historical exploratory hole locations are available on the BGS website; these are summarised in Table 2.4.

Capabilities on project:
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Table 2.4. Historical BGS Boreholes.

Borehole Reference NGR Distance from the site (Date)	Stratum	Description	Depth to Top of Stratum (m bgl)	Level of Top of Stratum (m OD)	Thickness (m)
SJ89SE32 389152,390206 On site (Unknown)	Made Ground	Made Ground	G.L	42.67	0.3
	Glaciofluvial Deposits	Red Sand	0.3	42.37	0.91
	Glaciofluvial Deposits	Grey Sand	1.21	41.46	0.92
	Glaciofluvial Deposits	Gravel	2.13	40.54	1.52
	Chester Pebble Beds Formation	Red Sandstone rock	3.65	39.02	5.8
SJ89SE789 389270, 390090 On site (31/3/1988)	Made Ground	Medium dense brown clayey silty sandy brick gravel	GL	Unknown	1.0
	Glaciofluvial Deposits	Medium dense reddish brown very silty gravelly SAND	1.0	Unknown	0.5
	Sandstone	Reddish brown slightly to moderately weather SANDSTONE	1.5	Unknown	1.5
SJ89SE790 389270, 390120 On site (1/4/1988)	Made Ground	Medium dense brown silty brick gravel and cobbles	GL	Unknown	2.4
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	2.4	Unknown	1.25
SJ89SE91 389230,390120 On site (1/4/1988)	Made Ground	Loose brown brick gravel and cobbles	GL	Unknown	1.3
	River Terrace deposits	Soft brown CLAY	1.3	Unknown	0.6
	Glaciofluvial Deposits	Dense to very dense reddish brown very silty sandy GRAVEL	1.9	Unknown	0.9
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	2.8	Unknown	3.3
SJ89SE792 389230, 390110 On Site (31/3/1988)	Made Ground	Loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (rubble)	GL	Unknown	1.2
	Made Ground	Very loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (rubble) Made round with some to occasion off white gravel sized particles with a limey odour possible chemical waste	1.2	Unknown	3.3
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	4.5	Unknown	3.1

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2.5 Mining and Quarrying

The Coal Authority website (www.coal.gov.uk) indicates that the site is outside of a Coal Mining Reporting Area. Given the urban nature of the site, it is unlikely to be impacted by any historical underground or surface mining activity.

Information included in the Envirocheck Report ^(Ref. 02) and on the EA website indicates there are four closed clay/sand pits between 650 and 860m from the site. These are located to the east and west/northwest of the site north of the River Mersey.

2.6 Hydrology and Hydrogeology

The EA website shows the Chester Pebble Beds Formation is classified as a Principal Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The Glacial Fluvial Deposits are classed as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The Glacial Till is classed as an Unproductive Strata. These are drift deposits with low permeability that have negligible significance for water supply or river base flow.

The site is not located within a Groundwater Source Protection Zone.

The nearest surface water course is the River Mersey which is culverted under the eastern section of the site and runs from east to west. The EA graded the Water Quality as Fair.

The River Tame lies to the north east of the site running from north east to south west. The River Tame meets the River Goyt, approximately 750m north east of the site, to form the River Mersey, which flows from east to west through the site.

A single surface water abstraction point has been identified within 1km of the site. The abstraction is located approximately 850m to the north east and is operated by Salpa Kay Ltd for cooling purposes, with the abstraction taken from the River Tame.

The indicative floodplain map for the area, published by the EA, shows that the site lies within the predicted flood plain of River Mersey, Flood Risk Zone 2. Therefore the site is considered to be susceptible to fluvial flooding.

2.7 Preliminary Risk Assessment

2.7.1 Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the proposed site redevelopment which will comprise a new interchange which a rearrangement of the current road layout including the building of a new bridge across the River Mersey and an expansion of Mersey Square as identified in Section 1.1

The legislative framework for land contamination risk assessment and the principle of contaminant linkages to derive a Conceptual Site Model (CSM) are described in Appendix B.

Capabilities on project:
Environment

2.8 Potential Sources of Contamination

2.8.1 Historical Usage

A review of historical OS maps of the area revealed that the site was formerly occupied by a combination of residential commercial and industrial development and associated infrastructure. Industrial development included. but was not limited to. mills, gas works, hat manufacturers, print works and timbers yards. Demolition and redevelopment of sections of the site is also recorded. Possible releases of contamination may therefore have historically taken place on the site and may have included the following:

- Petroleum hydrocarbons;
- Solvents (including chlorinated hydrocarbons);
- Phenols;
- Polycyclic Biphenyls (PCBs);
- Organic and inorganic pigments;
- Inorganic compounds including cyanide (gas work waste);
- Polycyclic aromatic hydrocarbons (PAHs);
- Heavy metals (including mercury and arsenic);
- Sulphates; and
- Asbestos.

In addition to the schedule given above, the land may have become contaminated by filling and/or other construction activities, or by illegal dumping. Soil gases and or other mobile contaminants may also potentially be present.

2.8.2 Recent and Current Usage

The current site use is an operational bus station and commercial properties, there is the possibility that there will be release of hydrocarbons into the ground.

Contamination may have arisen through leaks and spills of fuels and oils around storage areas where bunding has not been provided.

2.8.3 Off Site Sources of Contamination

The site is located in an urban area which includes a variety of historical and recent potentially contaminating land uses. It is possible that any potential contamination associated with these land uses has resulted in the contamination of soils and groundwater and resulted in the generation of potential ground gas. These sources have the potential to migrate onsite via aerial deposition and lateral sub-ground migration of contaminated groundwater and/or ground gas. As such off site sources of contamination may have the ability to effect the site and future developments.

The landfill (former clay/sand pit) is considered to be of sufficient distance, over 600m to the north east, from the site and is not to be considered a potential source of contamination.

2.8.4 Summary

The potential sources of contamination can be summarised as follows:

S1 – Potentially contaminated Made Ground and shallow natural soils; and

S2 – Potentially contaminated groundwater flowing onto site from off site sources;

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2.9 Potential Pathways

Potential pathways for contamination present include the following:

- P1 – Direct contact with soil (ingestion and dermal);
- P2 – Inhalation of dust and/or vapours;
- P3 – Ingress and /or accumulation of ground gas /vapours;
- P4 - Inhalation of ground gas;
- P5 – Surface water run-off;
- P6 – Leaching of contaminants and vertical migration into groundwater;
- P7 – Lateral migration of groundwater providing base flow to watercourses;
- P8 – Direct contact of contaminated ground with in-ground structures and ecological receptors; and
- P9 – Plant uptake.

2.10 Potential Receptors

Human Health Receptors

- R1 – Construction workers;
- R2 – Maintenance workers;
- R3 – Final end users; and
- R4 – Adjacent site users.

Controlled Waters

- R5 – Primary /Secondary Aquifers underlying the site; and
- R6 – Surface Water in the vicinity of the site (River Mersey).

Ecological Receptors

- R7 – Future planting and landscaping.

Property

- R8 – Future proposed services and structures.

2.11 Preliminary Risk Assessment

A qualitative 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human, environmental, or controlled water receptors from contamination sources on or in the vicinity of the site, via transport pathways. Risks to receptors have been assessed using the guidelines given in CIRIA document 552 'Contaminated Land Risk Assessment, A Guide to Good Practice' ^(Ref. 06), where the probability and consequences of

Capabilities on project:
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contamination risks being realised are evaluated. The tables presented in Appendix B summarise the elements of the risk assessment process.

A Conceptual Site Model (CSM) illustrating plausible contaminant linkages has been formulated for this site. The qualitative risk assessment of the possible linkages of the above sources (S1 to S2), transport pathways (P1 to P9) and receptors (R1 to R8) is provided in the Table 2.5.

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Table 2.5. Preliminary Risk Assessment.

Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
S1: Potentially contaminated Made Ground and shallow natural soils	P1: Direct contact with soil (ingestion and dermal)	R1: Construction workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated, appropriate mitigation measures will be required, including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.	1
		R2: Maintenance workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are managed by appropriate facility health and safety plans.	2
		R3: Final end users	Medium	Unlikely	Low Risk	It is assumed that the site will be covered in either structures and /or hardstanding, therefore there will be no pathway between end users and potentially contaminated soils.	No contaminant linkage
	P2: Inhalation of dust and / or vapours	R1: Construction workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated, appropriate mitigation measures will be required, including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.	3
		R2: Maintenance workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are	4

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Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID	
						managed by appropriate facility health and safety plans.		
		R3: Final end users	Medium	Likely	Moderate	<p>Vapours may migrate into building via preferential pathways in service trenches and through foundations.</p> <p>It is assumed that the site will be covered in either structures and /or hardstanding, therefore there will be no pathway between end users and potentially contaminated dust.</p> <p>An intrusive ground investigation will be necessary to determine the potential for volatile contaminants in soils and groundwater.</p>	5	
		R4: Adjacent site users	Medium	Low Likelihood	Moderate / Low Risk	<p>Adjacent site users may be at risk during the construction phase, when potentially contaminated soils will be excavated and stockpiled.</p> <p>If necessary implement appropriate mitigation measures during the construction phases to minimise the risk to adjacent site users from wind blow dust.</p> <p>An intrusive ground investigation will be necessary to quantify and characterise possible contamination.</p>	6	
	P4: Inhalation of ground gas		R1: Construction workers	Severe	Likely	High Risk	<p>An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.</p> <p>If the site is contaminated, appropriate mitigation measures will be required including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.</p>	7
			R2: Maintenance workers	Severe	Likely	High Risk	<p>An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.</p> <p>If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are managed by appropriate facility health and safety plans.</p>	8

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Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
		R3: Final end users	Severe	Likely	High Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.	9
	P6: Surface water run-off and/or direct percolation from surface	R6: Surface water (River Mersey)	Medium	Low Likelihood	Moderate /Low Risk	Exposure of potentially contaminated soils during the construction phase may results in contaminated run-off entering the river. Following construction it is assumed that the site will be covered in hard standing minimising the risk of contaminated run off. An intrusive ground investigation may be necessary to characterise possible contamination in the soils and allow appropriate mitigation to be implemented during the construction phase.	10
	P5: Leaching of contaminants	R5: Principal Aquifer/Secondary Aquifer	Medium	Low Likelihood	Moderate /Low Risk	Leaching of contaminants may occur during the construction phase. Mitigation measures may be necessary during the construction phase to minimise the risk of leaching. It is assumed that following construction the site will be covered in relatively impermeable hard standing. An intrusive ground investigation may be necessary to characterise possible contamination in the soils and groundwater.	11
	P8: Direct contact with in-ground structures and services.	R8: Proposed services and structures	Mild	Likely	Moderate /Low Risk	An intrusive ground investigation will be necessary to further quantify and characterise possible contamination.	12
	P9: Plant uptake	R7: Proposed planting	Minor	Likely	Low Risk	An intrusive ground investigation will be necessary to further quantify and characterise possible contamination.	13
	P8: Migration and accumulation of gases	R8: Proposed services and structures	Severe	Low Likelihood	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.	14

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Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
S2: Potentially contaminated groundwater	P7: Vertical and lateral migration of groundwater	R5: Principal Aquifer/Secondary Aquifer	Medium	Low Likelihood	Moderate /Low Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination in groundwater.	15
	P7: Vertical and lateral migration of groundwater	R6: Surface waters	Medium	Low Likelihood	Moderate /Low Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination in groundwater.	16

Ground Investigation

Capabilities on project:
Environment

3 Ground Investigation

3.1 Overview

An intrusive ground investigation was carried out by Geotechnics Ltd between 30 November and 18 December 2015. The investigation comprised the following elements:

- 21 No. boreholes progressed to a depth between 0.5 and 6.5m below ground level (m bgl) using cable percussion techniques;
- 10 No. boreholes extended by up to 15m into bedrock, to depths between 7.8 and 22.3m bgl, using rotary coring techniques;
- 13 No. hand dug trial pits excavated to depths between 0.24 and 1.30m;
- 10 No. dynamic probes progressed to depths between 3.45 and 4.98m;
- 19 No. window samples undertaken to between 0.30 and 5.45m bgl;
- 24 No. exploratory holes (9 No. in boreholes, 15 No. in window sample holes) had 50mm dual gas and groundwater monitoring wells installed; and
- 3 No. gas and groundwater monitoring rounds.

The findings of the ground investigation (GI) are presented in Geotechnics' Ground Investigation Factual Report for Stockport Bus Station ^(Ref. 07) (hereafter, Factual Report), included in Appendix C. The exploratory hole location plan is shown on Drawing 60340298-ACM-00-GEO-DR-0001, with the geological sections presented on Drawing 60340298-ACM-00-GEO-DR-0002.

3.2 Boreholes

A summary of the boreholes is presented in Table 3.1.

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Environment

Table 3.1. Borehole Summary.

Borehole	Drilling method	Completion Depth (m bgl)	Borehole Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
						Initial strike	After 20 mins
BH101	CP/RC	15.30	45.22	50mm dia. dual groundwater/ground gas standpipe.	5.00-7.00	1.20	No rise
BH102	CP/RC	14.70	43.35	50mm dia. dual groundwater/ground gas standpipe.	8.00-10.00	-	-
BH103	CP/RC	14.70	42.42	50mm dia. dual groundwater/ground gas standpipe.	11.00-14.00	-	-
BH104	CP/RC	15.00	42.47	50mm dia. dual groundwater/ground gas standpipe.	1.00-3.50	-	-
BH105	CP/RC	15.20	42.62	50mm dia. dual groundwater/ground gas standpipe.	9.50-12.00	-	-
BH106	CP/RC	15.00	42.45	50mm dia. dual groundwater/ground gas standpipe.	5.00-7.00	-	-
BH107 *	CP/RC	7.80	42.27	No installation.	-	-	-
BH108	CP/RC	22.30	42.72	50mm dia. dual groundwater/ground gas standpipe.	18.00-21.00	-	-
BH109	CP/RC	20.70	42.36	50mm dia. dual groundwater/ground gas standpipe.	18.00-20.00	-	-
BH111	CP	1.55	50.92	No installation.	-	-	-
BH112	CP/RC	14.80	43.70	50mm dia. dual groundwater/ground gas standpipe.	12.80-14.80	-	-
CT1	N/A	1.20	42.24	No installation.	-	-	-
CT1A	CP	4.32	42.19	No installation.	-	-	-
CT3	CP	4.35	42.11	No installation.			

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CT4	CP	3.30	42.07	No installation.	-	-	-
CT5	CP	5.15	42.73	No installation.	-	-	-
CT6	CP	0.50	42.60	No installation.	-	-	-
CT6A	CP	1.00	42.59	No installation.	-	-	-
CT6B	CP	5.50	42.66	No installation.	-	-	-
CT7	CP	5.50	42.75	No installation.	-	-	-
CT8	CP	6.50	42.72	No installation.	-	-	-

CP= Cable Percussion, RC= Rotary Coring.

* BH107 terminated at 9.1m bgl, after encountering a void from 7.8m bgl. The void was later identified as a sewer. The hole encountered Made Ground from surface to 0.9m bgl, Glacial Sand and Gravel from 0.9 to 3.0m bgl, weathered Sherwood Sandstone 3.0 to 4.0m bgl, Sherwood Sandstone (cored) from 4.0 to 7.5m bgl and tunnel brick lining from 7.5 to 7.8m bgl.

3.3 Window Samples

A summary of the window sample holes is presented in Table 3.2.

Table 3.2. Window Sample Summary.

Window Sample	Depth (m bgl)	Ground Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
					Initial strike	After 20 mins
WS201	4.27	45.61	50mm dia. dual groundwater/ground gas standpipe.	3.50-4.00	-	-
WS203	3.34	43.01	50mm dia. dual groundwater/ground gas standpipe.	2.00-3.00	-	-
WS204	2.86	42.85	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.45	-	-
WS205	2.38	42.39	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.00	-	-

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Window Sample	Depth (m bgl)	Ground Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
					Initial strike	After 20 mins
WS206	2.34	48.13	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.00	-	-
WS208	3.20	42.35	50mm dia. dual groundwater/ground gas standpipe.	1.70-2.80	-	-
WS209	3.26	42.67	50mm dia. dual groundwater/ground gas standpipe.	1.00-3.00	-	-
WS210	5.09	44.43	50mm dia. dual groundwater/ground gas standpipe.	3.00-5.00	-	-
WS211	4.67	44.88	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.00	-	-
WS212	4.43	45.74	50mm dia. dual groundwater/ground gas standpipe.	2.50-3.50	-	-
WS214	5.45	46.35	50mm dia. dual groundwater/ground gas standpipe.	0.50-1.00	-	-
WS217	2.68	42.30	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.50	-	-
WS218	1.70	42.75	No installation.	-	0.9	0.8
WS218A	3.17	42.71	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.50	0.9	Damp
WS219	2.45	45.13	No installation.	-	-	-
WS220	4.07	44.69	50mm dia. dual groundwater/ground gas standpipe.	1.20-1.70	-	-
WS221	0.30	51.03	No installation.	-	-	-
WS223	3.72	43.39	50mm dia. dual groundwater/ground gas standpipe.	0.50-1.40	1.20	Slow inflow
WS224	1.70	53.31	No installation.	-	-	-

Capabilities on project:
Environment

3.4 Dynamic Probe

A summary of the dynamic probe holes is presented in Table 3.3.

Table 3.3. Dynamic Probe Summary.

Dynamic Probe	Completion Depth (m bgl)	Ground Level (m OD)
DP1	3.40	42.30
DP2	3.80	42.13
DP3	3.90	42.13
DP4	4.30	42.07
DP5	3.90	42.73
DP6	4.70	42.62
DP7	4.40	42.59
DP8	4.00	42.85
DP9	4.10	42.71
DP10	4.90	42.65

3.5 Trial Pits

A summary of the hand dug trial pits is presented in Table 3.4.

Capabilities on project:
Environment

Table 3.4. Trial Pit Summary.

Trial Pit	Depth (m bgl)	Ground Level (m OD)	Stability of Trial Pit Walls	Water Strike (m bgl)	
				Initial strike	After 20 mins
HP01	1.2	48.58	Stable	-	-
HP02	1.2	52.84	Stable	-	-
TP1	0.65	42.25	Stable	-	-
TP2	1.10	42.09	Stable	-	-
TP3	0.85	42.07	Stable	-	-
TP4	0.80	42.12	Stable	-	-
TP5	1.20	42.16	Stable	-	-
TP6A	1.25	-	Stable	-	-
TP6B	0.40	-	Stable	-	-
TP7A	1.30	-	Stable	-	-
TP7B	0.33	-	Stable	-	-
TP8	0.80	42.80	Stable	-	-
TP9	0.24	42.79	Stable	-	-

3.6 In-situ Testing

Standard Penetration Tests (SPTs) were undertaken in the cable percussion holes, rotary holes and window sample holes. The tests were undertaken generally at 1m intervals within the first 5m in soils and weathered Sherwood Sandstone and in rotary holes where core recovery was less than 80%.

Hand shear vane tests were not undertaken due to the granular nature of the Made Ground.

Capabilities on project:
Environment

3.7 Laboratory Testing

3.7.1 Geotechnical Testing

Soil samples were obtained from the boreholes, window samples and within the trial pits. Selected soil samples were scheduled for a range of the following geotechnical tests;

- Natural moisture content (12 No.);
- Atterberg Limits (11 No.);
- Particle Size Distribution (11 No.);
- pH (35 No.);
- Organic matter content, Total Acid Soluble Sulphate (Total Sulphate BRE) and Water Soluble Sulphate (Sulphate as SO₄ (2:1 Ext)) (35 No.);
- Dry Density, Moisture Content Relationship (1 No.);
- Unconfined Compressive Strength (No. TBC.); and
- Point Load Testing (54 No.).

3.7.2 Contamination Testing

Soil samples for contamination testing were taken from the exploratory holes at 0.3m bgl, 0.5m bgl, and 1.0m bgl, and thereafter in metre intervals within the Made Ground deposits and strata where visual or olfactory evidence of contamination was encountered. Water samples from boreholes were obtained during post investigation groundwater and gas monitoring visits.

Based on the potential contaminants identified on site and with AECOMs Desk Study (Ref. 12), selected soil and groundwater samples were analysed by Jones Laboratories for the determinants as listed in Table 3.5.

Capabilities on project:
Environment

Table 3.5. Chemical Testing Suites.

Determinand	Total Soils analytical suite	Total Leachate analytical suite	Total Waters analytical suite
Arsenic	✓	✓	✓
Cadmium	✓	✓	✓
Chromium (Total)	✓	✓	✓
Chromium III	✓	✓	✓
Chromium VI	✓	✓	✓
Copper	✓	✓	✓
Lead	✓	✓	✓
Nickel	✓	✓	✓
Mercury	✓	✓	✓
Selenium	✓	✓	✓
Zinc	✓	✓	✓
Vanadium	✓	✓	✓
pH	✓	✓	✓
Total/Dissolved Organic Carbon	✓	✓	✓
Cyanide (total)	✓	✓	✓
TPH UK-CWG Banding incl. BTEX *	✓	✓	✓
PAH Speciated 16 USEPA	✓	✓	✓
Phenols	✓	✓	✓
PCBs (7 congeners)	✓	✓	✓
Asbestos Screen	✓		
Asbestos Quantification	✓		
Chloride	✓		
VOCs	✓	✓	✓
SVOCs (incl. 16 USEPA speciated PAHs and total phenols)	✓	✓	✓
Boron (Water Soluble)	✓		
Sulphate (total)	✓		
Sulphur (total)	✓		
Ammoniacal Nitrogen			✓
Sulphate (Soluble)			✓
Sulphide		✓	✓
SVOCs (excl. 16 USEPA speciated)		✓	✓
Total	41 Samples	17 Samples	9 Samples

3.8 Gas and Groundwater monitoring.

A summary of the installation details is included in Table 3.1 and 3.2.

Capabilities on project:
Environment

Gas and groundwater monitoring was completed on 9 February 2016. To date, monitoring of groundwater and ground gas has been undertaken at the time of installation and on three occasions post site works, on 11 and 25 January and 9 February 2016.

A Gas Data LMSxi portable gas analyser was used to record the levels of oxygen, carbon dioxide, methane, carbon monoxide and hydrogen sulphide. In addition differential pressure and flow rates were recorded at each reading.

Ground Conditions and Material Properties

Capabilities on project:
Environment

4 Ground Conditions and Material Properties

4.1 Introduction

The following section provides a review of the results of the ground investigation information. The factual data is included within Geotechnics' Factual Report ^(Ref. 07).

A summary of the ground conditions encountered across previous ground investigation works undertaken in the wider area surrounding the site is presented as part of the AECOM Desk Study ^(Ref. 01).

Geological long sections across the proposed Stockport Interchange development and proposed bridge are shown on Drawing 60340298-ACM-00-GEO-DR-0002.

4.2 Stratigraphy

A summary of the ground conditions encountered across the site is presented in Table 4.1.

Table 4.1. Ground Conditions Encountered during the Ground Investigation.

Geological Unit	Typical Description	Range of depths to top of stratum (m bgl)	Range of levels to top of stratum (m OD)	Range of thickness (m)	Comments
Made Ground – Other ¹	Grey concrete paving slab. Black tarmacadam. Grey subangular granite cobble setts	0.00 to 0.95	41.64 to 51.03	0.05 to 1.20	Widespread.
Made Ground - Cohesive	MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	0.30 to 1.00	42.70 to 50.62	0.30 to 1.20	Four holes.
Made Ground - Granular	MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone with a medium angular cobble content. (Sub base). MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Some wood.	0.00 to 2.60	41.65 to 53.31	0.05 to 4.95	Widespread.
Alluvial Clay	Soft dark brown and black very organic CLAY, locally sandy silt, with organic remains.	1.40 to 1.60	41.99 to 42.10	0.40 to 0.60	Two holes.
Glacial Clay	Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to	1.30 to 2.40	41.05 to 43.62	0.40 to 1.50	Four holes.

Capabilities on project:
Environment

Geological Unit	Typical Description	Range of depths to top of stratum (m bgl)	Range of levels to top of stratum (m OD)	Range of thickness (m)	Comments
	coarse of various lithologies.				
Glacial Sands and Gravels ¹	Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt. Dark brown gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded of various lithologies.	0.50 to 3.20	38.91 to 52.11	1.0 to 1.72	Widespread.
Weathered Sherwood Sandstone ¹	Extremely weak to very weak dark red fine to medium grained SANDSTONE recovered as silty sand. Very dense reddish brown fine to coarse SAND.	0.85 to 5.00	37.72 to 50.07	0.12 to 2.35	Widespread.
Sherwood Sandstone ¹	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are subhorizontal, very closely spaced, rough and clean. Very weak to medium strong reddish brown medium grained SANDSTONE with abundant micaceous minerals and rare fine to coarse rounded gravel. Discontinuities are very closely to medium spaced horizontal to subvertical smooth planar and undulating.	3.40 to 6.55	35.81 to 41.16	9.35 to 16.15 (unproven)	Widespread.

¹ Strata not fully explored in some exploratory holes

4.2.1 Made Ground - Other

Made Ground – Other was recorded from the surface in nearly all exploratory holes across the site. The descriptions are generally either concrete/paving slabs or black tarmacadam. The material ranged in thickness between 0.05 and 1.20m. The thickest deposit was in exploratory hole CT1 where black tarmacadam (0.1m thick) was underlain by a strata described as 'brick wall onto obstruction' to the base of the hole at 1.20m. The full thickness of the strata was not proved.

Capabilities on project:
Environment

The Made Ground - Other material has not been subject to any field or laboratory testing and is not discussed further.

Surface deposits of Made Ground – Other are expected to be removed during site works. It is likely that this material when crushed and screened will be suitable for re-use as capping or as an aggregate in the pavement construction, subject to appropriate testing.

4.2.2 Made Ground – Cohesive

Made Ground – Cohesive was recorded in four holes from 0.3 to 2.00m depth. The material is generally described as soft/firm brown slightly gravelly/gravelly slightly sandy/ sandy clay. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete. The material was recorded in four holes, BH111, BH112, WS201 and WS211. These are located across the site with WS211 located to the north east, BH112 located to the east, WS201 to the south west and BH111 to the south. There does not appear to be any geographical link with the locations.

Laboratory testing was undertaken on one sample from WS201 from 1.2 to 1.65m bgl. Moisture content and Atterberg Limit testing was undertaken with the sample recorded to have a moisture content of 33% and liquid limit of 33%. The determination for the plastic limit found the sample to be non-plastic. Although the sample was described as a clay, the laboratory described the sample as brown sandy gravelly silt (noted the in the stratum description).

Two SPTs were undertaken in the Made Ground – Cohesive. The first in BH112 at 1.2m recorded a value of 4 and the second in WS201 also at 1.2m bgl recorded a value of 28. The SPT values are very different as are the locations of the holes; no trend or inference of the results is noted, besides the variability of the material.

A review of the suitability of the Made Ground – Cohesive for re-use should be undertaken during detailed design and once an earthworks specification has been prepared. The current design does not have any significant earthworks. However, based on the descriptions from the ground investigation and due to the limited presence of the material across the site, the volume of material may not be economic to separate out for re-use.

4.2.3 Made Ground – Granular

Made Ground – Granular was recorded from the surface to 2.6m bgl in the majority of exploratory holes. The maximum thickness of 4.95m was recorded in BH108 from 0.05 to 5.00m depth; with the majority of the fill described as 'loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay'.

The material is generally described as one of the following three sub-divisions

- a sub-base with a general description of grey sandy angular to subangular fine to coarse gravel of limestone/dolerite with a medium angular cobble content;
- a sand with a general description of dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of granite, concrete, timber and plastic; or
- a gravel with a general loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.

Other minor constituents noted include ash, clinker, glass and wood.

Capabilities on project:
Environment

A strong hydrocarbon odour and organic remains were recorded in a clayey gravelly sand stratum in WS211 from 1.20 to 1.80m bgl. The hole is located to the north east of the site. Black organic matter is recorded in WS212 and WS220 from 1.50 to 1.70m bgl and from 1.20 to 1.70m bgl respectively. The strata are both described as gravelly sand. WS212 is located to the north of the site and WS220 to the west of the site.

Engineering properties of Made Ground – Granular cannot be relied upon and are not discussed in detail in this report. However, material described as sub-base should be able to be re-used a sub-base, depending upon environmental testing.

Laboratory testing was undertaken on five samples described as Made Ground – Granular. Moisture content and Atterberg Limit testing was undertaken, with the results presented in Table 4.2.

Table 4.2. Laboratory Testing Summary – Made Ground Granular.

Exploratory Hole	Depth (m bgl)	Strata Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)
BH108	2.00 to 2.50	MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.	22.2	34	NP
	3.00 to 3.45		16.3	32	NP
WS208	1.20 to 1.65	MADE GROUND: Dark brownish grey gravelly sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	12.4	29	NP
WS220	1.30 to 1.70	MADE GROUND: Very loose/loose dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of brick and concrete.	33.2	69	NP
WS223	1.20	MADE GROUND: Loose brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	19.9	29	NP

The results show a range in moisture content between 12.4% in WS208 and 33.2% in WS220. Liquid limits are generally between 29 and 34%, with one higher value of 69% in WS220. Black organic matter was identified in WS220 from 1.20 to 1.70m bgl and may account for the significantly higher liquid limit.

SPTs were undertaken in Made Ground – Granular, 37 No., see Figure 1. The values ranged between 0 and >50, indicative of very loose to very dense material. 19 tests were <10 blows indicating that the material was very loose/loose. The majority of the 19 tests were undertaken at the base of inspection pits and some disturbance of the material at the base of the pit may have caused the lower numbers. 6 tests were 50 or greater indicating very dense conditions or the presence of an obstruction. The remaining 12 tests fell between 10 and 44 blows, i.e. indicative of medium dense or dense material.

Capabilities on project:
Environment

The range of SPT values indicates that the Made Ground - Granular material is unlikely to have been compacted or engineered and as such the SPT values are likely to represent the local level of compaction; indicating that the relative density of the Made Ground - Granular across the site is likely to vary significantly.

A review of the suitability of the Made Ground – Granular for re-use should be undertaken during detailed design and once an earthworks specification has been prepared. The current design does not have any significant earthworks. The material described as sub-base may be able to be re-used, but as it is not present across the site as a thick stratum, the volume of material may not be economic to separate out for re-use. The Made Ground – Granular material should be assessed when excavated and may be able to be re-used as a general fill, depending upon environmental and geotechnical testing.

4.2.4 Alluvial Clay

Alluvial Clay was encountered in two exploratory holes, BH112 and WS223. Alluvial clay has been identified as natural clay deposits with the presence of organic material. The strata in BH112, 1.60 to 2.0m bgl, is described as 'soft dark brown and black very organic CLAY, locally sandy silt, with organic remains' and the strata in WS223, 1.40 to 2.00, is described as 'firm grey mottled dark brown slightly gravelly slightly sandy CLAY with organic traces. Gravel is subangular to subrounded fine to coarse of various lithologies'.

BH112 is located to the east of the site and WS223 is located in the centre of the site.

Laboratory testing was undertaken on one sample from BH112 at 1.80m depth. A moisture content of 109% was determined and a liquid limit of 77%. The plastic limit was not determined and the sample classed as non-plastic. The higher moisture content and liquid limit is indicative of the presence of organic material.

SPTs were not undertaken in the material.

The alluvial clay material was only encountered in two locations. As the volume of this material is likely to be low, and its organic matter high, then where the material is encountered it should be removed and replaced with suitably compacted fill.

4.2.5 Glacial Clay

Glacial Clay was encountered in five exploratory holes, BH101, WS201, WS208, WS211 and WS212, generally above the weathered Sherwood Sandstone, except for WS2211 where it was encountered within the Glacial Sand and Gravel. It was overlain by Made Ground in WS210 and WS208 and by Glacial Sand and Gravel in BH101 and WS212.

This stratum was typically described as soft to stiff grey/greyish brown/brown slightly gravelly sandy clay, locally silty / laminated. It was encountered at depths from 1.3m (WS208) to 3.8m (WS211). The thickness of strata ranged from 0.20m (WS211) to 1.50m (WS201). The materials have been classified together based on their descriptions as clay and the absence of organic material.

The strata are described as 'locally silt' in BH101, WS211 and WS212. BH101, WS211 and WS212 are located in the centre, east and north east respectively, and not geographically close to each other. BH101 and WS201 are located close to each other and both have clay between 2.0 and 3.0m bgl; BH101 from 1.6 to 3.00m bgl and WS201 from 2.0 to 3.5m bgl. However the sample in BH101 is described as laminated and locally silt, and the sample in WS201 is not described as either laminated or silty.

Capabilities on project:
Environment

Laboratory testing was undertaken on four samples described as Glacial Clay. Moisture content and Atterberg Limit testing was undertaken, with the results presented in Table 4.3.

Table 4.3. Laboratory Testing Summary – Glacial Clay.

Exploratory Hole	Depth (m bgl)	Strata Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)
BH101	2.20 to 2.65	Firm grey thinly laminated sandy CLAY, locally silt.	23.3	26	NP
WS201	2.40 to 3.00	Firm greyish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies.	22.9	33	18
WS211	3.80 to 4.00	Soft dark grey sandy CLAY, locally silt.	42.5	38	NP
WS212	3.00 to 3.45	Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies.	21.9	37	NP

The results show a narrow range in moisture content generally between 21.9% in WS212 and 23.3 in BH101. The tested sample from WS211 had a significantly higher moisture content of 42.5%. Liquid limits are between 26 and 38%. Three of the four samples were described as non-plastic, with one plastic limit determined; 18% for WS201. This classifies the sample in WS201 as a clay with low plasticity. Correlation of the laboratory data for undrained shear strength data infers a strength for the sample in WS201 of low strength, i.e. between 20 and 40kPa.

Four SPTs were undertaken in the Glacial Clay. The values ranged between 5 (BH101 at 2.20m) and 25 (WS212 at 3.00m); with the other tests both undertaken in WS201 being 10 (3.00m) and 11 (2.00m). The lower SPT value of 5 in BH101 at 2.20m bgl was undertaken with a water level of 1.5m bgl. This water level may have led to an imbalance of water pressures leading to local softening of the soils at the testing level.

Empirical relationships ($c_u = f_1 \cdot N$ values from Stroud, 1975^(Ref. 08)) have been applied to derive the undrained shear strength (c_u) of the Glacial Clay from SPT N values. A conservative factor, f_1 , of 5 has been used, considering the plasticity index values recorded during the laboratory testing. c_u values were also derived from empirical correlations with Liquidity Index (Wroth, 1979^(Ref. 09)).

The c_u values range between 25kPa (SPT correlation in BH101) and 125kPa (SPT correlation in WS212). The other values 33 (Liquidity Index), 50 and 55kPa (both SPTs) indicate the material is generally a low to medium strength material (20 to 40kPa and 40 to 75kPa respectively).

BS8004 (2015)^(Ref. 10) presents a correlation between plasticity index and values of ϕ_{cv} . For the plasticity index of 15 determined in WS201 a ϕ_{cv} value of 27.3° is determined. As only one ϕ_{cv} value is determined and due to the limited presence of the Glacial Clay across the site recommendations are not discussed. As the volume of this material is likely to be low, then where the material is encountered, and depending upon location, it should be removed and replaced with suitably compacted fill.

Capabilities on project:
Environment

4.2.6 Glacial Sands and Gravel

Glacial Sands and Gravels were recorded in nearly all exploratory holes, generally beneath the surface Made Ground and above the weathered Sherwood Sandstone.

The stratum is typically comprised of a very loose to very dense brown / yellowish brown / reddish brown / grey slightly gravelly / gravelly, sometimes clayey, fine to medium sand. The material was also described as a sandy / very sandy gravel. It was encountered at depths ranging between 0.50 and 3.2m bgl, with thicknesses proved ranging between 0.5 and 3.0m. Where sands were recorded, which would generally be interpreted as weathered Sherwood Sandstone, if the descriptions of the gravels, if present, included anything apart from sandstone, i.e. granite, limestone, mixed lithologies, etc. these were interpreted as Glacial Sand and Gravel.

Figure 1 presents the SPT 'N' values for the strata, with SPT 'N' values ranging between 4 and >50, with a mean of 31 (>50 blows assumed to be 50 blows). Of the 49 tests undertaken 8 were <10, 15 between 10 and 30, 9 between 30 and 50, and 17 were 50 or greater. Low SPT 'N' values may be an indication of the presence of water. Only in BH101 at 1.2m bgl where an SPT test recorded 6 blows is a waterstrike recorded; the waterstrike was also recorded at 1.2m bgl with no water level rise recorded. The SPT test of 4 blows in WS214 at 3.0m bgl, may have been affected by the layer of dark brown mottled black sand with black organic remains present between 3.70 and 4.00 m depth. The remaining tests all show a large scatter of values indicated by the range from 4 to >50. In general the deposits are generally spread between being medium dense (10 to 30 blows), dense (30 to 50 blows) or very dense (>50 blows).

The drained internal (peak) angle of friction for the material has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974) ^(Ref. 11). The values range between 28° and 40°, with a mean of 36°. A conservative value of 34° will be used in design to account for variability of the material.

4.2.7 Weathered Sherwood Sandstone

Weathered Sherwood Sandstone was recorded in nearly all exploratory holes above the Sherwood Sandstone; it was generally found below Glacial Sand and Gravel, but also directly below Made Ground.

The stratum is typically described as extremely weak / weak dark red fine to medium grained sandstone recovered as silty sand. The material was also described as loose to very dense sometime clayey sometimes gravelly sand. It was encountered at depths ranging between 0.85 and 5.0m bgl, with thicknesses proved ranging between 0.12 and 2.35m.

Figure 1 presents the SPT 'N' values for the strata, with SPT 'N' values ranging between 2 and >50, with a mean of 44. 44 SPTs were undertaken with 37 tests 50 or greater and three tests <10 blows. The lowest values of 2 was recorded in WS214 at 4.0m bgl at the base of a layer described as dark brown mottled black sand with black organic remains present between 3.70 and 4.00 m depth. This is likely to have affected the SPT result. Low SPT 'N' values may also be an indication of where the holes were not completely topped up with water during drilling, and may not be representative of the strata.

The drained internal (peak) angle of friction for the soil mass has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974) ^(Ref. 11). The values range between 27° and 41°, with a mean of 39°. A conservative value of 36° will be used in design to account for variability of the material.

Capabilities on project:
Environment

4.2.8 Sherwood Sandstone

Sherwood Sandstone was recorded below weathered Sherwood Sandstone in nearly all exploratory holes. The exception is BH111, which encountered weathered Sherwood Sandstone from 0.85 to 1.55m bgl. BH111 is located to the south of the proposed development and rotary coring was not undertaken.

The strata is typically described as extremely weak to weak greyish / reddish brown fine to coarse sandstone with occasional subrounded fine to coarse gravel. Discontinuities are subhorizontal, very closely spaced, rough and clean. The material was also described as a gravelly sand where it was recovered in a weathered state. It was encountered at depths ranging between 3.40 and 6.55m bgl, with cored thicknesses ranging between 9.35 and 16.15m. The base of the sandstone was not proved.

The stratum was also described as mudstone in two boreholes; BH104 from 9.10 to 9.80m bgl (32.67 to 33.37m OD) and BH108 from 6.15 to 6.82m bgl (35.90 to 36.57m OD). BH104 is located to the west of the site and BH108 was undertaken on the south bank of the River Mersey. Given the local occurrence and thickness of the mudstone, it has been included as part of the Sherwood Sandstone stratum.

Figure 1 presents the SPT 'N' values for the strata, with SPT 'N' values all 50 or greater. Assuming the bedrock is a very dense soil, the drained internal (peak) angle of friction for material has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974)^(Ref. 11); the value is 41°. A conservative value of 40° will be used in design to account for variability of the material.

BS5930 (2015)^(Ref. 12) indicates unconfined compressive strengths of 0.6 to 1MPa for rocks described as extremely weak, increasing to 1 to 5MPa for rocks described as very weak, 5 to 25MPa for rocks described as weak, 25 to 50MPa for rocks described as medium strong, increasing to 50 to 100MPa for rocks described as strong and 100 to 250MPa for rocks described as very strong.

Rock strength testing was undertaken on selected samples. UCS testing has been undertaken on nine rock core samples. Six of the nine tests were undertaken beneath the footprint of the proposed River Mersey crossing, BH108 and BH109. The sample strengths ranged between 4MPa (BH108 at 19.0m bgl, BH109 at 9.4m bgl and BH112 at 9.6m bgl) and 12MPa (BH105 at 13.0m bgl), i.e. indicating very weak to weak rock strengths. The tests were undertaken at as received moisture contents, which ranged between 11.7 and 16.1%.

Point load testing was also performed on rock core samples. Testing was undertaken at 24 locations; with testing undertaken in the diametral direction, i.e. parallel to planes of weakness and axial direction, i.e. perpendicular to planes of weakness. The reported Is50 values are summarised in Table 4.4.

Table 4.4. Laboratory Testing Summary – Sherwood Sandstone.

Test Type / Direction	Is50 (MN/m ²)		
	Min	Max	Average
D / PL	0.016	0.162	0.06
A / PD	0.039	0.281	0.13

Notes:

Test Type D - diametral

A – axial

Capabilities on project:
Environment

Direction PL – parallel to planes of weakness
PD – perpendicular to planes of weakness

Point load testing was completed on samples of rock core. The tests were performed at as received moisture contents. The point load strength test is frequently used to determine crushing strength through established empirical relationships like those proposed by Broch and Franklin (1972)^(Ref. 13). Johnston (1991)^(Ref. 14) suggests typical multiplication factors to convert from point load strength index to uniaxial compressive strength; typical values between 20 and 25 are applied to diametral tests for unweathered rocks. For weak and destructured rocks, values as low as 7 to 15 are often adopted. CIRIA 181^(Ref. 15) states that the development of site specific or formation specific correlations based on UCS and $I_s(50)$ values is essential. An assessment of the UCS and point load data has been undertaken for the available information. A correlation factor of 20 has been assumed. This correlation calculates rock strengths in the range 0.78 to 5.6MPa with an average of 2.6MPa. 22 of the 31 samples (71%) have values between 1 and 3MPa. The rock description are predominantly extremely weak, i.e. 0.6 to 1MPa. The point load tests for the sandstone indicate strengths that are higher than anticipated from the sample descriptions.

Maximum past pre-consolidation pressures, pc' for the materials has not been determined; a conservative value of 150kPa is adopted for design.

4.3 Geotechnical Parameters

The geotechnical parameters used in design are presented in Table 4.5.

Capabilities on project:
Environment

Table 4.5. Summary of Geotechnical Parameters

Geological Unit	Parameter							
	γ_b kN/m ³	c_u kPa	c' kPa	ϕ'_{crit} °	ϕ'_{peak} °	c_c -	c_s -	UCS MPa
Made Ground - Other	-	-	-	-	-	-	-	-
Made Ground - Cohesive	-	-	-	-	-	-	-	-
Made Ground - Granular	19	N/A	0	-	30	0.10	0.010-	N/A
Alluvial Clay	-	-	-	-	-	-	-	-
Glacial Clay	20	40	0	26	-	0.20	0.020	N/A
Glacial Sand and Gravel	20	N/A	0	-	34	0.10	0.010	N/A
Weathered Sherwood Sandstone	22*	N/A	0	-	36	0.05	0.005	N/A
Sherwood Sandstone	24*	N/A	0	-	40	0.01	0.001	0.6

* Assumed value.

Capabilities on project:
Environment

4.4 Organic Matter Content

Organic matter content was determined on 36 samples; with values ranging between <2 and 56.5%. A summary of the testing is presented in Table 4.6.

Table 4.6. Summary of Organic Matter Testing.

Strata (No.)	Organic Matter Content (%)		
	Min	Maximum	Average
Made Ground – Cohesive (2)	1.3	14.1	7.7
Made Ground – Granular (27)	<0.2	56.5	10.2
Alluvial Clay (1)	21.7	21.7	21.7
Glacial Sand and Gravel (6)	<0.2	3.1	1.6
All Samples (36)	<0.2	56.5	9.8

A summary of the organic contents greater than 10% and their exploratory hole log descriptions are presented below:

- 56.5% - WS212 1.5 to 1.7m bgl - MADE GROUND: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies.
- 30.9% - WS211 0.2 to 0.5m bgl - MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.
- 21.7% - BH112 1.8m bgl - Soft dark brown and black very organic CLAY, locally sandy silt, with organic remains.
- 18.3% - CT8 1.2 to 1.65m bgl - MADE GROUND: Loose blackish brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash with a high cobble content and a high boulder content.
- 15.1% - WS214 0.5 to 1.0m bgl - MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.
- 14.8% - WS209 0.6 to 1.0m bgl - Medium dense reddish brown gravelly fine to coarse SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of various lithologies.
- 14.6% - BH108 0.8m bgl - MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.
- 14.1% - WS201 1.0 to 1.2m bgl - MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.
- 12.1% - WS214 0.5 to 1.0m bgl - MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.

Only two samples specifically mention organic content; WS212 – 56.5%, BH112 – 21.7%; this is considered unusual given the high organic matter values. This means that either the organic content was not obvious to the logging

Capabilities on project:
Environment

engineer or the sample was mis-logged. Any organic matter or material containing organic matter encountered on site should be removed and replaced with suitable material.

4.5 Groundwater

Groundwater monitoring installations are installed in nine boreholes and fifteen window sample holes. Details of the recorded groundwater levels are presented in Table 4.7.

Capabilities on project:
Environment

Table 4.7. Groundwater Level Monitoring Results.

Exploratory Hole	Ground Level (m OD)	Response Zone (m bgl)	Response Zone Stratum	Installation Details	Ground Water Depth (m bgl) and Level (m OD)					
					11/01/16	25/01/16	09/02/16	22/02/16	08/03/16	18/03/16
BH101	45.22	5.00-7.00	Sherwood Sandstone	50mm standpipe	6.17	5.83	5.79	5.54	6.03	5.72
					39.05	39.39	39.43	39.68	39.19	39.50
BH102	43.35	8.00-10.00	Sherwood Sandstone	50mm standpipe	5.42	5.46	5.35	5.45	5.47	5.52
					37.93	37.89	38.00	37.90	37.88	37.83
BH103	42.42	11.00-14.00	Sherwood Sandstone	50mm standpipe	6.60	6.20	6.50	6.66	6.67	6.73
					35.82	36.22	35.92	35.76	35.75	35.69
BH104	42.47	1.00-3.50	Glacial Sand and Gravel	50mm standpipe	3.56	DRY	3.57	DRY	DRY	DRY
					38.91	-	38.90	-	-	-
BH105	42.62	9.50-12.00	Sherwood Sandstone	50mm standpipe	6.41	6.49	6.40	6.48	6.50	6.56
					36.21	36.13	36.22	36.14	36.12	36.06
BH106	42.45	5.00-7.00	Sherwood Sandstone	50mm standpipe	5.41	5.46	5.20	5.45	5.50	5.54
					37.04	36.99	37.25	37.00	36.95	36.91
BH108	42.72	18.00-21.00	Sherwood Sandstone	50mm standpipe	6.68	6.86	6.35	6.72	6.84	6.95
					36.04	35.86	36.37	36.00	35.88	35.77
BH109	42.36	18.00-20.00	Sherwood Sandstone	50mm standpipe	5.18	5.29	4.83	5.16	5.24	5.37
					37.18	37.07	37.53	37.20	37.12	36.99
BH112	43.70	12.80-14.80	Sherwood Sandstone	50mm standpipe	5.02	5.05	4.96	5.07	5.06	5.09
					38.68	38.65	37.74	38.63	38.64	38.61
WS201	45.61	3.50-4.00	Weathered Sherwood Sandstone	50mm standpipe	3.85	DRY	DRY	DRY	DRY	DRY
					41.76	-	-	-	-	-
WS203	43.01	2.00-3.00	Glacial Sand and Gravel	50mm standpipe	CAR	DRY	CAR	2.66	2.67	2.62
								40.35	40.34	40.39
WS204	42.85	1.50-2.45	Made Ground Granular/ Weathered Sherwood Sandstone	50mm standpipe	2.45	DRY	DRY	DRY	CAR	DRY
					40.40	-	-	-	-	-
WS205	42.39	1.50-2.00	Made Ground Granular/ Glacial Sand and Gravel	50mm standpipe	1.94	DRY	DRY	DRY	DRY	1.93
					40.45	-	-	-	-	40.46
WS206	48.13	1.00-2.00	Made Ground Granular	50mm standpipe	1.82	DRY	DRY	DRY	DRY	DRY
					46.31	-	-	-	-	-

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Exploratory Hole	Ground Level (m OD)	Response Zone (m bgl)	Response Zone Stratum	Installation Details	Ground Water Depth (m bgl) and Level (m OD)					
					11/01/16	25/01/16	09/02/16	22/02/16	08/03/16	18/03/16
WS208	42.35	1.70-2.80	Weathered Sherwood Sandstone	50mm standpipe	2.72	DRY	DRY	DRY	DRY	DRY
					39.63	-	-	-	-	-
WS209	42.67	1.00-3.00	Glacial Sand and Gravel	50mm standpipe	2.91	DRY	DRY	DRY	DRY	DRY
					39.76	-	-	-	-	-
WS210	44.43	3.00-5.00	Glacial Sand and Gravel	50mm standpipe	5.00	DRY	DRY	DRY	DRY	DRY
					39.43	-	-	-	-	-
WS211	44.88	1.00-2.00	Made Ground Granular	50mm standpipe	1.87	1.92	1.90	1.87	1.87	1.90
					43.01	42.96	42.98	43.01	43.01	42.98
WS212	45.74	2.50-3.50	Glacial Clay	50mm standpipe	3.16	3.20	3.20	3.18	3.18	3.16
					42.58	42.54	42.54	42.56	42.56	42.58
WS214	46.35	0.50-1.00	Made Ground Granular	50mm standpipe	0.93	DRY	DRY	DRY	DRY	DRY
					45.42	-	-	-	-	-
WS217	42.30	1.50-2.50	Glacial Sand and Gravel	50mm standpipe	2.50	DRY	DRY	DRY	DRY	DRY
					39.80	-	-	-	-	-
WS218A	42.71	1.00-2.50	Made Ground Granular/ Glacial Sand and Gravel	50mm standpipe	2.50	DRY	DRY	DRY	DRY	DRY
					40.21	-	-	-	-	-
WS220	44.69	1.20-1.70	Made Ground Granular	50mm standpipe	1.60	1.65	1.60	1.65	1.67	1.67
					43.09	43.04	43.09	43.04	43.02	43.02
WS223	43.39	0.50-1.40	Made Ground Granular	50mm standpipe	1.60	1.60	1.50	1.53	DRY	DRY
					41.79	41.79	41.89	41.86	-	-

Capabilities on project:
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4.6 Aggressiveness of Ground to Concrete

BRE testing was undertaken on 35 samples recovered during the ground investigation. The samples tested include material classified as Made Ground Cohesive, Made Ground Granular and Glacial Sand and Gravel; due to the test result values they have all been classified together. A summary of the results is presented in Table 4.8.

Table 4.8. Summary of Sulphate (2:1 water:soil extract) & pH Results.

Determinand		Count	Min	Max
pH	Soils	35	7.86	12.40
Sulphate as SO ₄ (2:1 Ext) (g/l)	Soils	35	<0.0015	1.76 (0.31)*
Total Acid Soluble Sulphate (%)	Soils	35	<0.01	2.26

*The water soluble sulphate as SO₄ results generally classify for sulphate class DS-1, i.e. <0.5g/l (Ref. 16). However, one sample, WS212 at 1.5 to 1.7m bgl, has a sulphate at SO₄ value >1.5g/l. This value (1.76g/l) infers a sulphate class of DS-3. The remainder of the samples have a maximum sulphate as SO₄ of 0.31g/l, indicating a sulphate class of DS-1.

WS212 is located to the north east of the site and the sample is taken from a stratum described as 'MADE GROUND: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies'.

WS212 is located away from the Interchange development area, presumably in an area of pavement widening. Made Ground adjacent to any concrete in this area should be removed and replaced with clean compacted granular fill.

The recorded pH values are all >7.5; therefore the site classifies as an ACEC Class of AC-1 (Ref. 16).

Contamination Assessment

Capabilities on project:
Environment

5 Contamination Assessment

5.1 Introduction

This assessment has been carried out in order to identify potential contamination issues associated with the proposed development of the site. As outlined in Section 1, the objective of the assessment was to obtain ground condition information to inform the design of the proposed modifications to the site. It should be noted that the risk assessment may require updating should there be any changes to the overall design.

5.2 Basis of Assessment

5.2.1 Human Health

AECOM has a prescribed methodology for assessing risks to human health at a generic level termed 'generic quantitative risk assessment' (GQRA) or 'Stage 2' in CLR11.

For sites where the conceptual site model has identified one or more complete contaminant linkage to human health it is often necessary to clarify the risk posed by that contaminant linkage by comparison of reported concentrations with guideline values that represent acceptable concentrations.

The procedures outlined in Environment Agency Science Reports SC050021/SR2^(Ref. 17), SR3^(Ref. 18), SR4^(Ref. 19) and SR7^(Ref. 20) have been adopted in conjunction with the amendments to generic land-use exposure models published in DEFRA research report SP1010^(Ref. 21) detailing the derivation of Category 4 Screening Levels (C4SSL) to select and develop generic assessment criteria (GAC) for soil. This approach has also been adapted to develop assessment criteria for groundwater and soil vapour.

AECOM utilises a hierarchy of published sources for Stage 2 generic assessment criteria for soil. The hierarchy of published sources are as follows:

- Land Quality Management (LQM) / Chartered Institute of Environmental Health (CIEH) Suitable for Use Levels (S4UL) for Sandy loam soil;
- CL:AIRE Environmental Industries Commission (EIC) GAC;
- AECOM derived GAC (AGAC);
- Dutch Intervention Values (IV) and Serious Risk Concentrations (SRC); and
- United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSL).

No LQM or EIC values are available for lead, and therefore the published C4SLs for lead are the default soil GAC. Further consideration of Defra SP1010 C4SLs for other substances is made where appropriate, subject to the current limited availability to six substances.

There are no published sources of relevant GAC for non-potable groundwater and soil vapour.

Application of GAC to Site Data

A typical first step is to compare individual soil, groundwater, and/or soil vapour concentrations to the GAC in order to establish whether further more detailed assessment and/or potentially remediation is required. This comparison can be expressed numerically as a Hazard Quotient (HQ):

$HQ = \frac{\text{Sample Concentration}}{\text{GAC}}$

Dependent on the assessment assumptions and uncertainties, a $HQ < 1$ indicates an acceptable level of risk from the substance being evaluated. The assessment of cumulative risk from multiple substances is not required at a GQRA level with the exception of TPH. In accordance with Environment Agency science report P5-080/TR3^(Ref.)

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²²⁾, a hazard index (HI) is calculated for each individual sample based on the summation of the HQ for each TPH fraction.

Statistical analysis may be warranted, if justified by the available data, to support initial GAC comparisons to individual reported concentrations.

In accordance with Environment Agency guidance co-authored by AECOM, GAC can be used as a starting point for evaluating long-term risks to human health from substances in soil. They address one specific consideration – long-term adverse effects on human health – and are designed to indicate where long-term (chronic) human health soil exposure risks are considered to be tolerable or minimal. They do not represent the “trigger” for an unacceptable risk under Part 2A of EPA 1990, and they do not address risk related to construction workers, acute exposure, ecology, controlled waters or building materials, they do not inform on the geotechnical suitability of the soil, and they do not inform on the aesthetic quality of the soil – both visual and olfactory. Therefore the GAC have not been explicitly derived to define remediation standards and are just one component in the assessment of whether soil is suitable for use.

It is good practice to use multiple lines of evidence to support GQRA conclusions.

Proposed Land Use Scenario

The proposed development is modifications to the existing Stockport bus station, on this basis a commercial end use has been specified as the most suitable AGAC.

Exposure Scenario Modelling Parameters

The following default exposure pathways have been modelled by specifying a commercial end use:

- Soil and indoor dust ingestion;
- Soil and indoor dust dermal contact;
- Dust inhalation (indoor and outdoor);
- Soil vapour inhalation (indoor and outdoor); and
- Groundwater vapour inhalation (indoor and outdoor).

5.2.2 Controlled Waters

The recorded leachable soil concentrations have been assessed in accordance with the Environment Agency “Technical advice to third parties on Pollution of Controlled Waters for Part IIA of the Environmental Protection Act 1990, V.2” (Ref. 23) and The River Basin Districts Typology, Standards and Groundwater threshold values (Water framework Directive) (England and Wales) Directions 2010 (Ref. 24).

Section 2.6 identifies the site as being located above a Principal (bedrock) and Secondary A Aquifer (superficial deposits). The most stringent of the UK Drinking Water Standards (DWS) and Environmental Quality Standards for freshwater (EQS-F) have been used to assess the leachable soil concentrations and groundwater testing results.

The UK DWS are derived from (Water Supply (Water Quality) Regulations 1989 & 2000) and the EQS are listed under the Surface Waters (Dangerous Substances) (Classification) Regulations (1989, 1997, and 1998).

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5.2.3 Ecological Systems

It is understood that planting and landscaping is not proposed as part of the development. However, should planting and /or landscaping be incorporated in the future, a landscape architect should be provided with the chemical analysis in order to establish suitable plant species. Ecological receptors are not considered further.

5.2.4 Property: Buildings and Services

It is recommended that the potential risk to water supply pipes and any necessary mitigation measures should be determined in accordance with the water supply company's risk assessment guidelines. Agreement with the local water supply company should be sought prior to placement of water supply pipes.

The recorded ground gas concentrations were assessed against the guidelines presented in CIRIA Report C665 (2007)^(Ref. 25), 'Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments'^(Ref. 26).

5.3 Total Soil Concentrations

The majority of determinants were detected in concentrations below the commercial end use screening criteria for soils. However several determinants exceeded the chosen screening criteria, including Phenols, PAHs, SVOCs and VOCs. All of these exceedances occurred in Made Ground. A summary of the exceedances found in the Made Ground is included as Table 5.1. The full screening assessment for total soils is included in Appendix D.

Capabilities on project:
Environment

Table 5.1. Summary of Elevated Total Soil Concentrations.

Determinant	Unit	Minimum	Maximum	Count	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Phenols							
4-Methylphenol	µg/kg	<LOD	2907	40	LOD	4	0
Poly Aromatic Hydrocarbons							
Benzo (a) Anthracene	mg/kg	<LOD	591.71	35	170	1	0
Benzo (a) Pyrene	mg/kg	<LOD	649.52	35	35	2	0
Benzo(b)fluoranthene	mg/kg	<LOD	577.17	35	44	1	0
Chrysene	mg/kg	<LOD	628.96	35	350	1	0
Dibenzo (ah) Anthracene	mg/kg	<LOD	58.58	35	3.5	2	0
SVOCs							
Carbazole	µg/kg	<LOD	50353	22	LOD	12	0
Benzo(b)fluoranthene	mg/kg	<LOD	577.17	35	44	1	0
VOCs							
Trichloroethene (TCE)	µg/kg	<LOD	11	22	LOD	1	0
4-Isopropyltoluene	µg/kg	<LOD	10	22	LOD	1	0
Isopropylbenzene	µg/kg	<LOD	16	22	LOD	2	0
Dichloromethane (DCM)	µg/kg	<LOD	100	22	LOD	2	0

Asbestos was encountered in the form of chrysotile in exploratory holes BH112, WS201 and WS206 at 0.20m bgl, 0.50m bgl and 0.50m bgl respectively. Asbestos quantification on these samples found that the level of asbestos was below the laboratory limit of detection.

5.4 Controlled Waters

5.4.1 Leachate Concentrations

The majority of the determinants were detected below the Screening Criteria in the majority of the samples. However, several determinants exceeded the chosen screening criteria for metals, non-metals, TPH compounds, PAH's and SVOCs. The details are summarised as Table 5.2 and the complete screening assessment is included as Appendix E.

Capabilities on project:
Environment

Table 5.2. Summary of Elevated Leachate Concentrations.

Determinant	Unit	Minimum	Maximum	Total No. of Tested Samples	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Metals							
Arsenic	µg/l	<LOD	79.1	18	10	6	0
Hexavalent Chromium	mg/l	<LOD	0.02	8	0.0034	2	0
Chromium III	mg/l	<LOD	0.013	8	0.0047	4	0
Chromium	µg/l	<LOD	25.4	18	4.7	8	0
Copper	µg/l	<LOD	22	18	1	2	0
Lead	µg/l	<LOD	23	18	1.2	5	0
Nickel	µg/l	<LOD	6	18	4	3	0
Vanadium	µg/l	<LOD	39.8	15	10.9	2	0
Non Metals							
Total Cyanide	mg/l	<LOD	0.08	12	0.001	1	0
TPH compounds							
Aliphatics >C21-C36	µg/l	<LOD	120	18	LOD	1	0
Aliphatics >C35-C44	µg/l	<LOD	20	18	LOD	1	0
Aromatics>EC12-EC17	µg/l	<LOD	170	18	90	1	0
Aromatics>EC16-EC22	µg/l	<LOD	790	18	90	1	0
Aromatics>EC21-EC36	µg/l	<LOD	1330	18	90	1	0
Aromatics >EC35-EC44	µg/l	<LOD	270	18	90	1	0
Poly Aromatic Hydrocarbons							
Anthracene	µg/l	<LOD	0.32	12	0.1	1	0
Benzo(a)pyrene	µg/l	<LOD	1.82	12	0.00017	10	0
Benzo(k)fluoranthene	µg/l	<LOD	0.91	12	0.017	9	0
Benzo(bk)fluoranthene	µg/l	<LOD	3.24	12	0.017	11	0
Benzo(b)fluoranthene	µg/l	<LOD	2.33	12	0.017	10	0
Benzo(ghi)perylene	µg/l	<LOD	0.65	12	0.0082	9	0
Dibenzo(ah)anthracene	µg/l	<LOD	0.16	12	0.07	1	0
Fluoranthene	µg/l	<LOD	2.93	12	0.0063	11	0
Indeno(123cd)pyrene	µg/l	<LOD	0.71	12	LOD	9	0
SVOCs							
Carbazole	µg/l	<LOD	8	18	LOD	1	0

Capabilities on project:
Environment

5.4.2 Groundwater Concentrations

The majority of determinants were detected below the selected screening criteria. However, several of the groundwater determinants exceeded the screening criteria; these are summarised in Table 5.3. The complete screening assessment for groundwater samples is included in Appendix F.

Table 5.3. Summary of Elevated Groundwater Concentrations from Water Samples from Site.

Determinant	Unit	Minimum	Maximum	Total No. of Tested Samples	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Nickel	µg/l	<LOD	8	9	4	0	3
TPH compounds							
Aliphatics > C12-C17	µg/l	<LOD	1280	9	300	0	1
Aliphatics > C16-C22	µg/l	<LOD	10	9	LOD	0	1
Aliphatics > C35-C44	µg/l	<LOD	1299	9	LOD	0	1
VOCs							
Chloroform	µg/l	<LOD	5	9	2.5	0	1

5.5 Ground Gas

The ground gas assessment is based on the 3 No. ground gas monitoring visits undertaken to date. The maximum recorded and the maximum concentration of either methane or carbon dioxide has been used to derive the gas screening values in combination with the rate of flow at the time of each measurement.

The results of the ground gas assessment is summarised in Table 5.4.

Capabilities on project:
Environment

Table 5.4. Summary of Ground Gas Assessment.

Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max O2%	CO	H2S	Peak CH4 (% vol)	GSV (l/hr)	Characteristic Situation CH4	Peak CO2 (% vol)	GSV	Characteristic Situation CO2
BH101	11/01/2016	-2.0	969	21	<1	<1	0.0	0	1	0.1	0.002	1
	25/01/2016	-0.5	1001	16.7	<1	<1	0.0	0	1	4	0.02	1
	09/02/2016	-2.1	969	17.6	<1	<1	0.0	0	1	3.8	0.0798	2
BH102	11/01/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
BH103	11/01/2016	-0.1	969	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	1.0	1001	20.8	<1	<1	0.0	0	1	0.1	0.001	1
	09/02/2016	6.4	969	20.6	<1	<1	0.0	0	1	0.1	0.0064	1
BH104	11/01/2016	0.1	969	18.9	<1	<1	0.0	0	1	2.2	0.0022	1
	25/01/2016	1.2	1001	19.5	<1	<1	0.0	0	1	1.5	0.018	1
	09/02/2016	0.1	969	19.1	<1	<1	0.0	0	1	2.4	0.0024	1
BH105	11/01/2016	0.4	969	21	<1	<1	0.0	0	1	0.1	0.0004	1
	25/01/2016	0.3	1001	20.7	<1	<1	0.0	0	1	0.1	0.0003	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
BH106	11/01/2016	-0.9	969	20.9	<1	<1	0.0	0	1	0.1	0.0009	1
	25/01/2016	-0.5	1001	20.6	<1	<1	0.0	0	1	0.1	0.0005	1
	09/02/2016	-0.2	969	18.8	<1	<1	0.0	0	1	0.7	0.0014	1
BH108	11/01/2016	0.1	969	20.5	<1	<1	0.0	0	1	0.5	0.0005	1
	25/01/2016	0.1	1001	20.7	<1	<1	0.0	0	1	0.3	0.0003	1
	09/02/2016	0.1	969	19.9	<1	<1	0.0	0	1	1.9	0.0019	1
BH109	11/01/2016	-0.1	969	20.5	<1	<1	0.0	0	1	1.3	0.0013	1
	25/01/2016	0.1	1001	20.5	<1	<1	0.0	0	1	0.4	0.0004	1
	09/02/2016	0.1	969	18.4	<1	<1	0.0	0	1	2.4	0.0024	1
BH112	11/01/2016	-0.1	969	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.2	<1	<1	0.0	0	1	0.1	0.0001	1
WS201	11/01/2016	-0.3	969	21	<1	<1	0.0	0	1	0.1	0.0003	1
	25/01/2016	0.1	1001	18.2	<1	<1	0.0	0	1	3.6	0.0036	1
	09/02/2016	0.1	969	16.5	<1	<1	0.0	0	1	6.1	0.0061	2

Capabilities on project:
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Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max O2%	C0	H2S	Peak CH4 (% vol)	GSV (l/hr)	Characteristic Situation CH4	Peak CO2 (% vol)	GSV	Characteristic Situation CO2
WS203	11/01/2016	Location not monitored on this date – access to exploratory hole blocked.										
	25/01/2016	0.1	1001	14.4	<1	<1	0.0	0	1	2	0.002	1
	09/02/2016	Location not monitored on this date – access to exploratory hole blocked.										
WS204	11/01/2016	0.1	969	11.8	<1	<1	0.0	0	1	7.1	0.0071	2
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	19.9	<1	<1	0.0	0	1	1.8	0.0018	1
WS205	11/01/2016	0.1	969	21	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.4	<1	<1	0.0	0	1	2.3	0.0023	1
WS206	11/01/2016	-0.3	969	20.5	<1	<1	0.0	0	1	0.4	0.0012	1
	25/01/2016	0.1	1001	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.1	<1	<1	0.0	0	1	0.2	0.0002	1
WS208	11/01/2016	0.1	969	18.6	<1	<1	0.0	0	1	2.5	0.0025	1
	25/01/2016	0.1	1001	20.7	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.5	<1	<1	0.0	0	1	3.6	0.0036	1
WS209	11/01/2016	0.1	969	19.6	<1	<1	0.0	0	1	2.6	0.0026	1
	25/01/2016	0.1	1001	19.8	<1	<1	0.0	0	1	2.3	0.0023	1
	09/02/2016	0.1	969	20.3	<1	<1	0.0	0	1	1.8	0.0018	1
WS210	11/01/2016	0.1	969	20.4	<1	<1	0.0	0	1	1	0.001	1
	25/01/2016	1.4	1001	20.7	<1	<1	0.0	0	1	0.2	0.0028	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.4	0.0004	1
WS211	11/01/2016	-0.1	969	20.3	<1	<1	0.0	0	1	0.3	0.0003	1
	25/01/2016	-0.2	1001	20	<1	<1	0.0	0	1	0.6	0.0012	1
	09/02/2016	0.1	969	19.8	<1	<1	0.0	0	1	0.7	0.0007	1
WS212	11/01/2016	0.1	969	7.2	<1	<1	0.0	0	1	4	0.004	1
	25/01/2016	1.4	1001	15.1	<1	<1	0.0	0	1	1.4	0.0196	1
	09/02/2016	0.1	969	8.5	<1	<1	0.0	0	1	3.5	0.0035	1
WS214	11/01/2016	0.1	969	20.6	<1	<1	0.0	0	1	0.3	0.0003	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.1	<1	<1	0.0	0	1	3	0.003	1
WS217	11/01/2016	0.1	969	18.6	<1	<1	0.0	0	1	3.2	0.0032	1
	25/01/2016	0.1	1001	79.9	<1	<1	0.0	0	1	19.4	0.0194	2
	09/02/2016	0.1	969	18.9	<1	<1	0.0	0	1	3	0.003	1

Capabilities on project:
Environment

Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max O2%	CO	H2S	Peak CH4 (% vol)	GSV (l/hr)	Characteristic Situation CH4	Peak CO2 (% vol)	GSV	Characteristic Situation CO2
WS218A	11/01/2016	0.1	969	20.4	<1	<1	0.0	0	1	0.4	0.0004	1
	25/01/2016	-0.5	1001	20.7	<1	<1	0.0	0	1	0.1	0.0005	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
WS220	11/01/2016	0.1	969	19.4	<1	<1	0.0	0	1	0.6	0.0006	1
	25/01/2016	0.1	1001	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	17.2	<1	<1	0.0	0	1	2.5	0.0025	1
WS223	11/01/2016	0.1	969	18.9	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	18.3	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	20.2	<1	<1	0.0	0	1	0.1	0.0001	1
Maximum	n/a	6.4	1001.0	79.9	0.0	0.0	0.0	0.0	1	19.4 (WS217 on 25/01/16)	0.0196	2
Minimum	n/a	-2.1	969.0	7.2	0.0	0.0	0.0	0.0	1	0.1	0.0001	1

During the monitoring exploratory holes adjacent to proposed main building (WS204 and WS217) recorded elevated carbon dioxide levels. Elevated carbon dioxide levels were found elsewhere onsite in locations BH101 and WS201. In accordance with CIRIA Report C665^(Ref. 25) the ground gas regime for the site has been categorised as Characteristic Situation 2.

There are a number of potential sources of the ground gas, including Made Ground and organic material within natural strata. However, the available information cannot provide a basis for determining the actual source of the ground gas at this stage.

Refined Conceptual Site Model

Capabilities on project:
Environment

6 Refined Conceptual Site Model

6.1 Introduction

A refined conceptual site model (CSM) has been developed on the basis of the AECOM Desk Study Report ^(Ref 01) and the findings of the Geotechnics' ground investigation factual report ^(Ref. 07) and contamination assessment (Section 5). The CSM has been developed on the understanding that the site will developed for a commercial end use in line with the development proposal outlined in Section 1.1.

To assess the potential geo-environmental impacts associated with contamination at the site, the conceptual model has been revised using the source pathway receptor approach, promoted by DEFRA and the Environment Agency. For there to be an identifiable risk, not only must there be contaminants present on the site (source) there must also be a receptor and a pathway which allows the source to impact on the receptor.

6.2 Contamination Sources

6.2.1 Sources Based on the contamination assessment

Potential on site contamination sources include:

S1 – Potentially contaminated Made Ground and shallow natural soils; and

S2 – Potentially contaminated groundwater.

6.2.2 Contaminants of Concern

Table 6.1. Contaminants of Concern Encountered within Made Ground.

Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Metals			
Arsenic		✓	✓
Chromium III		✓	✓
Chromium VI		✓	✓
Chromium Total		✓	✓
Lead		✓	✓
Nickel		✓	✓
Vanadium		✓	✓
Non Metals			
Total Cyanide		✓	✓
Asbestos	✓		
TPH Compounds			
Aliphatic >C21-C36		✓	✓
Aliphatic >C35-C44		✓	✓

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Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Aromatic >EC12-EC17		✓	✓
Aromatic >EC16-EC22		✓	✓
Aromatic >EC21-EC36		✓	✓
Aromatic >EC21-EC36		✓	✓
Phenol			
4-methylphenol	✓		✓
PAHs			
Acenaphthene		✓	✓
Benzo(a)anthracene	✓		✓
Benzo(a)pyrene		✓	✓
Benzo(b)fluoranthene	✓	✓	✓
Benzo(k)fluoranthene		✓	✓
Benzo(bk)fluoranthene		✓	✓
Benzo(g,h,i)perylene		✓	✓
Carbazole	✓		✓
Dibenz(a,h)anthracene		✓	✓
Fluorene			✓
Fluoranthene		✓	✓
Indeno(1,2,3-cd)pyrene		✓	✓
VOCS			
Trichloroethene (TCE)	✓		
4-isopropyltoluene	✓		
Isopropylbenzene	✓		
Dichloromethane (DCM)	✓		

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Table 6.2. Contaminants of Concern Encountered within Natural Ground.

Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Nickel		✓	
TPH Compounds			
Aliphatic >C12-C17		✓	
Aliphatic >C16-C22		✓	
Aliphatic >C35-C44		✓	
VOCS			
Chloroform		✓	

6.3 Receptors

6.3.1 Human Health Receptors

- R1 – Construction workers
- R2 – Maintenance workers
- R3 – Final end users
- R4 – Adjacent site users

6.3.2 Controlled Waters

- R5 – Primary /Secondary Aquifers underlying the site
- R6 – Surface Water in the vicinity of the site (River Mersey)

6.3.3 Ecological Receptors & Property

- R7 – Future planting and landscaping
- R8 – Future proposed services and structures

6.4 Refined Conceptual Site Model

The refined conceptual site model is summarised in Table 6.3.

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Table 6.3. Refined Conceptual Site Model.

Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
S1: Potentially contaminated Made Ground and shallow natural soils	P1: Direct contact with soil (ingestion and dermal)	R1: Construction workers	Moderate Risk	The majority of the determinants were detected below the AECOM Screening Value. Only PAHs in Made Ground were detected in concentrations exceeding specific generic assessment criteria value. Several VOCs and SVOCs were detected above the LOD used in the absence of a screening value. Asbestos has been identified onsite albeit in concentrations below the LOD of (0.001 % of mass).	Minor	Low Likelihood	Very Low Risk	1
		R2: Maintenance workers	Moderate Risk	The majority of the site is covered in Hard standing breaking the pathway from the elevated concentrations in the Made Ground and end users.	Minor	Low Likelihood	Very Low Risk	2
	P2: Inhalation of dust and / or vapours	R1: Construction workers	Low Risk	It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage. Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to contaminants and asbestos through appropriate health and safety risk assessment processes, which are likely to require the adoption of appropriate health and safety measures such as adequate personal protective equipment (PPE), damping down for dust suppression and other normal safe practices for on-site workers.	Minor	Low Likelihood	Very Low Risk	3
		R2: Maintenance workers	Moderate Risk		Minor	Low Likelihood	Very Low Risk	4
		R3: Final end users	Moderate Risk	Asbestos has been identified onsite although testing has not been able to quantify the amount in given samples. An asbestos watching brief should be undertaken by site staff and should If asbestos is encountered again onsite it should be handled and disposed of appropriately by a specialist asbestos contractor. The risk to final end users from inhalation of vapours is unlikely to occur due to the end use being that of a bus station which is largely open space with structures being underlain by generally impermeable hardstanding. End users are also expected to be largely transient not spending large amounts of time onsite.	Minor	Unlikely	Very Low Risk	5

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Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
		R4: Adjacent site users	Moderate	<p>The risk of adjacent site users is only likely to occur during the development phase.</p> <p>Precautions should be taken to minimise the spread of dust from the site, such as damping down and wheel washes.</p> <p>Should asbestos be encountered during the works a specialist asbestos contractor should be consulted and additional control measures should be implemented.</p>	Minor	Unlikely	Very Low Risk	6
	P4: Inhalation of ground gas	R1: Construction workers	Moderate / Low Risk	<p>Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits.</p> <p>Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Anyone undertaking works in a confined space should be appropriately trained and wear suitable RPE and PPE, as per confined space regulations.</p>	Severe	Low Likelihood	Moderate Risk	7
		R2: Maintenance workers	High Risk		Severe	Low Likelihood	Moderate Risk	8
		R3: Final end users	High Risk	<p>Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation as specified CIRIA Report C665 (2007) 'Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments.'</p>	Severe	Low Likelihood	Moderate Risk	9
	P6: Surface water run-off and/or direct percolation from surface	R6: Surface water (River Mersey)	High Risk	<p>Elevated levels of contaminants have been identified in leachate samples above the chosen screening criteria. Following construction the site is expected to be generally covered in relatively impermeable hardstanding minimising infiltration and the contact of contaminated soils with surface run-off.</p>	Medium	Likely	Moderate Risk	10

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Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
	P5: Leaching of contaminants	R5: Principal Aquifer/ Secondary Aquifer	Moderate /Low Risk	<p>The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase. Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles.</p> <p>Following construction the site is expected to be generally covered in relatively impermeable hardstanding minimising the contact of contaminated soils with surface run-off.</p> <p>The site will be covered with relatively impermeable hard standing which will minimise infiltration and leaching of contaminants from the soils.</p>	Medium	Low Likelihood	Moderate/Low Risk	11
	P8: Direct contact with in-ground structures and services.	R8: Proposed services and structures	Moderate /Low Risk	<p>Potentially harmful chemicals and elements have been encountered in both total soils testing and leachate samples taken from the site.</p> <p>Advice should be sought from the local water supply companies to assist in the specification of drinking water supply pipes before emplacement.</p>	Mild	Low Likelihood	Low Risk	12
	P9: Plant uptake	R7: Proposed planting	Moderate /Low Risk	<p>Whilst landscaping and planting is not currently expected to be part of the proposed development, potentially phytotoxic chemicals have been encountered onsite.</p> <p>If planting is used onsite a geo-membrane should be used and covered within at least 600mm of clean imported topsoil</p>	Minor	Unlikely	Very Low Risk	13
	P8: Migration and accumulation of gases	R8: Proposed services and structures	Low Risk	<p>Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation.</p> <p>Any works undertaken in a confined space should be undertaken in accordance with the current confined space regulations and appropriate PPE and RPE worn</p>	Severe	Unlikely	Moderate/Low Risk	14

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Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
S2: Potentially contaminated groundwater	P7: Vertical and lateral migration of groundwater	R6: Principal Aquifer/ Secondary Aquifer	Moderate Risk	<p>Elevated levels of contaminants are present within groundwater samples taken from wells with their response zones situated in natural strata. These are not expected to pose a significant risk to controlled waters receptors for the following reasons:</p> <ul style="list-style-type: none"> - Metal concentrations only marginally exceed screening values and as such are not deemed to pose a significant risk to their receptors and are expected to be generally reflective of natural background levels. 	Medium	Low Risk	Moderate/Low Risk	15
	P7: Vertical and lateral migration of groundwater	R6: Surface waters	Moderate /Low Risk	<p>-The elevated levels of Aliphatic TPHs and chloroform encountered in BH109 are considered to be isolated and not widespread across the site, furthermore these determinants were not matched by similarly high levels in soils testing. It is therefore considered that the source of impact is from current or historical off site land uses.</p>	Medium	Low Risk	Moderate/Low Risk	16

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Table 6.4. Residual pollutant linkages.

Source	Contaminants of Potential Concern	Transport Pathway	Receptor	Contaminant Linkage ID	Remedial Action
S1: Potentially contaminated Made Ground and shallow natural soils	PAHs, SVOCs, and VOCs	P1: Direct contact with soil (ingestion and dermal)	R3: Final End users		It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage.
	Ground Gas	P4: Inhalation of ground gas	R1: Construction workers	7	Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits. Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Anyone undertaking works in a confined space should be appropriately trained and wear suitable RPE and PPE, as per current confined space regulations.
			R2: Maintenance workers	8	
			R3: Final end users	9	The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation.
<ul style="list-style-type: none"> - Arsenic - Chromium III - Chromium VI - Chromium - Lead - Nickel - Vanadium - Cyanide - TPHs - PAHs - SVOCs 	P6: Surface water run-off and/or direct percolation from surface	R5: Surface water (River Mersey)	10	<p>The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase.</p> <p>Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles.</p>	

Engineering Assessment of Ground Conditions

7 Engineering Assessment of Ground Conditions

7.1 Proposed Development

Stockport bus station is proposed to be re-developed by TfGM. The proposed scheme includes the demolition of the existing bus station, building of a new Interchange, realignment of the current road layout, expansion of Mersey Square and the construction of a bridge across the River Mersey.

7.2 Seasonal Shrinkage

The potential for shrinkage and swelling of the potentially 'shrinkable' soils underlying the site has been considered based on NHBC Standards Chapter 4 (2007) ^(Ref. 27).

Due to the nature of the underlying soils only one Plasticity Index was determined. The modified Plasticity Index for the Glacial Clay deposits was <20%, these indicate that this material is likely to have a low potential for volume change.

7.3 Groundwater

Groundwater monitoring instruments have been installed within the various geological units encountered beneath the site. It should be noted that possible fluctuations in groundwater levels seasonally or due to climatic effects have not been determined within the limited monitoring period.

Groundwater levels are included in Geotechnics' factual report ^(Ref. 07) and are presented on the geological sections, Drawing 60340298-ACM-00-GEO-DR-0002. A number of the installations only recorded a small quantity of water at the base of the installation or were not accessible at the time of the monitoring visit. The anticipated low permeability of the Glacial Clay deposits is such that a longer monitoring period is likely to be required to assess equilibrium groundwater levels within the clays.

Groundwater within the more permeable strata, i.e. Made Ground Granular, Glacial Sands and Gravels and Sherwood Sandstone, would expect a quicker response and equalisation of water pressures would be anticipated.

7.4 Drainage – Soakaway Drainage

The ground conditions on the site appear to be suitable for soakaway drainage, i.e. Glacial sands and gravels overlying Sherwood Sandstone. Once the site levels and location of any soakaways have been determined this should be confirmed in accordance with BRE Digest 365, Soakaway Design 2007. The sensitivity of the underlying Principal Aquifer and final end use of the site should be taken into consideration when designing the soakaway to ensure ground and surface waters are not impacted. Approval from the Environment Agency (EA) is likely to be required for the use of soakaways, and, where necessary, the EA will issue permits or notices in order to control the risk to groundwater from contaminated discharges.

7.5 Shallow Foundations

7.5.1 General

The Interchange is proposed to be a lightly loaded structure, i.e. station canopy with isolated single storey walls for offices/retail outlets, and may be supported by a raft foundation, subject to detailed design. Preliminary details of structural loading have been provided with maximum loading around 60 to 66kPa anticipated below the canopy

external support columns. The majority of the concourse area will have contact stresses of 15kPa or lower. The foundation geometries and structural tolerance to differential settlement will be confirmed at detailed design.

It is anticipated that the underlying medium dense Glacial Sands and Gravels will provide adequate bearing stratum for lightly loaded spread foundations, subject to detailed design.

Foundations should be located within natural ground below any fill and below the depth of effect of variations due to vegetation, seasonal and climatic change.

Due to the localised nature of the Glacial Clay deposits encountered during the ground investigation, it is recommended that if this fine grained material is encountered it should be removed and replaced with suitably compacted granular fill. For the Glacial Sand and Gravel deposits using minimum shear strength in terms of effective stress, $c'0$, $\phi' 34^\circ$, presumed bearing values (net) of the order 300kPa may be adopted in preliminary design. The bearing capacity calculations are undertaken presuming a 2m by 2m foundation at 1.0m depth, with groundwater at 1.0m bgl. Additional consideration of bearing capacity and settlement will be required at detailed design stage when details of structural tolerance to movement, foundation layout and geometry are available.

7.6 Piled Foundations

7.6.1 Types of Pile

Piled foundations may be considered for heavy structures and/or to minimise size and number of discrete spread foundations given the limited working area as the bus station may still be working during the construction period. Piles may derive capacity from a combination of skin friction and end bearing in the superficial soils and in rock. Pile diameters and lengths will be dictated by design loads. Non displacement, bored cast in situ concrete piles or small displacement driven steel systems are likely to provide optimum performance.

7.6.2 Preliminary Pile Design

The SPT N values for the superficial soils and underlying bedrock are presented on Figure 1. The variation in the Glacial deposits level across the site is shown on the geological cross sections presented on Drawing 60340298-ACM-00-GEO-DR-0002.

A detailed pile design is outside the scope of this report. The design procedure for piles varies considerably, depending on the proposed type of pile. However, for illustrative purposes only, the safe geotechnical axial capacity of a single 600mm diameter bored cast-in-situ concrete pile, 5m long pile and toed into the weathered Sherwood Sandstone. The ground model used was BH108 located on the south side of the proposed River Mersey crossing. The model assumed a 1.0m pile cap, Made Ground Granular to 5.0m bgl, with weathered Sherwood Sandstone to 6.8m bgl with Sherwood Sandstone below. Groundwater is assumed at 5.5m bgl. Based on calculations using Eurocode partial factors the modelled pile is estimated to have a load carrying capacity of 480kN. This value will be reviewed during the detailed design stage depending upon the location of any proposed structures. If an increase in load carrying capacity is required, the piles should be extended and toed into the Sherwood Sandstone. Consideration of pile capacity will be required at detailed design stage when details of structural tolerance to movement, foundation layout and geometry are available.

It should be noted that no reduction in load capacity due to pile group effects has been taken into account in the above value.

7.7 Subgrade Conditions for Road Pavements

The pavement subgrade will predominantly be Made Ground Granular deposits, with localised areas of Made Ground Cohesive material. Natural subgrade soils, if present, will generally be granular sand deposits with localised areas of low plasticity cohesive materials. Pavement design requires prediction of long term stiffness of the subgrade soils under road loading and under equilibrium groundwater condition. In order to avoid subgrade damage design will need to be based on the lower of the undrained in situ condition and longer term equilibrium values.

If the localised cohesive materials are removed and replaced with compacted granular fill, the Made Ground Granular and Glacial Sands and Gravels, expected to be present across the majority of the site, would allow for a preliminary design CBR value of 5%. This value assumes that during construction the formation level will be carefully compacted and any soft spots, i.e. localised cohesive material only, dug out and replaced by suitable compacted granular material. Made Ground present at formation level should be excavated, graded and recompacted to form a suitable foundation material.

7.8 Excavations & Earthworks

All temporary excavations should be battered back to a safe angle as determined on site, or provided with close/continuous support.

Considering the limited and variable groundwater information obtained from installations within the exploratory holes and the presence of groundwater within the Made Ground deposits; it is recommended that provision is made for pumping from sumps to control ingress of groundwater into excavations in the event that water bearing granular bodies are encountered.

The current design does not have any significant earthworks. Significant arisings from drainage excavations may occur during construction; these are likely to require off-site disposal. Re-use of material on site will require a Materials Management Plan if the material to be re-used exceeds 1000 tonnes. Excavation should be possible using conventional site plant.

7.9 Slope stability

Permanent slopes of significant height have not been identified during preliminary design.

Side slopes of 1v:2h within the Glacial Sands and Gravels are likely to provide an adequate factor of safety where slopes are not saturated. It is recommended that slope stability analyses are undertaken at detailed design stage to establish maximum permissible slope angles.

7.10 Utilities

A strategy to deal with the existing and proposed underground and overhead utilities across the site in relation to the proposed development is being progressed by others.

A United Utilities' sewer is to underlie the proposed Stockport Interchange building footprint. The sewer was encountered in BH107 at 7.5m bgl, with Sherwood Sandstone bedrock encountered at 4.0m bgl. The location and

level of this sewer, apart from at BH107, is unknown. A condition survey and position/level survey should also be undertaken to confirm the sewer's condition, depth and location.

In BH107 the sewer was encountered over 3m below the bedrock surface. The Interchange is proposed to be a lightly loaded structure, i.e. station canopy with isolated single storey walls for offices/retail outlets, and may be supported by a raft foundation on the Glacial Sands and Gravels above the sewer, subject to detailed design.

Approval from United Utilities will be required to confirm the proposed building does not affect their asset; United Utilities may have further modelling/ confirmation requirements in order to allow construction over their asset.

7.11 Geotechnical Risk Register

Table 7.1 summarises the key geotechnical hazards and risk.

Table 7.1. Geotechnical Risk Register.

HAZARD RISK	CAUSE	BEFORE CONTROL			CONSEQUENCE	AFFECTED	MITIGATION MEASURES
		P	I	R			
Buried utilities	Disruption	4	3	12	Unexpected utility exposed during excavations. Cutting modification/construction may lead to restricted access to utility provider.	Proposed works.	Confirm status of all utilities – undertake utilities search. Utility diversions / construction amendment. Consultation with United Utilities regarding sewer under proposed building footprint.
Settlement (buildings, bridge)	Soft ground, loose deposits present	4	4	16	Settlement of structures. Possible differential settlement.	Proposed works.	Allowance for risk item in construction and design life /maintenance costs. Adequate design. Piled foundation design.
Foundation failure (buildings, bridge)	Soft ground, loose deposits present	4	4	16	Failure of structure foundation.	Proposed works.	Allowance for risk item in construction and design life /maintenance costs. Conservative parameters used in analyses. Adequate design. Piled foundation design.
Concrete attack	High soluble sulphate	1	5	5	Reduction in concrete strength / structural damage.	Retaining wall / foundation materials.	Ground investigation undertaken and chemical classification undertaken to BRE SD1. Use appropriate concrete class required.

Material reuse	Limited cut and fill proposed	3	3	9	Disposal offsite.	Excavations.	Cut and fill design to minimise excavation. Chemical analysis for materials to be disposed of.
Groundwater contamination	Migration of contaminated water	3	3	9	Contamination of groundwater. Prosecution as a result of pollution event.	Proposed works and drainage.	High standard of construction practice on site. Adequate design.
Pavement Failure	Failure of pavement surface	2	4	8	Pavement requires replacement/ regular maintenance. Bus station movements affected.	Proposed works.	Conservative parameters used in analyses. Adequate design.

Conclusions and Recommendations

Capabilities on project:
Environment

8 Conclusions and Recommendations

	Conclusions	Recommendations
Infrastructure	<p>Potential contaminants which can impact water supply pipes have been identified in recovered samples.</p>	<ul style="list-style-type: none"> Once the location of water supply pipes has been confirmed, it is recommended that the potential risk and any necessary mitigation measures should be determined in accordance with the water supply company's risk assessment guidelines. Agreement with the local water supply company should be sought prior to placement of the pipes.
Ground Gas	<ul style="list-style-type: none"> Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits. Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2. 	<ul style="list-style-type: none"> Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Furthermore any confined space working should be undertaken in accordance with the confined space regulations. <p>Gas protection measures appropriate to the proposed development and Characteristic Situation should be implemented within the design as specified in CIRIA Report C665 (2007) 'Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments'.</p>
Human Health	<ul style="list-style-type: none"> It is considered that future site users will generally not be exposed to levels of contaminants considered to pose a risk to human health. Construction and maintenance workers could encounter unidentified isolated areas of potentially impacted ground during the proposed development works. 	<ul style="list-style-type: none"> It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage. Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to contaminants through appropriate health and safety risk assessment processes, which are likely to require the adoption of appropriate health and safety measures such as adequate PPE and normal safe practices for on-site workers. Material encountered that is considered to be potentially contaminated through visual or olfactory evidence, or different to that assessed in the ground investigation will require appropriate assessment to be undertaken to determine if remedial works are required. It is recommended that during construction appropriate control measures are implemented in order to reduce the risk of off-site migration of

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	Conclusions	Recommendations
		contaminants, in particular dust and surface water run off.
Surface Waters	<ul style="list-style-type: none"> - Elevated concentrations above the chosen Screening Values have been detected in both leachate testing and groundwater samples taken during the ground investigation. 	<ul style="list-style-type: none"> - The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase. - Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles. - Any water removed during excavation works should be tested and disposed of appropriately.
Suitability for Reuse	<ul style="list-style-type: none"> - It is understood that ground levels will remain generally unchanged and cut and fill across this site will be minimal. - An initial assessment of soil results to date suggests that material on site is unlikely to be classified as hazardous waste. 	<p>Materials encountered during the ground investigation may be reused on site providing that it is excavated and placed in a controlled manner as to not create any contaminant linkages.</p> <ul style="list-style-type: none"> - Material encountered during construction works that is considered to be potentially contaminated through visual or olfactory evidence, or different to that assessed in the ground investigation will require chemical testing to confirm suitability for reuse.
Unforeseen Contamination	<ul style="list-style-type: none"> - Due to the historical use of the site and heterogeneous nature of the Made Ground there is the potential for significant hydrocarbon contamination to be present on the site. 	<p>A watching brief should be maintained on site and if identified suitable sampling and risk assessment will be required.</p>
Waste Issues, Disposal of Material (Duty of Care, sustainability, waste acceptance criteria)	<ul style="list-style-type: none"> - Made Ground has been identified at the site. Excavated Made Ground may be considered to be a Controlled Waste by the Environment Agency. 	<ul style="list-style-type: none"> - Any cut and fill works required at the site are likely to be considered to fall under the Environmental Permitting Regulations 2010 by the Environment Agency and may require an Environmental Permit. However, it may be possible to apply for a waste exemption under the Environmental Permitting Regulations. - Alternatively, it may be possible to re-use material on site under the CL:AIRE Code of Practice 'The Definition of Waste: Development Industry Code of Practice (CL:AIRE 2011)', if agreed with the Environment Agency. - Material encountered during construction works that is considered to be potentially contaminated through visual or olfactory evidence will require

Capabilities on project:
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	Conclusions	Recommendations
		<p>chemical testing to confirm the waste classification.</p> <ul style="list-style-type: none"> - If excavated, hazardous material should either be treated on site for re-use or should be removed from site and taken to a suitable licensed receiving facility. All waste classifications should be confirmed by the receiving facility.
Foundations & Floor Slabs	<ul style="list-style-type: none"> - Both shallow and piled foundation solutions may be considered for the proposed structures on site. Foundation selection will depend on design loads, foundation geometry and structural tolerance to total and differential settlement. - Presumed bearing values of the order 300kPa are suggested for shallow foundations bearing with the natural glacial sand and gravels soils below any made ground and below the depth of effect of variations due to vegetation, seasonal and climatic changes. - Piled foundations may be considered for heavy structures and/or to minimise size and number of discrete spread foundations. Piles may derive capacity from a combination of skin friction and end bearing in the superficial soils. Pile diameters and lengths will be dictated by design loads and third party requirements. Non displacement, bored cast in situ concrete piles or small displacement driven steel systems are likely to provide optimum performance. - The results indicate that the Glacial Clay deposits typically have a low potential for volume change. 	<ul style="list-style-type: none"> - If piling is considered, advice should be obtained from a specialist piling contractor. - If any soft, loose or deleterious deposits are encountered at formation level, these should be removed and backfilled with suitable engineered fill or mass concrete. - The use of ground bearing floor slabs will require the removal of existing topsoil, Made Ground, and soft clay deposits and its replacement to proposed formation levels with suitably engineered selected granular fills placed to an end product specification.
Excavations & Earthworks	<ul style="list-style-type: none"> - Significant earthworks are not proposed. 	<ul style="list-style-type: none"> - All excavations should be battered back to a safe angle as determined on site or be provided with close/continuous support. - If earthworks are proposed it is recommended that slope stability analyses are undertaken at detailed design stage to establish maximum permissible slope angles.

Capabilities on project:
Environment

	Conclusions	Recommendations
Infrastructure	<ul style="list-style-type: none"> - Levels of Sulphate and pH which can aggressively attack concrete have not been identified at the site. 	<ul style="list-style-type: none"> - A Design Sulphate Class of DS-1 and ACEC Classification of AC-1 are recommended for concrete structural elements in contact with the Made Ground and Glacial deposits.
United Utilities Sewer	<ul style="list-style-type: none"> - A United Utilities' sewer is to underlie the proposed Stockport Interchange building footprint. The sewer was encountered in BH107 at 7.5m bgl, with Sherwood Sandstone bedrock encountered at 4.0m bgl. - Approval from United Utilities will be required to confirm the proposed building does not affect their asset. 	<ul style="list-style-type: none"> - The sewer is located over 3m below the bedrock surface in BH107. A condition survey and position/level survey should also be undertaken of the sewer to confirm its depth and location. - Lightly loaded structures may be supported above the sewer, subject to detailed design. Approval from United Utilities will be required.

Capabilities on project:
Environment

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Capabilities on project:
Environment

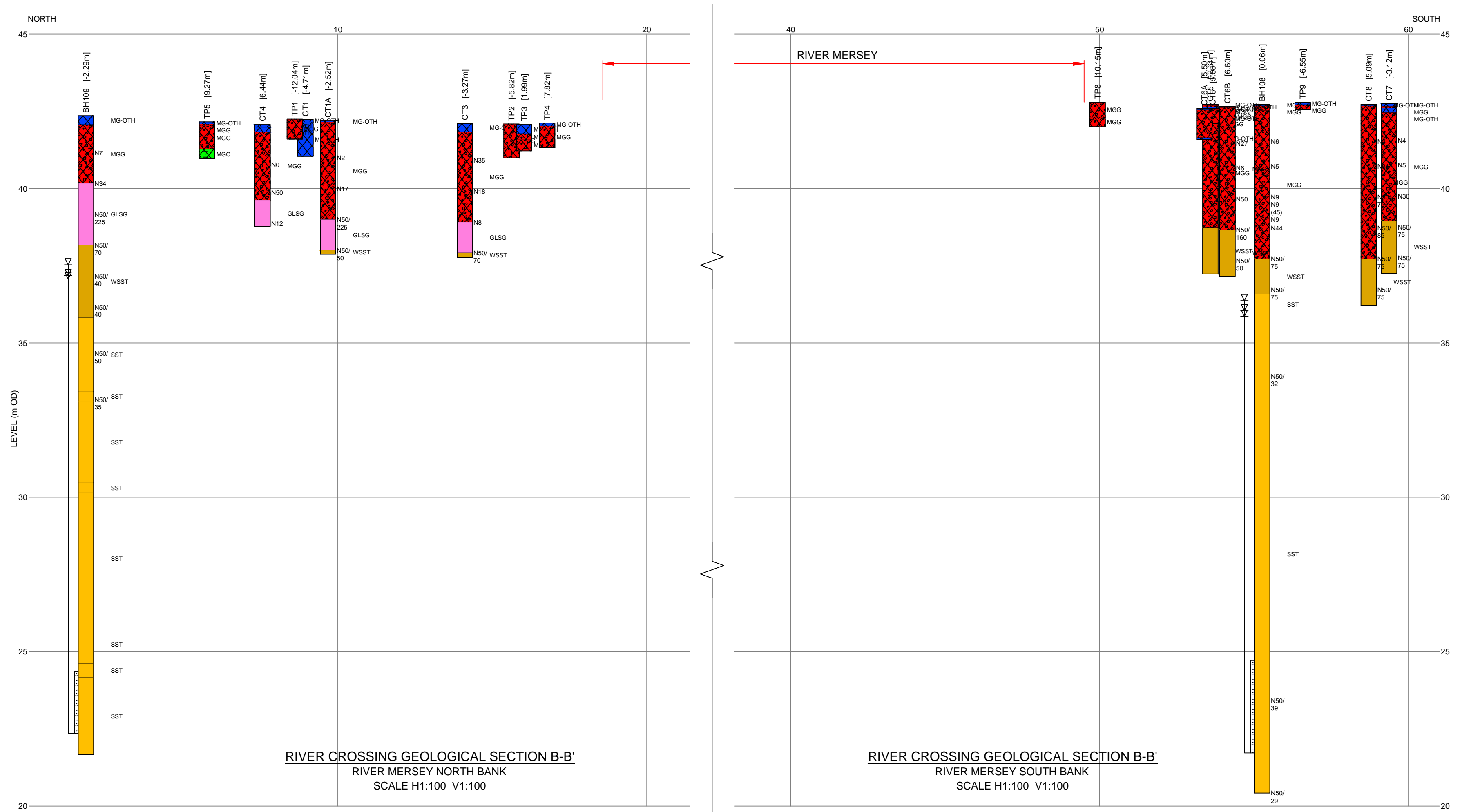
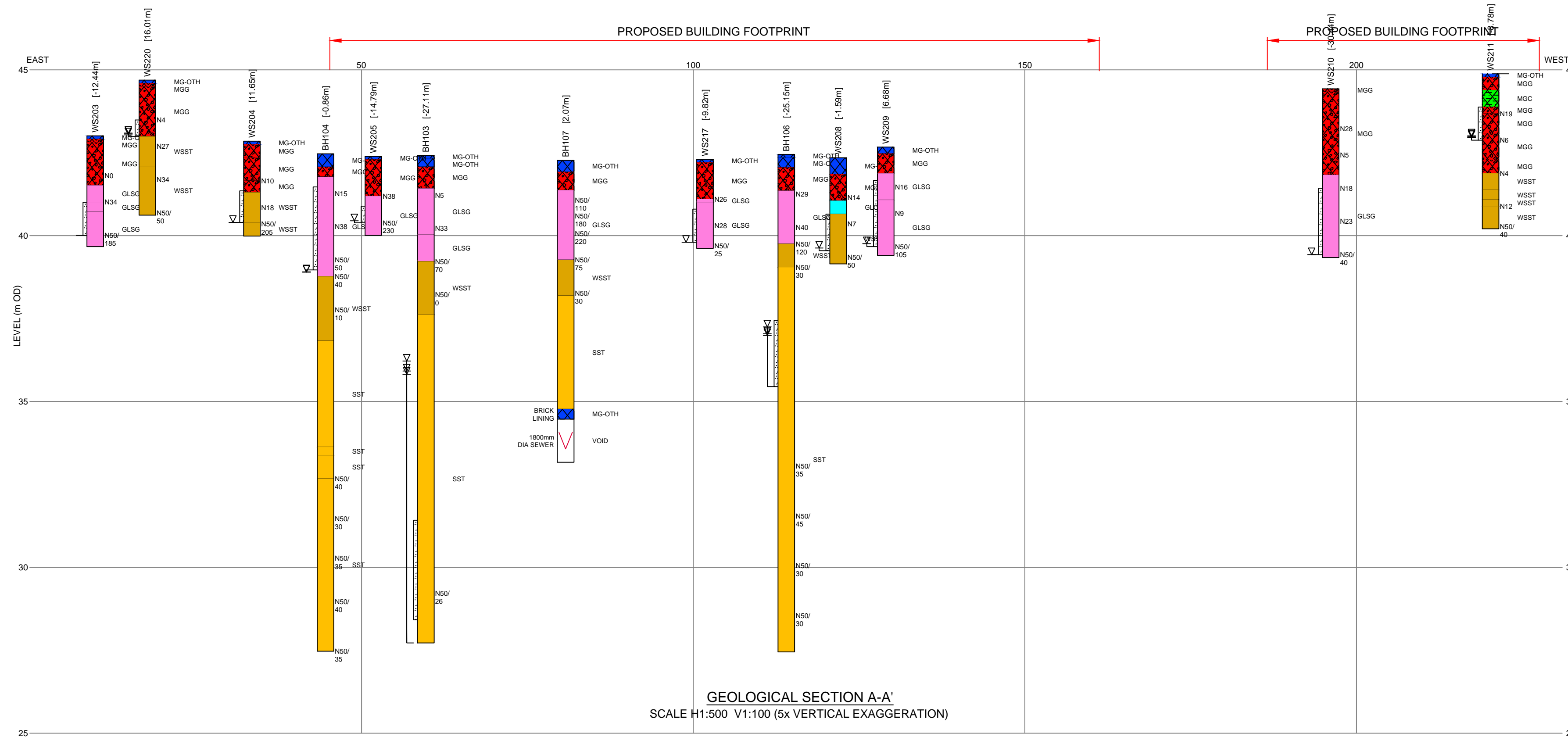
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Capabilities on project:
Environment

Figures

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Drawings



- NOTES**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF OVERSEEING ORGANISATION.
 - ALL DIMENSIONS TO BE CHECKED BEFORE COMMENCEMENT OF WORK ON SITE.
 - ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
 - GROUND INVESTIGATION DATA TAKEN FROM DRAFT FACTUAL REPORT PREPARED BY GEOTECHNICS LTD ON STOCKPORT BUS STATION, REF PN153428, DATED FEBRUARY 2016.

ISSUE/REVISION

NO	DATE	DESCRIPTION
P01	MAR 2016	FIRST ISSUE
I/R	DATE	DESCRIPTION

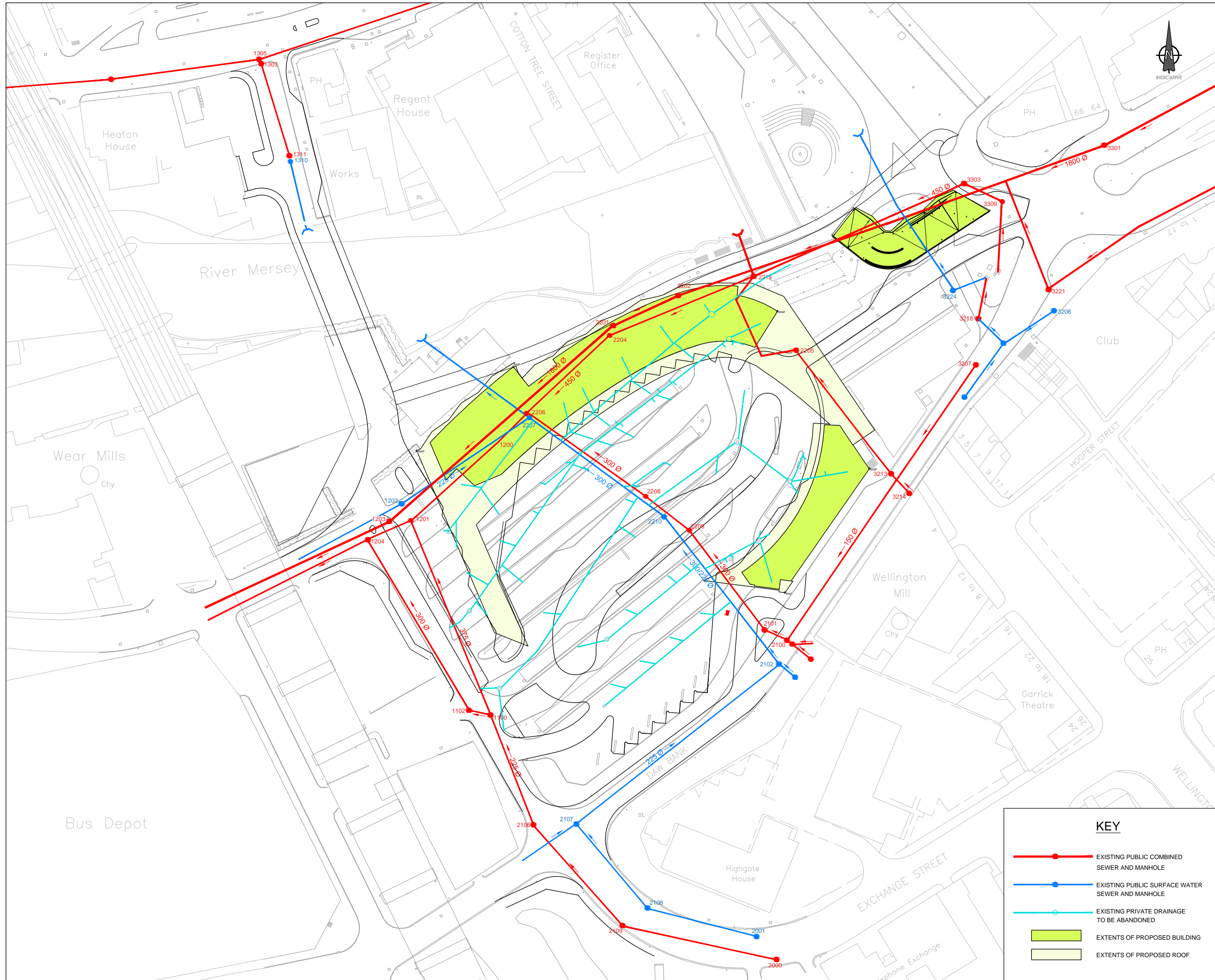
PROJECT NUMBER
60340298

SHEET TITLE
GROUND INVESTIGATION REPORT
GEOLOGICAL SECTIONS A - A'
AND B - B'

SHEET NUMBER
60340298-ACM-00-GEO-DR-0002 P01

Capabilities on project:
Environment

Appendix A- Proposed Site Layout



KEY

- EXISTING PUBLIC COMBINED SEWER AND MAN-HOLE
- EXISTING PUBLIC SURFACE WATER SEWER AND MAN-HOLE
- EXISTING PRIVATE DRAINAGE TO BE ABANDONED
- EXTENTS OF PROPOSED BUILDING
- EXTENTS OF PROPOSED ROOF



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 - ALL DIMENSIONS TO BE CHECKED BEFORE COMMENCEMENT OF WORK ON SITE.
 - ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
 - THE DETAILED DESIGN IS SUBJECT TO APPROVAL OF STOCKPORT METROPOLITAN BOROUGH COUNCIL.
 - DRAWING BASED ON TOPOGRAPHICAL SURVEY PAS128 25915.T SITE SURVEY PROVIDED BY SUBSCAN.

ISSUE/REVISION

I/R	DATE	DESCRIPTION

PROJECT NUMBER
60340298

SHEET TITLE
STAGE 3 DRAINAGE STRATEGY
APPENDIX D2
EXISTING DRAINAGE

SHEET NUMBER
60340298-ACM-XX-DR-0901

Capabilities on project:
Environment

Appendix B – Legislative Framework for Land Contamination Risk Assessment

Guidance on AECOM's Approach to Contaminated Land Risk Assessment

Legislative Framework

The Contaminated Land Regime in Part IIA of the Environment Protection Act 1990 was introduced to specifically address the historical legacy of land contamination. Part IIA of the Environmental Protection Act 1990 (Amended April 2012) has introduced the following statutory definition for 'Contaminated Land':

'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 controlled waters is being caused, or there is a significant possibility of such pollution being caused.*

The Process of Risk Assessment

The assessment of contaminated land can be seen as a two phase risk based process, comprising:

- (1) A qualitative assessment of the likelihood of plausible contaminant linkages, i.e. there must not only be a source of contamination, but a pathway and a receptor; and
- (2) A quantitative element which will seek to determine the degree of harm and the significance of such harm on a receptor.

A 'contaminant' is a substance which is in, on or under the land and which has the potential to cause significant harm to a receptor or to cause significant pollution of controlled waters.

A 'pathway' is a route by which a receptor is or might be affected by a contaminant.

A 'receptor' is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property or controlled waters.

The term 'contaminant linkage' indicates that all three elements (i.e. a contaminant, a pathway and a receptor) have been identified. The term 'significant contaminant linkage' means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as Contaminated Land. The term 'significant contaminant' means the contaminant which forms part of a significant contaminant linkage.

Significant Harm to Human Health

The following health effects constitute significant harm: death, life threatening diseases (cancers), other diseases likely to have a serious impact on health, serious injury, birth defects and impairment of reproductive functions.

Significant Possibility of Significant Harm to Human Health

In deciding whether or not land is Contaminated Land on the grounds of significant possibility of significant harm to human health, the local authority use the following categorisations:

Category 1: Human Health

Land should be deemed to be a Category 1: Human Health case where:

- (a) the authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or
- (b) the authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom, or elsewhere;

- (c) the authority considers that significant harm may already have been caused by contaminants in, on or under land, and that there is an unacceptable risk that it may continue or occur again if no action is taken.

Category 2: Human Health

Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure have caused harm before, but nonetheless the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis.

Category 3: Human Health

Land should be placed into Category 3 if the authority concludes that the strong case of Category 2 does not exist. Category 3 may include land where risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose.

Category 4: Human Health

The local authority should consider that the following types of land should be placed into Category 4: Human Health:

- (a) Land where no relevant contaminant linkage has been established.
- (b) Land where there are only normal levels of contaminants in the soil.
- (c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed generic assessment criteria.
- (d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

“Normal” Presence of Contaminants

“Normal” levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is particular reason to consider otherwise. “Normal” levels of contaminants in soils may result from:

- (a) The natural presence of contaminants (e.g. caused by underlying geology) at levels that might reasonably be considered typical in an area and have not been shown to pose an unacceptable risk.
- (b) The presence of contaminants caused by low level diffuse pollution, and common human activity. For example, this would include diffuse pollution from historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts and the spreading of domestic ash in gardens that might reasonably be considered typical.

Significant Pollution of Controlled Waters

Pollution of controlled water means the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter. The term ‘controlled water’ is as defined in Part 3 of the Water Resources Act 1991, except that ground waters does not include waters contained in underground strata but above the saturation zone (i.e. perched water).

The following criteria are used to establish whether significant pollution of controlled waters has occurred:

- (a) Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009.
- (b) Inputs resulting in the deterioration of the quality of water abstracted, or intended to be used in the future.
 - (c) A breach of a statutory surface water Environmental Quality Standard, either directly or via a groundwater pathway.
- (d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants.

The following categories are adopted in relation to determining the significant possibility of significant pollution of controlled waters.

Category 1: Water

This covers land where the authority considers that there is a strong and compelling case for considering that a significant possibility of significant pollution of controlled waters exists. In particular, this would include cases where there is robust science-based evidence for considering that it is likely that high impact pollution would occur if nothing were done to stop it.

Category 2: Water

This covers land where:

- (a) The authority considers the strength of evidence to put the land into Category 1 does not exist; but
- (b) Nonetheless, on the basis of the available scientific evidence and expert opinion, the authority considers that the risks posed by the land are of sufficient concern that the land should be considered to pose a significant possibility of significant pollution of controlled waters on a precautionary basis, with all that this might involve (e.g. likely remediation requirements, and the benefits, costs and other impacts of regulatory intervention). Among other things, this category might include land where there is a relatively low likelihood that the most serious types of significant pollution might occur.

Category 3: Water

This covers land where the authority concludes that the risks are such that (whilst the authority and others might prefer they did not exist) the tests set out in Categories 1 and 2 are not met, and therefore regulatory intervention under Part 2A is not warranted. This category should include land where the authority considers that it is very unlikely that serious pollution would occur; or where there is a low likelihood that less serious types of significant pollution might occur.

Category 4: Water

This covers land where the authority concludes that there is no risk, or that the level of risk posed is low. In particular, the authority should consider that this is the case where:

- (a) No contaminant linkage has been established in which controlled waters are the receptor in the linkage; or
- (b) the possibility only relates to type of pollution that should not be considered to be significant pollution; or
- (c) The possibility of water pollution similar to that which might be caused by “background” contamination.

Terminology

The term ‘Contaminated Land’ is used to mean land which meets the Part IIA definition. Other terms, such as ‘land affected by contamination’ or ‘land contamination’ are used to describe much broader categories of land where contaminants are present but usually not at sufficient level of risk to be Contaminated Land.

Planning Policy and Land Contamination

The National Planning Policy Framework has replaced Planning Policy Statement PPS23: Planning and Pollution Control.

The key parts of the policy specifically relating to soils, geology and contamination are summarised below.

Taken from the section **11 Conserving and enhancing the natural environment**

109. The planning system should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

111. Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. Local planning authorities may continue to consider the case for setting a locally appropriate target for the use of brownfield land.

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. Planning policies and decisions should also ensure that:

- *the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information*, prepared by a competent person, is presented.*

*Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 (2011) Code of Practice for the Investigation of Potentially Contaminated Sites). The minimum information that should be provided by an applicant is the report of a desk study and site reconnaissance.

AECOM's Approach to Screening for Land Affected by Contamination

For a typical ground contamination assessment, principally for planning, AECOM has adopted the following approach to evaluate the results obtained in the investigation.

Where no current UK guideline values are available, professional expertise within AECOM has been used to assess the extent of contamination.

Human Health Risk Assessment

The potential chronic risks to human health have been assessed by comparing the recorded concentrations of contaminants against AECOM Generic Assessment Criteria (AGAC), as an initial screen.

AGAC Generic Screening Values – Modelling Assumptions

1. Calculated Risk Levels

AGACs are calculated for a minimal level of risk in line with SGVs with the current exception of arsenic, which follows alternative SGV guidance. Therefore concentrations found below AGACs are not normally considered any further. However when process based remediation is being considered it would be advantageous to reduce concentrations of index chemicals to a practical minimum. SGVs may sometimes be calculated at an acceptable level of risk which is higher than a minimal risk level. One example of this is the SGV for Arsenic: in order to keep the SGV on a par with standards for water, the oral human health criterion has been based on the UK Drinking Water Standard, which results in a higher SGV for arsenic than would otherwise be indicated.

2. Soil Guideline Values and soil type

SGVs have been reproduced using CLEA1.04 software using the assumptions in the corresponding TOX and SGV reports. However, SGVs have been calculated using a SOM of 6% which is not generally representative of contamination samples taken from development sites. AGACs for chemicals with SGVs have been recalculated with a SOM of 1%. The AGAC's are also calculated for a "sandy loam" rather than "sandy soil" as in the case of the withdrawn SGVs. AGACs are calculated for a sandy soil in order to ensure they are conservative as an initial screen. If AGAC's are exceeded it may be appropriate to recalculate a more site specific GAC based on different soil properties. As new SGVs are issued it is likely that AGACs will need to be revised in light of the revised TOX and SGV reports. AGAC's will also be reviewed as other authoritative peer-reviewed toxicological or chemical data becomes available.

3. Verification and Robustness

In order to have confidence in the screening values produced initially the CLEA 1.04 model was used to reproduce the newly published but limited number of SGVs. Further cross checking has been undertaken on the values generated by the CLEA 1.04 model by comparing the results against values produced by our in-house software program FM-CLaRAT. AECOM is a contributor to the LQM CIEH and EIC working groups who are seeking to publish authoritative peer reviewed screening values for contaminants which currently do not have SGV's. Consequently the invaluable knowledge about the limitations of the model and how it works gained as part of this process has been utilised fully in producing the AGAC. Details of sensitivity analyses undertaken in connection with land use scenarios are described below. It is noted that CLEA 1.05 was released in 2009 with primarily cosmetic changes and the addition of dioxins and dioxin-like PCBs, the release of which resulted in the existing published SGVs being withdrawn. CLEA 1.05 was almost immediately superseded by CLEA 1.06, the only change being the password. Consequently the AGACs produced using CLEA 1.04 (which do

not include values for dioxins and dioxin-like PCBs) are still considered valid as an initial screen.

4. Receptor characteristics

AGAC's are calculated for standard CLEA land use receptors as follows:

<i>Land Use</i>	<i>Standard Receptor</i>
Residential with homegrown produce	Female 0-6yrs
Residential without homegrown produce	Female 0-6yrs
Industrial/Commercial	Female 16-65yrs

5. Assumptions for buildings

Contamination is assumed to be at a depth of 65cm below ground level underneath buildings and at surface level external to buildings in line with assumptions for SGVs.

Default gas ingress rates and effective air permeability are also assumed for each building type.

Residential

A sensitivity study of CLEA1.04 residential building types has been carried out to determine the most appropriate setting for calculation of screening values. It transpires that the most sensitive residential building type by a significant margin is a bungalow. The building type used for SGVs is a small terraced house which is not too unusual for high density low cost housing on brownfield sites. The building type used for AGACs is small terraced house in order to avoid too high a degree of conservatism for most developments. It is considered that for this site the selected building type is appropriate.

Commercial and industrial

SGVs and AGAC's are appropriate for screening chemical concentrations for the purpose of obtaining Planning Consent, but are not appropriate for Part IIa determination. A sensitivity study of standard CLEA1.04 commercial and industrial buildings indicates that pre-1970s buildings are more sensitive to contamination than modern buildings. For Planning purposes however it is more appropriate to model risk in modern buildings and so AGACs are based on a post- 1970 office, which is generally slightly more sensitive than a post- 1970 warehouse.

6. Indoor vapour pathway correction factor

Calculation of petroleum hydrocarbon ingress to buildings utilises a "sub-surface soil to indoor air correction factor" of 10 in line with DEFRA guidance on BTEX SGVs. This correction arises from a discrepancy found between observed and predicted hydrocarbon concentrations using the Johnson-Ettinger model in the UK. It is found that indoor concentrations of hydrocarbons are typically at least an order of magnitude lower in practice compared with theory. As it is uncertain whether this discrepancy is due to a difference in the typical foundation design employed in the UK and USA, or results from chemical specific attenuation of contaminants through breakdown, this factor is not included for other species, e.g. elemental mercury and chlorinated hydrocarbons.

7. Soil vapour limit

Risk to human health from soil vapour calculated by CLEA1.04 rises linearly with increasing soil concentration despite the physical limits to concentration in air set by the maximum vapour pressure. A manual procedure has been used to calculate the allowable intake for non-vapour pathways at the limiting soil concentration. The AGAC is calculated to be the soil concentration resulting in the allowable intake for non-vapour pathways. Calculations have been cross-checked with FM-CLaRAT which corrects for soil vapour limit automatically.

8. Saturation limit

Plant uptake may be limited by the concentration of the chemical in the soil pore water. Calculation of GACs using the saturation limit would be a laborious task especially where vapour pressure also limits uptake. Given that plant uptake is only present in one of the current

AECOM scenarios and the reservations expressed by the EA as to whether saturation is always limiting, the current AGACs do not apply an upper limit to plant uptake based on saturation limit. This will be a further option to consider for a more detailed analysis if the initial screen is failed. FMCLaRAT checks have been performed without using the saturation limit in order to maintain consistency with CLEA1.04.

9. Free-phase hydrocarbon limit

SGVs for BTEX compounds have been limited by DEFRA to the limiting upper soil concentration for solubility or maximum vapour pressure, whichever is the lower. Although the reason given for capping SGVs is for protection of human health, no mechanism is elucidated for the increased risk from free-phase hydrocarbons. Heavy hydrocarbons are relatively insoluble and so general adoption of this rule would result in very low GAC values, despite the free-phase being immobile, e.g. solid or bound within the soil particles. Therefore AGAC values have with the exception of BTEX been calculated without this free-phase constraint. If the soil contains a free-phase, consideration should be given as to whether this is acceptable based on human health, ecological, hydrological and aesthetic criteria.

10. Nickel screening values

DEFRA guidance for nickel suggests that risk via inhalation and oral pathways is not additive. AGAC for nickel uses the lower of the inhalation and oral assessment criteria in accordance with the nickel SGV methodology.

11. Asbestos, VOCs, SVOCs and PCBs

The analytical detection limit for PCBs, VOCs and sVOCs has been adopted as an initial screen. The presence of asbestos fibres identified within any of the samples has been adopted as a screen for assessing asbestos.

12. Cyanide

The current CLEA methodology only assesses the chronic risks to human health. Cyanide may also pose an acute risk to human health. Where cyanide is present above the detection limit then the risk will be considered on a site specific basis.

Statistical Analysis of Data

Statistical assessment of soil data has been undertaken (where appropriate) in accordance with guidance provided by CL:AIRE/CIEH, Guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008. This assessment was undertaken using a proprietary software package developed by ESI.

Guidelines for the Assessment of Contamination in Groundwater

The assessment of contamination in groundwater is based on a site-specific approach to assessment and remediation, as outlined in the Environment Agency's (2006) guidance 'Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination'. The EA guidance is based on a risk assessment approach incorporating a contaminant-pathway-receptor analysis. The methodology adopts a tiered approach to determine risk-based remedial targets, involving structured decision-making, cost-benefit considerations and progressive data collection and analysis.

At each level a remedial target is derived, but this is likely to be less onerous at the next level as additional processes (such as dilution and attenuation, degradation) which affect contaminant concentrations along its pathway to the receptor are taken into account. With successive levels, the data requirements and the sophistication of the analysis increase, and the confidence in the predicted impact also increases. Consequently, the contaminant-pathway-receptor relationship is better defined and remedial requirements are likely to be less onerous, if the risk assessment results are favourable. The tiered approach allows low risk sites to be screened out and attention is focussed on those sites where the risks to water are greatest.

Ground Gas Risk Assessment

The assessment of risk from the presence of ground gas takes account of the nature of the identified gas/vapour, its concentration in air, and its borehole flow rate in litres per hour. The data is used to

produce a gas screening value which is then used to assess the need or otherwise for gas protection measures. In addition the raw data may be used to assess the short term risk of harm to human health or explosive risk to buildings or other built environment.

The assessment of ground gas contamination is based on the following good practice guidance documents and standards:

- British Standards Institution, 2007. BS8485:2007 Code of practice for characterisation and remediation from ground gas in affected developments. London: BSI.
- Building Regulations, 2010.). Approved Document C - Site preparation, resistance to contaminants and moisture, 2004 edition, incorporating 2010 amendments.
- Environment Agency, 2004. Guidance on the management of landfill gas, Landfill Technical Guidance Note (LFTGN) 03. Bristol: Environment Agency.;
- Building Research Establishment (1991). Construction of new buildings on gas-contaminated land, Report 212. Watford: BRE.;
- CIRIA (2007). Assessing risks posed by hazardous ground gases to buildings, Publication C665. London: CIRIA;
- CIRIA (2009). VOCs handbook: investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination, Publication C682. London: CIRIA.
- CIRIA (1995). Protecting development from methane: Methane and associated hazards to construction, Report R 149. London: CIRIA.
- Wilson, S., Card, G., and Haines, S., (2009). Ground gas handbook. London: Whittles Publishing.

Guidance for the selection of typical gas protection measures are provided in some of the above and the following documents:

- Ove Arup & Partners, 1996. Vols I&II, Passive Venting of Soil Gases beneath Buildings Research Report, Design Guide, Partners in Technology;
- Building Research Establishment (1991). Construction of new buildings on gas-contaminated land, Report 212. Watford: BRE.;

After CIRIA document 552: 'Contaminated Land Risk Assessment; A Guide to good practice'.

Table 1: Classification of Consequence

Classification	Definition
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined in the Environmental Protection Act, Part IIA. Short-term risk of pollution of sensitive water resource (note: Water Resources Act contains no scope for considering significance of pollution). Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000)
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act 1991 contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000)
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/services or the environment
Minor	Harm, although not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). Easily repairable effects of damage to buildings, structures and services.

Table 2: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 3: Comparison of Consequence against Probability

Probability	Consequence			
	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High risk	Moderate risk	Moderate Risk/low risk
Likely	High Risk	Moderate risk	Moderate/ low risk	Low risk
Low Likelihood	Moderate risk	Moderate risk/low risk	Low risk	Very low risk
Unlikely	Moderate/Low risk	Low risk	Very low risk	Very low risk

Table 4: Description of Classified Risks and Likely Actions Required

Risk Descriptor	Definition
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to the designated receptor is currently happening. The risk, if realised, is likely to result in substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required
High risk	Harm is likely to arise to a designated receptor from an identified hazard. The risk, if realised, is likely to result in substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely in the long term.
Moderate Risk	It is possible that harm could arise to a designated receptor for an identified hazard. However, if it is either unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk, and to determine the potential liability. Some remedial works may be required in the long term.
Low Risk	It is possible that harm could arise to a designated receptor for an identified hazard, but it is likely that this harm, if realised, would at worst be mild
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Appendix C – Ground Investigation Factual Report

Ground Investigation



www.geotechnics.co.uk



STOCKPORT BUS STATION

Factual Report

for
Transport for Greater Manchester

Engineer : AECOM

Project Number PN153428

March 2016

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Factual Report

STOCKPORT BUS STATION

for
Transport for Greater Manchester

Engineer :
AECOM

Project No:
PNI53428
March 2016

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STOCKPORT BUS STATION

Project No: PNI53428
March 2016

1.0 INTRODUCTION

A geotechnical and geo-environmental investigation was undertaken by Geotechnics Limited at the site of proposed redevelopment works at Stockport Bus Station. The investigation was carried out to the instructions of the Engineer, AECOM on behalf of the Client, Transport for Greater Manchester. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The investigation comprised cable percussive boreholes, rotary follow-on boreholes, dynamic sample boreholes, trial pits, dynamic probes and concrete core holes, in situ and laboratory testing and reporting. A Factual Report only was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 13 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 14 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" (Fourth Edition) published by the AGS (the AGS Format) are

presented separately on disk together with a copy of the report in electronic PDF format.

4.0 THE SITE

4.1 Location

The site is located in Stockport town centre, extending from Stockport Railway Station northwards to Heaton Lane and from the railway viaduct eastwards to Mersey Square. The approximate Ordnance Survey National Grid Reference for the centre of the site is SJ 892 902 and an extract from the relevant 1:50,000 Scale O.S. Map is included as Appendix 1.

4.2 Description

The site is irregular in shape with maximum dimensions of approximately 350m (north-west to south-east) and 250m (north-east to south-west). The River Mersey flows through the northernmost part of the site from east to west. Ground levels across the site generally fall towards the river, such that levels fall from around 68m AOD at the southern boundary (railway station/Station Road) to around 42m AOD on the banks of the River Mersey before rising again to around 45m AOD at the northern boundary (Heaton Road).

The majority of the site comprises Stockport Bus Station which remained operational at the time of the investigation fieldwork. Some warehouse and office buildings are present adjacent to the bus station. The A6 Wellington Road crosses the easternmost part of the site on a viaduct which trends roughly north-west to south-east. Beyond this viaduct lies the primarily hard landscaped public open space of Mersey Square. The River Mersey flows in culvert below Mersey Square.

To the south of the bus station the site includes the western section of Exchange Street and an area of landscaped ground and car park beyond. The River Mersey bounds the bus station to the north. Between the river and the northern site boundary

(Heaton Lane) the site includes an area of car park to the west of Astley Street.

It is understood that tunnels are present below part of the site. These are presumed to be former mill water race excavations through the rock extending from the site of existing and former mills to the River Mersey.

4.3 Site Geology

The 1:50,000 scale map of Stockport published by the British Geological Survey, Sheet 98 Drift edition dated 1962, shows the southernmost part of the site to be underlain by Glacial Till (shown on the map as Boulder Clay). Towards the River Mersey River Terrace Deposits are indicated (shown on the map as First Terrace) whilst beyond the river Fluvio-glacial Sheet Deposits are indicated (shown on the map as Fluvio-glacial Gravel).

The 1:50,000 Solid edition map (dated 1977) indicates that the site is underlain by rocks of the Chester Pebble Beds Formation, part of the Sherwood Sandstone Group of Triassic age. The conjectured trace of a north-north-west to south-south-east trending fault is shown approximately 100m to the west of the railway viaduct. The strata to the east of this fault are shown to be downthrown. The conjectured trace of a second fault is shown approximately 200m to the east of the site. This fault trends roughly parallel to the other fault and the strata to the east are again downthrown.

The British Geological Survey maps do not show the presence of Made Ground below the site. However, Made Ground may be present for which the British Geological Survey have no records or which are too shallow for incorporation into the maps. Given historical land uses of this urban site, a thickness of Made Ground would be anticipated across the site.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with the Client's requirements.

5.2 General

The procedures followed in this site investigation are based on BS 5930:1999 + A2:2010 – *Code of Practice for Site Investigations* and BS 10175:2011 *Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:1999+A2:2010 and BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. The Cable Percussive/Rotary Borehole, Dynamic Sample Borehole, Trial Pit, Dynamic Probe and Concrete Core Records are included in Appendices 2 to 8 and their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 13.

The Exploratory Hole locations were specified by the Engineer. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level.

At each exploratory hole location with the exception of the concrete cores an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT).

5.3 Boreholes

Twenty-one (21 No.), 150mm diameter boreholes (numbered BH101 to BH109, BH111, BH112, CT1, CT1A, CT3 to CT8, CT6A and CT6B) were sunk by Cable Percussion Tool techniques to depths varying between 0.50m (CT6) and 6.50m below ground level. The work was carried out between 30th November and 17th December 2015.

Representative disturbed (D and B) samples of the soils encountered were obtained at regular intervals. A driven open-tube thick-walled (U) sample was attempted but failed in borehole BH108. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, environmental soil samples (ES) were recovered at the depths indicated on the Borehole Records, presented in Appendix 2.

Boreholes BH101 to BH109 and BH112 were continued by rotary coring techniques to depths varying between 7.80m (BH107) and 22.30m (BH108) below ground level. The rotary

coring commenced through the base of the Cable Percussion Boreholes which had been left open and cased to facilitate coring, as instructed by the Engineer. This element of the work was carried out during the period between 1st and 17th December 2015.

The drilling equipment on this particular contract utilised water or polymer foam as the flushing medium. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes. Photographs of the individual core boxes are included in Appendix 3.

Groundwater observations are included on the Borehole Records where appropriate. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Borehole Records.

On completion, standpipes were installed in Boreholes BH101 to BH106, BH108, BH109 and BH112 (see Section 5.8). Borehole BH107 was terminated after encountering a brick sewer. The borehole casing was left in this borehole at the instruction of the asset holder and reinstated at the surface with a heavy duty flush cover. The other boreholes were backfilled with bentonite and the surface reinstated.

5.4 Trial Pits

Thirteen (13 No.) Trial Pits (numbered HP01, HP02, TP1 to TP5, TP6A, TP6B, TP7A, TP7B, TP8 and TP9) were excavated to depths varying between 0.24m (TP9) and 1.30m (TP7A) below ground level using hand tools. The work was carried out between 9th and 15th December 2015 and was supervised on site by a geotechnical engineer.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. Representative samples were taken, where appropriate, for laboratory examination and analysis and in addition, environmental soil samples (ES) were recovered at the depths indicated on the Trial Pit Records. Groundwater observations and trench

stability notes are included on the Trial Pit Records, presented in Appendix 4. Photographs of the pits are presented in Appendix 5.

5.5 Dynamic Probes

Ten (10 No.) Dynamic Probe Holes (numbered DPI to DPI10) were undertaken at the site to depths varying between 3.45m (DPI) and 4.98m (DPI10) below ground level using the super-heavy Dynamic Probe. The work was carried out on 16th and 17th December 2015.

The Probes were taken to the depths at which refusal was achieved for the equipment used. The equipment used conforms to the super heavy (DPSH-B) dynamic probing apparatus as defined in BS EN ISO 22476-2:2005+A1:2011 and effectively drives a 90° cone into the ground using a 63.5 kg automatic trip hammer falling over 750mm. The number of blows required to achieve increments of 100mm penetration is recorded and plotted graphically on the records, presented in Appendix 6.

5.6 Dynamic Sample Boreholes

Nineteen (19 No.) Dynamic Sample Boreholes (numbered WS201, WS203 to WS206, WS208 to WS212, WS214, WS217 to WS221, WS223, WS224 and WS218A) were undertaken at the site to depths varying between 0.30m (WS221) and 5.45m (WS214) below ground level. The work was carried out between 30th November and 16th December 2015.

The Dynamic Samples were taken using the super-heavy Dynamic Probe apparatus which drives lined steel tubes into the ground in 1m lengths. Samples are retrieved in the plastic liners. The hole is not cased and progress depends on the nature of the strata penetrated.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate.

On completion, standpipes were installed in each of the boreholes except WS218, WS219, WS221 and WS224 (see Section 5.8). The other boreholes were backfilled with arisings/bentonite.

5.7 Concrete Cores

Ten (10 No.) concrete cores (numbered CCI to CC6, CC8 to CCI0 and CC5A) were carried out using a hand held coring apparatus to depths varying between 0.14m (CCI) and 0.71m (CCI0) behind the face of wall. The cores were drilled horizontally. The cores were extracted from the core-barrel, photographed and logged.

The Concrete Core Records are presented in Appendix 8. Photographs of the concrete cores are presented in Appendix 9.

5.8 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Standpipe Slotted Pipe & Filter Zone (m)
BH101	5.00 to 7.00
BH102	8.00 to 10.00
BH103	11.00 to 14.00
BH104	1.00 to 3.50
BH105	9.50 to 12.00
BH106	5.00 to 7.00
BH108	18.00 to 21.00
BH109	18.00 to 20.00
BH112	12.80 to 14.80
WS201	3.50 to 4.00
WS203	2.00 to 3.00
WS204	1.50 to 2.45
WS205	1.50 to 2.00
WS206	1.00 to 2.00
WS208	1.70 to 2.80
WS209	1.00 to 3.00
WS210	3.00 to 5.00
WS211	1.00 to 2.00
WS212	2.50 to 3.50
WS214	0.50 to 1.00
WS217	1.50 to 2.50
WS218A	1.00 to 2.50
WS220	1.20 to 1.70
WS223	0.50 to 1.40

Monitoring of the gas and groundwater levels at the site commenced on 11th January 2016 with further visits on 25th January, 9th February, 22nd February and 8th March 2016. A sixth (final) monitoring visit is proposed for late March. The results of that monitoring will be issued as an Addendum.

On each of the water monitoring visits a record of the groundwater level in all the standpipes was obtained. On the 25th January visit where water was recorded, samples were obtained following purging of water in the standpipes.

In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a Gas Data LMSxi Gas Analyser:-

- Concentrations (% Vol) of CH₄, O₂, CO₂, along with (% LEL) CH₄ and (ppm) H₂S, CO
- Flow Rate
- Barometric Pressure

The results of the monitoring are presented in Appendix 10.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer. Unless otherwise stated, the tests were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Summary Sheets in Appendix 11. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

BS EN ISO 17892-1:2014

12 No. Water Content Determination

BS 1377:1990

Test No. **Test Description**

Part 2

4.3 & 5.3 11 No. Liquid and Plastic Limit Determination

9.2 & 9.3 11 No. Mechanical Analysis – Wet Sieving

9.4 1 No. Mechanical Analysis - Sedimentation

Part 4

3.3 1 No. Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)

ISRM Testing Methods

24 No. Point Load Determination

The following testing was carried out at the laboratories of Jones Environmental Laboratory Limited (UKAS Accredited Laboratory, No. 4225).

36 No. Organic Content Determination

BRE Special Digest I Suite

35 No. Suites comprising:-
Soluble Sulphate
Acid Soluble Sulphate
pH

The following testing was carried out at the laboratories of Celtest Limited (UKAS Accredited Laboratory, No. 0494).

ISRM Testing Methods

2 No. Point Load Determination

9 No. Unconfined Compressive
Strength Determination

The results of these tests are also presented in Appendix I I.

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Jones Environmental Laboratory Limited (UKAS Accredited Laboratory, No. 4225) for a number of determinands in order to check on potential site contamination. The determinands were specified by the Engineer. The specified determinands are detailed on the results sheets in Appendix I2 together with the test result as well as the test method, accreditation and detection limit.

Signed for and on behalf of Geotechnics Limited.

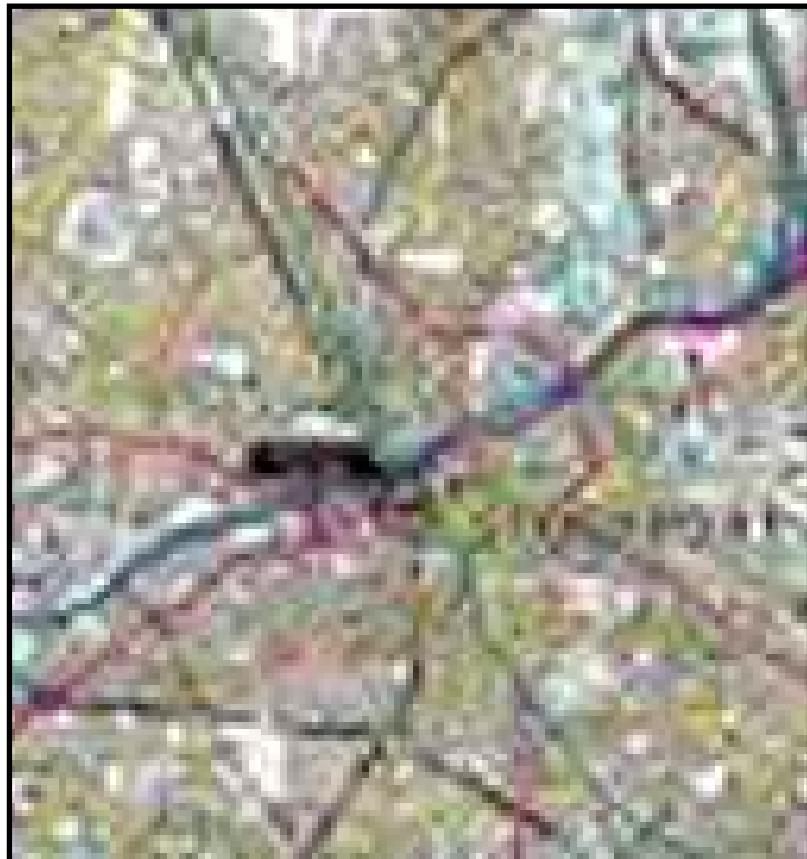
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APPENDIX I

Site Location Plan

SITE LOCATION PLAN



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STOCKPORT BUS STATION
for
Transport for Greater Manchester

GEOTECHNICS
CONSULTING AND INVESTIGATION SERVICES

APPENDIX 2

Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/-(mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal	
Filter	
Seal	

Strata Legend

Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued

Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials

Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION


Engineer AECOM

Borehole **BH101**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389243.3 E
390165.1 N

Ground Level 45.22 m OD


Sampling		Properties				Strata		Scale 1:50						
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
0.00	C					MADE GROUND: Grey concrete paving slab.	G.L.		45.22					
0.20- 0.40	D					MADE GROUND: Grey concrete.	0.10		45.12					
0.20- 0.40	ES						0.40		44.82					
0.50- 0.70	D													
0.50- 0.70	ES					MADE GROUND: Reddish brown sandy angular to subangular fine to coarse gravel of limestone. Low angular to subangular cobble content of limestone. (Sub base).	0.70		44.52					
1.00- 1.20	D						1.00		44.22					
1.00- 1.20	ES													
1.20- 1.65	B													
1.20- 1.65	D	(1.00)			S6	MADE GROUND: Light grey sandy angular to subangular fine to coarse gravel of limestone. Low angular to subangular cobble content of limestone. (Sub base).								
2.00- 2.20	D					Loose yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL including limestone, granite and quartzite. High rounded to subrounded cobble content.	1.60		43.62					
2.00- 2.20	ES													
2.20- 2.65	B					Below 1.20m, grading to very gravelly sand.								
2.20- 2.65	D	2.20 (1.50)		23	S5	Firm thinly laminated grey sandy CLAY, locally grading to silt. At 2.20m, soft.								
3.00- 3.12	B						3.00		42.22					
3.00- 3.12	D	3.00 (DRY)			S50/50	Weak dark red fine to medium grained SANDSTONE (recovered as gravelly sand).								
4.00- 4.06	#	4.00 (3.60)			C50/25		4.06		41.16					
Core Run	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques								
Core Dia						General	Detail							
4.06- 4.80		0		0		Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced	Below 6.80m, discontinuities are very closely to closely spaced.							
4.80- 6.30		30	0.07	0	(AZCL)									
4.80- 4.84	4.00	9	0.01		C50/25									
					(NI)									
					(33)									
6.30- 7.80		66	0.13	9	(NI)									
6.40- 6.55	4.00	44	0.01		(44)									
6.30- 6.34		C			C50/20									
					(AZCL)									
					(25)									
7.80- 9.30		84	0.26	48	(NI)	Below 8.03m, discontinuities are planar to undulating.	At 8.70m, subvertical discontinuity.							
7.80- 7.94		69	0.03		(AZCL)									
		C			(15)									
					(NI)									
					(15)									
					(NI)									
					(13)									
9.30-10.80		52	0.20	41	(NI)									
		45	0.05		(66)									
					(AZCL)									
Boring						Progress				Ground water				
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	JP	G.I.			30/11/15	08:00	1.20					No rise.
4.06	0.15	Cable Percussion	JP	4.05	4.00	3.60	30/11/15	18:00						
15.30	0.09	Rotary Core	PB	4.05	4.00		01/12/15	08:00						
				12.36	4.00	Added	01/12/15	18:00						
				12.36	4.00	Added	02/12/15	08:00						
				15.30	4.00	Added	02/12/15	18:00						
Remarks Inspection pit hand excavated to 1.20m depth. ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar. A 50mm standpipe was installed to 7.00m with a geowrapped slotted section from 5.00m to 7.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 7.00m, gravel filter up to 5.00m, bentonite seal up to 0.30m, concrete up to ground level. Flush: 4.06-15.30m, Water, 70% returns. All dimensions are in metres.														
Logged by SG Figure 1 of 2 11/03/2016														
Logged in accordance with BS5930:1999 + A2:2010														

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH101
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389243.3 E 390165.1 N Ground Level 45.22 m OD


Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI) (11)		Between 10.08m and 10.80m, some sand infill on discontinuities.			
10.80-12.30		0		0						
10.80-10.85	4.00				C50/25 (AZCL)					
12.30-13.80		66 40	0.15 0.01	16						
12.30-12.36	4.00				C50/35 (NI) (15)					
13.80-15.30		66 54	0.17 0.03	24	(NI) (AZCL) (13) (NI) (20) (23)		Below 14.30m, discontinuities are closely spaced. Between 14.83m and 15.30m, discontinuities are very closely spaced.			
						End of Borehole		15.30		29.92

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 2 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole **BH102**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389276.7 E
390240.0 N

Ground Level 43.35 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (F)	Description	Depth	Legend	Level m OD	
0.10- 0.15	B					MADE GROUND: Grey concrete paving slabs.	G.L.		43.35	
0.50	ES					MADE GROUND: Brown gravelly fine to medium sand. Gravel is subrounded to rounded fine to medium of sandstone, limestone and quartzite.	0.10 0.15		43.25 43.20	
0.60- 0.80	B						0.50		42.85	
1.00	ES					MADE GROUND: Grey reinforced concrete.				
1.20- 1.70	B					MADE GROUND: Brown sandy angular to subangular fine to coarse gravel of limestone. Low angular cobble content.	1.20		42.15	
1.20- 1.65	D	(DRY)			S4					
1.80	D					MADE GROUND: Very loose/loose black sandy angular to subangular fine to coarse gravel of brick, concrete, ash and clinker. High angular cobble content.	2.00		41.35	
2.00- 2.38	D	2.00 (DRY)			S50/225					
2.00	ES					Very dense yellowish brown sandy rounded to subrounded fine to coarse GRAVEL of limestone, sandstone, quartzite and granite. High rounded to subrounded cobble content.				
2.80	D									
2.80- 3.03	D	2.80 (DRY)			S50/75					
3.00- 3.50	B									
3.00- 3.15	D	3.00 (DRY)			S50/75					
3.80	D									
4.00- 4.50	B									
4.00- 4.23	D	4.00 (DRY)			S50/75	Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.00		39.35	
5.00- 5.15	D	4.50 (DRY)			S50/75		5.15		38.20	
Core Run	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (F)	Continued by Rotary techniques General	Detail			
5.00- 5.54	5.00	96	0.22	22	(AZCL)	Extremely weak to weak reddish brown fine to medium grained SANDSTONE. Discontinuities are very closely to closely spaced subhorizontal undulating smooth and clean.	At 5.29m, subvertical undulating smooth clean discontinuity. At 5.47m, dark brown sand infill on discontinuities. Between 5.65m and 6.34m, discontinuities become closely to medium spaced and planar. Between 6.34m and 6.38m, discontinuities become extremely to very closely spaced. Between 6.38m and 6.95m, discontinuities become closely to medium spaced. Below 6.95m, discontinuities are very closely to closely spaced. Between 8.18m and 8.38m, discontinuities are medium spaced.			
5.17- 5.26		68	0.01		(22)					
5.54- 7.04	5.00	93	0.43	73	(AZCL)					
		93	0.03		(7)					
					(50)					
					(7)					
7.04- 8.54		58	0.21	13	(44)					
		29	0.01		(AZCL)					
					(NI)					
					(50)					
8.54- 9.54		0		0	(10)					
		0			(19)					
8.54- 8.60	4.00 (ADDED)				(AZCL)					
9.54-10.20		9		0	S50/34					

Boring				Progress				Groundwater						
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	HR	G.I.			30/11/15	08:00						None encountered
5.15	0.15	Cable Percussion	HR	3.03	2.80	DRY	30/11/15	18:00						
14.70	0.09	Rotary Core	SL	3.03	2.80	DRY	01/12/15	08:00						
				7.04	5.00	ADD	01/12/15	18:00						
				7.04	5.00	ADD	02/12/15	08:00						
				14.70	5.00	ADD	02/12/15	18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 Water was added to assist boring between 2.00m and 5.50m.
 A 50mm standpipe was installed to 10.00m with a geowrapped slotted section from 8.00m to 10.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 10.00m, fine gravel filter up to 8.00m, bentonite seal up to 0.10m, concrete up to ground level.
 Chiselling: 1.80-2.00m for 60 minutes and 2.50-3.00m for 60 minutes.

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 Figure 1 of 2
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geotechnics

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH102
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389276.7 E 390240.0 N Ground Level 43.35 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
10.20-11.70	4.00 (ADDED)	66 47	0.10 0.04	6	(33)					
10.20-10.34					(AZCL) S50/46					
					(NI)					
					(40)					
					(NI)					
11.60-11.70		C			(40)					
11.70-12.70		100 62	0.21 0.01	43	(20)		Between 12.40m and 12.70m, discontinuities become closely to medium spaced.			
					(NI)					
					(14)					
					(NI)		Below 13.02m, discontinuities become closely spaced.			
12.70-13.20		12 12	0.10 0.01	6	(50)					
					(NI)		Between 14.23m and 14.47m, discontinuities are medium spaced.			
13.20-14.70		66 66	0.20 0.03	31	(17)					
					(NI)					
					(10)					
					(AZCL)					
					(11)		End of Borehole			
					(AZCL)					
					(13)					
					(4)					
					(13)					

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 2 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole Project No **BH103** PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389205.7 E 390216.4 N Ground Level 42.42 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD	
0.35- 0.55	D					MADE GROUND: Grey concrete paving slabs.	G.L.		42.42	
0.35- 0.55	ES					MADE GROUND: Grey concrete.	0.10		42.32	
1.00- 1.20	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base). Loose greyish brown silty slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium including sandstone, quartzite and limestone.	0.35		42.07	
1.00- 1.20	ES						1.00		41.42	
1.20- 1.65	B	1.20 (DRY)			S5					
1.20- 1.65	D									
2.00- 2.20	D					Dense yellowish brown sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.	2.40		40.02	
2.00- 2.20	ES									
2.20- 2.65	B	2.20 (DRY)			S33					
2.20- 2.65	D									
3.20- 3.27	B	3.20 (DRY)				Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.20		39.22	
3.20- 3.35	D				S50/70					
4.20- 4.24	D	4.20 (DRY)				S50/0				
Core Run	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	4.80		37.62	
4.80- 5.70	(ADD)	100 89	0.14 0.00	39	(NI) (12)	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean. Between 5.90-6.20m, discontinuities are subvertical and rough.				
5.70- 7.20	(ADD)	90 90	0.15 0.00	40	(NI) (AZCL) (15)					
6.70- 6.86		C								
7.20- 8.70	(ADD)	100 90	0.18 0.00	87	(11) (NI) (11) (NI) (15)					
8.70-10.20	(ADD)	87 87	0.20 0.00	40	(NI) (15) (12) (14)					

Boring				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I.			08/12/15	08:00						None encountered.
4.80	0.15	Cable Percussion	JP	3.27	3.20	DRY	08/12/15	18:00						
14.70	0.09	Rotary Core	SL	3.27	3.20	DRY	09/12/15	08:00						
				4.80	4.20	DRY	09/12/15	18:00						
				4.80	4.20	DRY	10/12/15	08:00						
				14.70	4.20	ADD	10/12/15	18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 Water was added to assist boring between 1.20m and 3.20m.
 A 50mm standpipe was installed to 14.70m with a geowrapped slotted section from 11.00m to 14.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 14.00m, gravel filter up to 11.00m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
 Chiselling: 4.00-4.20m for 60 minutes.

Logged in accordance with BS5930:1999 + A2:2010


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 Figure 1 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH103
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389205.7 E 390216.4 N Ground Level 42.42 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
					(AZCL)					
10.20-11.70	(ADD)	67 57	0.10 0.00	7	(18)					
					(AZCL)					
11.70-13.20	(ADD)	40 33	0.10 0.00	13	(17)					
					(AZCL)					
13.20-14.70	(ADD)	87 87	0.35 0.00	67	(13)		Between 13.20-14.70m, discontinuities become closely spaced.			
13.20-13.39	4.20	C			S50/26					
13.20-13.25	(DRY)				(8)					
						End of Borehole		14.70		27.72


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by DSA
 Figure 2 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION


Engineer AECOM

Borehole **BH104**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389178.1 E
390228.9 N

Ground Level 42.47 m OD


Sampling			Properties			Strata			Scale 1:50					
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
						MADE GROUND: Grey reinforced concrete.	G.L.		42.47					
0.40- 0.60	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).	0.40		42.07					
0.40- 0.60	ES						0.70		41.77					
1.00- 1.20	D					Medium dense yellowish brown sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.								
1.00- 1.20	ES													
1.20- 1.65	B				S15									
1.20- 1.65	D	1.20 (DRY)												
2.00- 2.20	D					At 2.20m, dense.								
2.00- 2.20	ES													
2.20- 2.65	B				C38									
2.20- 2.65	D	2.20 (DRY)												
3.20- 3.30	B					At 3.20m, very dense.								
3.20- 3.37	B				C50/50									
3.70- 3.95	B					Weak dark red fine to medium grained SANDSTONE (recovered as sand).								
3.70- 3.77	B				C50/40		3.70		38.77					
4.70- 4.74						C50/10								
4.70- 4.74		4.70 (DRY)												
Core Run	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail							
5.00- 6.50		100 60	0.20 0.00	40	(NI)				5.65	36.82				
6.00- 6.10		C			(10)	Weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal and clean.	Between 6.00m and 6.10m, extremely weak. Subvertical discontinuities, rough and clean.							
6.50- 8.00		60 43	0.15 0.00	23	(AZCL)									
					(NI)									
					(15)									
8.00- 8.85		100 100	0.10 0.00	40	(12)									
8.50- 8.65		C					Between 8.50m and 8.65m, extremely weak to very weak.							
8.85- 9.10		71 71	0.15 0.00	35	(AZCL)	Weak greyish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean.			8.85	33.62				
9.10- 9.80		43 43	0.05 0.00	0	(18)				9.10	33.37				
9.80-11.00		38 38	0.09 0.00	0		Extremely weak to weak			9.80	32.67				
Boring			Progress			Ground water								
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	JP	G.I.			01/12/15	08:00						None encountered.
4.74	0.15	Cable Percussion	JP	2.00	2.00	DRY	01/12/15	18:00						
15.07	0.09	Rotary Core	PB	2.00			02/12/15	08:00						
				4.74	4.70	DRY	02/12/15	18:00						
				4.74	4.70	DRY	03/12/15	08:00						
				15.07	4.70	ADD	03/12/15	18:00						
Remarks Inspection pit hand excavated to 1.20m depth. ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jars. A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 1.00m to 3.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 3.50m, gravel filter up to 1.00m, bentonite seal up to 0.30m, concrete up to ground level. Chiselling: 3.70-3.95m for 60 minutes. Symbols and abbreviations are explained on the accompanying key sheet. All dimensions are in metres.														
Logged in accordance with BS5930:1999 + A2:2010														
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH104
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389178.1 E 390228.9 N Project No PN153428
 Ground Level 42.47 m OD


Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
9.80- 9.94	4.70 (ADDED)				(AZCL) C50/40 (19)	reddish brown MUDSTONE. Discontinuities are very closely spaced subhorizontal and clean.				
11.00-12.20		58 58	0.13 0.00	11	(17) C50/30	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Occasional subrounded clasts (up to 30mm) of quartzite. Discontinuities are very closely spaced subhorizontal rough and clean.				
11.00-11.07	4.70 (ADDED)									
12.10-12.20		C								
12.20-13.50		23 23	0.00 0.00	0	(AZCL) C50/35 (25)					
12.20-12.27	4.70 (ADDED)									
13.50-15.00		33 33	0.09 0.00	0	(AZCL) C50/40 (18)					
13.50-13.58	4.70 (ADDED)									
15.00-15.07	4.70 (ADDED)				C50/35	End of Borehole		15.00		27.47

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 2 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole Project No

BH105
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389234.8 E
390221.6 N


Ground Level 42.62 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD	
						MADE GROUND: Grey reinforced concrete.	G.L.		42.62	
0.50	ES					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).	0.40		42.22	
0.70- 0.80	B									
1.00	ES					s8 Loose yellowish brown very sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and basalt.	1.20		41.42	
1.10	D									
1.20- 1.65	D					At 2.00m, dense.				
1.20- 1.65	D									
1.80	D					s37				
2.00- 2.50	B									
2.00- 2.45	D	1.50 (DRY)				s50/75				
2.00	ES									
2.80	D					Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.00		39.62	
3.00- 3.50	B	3.00 (DRY)								
3.00- 3.15	D					s50/75				
3.80	D									
4.00- 4.15	D	4.00 (DRY)								
Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	4.50		38.12	
4.50- 5.50		30 20	0.08 0.00	0	(AZCL) (16)	Extremely weak to weak reddish fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean.				
5.50- 7.00		67 60	0.10 0.00	13	(AZCL) C50/30					
5.50- 5.57	4.00 (ADDED)				(15)					
7.00- 8.30		77 70 C	0.20 0.00	23	(AZCL)	Between 7.80-7.90m occasional subrounded clasts (up to 20mm) of basalt and feldspar.				
7.10- 7.29					(12) (NI) (12)					
8.30- 8.50		100 100	0.08 0.00	0	(20)					
8.50-10.00		68 23	0.13 0.00	9	(AZCL)					
					(30) (NI)					

Boring				Progress				Groundwater						
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	HR	G.I.			08/12/15	08:00						None encountered.
4.50	0.15	Cable Percussion	HR	1.20		DRY	08/12/15	18:00						
15.20	0.09	Rotary Core	PB	1.20		DRY	09/12/15	08:00						
				4.50	4.00	DRY	09/12/15	18:00						
				4.50	4.00	ADDED	14/12/15	08:00						
				15.20	4.00	ADDED	14/12/15	18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 Water was added to assist boring between 3.00m and 4.50m.
 A 50mm standpipe was installed to 12.00m with a geowrapped slotted section from 9.50m to 12.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 12.00m, gravel filter up to 9.50m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
 Chiselling: 1.50-2.00m for 30 minutes and 2.00-2.50m for 30 minutes.
 Flush: 4.50-8.50m, Water, 75% returns and 8.50-10.00m, Water, 0% returns and 10.00-15.20m,
 Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 2
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BOREHOLE RECORD - Cable Percussion and Rotary

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **BH105**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389234.8 E** Project No **PN153428**
390221.6 N Ground Level **42.62 m OD**

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
10.00-11.50		23	0.10	6	(15)					
10.00-10.07	4.00 (ADDED)	23	0.00		(AZCL) C50/35					
					(20)					
11.50-13.00		67	0.20	27	(AZCL) C50/35					
11.50-11.56	4.00 (ADDED)	53	0.00		(NI)					
					(12)					
13.00-14.35		74	0.36	56	(AZCL)					
13.00-13.34		74	0.00							
					(25)					
14.35-14.50		100	0.15	100						
		100	0.00		(10)					
14.50-15.20		100	0.20	71						
		86	0.00		(NI)					
					(20)	End of Borehole		15.20		27.42

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater


Remarks **Water, 60% returns.** Logged by **DS**
 Symbols and abbreviations are explained on the accompanying key sheet. Figure **2 of 2**
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010 11/03/2016

BOREHOLE RECORD - Cable Percussion and Rotary

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **BH106**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389248.7 E** Project No **PN153428**
390249.7 N Ground Level **42.45 m OD**

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
10.80-10.90		C			(12)					
10.90-12.40		17	0.80	0	(20)					
10.90-10.98	3.40 (ADDED)	17	0.01		C50/45					
					(AZCL)					
12.40-13.90		47	0.30	20			Between 12.40 and 13.90m, discontinuities are medium spaced.			
12.40-12.48	3.40 (ADDED)	40	0.01		C50/30					
					(10)		Between 13.10 and 13.30m, with subangular to subrounded clasts (up to 50mm) of quartzite.			
					(NI)					
					(5)					
13.90-15.00		73	0.15	36	(AZCL)					
13.90-13.97	3.40 (ADDED)	55	0.01		C50/30					
					(10)					
						End of Borehole		15.00		27.45

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks **Flush: 3.40-15.00m, Water, 75% returns.** Logged by **GT**
 Symbols and abbreviations are explained on the accompanying key sheet. Figure **2 of 2**
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010 11/03/2016


BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole Project No **BH107**
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389205.8 E
390252.4 N

Ground Level 42.27 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD	
0.35- 0.55	D					MADE GROUND: Grey reinforced concrete.	G.L.		42.27	
0.35- 0.55	ES					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).	0.35		41.92	
0.90- 1.10	D					Very dense yellowish brown silty very sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.	0.90		41.37	
0.90- 1.10	ES									
1.20- 1.31	B									
1.20- 1.46	D	(DRY)			S50/110					
1.31- 1.47	B									
1.31- 1.64	D	1.30 (DRY)			S50/180					
2.00- 2.20	D					Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.00		39.27	
2.00- 2.20	ES									
2.20- 2.42	B									
2.20- 2.57	D	2.20 (DRY)			S48/220					
3.00- 3.07	B					3.00			39.27	
3.00- 3.10	D	3.00 (DRY)			S50/75					
4.00- 4.08	#	4.00 (DRY)			S50/30		4.08		38.19	
Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail			
4.00- 5.00	4.00	50 10	0.05 0.01	0	(NR) (NI)	Extremely weak reddish brown fine to medium grained SANDSTONE (recovered as gravel).				
5.00- 6.50	4.00	26 6	0.05 0.01	0	(NR) (NI)					
6.50- 8.00	6.50	0 0	- -	0	(NR)					
						MADE GROUND: Strong orangish red brick with well bonded mortar (10mm thick).	7.50		34.77	
						VOID (Sewer).	7.80		34.47	
						End of Borehole	9.10		33.17	

Boring				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I.			07/12/15	08:00						None encountered.
4.08	0.15	Cable Percussion	JP	2.42	2.20	DRY	07/12/15	18:00						
7.80	0.09	Rotary Core	PB	2.42 7.80	2.20 6.50	DRY ADD	08/12/15 08/12/15	08:00 18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 Water was added to assist boring from 1.20m.
 During rotary drilling the flush returns were lost at 4.40m with the core barrel flushing in between 5.00m and 6.00m with no rotation. The casing was subsequently advanced to 6.50m.
 At 7.50m a brick sewer was encountered and proved using CCTV. Following confirmation the asset holder requested that the casing be left in to provide an access point and re-instated at surface with a heavy duty flush cover.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 2
11/03/2016
geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **BH107**
 Project No **PN153428**

Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389205.8 E**
390252.4 N Ground Level **42.27 m OD**


Drilling		Properties/Sampling				Strata			Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD	

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks **Chiselling: 3.00-4.00m for 60 minutes.**

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure **2 of 2**
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION


Engineer AECOM

Borehole **BH108**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389157.8 E
390268.0 N

Ground Level 42.72 m OD

Sampling			Properties			Strata		Scale 1:50						
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
0.10- 0.20	B					MADE GROUND: Black tarmacadam.	G.L.		42.72					
0.20	ES						0.05		42.67					
0.30- 0.40	B					MADE GROUND: Yellowish brown sandy angular fine to coarse gravel of limestone. Medium angular cobble content of limestone. (Sub base).	0.20		42.52					
0.50	ES													
0.80	D					MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. Medium angular cobble content of brick and some pockets of clay.								
1.00	ES													
1.20- 1.65	D	1.20 (DRY)			S6									
1.80	D													
2.00- 2.50	B			22										
2.00- 2.45	D	1.50 (DRY)			S5									
2.00	ES													
2.70	D													
3.00- 3.50	B													
3.00- 3.45	D	3.00 (DRY)		16	S9									
3.00- 3.45	D													
3.00	ES													
3.00- 3.45	UF45	3.00 (DRY)												
3.80	D													
4.00- 4.50	B					At 4.00m, dense.								
4.00- 4.45	D	4.00 (DRY)			S44									
4.00	ES													
5.00- 5.50	B					Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	5.00		37.72					
5.00	D													
5.00- 5.15	D	5.00 (DRY)			S50/75									
5.00	ES													
5.80	D													
6.00- 6.15	D	5.00 (DRY)			S50/75		6.15		36.57					
Core Run Core Dia			Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General		Detail				
6.50- 7.30 (80mm)	6.00 (ADD)	0.85 0.30	0.10 -	0.10	(>25)		(NI)	Very weak thinly laminated brown micaceous MUDSTONE. Discontinuities are very closely spaced planar smooth with some clay infill.		6.82				
7.30- 8.80 (80mm)	6.00 (ADD)	0.45 0.21	0.90 -	-	(14)		(16)	Very weak to medium strong reddish brown medium grained micaceous SANDSTONE with rare rounded clasts (up to 60mm) of quartzite. Discontinuities are very closely to medium spaced horizontal to subvertical planar and undulating smooth.						
8.80-10.30 (80mm)	6.00 (ADD)	1.10 0.72	0.11 -	0.21	(NI)		(>25)	Between 8.80m and 10.30m, discontinuities are occasionally stepped.						
8.80- 8.93	6.70 (ADDED)				(1)		S50/32							
					(AZCL)		(18)							
Boring			Progress				Ground water							
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I.			02/12/15	08:00						None encountered.
6.15	0.15	Cable Percussion	JP	1.20		DRY	02/12/15	18:00						
22.30	0.09	Rotary Core	SL	1.20		DRY	03/12/15	08:00						
				6.15	4.50	DRY	03/12/15	18:00						
				6.15	6.00	DRY	08/12/15	08:00						
				7.30	6.70	ADD	04/12/15	18:00						
Remarks													Logged by	JL
Inspection pit hand excavated to 1.20m depth. ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars Water was added to assist boring from 5.00m. During rotary coring there was no flush returns between 6.50m and 7.30m The casing was subsequently advanced to 6.70m. A 50mm standpipe was installed to 21.00m with a geowrapped slotted section from 18.00m to 21.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 21.00m, gravel filter up to 18.00m, bentonite seal up to 0.50m, sub base up to													Figure	1 of 3 11/03/2016
All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010														

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH108
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389157.8 E 390268.0 N Ground Level 42.72 m OD


Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI)					
10.30-11.80 (80mm)	6.00 (ADD)	1.35 1.12	0.57 -	0.83	(12) (AZCL) (-) (13) (3)		Between 10.30m and 11.80m, discontinuities occasionally have black staining (1mm penetration).			
11.80-13.30 (80mm) 11.80-14.80	6.00 (ADD)	1.20 0.91 C	0.33 -	0.68	(AZCL) (13) (NI) (17)		Between 11.80m and 13.30m, discontinuities infilled with clay in places.			
13.30-14.80 (80mm)	6.00 (ADD)	1.40 0.92	0.26 -	0.60	(AZCL) (11) (NI) (15)					
14.35-14.61		C								
14.80-16.30 (80mm) 15.30-15.38	6.00 (ADD)	1.50 1.05 C	0.27 -	0.87	(6) (10) (NI)					
16.30-17.80 (80mm) 17.30-17.58	6.00 (ADD)	1.25 1.04 C	0.33 0.04	0.93	(4) (AZCL) (10) (4)		Between 16.55 and 16.65, sandstone is fine grained. Below 16.90m, becoming occasionally gravelly.			
17.80-19.30 (80mm)	6.00 (ADD)	0.45 0.13	0.13 -	0.13	(AZCL) (NI) (8)		Between 17.80m and 20.80m, discontinuities infilled with clay in places.			
19.30-20.80 (80mm) 19.30-19.37	6.00 (ADD) 6.70 (ADDED)	0.80 0.48	0.12 -	0.33	(AZCL) S50/39					

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
				7.30	6.70	ADD	09/12/15	08:00						
				22.30	6.70	ADD	09/12/15	18:00						

Remarks **0.30m, tarmacadam up to ground level.**
ABS chiselling: 4.50-5.00m for 60 minutes and 5.00-6.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by JL
 Figure 2 of 3
 11/03/2016



BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH108
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389157.8 E 390268.0 N Ground Level 42.72 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI)		Between 20.15m and 20.20m, thin band of weak thinly laminated dark brown mudstone.			
					(8)					
20.80-22.30 (80mm)	6.00 (ADD)	0.80 0.45	0.19 -	0.29	(AZCL)					
					(NI)					
					(6)					
					(4)					
22.30-22.35	6.70 (ADDED)				S50/29	End of Borehole		22.30		20.42

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by JL
 Figure 3 of 3
 11/03/2016

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole **BH109**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389136.4 E
390317.0 N

Ground Level 42.36 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD	
0.30- 0.50	D					MADE GROUND: Black tarmacadam.	G.L.		42.36	
0.30- 0.50	ES					MADE GROUND: Loose blackish brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High angular cobble and boulder content of brick.	0.30		42.06	
1.00- 1.20	D				S7					
1.00- 1.20	ES									
1.20- 1.65	B									
1.20- 1.65	D	(DRY)								
2.00- 2.20	D					Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt.	2.20		40.16	
2.00- 2.20	ES				S34					
2.20- 2.65	B									
2.20- 2.65	D	2.20 (DRY)								
3.00- 3.20	D									
3.00- 3.20	ES					At 3.20m, very dense.				
3.20- 3.42	B				S50/225					
3.20- 3.58	D	3.20 (DRY)								
4.20- 4.27	B									
4.20- 4.36	D	4.20 (DRY)								
5.20- 5.32	#	5.20 (DRY)				Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.20		38.16	
					S50/70					
Core Run	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques				
Core Dia						General	Detail			
5.20- 6.20 (92mm)		0		0						
6.20- 7.70 (92mm)		86		0		Extremely weak reddish brown fine to coarse grained SANDSTONE with closely spaced bands of mudstone. Discontinuities are predominately horizontal with slightly clayey sand infill.				
6.20- 6.30	5.20 (ADDED)	0			C50/40				6.55	35.81
					(NI)					
7.70- 9.20 (92mm)		22	0.10	6		Extremely weak reddish brown fine to coarse grained SANDSTONE.				
7.70- 7.81	5.20 (ADDED)	20	0.01		C50/50				8.95	33.41
					(>30)					
9.20-10.70 (92mm)		83	0.20	62		Extremely weak to very weak reddish brown fine to coarse grained				
9.20- 9.27	5.20 (ADDED)	76	0.01		C50/35				9.25	33.11
9.40- 9.60		C			(7)					

Boring				Progress					Ground water					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I.			15/12/15	08:00						None encountered.
5.20	0.15	Cable Percussion	JP	5.20	5.20	DRY	15/12/15	18:00						
20.70	0.09	Rotary Core	PB	5.20	5.20	ADD	16/12/15	08:00						
				16.70	5.20	ADD	16/12/15	18:00						
				16.70	5.20	ADD	17/12/15	08:00						
				20.70	5.20	ADD	17/12/15	18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A 50mm standpipe was installed to 20.00m with a geowrapped slotted section from 18.00m to 20.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 20.00m, gravel filter up to 18.00m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
 Chiselling: 2.00-2.20m for 60 minutes.
 Flush: 5.20-20.70m, Water, 75% returns.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010




BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH109
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389136.4 E 390317.0 N Ground Level 42.36 m OD


Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
		TCR/SCR%								
10.70-12.20 (92mm)		51 29	0.35 0.01	14	(8)	SANDSTONE. Discontinuities are very closely to closely spaced subhorizontal undulating rough with occasional sand infill (up to 150mm thick).				
					(NI)	Extremely weak reddish brown SANDSTONE (recovered as gravelly sand).		11.90		30.46
12.20-13.70 (92mm) 12.30-12.62		83 75 C	0.35 0.01	48	(8)	Extremely weak to very weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely to medium spaced horizontal undulating rough with sand infill (up to 10mm thick).		12.20		30.16
13.70-15.20 (92mm) 13.90-14.15		70 65 C	0.20 0.01	47	(10)					
15.20-16.70 (92mm)		60 46	0.10 0.01	14	(14)					
16.70-18.20 (92mm)		60 14	0.07 0.01	0	(NI)	Extremely weak reddish brown slightly gravelly fine to coarse grained SANDSTONE with silty bands (recovered as slightly gravelly fine to coarse sand).		16.50		25.86
					(26)	Extremely weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are extremely to very closely spaced horizontal undulating rough with sand infill (up to 10mm thick).		17.75		24.61
18.20-19.70 (92mm)		100 98	0.34 0.01	64	(8)	Extremely weak to very weak reddish brown fine to coarse grained SANDSTONE with widely spaced slightly gravelly bands (up to 50mm thick). Gravel is fine to medium of quartzite.		18.20		24.16
19.40-19.60		C								
19.70-20.70 (92mm) 19.70-19.90		98 92 C	0.15 0.01	22						

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 2 of 3
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BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole **BH109**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389136.4 E
390317.0 N

Ground Level 42.36 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
					(12)	Discontinuations are closely to medium spaced locally very closely spaced subhorizontal undulating rough with sand infill (up to 10mm thick).		20.70		21.66
						End of Borehole				

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 3 of 3
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BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH111
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389253.5 E 390080.2 N Ground Level 50.92 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.40	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content.	G.L.		50.92		
0.20- 0.40	ES						0.30		50.62		
0.50- 0.70	D					MADE GROUND: Firm dark brown slightly sandy slightly gravelly clay. Gravel is angular to subangular fine to coarse of brick and concrete.	0.85		50.07		
0.50- 0.70	ES										
0.85- 1.00	B	(DRY)			s50/150	Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	1.55		49.37		
0.85- 1.15	D										
1.50- 1.56		1.50 (DRY)			C50/30	End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.85	0.50	Inspection Pit Cable Percussion	JP	G.I.			03/12/15	08:00						None encountered.
1.55	0.15		JP	1.55	1.50	DRY	03/12/15	18:00						

Remarks Inspection pit hand excavated to 0.85m depth.
 ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 Backfill details from base of hole: bentonite seal up to 0.30m, arisings up to ground level.
 Chiselling: 1.50-1.55m for 60 minutes.

Logged by GT
 Figure 1 of 1
 11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole **BH112**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389295.7 E
390239.9 N

Ground Level 43.70 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD	
0.20	ES					MADE GROUND: Grey concrete paving slabs.	G.L.		43.70	
0.40- 0.50	B					MADE GROUND: Light red sandy angular to subangular fine to coarse gravel of limestone. Medium angular to subangular cobble content. (Sub base)	0.15		43.55	
0.50	ES									
0.80	D					MADE GROUND: Firm greyish brown slightly sandy slightly gravelly clay with a medium angular to subangular cobble content. Gravel is angular to subangular fine to coarse of brick and concrete.	1.00		42.70	
1.00	ES									
1.20- 1.70	B									
1.20- 1.65	D	(DRY)			S4	Soft dark brown and black very organic CLAY. Locally sandy silt, with organic remains.	1.60	x	42.10	
1.80	D		109							
2.00- 2.45	D	2.00 (DRY)			S49	Dense to very dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of quartzite and sandstone. High rounded cobble content.	2.00	x	41.70	
3.00- 3.50	B									
3.00- 3.23	D	4.00 (DRY)			S50/75					
3.80	D					Weak dark red fine to medium grained SANDSTONE (recovered as sand).	3.90		39.80	
4.00- 4.50	B									
4.00- 4.15	D	3.00 (DRY)			S50/75					
5.00- 5.15	D	4.50 (DRY)			S50/75		5.15		38.55	
Core Run		Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General		Detail	
5.50- 5.80	5.50 (ADD)	100	0.10	67	(22)	Extremely weak to weak reddish brown fine to coarse SANDSTONE with occasional subrounded clasts (up to 50mm) of quartzite. Discontinuities are very closely spaced subhorizontal rough and clean.				
5.80- 7.30	5.50 (ADD)	93	0.28	33	(AZCL)					
6.50- 6.80	C	93			(16)					
					(15)					
7.30- 8.80	5.50 (ADD)	100	0.20	70	(9)					
		100	0.00		(10)					
8.80-10.30	5.50 (ADD)	80	0.20	60	(AZCL)					
		80	0.00		(12)					
9.60- 9.80	C				(AZCL)					
					(14)					

Boring				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	HR	G.I.			01/12/15	08:00						None encountered.
5.15	0.15	Cable Percussion	HR	2.50	2.50	DRY	01/12/15	18:00						
14.80	0.09	Rotary Core	SL	2.50	2.50	DRY	02/12/15	08:00						
				5.15	4.50	DRY	02/12/15	18:00						
				5.15	4.50	DRY	03/12/15	08:00						
				11.80	5.50	ADD	03/12/15	18:00						

Remarks
 Inspection pit hand excavated to 1.20m depth.
 ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 Water was added to assist boring between 2.00m and 2.50m, and 3.00m and 5.50m.
 A 50mm standpipe was installed to 14.80m with a geowrapped slotted section from 12.80m to 14.80m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 12.80m, bentonite seal up to 0.30m, concrete up to ground level.
 Chiselling: 3.00-3.20m for 90 minutes and 3.20-3.40m for 60 minutes and 4.00-5.00m for 60 minutes.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010



BOREHOLE RECORD - Cable Percussion and Rotary

Project STOCKPORT BUS STATION Engineer AECOM Borehole BH112
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389295.7 E 390239.9 N Ground Level 43.70 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (F)	Description General	Description Detail	Depth	Legend	Level m OD
10.30-11.80	5.50 (ADD)	60 47	0.35 0.00	33	(AZCL) (NI) (11)					
11.80-13.30	5.50 (ADD)	67 53	0.17 0.00	37	(AZCL) (15) (NI) (13)					
13.30-14.80	5.50 (ADD)	67 57	0.15 0.00	40	(AZCL) (11)					
End of Borehole								14.80		28.90

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
				11.80	5.50	ADD	04/12/15	08:00						
				14.80	5.50	ADD	04/12/15	18:00						


Remarks **DF** Flush: 5.50-5.80m, Water, 80% returns and 5.80-7.30m, Water, 0% returns and 7.30-8.80m, **AB** Water, 50% returns and 8.82-10.30m, Water, 80% returns and 10.30-11.80m, Water, 80% returns and 11.80-13.30m, Water, 80% returns and 13.30-14.80m, Water, 80% returns.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010


Figure 2 of 2
11/03/2016

BOREHOLE RECORD - Cable Percussion


Project STOCKPORT BUS STATION Engineer AECOM Borehole CT1
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389136.7 E 390309.5 N Ground Level 42.24 m OD

Sampling			Properties		Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description	Depth	Legend	Level m OD	
					MADE GROUND: Black tarmacadam.	G.L. 0.10		42.24 42.14	
					MADE GROUND: **Brick wall onto obstruction at 1.20m.				
					End of Borehole	1.20		41.04	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I. 1.10			16/12/15 16/12/05	09:00 18:00						None encountered.

Remarks  The borehole was terminated at the base of the inspection upon encountering a brick obstruction.
 ** Driller's description.
 Backfill details from base of hole: bentonite seal up to 0.30m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT1A
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389139.0 E 390309.6 N Ground Level 42.19 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
						MADE GROUND: Black tarmacadam.	G.L. 0.05		42.19 42.14		
1.20- 1.65	D				S2						
2.20- 2.65	D	1.20 (DRY)			S17	At 2.20m, medium dense.					
3.20- 3.58	D	3.20 (DRY)			S50/225	Very dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt.	3.20		38.99		
4.20- 4.32	D	4.20 (DRY)			S50/50	Weak dark red fine to medium grained SANDSTONE (recovered as sand).	4.20 4.32		37.99 37.87		
						End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I. 4.32	4.20	DRY	17/12/15	08:00						None encountered.
4.32	0.15	Cable Percussion	JP				17/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 Backfill details from base of hole: bentonite seal up to 0.30m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by JP
 Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT3
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389139.9 E 390305.2 N Ground Level 42.11 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Black tarmacadam.	G.L.		42.11	
1.20- 1.65	D	(DRY)			S35	MADE GROUND: Medium dense dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High cobble content and a high boulder content of brick.	0.30		41.81	
2.20- 2.65	D	2.20 (DRY)			S18					
3.20- 3.65	D	3.20 (DRY)			S8	Loose brown slightly gravelly silty SAND. Gravel is fine to medium including sandstone, limestone and quartzite.	3.20		38.91	
4.20- 4.35	D	4.20 (DRY)			S50/70		4.20		37.91	
						Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.35		37.76	
End of Borehole										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit Cable Percussion	JP JP	G.I.	4.20	DRY	16/12/15	08:00						None encountered.
4.35	0.15			4.35			16/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth. Water was added to assist boring between 3.20m and 4.20m. Backfill details from base of hole: bentonite seal up to 0.60m, sub base up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010


Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT4
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389146.6 E 390314.8 N Project No PN153428
 Ground Level 42.07 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Black tarmacadam.	G.L.		42.07	
						MADE GROUND: Stone setts.	0.10		41.97	
						MADE GROUND: Brown slightly clayey sand. Locally grading to very soft slightly gravelly sandy clay. Gravel is angular to subangular medium to coarse of brick fragments.	0.25		41.82	
1.30- 1.75	D	(DRY)			S1					
2.20- 2.65	D	2.20 (DRY)			S50					
						Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL including sandstone.	2.45		39.62	
						At 3.20m, medium dense.				
3.20- 3.65	D	3.20 (DRY)			S12					
						End of Borehole	3.30		38.77	


Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.I.			10/12/15	08:00						None encountered.
3.30	0.15	Cable Percussion	JP	1.30		DRY	10/12/15	18:00						
				1.30		DRY	11/12/15	08:00						
				3.30	3.20	DRY	11/12/15	18:00						

Remarks  Inspection pit hand excavated to 1.20m depth. The Borehole was terminated at a depth of 3.30m due to the presence of a potential buried service. Backfill details from base of hole: bentonite seal up to 0.25m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by GT
 Figure 1 of 1
 11/03/2016



BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT5
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389154.7 E 390268.6 N Ground Level 42.73 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Black tarmacadam.	G.L.		42.73	
						MADE GROUND: Yellowish brown sandy fine to coarse angular gravel of limestone (Sub base).	0.05		42.68	
						MADE GROUND: Concrete and brick.	0.10		42.63	
1.20- 1.65	D				S4	MADE GROUND: Loose dark brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash. High cobble content and a high boulder content.	0.45		42.28	
2.00- 2.45	D	2.00 (DRY)			S6					
3.00- 3.45	D	3.00 (DRY)			S10					
4.00- 4.15	D	4.00 (DRY)			S50/75	Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.00		38.73	
5.00- 5.15	D	5.00 (DRY)			S50/75					
						End of Borehole	5.50		37.23	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	HR	G.I.			03/12/15	08:00						None encountered.
5.50	0.15	Cable Percussion	HR	3.50	3.00	DRY	03/12/15	18:00						
				3.50	3.00	DRY	04/12/15	08:00						
				5.50	4.50	DRY	04/12/15	18:00						



Remarks Inspection pit hand excavated to 1.20m depth.
 Water was added to assist boring between 3.50m and 4.00m.
 Backfill details from base of hole: bentonite seal up to 0.15m, tarmacadam up to ground level.
 Chiselling: 4.00-5.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010


Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion


Project STOCKPORT BUS STATION Engineer AECOM Borehole CT6
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389161.9 E 390271.3 N Ground Level 42.60 m OD

Sampling			Properties		Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description	Depth	Legend	Level m OD	
					MADE GROUND: Black tarmacadam.	G.L.		42.60	
					MADE GROUND: Black/brown sandy angular to subangular fine to coarse gravel of brick, ash, and concrete.	0.05		42.55	
					At 0.50m, brick obstruction.	0.50		42.10	
					End of Borehole				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.50	0.40	Inspection Pit	HR	G.I. 0.50			07/12/15 07/12/15	08:00 18:00						None encountered.

Remarks  The Borehole was terminated at a depth of 0.50m within the inspection pit upon encountering a brick obstruction. The rig was moved to BHCT6A.
 Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole Project No **CT6A**
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389162.2 E
390271.7 N

Ground Level 42.59 m OD

Sampling			Properties		Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description		Depth	Legend	Level m OD
					MADE GROUND: Black tarmacadam.		G.I. 0.05		42.59 42.54
					MADE GROUND: Black sandy angular to subangular fine to coarse gravel of ash, concrete and brick.				
					MADE GROUND: Metal plate.		0.95 1.00		41.64 41.59
					End of Borehole				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.00	0.40	Inspection Pit	HR	G.I. 1.00			07/12/15 07/12/15	08:00 18:00						None encountered.

Remarks The Borehole was terminated at a depth of 1.00m within the inspection pit upon encountering a metal plate obstruction. The rig was moved to BHCT6B.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010



Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion


Project STOCKPORT BUS STATION Engineer AECOM Borehole Project No CT6B PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389163.5 E 390271.4 N Ground Level 42.66 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
						MADE GROUND: Black tarmacadam.	G.L. 0.05		42.66		
1.20- 1.65	D				S27				42.61		
2.00- 2.45	D	2.00 (DRY)			S6	At 2.00m, loose.					
3.00- 3.45	D	3.00 (DRY)			S50	At 3.00m, dense.					
4.00- 4.31	D	4.00 (DRY)			S50/160	Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.00		38.66		
5.00- 5.14	D	4.00 (DRY)			S50/50						
						End of Borehole	5.50		37.16		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	HR	G.I. 5.50	4.00	DRY	07/12/15	09:00						None encountered.
5.50	0.15	Cable Percussion	HR				07/12/15	18:00						

Remarks  Inspection pit hand excavated to 1.20m depth.
 Water was added to assist boring between 4.00m and 5.00m.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
 11/03/2016


BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT7
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389156.2 E 390263.3 N Ground Level 42.75 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Black tarmacadam.	G.L.		42.75	
						MADE GROUND: Yellowish brown sandy fine to coarse angular gravel of limestone (Sub base).	0.10		42.65	
						MADE GROUND: Concrete.	0.15		42.60	
						MADE GROUND: Loose dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High cobble content and a high boulder content.	0.30		42.45	
1.20- 1.65	D				S4					
2.00- 2.45	D	1.50 (DRY)			S5					
3.00- 3.45	D	3.00 (DRY)			S30	At 3.00m, medium dense/dense.				
4.00- 4.15	D	4.00 (DRY)			S50/75	Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.80		38.95	
5.00- 5.15	D	4.50 (DRY)			S50/75					
						End of Borehole	5.50		37.25	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	HR	G.I.			04/12/15	08:00						None encountered.
5.50	0.15	Cable Percussion	HR	5.50	4.50	DRY	04/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth. Water was added to assist boring between 4.00m and 5.00m. Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level. Chiselling: 4.00-5.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
11/03/2016

BOREHOLE RECORD - Cable Percussion

Project STOCKPORT BUS STATION Engineer AECOM Borehole CT8
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389163.8 E 390266.4 N Project No PN153428
 Ground Level 42.72 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
						MADE GROUND: Black tarmacadam.	G.L. 0.05		42.72		
1.20- 1.65	D				S4	MADE GROUND: Loose dark brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash. High cobble content and a high boulder content.			42.67		
2.00- 2.45	D	1.50 (DRY)			S31	Boulder of dark red fine to medium grained sandstone.					
3.00- 3.15	D	3.00 (DRY)			S50/75	At 3.00m, very dense.					
4.00- 4.17	D	4.00 (DRY)			S50/85						
5.00- 5.15	D	4.50 (DRY)			S50/75	Very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	5.00		37.72		
6.00- 6.15	D	4.50 (DRY)			S50/75						
						End of Borehole	6.50		36.22		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	HR	G.I.			07/12/15	08:00						None encountered.
6.50	0.15	Cable Percussion	HR	1.20		DRY	07/12/15	18:00						
				1.20		DRY	08/12/15	08:00						
				6.50	4.50	DRY	08/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 Backfill details from base of hole: bentonite seal up to 0.30m, gravel filter up to 0.20m, tarmacadam up to ground level.
 Chiselling: 3.00-3.50m for 60 minutes and 5.00-6.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
11/03/2016

APPENDIX 3

Rotary Core Photographs

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH101 4.80m - 9.30m



BH101 9.30m - 15.30m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH102 5.00m - 8.54m



BH102 8.54m - 12.70m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BHI02 12.70m - 14.70m



BHI03 4.80 - 7.20

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH103 7.20 - 10.20



BH103 10.20 - 14.70

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH104 5.00 - 8.85



BH104 8.85 - 15.00

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH105 4.50-8.30



BH105 8.30 - 14.35

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH105 14.35 - 15.20



BH106 3.40 - 6.90

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH106 6.90 - 12.40



BH106 12.40 - 15.00

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH107 4.00 - 8.00



BH108 6.50m - 8.80m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH108 8.80m - 11.80m



BH108 11.80m - 14.80m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH108 14.80m - 17.80m



BH108 17.80m - 22.30m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH109 5.20m - 12.20m



BH109 12.20m - 16.50m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH109 16.90m - 19.70m



BH109 19.70m - 20.70m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH1 | 2 5.50m - 7.30m



BH1 | 2 7.30m - 10.30m

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



BH112 10.30m - 14.80m

APPENDIX 4

Trial Pit Records & Sketches

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/-(mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal	
Filter	
Seal	

Strata Legend

Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued

Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials

Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION


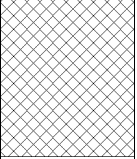
Engineer AECOM

Trial Pit **HP01**
Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389288.6 E
390260.6 N

Ground Level 48.58 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
				MADE GROUND: Black tarmacadam.	G.L.		48.58
0.20- 0.50	B			MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick and concrete.	0.10		48.48
0.20	ES						
0.50- 1.00	B						
0.50	ES						
1.00	ES			End of Excavation	1.20		47.38

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date	09/12/2015	Length (C)	0.40			None encountered.
Shoring	None.	Date Backfilled	09/12/2015			
Stability	stable during excavation.					


Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1
11/03/2016



TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

Engineer AECOM

Trial Pit **HP02**
Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389310.6 E
390281.3 N

Ground Level 52.84 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
				MADE GROUND: Black tarmacadam.	G.L.		52.84
0.20	ES			MADE GROUND: Brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	0.10		52.74
0.20- 0.30	ES				0.30		52.54
0.30- 0.60	B				0.60		52.24
0.50	ES						
0.60- 1.00	B			MADE GROUND: Light brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of sandstone, concrete and brick.			
1.00	ES			MADE GROUND: Dark brown to grey clayey gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	1.20		51.64
				End of Excavation			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date	09/12/2015	Length (C)	0.40			None encountered.
Shoring	None.	Date Backfilled	09/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars


Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1
11/03/2016



TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

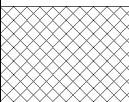
Engineer AECOM

Trial Pit Project No **TP1**
PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389129.8 E
390307.0 N

Ground Level 42.25 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, brick, timber, plastic and ceramic.	G.L.		42.25
0.50	ES				0.65		41.60
				End of Excavation			


Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.50	Depth Observed	Depth of Pit	Details
Date	14/12/2015	Length (C)	1.00			None encountered.
Shoring	None.	Date Backfilled	14/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A drawing of the excavation is presented separately.
 The inspection pit was terminated at 0.65m upon encountering concrete.
 Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010


Logged by **NM**
 Figure 1 of 1
 11/03/2016




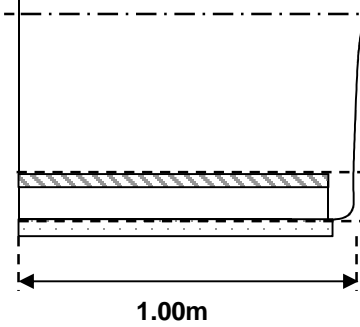
Concrete Wall

1.40m

KEY:

 **Concrete 1**

 **Concrete 2**



GL

Strata 1: MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies including brick, wood, tile, plastic and concrete

0.50mbgl

0.65mbgl

1.00m

TP1

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:
TFGM

Project:
Stockport Bus Station

Project No: **PN153428**

Title:
Foundation Pit Record

View:
Cross-section

Excavated: **14.12.2015**

Drawn by: **NM**

Date: **14.12.2015**

Contact: NMisyris@geotechnics.co.uk



The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

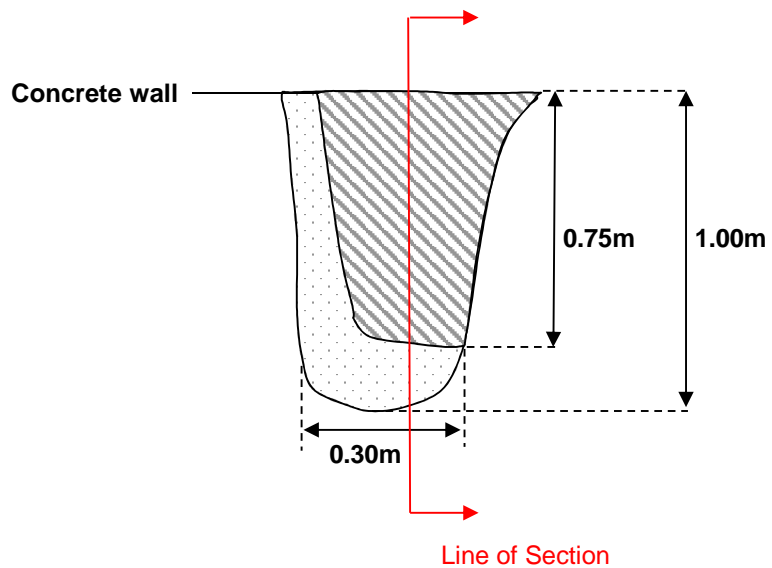
Tel: **01244 671117**

Fax: **01244 671122**



N^o **TP1(2)**

All dimensions in metres, unless otherwise stated





KEY:

-  Concrete 2
-  Concrete 1

TP1

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated:

14.12.2015

Drawn by:

NM

Date:

14.12.2015

Contact:

NMisyris@geotechnics.co.uk



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 Unit 1
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Tel.

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Fax.

01244 671122

N^o

TP1(1)

All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

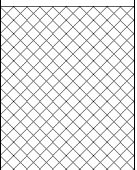
Engineer AECOM

Trial Pit **TP2**
Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389138.2 E
390302.5 N

Ground Level 42.09 m OD

Samples and Tests				Strata	Scale 1:50			
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD	
0.20	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	G.L.		42.09	
0.50	ES							
1.00	ES							
				End of Excavation	1.10		40.99	


Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.65	Depth Observed	Depth of Pit	Details
Date	14/12/2015	Length (C)	0.45			None encountered.
Shoring	None.	Date Backfilled	14/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
Figure 1 of 1
11/03/2016



NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

14.12.2015

Drawn by:

NM

Date:

14.12.2015

Contact:

NMisyris@geotechnics.co.uk



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Tel.

01244 671117

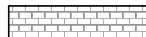
Fax.

01244 671122

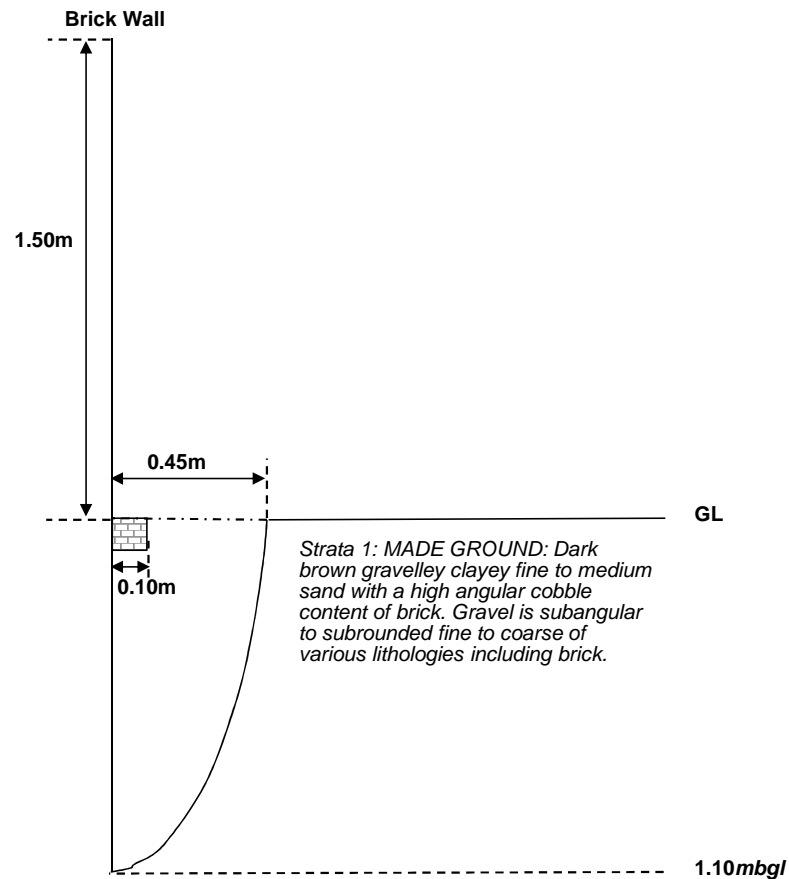
N^o

TP2(2)

KEY:

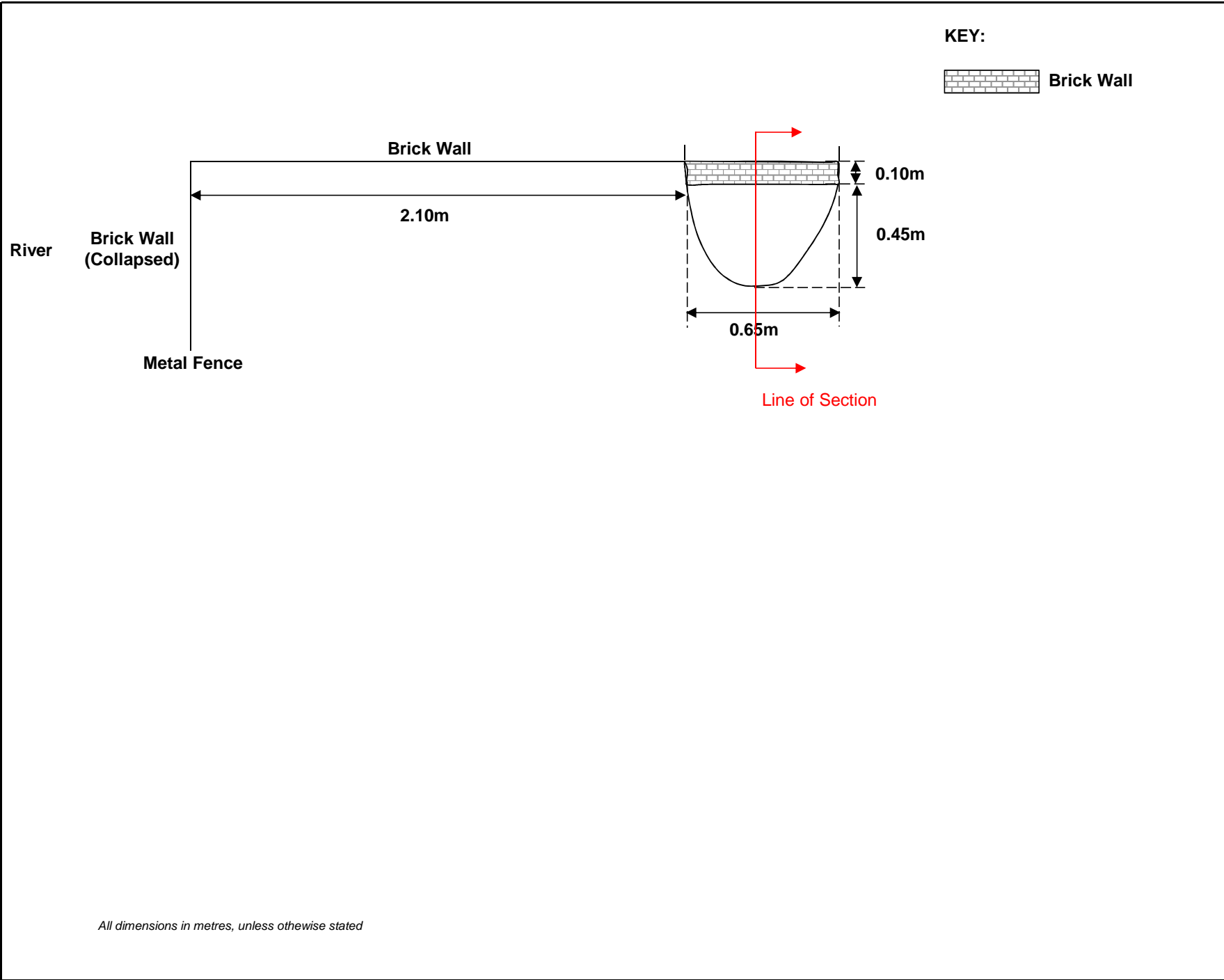


Brickwork



All dimensions in metres, unless otherwise stated





TP2

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:
TFGM

Project:
Stockport Bus Station

Project No: **PN153428**

Title:
Foundation Pit Record

View:
Plan

Excavated: **14.12.2015**

Drawn by: **NM**

Date: **14.12.2015**

Contact: NMisyris@geotechnics.co.uk



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Tel. **01244 671117**

Fax. **01244 671122**

N^o **TP2(1)**

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION




Engineer AECOM

Trial Pit **TP3**
Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389145.5 E
390305.3 N

Ground Level 42.07 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Black tarmacadam.	G.L.		42.07
0.50	ES			MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies.	0.30 0.50		41.77 41.57
0.85	ES			MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of granite, concrete, timber and plastic.	0.85		41.22
				End of Excavation			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.50	Depth Observed	Depth of Pit	Details
Date	11/12/2015	Length (C)	0.50			None encountered.
Shoring	None.	Date Backfilled	11/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.


Symbols and abbreviations are explained on the accompanying key sheet.

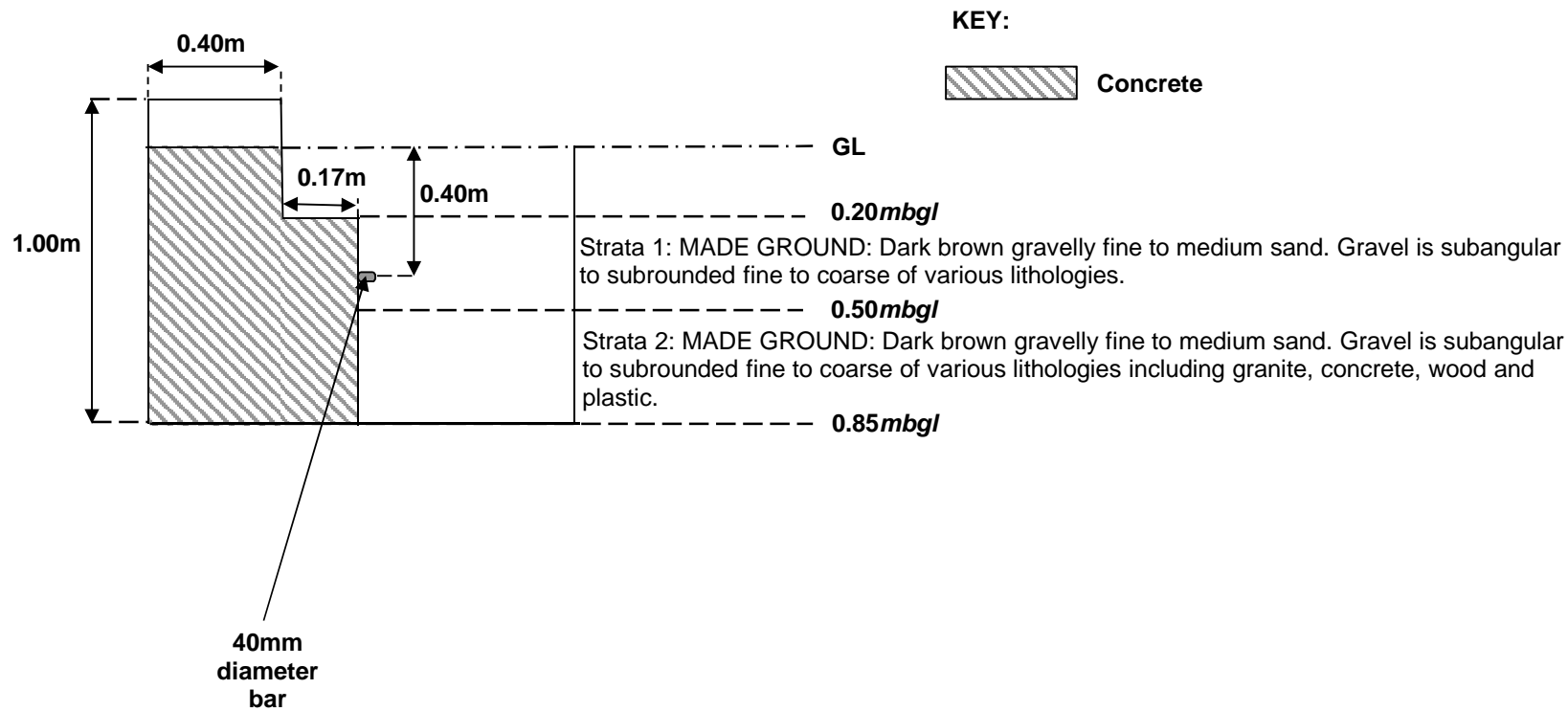
All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1
11/03/2016





All dimensions in metres, unless otherwise stated

TP3

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

11.12.2015

Drawn by:

NM

Date:

11.12.2015

Contact:

NMisyris@geotechnics.co.uk



The Geotechnical Centre
 Unit 1
 Borders Industrial Park
 River Lane
 Saltney
 Chester
 CH4 8RJ

Tel.

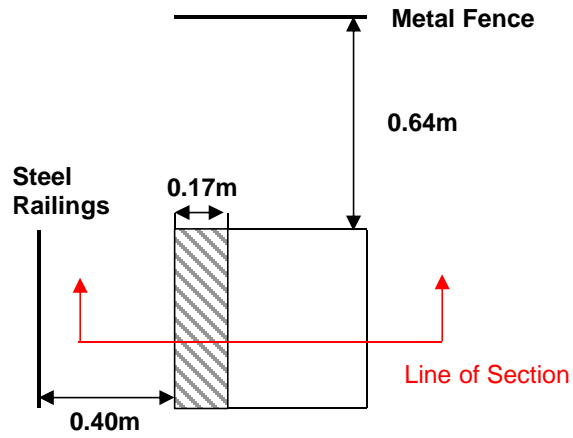
01244 671117

Fax.

01244 671122

N°

TP3(2)



KEY:



Concrete

TP3

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated:

11.12.2015

Drawn by:

NM

Date:

11.12.2015

Contact:

NMisyris@geotechnics.co.uk



The Geotechnical Centre
 Unit 1
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 Chester
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Tel.

01244 671117

Fax.

01244 671122

N^o

TP3(1)

All dimensions in metres, unless otherwise stated



TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

Engineer AECOM

Trial Pit **TP4**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389151.2 E
390306.7 N

Ground Level 42.12 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Black tarmacadam.	G.L.		42.12
0.50	ES			MADE GROUND: Black sandy angular to subangular fine to coarse gravel of brick and concrete. Ash present.	0.10		42.02
				End of Excavation	0.80		41.32

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.46	Depth Observed	Depth of Pit	Details
Date	09/12/2015	Length (C)	0.40			None encountered.
Shoring	None.	Date Backfilled	09/12/2015			
Stability	stable during excavation.					

Remarks The inspection pit was terminated at 0.80m upon encountering concrete.
 ES sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by GT
 Figure 1 of 1
 11/03/2016

TP4

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

09.12.2015

Drawn by:

GT

Date:

09.12.2015

Contact:

GTeasdale@geotechnics.co.uk



The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
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Chester
CH4 8RJ

Tel.

01244 671117

Fax.

01244 671122

Nº

TP4(2)

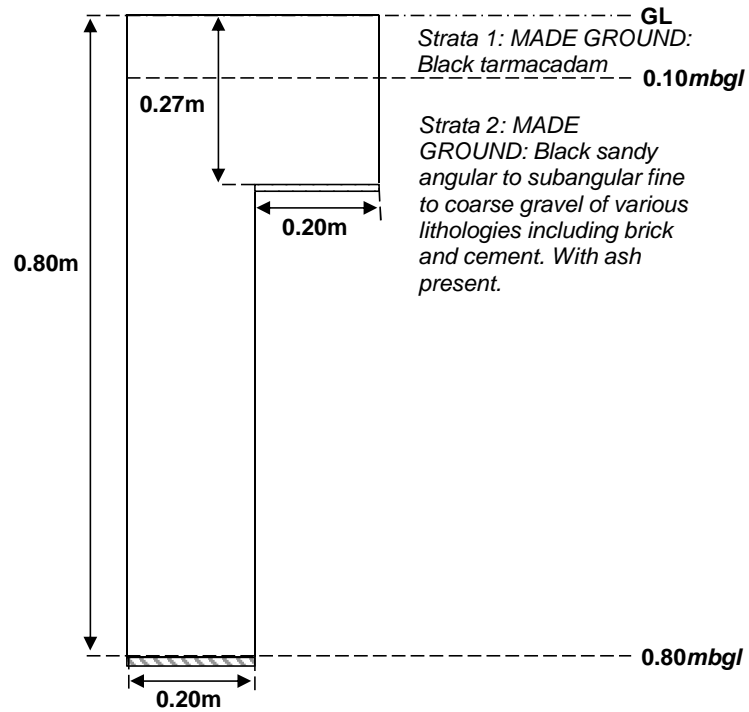
KEY:



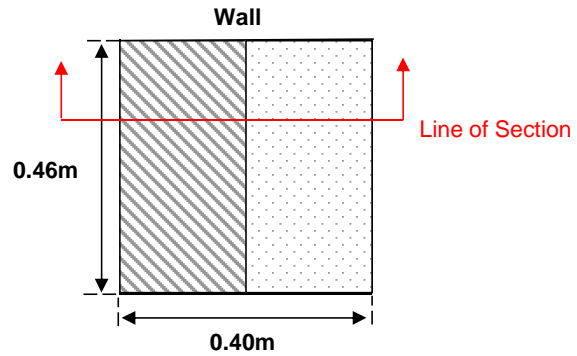
Concrete 1



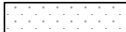

Concrete 2



All dimensions in metres, unless otherwise stated



KEY:

-  Concrete 1
-  Concrete 2

TP4

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No: PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated: 09.12.2015

Drawn by: GT

Date: 09.12.2015

Contact: GTeasdale@geotechnics.co.uk



The Geotechnical Centre
 Unit 1
 Borders Industrial Park
 River Lane
 Saltney
 Chester
 CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N^o

TP4(1)

All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

Engineer AECOM

Trial Pit **TP5**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Grid Coordinates 389148.6 E
390317.5 N

Ground Level 42.16 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Black tarmacadam.	G.L. 0.08 0.14		42.16 42.08 42.02
0.50	ES			MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite.			
1.00	ES			MADE GROUND: Black gravelly fine to coarse sand. Gravel is angular and fine to coarse of brick.	0.90		41.26
				MADE GROUND: Firm brown slightly sandy slightly gravelly clay. Gravel is angular and fine to coarse of brick fragments.	1.20		40.96
				End of Excavation			

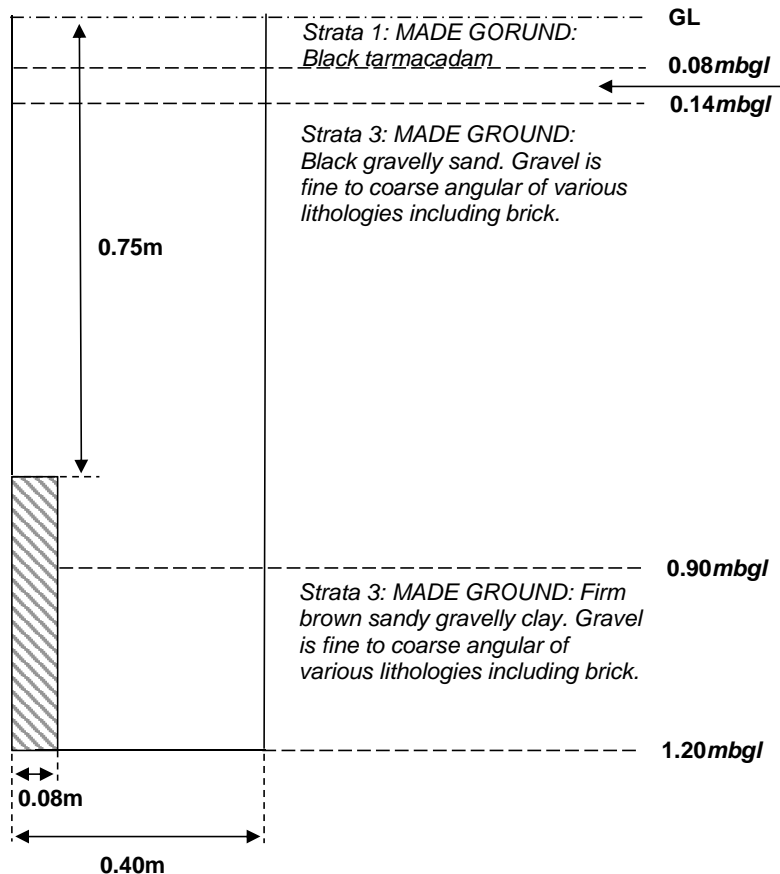
Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date	09/12/2015	Length (C)	0.35			None encountered.
Shoring	None.	Date Backfilled	09/12/2015			
Stability	stable during excavation.					

Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by GT
Figure 1 of 1
11/03/2016



KEY:
 **Brickwork**

TP5

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:
TFGM

Project:
Stockport Bus Station

Project No: PN153428

Title:
Foundation Pit Record

View:
Cross-Sectional

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk



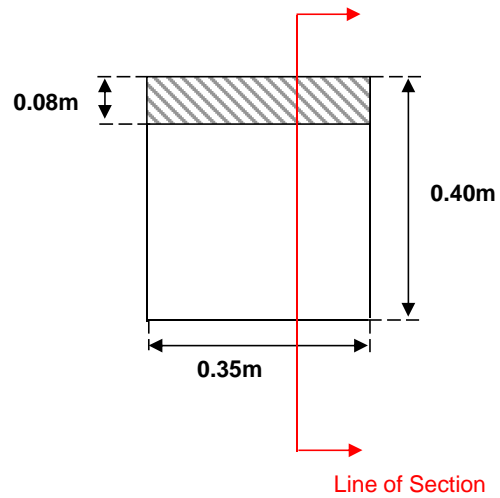
The Geotechnical Centre
 Unit 1
 Borders Industrial Park
 River Lane
 Saltney
 Chester
 CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

Nº TP5(2)

All dimensions in metres, unless otherwise stated



KEY:
 **Brickwork**

TP5

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated:

15.12.2015

Drawn by:

GT

Date:

15.12.2015

Contact:

GTeasdale@geotechnics.co.uk



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N^o

TP5(1)

All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION





Engineer

AECOM


Trial Pit
Project No

TP6A
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
				MADE GROUND: Black tarmacadam.	G.L.		
0.50	ES			MADE GROUND: Intact brickwork.	0.20 0.30		
1.00	ES			MADE GROUND: Light brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	0.60		
				MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	1.25		
				End of Excavation			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.30	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	0.35			None encountered.
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars. The excavation was subsequently extended and presented as TP6B.


Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

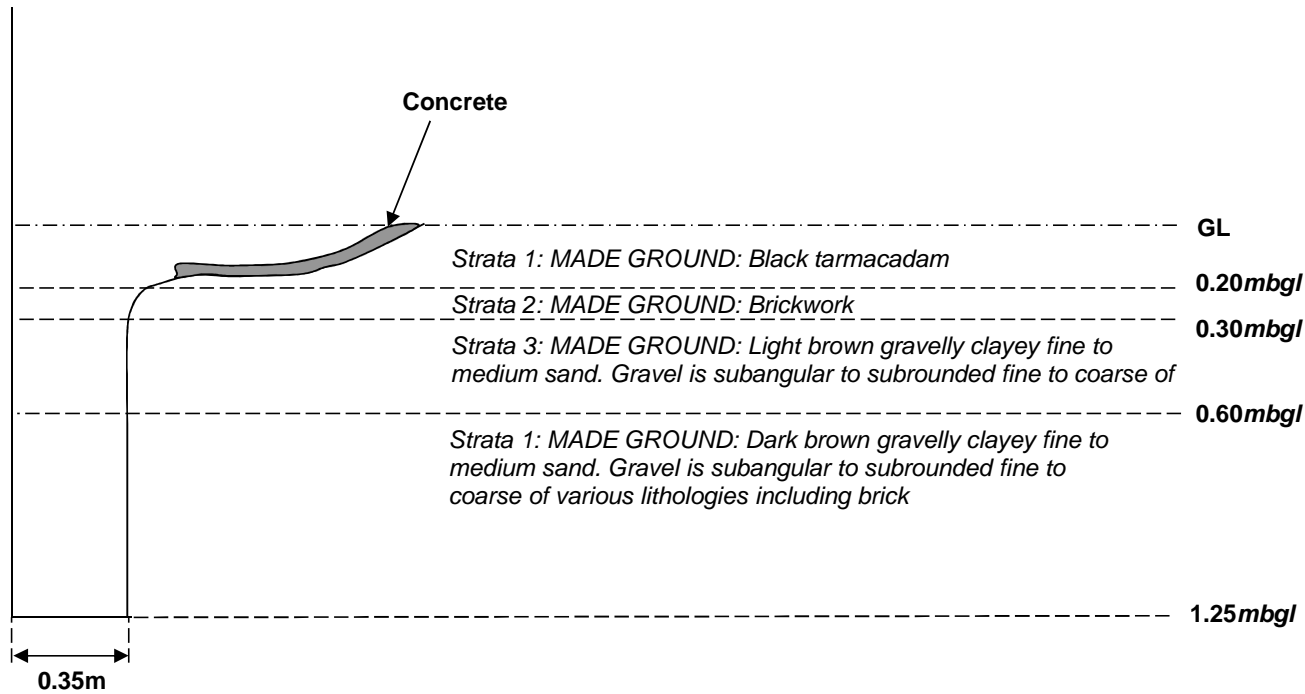
Logged in accordance with BS5930:1999 + A2:2010

Logged by **NM**

Figure **1 of 1**
11/03/2016



Brick Wall



All dimensions in metres, unless otherwise stated

TP6a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

15.12.2015

Drawn by:

NM

Date:

15.12.2015

Contact:

NMisyris@geotechnics.co.uk



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River Lane
Saltney
Chester
CH4 8RJ

Tel.

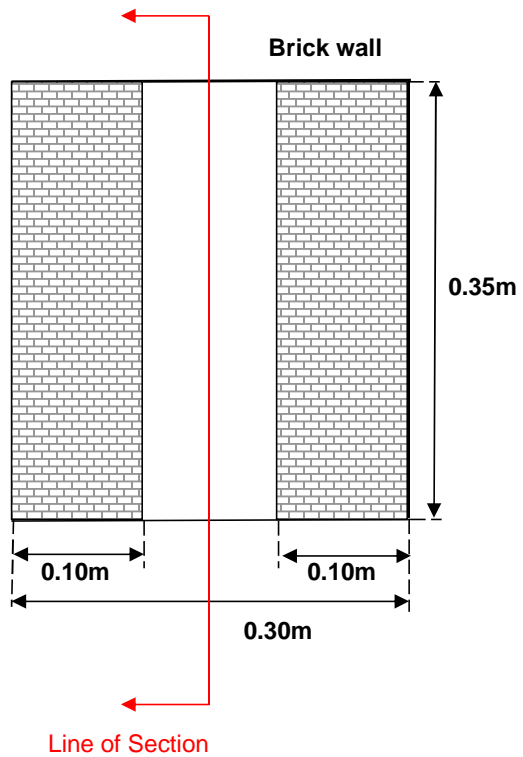
01244 671117

Fax.

01244 671122

N^o

TP6a(2)



TP6a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated:

15.12.2015

Drawn by:

NM

Date:

15.12.2015

Contact:

NMisyris@geotechnics.co.uk



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N^o

TP6a(1)

All dimensions in metres, unless otherwise stated



Samples and Tests				Strata		Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend		
0.10	ES			MADE GROUND: Black tarmacadam.	G.L.			
				MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite.	0.10			
				MADE GROUND: Black tarmacadam.	0.24			
				MADE GROUND: Grey sandstone paving slab.	0.35			
				End of Excavation	0.40			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.70	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	5.65			None encountered.
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					

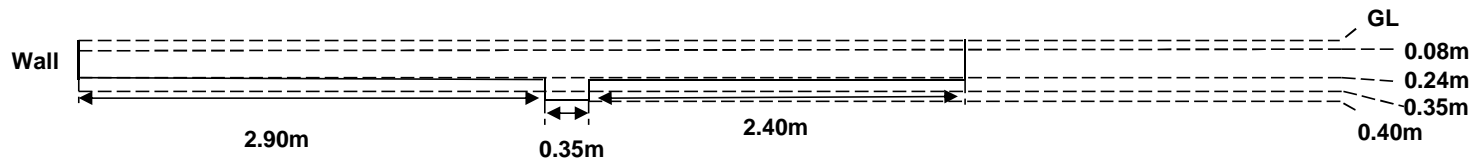
Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A drawing of the excavation is presented separately.
 The excavation is an extension to TP6A.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT
 Figure 1 of 1
 11/03/2016



KEY:

-----	GL
<i>Strata 1: MADE GROUND: Black tarmacadam</i>	
-----	0.08m
<i>Strata 2: MADE GROUND: Pinkish grey sandy subangular to subrounded fine to coarse gravel of dolomite (sub base).</i>	
-----	0.24m
<i>Strata 3: MADE GROUND: Black tarmacadam</i>	
-----	0.35m
<i>Strata 4: MADE GROUND: Grey sandstone paving slab.</i>	
-----	0.40m

All dimensions in metres, unless otherwise stated

TP6b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No: PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk



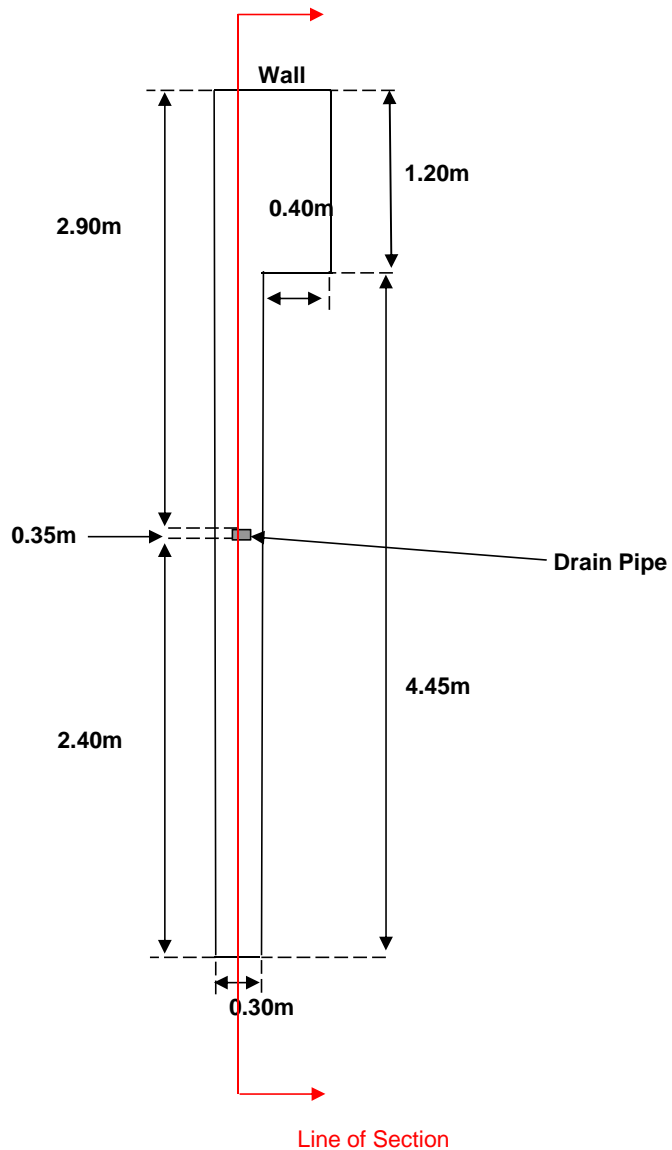
The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N^o

TP6b(2)



TP6b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No: PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk



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TP6b(1)

All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION



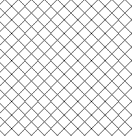
Engineer

AECOM


Trial Pit
Project No

TP7A
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.50	ES			MADE GROUND: Black tarmacadam.	G.L.		
				MADE GROUND: Grey concrete.	0.20 0.35		
1.00	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick and concrete.			
				End of Excavation	1.30		

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.50	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	0.30			
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					


Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A drawing of the excavation is presented separately.
 The excavation was subsequently extended and presented as TP7B.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
 Figure 1 of 1
 11/03/2016



TP7a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

15.12.2015

Drawn by:

NM

Date:

15.12.2015

Contact:

NMisvris@geotechnics.co.uk



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N^o

TP7a(2)

Brick Wall

Concrete

GL

Strata 1: MADE GROUND:
Black tarmacadam and brick

0.20mbgl

Strata 2: MADE GROUND:
Grey concrete

0.35mbgl

Strata 3: MADE GROUND:
Dark brown gravelly clayey
fine to medium SAND. Gravel
is subangular to subrounded
fine to coarse of various
lithologies including brick and
concrete.

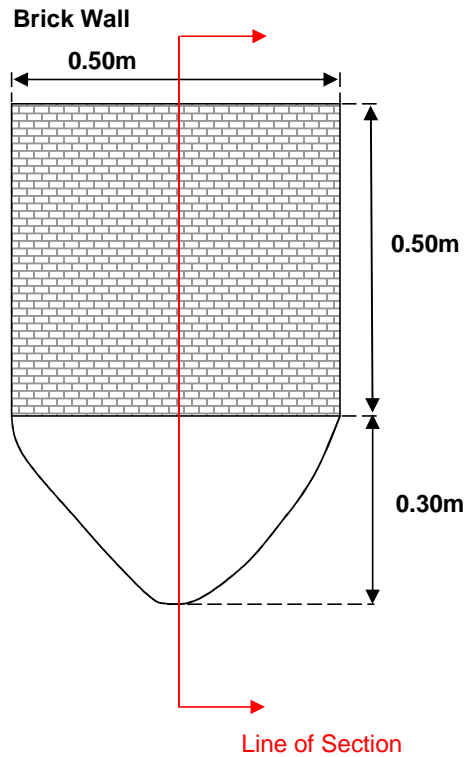
1.30mbgl

0.50m


0.30m

All dimensions in metres, unless othewise stated





KEY:

 Brickwork

All dimensions in metres, unless otherwise stated

TP7a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan View

Excavated:

15.12.2015

Drawn by:

NM

Date:

15.12.2015

Contact:

NMisyris@geotechnics.co.uk



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Unit 1
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N^o

TP7a(1)

TRIAL PIT RECORD

Inspection Pit


Project STOCKPORT BUS STATION

Engineer AECOM


Trial Pit
Project No

TP7B
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.10	ES			MADE GROUND: Black tarmacadam.	G.L. 0.08		
				MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite.	0.33		
				At 0.24, refusal on black tarmacadam.			
				End of Excavation			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.70	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	3.00			None encountered.
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					

Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A drawing of the excavation is presented separately.
 The excavation is an extension to TP7A.


Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

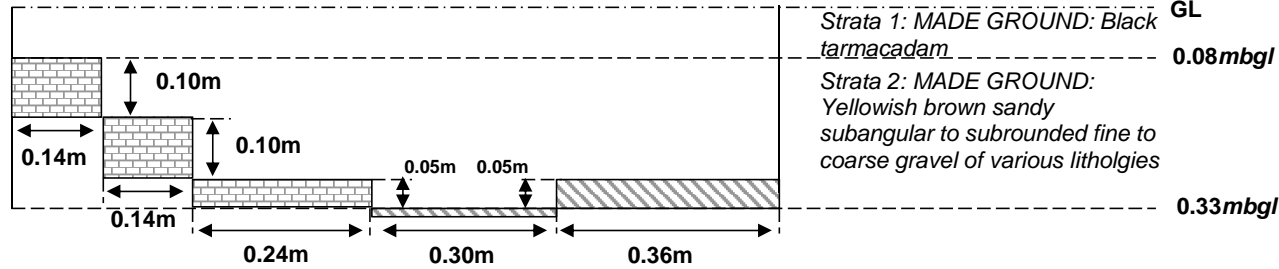
Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1
11/03/2016



Brick Wall



KEY:

-  **Brickwork**
-  **Concrete**

All dimensions in metres, unless otherwise stated

TP7b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

15.12.2015

Drawn by:

GT

Date:

15.12.2015

Contact:

GTeasdale@geotechnics.co.uk



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Chester
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N^o

TP7b(2)

TP7b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stockport Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Plan

Excavated:

15.12.2015

Drawn by:

GT

Date:

15.12.2015

Contact:

GTeasdale@geotechnics.co.uk



The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel.

01244 671117

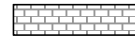
Fax.

01244 671122

N^o

TP7b(1)

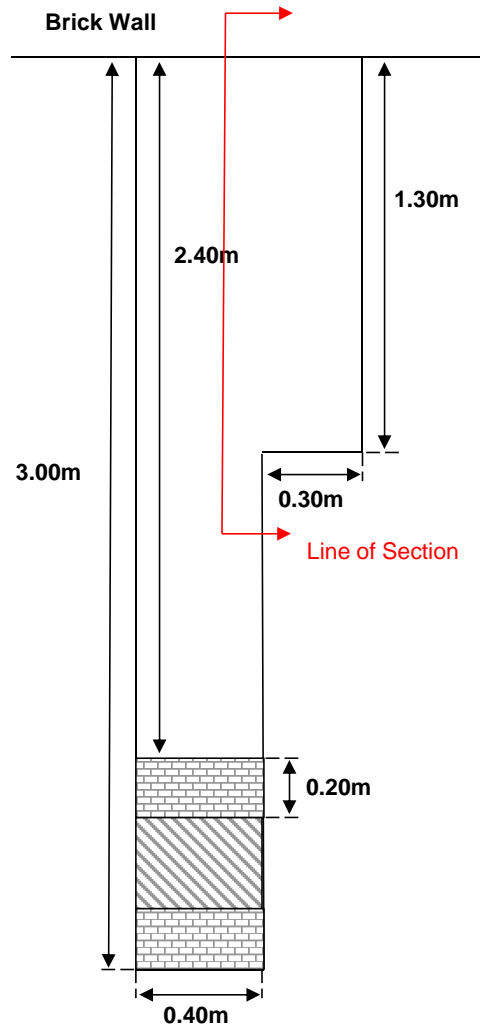
KEY:



Brickwork



Concrete base



All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

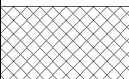

Engineer AECOM

Trial Pit **TP8**
Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389165.3 E
390276.6 N

Ground Level 42.80 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Black organic gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of brick. Ash present.	G.L.		42.80
0.50	ES				MADE GROUND: Blackish brown sandy angular to subangular fine to coarse gravel of clinker. Ash present.	0.50	
				End of Excavation	0.80		42.00


Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.35	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	1.25			None encountered.
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					

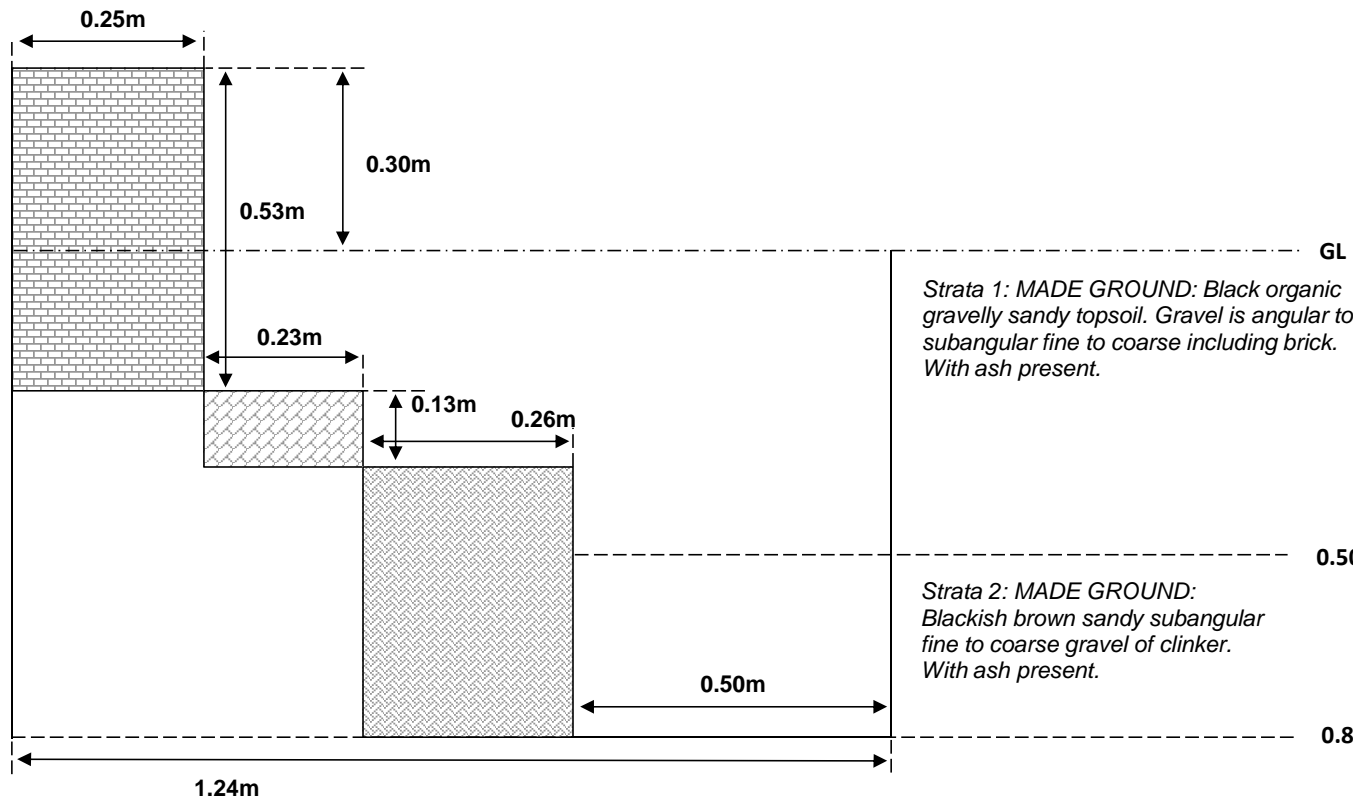
Remarks  ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

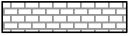


All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by GT
Figure 1 of 1
11/03/2016





KEY:

-  **Brickwork 1**
-  **Brickwork 2**
-  **Brickwork 3**

All dimensions in metres, unless otherwise stated

TP8

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

TFGM

Project:

Stock port Bus Station

Project No:

PN153428

Title:

Foundation Pit Record

View:

Cross-Section

Excavated:

15.12.2015

Drawn by:

GT

Date:

15.12.2015

Contact:

GTeasdale@geotechnics.co.uk



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Unit 1
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Saltney
Chester
CH4 8RJ

Tel.

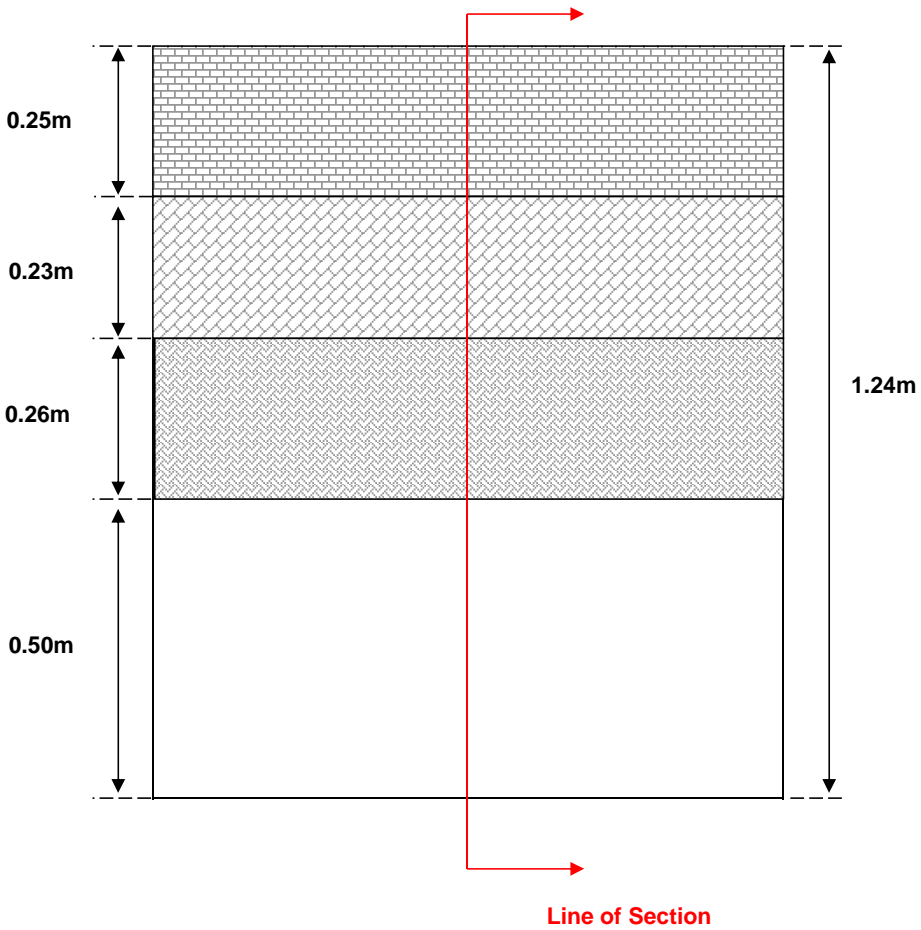
01244 671117




Fax.

01244 671122

Nº

TP8(2)



- KEY:**
-  **Brickwork 1**
 -  **Brickwork 2**
 -  **Brickwork 3**

TP8

NOT TO SCALE
All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:
TFGM

Project:
Stockport Bus Station

Project No: PN153428

Title:
Foundation Pit Record

View:
Plan

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk



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Unit 1
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N ^o	TP8(1)
----------------	--------

All dimensions in metres, unless otherwise stated

TRIAL PIT RECORD

Inspection Pit

Project STOCKPORT BUS STATION

Engineer AECOM

Trial Pit **TP9**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389152.1 E
390264.4 N

Ground Level 42.79 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
0.20	ES			MADE GROUND: Black tarmacadam.	G.L.		42.79
				MADE GROUND: Yellowish brown sandy angular fine to coarse gravel of dolerite (sub base).	0.08		42.71
				End of Excavation	0.24		42.55

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.35	Depth Observed	Depth of Pit	Details
Date	15/12/2015	Length (C)	3.50			None encountered.
Shoring	None.	Date Backfilled	15/12/2015			
Stability	stable during excavation.					

Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1
11/03/2016

APPENDIX 5

Trial Pit Photographs

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TPI - Photo A



TPI - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP2 - Photo A



TP2 - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP3 - Photo A



TP3 - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP4 - Photo A



TP4 - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP5 - Photo A



TP5 - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP6 - Photo A



TP6 - Photo B

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP6 - Photo C



TP7 - Photo A

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP7 - Photo B



TP8 - Photo A

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP8 - Photo B



TP9 - Photo A

PHOTOGRAPHS

Project Number : PNI53428

Project : Stockport Bus Station



TP9 - Photo B

APPENDIX 6

Dynamic Probe Test Results

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/-(mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal	
Filter	
Seal	

Strata Legend

Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued

Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials

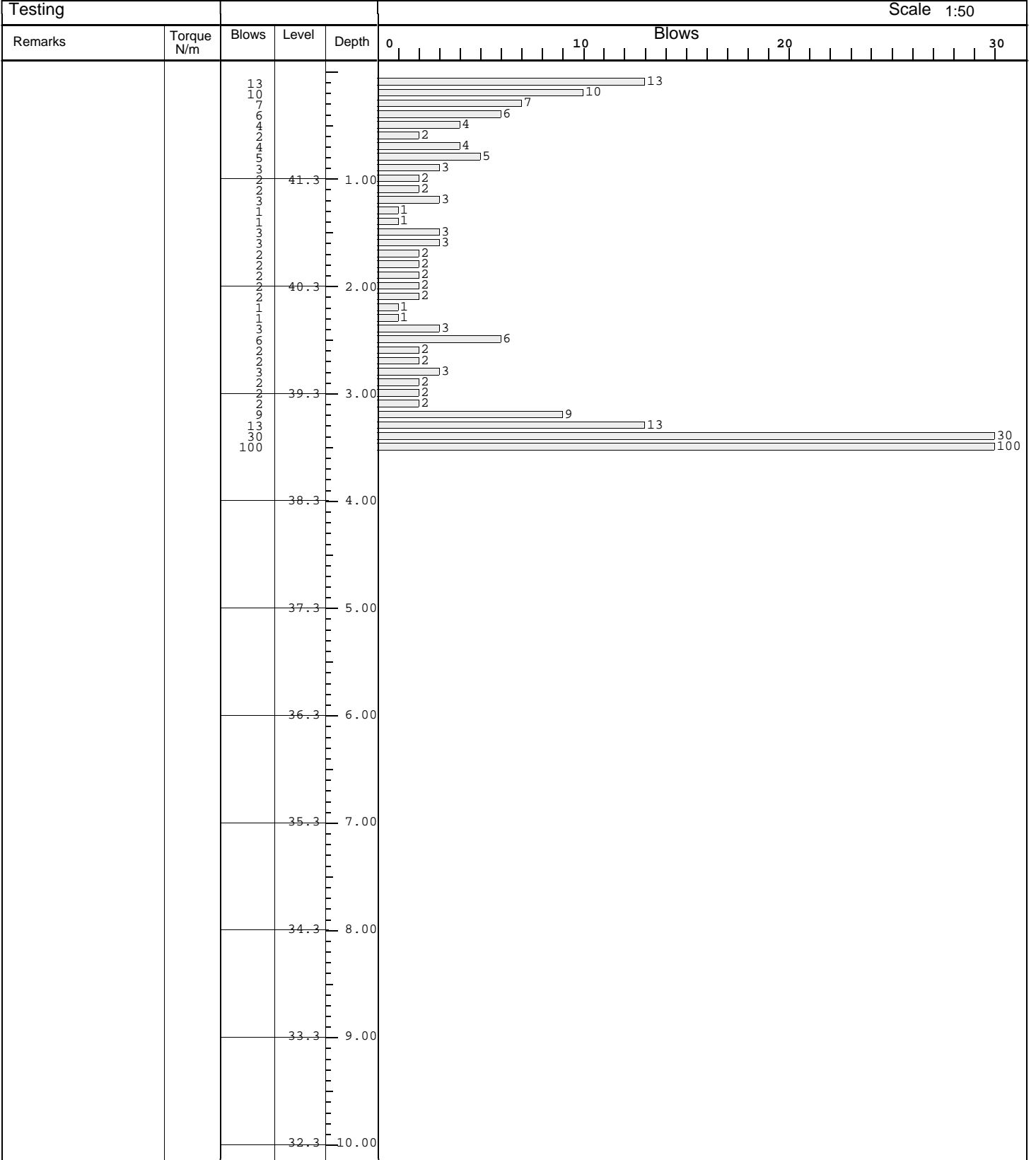
Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

DYNAMIC PROBE RECORD - Super Heavy

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **DP1**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389135.6 E**
390312.5 N Project No **PN153428** Ground Level **42.30 m OD**

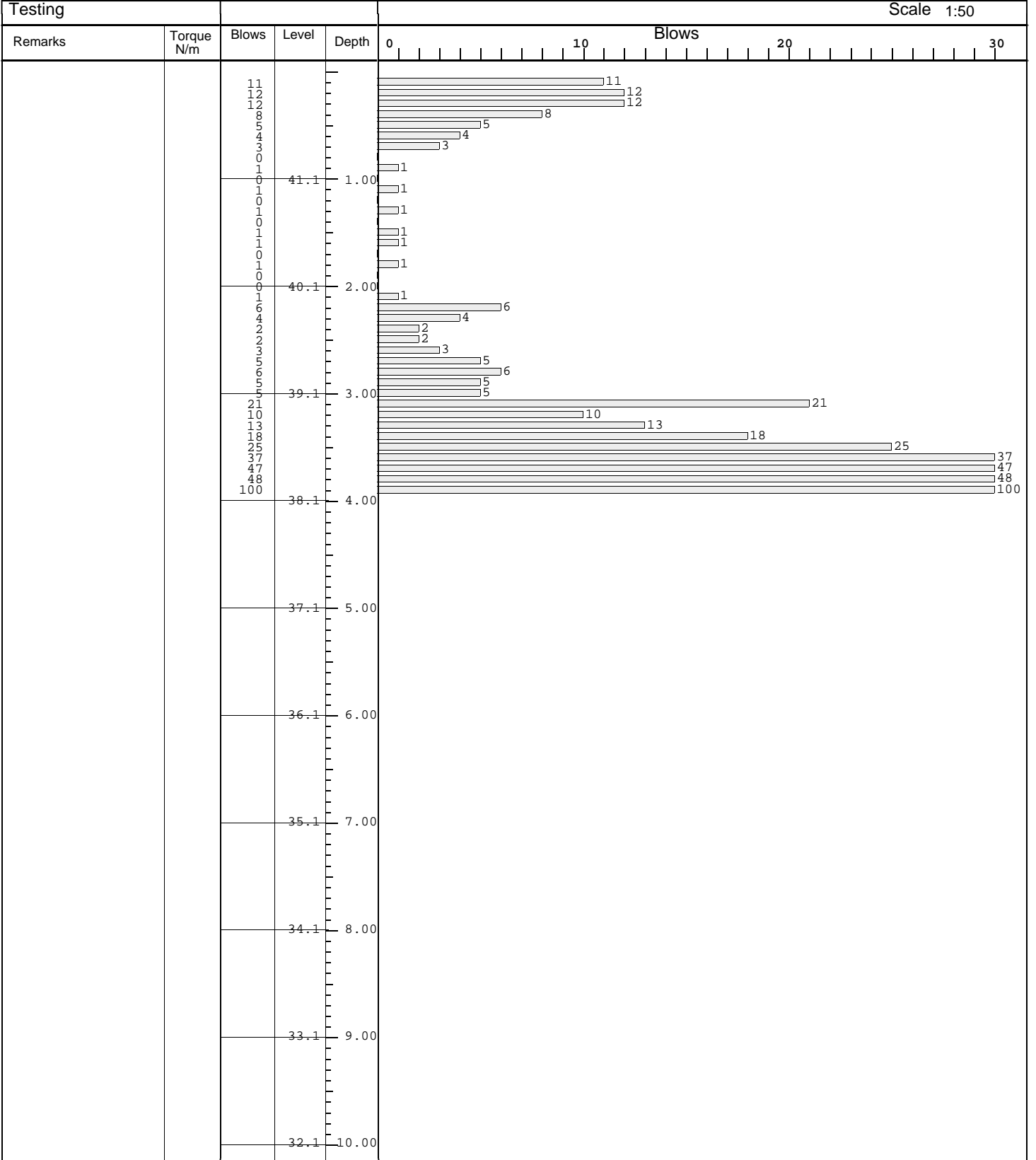


Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
3.45	0.05	Dynamic Probe	AT	G.I. 3.45		DRY	17/12/15	08:00						None encountered.

Remarks Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

DYNAMIC PROBE RECORD - Super Heavy

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **DP2**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389141.1 E**
390310.4 N Project No **PN153428** Ground Level **42.13 m OD**

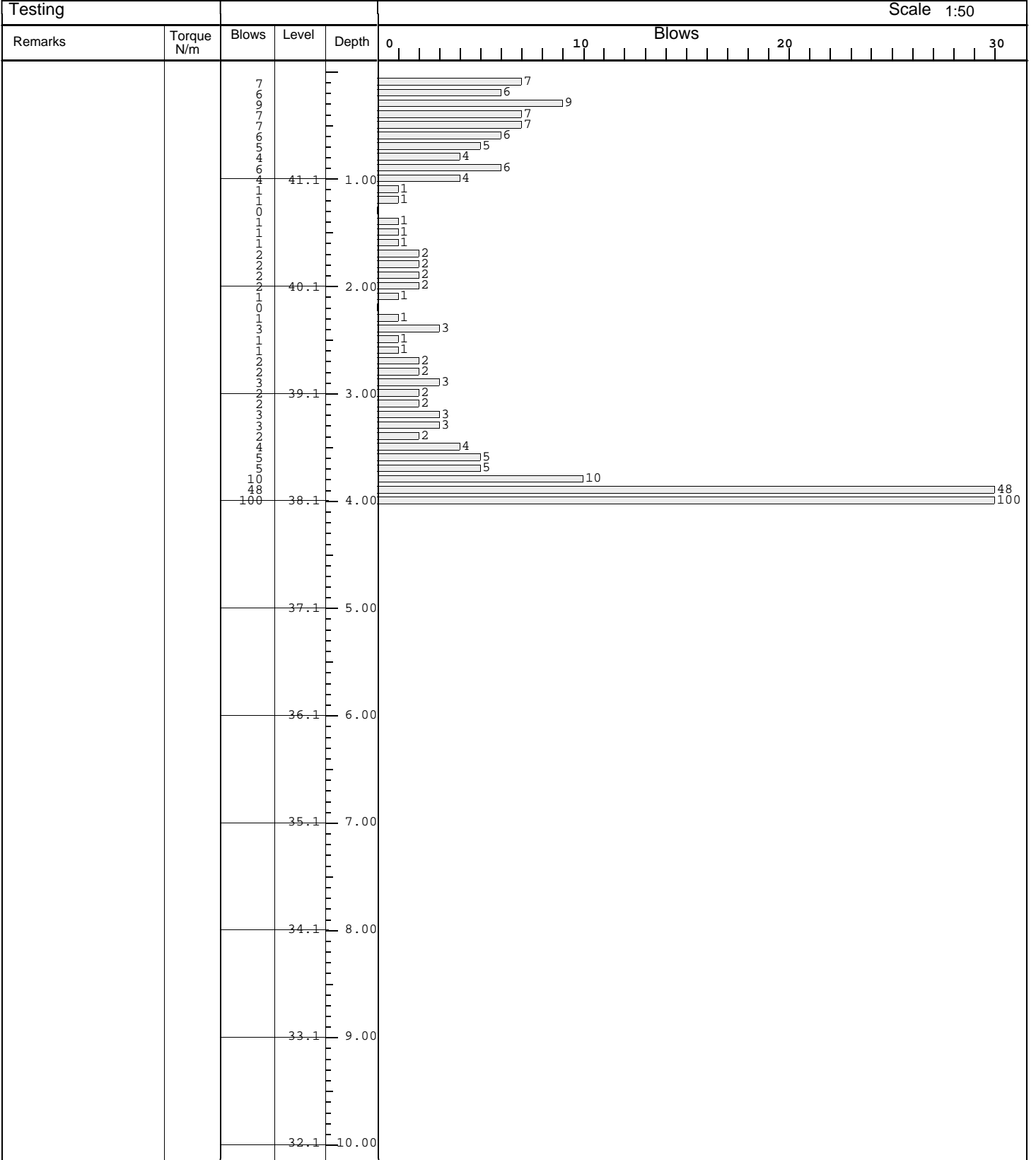


Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
3.87	0.05	Dynamic Probe	AT	G.I. 3.87		DRY	17/12/15	08:00						None encountered.

Remarks Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

DYNAMIC PROBE RECORD - Super Heavy

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **DP3**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389138.1 E** Project No **PN153428**
390305.6 N Ground Level **42.13 m OD**

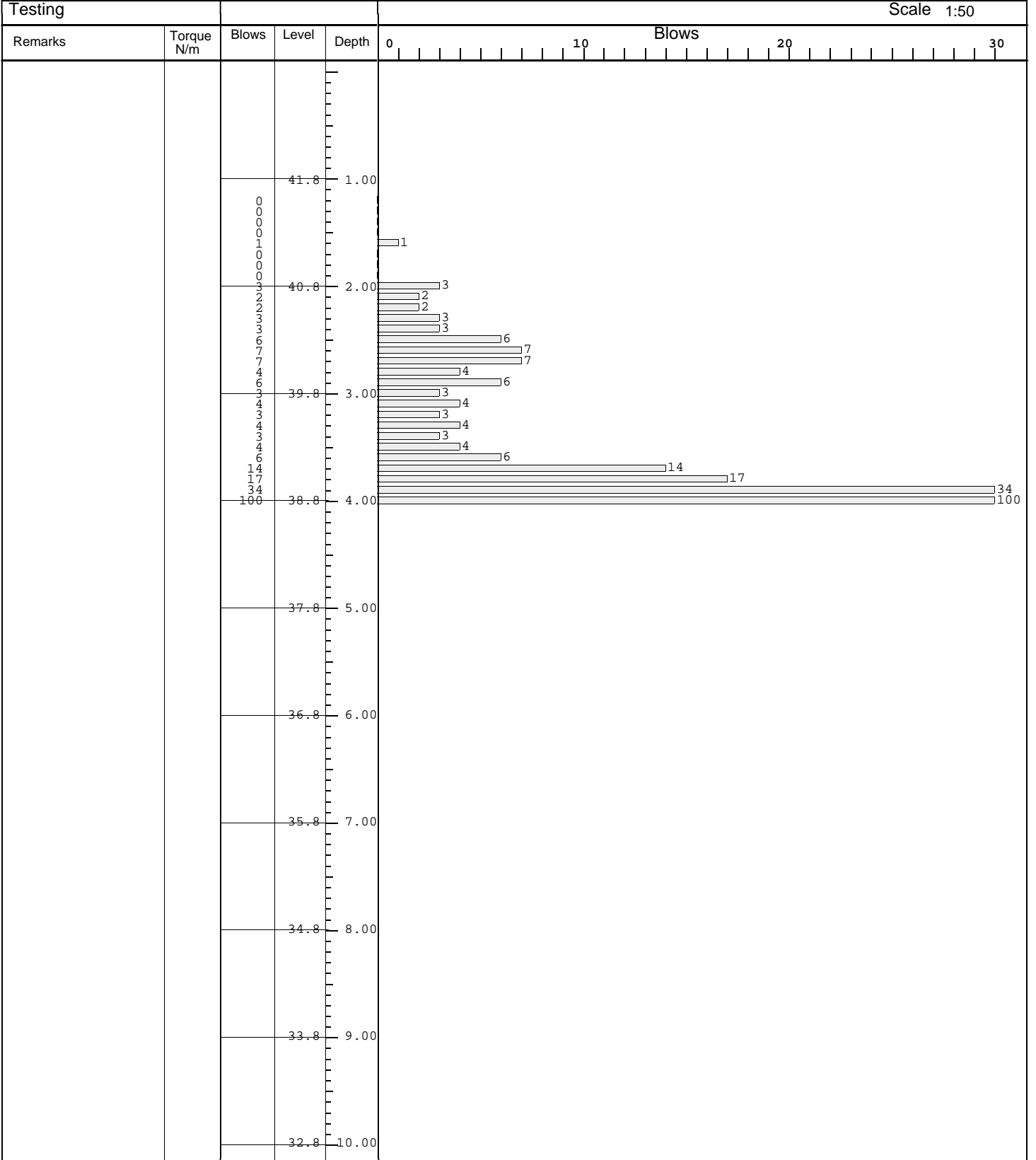


Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
3.95	0.05	Inspection Pit	AT	G.I. 3.95		DRY	17/12/15 17/12/15	08:00 18:00						None encountered.

Remarks Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

DYNAMIC PROBE RECORD - Super Heavy

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **DP8**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389152.9 E**
390260.0 N Project No **PN153428** Ground Level **42.85 m OD**

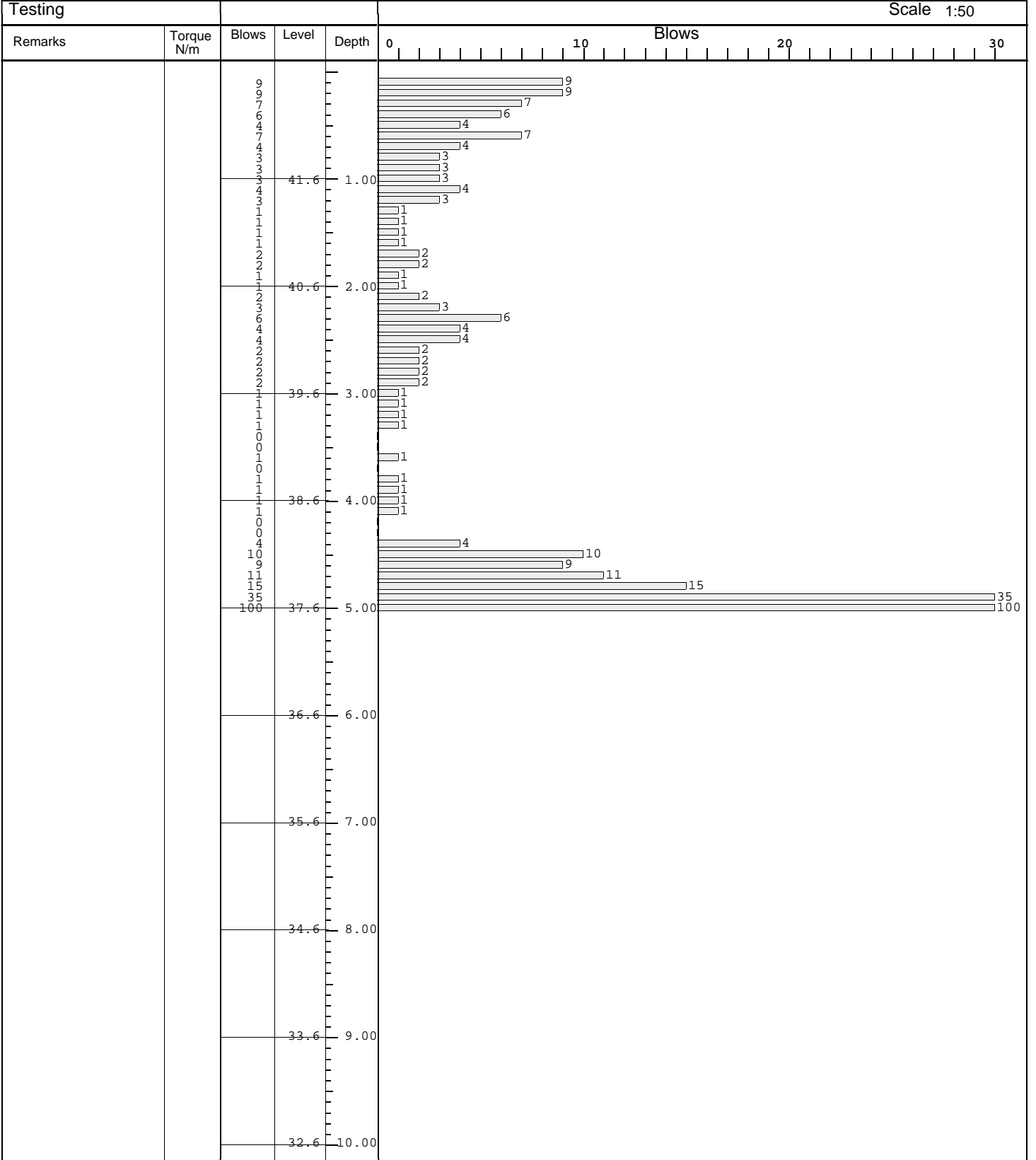


Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.L.			16/12/15	08:00						None encountered.
4.07	0.05	Dynamic Probe	AT	4.07		DRY	16/12/15	18:00						

Remarks Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

DYNAMIC PROBE RECORD - Super Heavy

Project **STOCKPORT BUS STATION** Engineer **AECOM** Borehole **DP10**
 Client **TRANSPORT FOR GREATER MANCHESTER** National Grid Coordinates **389164.1 E**
390266.9 N Project No **PN153428** Ground Level **42.65 m OD**



Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
4.98	0.05	Dynamic Probe	AT	G.L. 5.98		DRY	16/12/15 16/12/15	08:00 18:00						None encountered.

Remarks Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

APPENDIX 7

Dynamic Sample Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/-(mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal	
Filter	
Seal	

Strata Legend

Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued

Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials

Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS201 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389210.7 E 390145.9 N Ground Level 45.61 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.20	ES					MADE GROUND: Brownish orange gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	G.L.		45.61	
0.50	ES						0.80		44.81	
1.00- 1.20	D	(DRY)	18	S28	S11	MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments. Below 1.20m, stiff.	2.00		43.61	
1.00	ES									
1.20- 2.00	B									
1.20- 1.65	D									
2.00- 2.45	D	(DRY)			S11	Firm greyish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies.	2.00		43.61	
2.00- 2.40	D									
2.40- 3.00	B		23		S10	Firm brown CLAY.	3.00		42.61	
3.00- 3.45	D	(DRY)			S10					
3.00- 3.20	D					Very dense reddish brown fine to medium SAND.	3.50		42.11	
3.20- 3.50	B									
3.50- 3.60	D					End of Borehole	4.27		41.34	
3.60- 4.00	B									
4.00- 4.27	D	(DRY)		S50/115						

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			30/11/15	08:00						None encountered.
4.27	0.10	Dynamic Sampler	AT	4.27		DRY	30/11/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth. ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar. A 50mm standpipe was installed to 4.00m with a slotted section from 3.50m to 4.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 3.50m, bentonite seal up to 1.50m, arisings up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS203
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389159.1 E 390201.0 N Ground Level 43.01 m OD


Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.50	B					MADE GROUND: Tarmacadam.	G.L.		43.01		
0.20	ES					MADE GROUND: Dark brown sandy angular to subangular fine to medium gravel of various lithologies, fragments of brick and concrete. Occasional rootlets.	0.10		42.91		
0.50- 1.00	B						0.20		42.81		
0.50	ES					MADE GROUND: Very loose dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.					
1.00	ES										
1.20- 2.00	B	(DRY)			S0						
1.20- 1.65	D					Very loose reddish brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of sandstone. Low cobble content of sandstone.	1.50		41.51		
2.00- 3.00	B	(DRY)			S34	Dense brown gravelly fine to medium SAND with black organic matter. Gravel is subangular to subrounded fine to coarse of sandstone.	2.00		41.01		
2.00- 2.45	D										
						Dense orangish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone. Low cobble content of sandstone. At 3.00m, very dense.	2.30		40.71		
3.00- 3.34	D	(DRY)			S50/ 185		3.34		39.67		
						End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			04/12/15	08:00						None encountered.
3.34	0.10	Dynamic Sampler	AT	3.34		DRY	04/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 2.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 2.00m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole **WS204**
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389161.8 E
390232.6 N

Ground Level 42.85 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.20- 0.50	B					MADE GROUND: Tarmacadam.	G.L.		42.85	
0.20	ES					MADE GROUND: Dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	0.10		42.75	
0.50- 1.00	B				0.50			42.35		
0.50	ES									
1.00	ES									
1.20- 2.00	B				S10	MADE GROUND: Brown gravelly fine to medium sand. Gravel is angular to subangular fine to medium of various lithologies and fragments of brick. Many rootlets.	1.20		41.65	
1.20- 1.65	D	(DRY)								
2.00- 2.50	B				S18	MADE GROUND: Loose orangish brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Between 1.40m and 1.50m, band of sandy clay. Between 1.50m and 1.55m, cobbles of sandstone.	1.55		41.30	
2.00- 2.45	D	(DRY)								
2.50- 2.86	D	(DRY)			S50/ 205	Medium dense orangish grey fine to coarse SAND.	2.45		40.40	
						Very dense orange gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone.	2.86		39.99	
End of Borehole										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			03/12/15	08:00						None encountered.
2.86	0.10	Dynamic Sampler	AT	2.86		DRY	03/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 2.45m with a geowrapped slotted section from 1.50m to 2.45m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.45m, fine gravel filter up to 1.50m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS205
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389192.1 E 390221.8 N Ground Level 42.39 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20	ES					MADE GROUND: Grey granite cobble setts.	G.L. 0.10		42.39		
0.50	ES					MADE GROUND: Light brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete.			42.29		
1.00	ES										
1.20- 2.00	B	(DRY)			S38	Dense orangish brown gravelly fine to coarse SAND with a medium subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone.	1.20		41.19		
1.20- 1.65	D	(DRY)									
2.00- 2.38	D	(DRY)			S50/ 230	At 2.00m, very dense.					
						End of Borehole	2.38		40.01		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			11/12/15	08:00						None encountered.
2.38	0.10	Dynamic Sampler	AT	2.38		DRY	11/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars.
 A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.50m to 2.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.50m, gravel filter up to 1.00m, bentonite seal up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS206
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389278.8 E 390194.8 N Ground Level 48.13 m OD


Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.20	ES					MADE GROUND: Tarmacadam.	G.L.		48.13	
0.50- 1.00	B					MADE GROUND: Dark greyish brown gravelly sand of ash. Gravel is subangular to subrounded fine to medium of various lithologies.	0.20		47.93	
0.50	ES									
1.00	ES					MADE GROUND: Dense to very dense brown slightly gravelly fine to medium sand of ash. Gravel is angular to subangular fine to medium of various lithologies. Low cobble content of broken brick and concrete.	1.00		47.13	
1.20- 1.65	D	(DRY)			S50					
1.20- 1.50	D									
1.50- 2.00	B									
2.00- 2.34	D	(DRY)			S50/ 190	End of Borehole	2.34		45.79	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			02/12/15	08:00						None encountered.
2.34	0.10	Dynamic Sampler	AT	2.34		DRY	02/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.00m to 2.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS208
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389241.3 E 390273.4 N Ground Level 42.35 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
						MADE GROUND: Concrete.	G.L.		42.35		
0.50- 1.00	B					MADE GROUND: Dark brownish grey gravelly sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	0.50		41.85		
0.50	ES										
1.00	ES					Firm brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of various lithologies.	1.30		41.05		
1.20- 1.65	D	(DRY)	12	S14							
1.20- 1.30	D										
1.30- 1.70	B										
1.70- 1.80	D					Loose light brown to reddish brown gravelly SAND. Gravel is subrounded fine to medium of sandstone.	1.70		40.65		
1.80- 2.00	D										
2.00- 2.45	D	(DRY)		S7							
2.00- 2.40	D										
2.40- 2.80	B					Between 2.40m and 2.80m, grading to silty sand and gravel.					
2.40- 2.80	B										
2.80- 3.00	D					At 3.00m, very dense.					
3.00- 3.50	B										
3.00- 3.20	D	(DRY)		S50/50							
						End of Borehole	3.20		39.15		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			01/12/15	08:00						None encountered.
3.20	0.10	Dynamic Sampler	AT	3.20		DRY	01/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 2.80m with a geowrapped slotted section from 1.70m to 2.80m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.80m, fine gravel filter up to 1.70m, bentonite seal up to 0.70m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS209
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389242.3 E 390284.3 N Ground Level 42.67 m OD


Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.20	ES					MADE GROUND: Tarmacadam.	G.L.		42.67	
0.50	ES					MADE GROUND: Dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to medium of various lithologies and fragments of concrete and brick.	0.20		42.47	
0.60- 1.00	B									
1.00	ES					Medium dense reddish brown gravelly fine to coarse SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and quartzite.	0.80		41.87	
1.20- 1.65	D	(DRY)			S16					
1.20- 1.30	D									
1.30- 1.60	B									
1.60- 2.00	B					Loose reddish brown very gravelly clayey SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone.	1.60		41.07	
2.00- 2.45	D	(DRY)			S9					
2.00- 2.40	D									
2.40- 3.00	B									
3.00- 3.26	D	(DRY)			S50/105	At 3.00m, very dense.				
						End of Borehole	3.26		39.41	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			02/12/15	08:00						None encountered.
3.26	0.10	Dynamic Sampler	AT	3.26		DRY	02/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 1.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS210
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389316.0 E 390273.8 N Ground Level 44.43 m OD


Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.50	B					MADE GROUND: Grey and red angular cobbles of brick and concrete.	G.L. 0.10		44.43		
0.20	ES								44.33		
0.50- 1.00	B					MADE GROUND: Loose to medium dense dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick.					
0.50	ES										
1.00	ES										
1.20- 2.00	B	(DRY)			S28						
1.20- 1.65	D										
2.00- 3.00	B					At 2.00m, loose, grading to slightly silty very sandy gravel.					
2.00- 3.00	B				S5						
2.00- 2.45	D	(DRY)									
3.00- 4.00	B					Medium dense greyish orange very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone.	2.60		41.83		
3.00- 3.45	D	(DRY)			S18						
4.00- 5.00	B					At 4.00m, silty.					
4.00- 4.45	D	(DRY)			S23						
5.00- 5.09	D	(DRY)			S50/40	At 5.00m, very dense.	5.09		39.34		
End of Borehole											

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			09/12/15	08:00						None encountered.
5.09	0.15	Cable Percussion	AT	5.09		DRY	09/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 5.00m with a geowrapped slotted section from 3.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 3.00m, bentonite seal up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS211
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389333.0 E 390302.7 N Ground Level 44.88 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.50	B					MADE GROUND: Grey concrete.	G.L.		44.88		
0.20	ES						0.10		44.78		
0.50- 1.00	B					MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	0.50		44.38		
0.50	ES										
1.00- 1.20	B					MADE GROUND: Soft brown slightly gravelly sandy clay. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	1.00		43.88		
1.00	ES						1.20		43.68		
1.20- 1.50	B	(DRY)			S19	MADE GROUND: Light brown gravelly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse to various lithologies and brick fragments.	1.20		43.08		
1.20- 1.65	D						1.80		43.08		
1.50- 1.60	D										
1.60- 1.80	B					MADE GROUND: Medium dense dark brown mottled black clayey gravelly fine to medium sand with a strong hydrocarbon odour and organic remains. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	2.60		42.28		
1.80- 2.00	B				S6						
2.00- 2.60	B	(DRY)				MADE GROUND: Loose orangish brown clayey gravelly fine to medium sand. Gravel is angular to subrounded fine to coarse of various lithologies, brick and glass.	3.00		41.88		
2.00- 2.45	D										
2.60- 2.80	B					MADE GROUND: Dark grey clayey gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	3.50		41.38		
2.80- 3.00	B				S4						
3.00- 3.50	B	(DRY)				Very loose/loose grey clayey fine to coarse SAND.	3.80		41.08		
3.00- 3.45	D					Orangish grey fine to coarse SAND.	4.00		40.88		
3.50- 3.80	B					Soft dark grey sandy CLAY, locally silt.	4.67		40.21		
3.80- 4.00	D	(DRY)			S12						
4.00- 4.45	D					Medium dense greyish orange fine to coarse SAND. At 4.60m, very dense.					
4.00- 4.50	D										
4.60- 4.67	B	(DRY)			S50/40						
						End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			08/12/15	08:00						None encountered.
4.67	0.10	Dynamic Sampler	AT	4.67		DRY	08/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.00m to 2.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.00m, fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION

Engineer AECOM

Borehole Project No **WS212**
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

National Grid Coordinates 389284.7 E
390377.1 N

Ground Level 45.74 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
						MADE GROUND: Concrete slab.	G.L. 0.08		45.74		
0.50	ES					MADE GROUND: Loose dark brown gravelly fine to medium sand of ash. Gravel is angular to subangular fine to coarse of various lithologies and concrete.			45.66		
1.00	ES										
1.20- 1.50	B	(DRY)			S9						
1.20- 1.65	D										
1.50- 1.70	D										
1.70- 2.00	B					MADE GROUND: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies.	1.50		44.24		
2.00- 2.40	B	(DRY)			S4		1.70		44.04		
2.00- 2.45	D										
2.40- 2.60	D					Very loose/loose brown slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse predominantly of sandstone.	2.40		43.34		
2.60- 3.00	B										
3.00- 3.45	D	(DRY)		22	S25	Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies. At 3.00m, stiff.					
3.00- 3.40	D										
3.00- 3.40	D										
3.40- 3.70	B					Stiff brown slightly sandy CLAY.	3.40		42.34		
3.70- 4.00	B										
4.00- 4.43	D	(DRY)			S50/275	Very dense reddish brown fine to coarse SAND.	3.70		42.04		
						End of Borehole	4.43		41.31		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			07/12/15	08:00						None encountered.
4.43	0.10	Dynamic Sampler	AT	4.43		DRY	07/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 2.50m to 3.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 3.50m, fine gravel filter up to 2.50m, bentonite seal up to 1.00m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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geotechnics

BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS214
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389280.9 E
 390357.9 N Ground Level 46.35 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.50	B					MADE GROUND: Grey concrete.	G.L.		46.35		
0.20	ES					MADE GROUND: Orange fine to coarse sand.	0.07		46.28		
0.50- 1.00	B					MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.	0.15		46.20		
0.50	ES										
1.00- 1.20	B						1.00		45.35		
1.00	ES										
1.20- 1.65	D	(DRY)			S14	Medium dense reddish brown fine to coarse SAND with a low cobble content.					
1.20- 1.40	D						1.50		44.85		
1.40- 1.50	D										
1.50- 1.80	B					Medium dense reddish brown gravelly fine to medium SAND with black organic remains. Gravel is subangular to subrounded fine to coarse of various lithologies.	1.80		44.55		
1.80- 2.00	D	(DRY)			S5						
2.00- 2.45	D										
2.00- 2.40	D										
2.40- 3.00	B					Loose reddish brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone. At 2.40m, very gravelly.					
3.00- 3.45	D	(DRY)			S4						
3.00- 3.50	D										
3.50- 3.70	B										
3.70- 4.00	B						3.70		42.65		
4.00- 4.45	D	(DRY)			S2	Dark brown mottled black fine to coarse gravelly SAND with black organic remains. Gravel is subangular to subrounded fine to coarse including mudstone.	4.00		42.35		
4.50- 4.70	D					Very loose brown clayey fine to coarse SAND.					
5.00- 5.45	D	(DRY)			S9	Loose brown fine to coarse SAND.	4.70		41.65		
							5.45		40.90		
						End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			08/12/15	08:00						None encountered.
5.45	0.10	Dynamic Sampler	AT	5.45		DRY	08/12/15	18:00						

Remarks: Inspection pit hand excavated to 1.20m depth. ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar. Clay pipe noted in side of inspection pit. A 50mm standpipe was installed to 1.00m with a geowrapped slotted section from 0.50m to 1.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.00m, fine gravel filter up to 0.50m, bentonite seal up to 0.20m, concrete up to ground level.

Logged by NM
 Figure 1 of 1
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geotechnics

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS217
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389229.8 E 390255.0 N Ground Level 42.30 m OD


Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20	ES					MADE GROUND: Grey subangular granite cobble setts.	G.L. 0.10		42.30		
0.50	ES				MADE GROUND: Light brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete (Sub base).		42.20				
1.00	ES										
1.20- 1.30	D	(DRY)			S26	Dark brown clayey gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse including limestone and sandstone.	1.20		41.10		
1.20- 1.65							1.30		41.00		
1.30- 2.00	B										
1.30	ES										
2.00- 2.60	B	(DRY)			S28	Medium dense greyish orange gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including limestone, sandstone and quartzite.					
2.00- 2.45	D										
2.60- 2.68	D	(DRY)			S50/25	At 2.60m, very dense.					
						End of Borehole	2.68		39.62		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			14/12/15	08:00						None encountered.
2.68	0.10	Dynamic Sampler	AT	2.68		DRY	14/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 1.50m to 2.50m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 1.50m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS218
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389254.7 E 390238.1 N Ground Level 42.75 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.50	ES					MADE GROUND: Grey concrete.	G.L.		42.75		
0.95- 1.00	D					MADE GROUND: Light grey gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete, granite and sandstone. At 0.60m, with a medium angular cobble content of sandstone, granite and concrete.	0.40		42.35		
1.00	ES	(0.90)					0.95		41.80		
1.20- 1.65	D				S27	Medium dense greyish brown clayey sandy angular to subangular fine to coarse GRAVEL including sandstone and limestone. At 0.95m, with clay bands.	1.70		41.05		
						End of Borehole					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			15/12/15	08:00	0.90		0.80	20		Slow inflow.
1.65	0.10	Dynamic Sampler	AT	1.70		0.90	15/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 The borehole was terminated at a depth of 1.70m having met refusal on an obstruction.
 Backfill details from base of hole: arisings up to 0.40m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS218A
 Project No PN153428


Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389253.9 E 390239.0 N Ground Level 42.71 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Grey concrete.	G.L.		42.71	
0.50	ES					MADE GROUND: Light grey gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete, granite and sandstone.	0.40		42.31	
1.00	ES									
1.20- 2.00	B	(DAMP)			S11	Loose greenish brown clayey fine to medium SAND.	1.20		41.51	
1.20- 1.65	D									
1.20	ES					Medium dense orangish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone.	1.50		41.21	
2.00- 3.00	B	(DRY)			S14					
2.00- 2.45	D									
3.00- 3.17	D	(DRY)			S50/50	Very dense orange gravelly fine to coarse SAND with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	2.50		40.21	
						End of Borehole	3.17		39.54	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			16/12/15	08:00	0.90					Damp - no rise.
3.17	0.15	Dynamic Sampler	AT	3.17		DRY	16/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 1.00m to 2.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.50m, gravel filter up to 1.00m, bentonite seal up to 0.40m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS219
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389259.7 E
 390175.3 N Ground Level 45.13 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Concrete.	G.L.		45.13	
0.50- 0.90	B					MADE GROUND: Greyish brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of various lithologies.	0.20		44.93	
0.50	ES						0.50		44.63	
1.00	ES					Reddish brown sandy angular to subangular fine to coarse GRAVEL of limestone. Medium angular to subangular cobble content.				
1.20- 2.00	B				S26	Medium dense brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of limestone.	1.20		43.93	
1.20- 1.65	D	(DRY)								
2.00- 2.45	D	(DRY)			S44	At 2.00m, dense.				
						End of Borehole	2.45		42.68	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			01/12/15	08:00						None encountered.
2.45	0.10	Dynamic Sampler	AT	2.45		DRY	01/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS220
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389143.2 E 390224.6 N Ground Level 44.69 m OD


Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.20- 0.50	B					MADE GROUND: Tarmacadam.	G.L.		44.69	
0.20	ES					MADE GROUND: Light brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	0.10		44.59	
0.50- 1.00	B						0.20		44.49	
0.50	ES					MADE GROUND: Very loose/loose dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of brick and concrete. Between 1.20m and 1.70m, black organic matter.				
1.00	ES				S4					
1.20- 1.65	D	(DRY)								
1.20- 1.30	D									
1.30- 1.70	B				33					
1.30- 1.70	D					Medium dense light grey fine to coarse SAND. Between 2.00m and 2.60m, gravelly. Gravel is subangular to subrounded fine to coarse of sandstone.	1.70		42.99	
1.70- 2.00	B									
2.00- 2.45	D	(DRY)			S27					
2.00- 2.40	D									
2.40- 2.60	D					Dense orangish brown gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of sandstone.	2.60		42.09	
2.60- 3.00	B									
3.00- 4.00	B	(DRY)			S34					
3.00- 3.45	D					Below 3.60m, cobbles of sandstone.				
4.00- 4.07	D	(DRY)			S50/50	At 4.00m, very dense.	4.07		40.62	
						End of Borehole				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			03/12/15	08:00						None encountered.
4.07	0.10	Dynamic Sampler	AT	4.07		DRY	03/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 A 50mm standpipe was installed to 1.70m with a geowrapped slotted section from 1.20m to 1.70m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.70m, gravel filter up to 1.20m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.


Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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


BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS221
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389275.0 E 390086.2 N Ground Level 51.03 m OD


Sampling			Properties		Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description		Depth	Legend	Level m OD
0.10- 0.30	ES				**MADE GROUND: Topsoil with broken concrete. At 0.30m, sandstone.		G.L.		51.03
					End of Borehole		0.30		50.73

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.30	0.50	Inspection Pit	AT	G.I. 0.30			03/12/15 03/12/15	08:00 18:00						None encountered.

Remarks  Inspection pit hand excavated to 0.30m depth.
 VES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 The Trial Pit was terminated at a depth of 0.30m due to the presence of an obstruction.
**** Driller's description.**
 Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS223
 Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389237.7 E 390204.9 N Ground Level 43.39 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Grey concrete.	G.L.		43.39	
0.50- 1.00	B					MADE GROUND: Loose brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	0.40		42.99	
0.50	ES									
1.00	ES					Firm grey mottled dark brown slightly gravelly slightly sandy CLAY with organic traces. Gravel is subangular to subrounded fine to coarse of various lithologies.	1.40		41.99	
1.20	D	(1.00)	20	S5						
1.20- 1.65	D									
1.30- 1.90	B									
2.00- 2.50	B					Loose/medium dense greyish brown fine to medium clayey SAND.	2.00		41.39	
2.00- 2.45	D	(1.30)		S10						
2.00	ES					Medium dense greyish orange silty slightly gravelly fine to coarse SAND.	2.50		40.89	
2.50- 3.00	B									
3.00- 3.65	B					Medium dense greyish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including quartzite and some igneous lithologies. At 3.65m, very dense.	3.20		40.19	
3.00- 3.45	D	(2.50)		S20						
3.65- 3.72		(3.00)		S50/40			3.72		39.67	
End of Borehole										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.I.			10/12/15	08:00	1.20					Slow inflow.
3.72	0.10	Dynamic Sampler	AT	3.72		3.00	10/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
 A 50mm standpipe was installed to 1.40m with a geowrapped slotted section from 0.50m to 1.40m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.40m, gravel filter up to 0.50m, bentonite seal up to 0.30m, tarmacadam up to ground level.

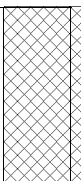



Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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geotechnics

BOREHOLE RECORD - Dynamic Sample

Project STOCKPORT BUS STATION Engineer AECOM Borehole WS224
 Project No PN153428
 Client TRANSPORT FOR GREATER MANCHESTER National Grid Coordinates 389229.7 E 390086.4 N Ground Level 53.31 m OD


Sampling			Properties		Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description	Depth	Legend	Level m OD	
0.20- 0.50	B				<p>MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Some wood.</p> <p>Dark brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse including mudstone and quartzite.</p> <p>Brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of various lithologies.</p> <p>End of Borehole</p>	G.L.		53.31	
0.20	ES								
0.50- 1.00	B								
0.50	ES								
1.00	ES								
1.20- 1.40	D						1.20		52.11
1.40- 1.70	B						1.40		51.91
							1.70		51.61

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.I.			04/12/15	08:00						None encountered.
1.70	0.10	Dynamic Sampler	AT	1.20		DRY	04/12/15	18:00						
				1.20		DRY	10/12/15	08:00						
				1.70		DRY	05/12/15	18:00						

Remarks Inspection pit hand excavated to 1.20m depth.
 ABS Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
 The Dynamic Sample was undertaken using hand held equipment.
 Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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 Figure 1 of 1
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APPENDIX 8
Concrete Core Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/-(mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal	
Filter	
Seal	

Strata Legend

Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued

Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials

Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole
Project No

CC1
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type	Length Max/Min	RQD %	Description		Depth	Legend		
		TCR/SCR%			General	Detail				
0.00- 0.14		C			MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey mottled white mortar up to 5mm thick. End of Borehole		G.L. 0.14			


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.14		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
Figure 1 of 1
11/03/2016




BOREHOLE RECORD - Concrete core

Project STOCKPORT BUS STATION


Engineer AECOM

Borehole CC2
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend	
0.00- 0.24		C			<p>MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey mottled white mortar up to 5mm thick.</p> <p>End of Borehole</p>		G.L. 0.24		


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.24		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole Project No

CC3
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend	
0.00- 0.37		C			MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey concrete, 70-80% aggregate of angular to subangular fine to coarse gravel of various lithologies. 5% voids in concrete.		G.L. 0.37		
					End of Borehole				


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.37		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole
Project No

CC4
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.25		C			MADE GROUND: Strong light grey fine grained micaceous sandstone with occasional orangish brown staining.		G.L. 0.25			
					End of Borehole					


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.25		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

Logged by NM
Figure 1 of 1
11/03/2016




BOREHOLE RECORD - Concrete core

Project STOCKPORT BUS STATION


Engineer AECOM

Borehole CC5
Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.40		C			<p>MADE GROUND: Medium strong orangish brown bricks (216 x 102 x 64mm) with voids up to 5mm in size. Well bonded dark brown mortar up to 10mm thick.</p> <p>End of Borehole</p>		G.L. 0.40			


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.40		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
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BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole Project No

CC5A
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.52		C			<p>MADE GROUND: Medium strong orangish brown bricks (216 x 102 x 64) with voids up to 30mm in size. Well bonded, occasionally poorly bonded, dark brown mortar up to 15mm thick.</p> <p>End of Borehole</p>		G.L. 0.52			


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.52		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
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BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole
Project No

CC6
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.27		C			MADE GROUND: Strong light grey coarse grained sandstone.		G.L. 0.27			
					End of Borehole					


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.27		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



BOREHOLE RECORD - Concrete core

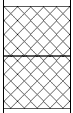
Project STOCKPORT BUS STATION

Engineer AECOM


Borehole Project No

CC8
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata		Scale 1:50		
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend	
0.00- 0.67		C			<p>MADE GROUND: Strong to very strong grey coarse grained sandstone.</p> <p>MADE GROUND: Orangish brown/reddish brown bricks (216 x 102 x 64mm) with voids up to 30mm in size. Well bonded grey mortar up to 10mm thick.</p> <p>End of Borehole</p>	<p>Between 0.10-0.17m, 70mm diameter void (probably previous core hole).</p>	<p>G.L.</p> <p>0.32</p> <p>0.67</p>		


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.67		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



BOREHOLE RECORD - Concrete core


Project STOCKPORT BUS STATION

Engineer AECOM


Borehole
Project No

CC9
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.48		C			Brownish orange/red mottled yellow bricks (216 x 102 x 64mm) with voids up to 10mm. Well bonded grey mortar, up to 25mm thick.		G.L.			
					End of Borehole		0.48			


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.48		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



BOREHOLE RECORD - Concrete core

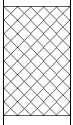
Project STOCKPORT BUS STATION

Engineer AECOM


Borehole Project No

CC10
PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Drilling		Properties/Sampling			Strata				Scale 1:50	
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	Description General	Description Detail	Depth	Legend		
0.00- 0.71		C			<p>MADE GROUND: Reddish brown locally mottled yellowish brown mottled (216 x 102 x 64mm) with voids up to 50mm. Well bonded light grey sharp sand mortar up to 10mm thick.</p> <p>End of Borehole</p>		G.L. 0.71			


Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.71		Concrete core	UU											

Remarks  Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:1999 + A2:2010

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Figure 1 of 1
11/03/2016



APPENDIX 9

Concrete Core Photographs

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



Concrete core 1



Concrete core 2

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



Concrete core 3



Concrete core 4

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



Concrete core 5



Concrete core 5A

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



Concrete core 6



Concrete core 8

PHOTOGRAPHS

Project Number : PNI53428

Project : STOCKPORT BUS STATION



Concrete core 9



Concrete core 10

APPENDIX 10
Monitoring Results

FIELDWORK - Water Level Monitoring

Project STOCKPORT BUS STATION

Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No 1

Borehole		BH101		BH102		BH103		BH104		BH105		BH106	
Instrument (dia. mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)	
Depth to Base (m)		7.00		10.00		14.70		3.50		12.00		7.00	
Filter Zone (m)		5.00-7.00		8.00-10.00		11.00-14.00		1.00-3.50		9.50-12.00		5.00-7.00	
Level		45.22 m OD		43.35 m OD		42.42 m OD		42.47 m OD		42.62 m OD		42.45 m OD	
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
11 Jan 2016		6.17	39.05	5.42	37.93	6.60	35.82	3.56	38.91	6.41	36.21	5.41	37.04
25 Jan 2016		5.83	39.39	5.46	37.89	6.20	36.22	DRY		6.49	36.13	5.46	36.99
9 Feb 2016		5.79	39.43	5.35	38.00	6.50	35.92	3.57	38.90	6.40	36.22	5.20	37.25
22 Feb 2016		5.54	39.68	5.45	37.90	6.66	35.76	DRY		6.48	36.14	5.45	37.00
8 Mar 2016		6.03	39.19	5.47	37.88	6.67	35.75	DRY		6.50	36.12	5.50	36.95

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.



FIELDWORK - Water Level Monitoring

Project STOCKPORT BUS STATION

Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No 2

Borehole		BH108		BH109		BH112		WS201		WS203		WS204	
Instrument (dia. mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)	
Depth to Base (m)		21.00		20.00		14.80		4.00		3.00		2.45	
Filter Zone (m)		18.00-21.00		18.00-20.00		12.80-14.80		3.50-4.00		2.00-3.00		1.50-2.45	
Level		42.72 m OD		42.36 m OD		43.70 m OD		45.61 m OD		43.01 m OD		42.85 m OD	
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
11 Jan 2016		6.68	36.04	5.18	37.18	5.02	38.68	3.85	41.76	CAR		2.45	40.40
25 Jan 2016		6.86	35.86	5.29	37.07	5.05	38.65	DRY		DRY		DRY	
9 Feb 2016		6.35	36.37	4.83	37.53	4.96	38.74	DRY		CAR		DRY	
22 Feb 2016		6.72	36.00	5.16	37.20	5.07	38.63	DRY		2.66	40.35	DRY	
8 Mar 2016		6.84	35.88	5.24	37.12	5.06	38.64	DRY		2.67	40.34	CAR	

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.



FIELDWORK - Water Level Monitoring

Project STOCKPORT BUS STATION

Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No 3

Borehole		WS205		WS206		WS208		WS209		WS210		WS211	
Instrument (dia. mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)	
Depth to Base (m)		2.00		2.00		2.80		3.00		5.00		2.00	
Filter Zone (m)		1.50-2.00		1.00-2.00		1.70-2.80		1.00-3.00		3.00-5.00		1.00-2.00	
Level		42.39 m OD		48.13 m OD		42.35 m OD		42.67 m OD		44.43 m OD		44.88 m OD	
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
11 Jan 2016		1.94	40.45	1.82	46.31	2.72	39.63	2.91	39.76	5.00	39.43	1.87	43.01
25 Jan 2016		DRY		DRY		DRY		DRY		DRY		1.92	42.96
9 Feb 2016		DRY		DRY		DRY		DRY		DRY		1.90	42.98
22 Feb 2016		DRY		DRY		DRY		DRY		DRY		1.87	43.01
8 Mar 2016		DRY		DRY		DRY		DRY		DRY		1.87	43.01

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.



FIELDWORK - Water Level Monitoring

Project STOCKPORT BUS STATION

Project No PN153428

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No 4

Borehole		WS212		WS214		WS217		WS218A		WS220		WS223	
Instrument (dia. mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)		S (50mm)	
Depth to Base (m)		3.50		1.00		2.50		2.50		1.70		1.40	
Filter Zone (m)		2.50-3.50		0.50-1.00		1.50-2.50		1.00-2.50		1.20-1.70		0.50-1.40	
Level		45.74 m OD		46.35 m OD		42.30 m OD		42.71 m OD		44.69 m OD		43.39 m OD	
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
11 Jan 2016		3.16	42.58	0.93	45.42	2.50	39.80	2.50	40.21	1.60	43.09	1.60	41.79
25 Jan 2016		3.20	42.54	DRY		DRY		DRY		1.65	43.04	1.60	41.79
9 Feb 2016		3.20	42.54	DRY		DRY		DRY		1.60	43.09	1.50	41.89
22 Feb 2016		3.18	42.56	DRY		DRY		DRY		1.65	43.04	1.53	41.86
8 Mar 2016		3.18	42.56	DRY		DRY		DRY		1.67	43.02	DRY	

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 11/01/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (1 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane CH4 (% VOL)	Methane CH4 (% LEL)	Carbon Dioxide CO2 (% VOL)	Oxygen O2 (% VOL)	Nitrogen N2 (% VOL)	Remarks
BH101	7.00	6.17	7.00	0.0	0.0	0.0	21.0	78.9	
BH102	10.00	5.42	9.85	0.0	0.0	0.1	20.8	79.0	
BH103	14.70	6.60	13.06	0.0	0.0	0.0	20.9	79.0	
BH104	3.50	3.56	3.64	0.0	0.0	2.2	18.9	78.8	
BH105	12.00	6.41	11.90	0.0	0.0	0.0	21.0	78.9	
BH106	7.00	5.41	7.00	0.0	0.0	0.0	20.9	79.0	
BH108	21.00	6.68	20.94	0.0	0.0	0.5	20.5	78.9	
BH109	20.00	5.18	20.12	0.0	0.0	1.3	20.5	78.1	
BH112	14.80	5.02	14.52	0.0	0.0	0.0	21.1	78.8	
WS201	4.00	3.85	3.85	0.0	0.0	0.0	21.0	78.9	
WS203	3.00	CAR		-	-	-	-	-	Car over
WS204	2.45	2.45	2.45	0.0	0.0	7.1	11.8	81.0	
WS205	2.00	1.94	1.94	0.0	0.0	0.0	21.0	78.9	
WS206	2.00	1.82	1.82	0.0	0.0	0.4	20.5	79.0	
WS208	2.80	2.72	2.72	0.0	0.0	2.5	18.6	78.8	
WS209	3.00	2.91	2.91	0.0	0.0	2.6	19.6	77.7	
WS210	5.00	5.00	4.40	0.0	0.0	1.0	20.4	78.5	
WS211	2.00	1.87	1.98	0.0	0.0	0.3	20.3	79.3	
WS212	3.50	3.16	3.46	0.0	0.0	4.0	7.2	88.7	
WS214	1.00	0.93	0.94	0.0	0.0	0.3	20.6	79.0	
WS217	2.50	2.50	2.23	0.0	0.0	3.2	18.6	78.1	
WS218A	2.50	2.50	2.46	0.0	0.0	0.4	20.4	79.1	
WS220	1.70	1.60	1.72	0.0	0.0	0.6	19.4	79.9	
WS223	1.40	1.60	1.64	0.0	0.0	0.0	18.9	81.0	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 11/01/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (2 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mBars)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
BH101	7.00	0.0	0.0	996	-2.0	-1.9	
BH102	10.00	0.0	0.0	969	0.0	0.0	
BH103	14.70	0.0	0.0	969	-0.1	0.0	
BH104	3.50	0.0	0.0	969	0.0	0.0	
BH105	12.00	0.0	0.0	969	0.4	0.0	
BH106	7.00	0.0	0.0	969	-0.9	-0.7	
BH108	21.00	0.0	0.0	969	0.0	0.0	
BH109	20.00	0.0	0.0	969	-0.1	0.0	
BH112	14.80	0.0	0.0	969	-0.1	0.0	
WS201	4.00	0.0	0.0	969	-0.3	-0.1	
WS203	3.00	-	-	969	-	-	Car over
WS204	2.45	0.0	0.0	969	0.0	0.0	
WS205	2.00	0.0	0.0	969	0.0	0.0	
WS206	2.00	0.0	0.0	969	-0.3	-0.1	
WS208	2.80	0.0	0.0	969	0.0	0.0	
WS209	3.00	0.0	0.0	969	0.0	0.0	
WS210	5.00	0.0	0.0	969	0.0	0.0	
WS211	2.00	0.0	0.0	969	-0.1	0.0	
WS212	3.50	0.0	0.0	969	0.0	0.0	
WS214	1.00	0.0	0.0	969	0.0	0.0	
WS217	2.50	0.0	0.0	969	0.0	0.0	
WS218A	2.50	0.0	0.0	969	0.0	0.0	
WS220	1.70	0.0	0.0	969	0.0	0.0	
WS223	1.40	0.0	0.0	969	0.0	0.0	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 25/01/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (1 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane CH4 (% VOL)	Methane CH4 (% LEL)	Carbon Dioxide CO2 (% VOL)	Oxygen O2 (% VOL)	Nitrogen N2 (% VOL)	Remarks
BH101	7.00	5.83	7.00	0.0	0.0	4.0	16.7	79.2	
BH102	10.00	5.46	9.85	0.0	0.0	0.0	20.9	79.0	
BH103	14.70	6.20	13.06	0.0	0.0	0.0	20.8	79.1	
BH104	3.50	DRY	3.64	0.0	0.0	1.5	19.5	78.9	
BH105	12.00	6.49	11.90	0.0	0.0	0.0	20.7	74.2	
BH106	7.00	5.46	7.00	0.0	0.0	0.0	20.6	79.3	
BH108	21.00	6.86	20.94	0.0	0.0	0.3	20.7	78.9	
BH109	20.00	5.29	20.12	0.0	0.0	0.4	20.5	79.0	
BH112	14.80	5.05	14.52	0.0	0.0	0.0	21.1	78.8	
WS201	4.00	DRY	3.85	0.0	0.0	3.6	18.2	78.1	
WS203	3.00	DRY	2.76	0.0	0.0	2.0	14.4	78.5	
WS204	2.45	DRY	2.45	0.0	0.0	0.0	20.9	79.0	
WS205	2.00	DRY	1.94	0.0	0.0	0.0	20.9	79.0	
WS206	2.00	DRY	1.82	0.0	0.0	0.0	20.8	79.1	
WS208	2.80	DRY	2.72	0.0	0.0	0.0	20.7	79.2	
WS209	3.00	DRY	2.91	0.0	0.0	2.3	19.8	77.9	
WS210	5.00	DRY	4.40	0.0	0.0	0.2	20.7	79.0	
WS211	2.00	1.92	1.98	0.0	0.0	0.6	20.0	79.3	
WS212	3.50	3.20	3.46	0.0	0.0	1.4	15.1	85.4	
WS214	1.00	DRY	0.94	0.0	0.0	0.0	20.9	79.0	
WS217	2.50	DRY	2.23	0.0	0.0	0.6	19.4	79.9	
WS218A	2.50	DRY	2.46	0.0	0.0	0.1	20.7	79.1	
WS220	1.70	1.65	1.72	0.0	0.0	0.0	20.8	79.1	
WS223	1.40	1.60	1.64	0.0	0.0	0.0	18.3	81.6	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 25/01/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (2 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mBars)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
BH101	7.00	0.0	0.0	1001	-0.5	0.0	
BH102	10.00	0.0	0.0	1001	0.0	0.0	
BH103	14.70	0.0	0.0	1001	1.0	0.5	
BH104	3.50	0.0	0.0	1001	1.2	0.4	
BH105	12.00	0.0	0.0	1001	0.3	0.0	
BH106	7.00	0.0	0.0	1001	-0.5	0.0	
BH108	21.00	0.0	0.0	1001	0.0	0.0	
BH109	20.00	0.0	0.0	1001	0.0	0.0	
BH112	14.80	0.0	0.0	1001	0.0	0.0	
WS201	4.00	0.0	0.0	1001	0.0	0.0	
WS203	3.00	0.0	0.0	1001	0.0	-0.5	
WS204	2.45	0.0	0.0	1001	0.0	0.0	
WS205	2.00	0.0	0.0	1001	0.0	0.0	
WS206	2.00	0.0	0.0	1001	0.0	0.4	
WS208	2.80	0.0	0.0	1001	0.0	0.0	
WS209	3.00	0.0	0.0	1001	0.0	0.0	
WS210	5.00	0.0	0.0	1001	1.4	0.4	
WS211	2.00	0.0	0.0	1001	-0.2	0.0	
WS212	3.50	0.0	0.0	1001	1.4	0.1	
WS214	1.00	0.0	0.0	1001	0.0	0.0	
WS217	2.50	0.0	0.0	1001	0.0	0.0	
WS218A	2.50	0.0	0.0	1001	-0.5	0.0	
WS220	1.70	0.0	0.0	1001	0.0	0.0	
WS223	1.40	0.0	0.0	1001	0.0	0.0	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428


Date 09/02/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (1 of 2)

Equipment Used									
GI Infra Red Gas Analyser		MK1 <input type="checkbox"/>	MK2 <input type="checkbox"/>	GA2000 <input type="checkbox"/>					
Other Gas Data LMSxi gas analyser;									
Weather / Site Conditions									
Wind		Still <input checked="" type="checkbox"/>	Light <input type="checkbox"/>		Moderate <input type="checkbox"/>		Strong <input type="checkbox"/>		
Cloud Cover		None <input type="checkbox"/>		Slight <input checked="" type="checkbox"/>		Cloudy <input type="checkbox"/>		Overcast <input type="checkbox"/>	
Precipitation		Dry <input checked="" type="checkbox"/>		Slight <input type="checkbox"/>		Moderate <input type="checkbox"/>		Heavy <input type="checkbox"/>	
Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane CH4 (% VOL)	Methane CH4 (% LEL)	Carbon Dioxide CO2 (% VOL)	Oxygen O2 (% VOL)	Nitrogen N2 (% VOL)	Remarks
BH101	7.00	5.79	7.00	0.0	0.0	3.8	17.6	78.5	
BH102	10.00	5.35	9.85	0.0	0.0	0.1	21.1	78.7	
BH103	14.70	6.50	13.06	0.0	0.0	0.0	20.6	79.3	
BH104	3.50	3.57	3.64	0.0	0.0	2.4	19.1	78.4	
BH105	12.00	6.40	11.90	0.0	0.0	0.0	20.8	79.1	
BH106	7.00	5.20	7.00	0.0	0.0	0.7	18.8	80.4	
BH108	21.00	6.35	20.94	0.0	0.0	1.9	19.9	78.1	
BH109	20.00	4.83	20.12	0.0	0.0	2.4	19.7	77.8	
BH112	14.80	4.96	14.52	0.0	0.0	0.1	21.2	78.6	
WS201	4.00	DRY	3.85	0.0	0.0	6.1	16.5	77.3	
WS203	3.00	CAR	2.76	-	-	-	-	-	Car over
WS204	2.45	DRY	2.45	0.0	0.0	1.8	19.9	78.2	
WS205	2.00	DRY	1.94	0.0	0.0	2.3	18.4	79.2	
WS206	2.00	DRY	1.82	0.0	0.0	0.2	21.1	78.6	
WS208	2.80	DRY	2.72	0.0	0.0	3.6	18.5	77.8	
WS209	3.00	DRY	2.91	0.0	0.0	1.8	20.3	77.8	
WS210	5.00	DRY	4.40	0.0	0.0	0.4	20.8	78.7	
WS211	2.00	1.90	1.98	0.0	0.0	0.7	19.8	79.4	
WS212	3.50	3.20	3.46	0.0	0.0	3.5	8.5	87.9	
WS214	1.00	DRY	0.94	0.0	0.0	3.0	18.1	78.8	
WS217	2.50	DRY	2.23	0.0	0.0	3.0	18.9	78.0	
WS218A	2.50	DRY	2.46	0.0	0.0	0.0	20.8	79.1	
WS220	1.70	1.60	1.72	0.0	0.0	2.5	17.2	80.2	
WS223	1.40	1.50	1.64	0.0	0.0	0.1	20.2	79.6	

Remarks



Form 002/3

FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 09/02/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (2 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mBars)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
BH101	7.00	0.0	0.0	969	-4.6	-2.1	
BH102	10.00	0.0	0.0	969	0.1	0.0	
BH103	14.70	0.0	0.0	969	7.4	6.4	
BH104	3.50	0.0	1.6	969	0.0	0.0	
BH105	12.00	0.0	1.3	969	0.0	0.0	
BH106	7.00	0.0	0.0	969	-0.6	-0.2	
BH108	21.00	0.0	0.0	969	0.0	0.0	
BH109	20.00	0.0	2.0	969	0.0	0.0	
BH112	14.80	0.0	0.0	969	0.0	0.0	
WS201	4.00	0.0	0.0	969	0.0	0.0	
WS203	3.00	-	-	969	-	-	Car over
WS204	2.45	0.0	0.0	969	0.0	0.0	
WS205	2.00	0.0	3.2	969	0.0	0.0	
WS206	2.00	0.0	0.0	969	0.3	0.1	
WS208	2.80	0.0	0.0	969	0.0	0.0	
WS209	3.00	0.0	0.0	969	0.2	0.1	
WS210	5.00	0.0	0.0	969	0.2	0.1	
WS211	2.00	0.0	0.0	969	0.0	0.0	
WS212	3.50	0.0	0.0	969	0.0	0.0	
WS214	1.00	0.0	0.0	969	0.0	0.0	
WS217	2.50	0.0	0.0	969	0.0	0.0	
WS218A	2.50	0.0	0.0	969	-0.1	0.0	
WS220	1.70	0.0	0.0	969	0.0	0.0	
WS223	1.40	0.0	0.0	969	0.0	0.0	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 22/02/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (1 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane CH4 (% VOL)	Methane CH4 (% LEL)	Carbon Dioxide CO2 (% VOL)	Oxygen O2 (% VOL)	Nitrogen N2 (% VOL)	Remarks
BH101	7.00	5.54	7.00	0.0	0.0	0.0	21.2	78.7	
BH102	10.00	5.45	9.85	0.0	0.0	0.0	20.9	79.0	
BH103	14.70	6.66	13.06	0.0	0.0	0.0	20.9	79.0	
BH104	3.50	DRY	3.64	0.0	0.0	0.1	20.9	78.9	
BH105	12.00	6.48	11.90	0.0	0.0	0.0	21.0	78.9	
BH106	7.00	5.45	7.00	0.0	0.0	0.0	20.9	79.0	
BH108	21.00	6.72	20.94	0.0	0.0	1.2	20.4	78.3	
BH109	20.00	5.16	20.12	0.0	0.0	0.5	20.5	78.9	
BH112	14.80	5.07	14.52	0.0	0.0	0.0	21.4	78.5	
WS201	4.00	DRY	3.85	0.0	0.0	1.5	20.3	78.1	
WS203	3.00	2.66	2.76	0.0	0.0	0.6	20.4	78.9	
WS204	2.45	DRY	2.45	0.0	0.0	0.0	20.9	79.0	
WS205	2.00	DRY	1.94	0.0	0.0	1.2	19.6	79.1	
WS206	2.00	DRY	1.82	0.0	0.0	0.0	21.3	78.6	
WS208	2.80	DRY	2.72	0.0	0.0	3.7	18.3	77.9	
WS209	3.00	DRY	2.91	0.0	0.0	2.4	19.9	77.6	
WS210	5.00	DRY	4.40	0.0	0.0	0.1	21.2	78.6	
WS211	2.00	1.87	1.98	0.0	0.0	0.0	21.1	78.8	
WS212	3.50	3.18	3.46	0.0	0.0	0.4	13.0	86.5	
WS214	1.00	DRY	0.94	0.0	0.0	1.0	19.9	79.0	
WS217	2.50	DRY	2.24	0.0	0.0	2.7	19.2	78.0	
WS218A	2.50	DRY	2.46	0.0	0.0	0.0	21.0	78.9	
WS220	1.70	1.65	1.72	0.0	0.0	2.3	19.1	78.5	
WS223	1.40	1.53	1.65	0.0	0.0	0.0	19.8	80.1	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 22/02/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (2 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mBars)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
BH101	7.00	0.0	0.0	996	-2.8	-1.5	
BH102	10.00	0.0	0.0	996	0.0	0.0	
BH103	14.70	0.0	0.0	996	1.5	1.2	
BH104	3.50	0.0	0.0	996	0.0	0.0	
BH105	12.00	0.0	0.0	996	-1.3	0.0	
BH106	7.00	0.0	0.0	996	-0.2	-0.1	
BH108	21.00	0.0	0.0	996	0.0	0.0	
BH109	20.00	0.0	0.0	996	1.7	0.0	
BH112	14.80	0.0	0.0	996	0.0	0.0	
WS201	4.00	0.0	0.0	996	0.0	0.0	
WS203	3.00	0.0	0.0	996	0.2	0.1	
WS204	2.45	0.0	0.0	996	0.2	0.0	
WS205	2.00	0.0	1.3	996	0.0	0.0	
WS206	2.00	0.0	0.0	996	-0.4	0.0	
WS208	2.80	0.0	0.0	996	0.0	0.0	
WS209	3.00	0.0	0.0	996	-0.1	0.0	
WS210	5.00	0.0	0.0	996	-1.4	-0.3	
WS211	2.00	0.0	0.0	996	-0.1	0.0	
WS212	3.50	0.0	1.3	996	0.8	0.2	
WS214	1.00	0.0	0.0	996	-0.6	-0.3	
WS217	2.50	0.0	0.0	996	0.0	0.0	
WS218A	2.50	0.0	0.0	996	0.0	0.0	
WS220	1.70	0.0	0.0	996	-0.2	0.0	
WS223	1.40	0.0	2.6	996	0.0	0.0	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428

Date 08/03/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (1 of 2)

Equipment Used

GI Infra Red Gas Analyser MK1 MK2 GA2000

Other Gas Data LMSxi gas analyser;

Weather / Site Conditions

Wind Still Light Moderate Strong

Cloud Cover None Slight Cloudy Overcast

Precipitation Dry Slight Moderate Heavy

Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane CH4 (% VOL)	Methane CH4 (% LEL)	Carbon Dioxide CO2 (% VOL)	Oxygen O2 (% VOL)	Nitrogen N2 (% VOL)	Remarks
BH101	7.00	6.03	7.00	0.0	0.0	0.1	21.1	78.7	
BH102	10.00	5.47	9.85	0.0	0.0	0.0	20.8	79.1	
BH103	14.70	6.67	13.06	0.0	0.0	0.0	21.0	78.9	
BH104	3.50	DRY	3.64	0.0	0.0	4.0	18.0	77.9	
BH105	12.00	6.50	11.90	0.0	0.0	0.0	20.9	79.0	
BH106	7.00	5.50	7.00	0.0	0.0	0.0	20.9	79.0	
BH108	21.00	6.84	20.94	0.0	0.0	0.6	21.2	78.1	
BH109	20.00	5.24	20.12	0.0	0.0	0.0	20.9	79.0	
BH112	14.80	5.06	14.52	0.0	0.0	0.0	21.3	78.6	
WS201	4.00	DRY	3.85	0.0	0.0	2.5	19.6	77.8	
WS203	3.00	2.67	2.76	0.0	0.0	3.0	19.0	77.9	
WS204	2.45	CAR	2.45	-	-	-	-	-	
WS205	2.00	DRY	1.94	0.0	0.0	0.1	21.0	78.8	
WS206	2.00	DRY	1.82	0.0	0.0	0.3	20.8	78.8	
WS208	2.80	DRY	2.72	0.0	0.0	3.3	18.9	77.7	
WS209	3.00	DRY	2.91	0.0	0.0	2.1	19.9	77.9	
WS210	5.00	DRY	4.40	0.0	0.0	0.5	20.8	78.6	
WS211	2.00	1.87	1.98	0.0	0.0	0.1	21.0	78.8	
WS212	3.50	3.18	3.46	0.0	0.0	2.8	12.4	84.7	
WS214	1.00	DRY	0.94	0.0	0.0	0.5	20.1	79.3	
WS217	2.50	DRY	2.24	0.0	0.0	3.0	19.1	77.8	
WS218A	2.50	DRY	2.46	0.0	0.0	0.0	21.0	78.9	
WS220	1.70	1.67	1.72	0.0	0.0	1.4	19.9	78.6	
WS223	1.40	DRY	1.65	0.0	0.0	0.0	20.1	79.8	

Remarks



FIELDWORK - Insitu Gas Monitoring - Daily Record

Project STOCKPORT BUS STATION

Project No PN153428


Date 08/03/2016

Client TRANSPORT FOR GREATER MANCHESTER

Sheet No. 1 (2 of 2)

Equipment Used							
GI Infra Red Gas Analyser		MK1 <input type="checkbox"/>	MK2 <input type="checkbox"/>	GA2000 <input type="checkbox"/>			
Other Gas Data LMSxi gas analyser;							
Weather / Site Conditions							
Wind		Still <input type="checkbox"/>	Light <input checked="" type="checkbox"/>	Moderate <input type="checkbox"/>	Strong <input type="checkbox"/>		
Cloud Cover		None <input type="checkbox"/>	Slight <input type="checkbox"/>	Cloudy <input type="checkbox"/>	Overcast <input checked="" type="checkbox"/>		
Precipitation		Dry <input type="checkbox"/>	Slight <input checked="" type="checkbox"/>	Moderate <input type="checkbox"/>	Heavy <input type="checkbox"/>		
Borehole	Depth to Base (m)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mBars)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
BH101	7.00	0.0	0.0	999	0.0	0.0	
BH102	10.00	0.0	0.0	999	0.0	0.0	
BH103	14.70	0.0	0.0	999	0.0	0.0	
BH104	3.50	0.0	0.0	999	0.0	0.0	
BH105	12.00	0.0	0.0	999	0.2	0.0	
BH106	7.00	0.0	0.0	999	0.0	0.0	
BH108	21.00	0.0	0.0	999	0.5	0.1	
BH109	20.00	0.0	0.0	999	0.0	0.0	
BH112	14.80	0.0	0.0	999	0.0	0.0	
WS201	4.00	0.0	0.0	999	0.2	0.0	
WS203	3.00	0.0	0.0	999	-0.6	-0.3	
WS204	2.45	-	-	999	-	-	
WS205	2.00	0.0	0.0	999	0.0	0.0	
WS206	2.00	0.0	0.0	999	0.0	0.0	
WS208	2.80	0.0	0.0	999	0.0	0.0	
WS209	3.00	0.0	0.0	999	0.0	0.0	
WS210	5.00	0.0	0.0	999	0.3	0.3	
WS211	2.00	0.0	0.0	999	0.0	0.0	
WS212	3.50	0.0	0.0	999	0.0	0.0	
WS214	1.00	0.0	0.0	999	-0.3	0.0	
WS217	2.50	0.0	0.0	999	0.4	0.2	
WS218A	2.50	0.0	0.0	999	0.0	0.0	
WS220	1.70	0.0	0.0	999	0.0	0.0	
WS223	1.40	0.0	0.0	999	0.1	0.0	

Remarks



Form 002/3

APPENDIX II

Laboratory Test Results - Geotechnical

Classification and Strength

Symbol	C - Clay	M - Silt
	(0 - containing organic matter)	
	Plasticity	L - Low
		I - Intermediate
		H - High
		V - Very High
		E - Extremely High
I_p	Plasticity Index	
%	% Retained on 425 μm sieve, shown under I_p value	
w_L	Liquid Limit	
w_p	Plastic Limit	
NP	Non-Plastic	
NAT	Sample tested in natural state	
w	Water Content	
p_d	Particle Density	
Test	Quick undrained triaxial tests	
	SS	Single stage - 102mm diameter.
	S3	Single stage - set of 3 38mm diameter.
	MS	Multistage - 102mm diameter.
	D	Drained Test
	HV	Hand Vane
	PP	Pocket Penetrometer (kg/cm^2)
	NST	Not suitable for test
γ_b	Bulk Density	
σ_3	Triaxial Cell Pressure	
$\sigma_1 - \sigma_3$	Deviator Stress	
##	Excessive Strain	
c_u	Undrained Cohesion	
c	Cohesion Intercept	
ϕ	Angle of Shearing Resistance	
Linear Shrink	Linear Shrinkage	

Consolidation

m_v	Coefficient of Volume Compressibility
c_{v50}	Coefficient of Consolidation - Log t
c_{v90}	Coefficient of Consolidation - \sqrt{t}

Rock

UF	Unacceptable Failure
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Chemical Analysis

Acid Soluble	Total sulphate in specimen, expressed as SO_3 %, value in brackets expressed as SO_4 %
Water Soluble	Soluble sulphate in 2:1 water : soil extract, expressed as SO_3 g/l, value in brackets expressed as SO_4 g/l
In Water	Sulphate content of groundwater, expressed as SO_3 g/l, value in brackets expressed as SO_4 g/l
pH	pH value
Organic content	Organic content expressed as a percentage of dry weight
Chloride	Chloride Ion content expressed as a percentage of dry weight

MCV, Compaction, CBR

MCV	Moisture Condition Value at natural water content
MCC	Moisture Condition Calibration
CCV	Chalk Crushing Value

Compaction

Type	2.5 = BS 2.5 kg Rammer
	4.5 = BS 4.5 kg Rammer
	V = BS Vibrating Hammer

γ_b Bulk Density

γ_d Dry Density

CBR California Bearing Ratio

Type	2.5 = Test on Specimen Recompacted using BS 2.5 kg Rammer
	4.5 = As above but using BS 4.5 kg Rammer
	V = As above but using BS Vibrating Hammer
	M = Test on open drive mould specimen cut in field
	S = Soaked Specimen

Top CBR at top of mould

Bottom CBR at bottom of mould

ND None Detected


Tests performed in accordance with BS 1377: Parts 1-9:1990 incorporating amendments where appropriate and BS EN ISO 17892: Parts 1-2:2014.

LABORATORY RESULTS - Classification and Strength

Project STOCKPORT BUS STATION

Project No: PN153428

Sample					Classification					Strength					
Hole	Depth (Specimen Depth) m	Type	Sample Ref	Description	Symbol	I_p (>425) %	w_L %	w_p %	w (p_d) %	Test	γ_b (γ_d) ³ Mg/m ³	σ_3 kN/m ²	$\sigma_1 - \sigma_3$ kN/m ²	c_u kN/m ²	c_{Avg} kN/m ²
BH101	2.20- 2.65 (2.20)	D	N61653	Grey sandy SILT.		(15%)	26	NP	23.3						
BH106	1.20- 1.70 (1.20)	B	N61702	Yellowish brown sandy fine to coarse GRAVEL.					5.0						
BH108	2.00- 2.50 (2.00)	B	N61711	MADE GROUND: Reddish grey and black sandy fine to coarse gravel with pockets of clay.		(54%)	34	NP	22.2						
BH108	3.00- 3.45 (3.00)	D	N61670	MADE GROUND: Reddish grey and black sandy fine to coarse gravel with pockets of clay.		(65%)	32	NP	16.3						
BH112	1.80 (1.80)	D	N61648	Dark brown/black sandy SILT.		(30%)	77	NP	109						
WS201	1.20- 1.65 (1.20)	D	N61671	MADE GROUND: Brown sandy gravelly silt.		(50%)	33	NP	17.6						
WS201	2.40- 3.00 (2.40)	B	N61675	Firm greyish brown sandy CLAY.	CL	15 (NAT)	33	18	22.9						
WS208	1.20- 1.65 (1.20)	D	N61649	Brown gravelly very clayey SAND.		(51%)	29	NP	12.4						
WS211	3.80- 4.00 (3.80)	D	N61652	Dark grey sandy SILT.		(9%)	38	NP	42.5						
WS212	3.00- 3.45 (3.00)	D	N61651	Brown slightly gravelly sandy SILT.		(49%)	37	NP	21.9						
WS220	1.30- 1.70 (1.30)	D	N61793	MADE GROUND: Dark brown gravelly sand with ash. (See Test Remarks Sheet for further information)		(73%)	69	NP	33.2						
WS223	1.20 (1.20)	D	N61655	MADE GROUND: Brown gravelly fine to medium sand.		(25%)	29	NP	19.9						

Remarks  NST - Not suitable for Test
 Water Content Test performed in accordance with BS EN ISO 17892 - 1: 2014
 All other Tests performed in accordance with BS1377: 1990



LABORATORY RESULTS - Particle Size Distribution

Project: STOCKPORT BUS STATION

Hole: BH101

Sample Depth: 1.20-1.65m

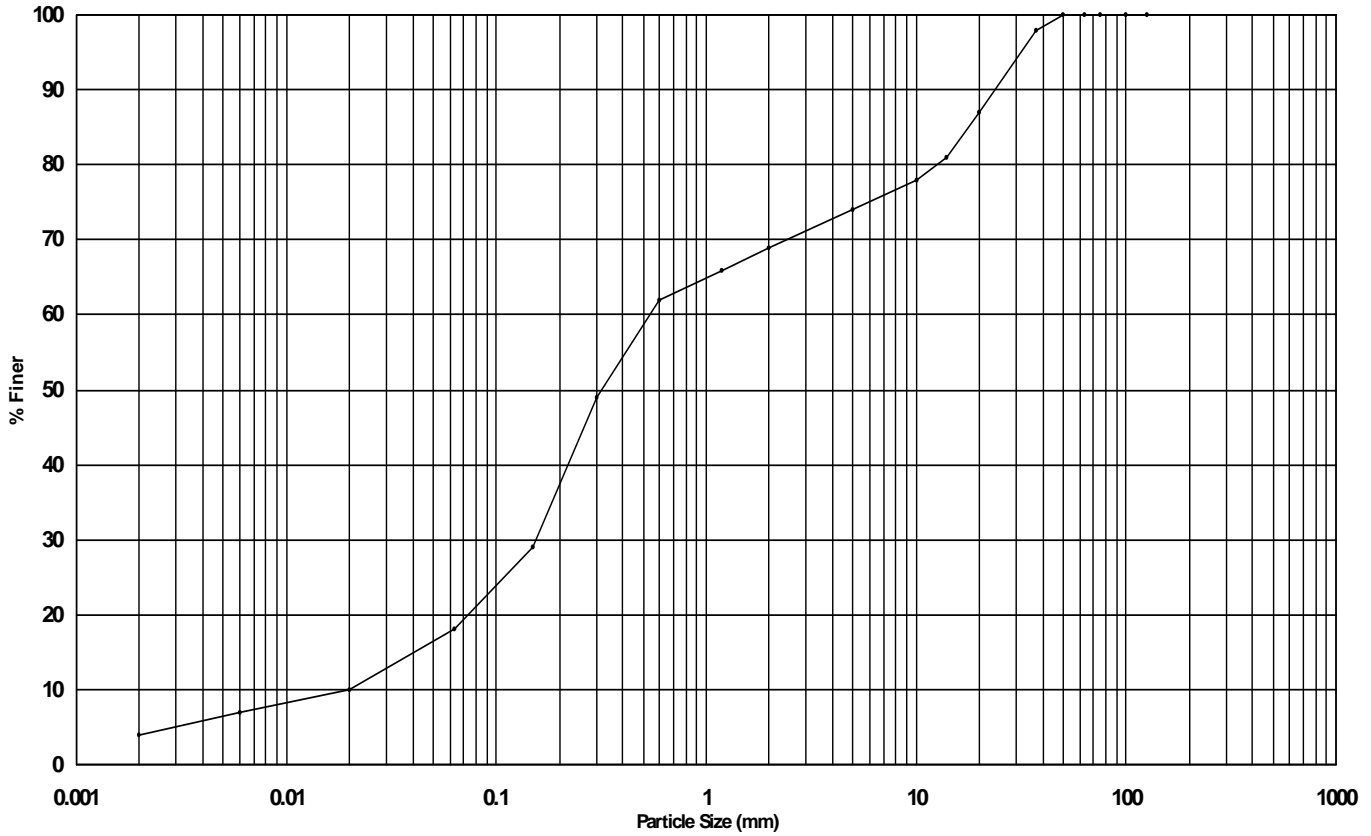
Project No: PN153428

Sample Type: B

Sample Ref: N61674

Sample Description

Yellowish brown clayey very gravelly fine to coarse SAND.



Classification	CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulders
		SILT			SAND			Gravel				

Classification	% of each
CLAY	4
SILT	14
SAND	51
GRAVEL	31
COBBLES	0
BOULDERS	0

Size	% Finer
125 mm	100
100 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	98
20 mm	87
14 mm	81
10 mm	78
5 mm	74
2 mm	69
1.18 mm	66
600 µm	62
300 µm	49
150 µm	29
63 µm	18

Size	% Finer
20 µm	10
6 µm	7
2 µm	4

Uniformity Coefficient	
30.88	
Sieving Method	
Wet sieve	
Fine Particle Analysis	
Method	Pipette
Pre-treated with	Hydrogen Peroxide
% loss on Pre-treatment	0.00
Particle Density	2.65 (Assumed)

Remarks: Test performed in accordance with BS 1377:Part 2:1990

10/02/2016



