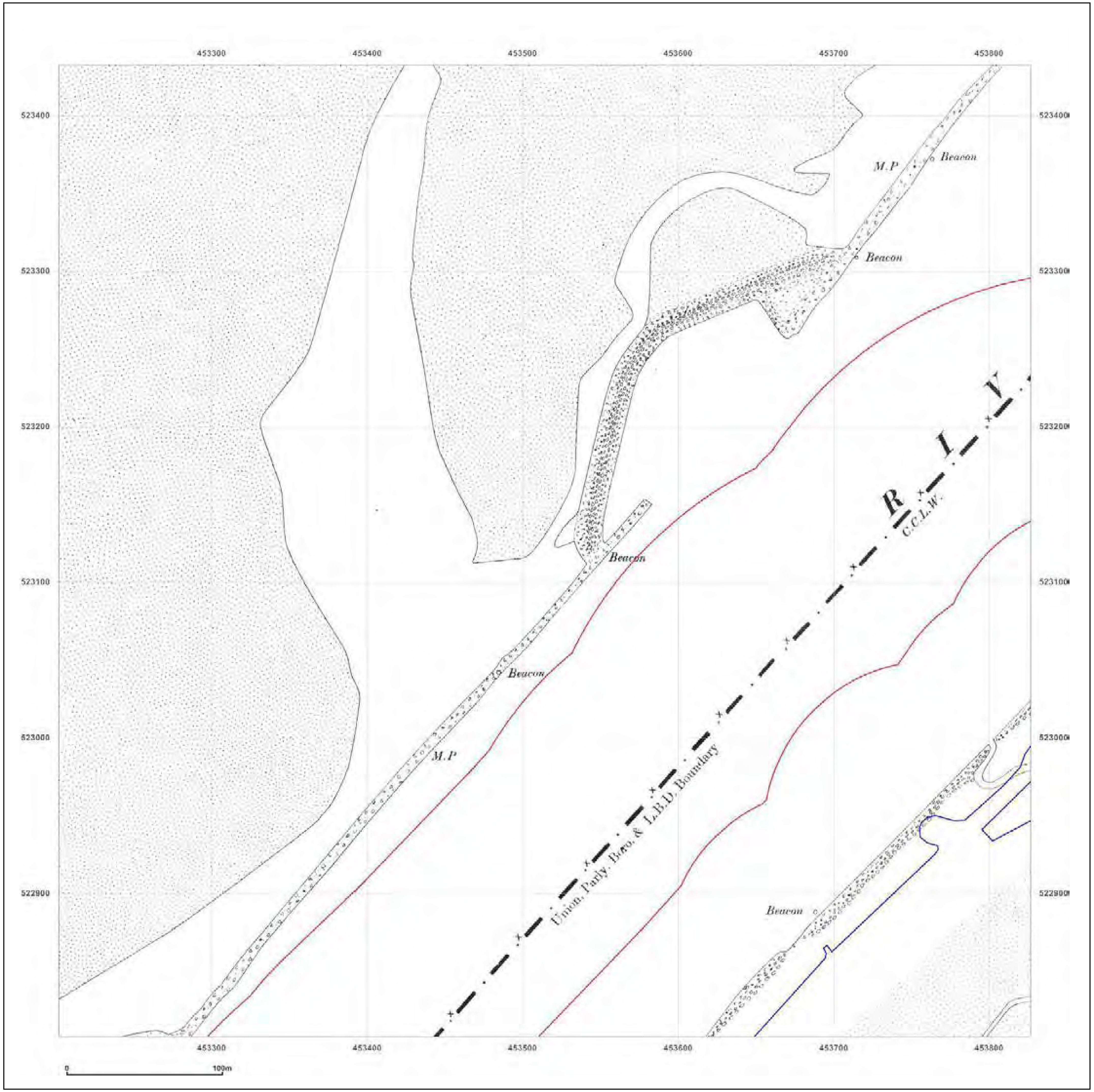


emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name:	County Series
Map date:	**1898**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1898
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

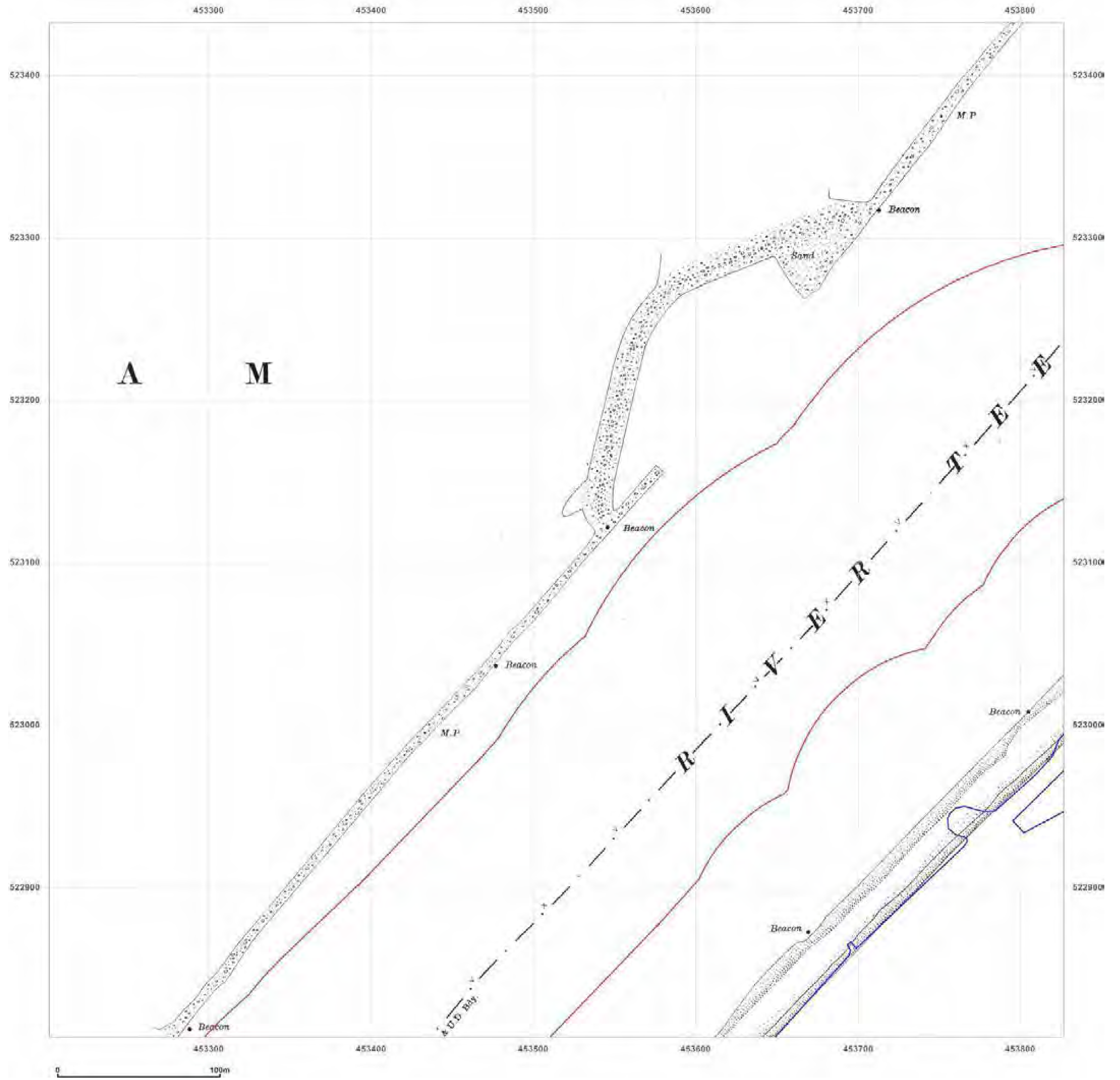
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

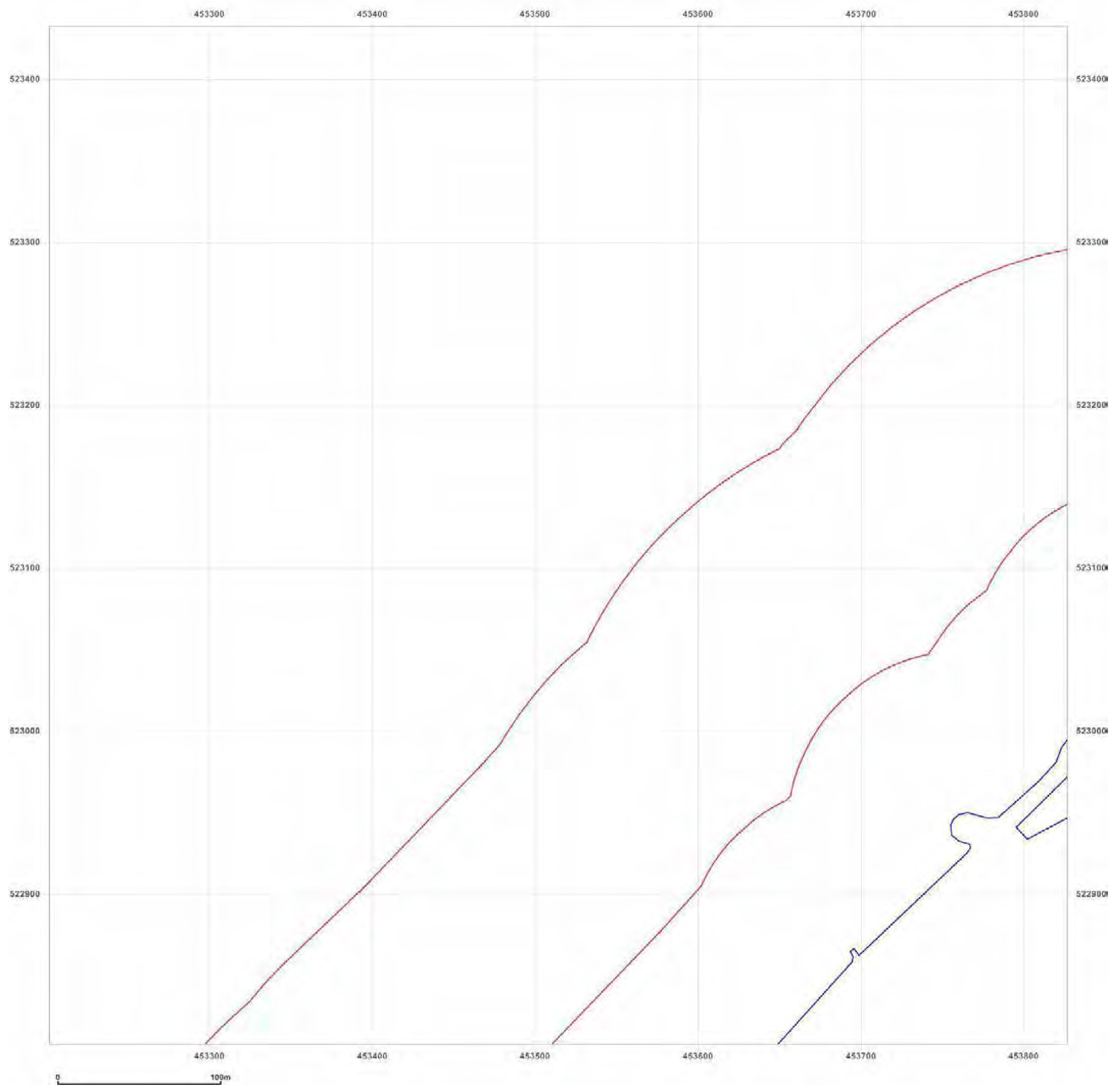
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

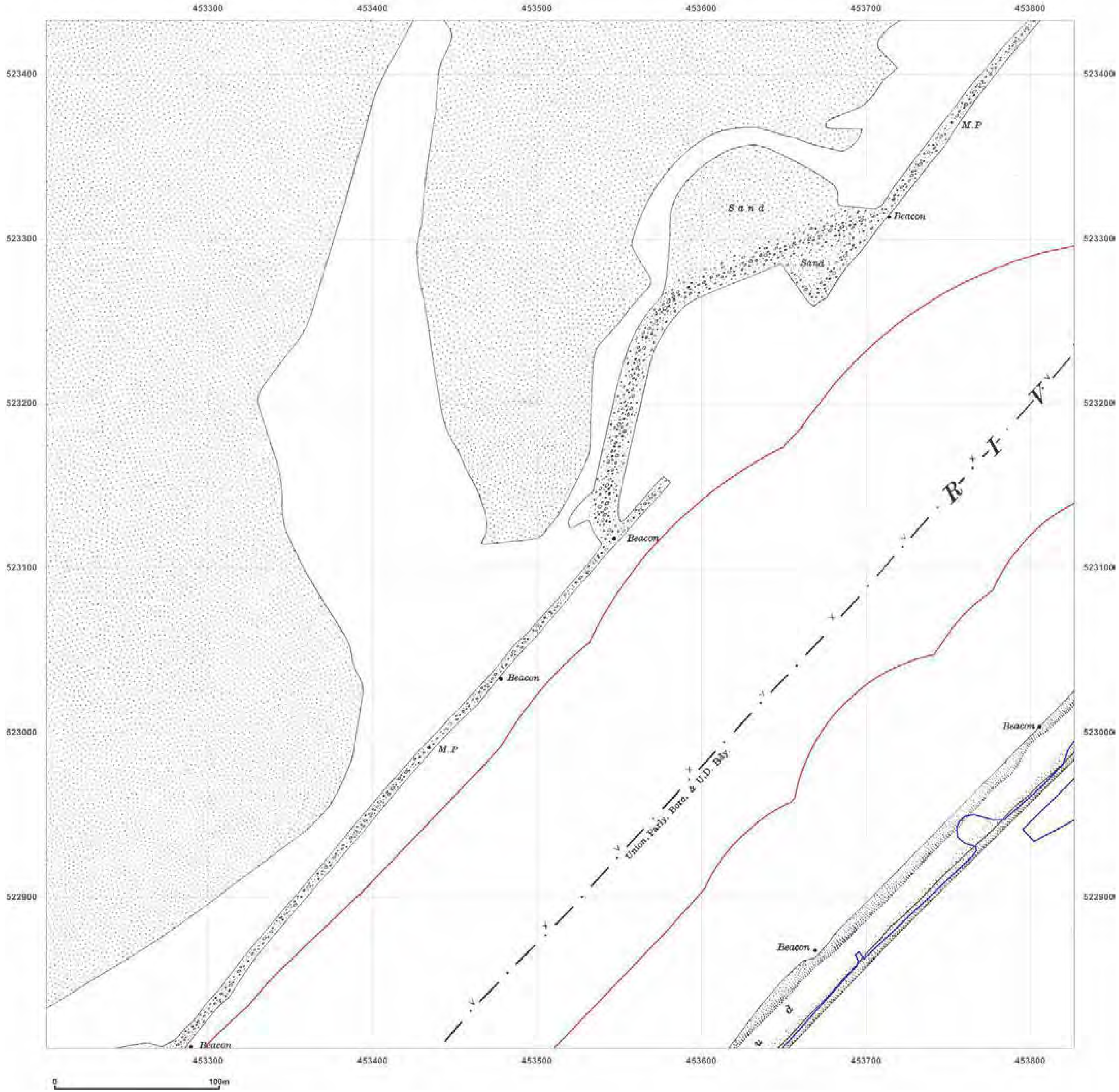
Powered by OS

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_2_4
Grid Ref:	453514, 523120

Map Name:	County Series
Map date:	**1917**
Scale:	1:2,500
Printed at:	1:2,500

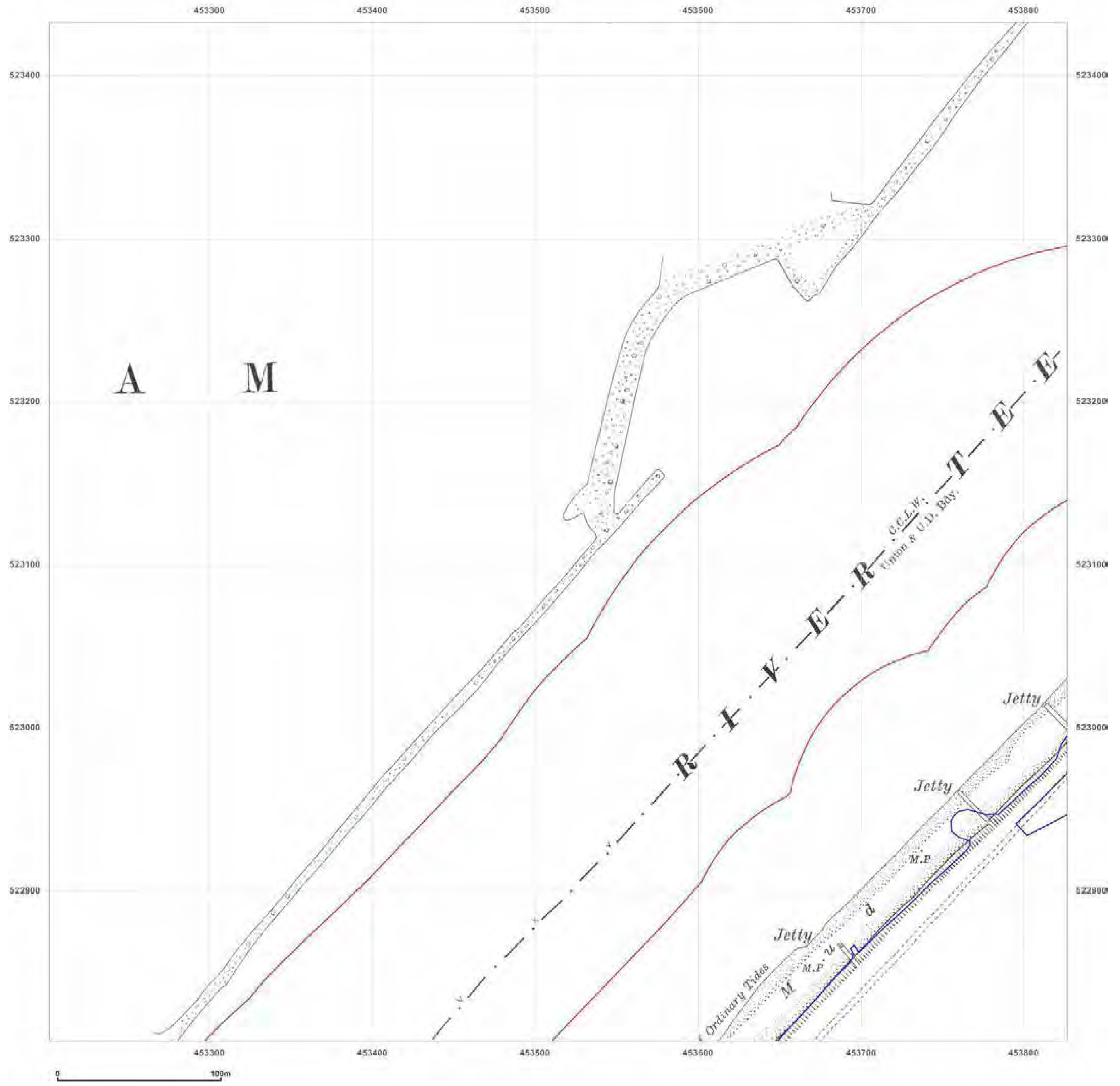
Surveyed 1917
Revised 1917
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: County Series

Map date: 1929

Scale: 1:2,500

Printed at: 1:2,500

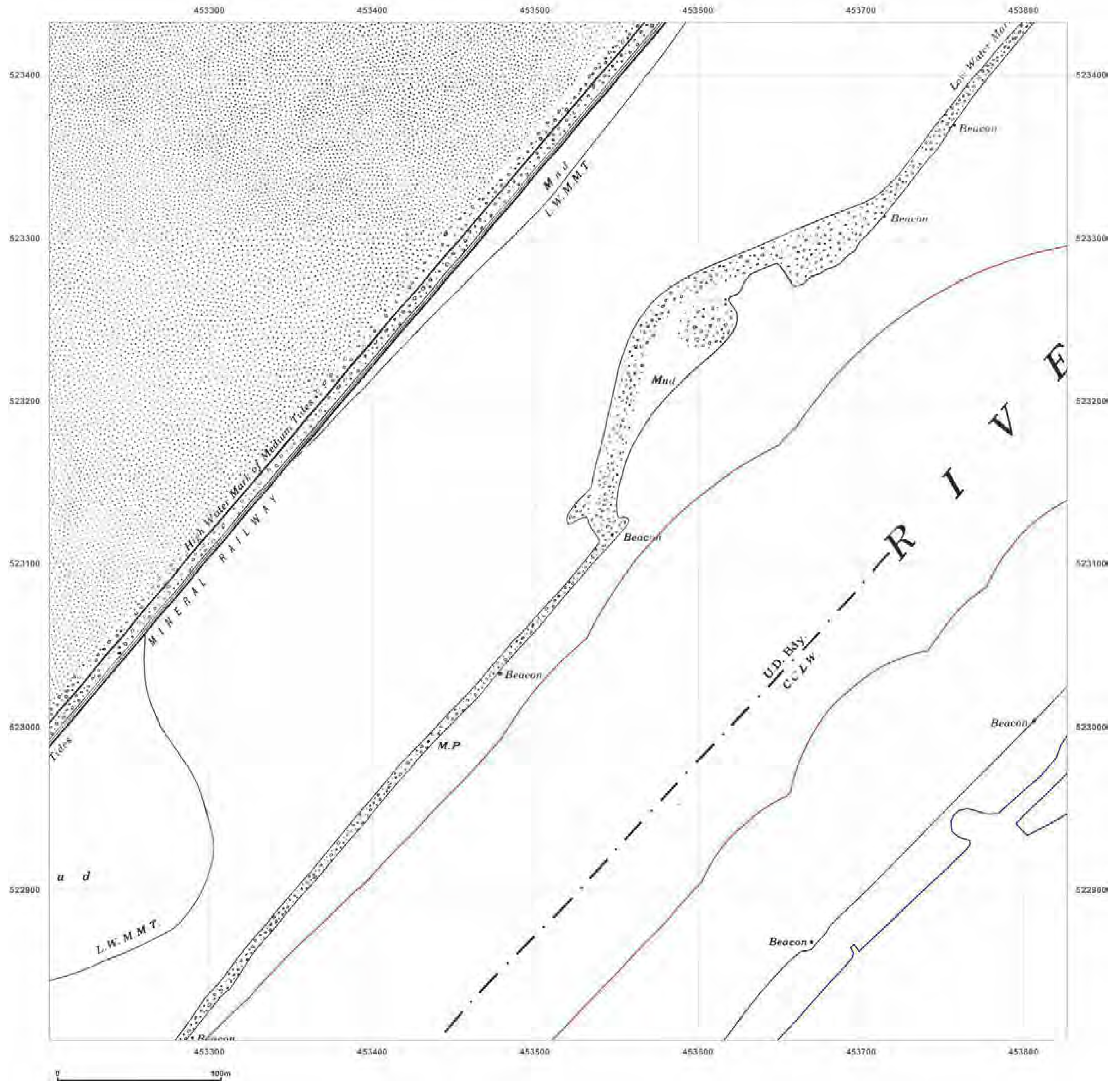
Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: County Series

Map date: 1940

Scale: 1:2,500

Printed at: 1:2,500

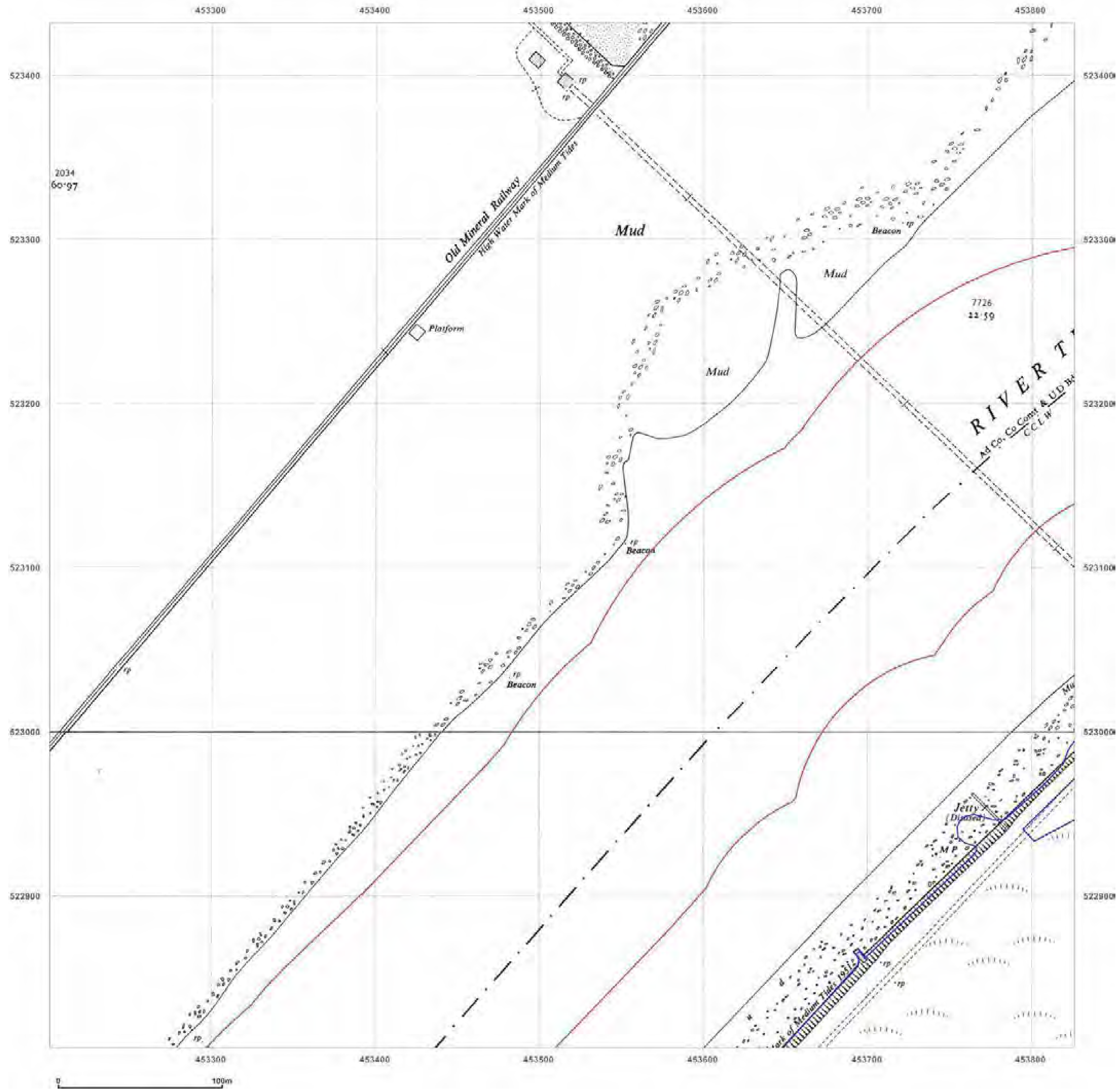
Surveyed 1940
Revised 1940
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: National Grid

Map date: **1952-1956**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Groundsure INSIGHTS

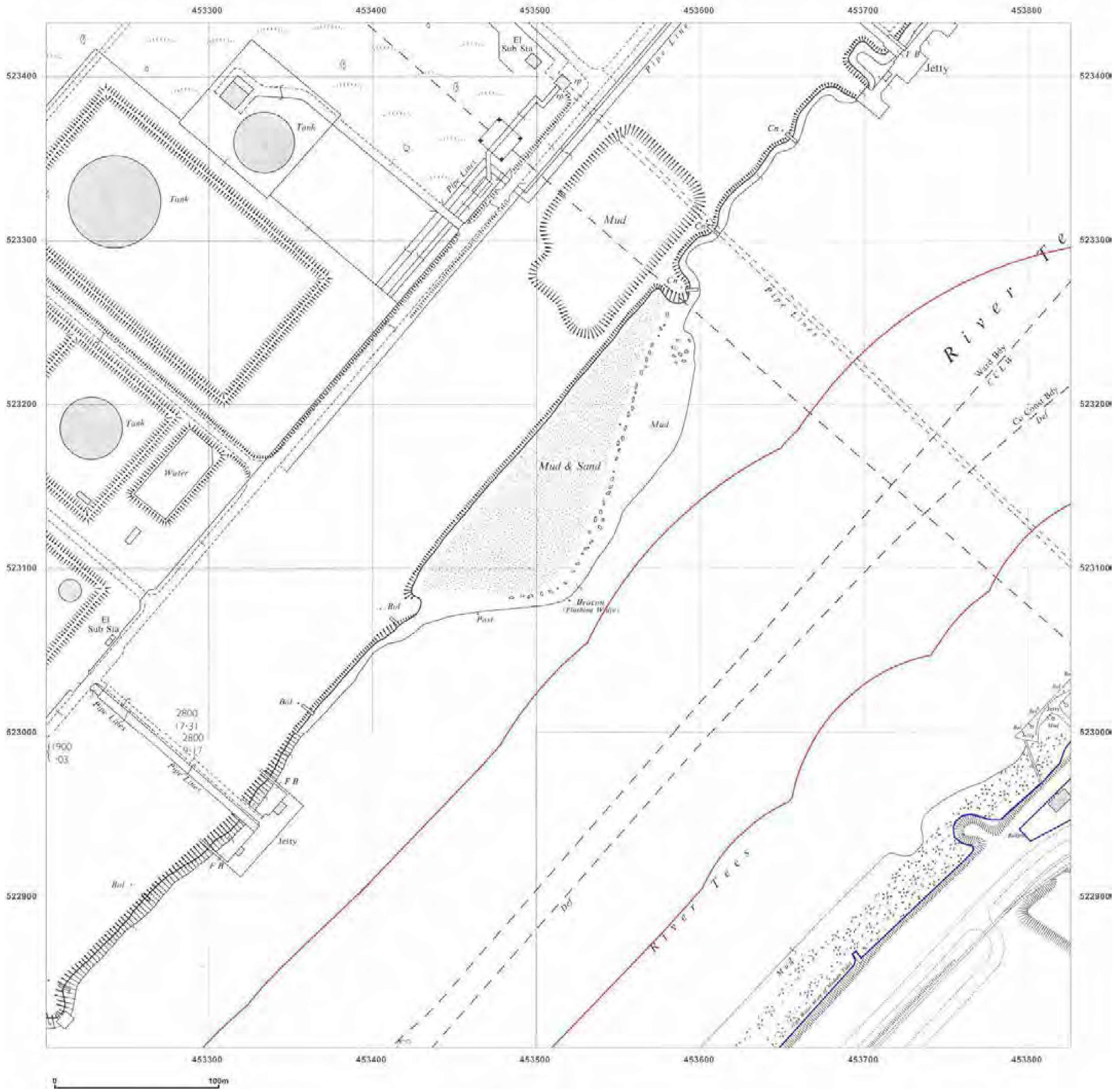
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

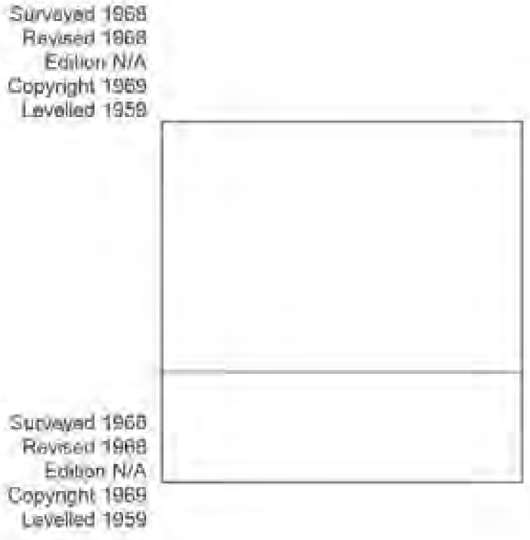
Map Name: National Grid

Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Groundsure INSIGHTS

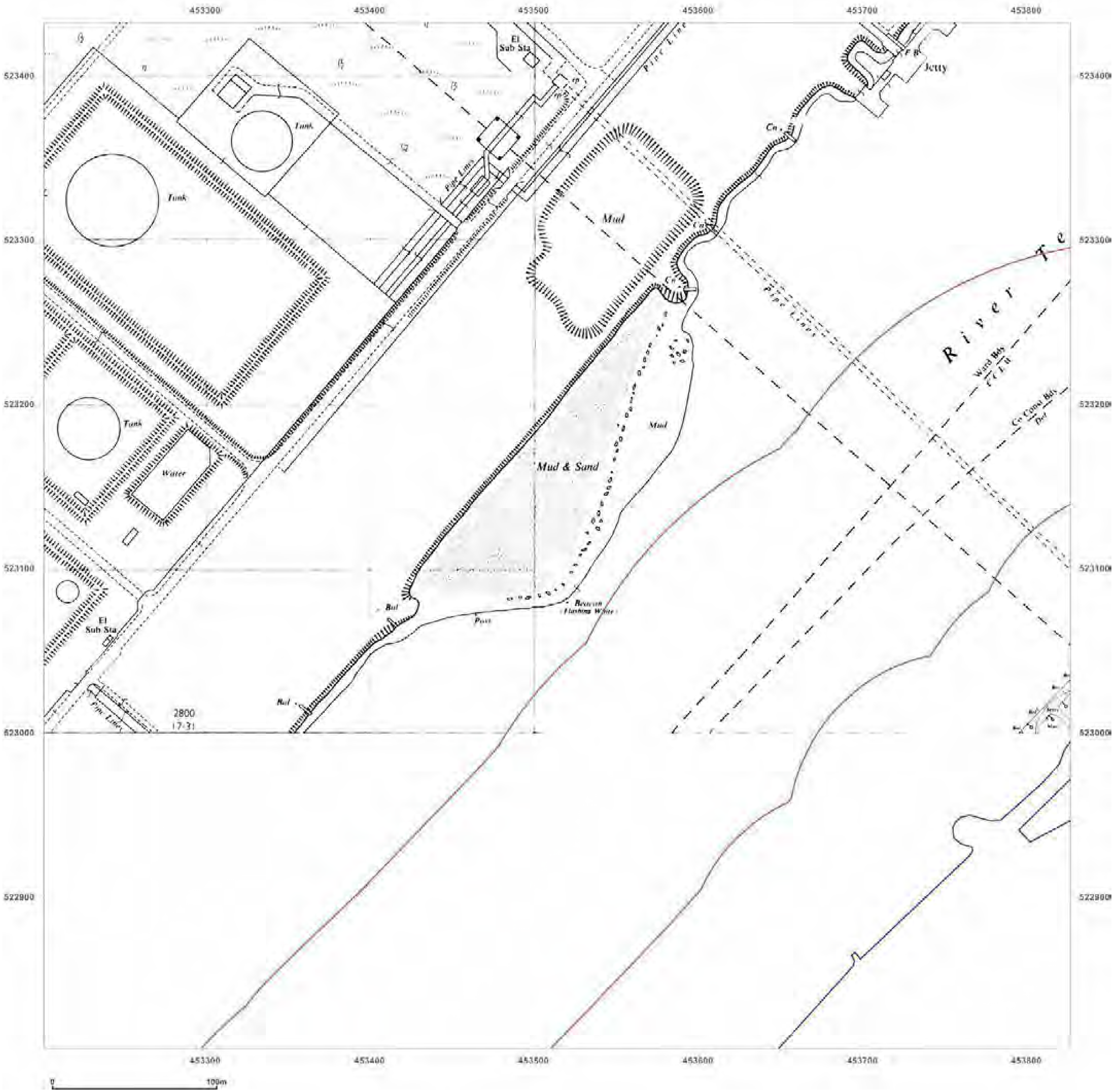
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_2_4
Grid Ref: 453514, 523120

Map Name: National Grid

Map date: **1969**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

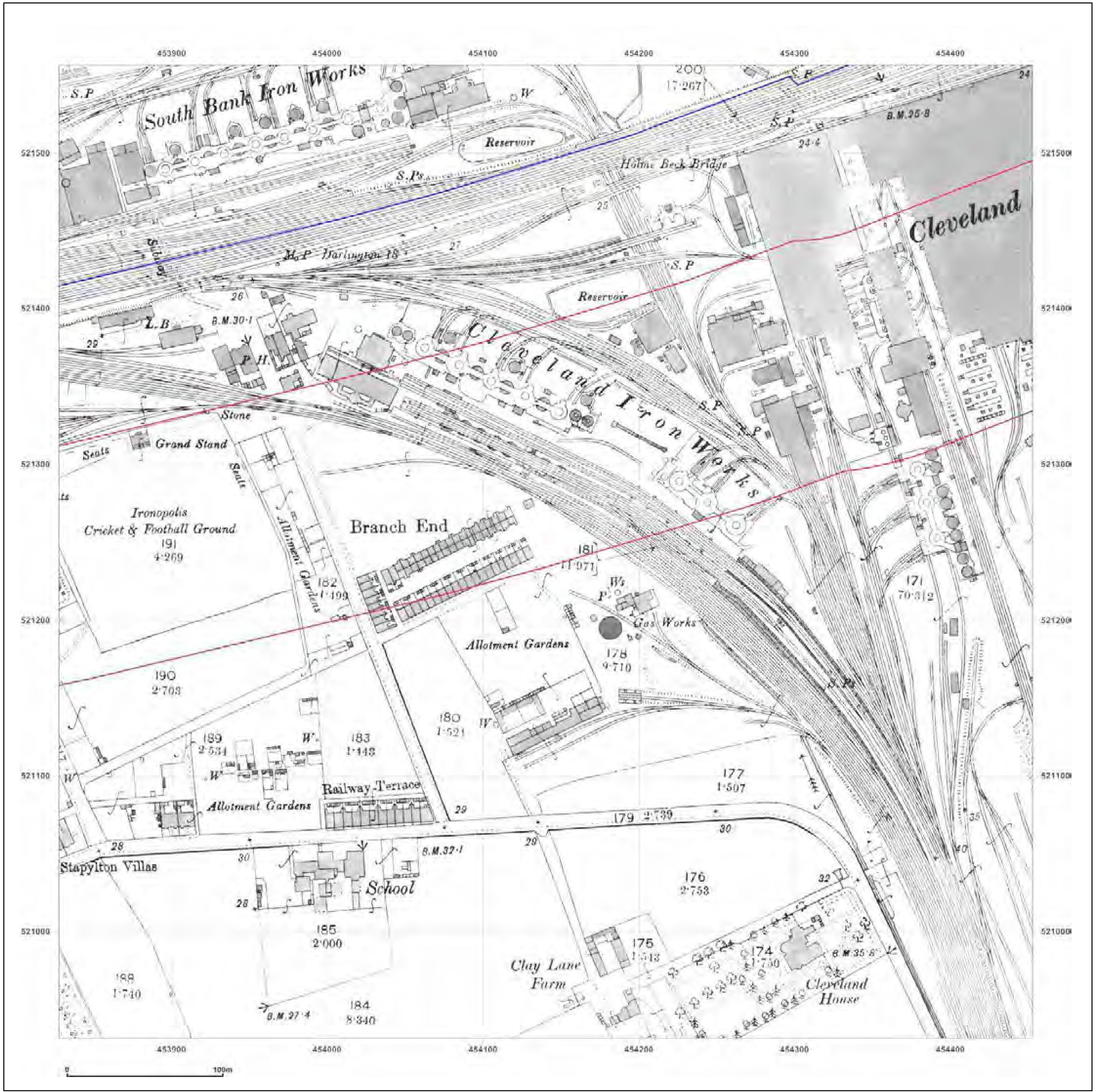
Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

1:2500 Scale Sections 3-1 to 3-4



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

Map Name: County Series

Map date: **1895**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S


Surveyed 1895
Revised 1895
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

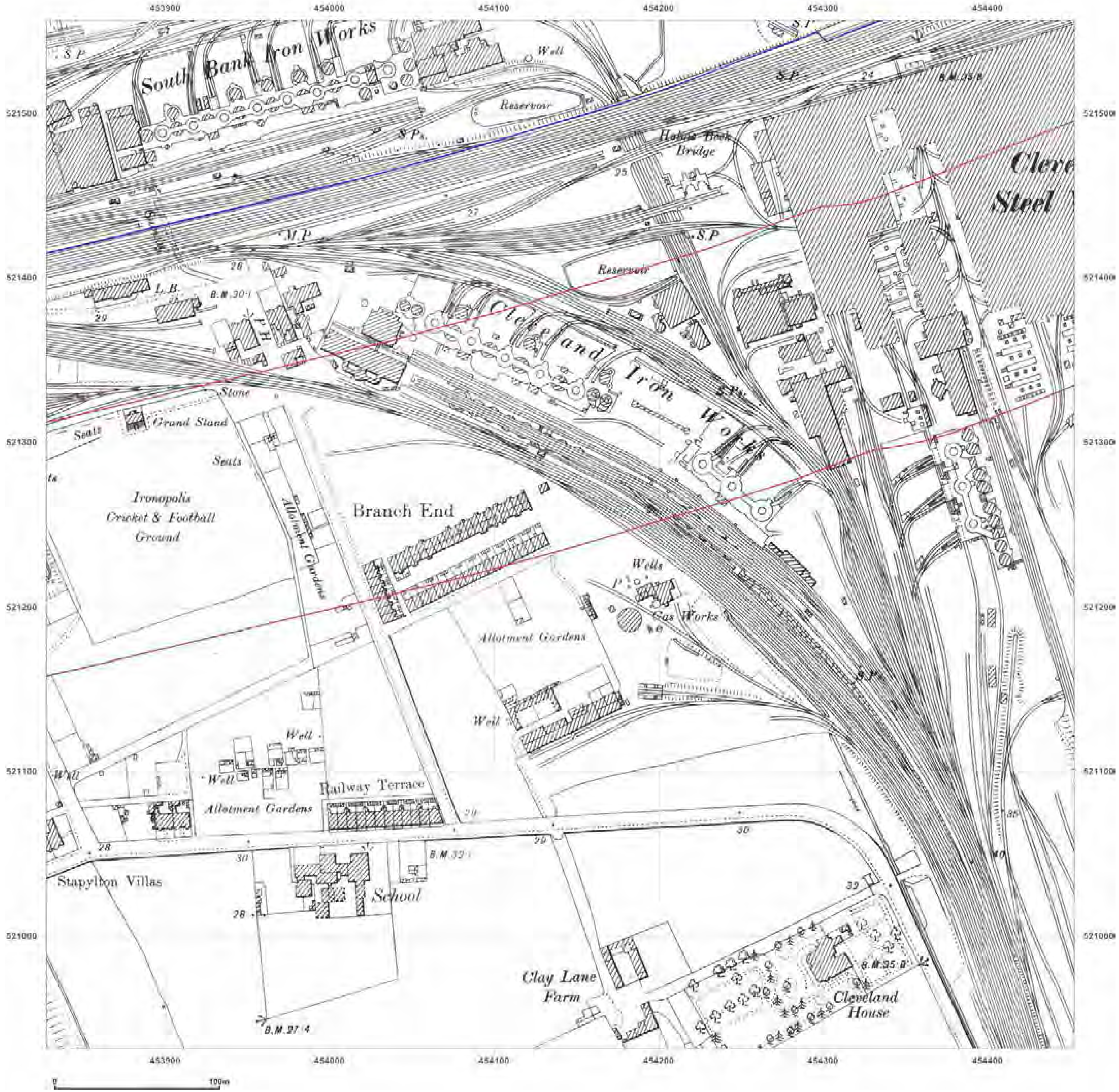
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

Map Name: County Series

Map date: 1899

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

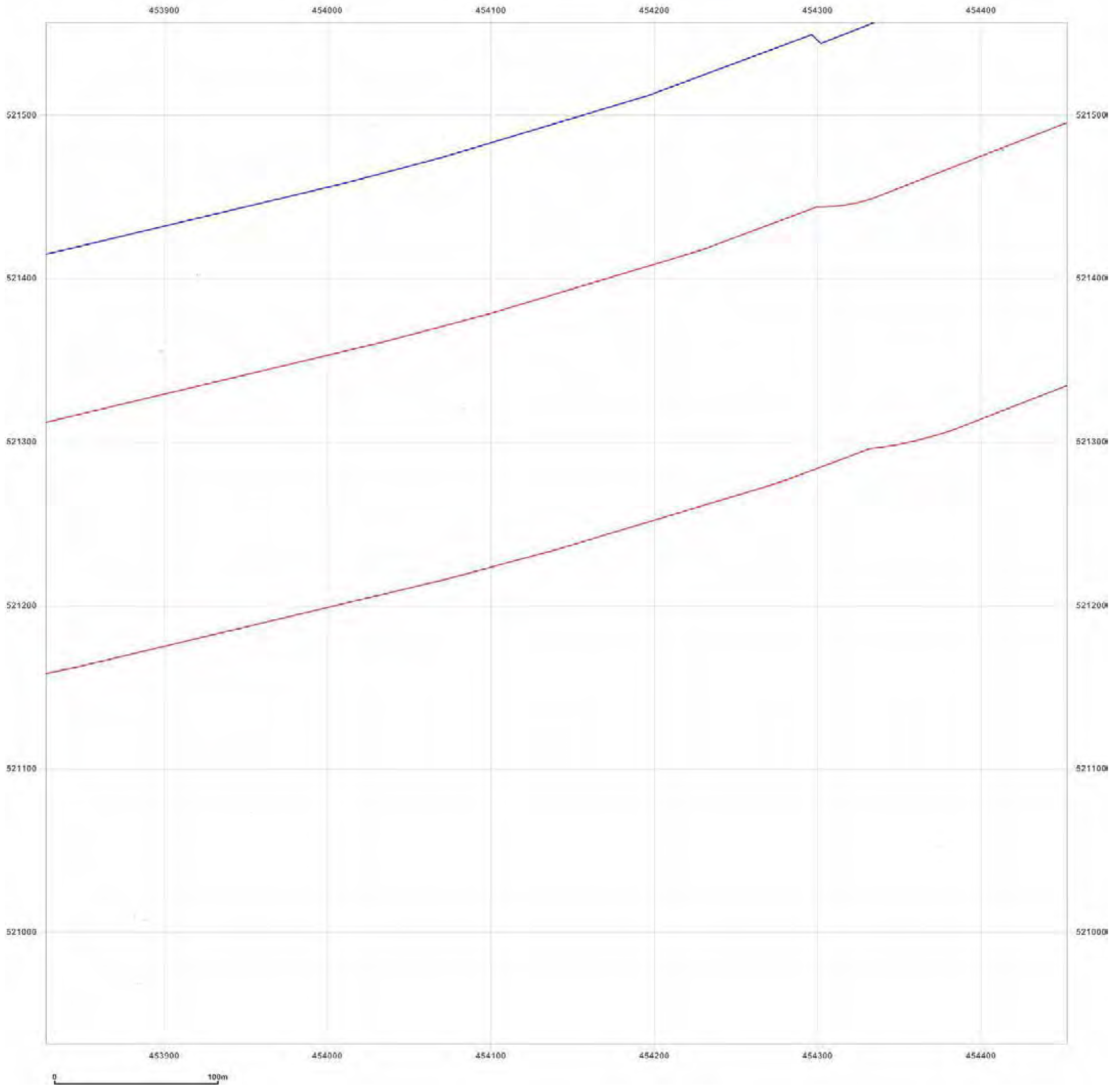
Surveyed 1899
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_1
Grid Ref:	454140, 521244

Map Name:	County Series
Map date:	**1913**
Scale:	1:2,500
Printed at:	1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W
E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

Map Name: County Series

Map date: 1929

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

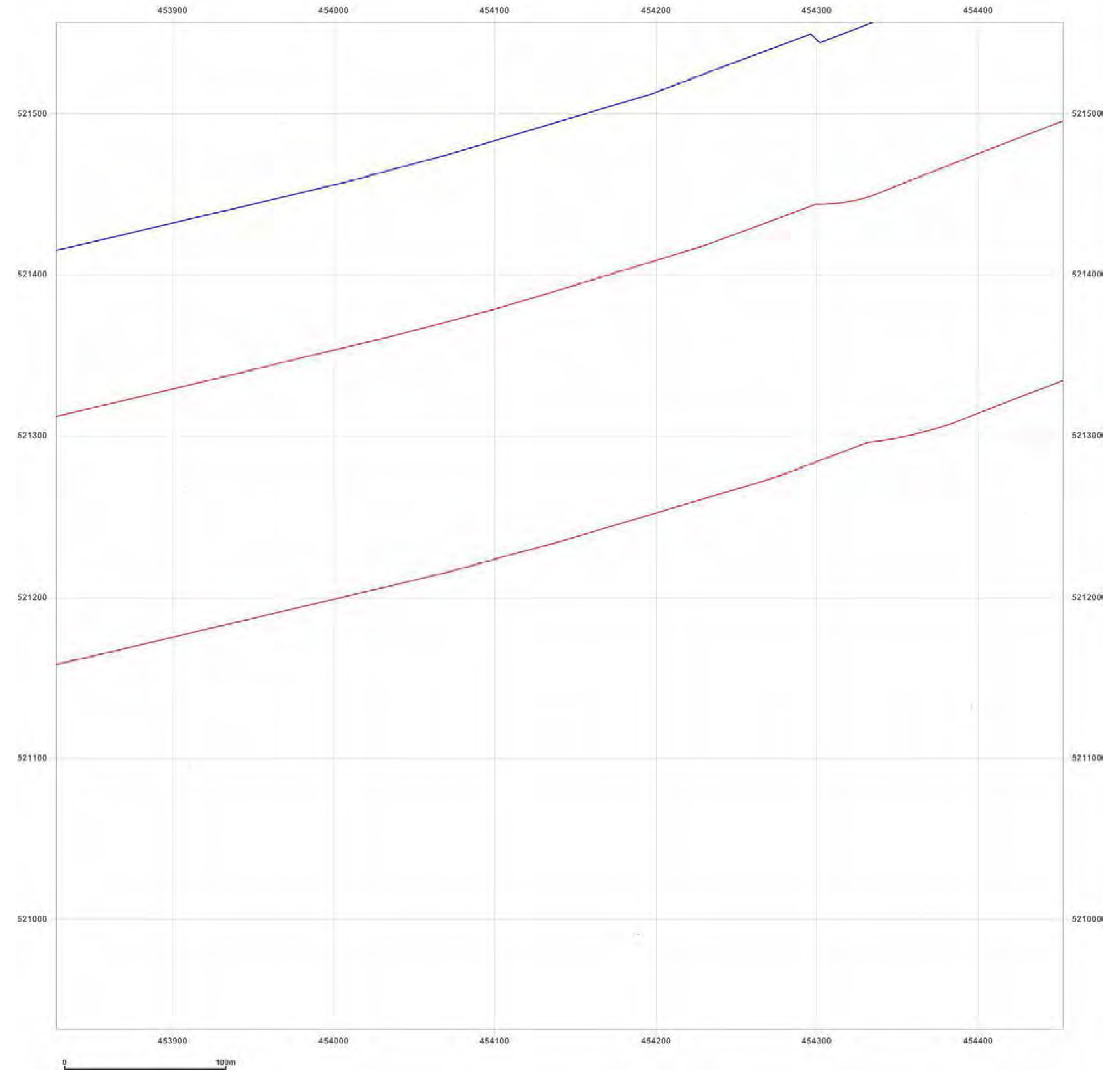
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

Map Name: County Series

Map date: **1941**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Groundsure INSIGHTS

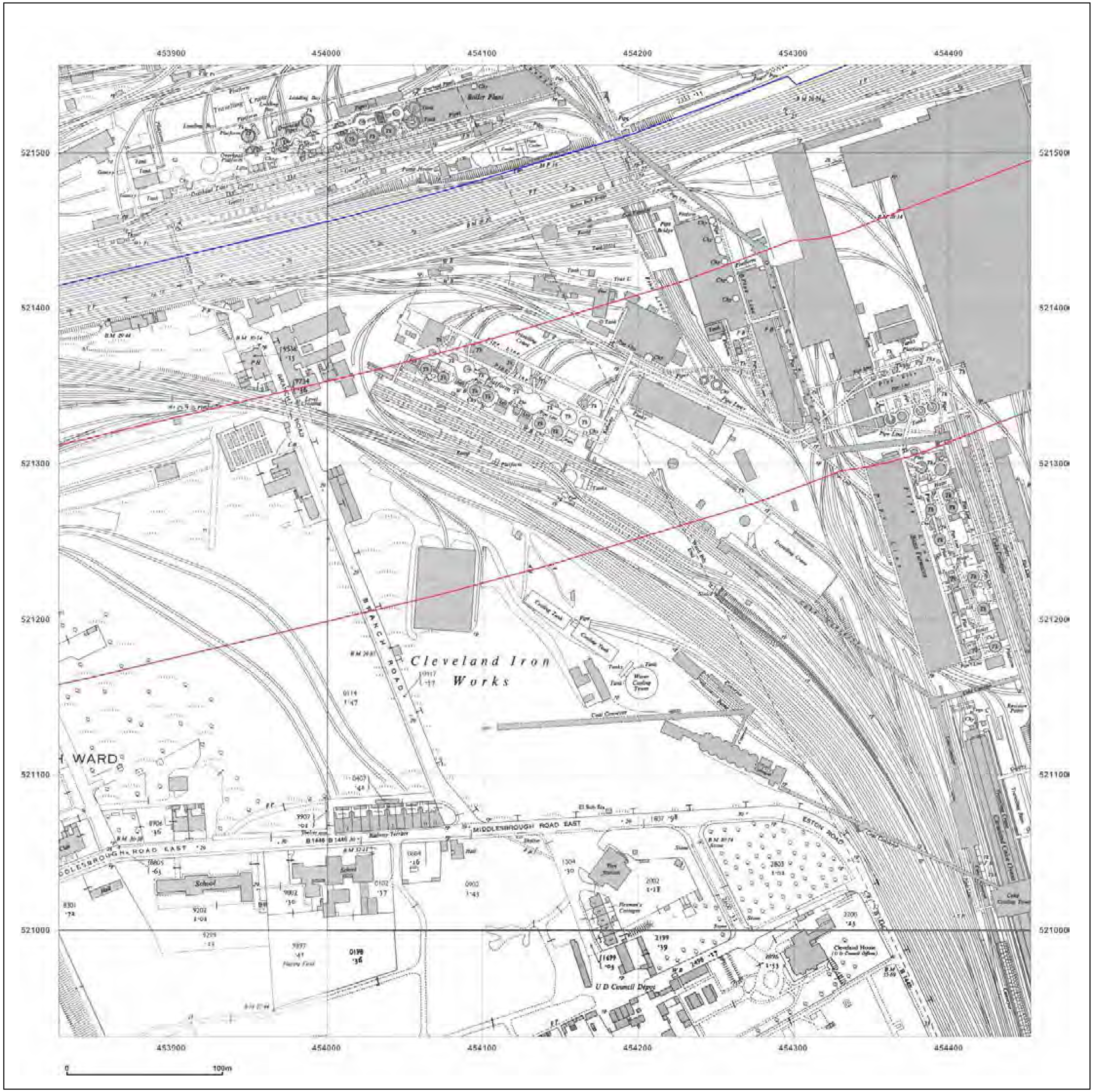
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

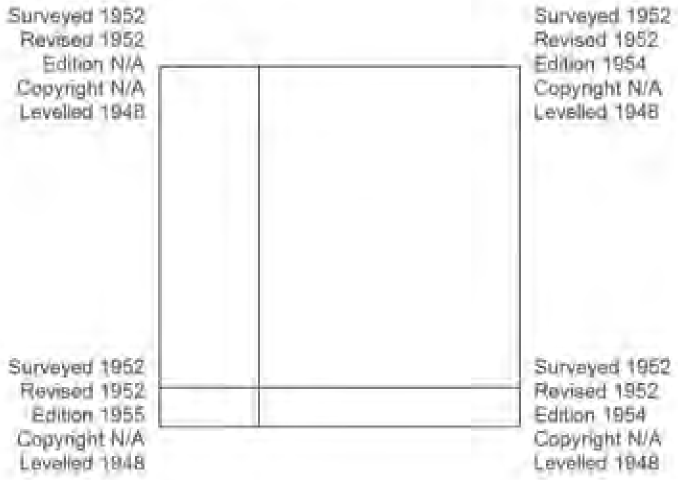
Map Name: National Grid

Map date: **1952-1955**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_1
Grid Ref: 454140, 521244

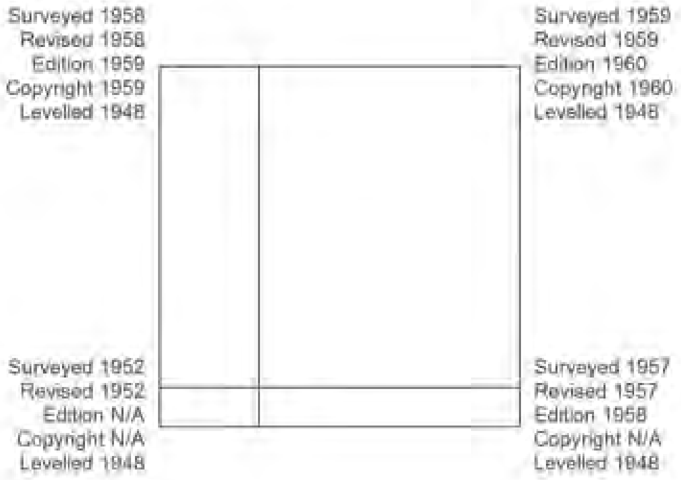
Map Name: National Grid

Map date: **1952-1960**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

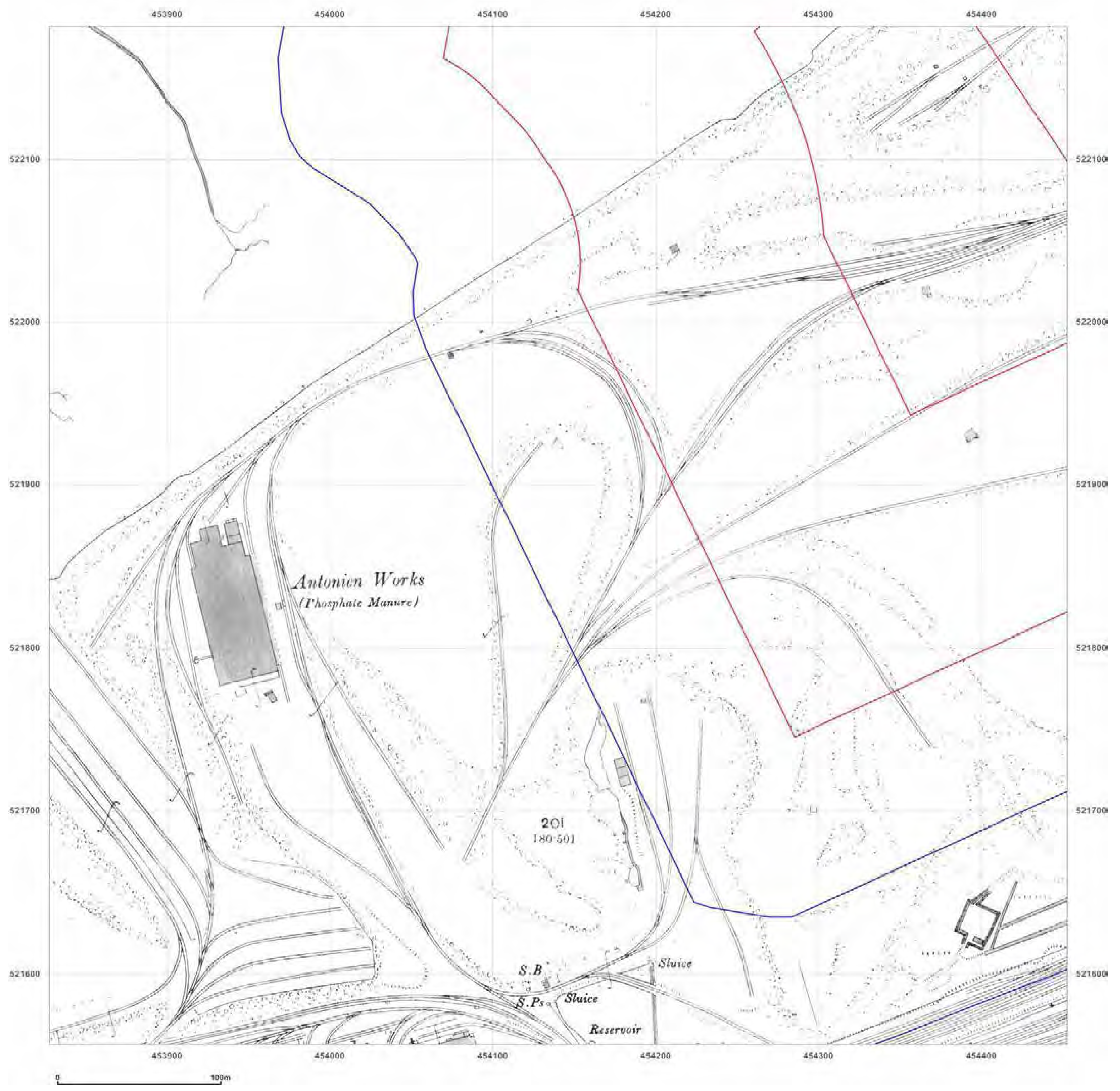


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name: County Series

Map date: **1895**

Scale: 1:2,500

Printed at: 1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_2
Grid Ref:	454140, 521869

Map Name:	County Series
Map date:	**1899**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1899
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

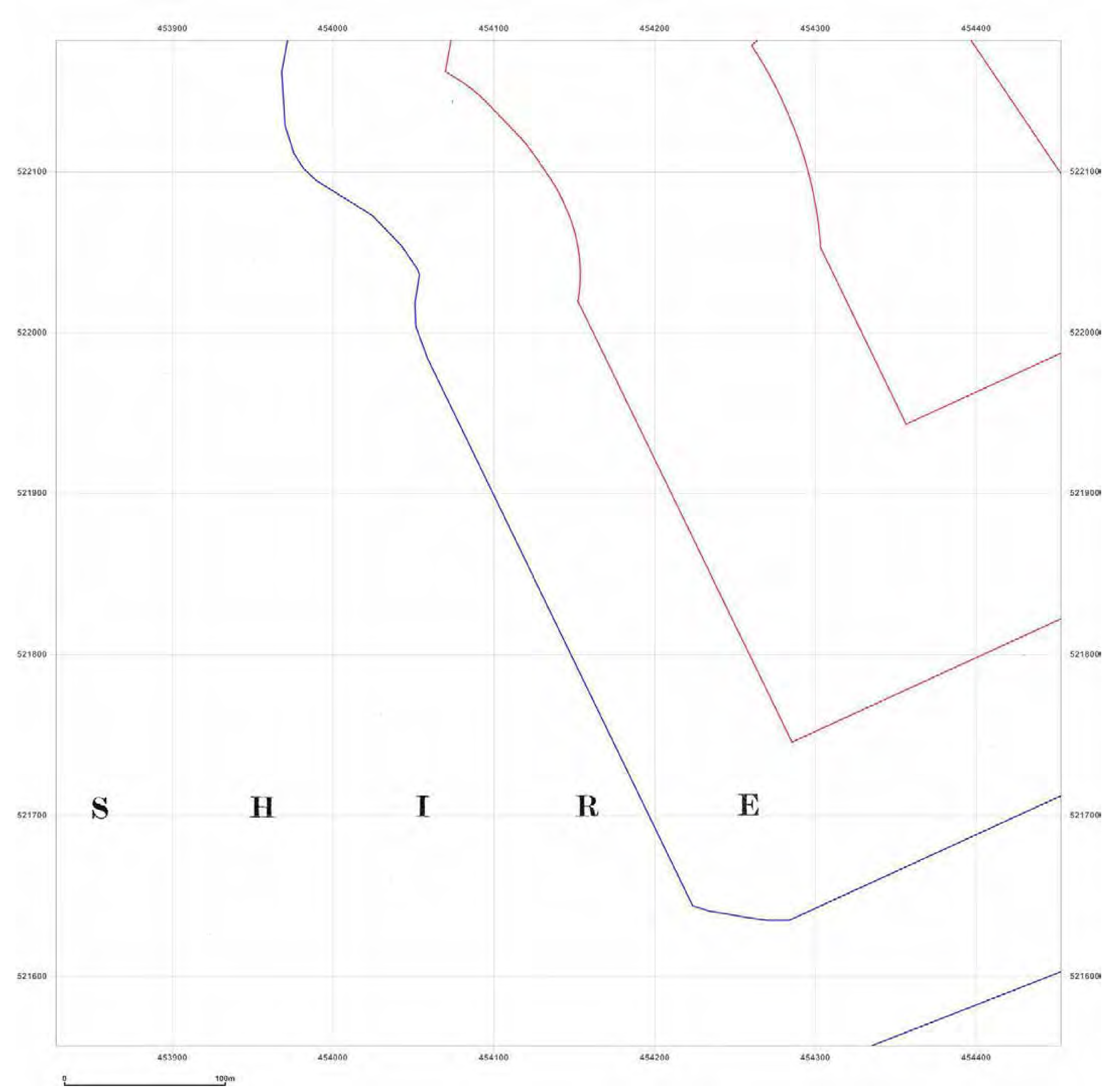
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

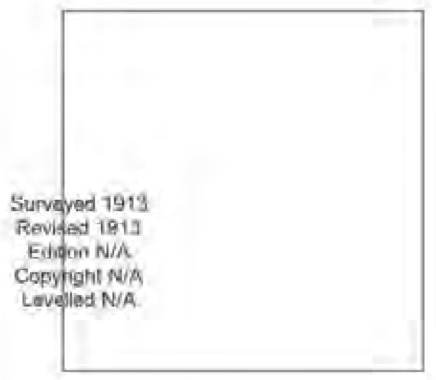


Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name:	County Series
Map date:	**1913**
Scale:	1:2,500
Printed at:	1:2,500

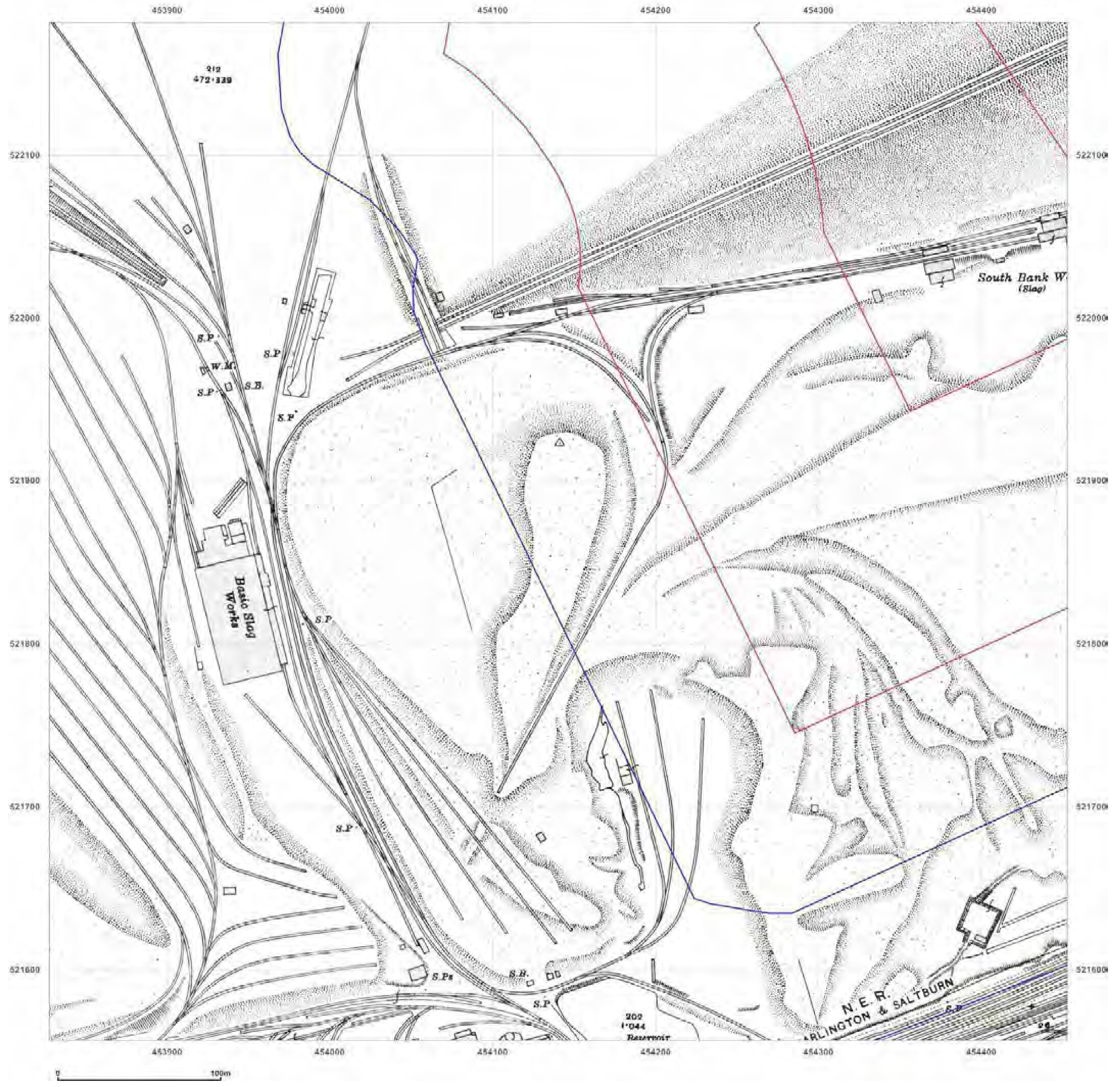


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

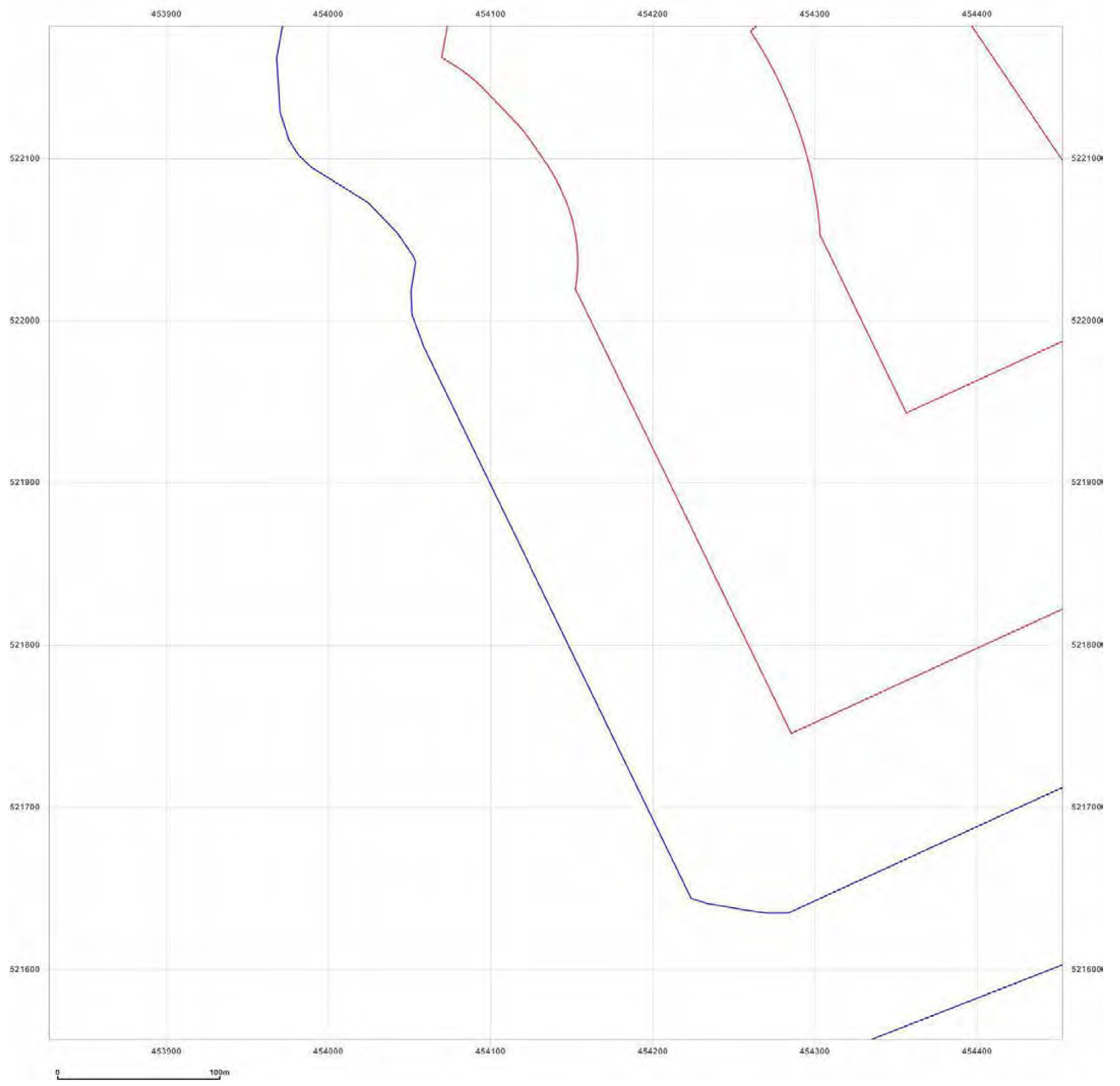
Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

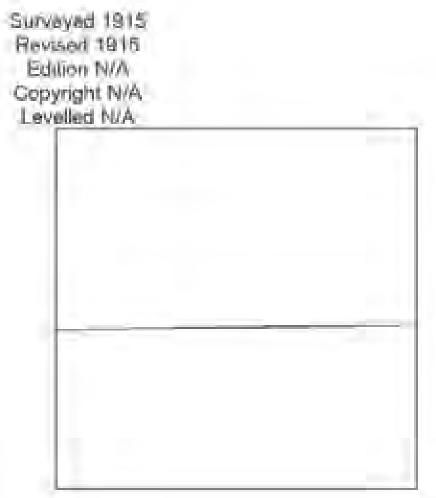
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

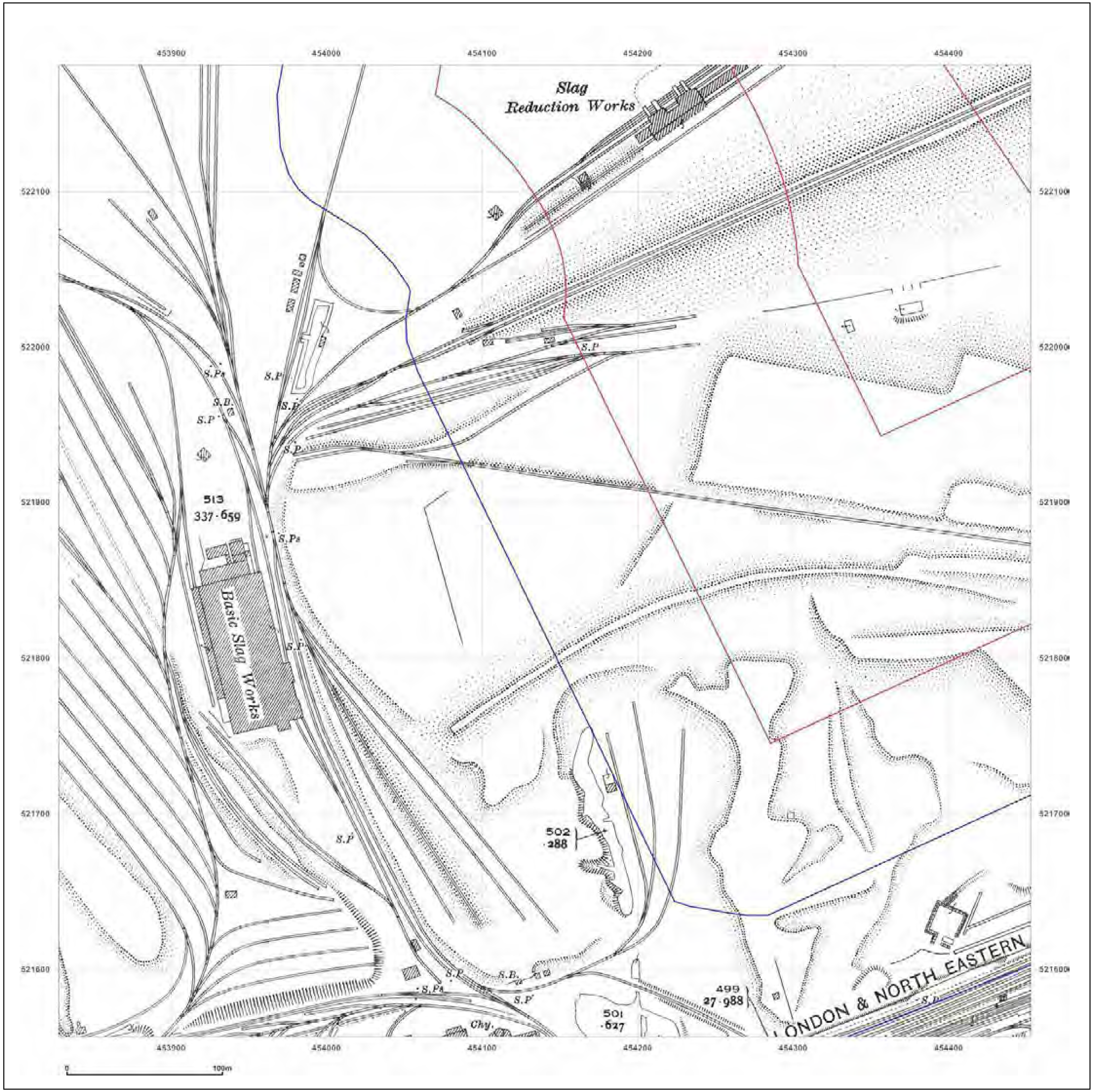
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_2
Grid Ref:	454140, 521869

Map Name:	County Series
Map date:	**1929**
Scale:	1:2,500
Printed at:	1:2,500

Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

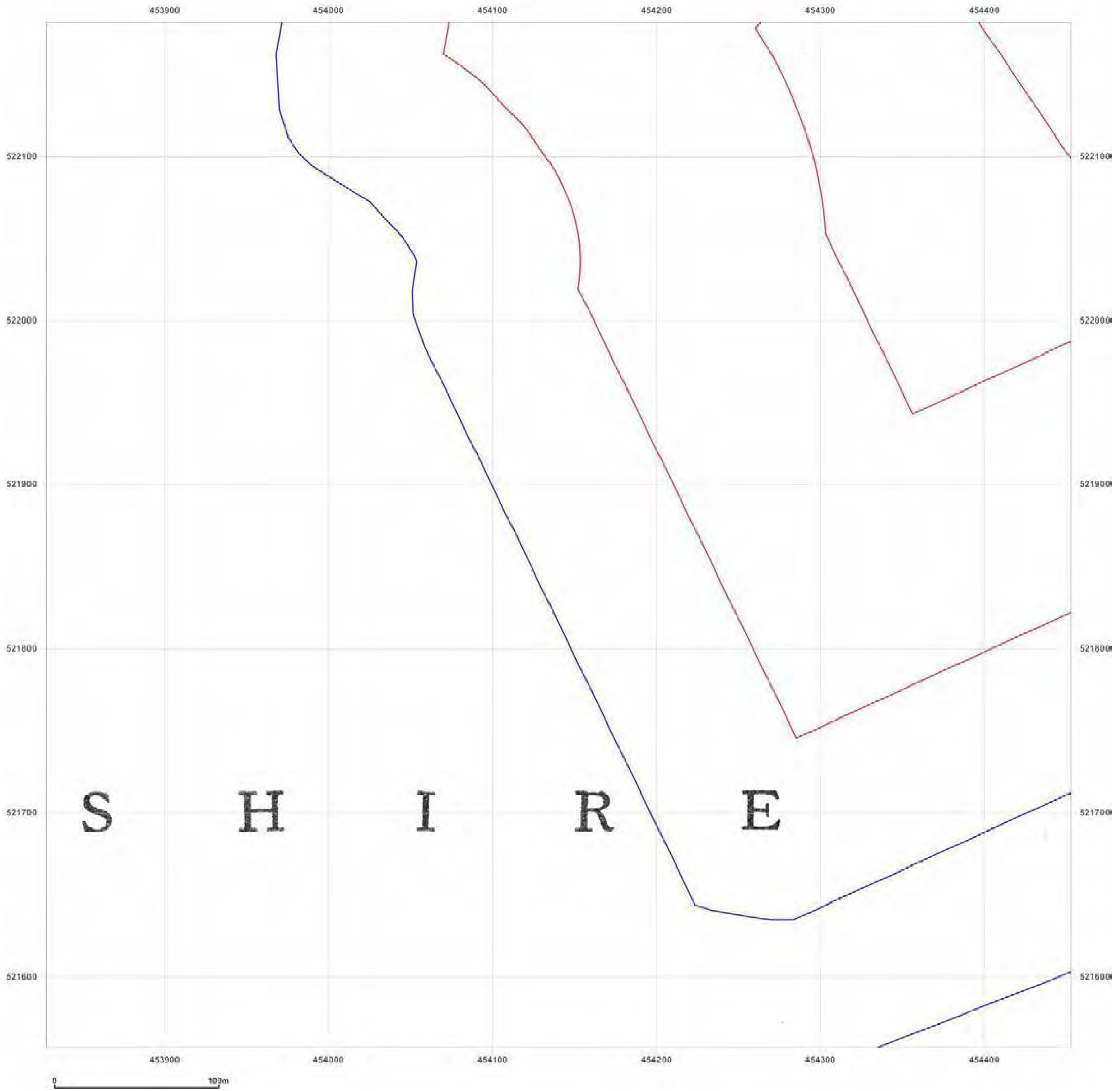
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name: County Series

Map date: **1941**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1941
Revised 1941
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

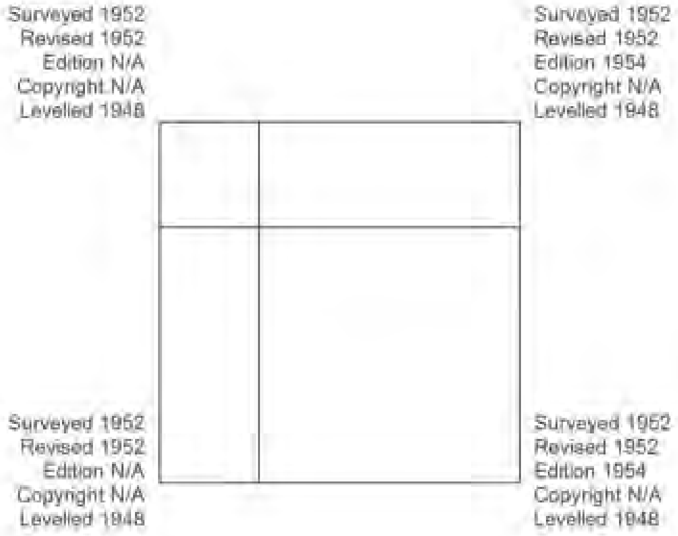
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name:	National Grid
Map date:	**1952**
Scale:	1:2,500
Printed at:	1:2,500

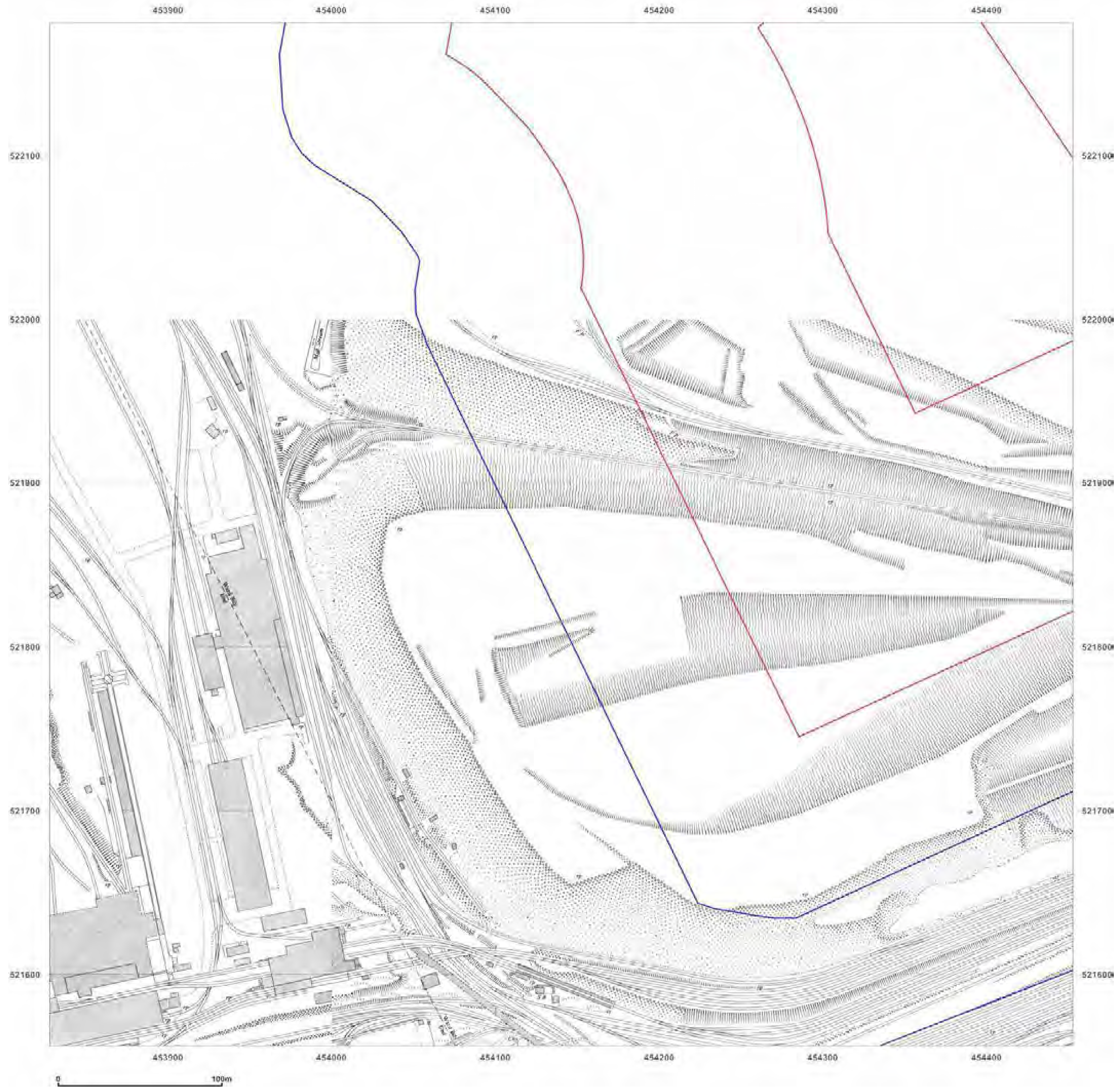


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

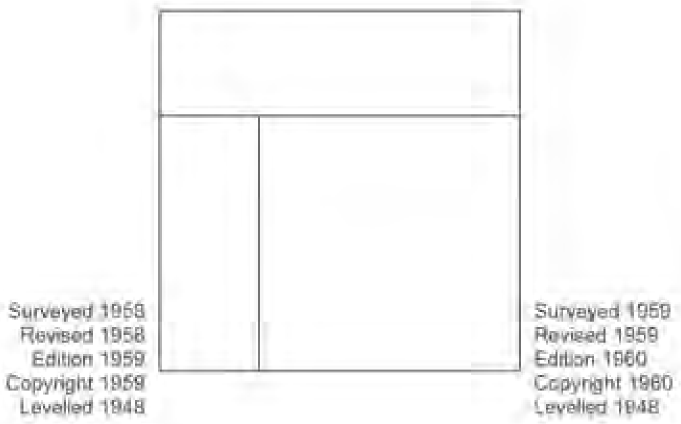
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_2
Grid Ref: 454140, 521869

Map Name: National Grid

Map date: **1959-1960**

Scale: 1:2,500

Printed at: 1:2,500

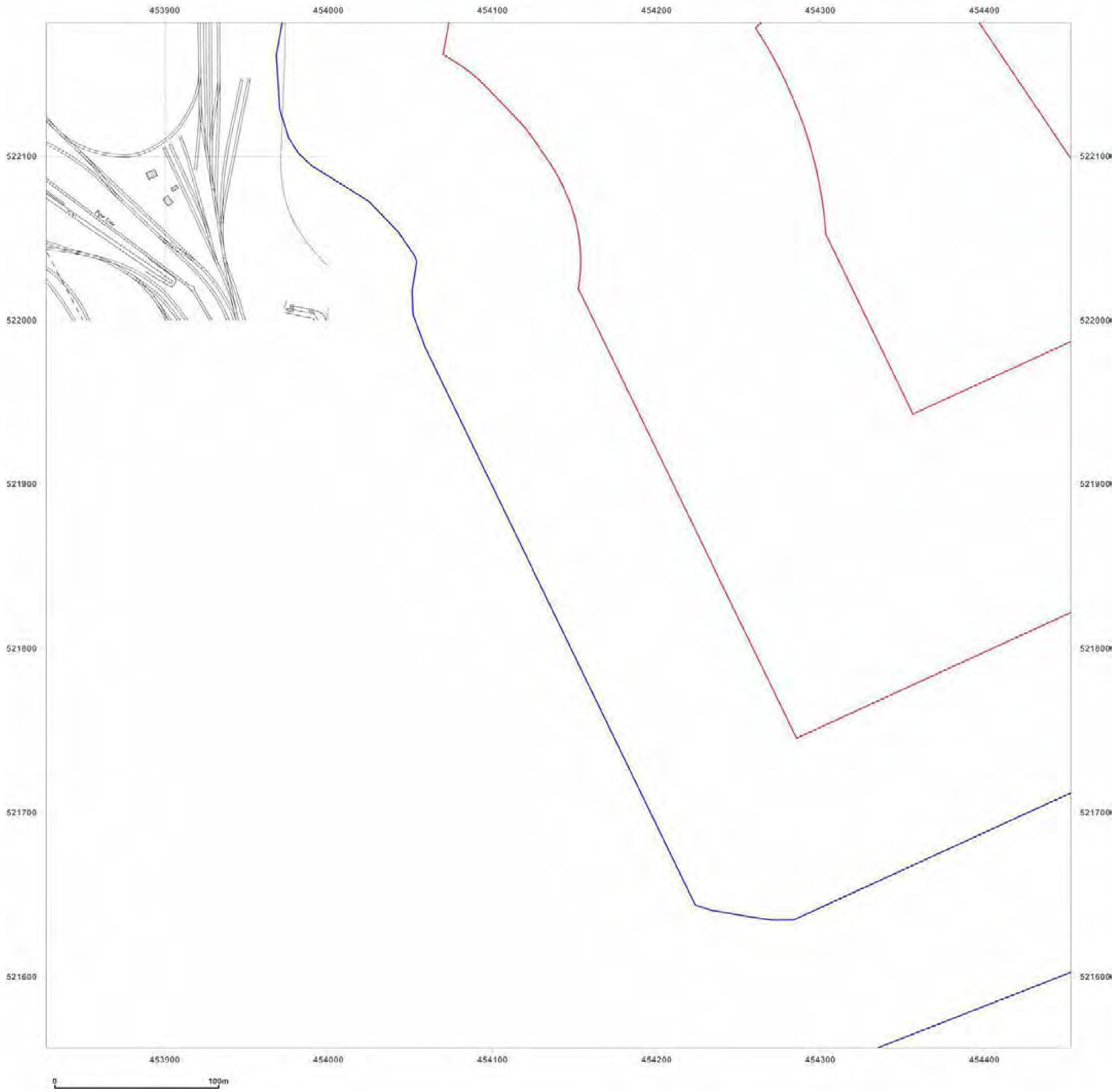


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

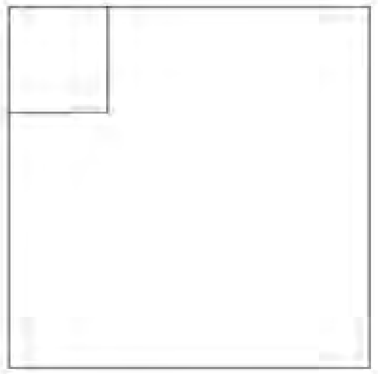
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_2
Grid Ref:	454140, 521869

Map Name:	National Grid
Map date:	**1968**
Scale:	1:2,500
Printed at:	1:2,500

Surveyed 1968
Revised 1968
Edition N/A
Copyright 1969
Levelled 1959

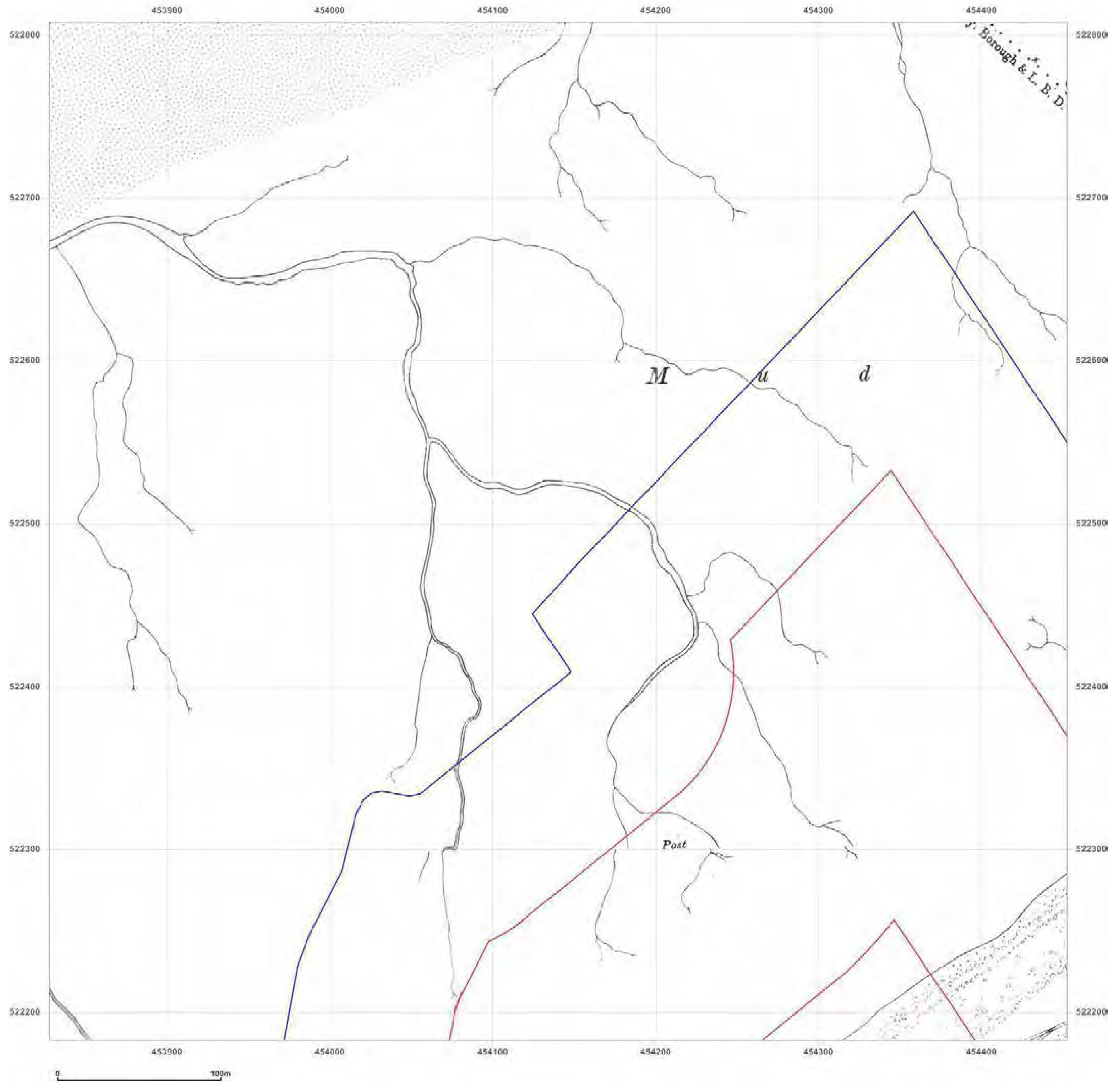


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: County Series

Map date: **1894-1895**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Groundsure INSIGHTS

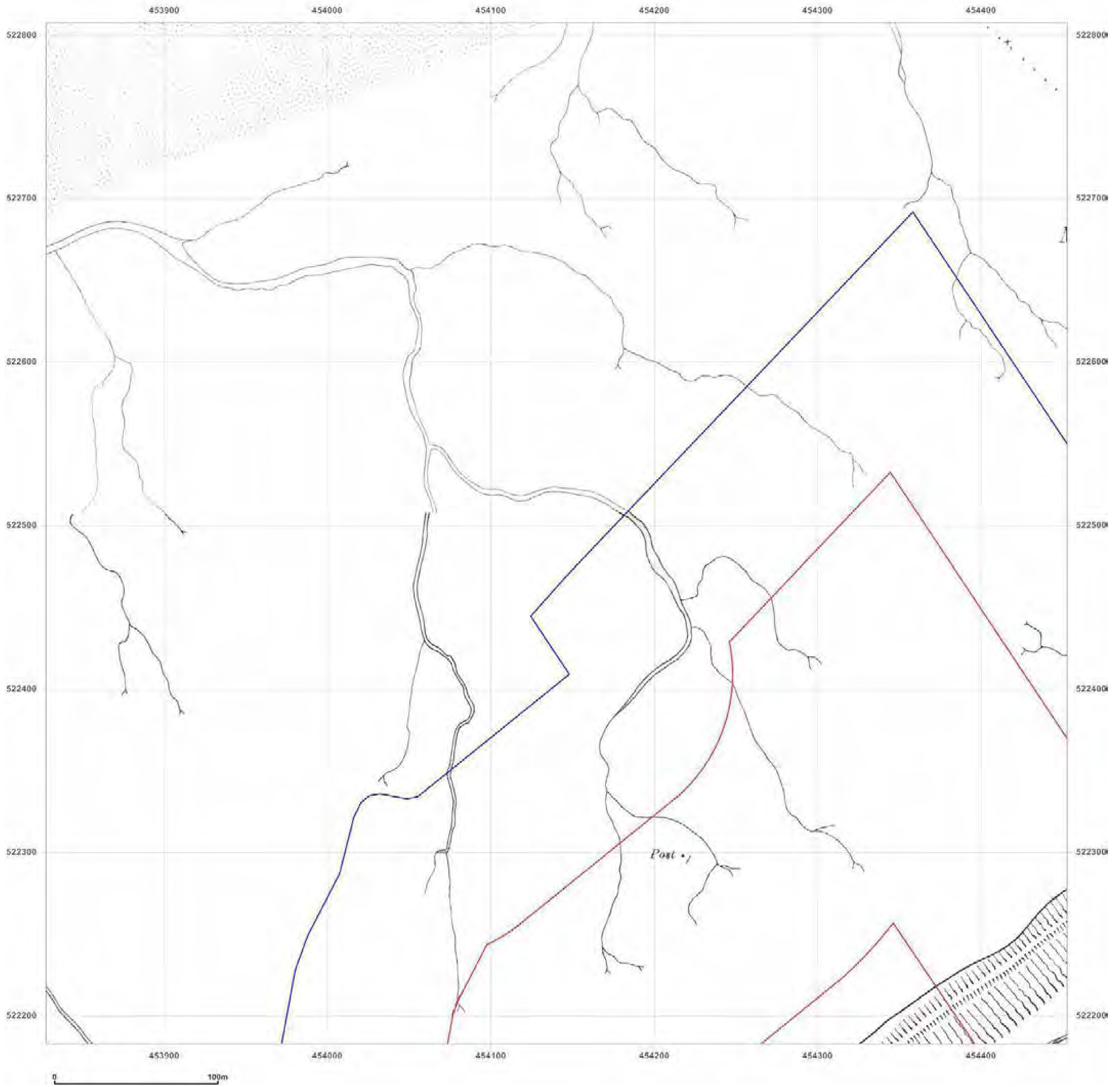
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_3
Grid Ref:	454140, 522495

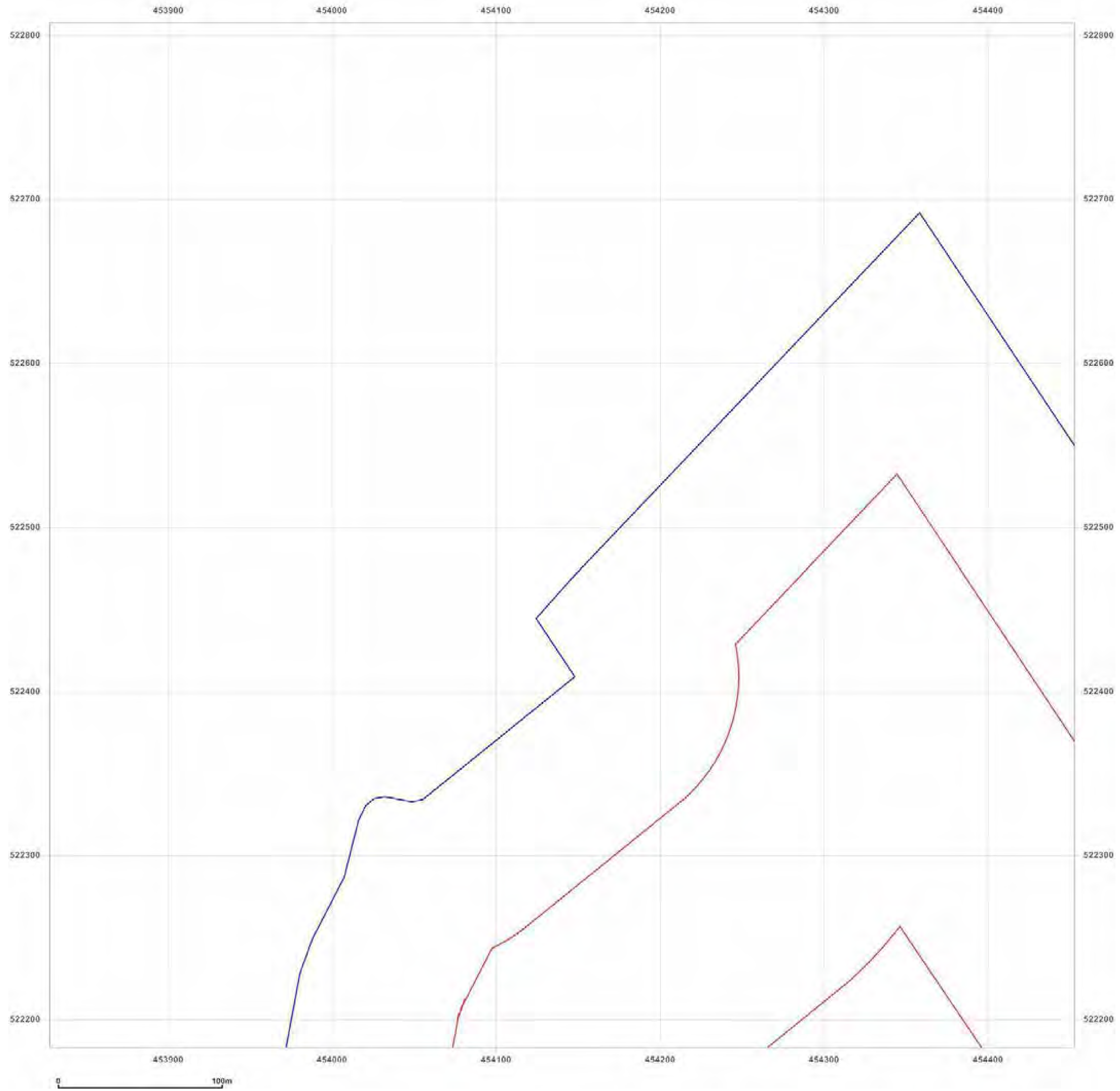
Map Name:	County Series
Map date:	**1898-1899**
Scale:	1:2,500
Printed at:	1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Groundsure INSIGHTS

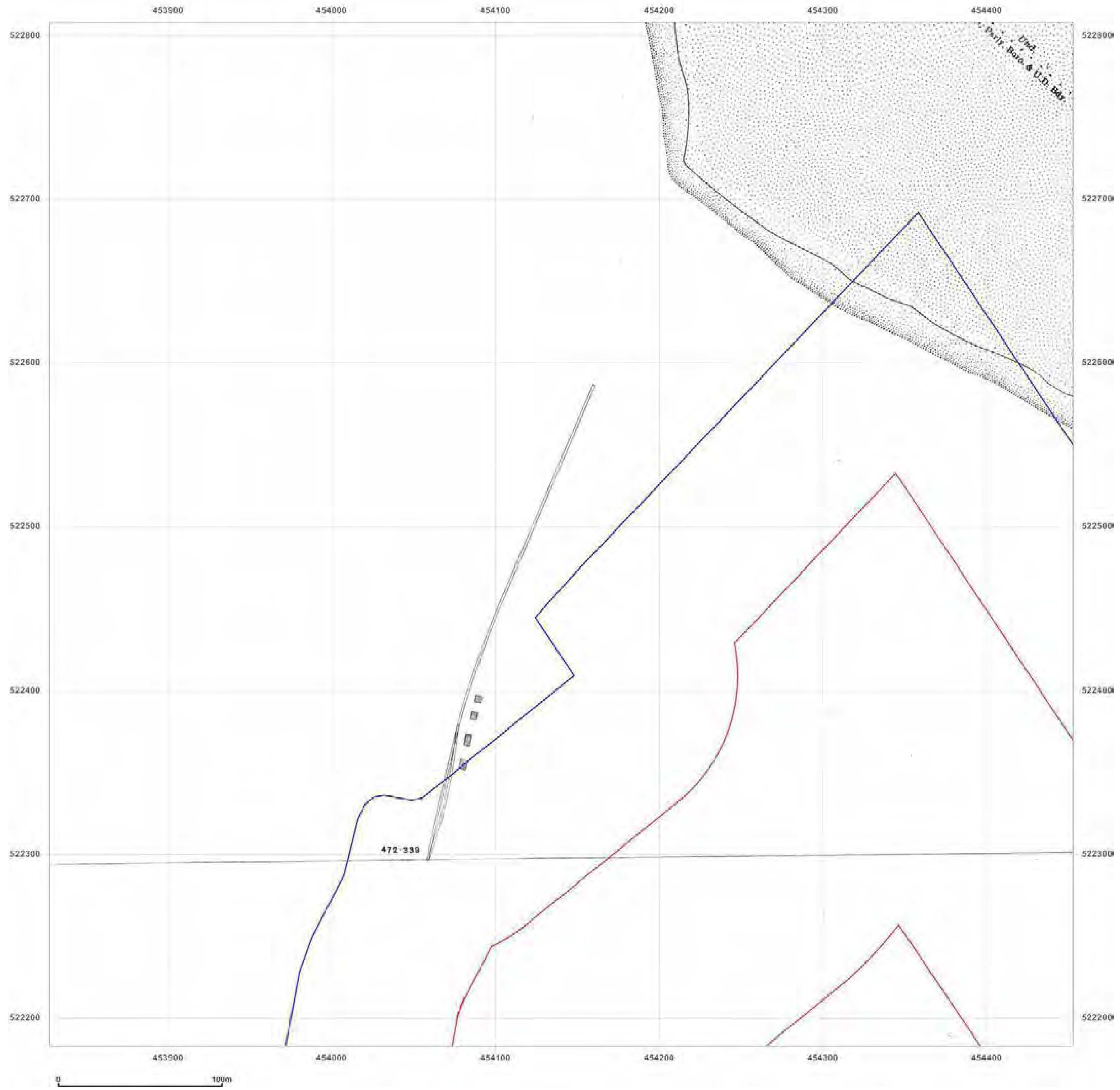
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_3
Grid Ref:	454140, 522495

Map Name:	County Series
Map date:	**1913-1915**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Groundsure INSIGHTS

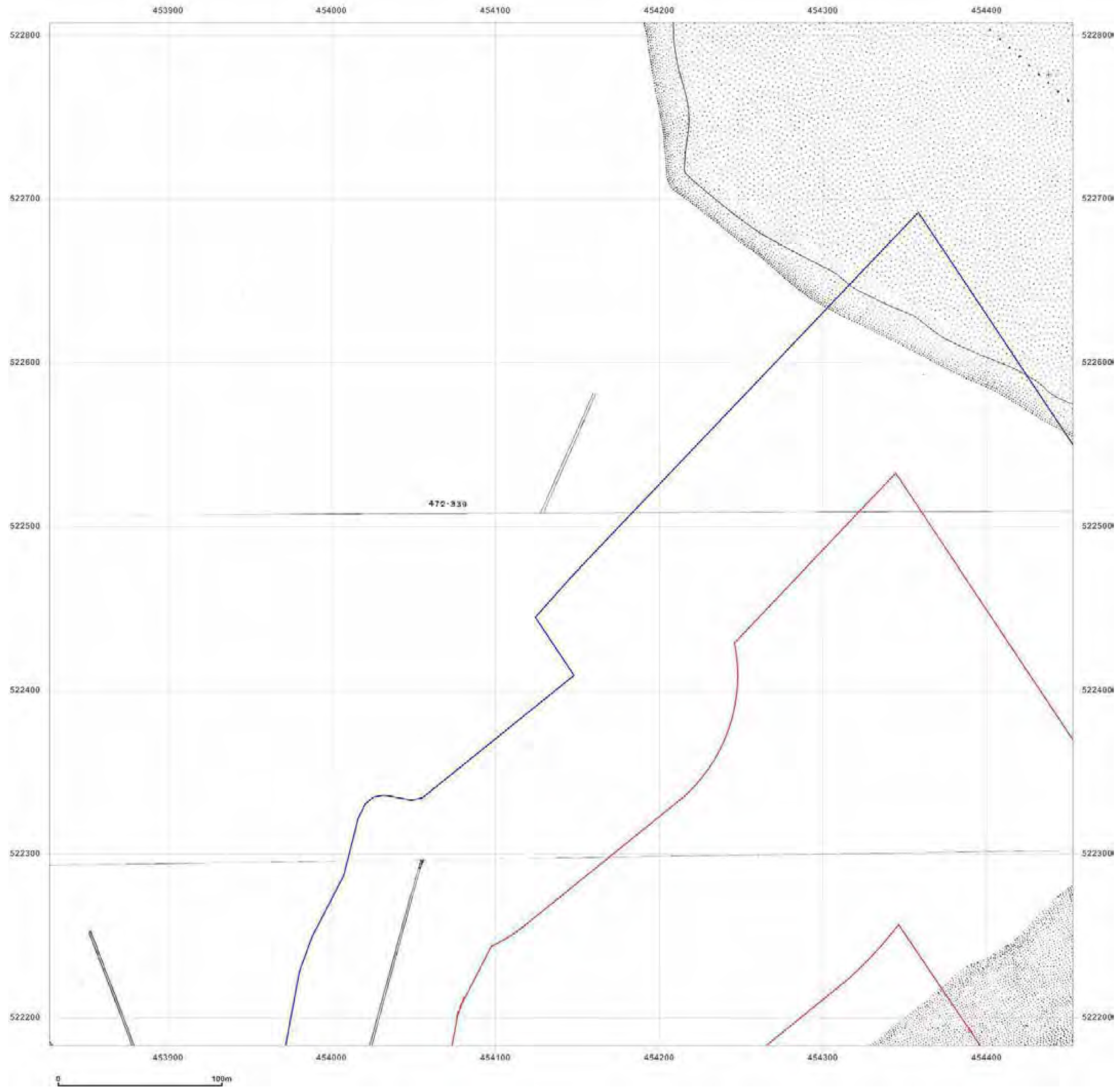
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: County Series

Map date: **1915-1917**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Groundsure INSIGHTS

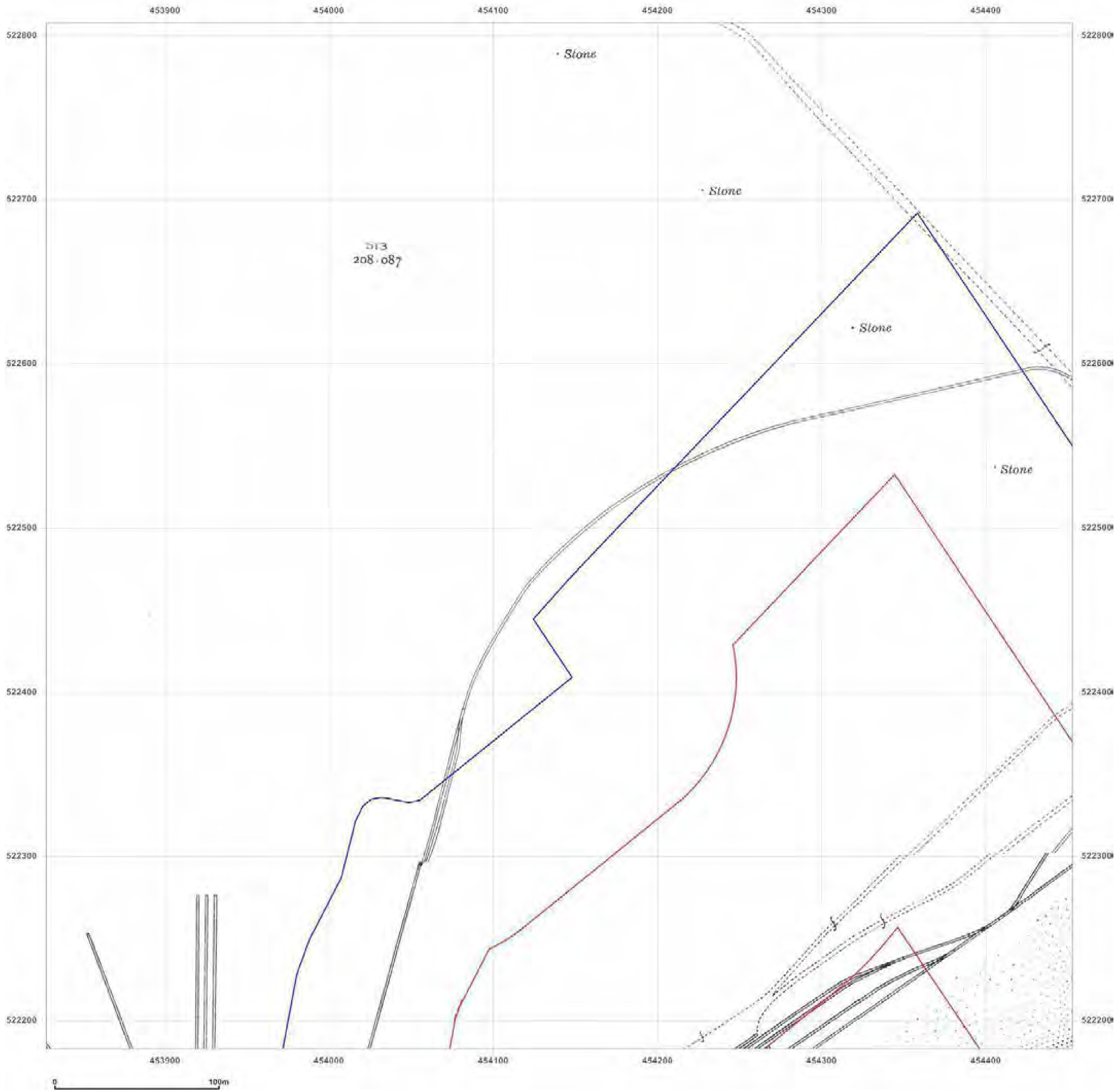
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: County Series

Map date: **1929**

Scale: 1:2,500

Printed at: 1:2,500

Groundsure INSIGHTS

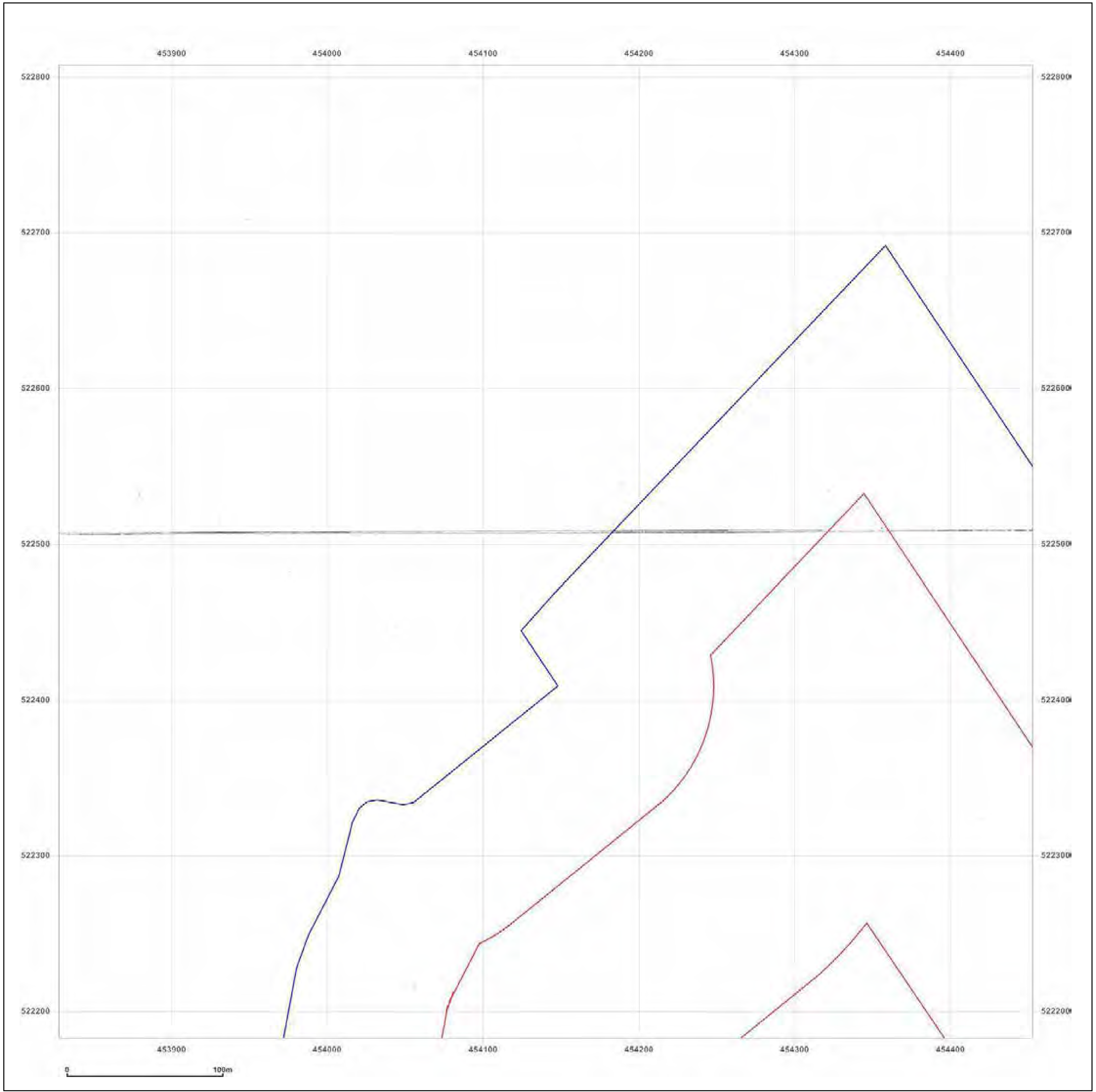
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: County Series

Map date: **1940-1941**

Scale: 1:2,500

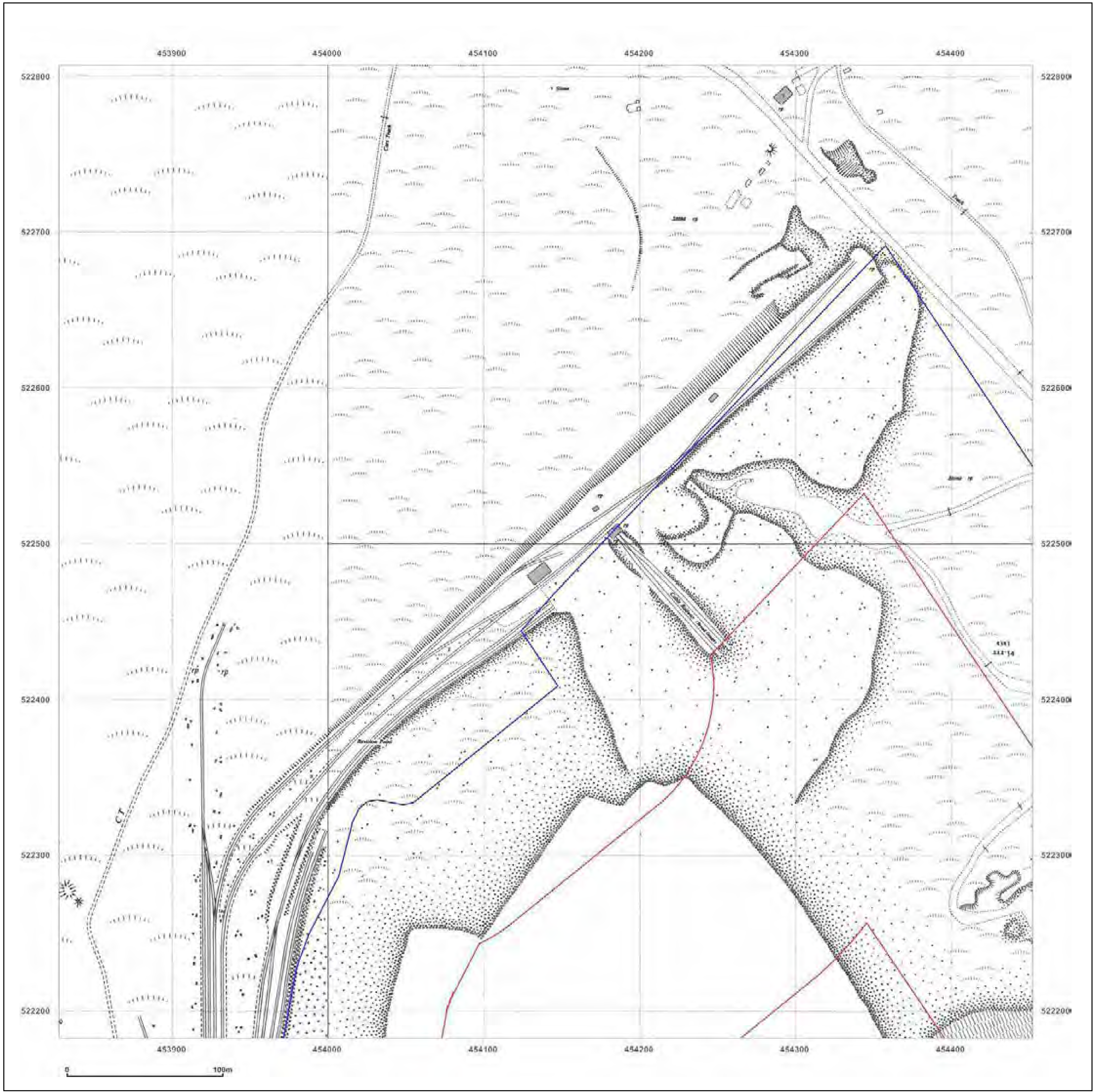
Printed at: 1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

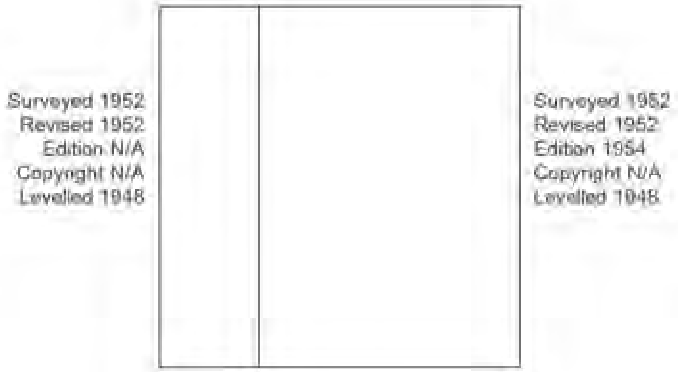
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: National Grid

Map date: **1952**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

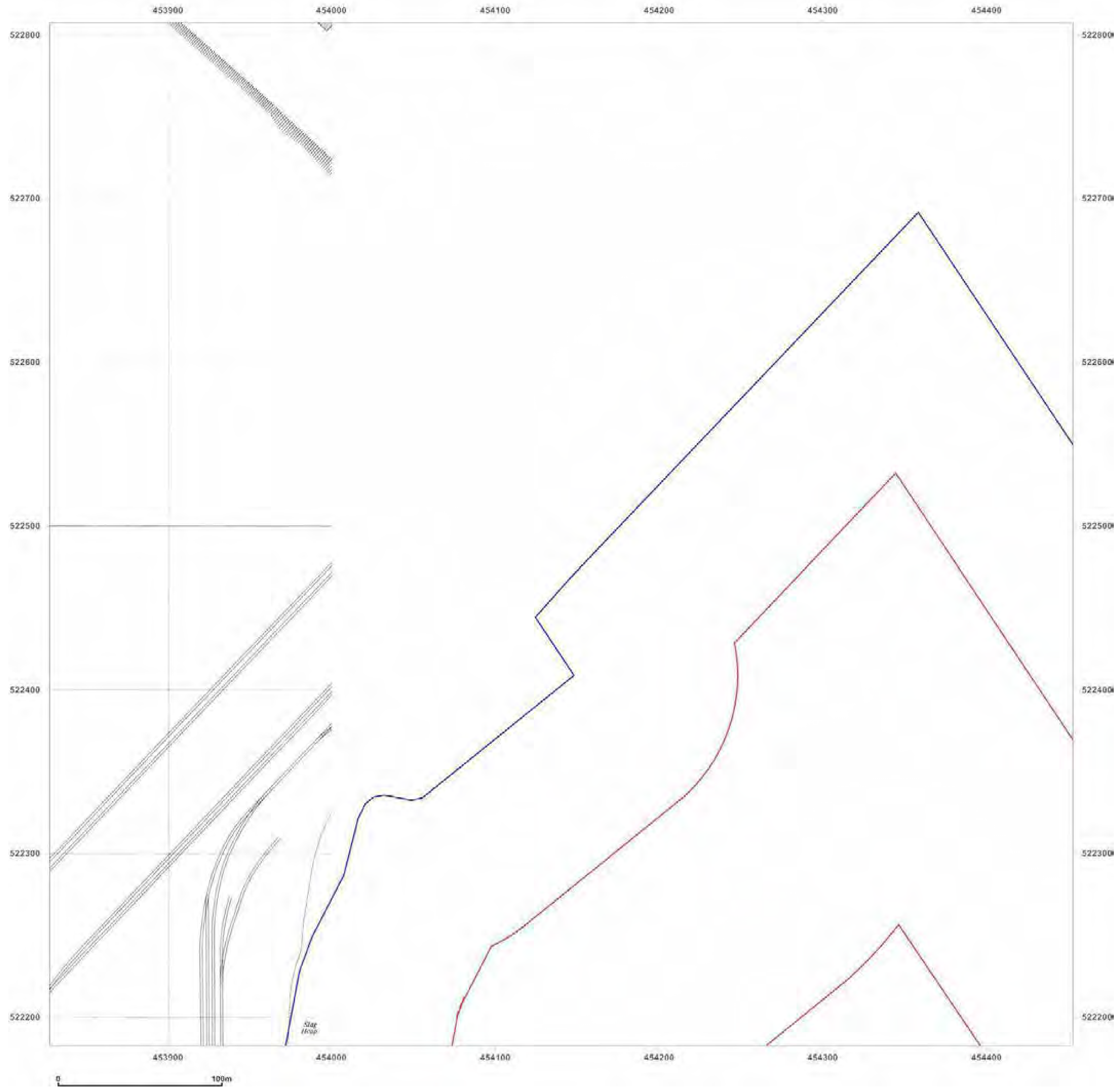
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

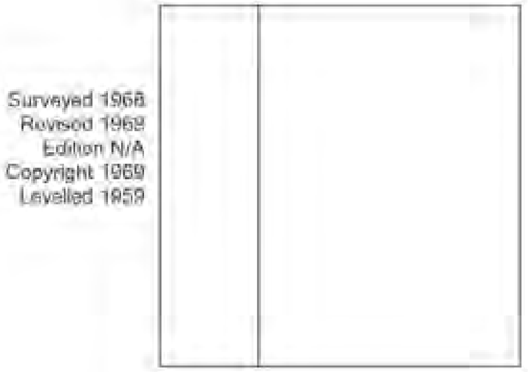
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_3
Grid Ref: 454140, 522495

Map Name: National Grid

Map date: **1968**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

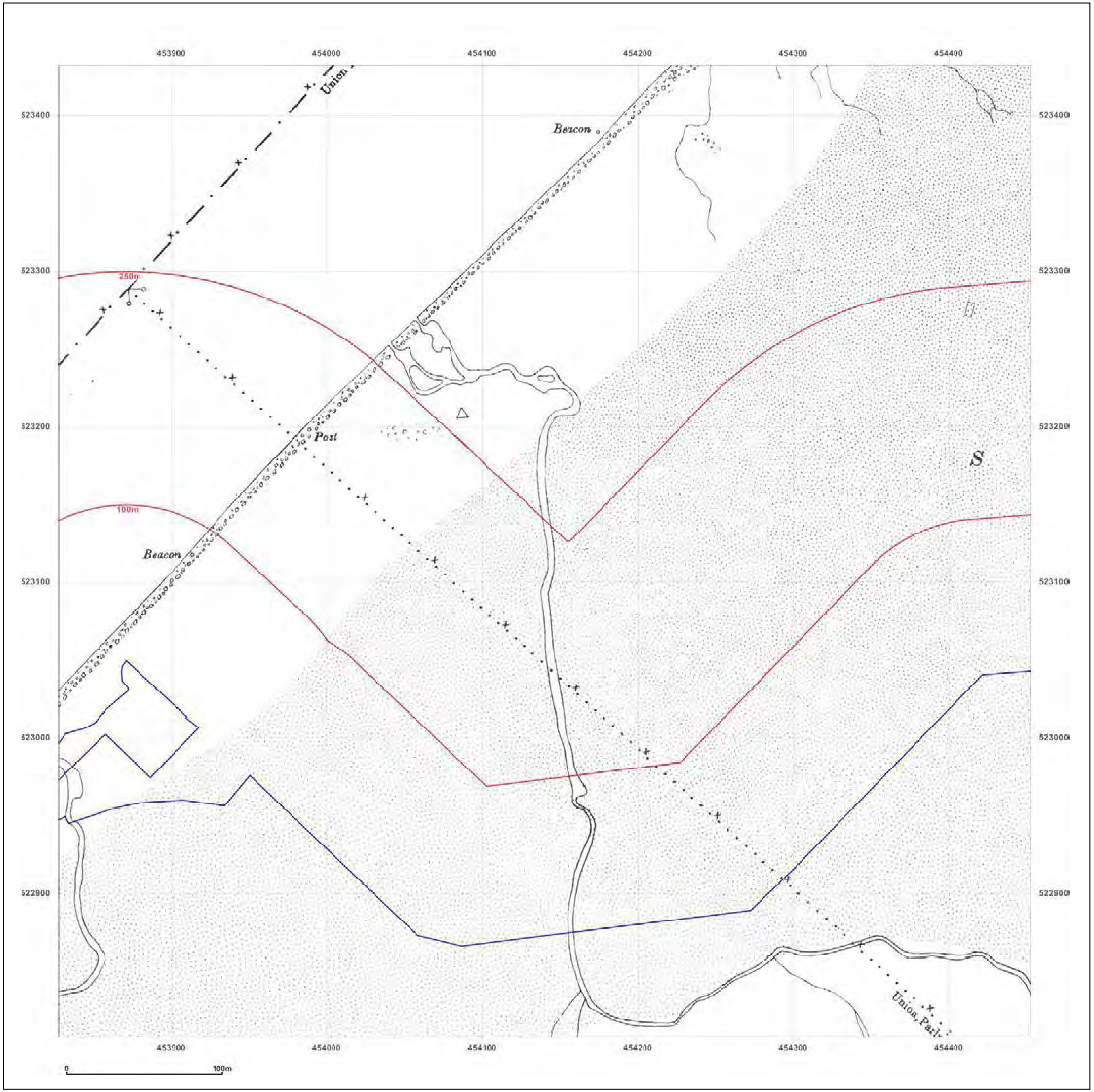
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: County Series

Map date: **1894**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1894
Revised 1894
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

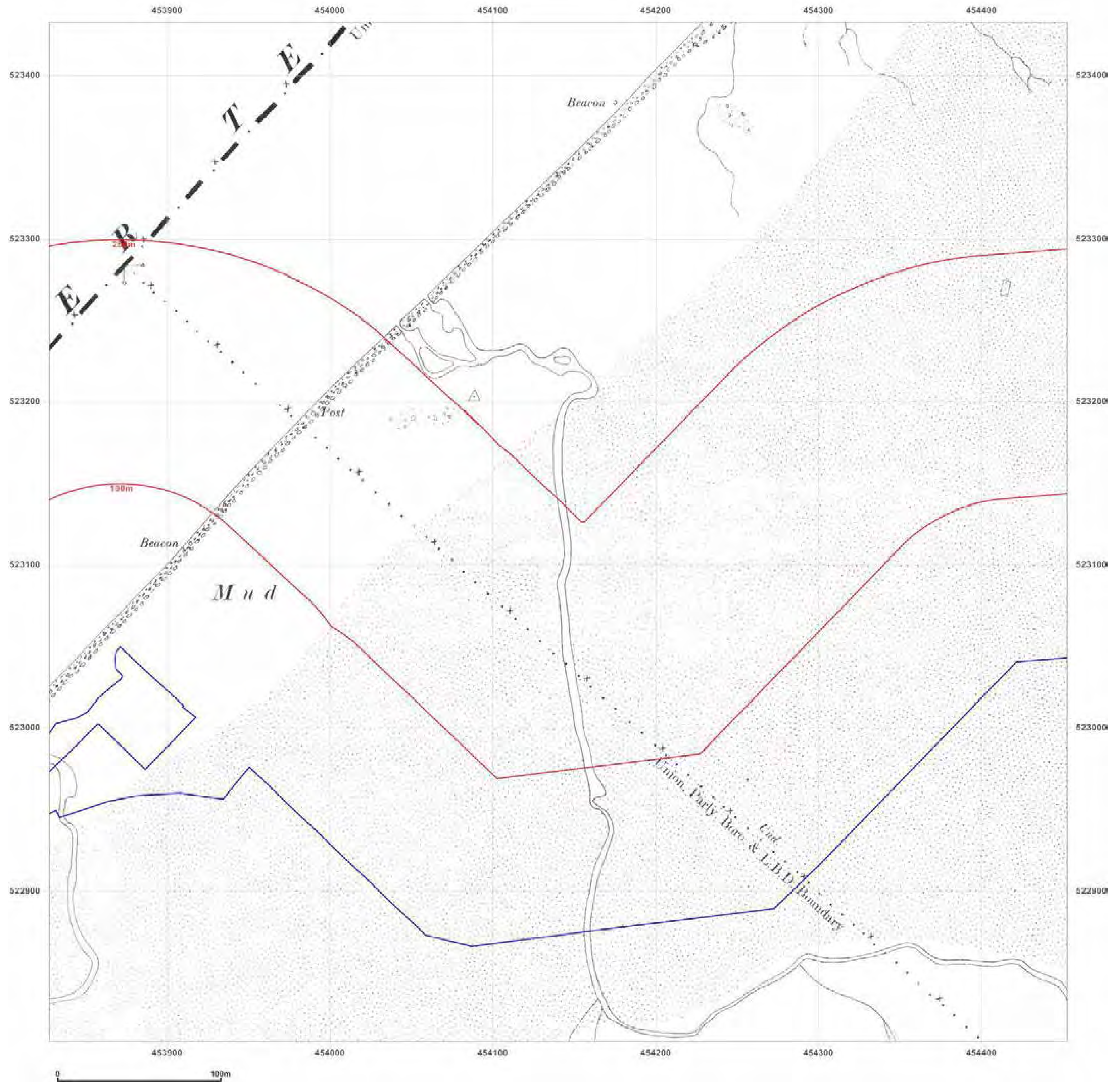
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: County Series

Map date: **1898**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1896
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

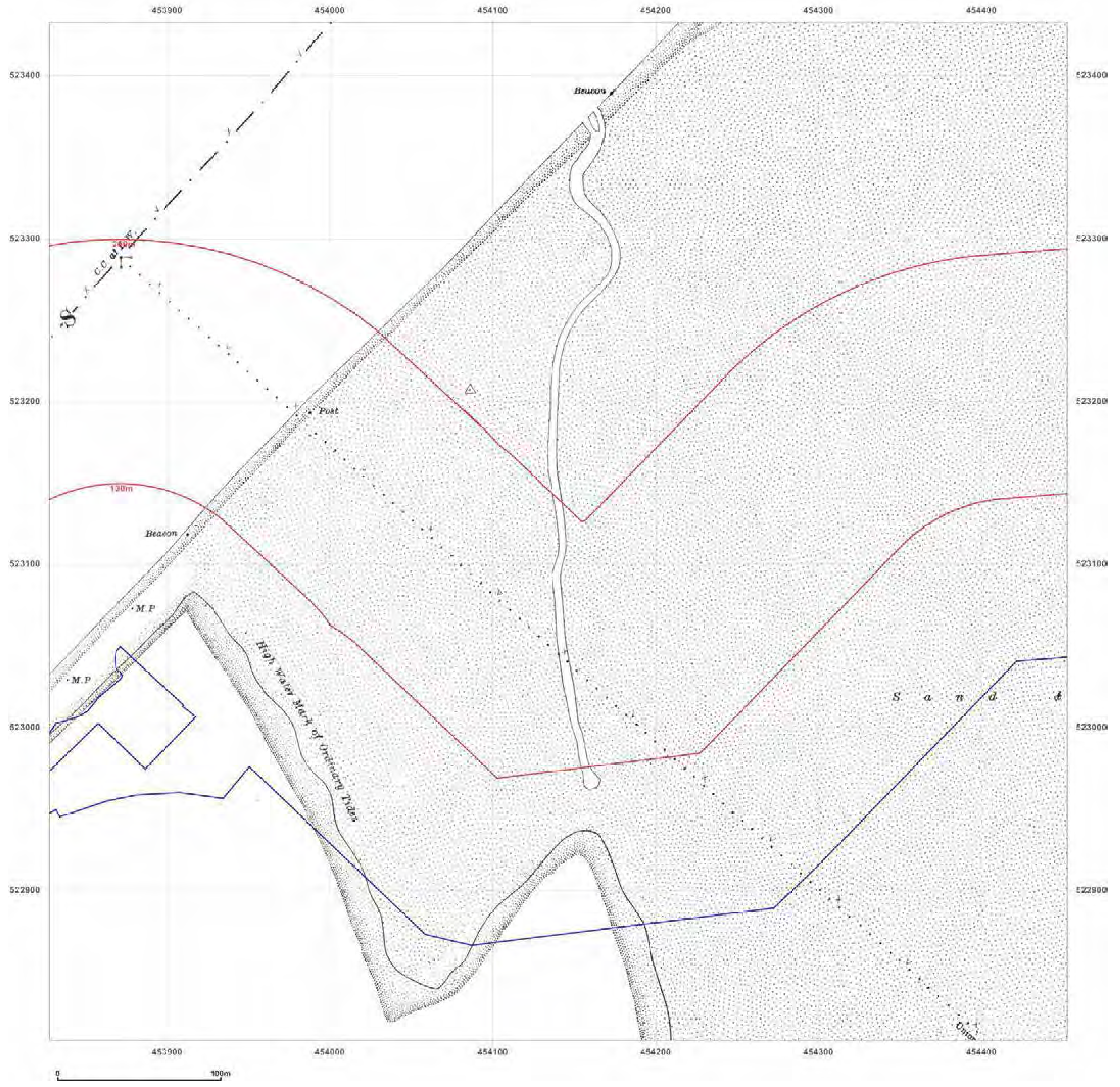
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

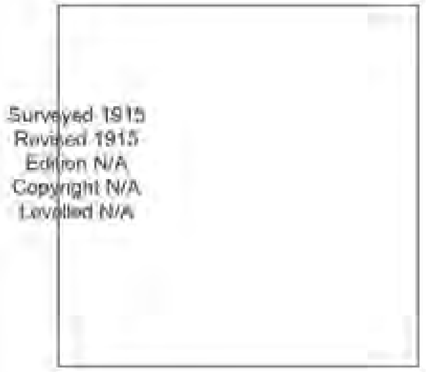
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

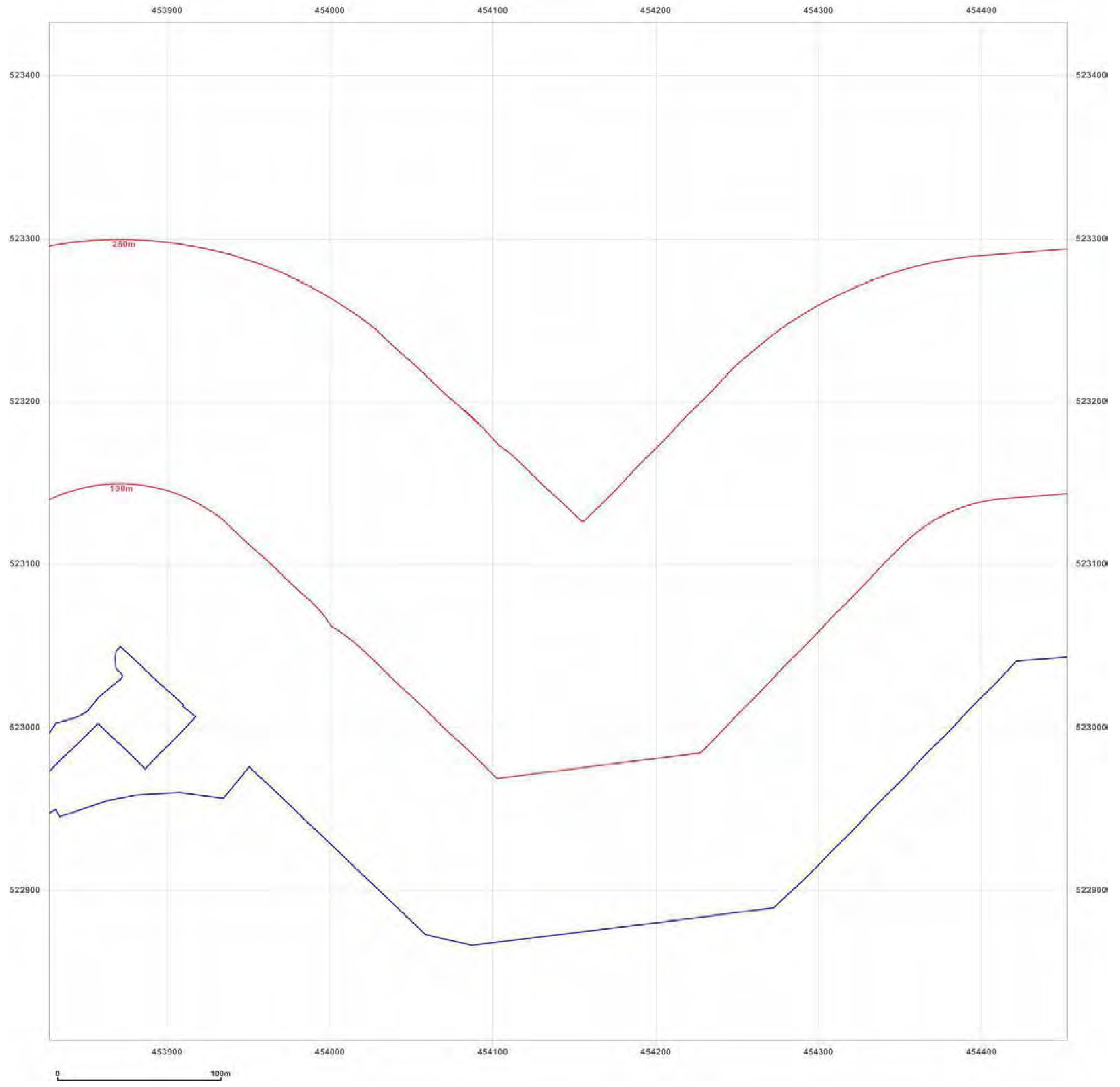


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

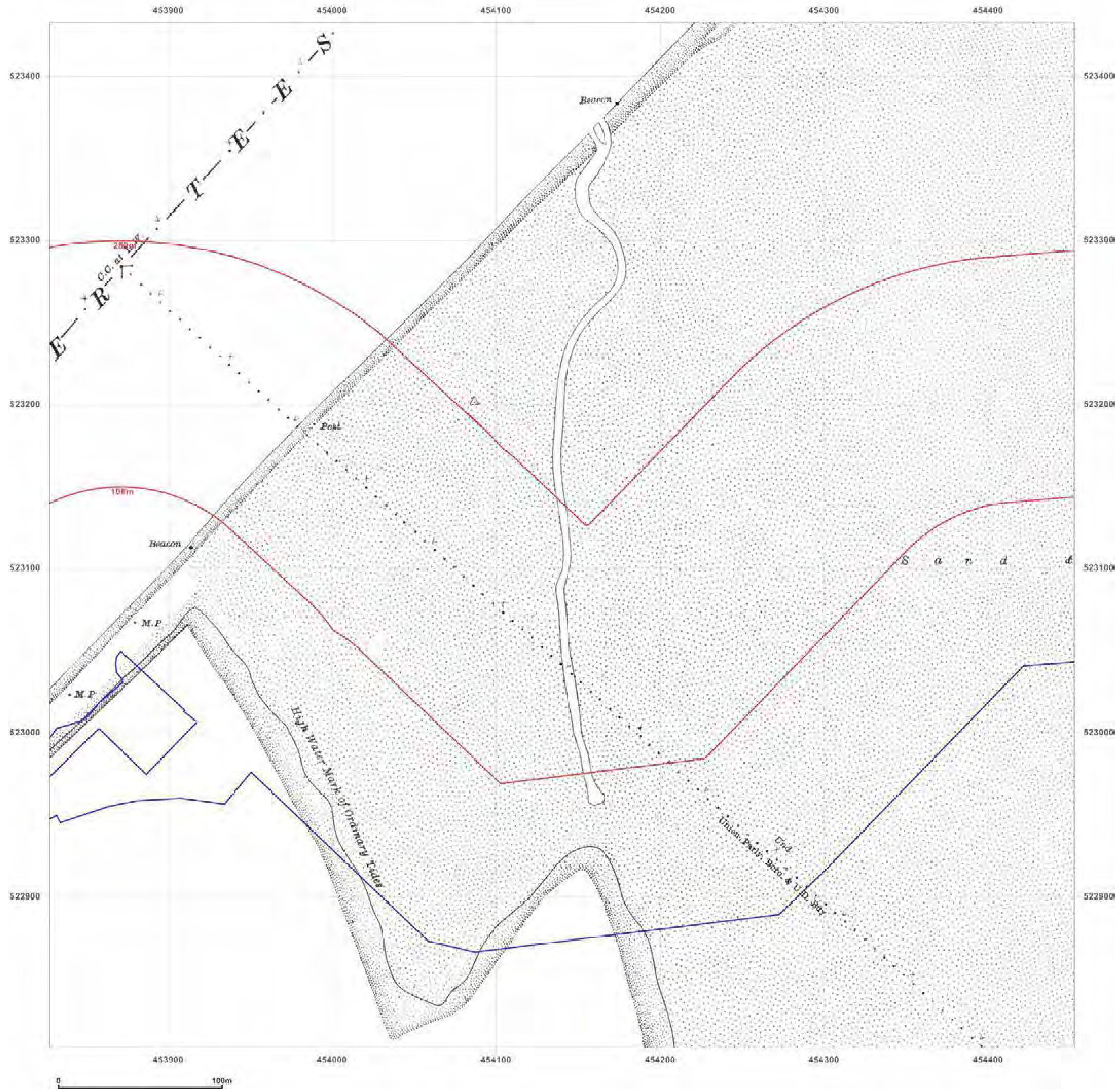
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: County Series

Map date: **1917**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1917
Revised 1917
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

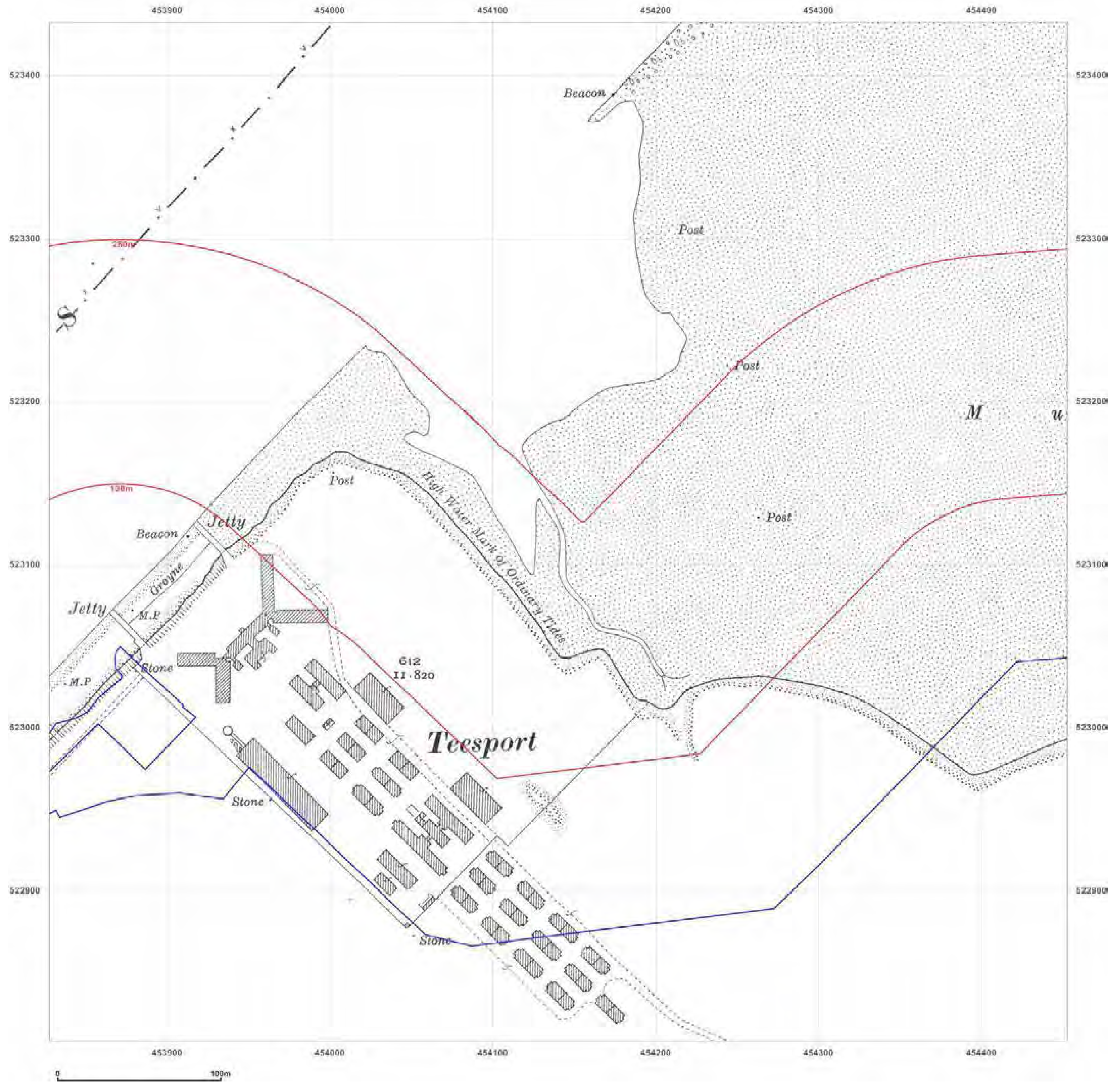
Powered by OS

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_4
Grid Ref:	454140, 523120

Map Name:	County Series
Map date:	**1929**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

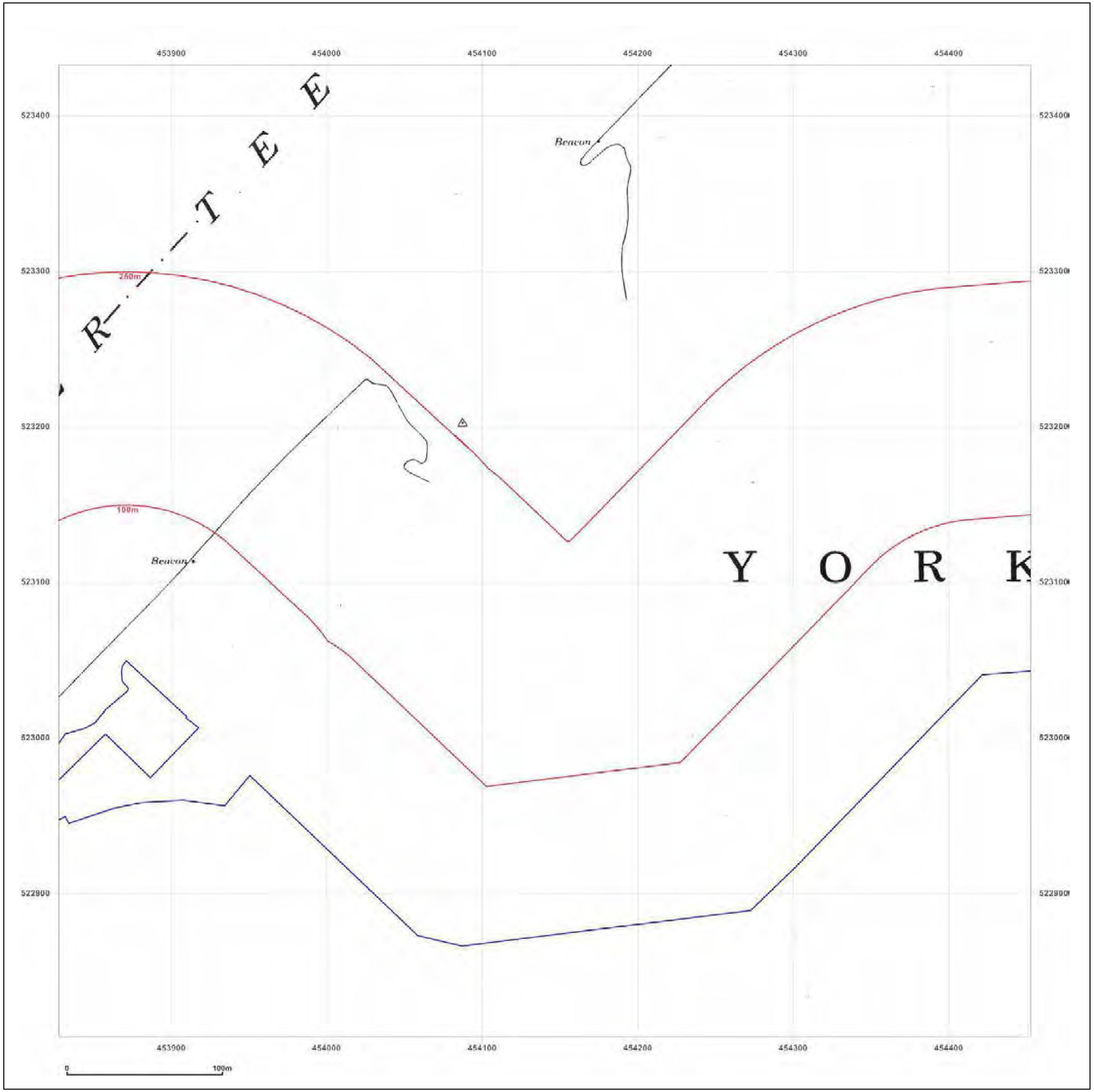
Powered by OS

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

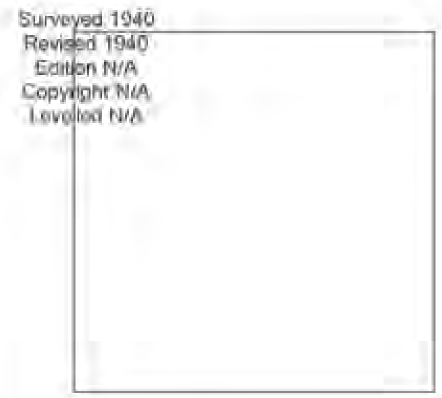
Map Name: County Series

Map date: **1940**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Groundsure INSIGHTS

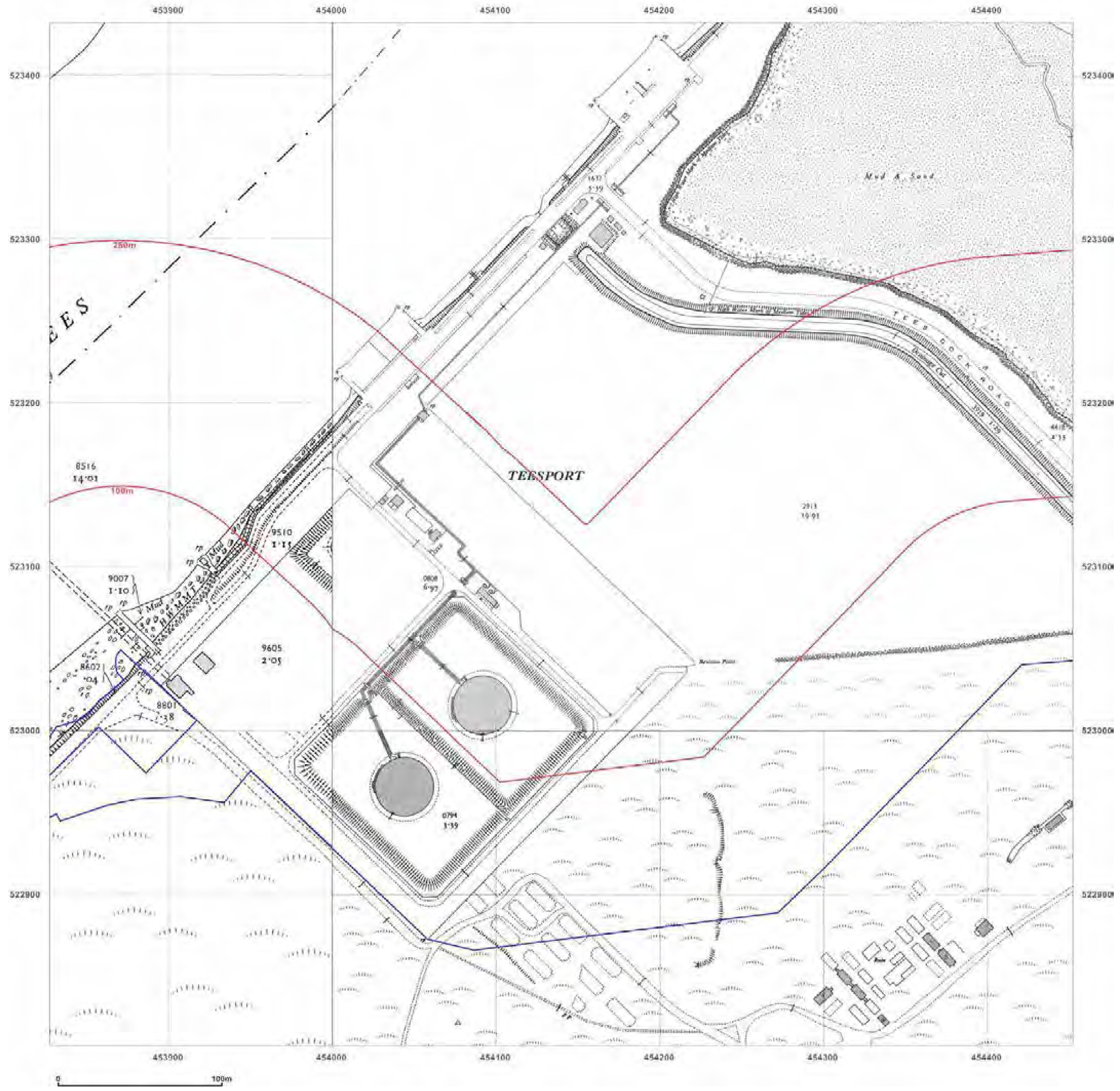
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

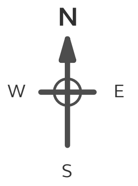


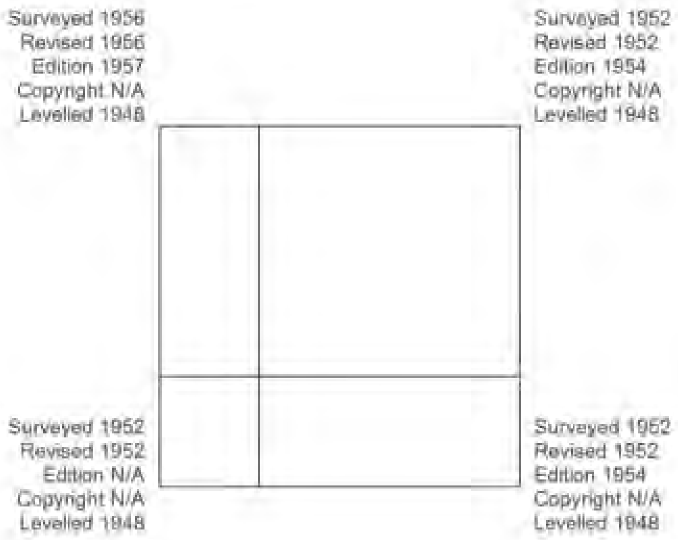
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_3_4
Grid Ref:	454140, 523120

Map Name:	National Grid
Map date:	**1952-1956**
Scale:	1:2,500
Printed at:	1:2,500



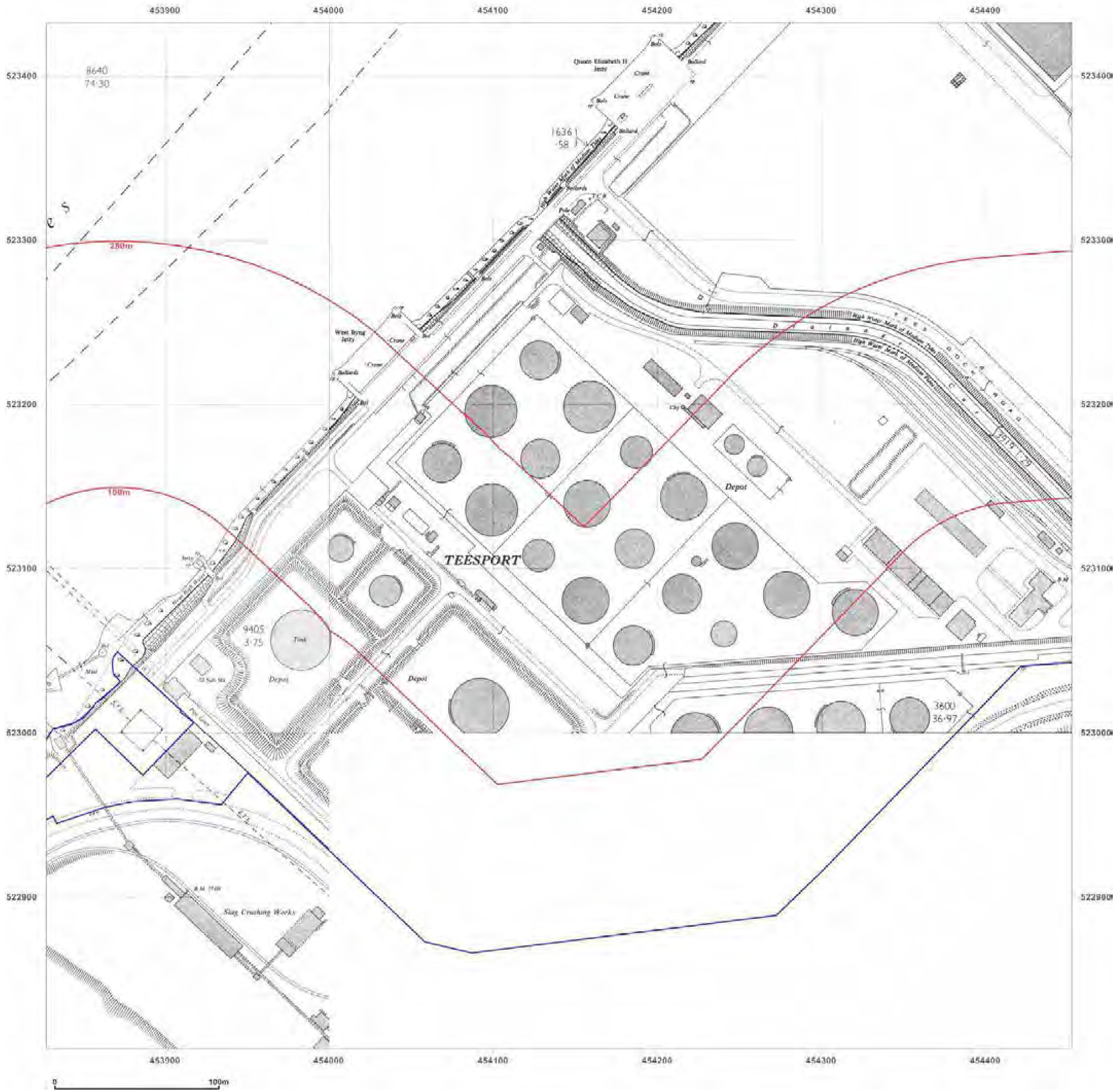


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

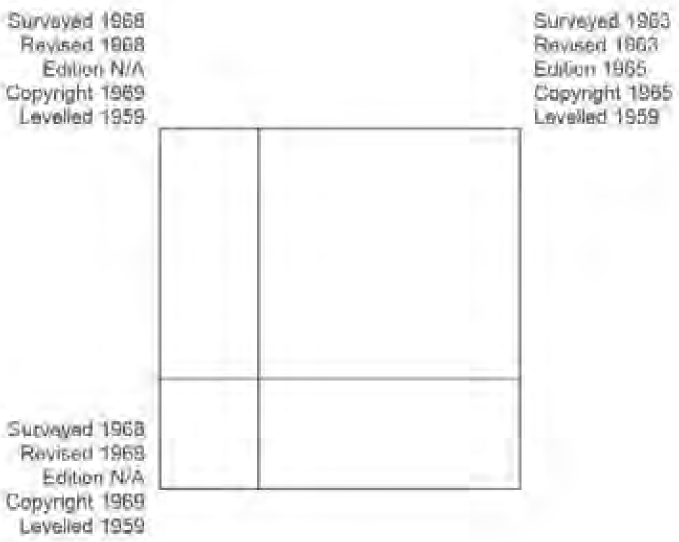
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: National Grid

Map date: **1963-1968**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

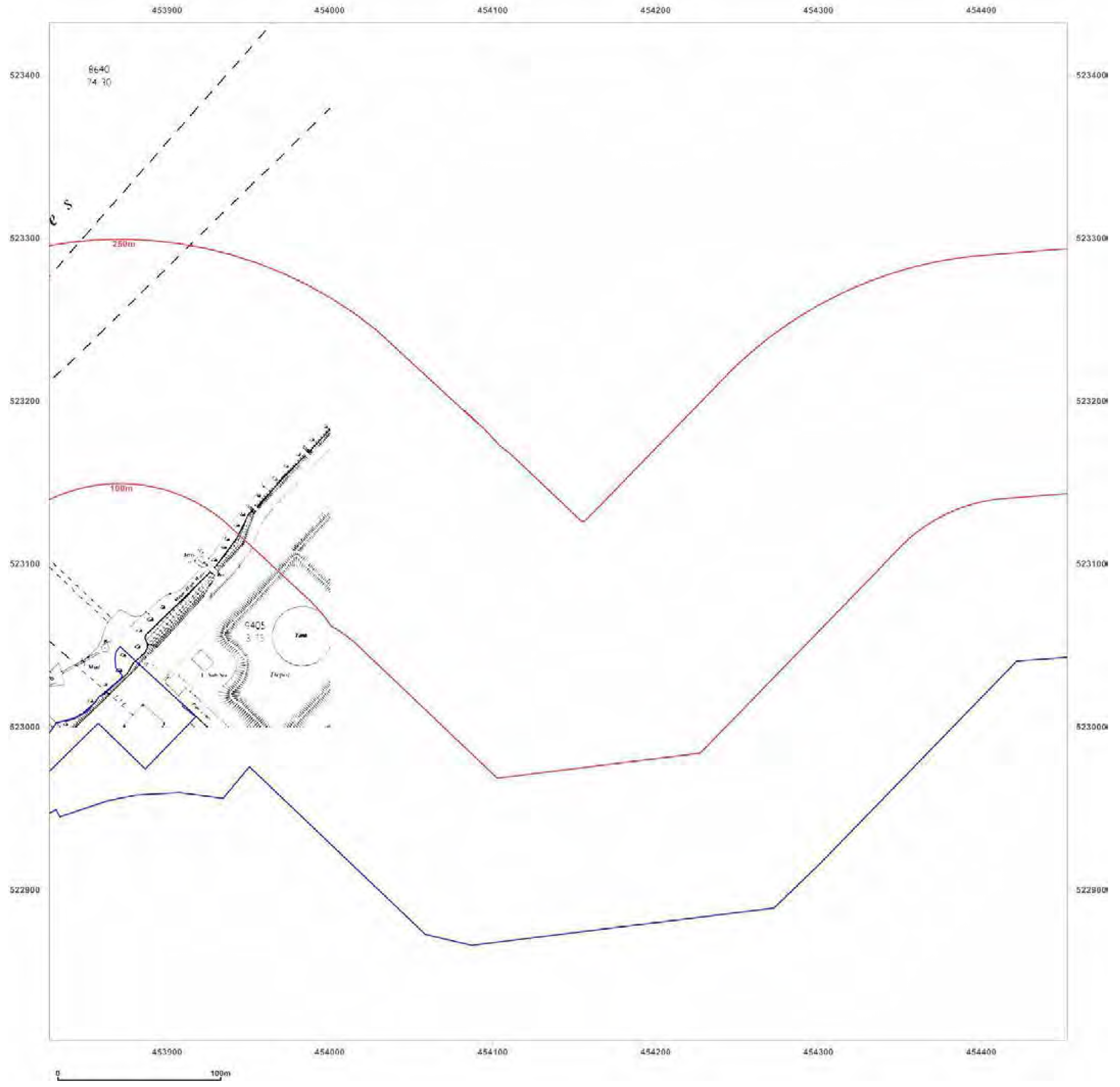
Powered by OS

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_3_4
Grid Ref: 454140, 523120

Map Name: National Grid

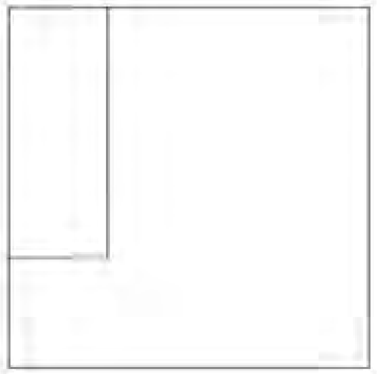
Map date: **1969**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

1:2500 Scale Sections 4-1 to 4-3

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name: County Series

Map date: **1895**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1895
Revised 1895
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name:	County Series
Map date:	**1899**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

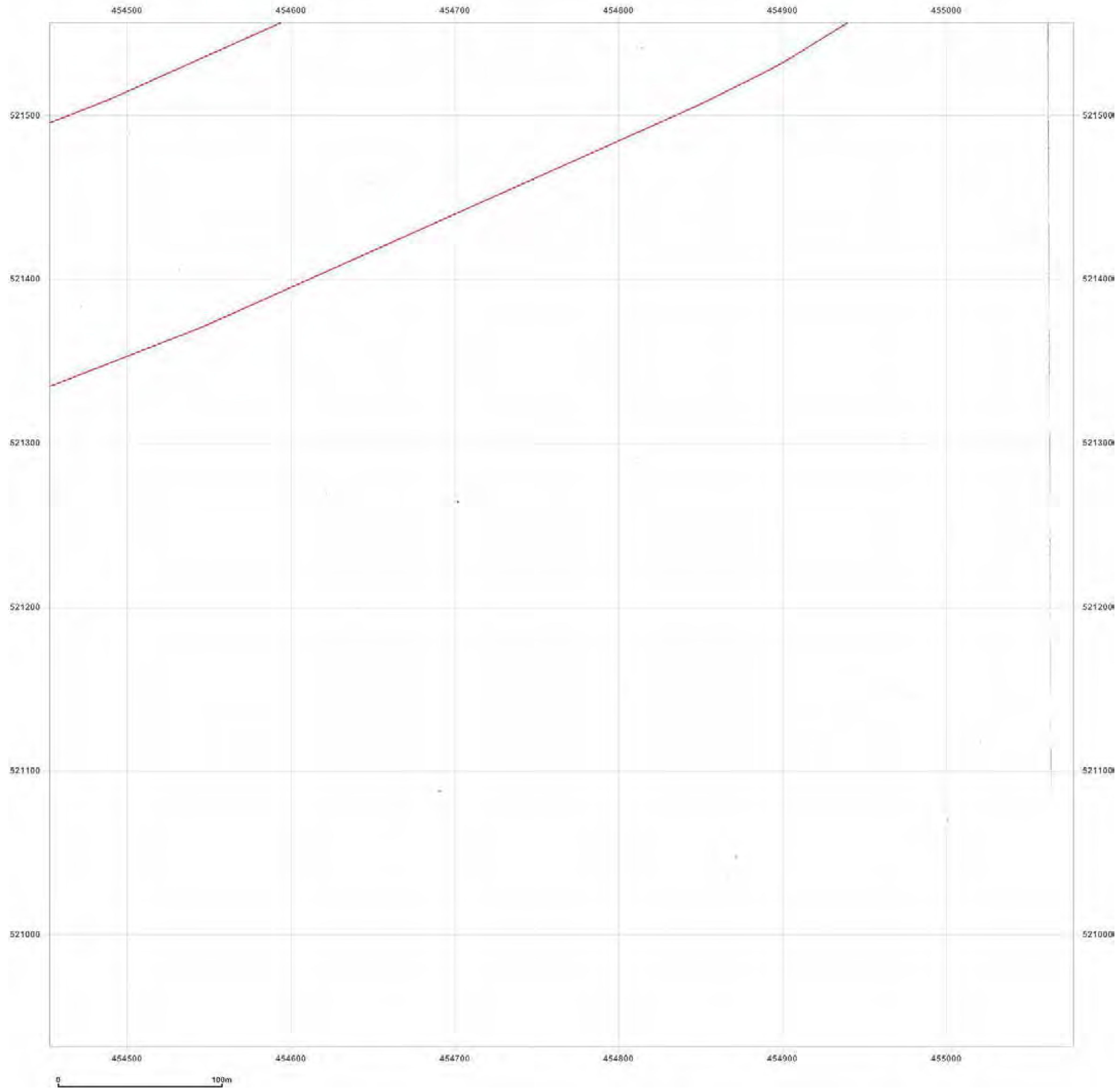
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

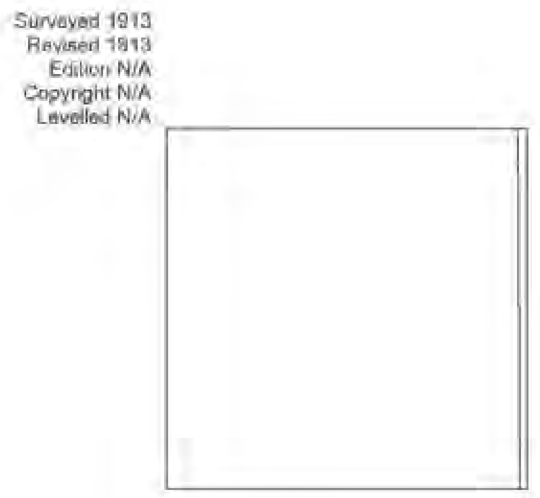
Map Name: County Series

Map date: **1913**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name: County Series

Map date: **1929**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

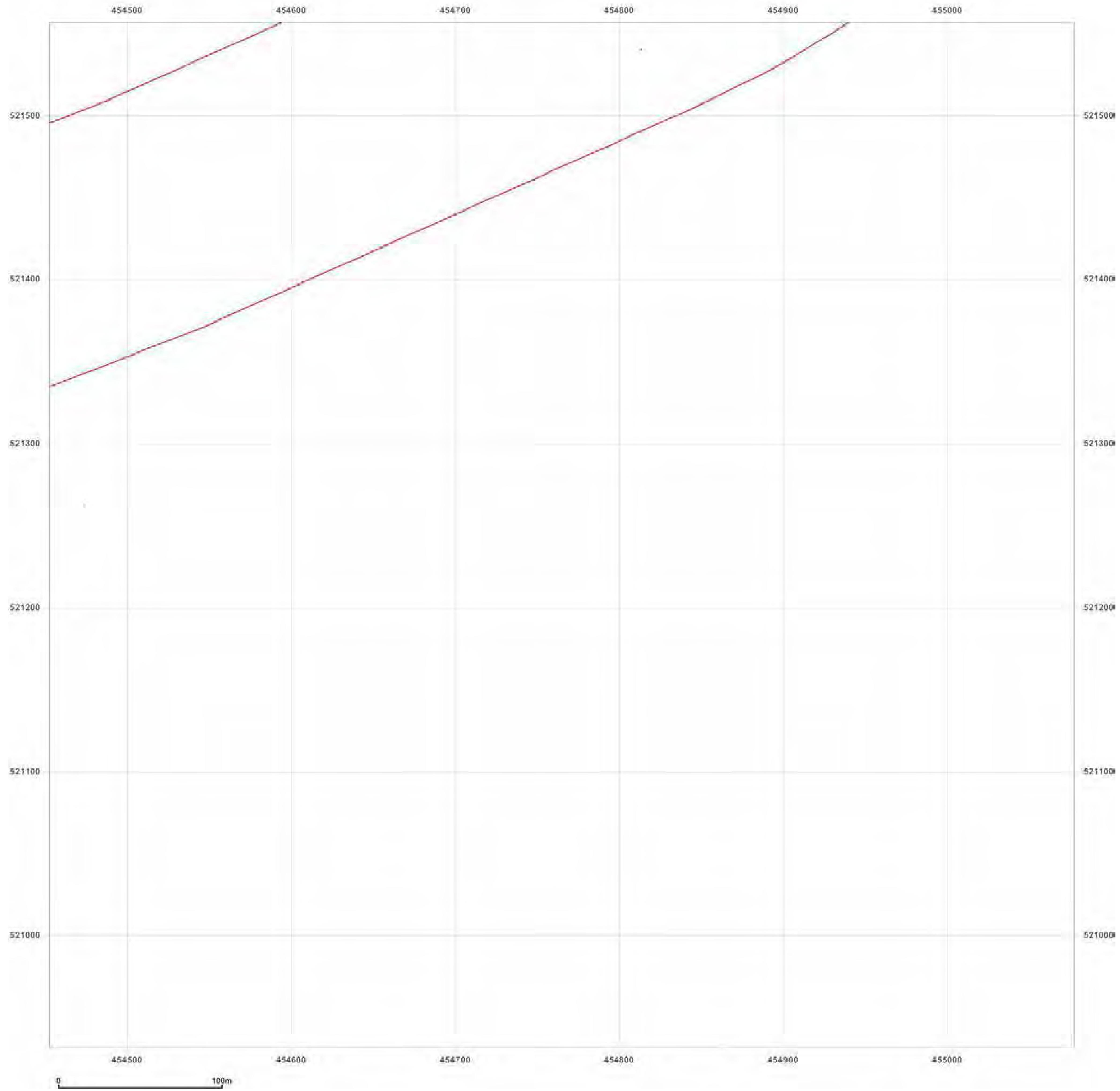
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name: County Series

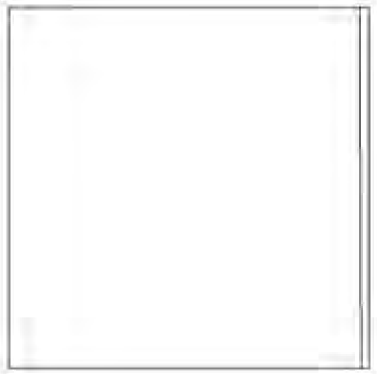
Map date: 1941

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1941
Revised 1941
Edition N/A
Copyright N/A
Levelled N/A

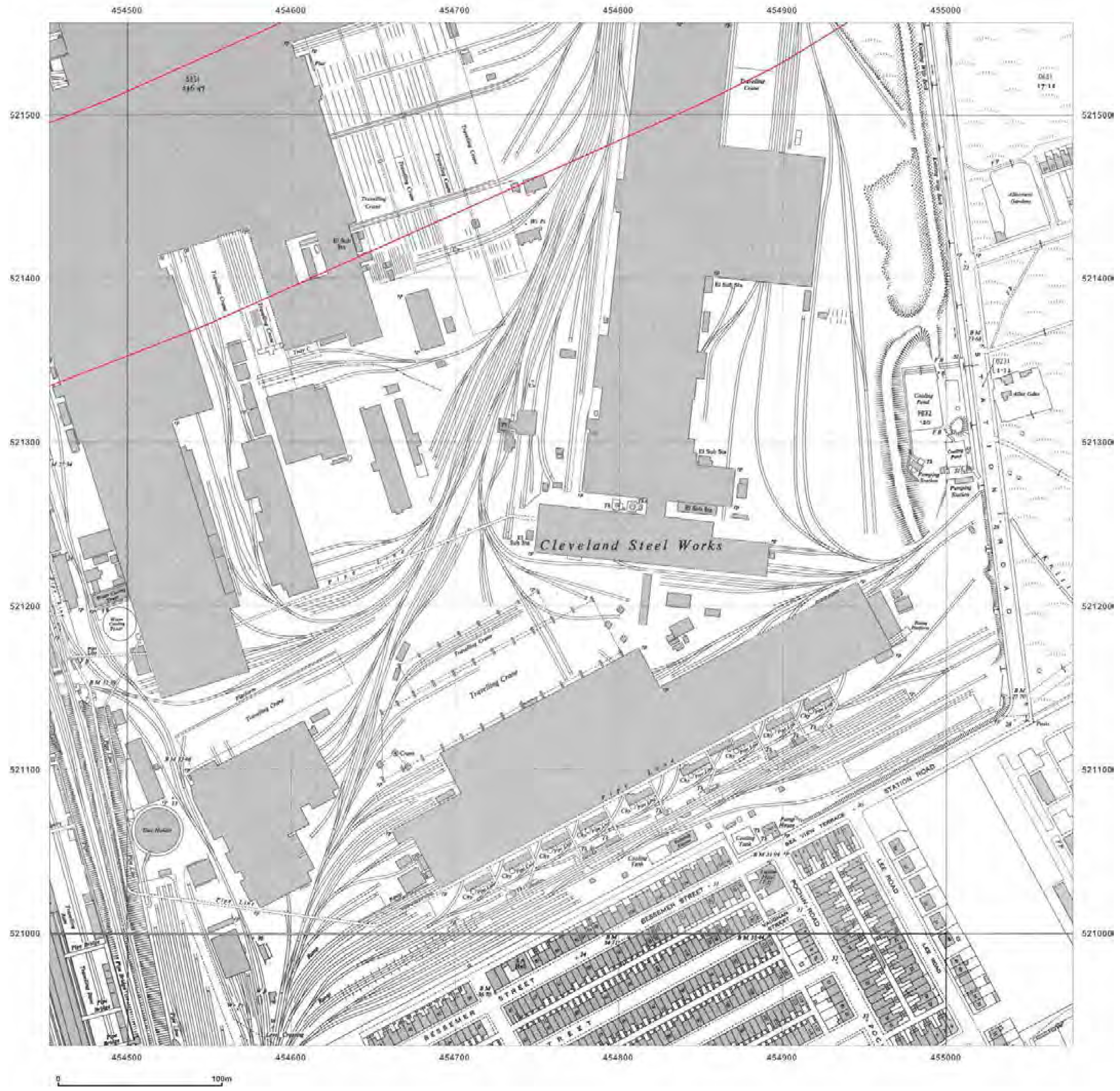


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

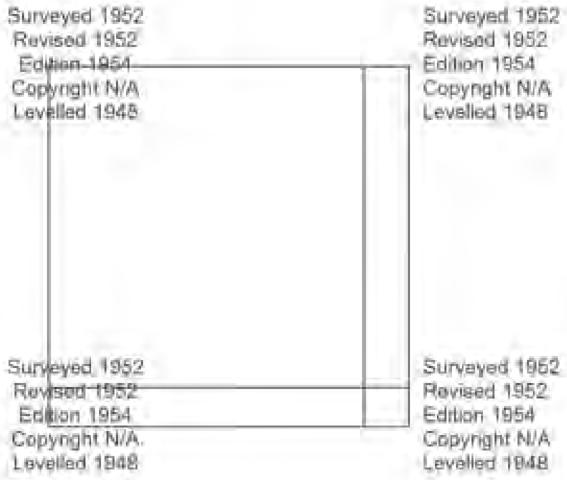
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_1
Grid Ref:	454765, 521244

Map Name:	National Grid
Map date:	**1952**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S



Groundsure INSIGHTS

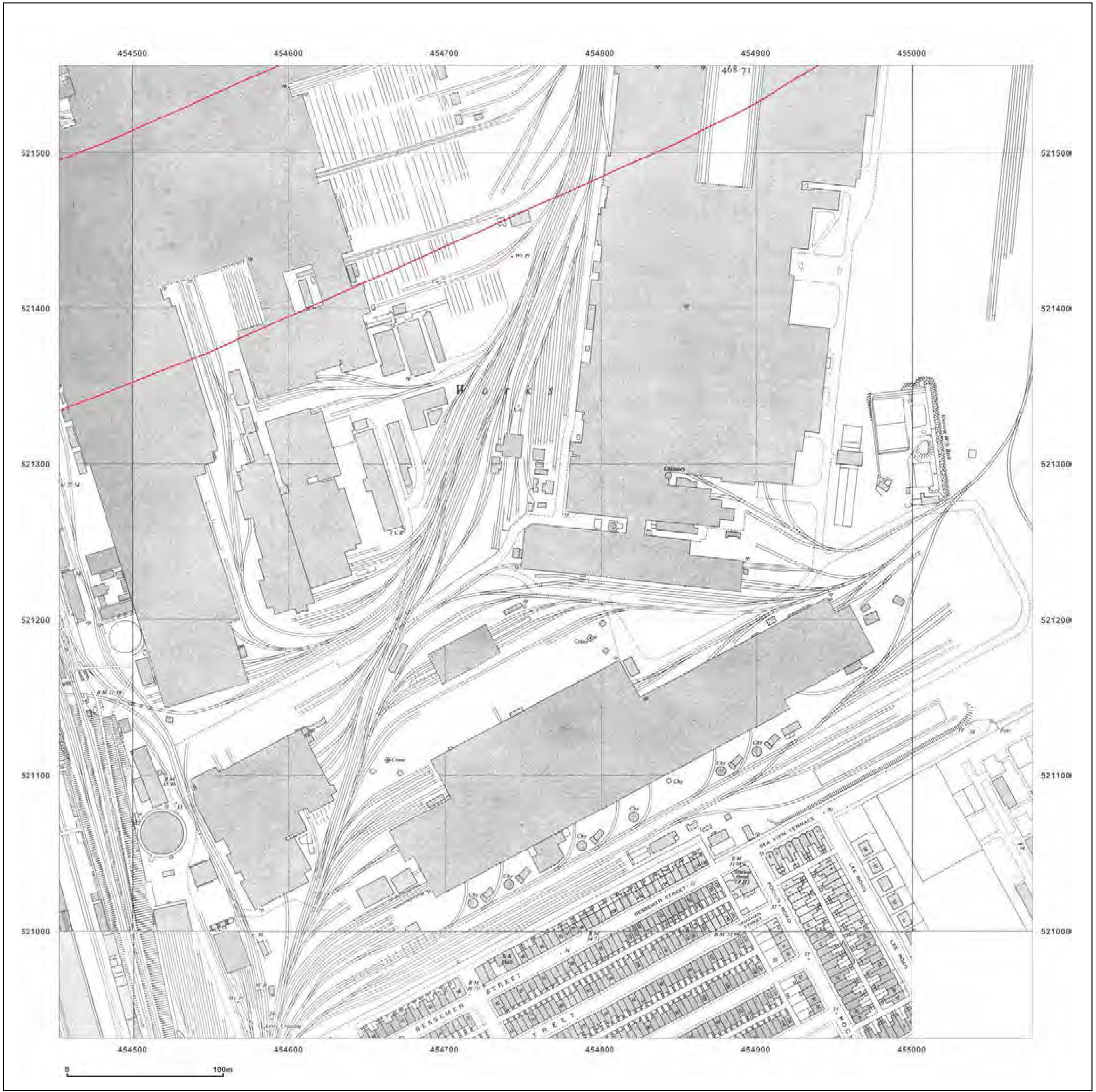
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_1
Grid Ref: 454765, 521244

Map Name: National Grid

Map date: **1957-1960**

Scale: 1:2,500

Printed at: 1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_2
Grid Ref:	454765, 521869
Map Name:	County Series
Map date:	**1895**
Scale:	1:2,500
Printed at:	1:2,500

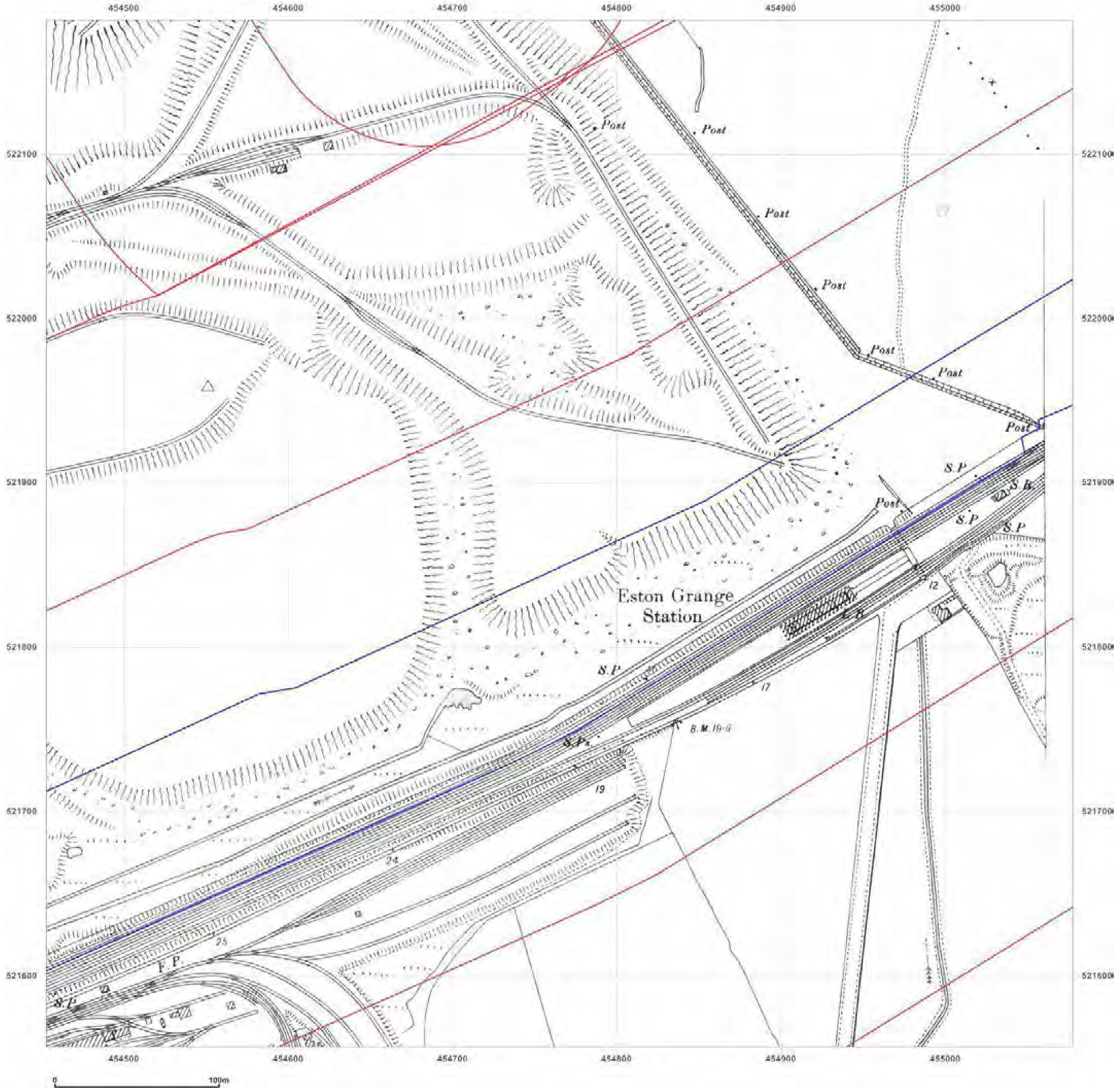
Surveyed 1895
Revised 1895
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_2
Grid Ref:	454765, 521869

Map Name:	County Series
Map date:	**1899**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A

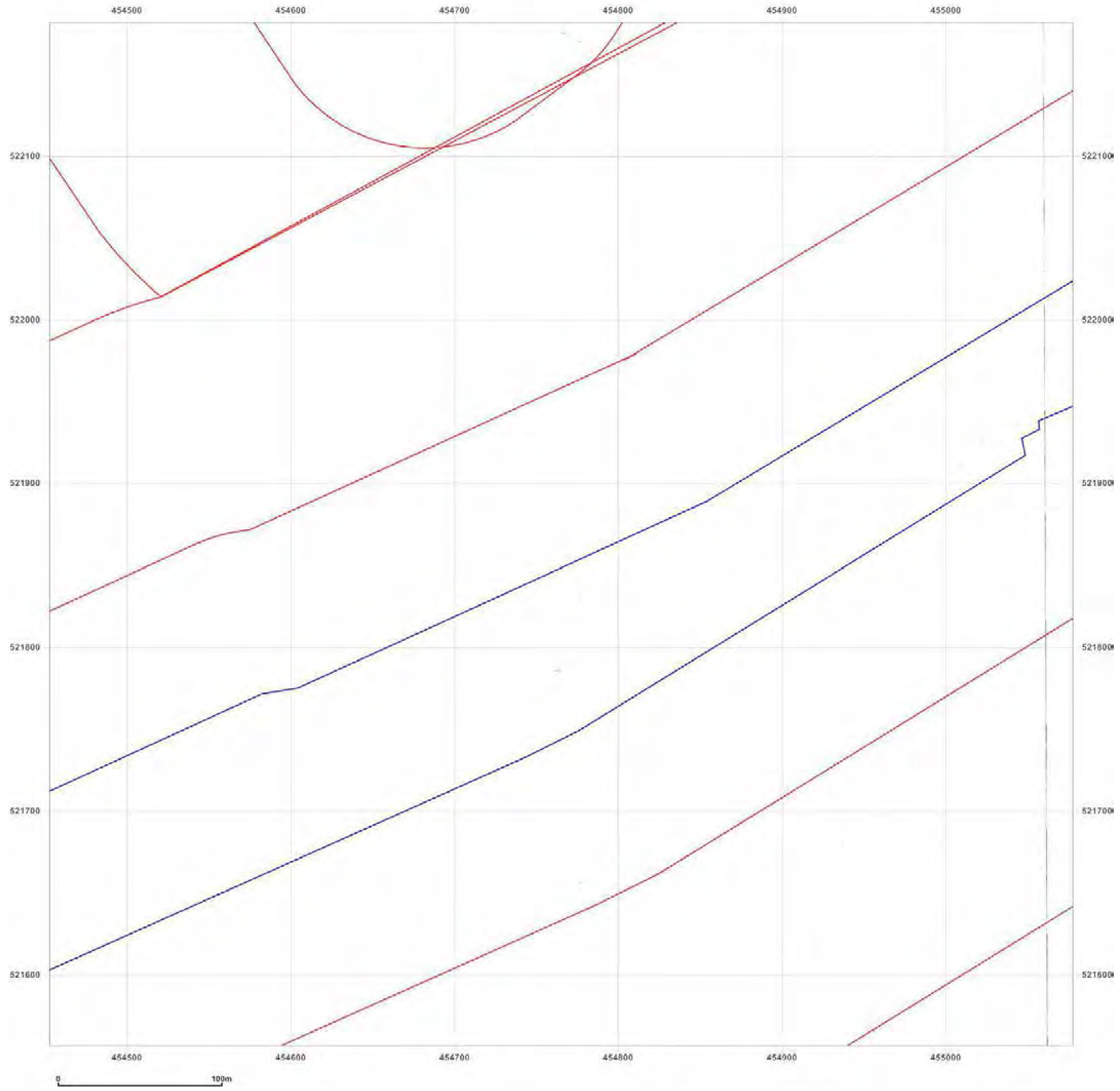
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

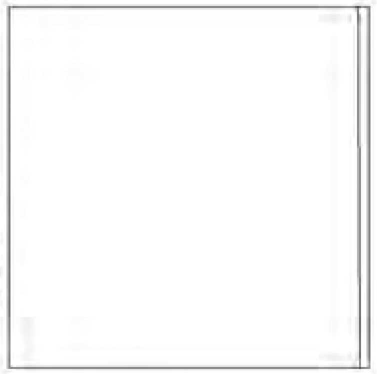
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_2
Grid Ref:	454765, 521869
Map Name:	County Series
Map date:	**1913**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1913
Revised 1913
Edition N/A
Copyright N/A
Levelled N/A



Groundsure INSIGHTS

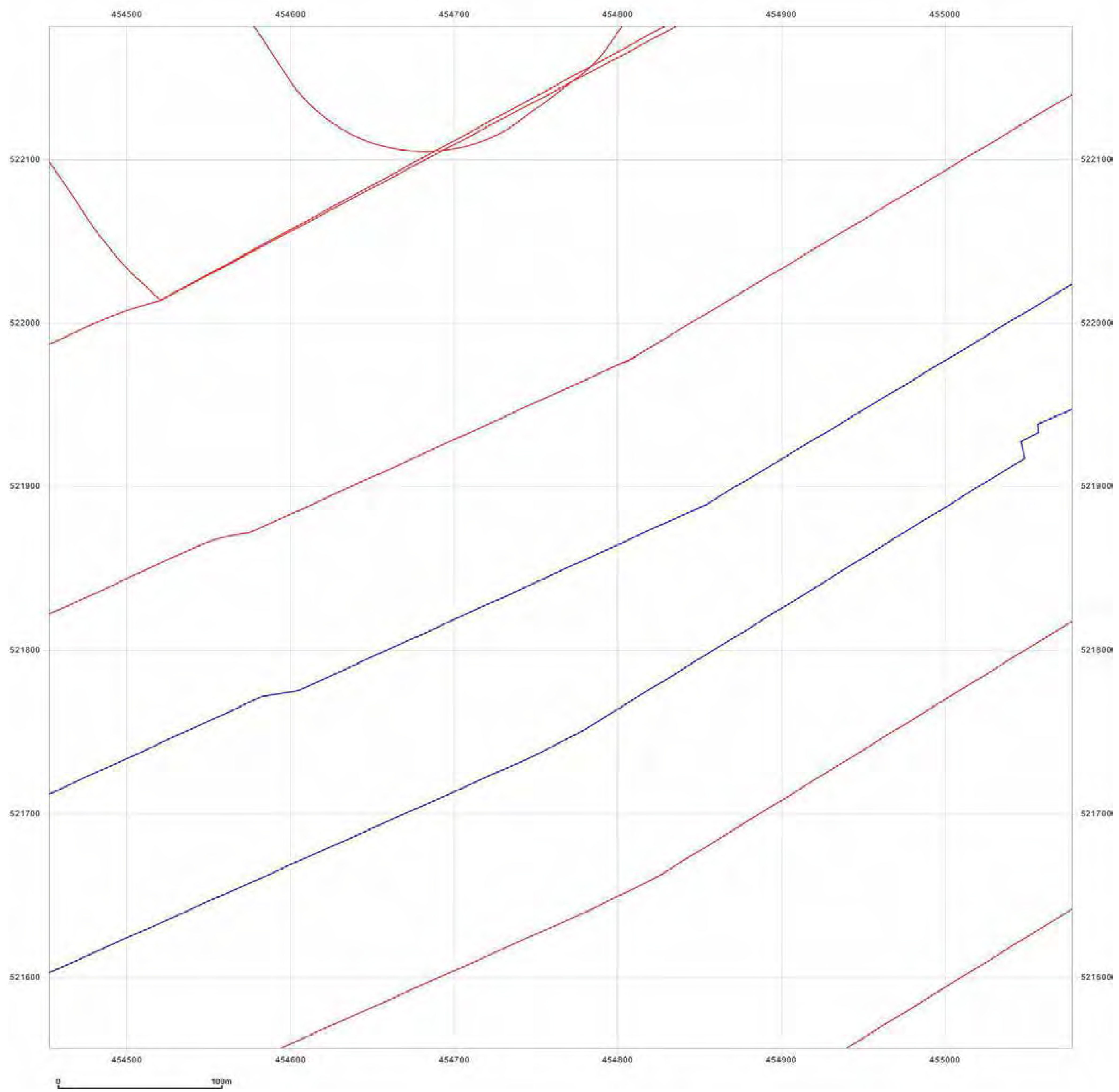
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name: County Series

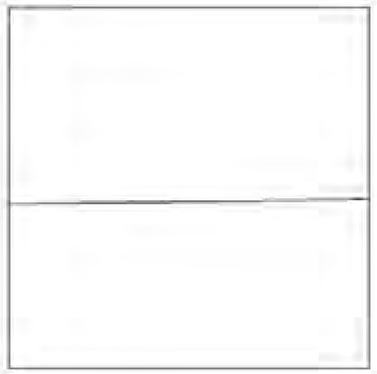
Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A



Groundsure INSIGHTS

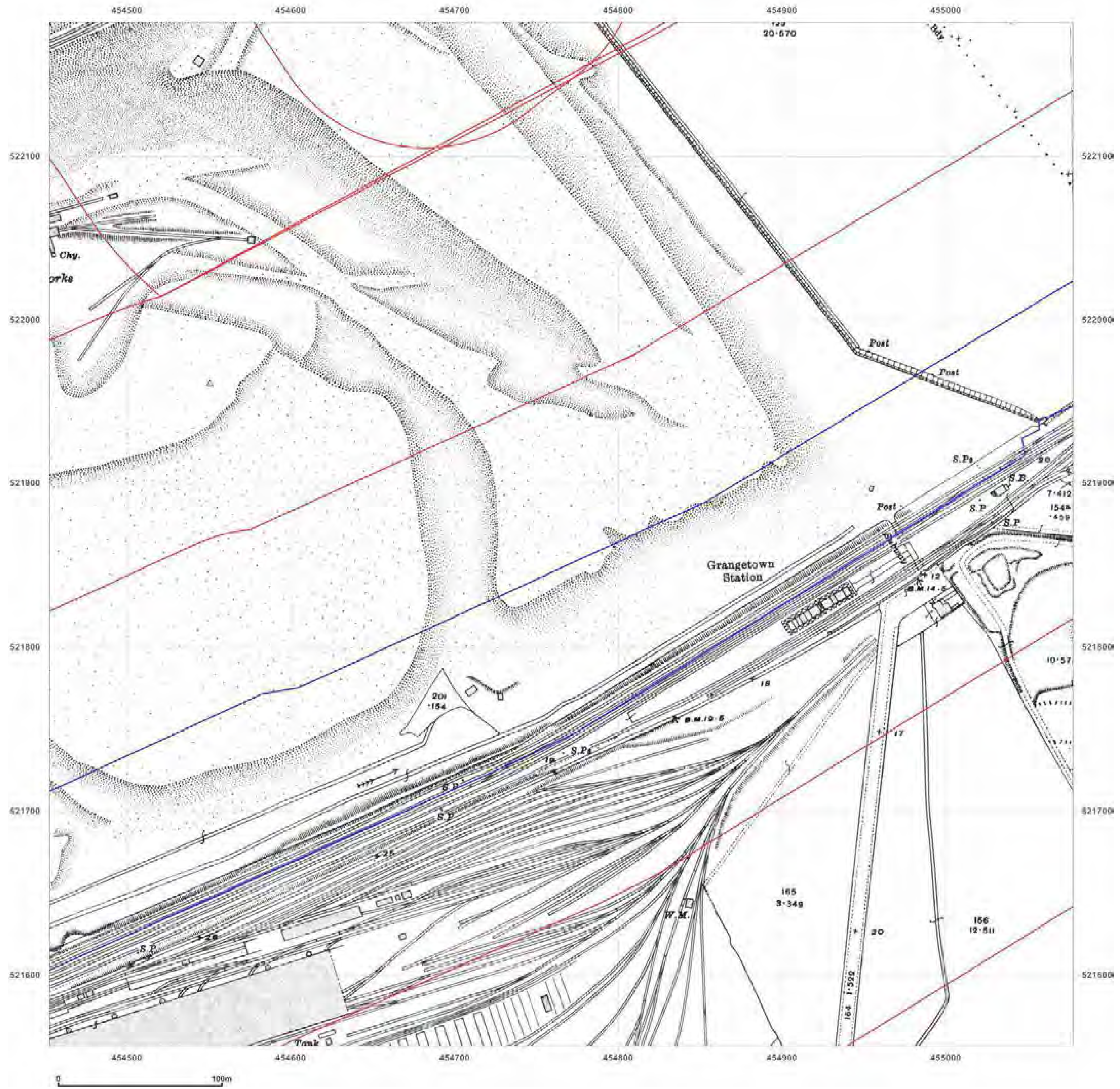
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

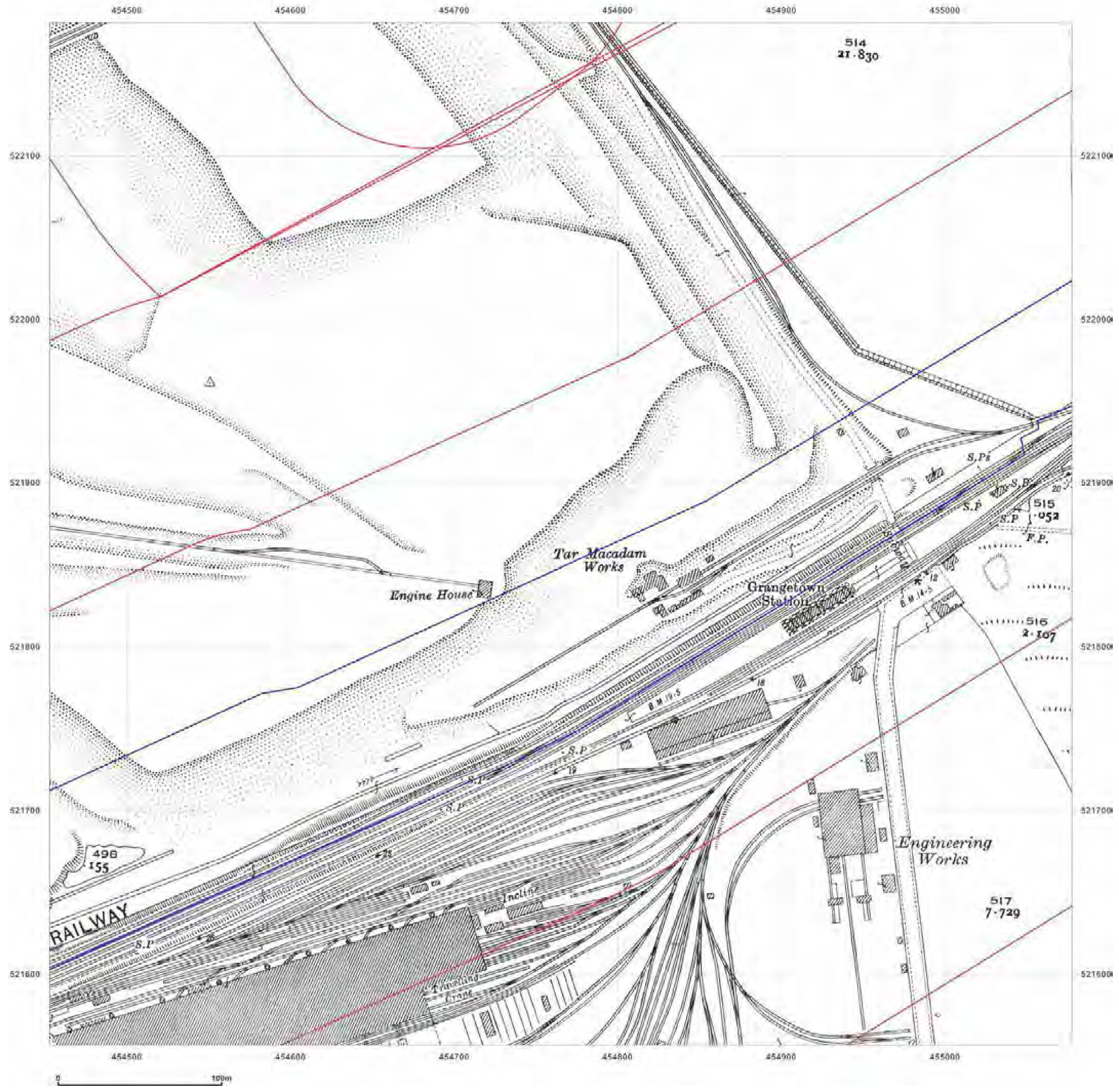
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name: County Series

Map date: **1929**

Scale: 1:2,500

Printed at: 1:2,500

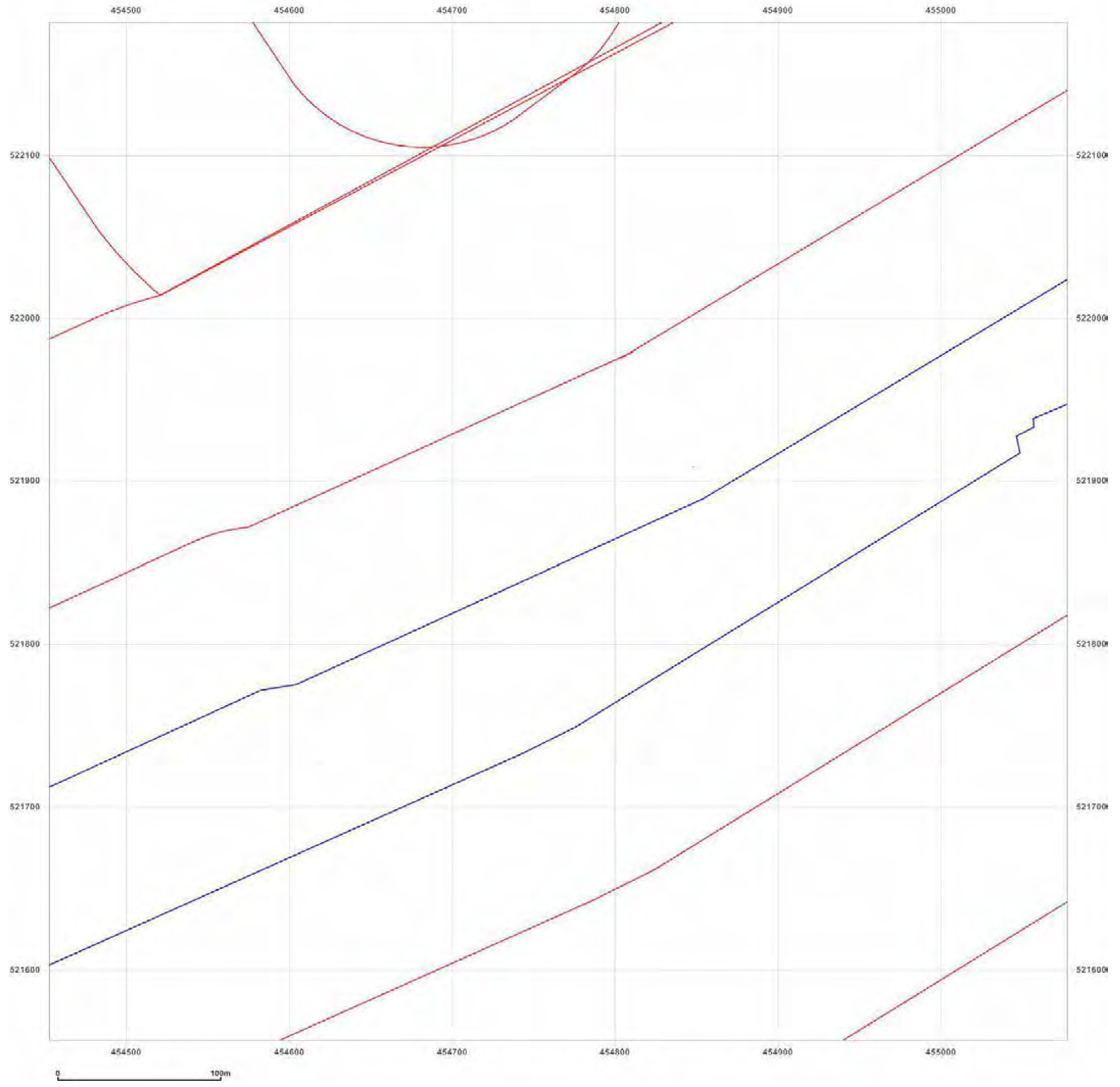
Surveyed 1929
Revised 1929
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

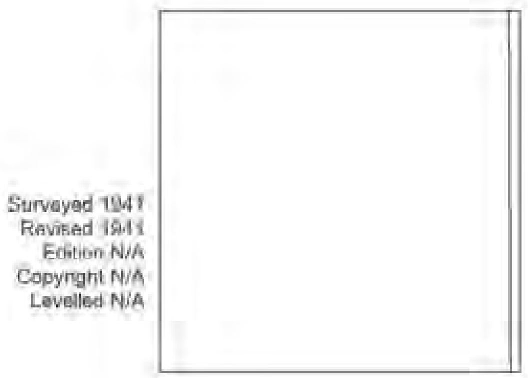
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name: County Series

Map date: **1941**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

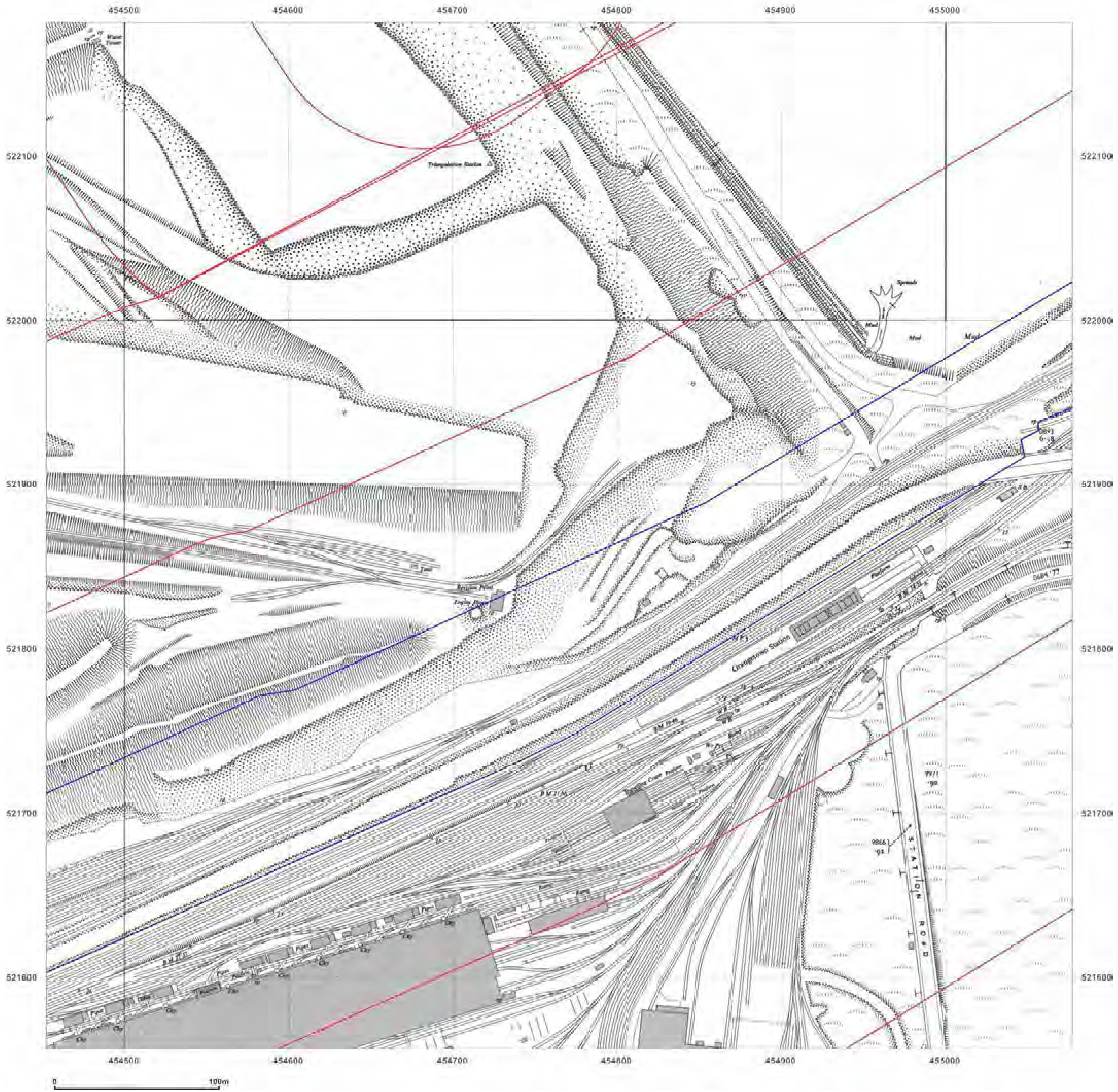
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



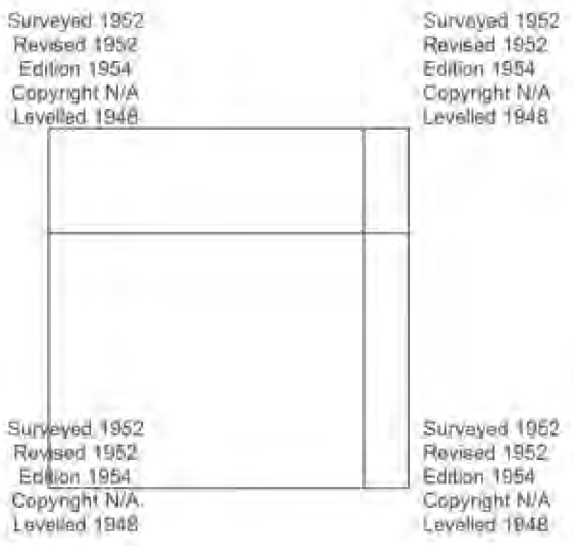
emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name:	National Grid
Map date:	**1952**
Scale:	1:2,500
Printed at:	1:2,500

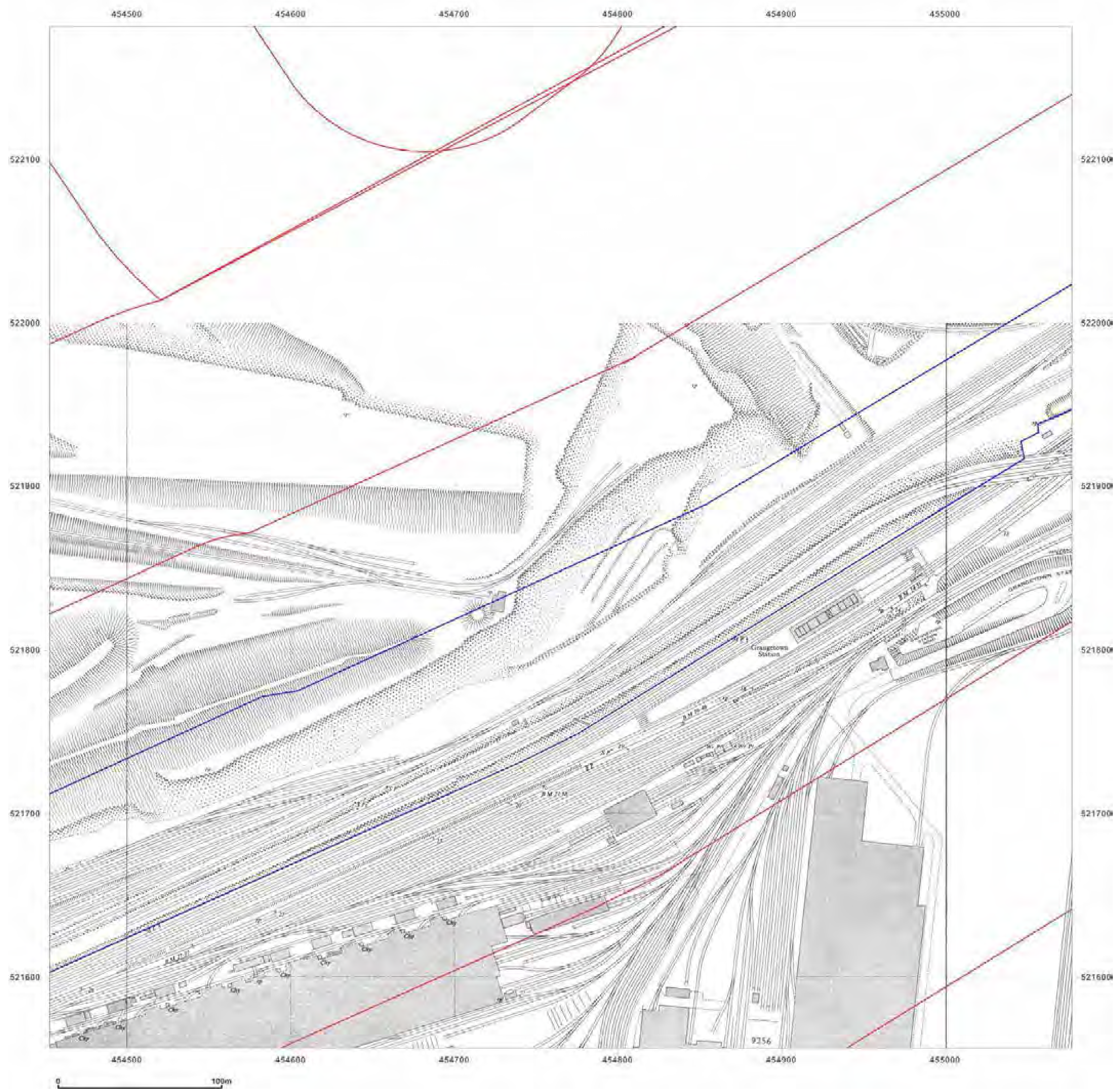


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_2
Grid Ref: 454765, 521869

Map Name: National Grid

Map date: **1960**

Scale: 1:2,500

Printed at: 1:2,500

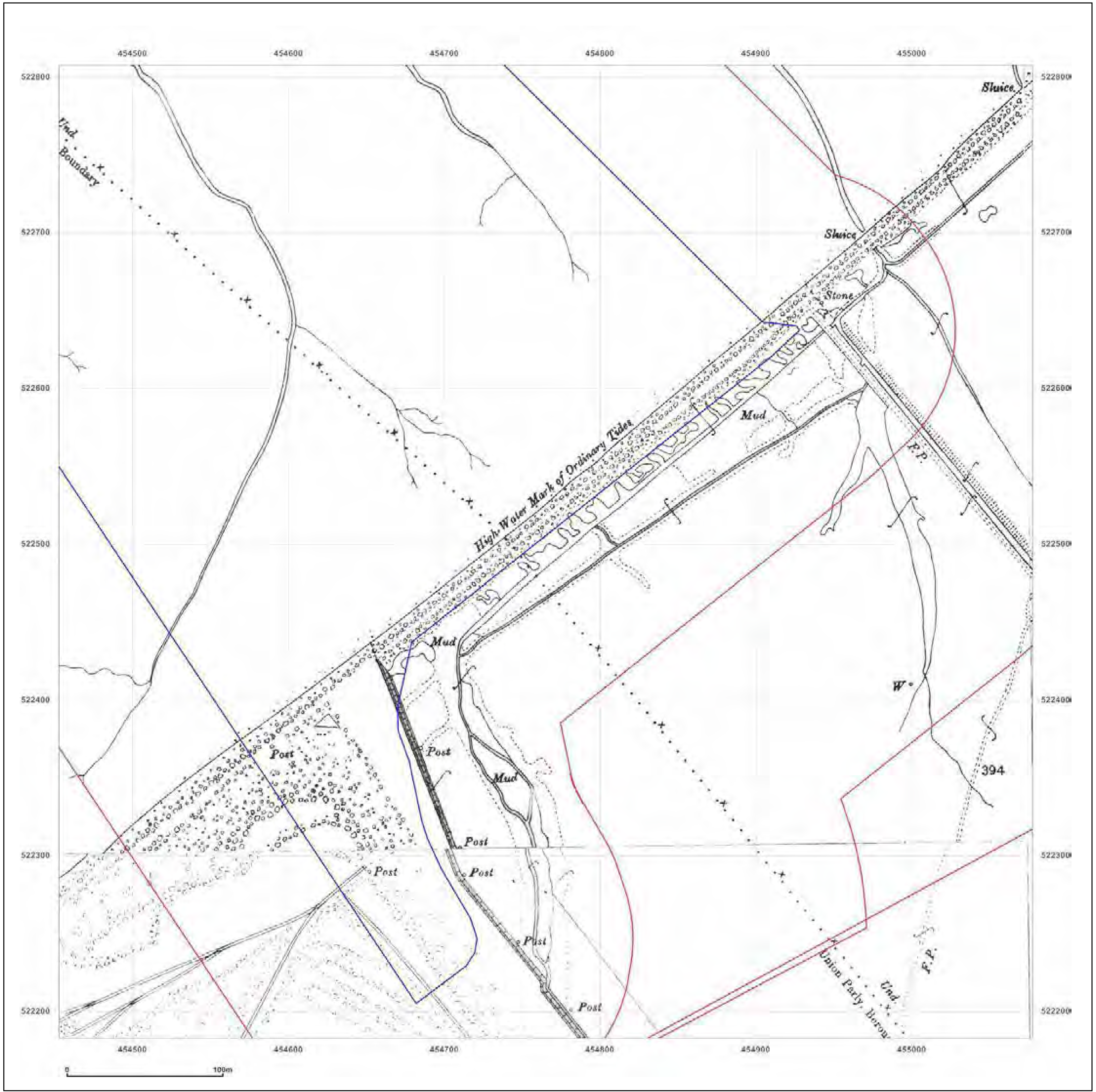
N
W E
S

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

Map Name:	County Series
Map date:	**1893-1895**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1894
Revised 1894
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1893
Revised 1893
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1895
Revised 1895
Edition N/A
Copyright N/A
Levelled N/A

Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

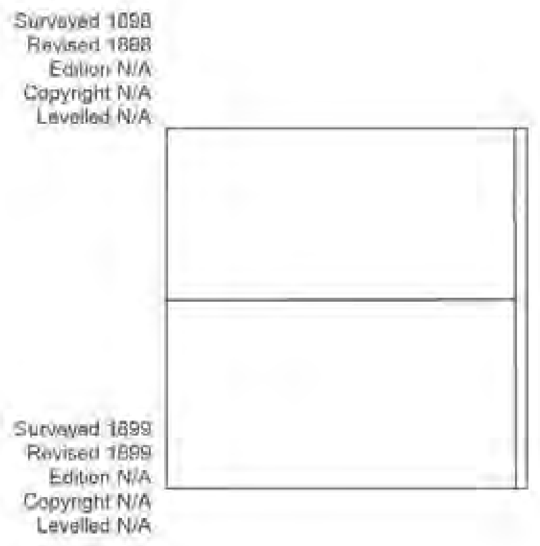
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

Map Name: County Series

Map date: **1898-1899**

Scale: 1:2,500

Printed at: 1:2,500



Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

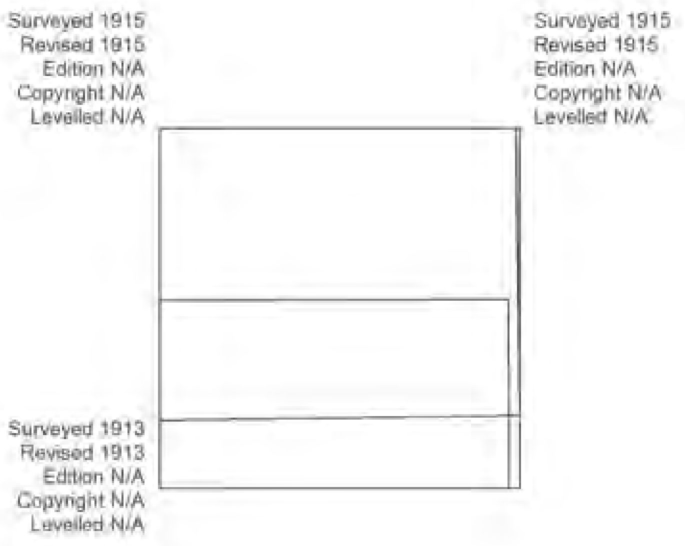
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

Map Name: County Series

Map date: **1913-1915**

Scale: 1:2,500

Printed at: 1:2,500

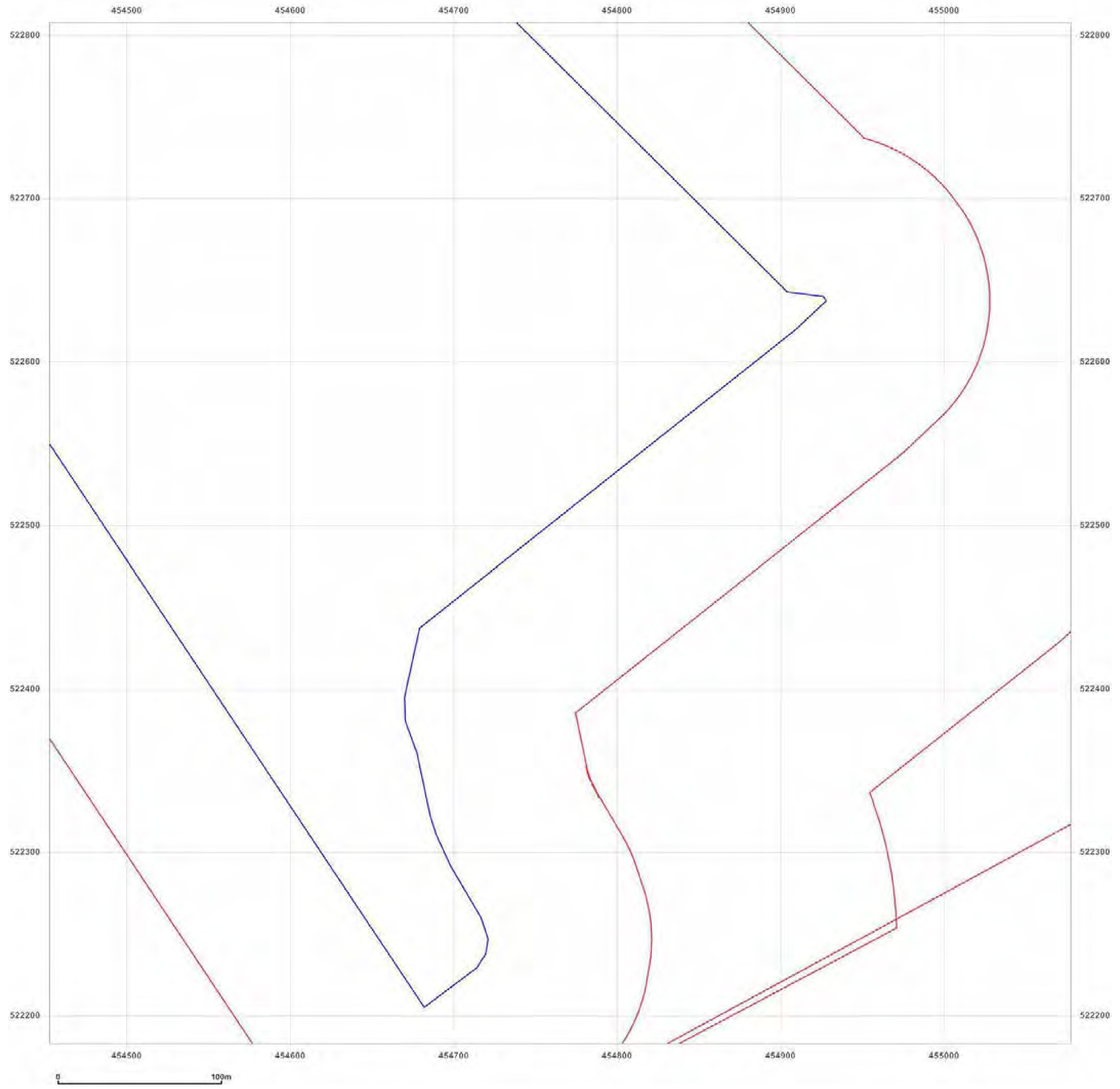


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

Map Name:	County Series
Map date:	**1915**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

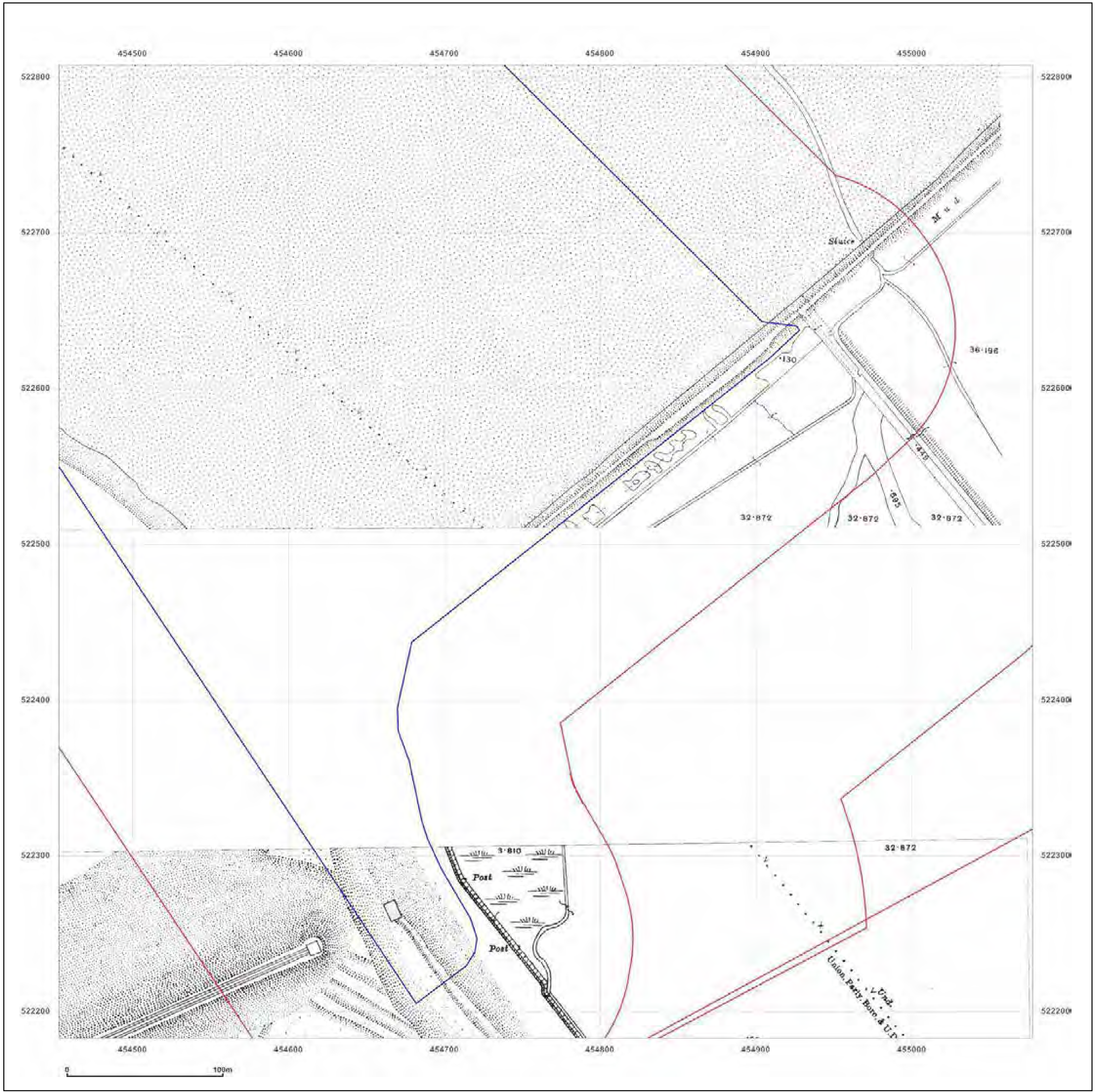
Surveyed 1915
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_3
Grid Ref:	454765, 522495
Map Name:	County Series
Map date:	**1915-1917**
Scale:	1:2,500
Printed at:	1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

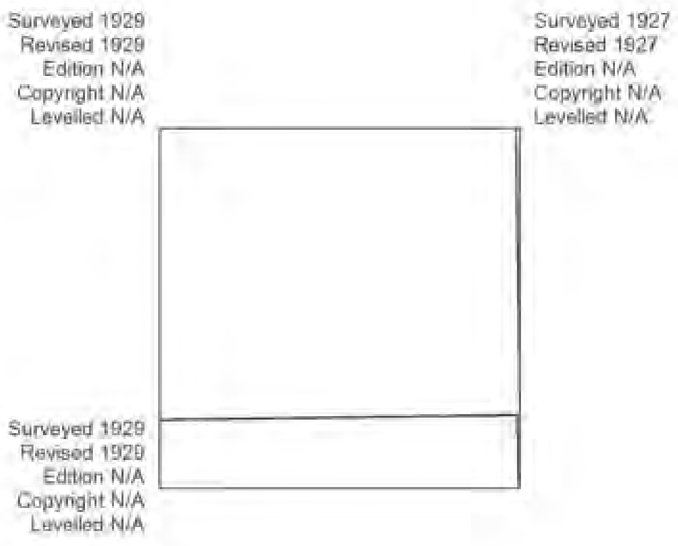
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_3
Grid Ref:	454765, 522495

Map Name:	County Series
Map date:	**1927-1929**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S



Groundsure INSIGHTS

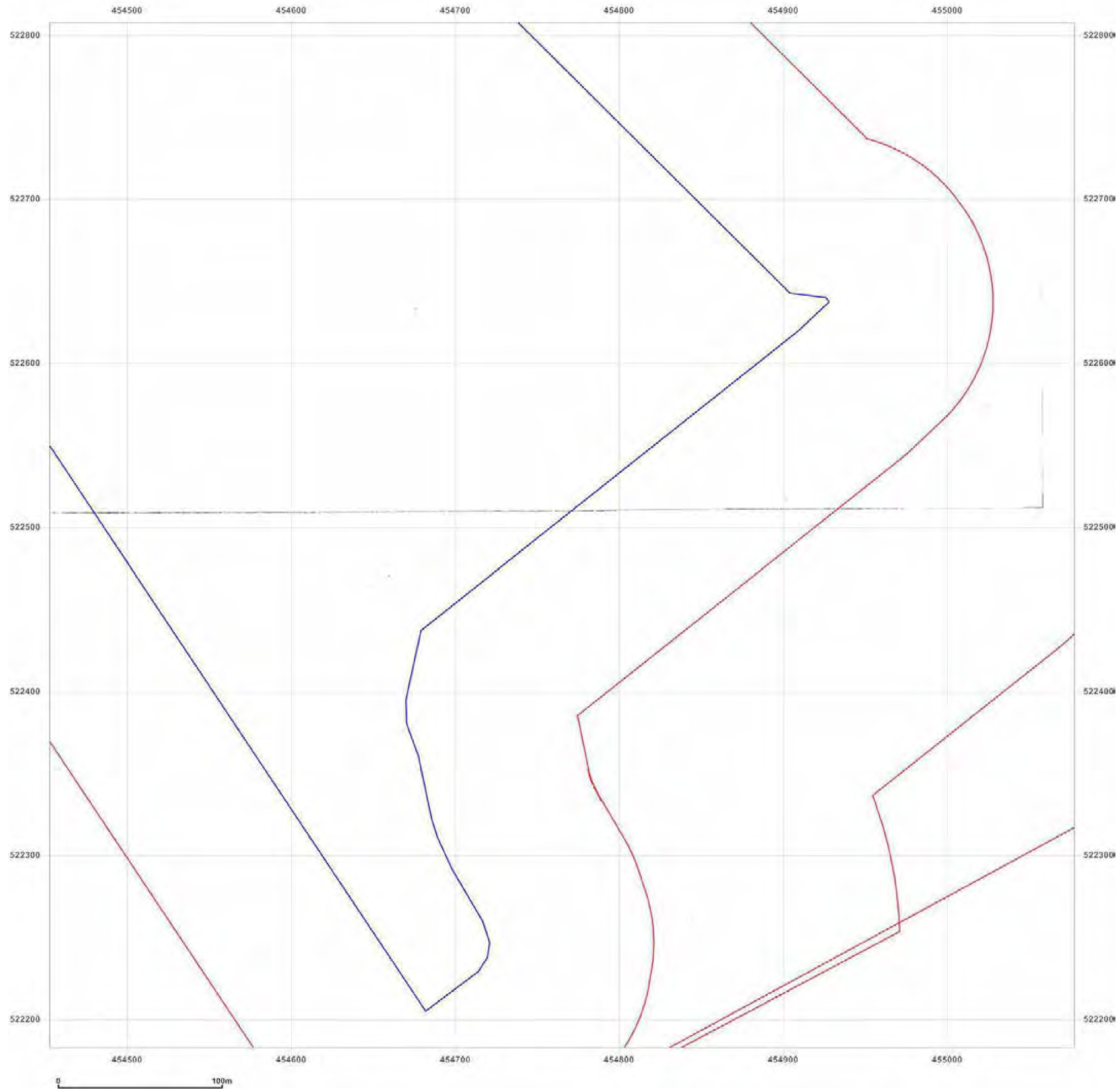
Powered by OS

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

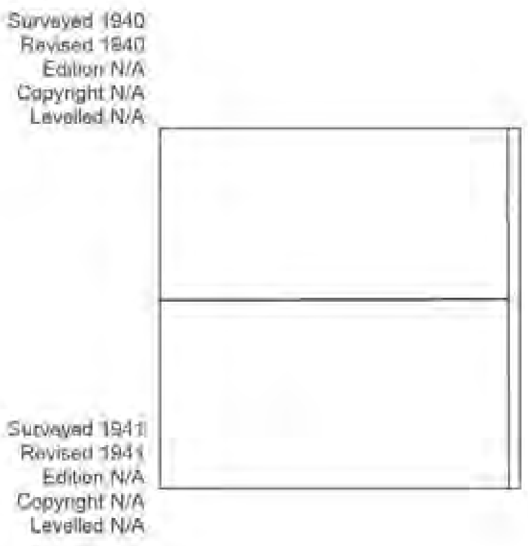
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

Map Name: County Series

Map date: **1940-1941**

Scale: 1:2,500

Printed at: 1:2,500



Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_3
Grid Ref: 454765, 522495

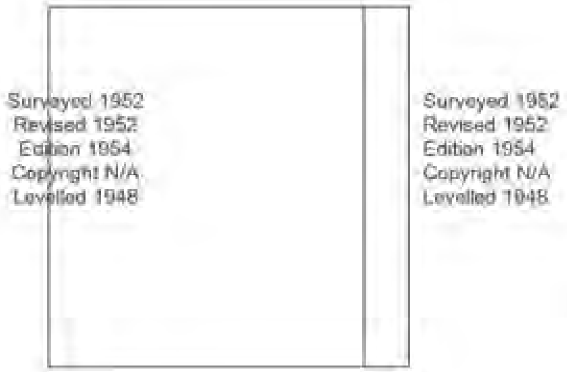
Map Name: National Grid

Map date: 1952

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



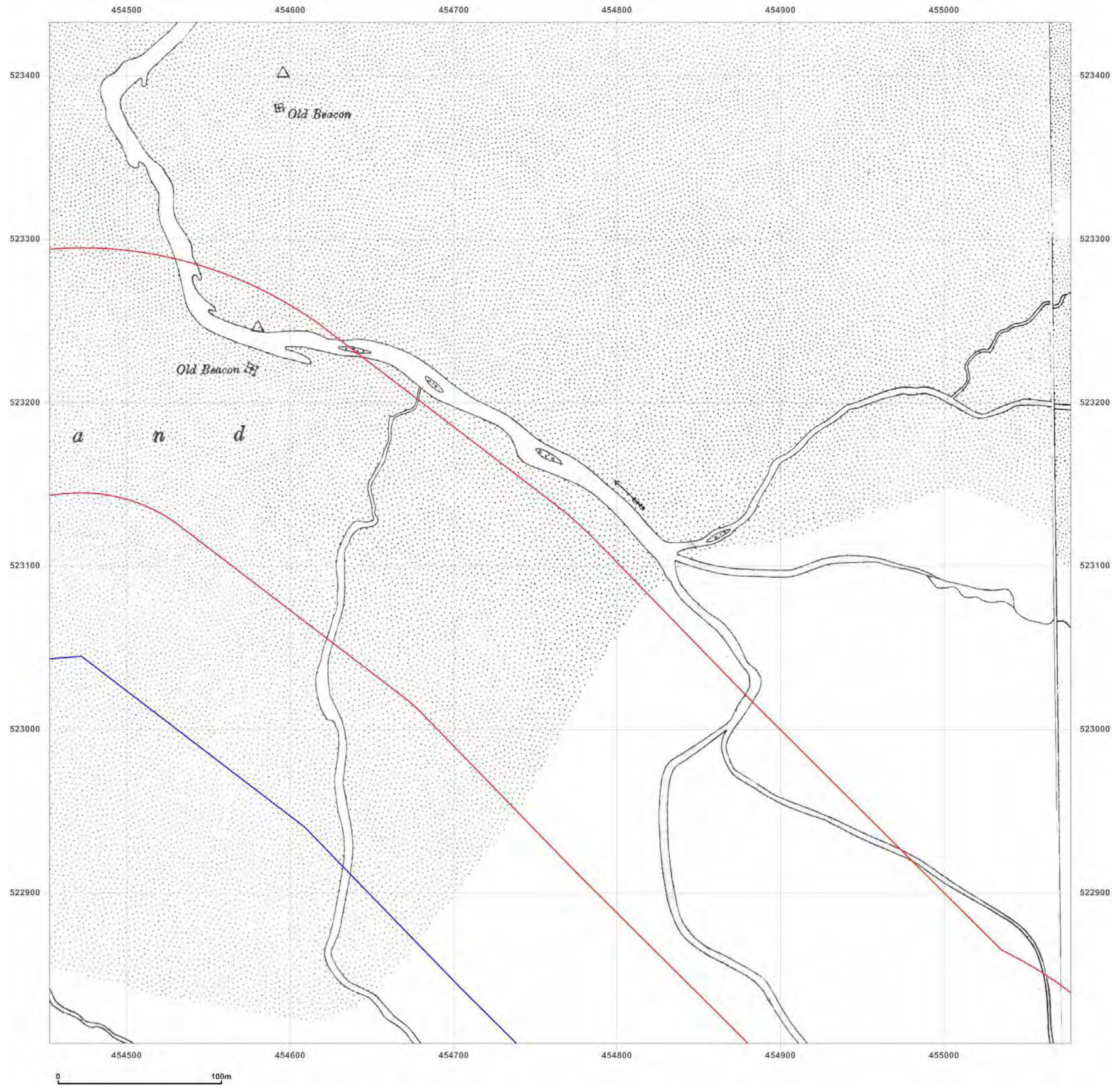
Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

1:2500 Scale Sections 4-4 to 5-3



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

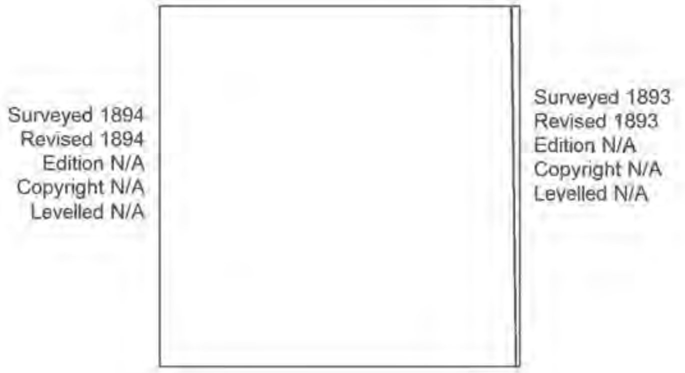
Map Name: County Series

Map date: **1893-1894**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

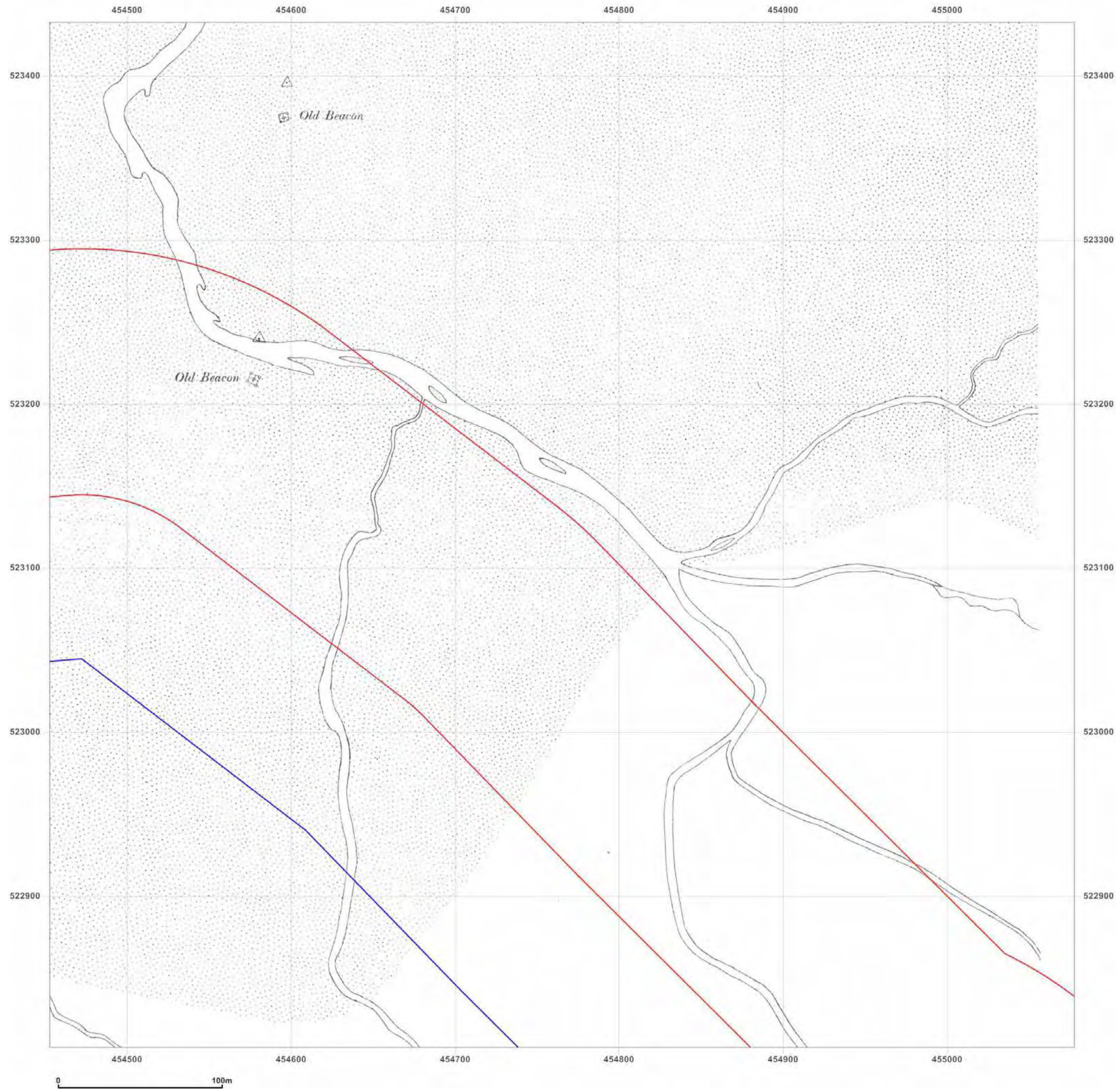


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_4
Grid Ref:	454765, 523120

Map Name:	County Series
Map date:	**1898**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1898
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A

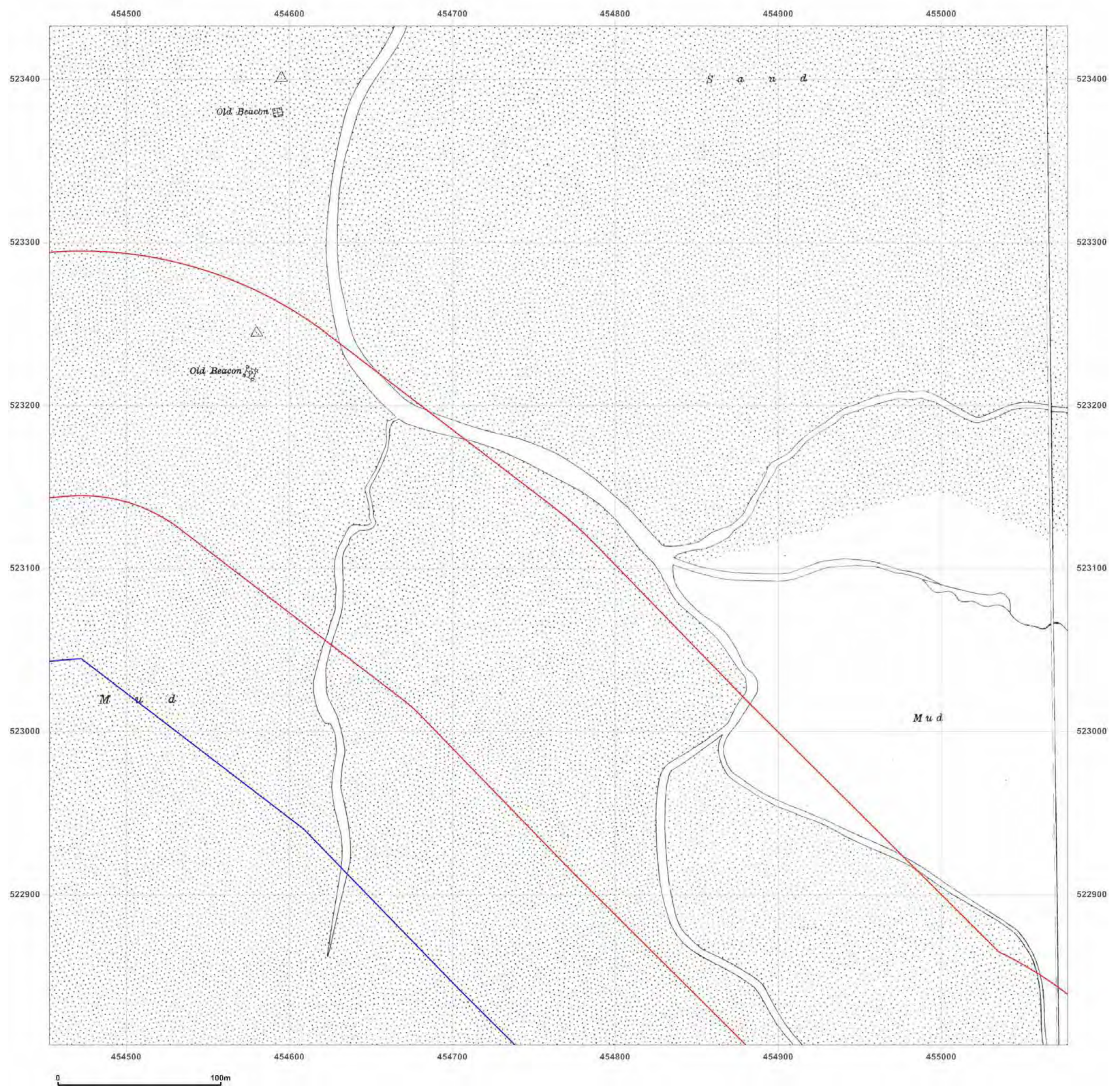
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

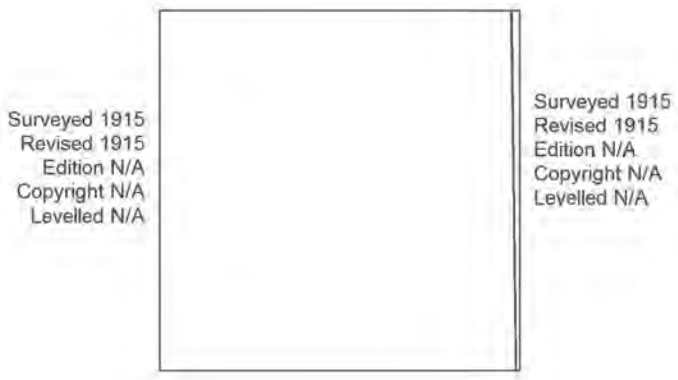
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

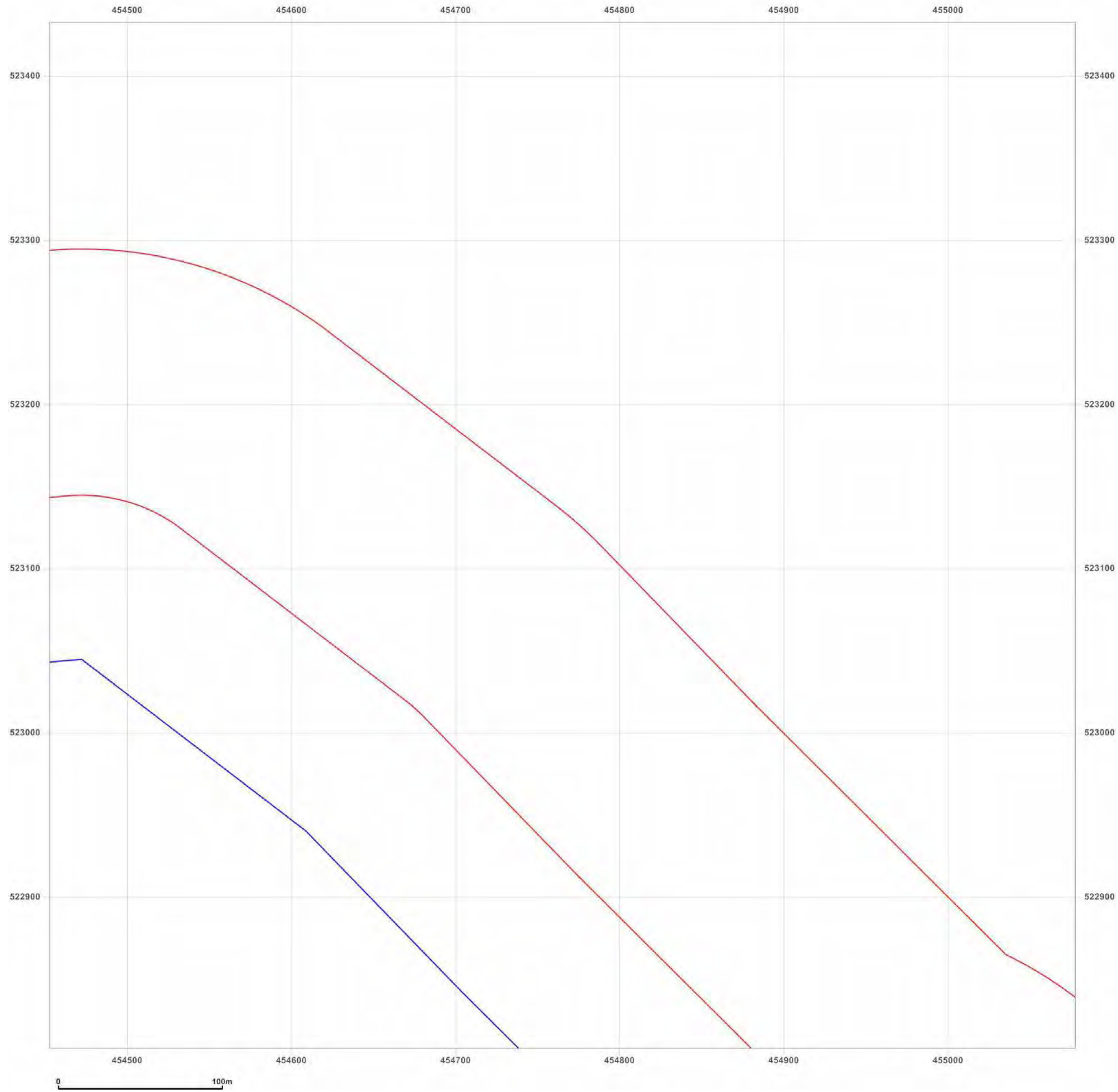


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

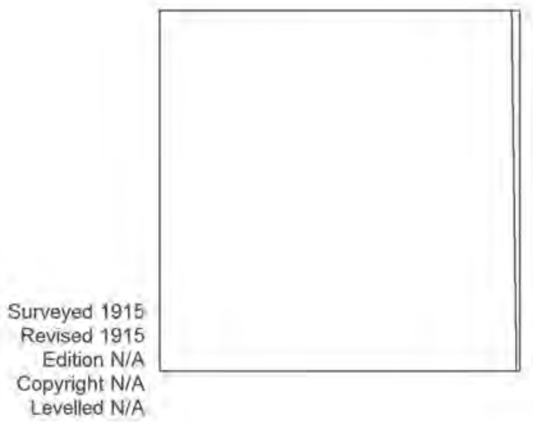
Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Groundsure INSIGHTS

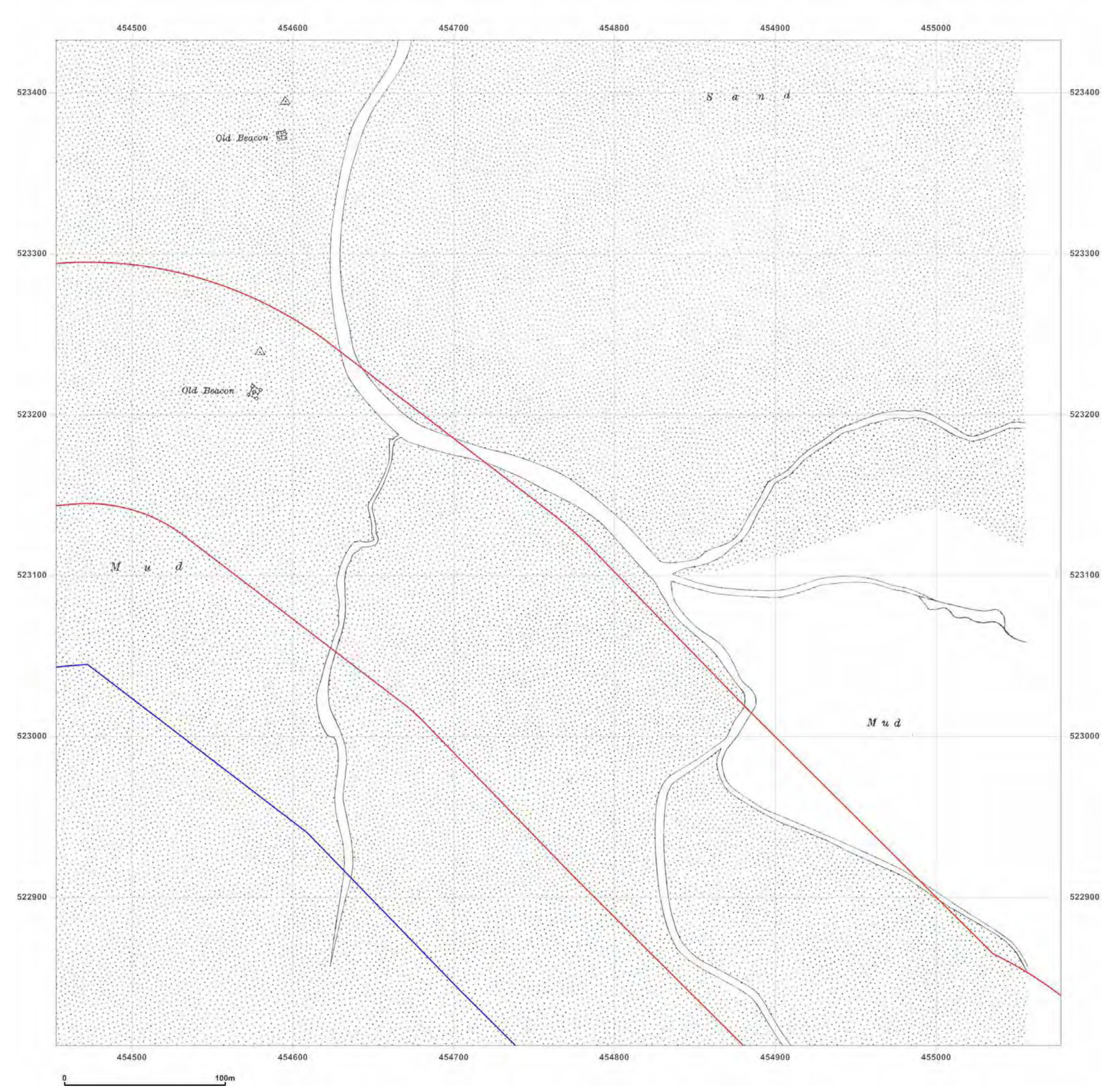
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

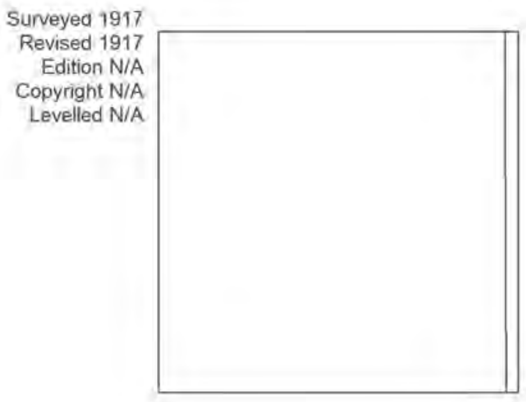


Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

Map Name:	County Series
Map date:	**1917**
Scale:	1:2,500
Printed at:	1:2,500

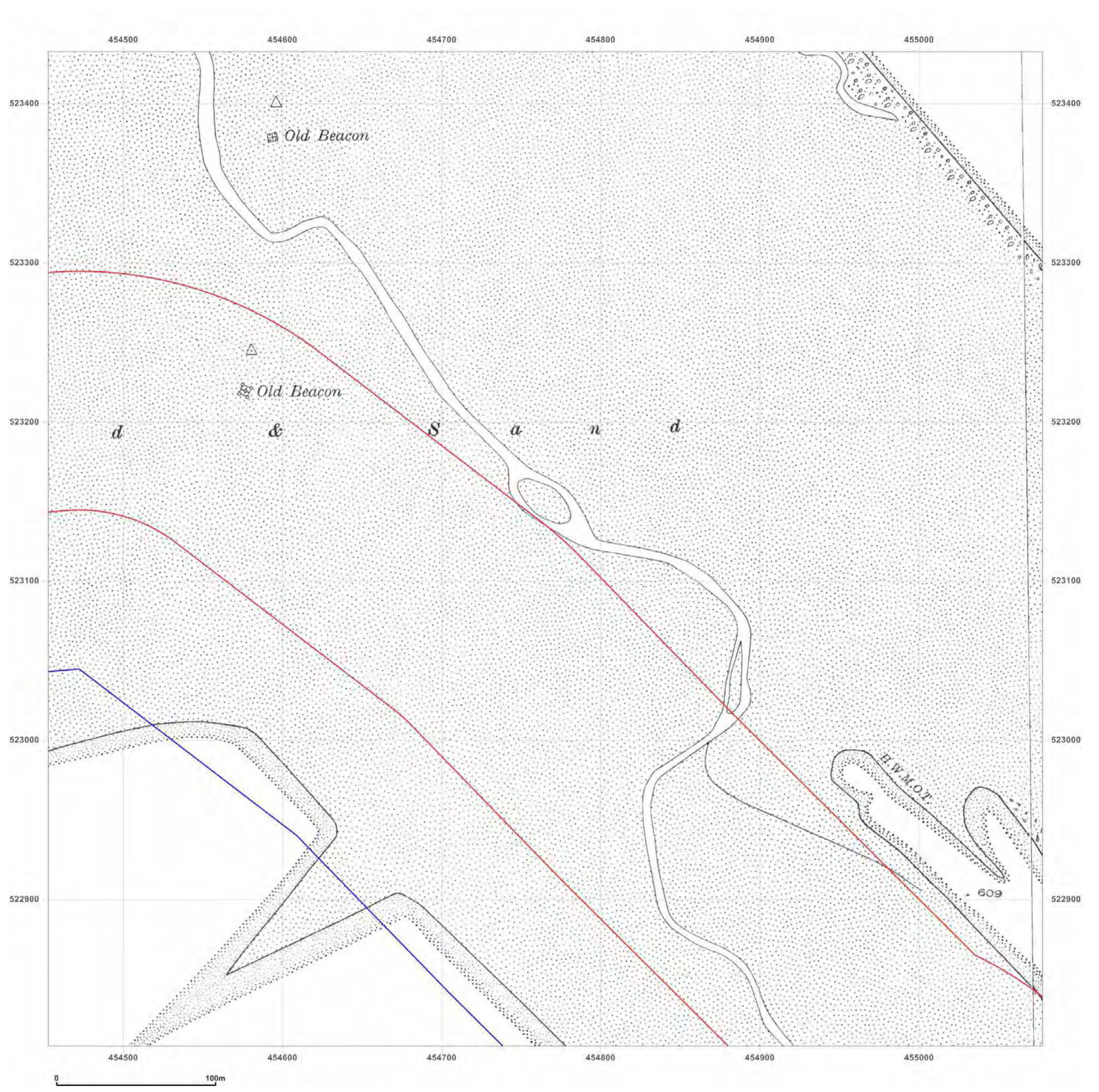


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



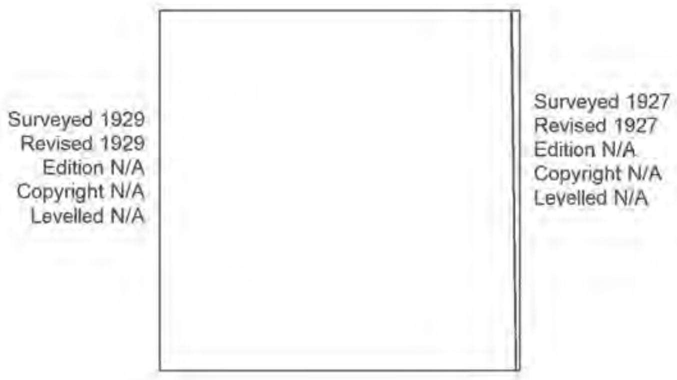
emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_4
Grid Ref:	454765, 523120

Map Name:	County Series
Map date:	**1927-1929**
Scale:	1:2,500
Printed at:	1:2,500



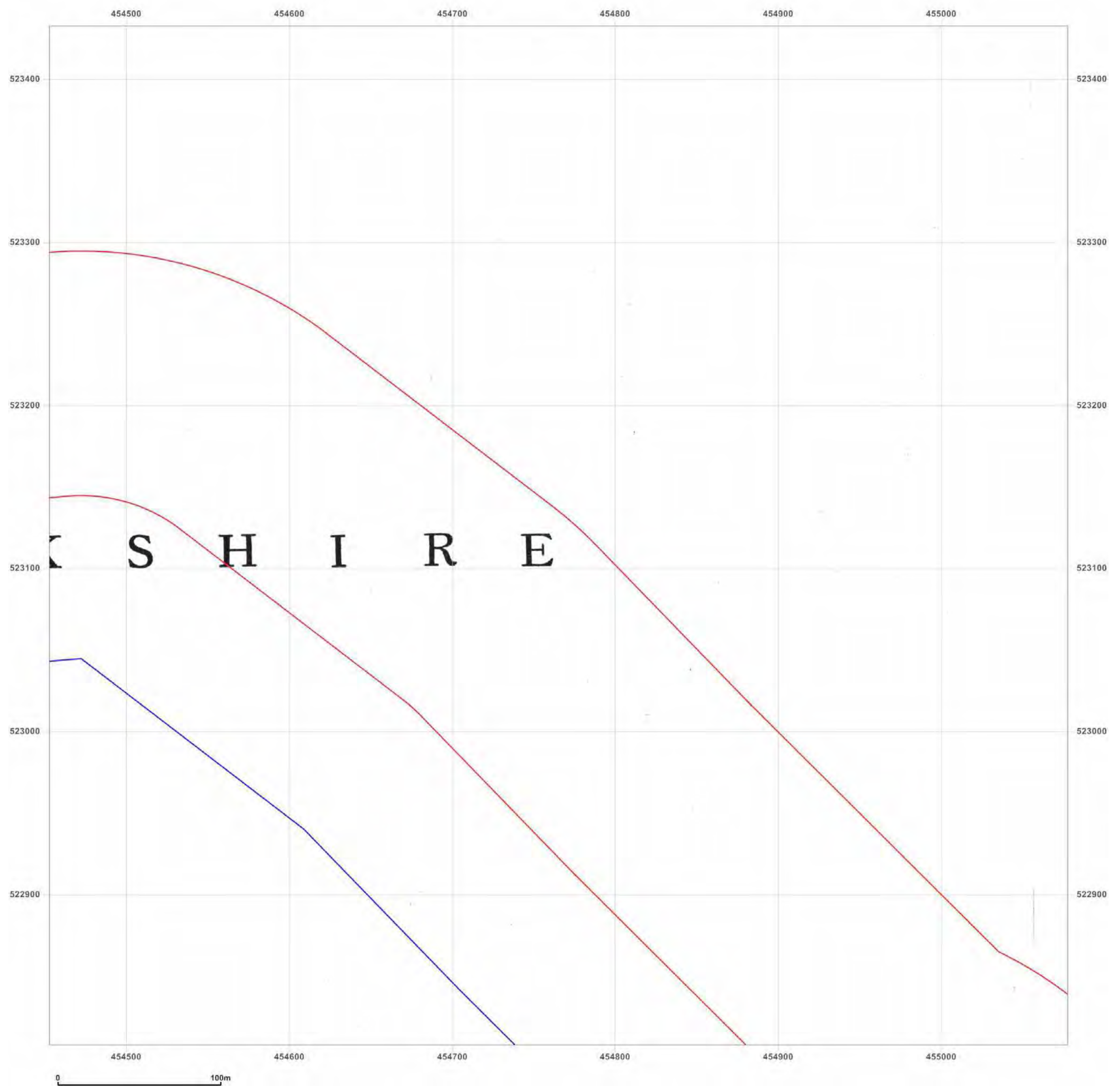
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_4_4
Grid Ref:	454765, 523120

Map Name:	County Series
Map date:	**1940**
Scale:	1:2,500
Printed at:	1:2,500

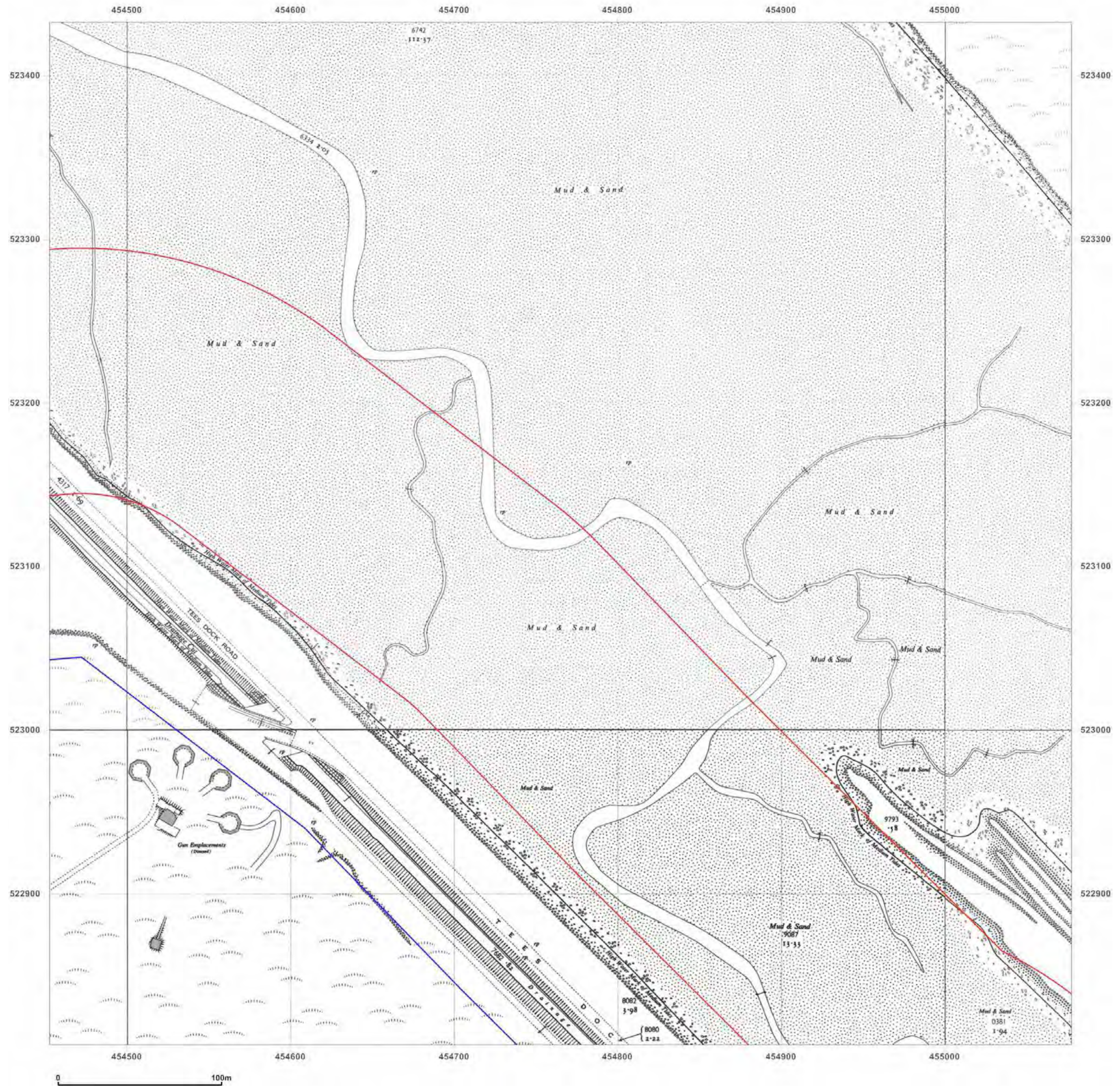
Surveyed 1940
Revised 1940
Edition N/A
Copyright N/A
Levelled N/A

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

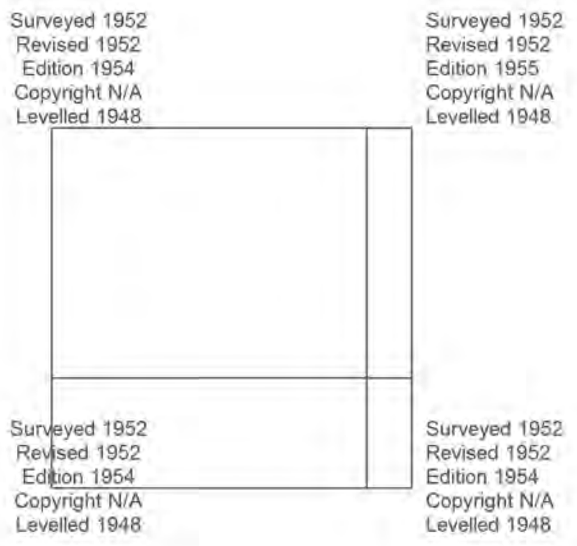
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

Map Name: National Grid

Map date: **1952**

Scale: 1:2,500

Printed at: 1:2,500

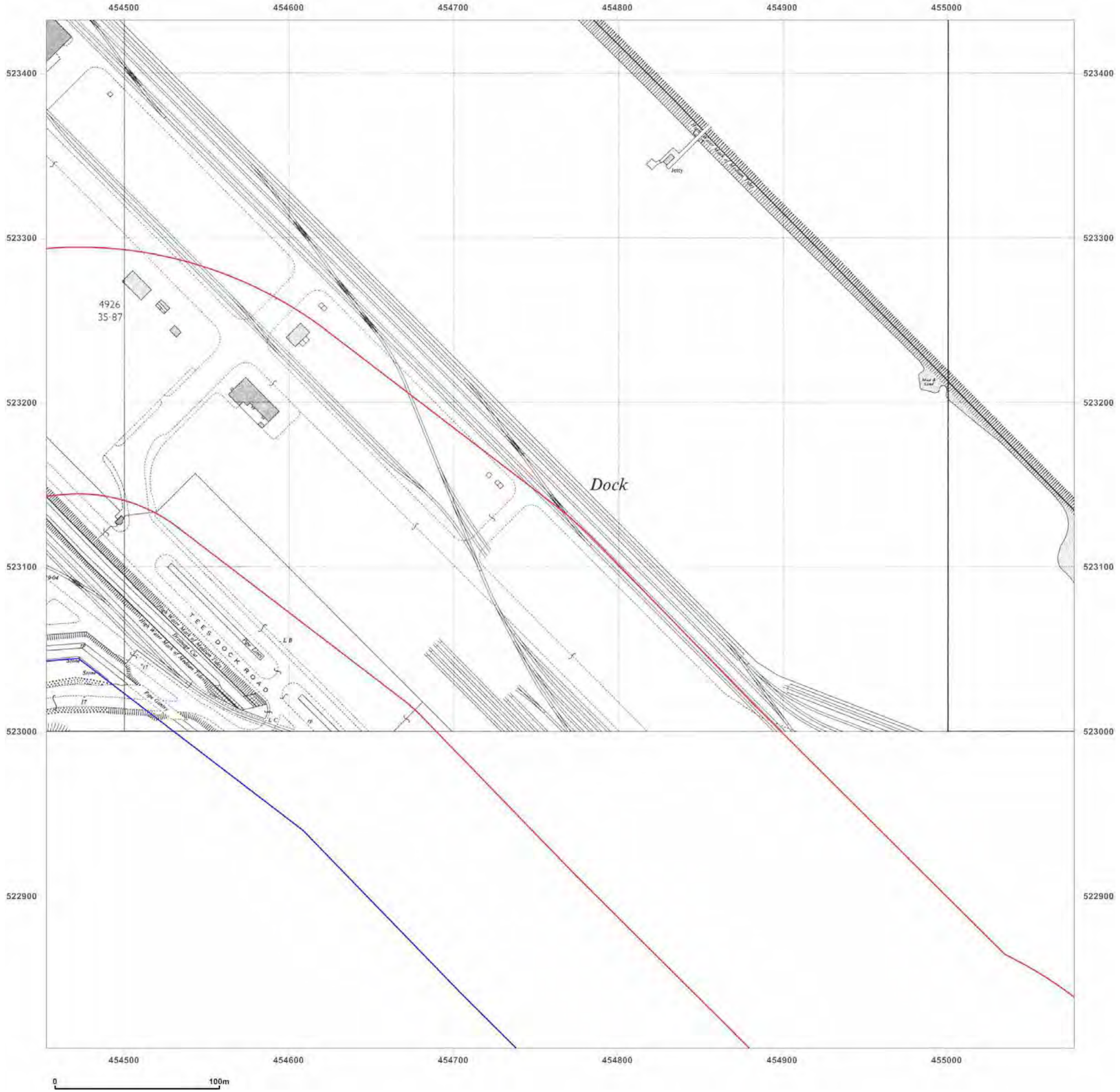


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_4_4
Grid Ref: 454765, 523120

Map Name: National Grid

Map date: **1963**

Scale: 1:2,500

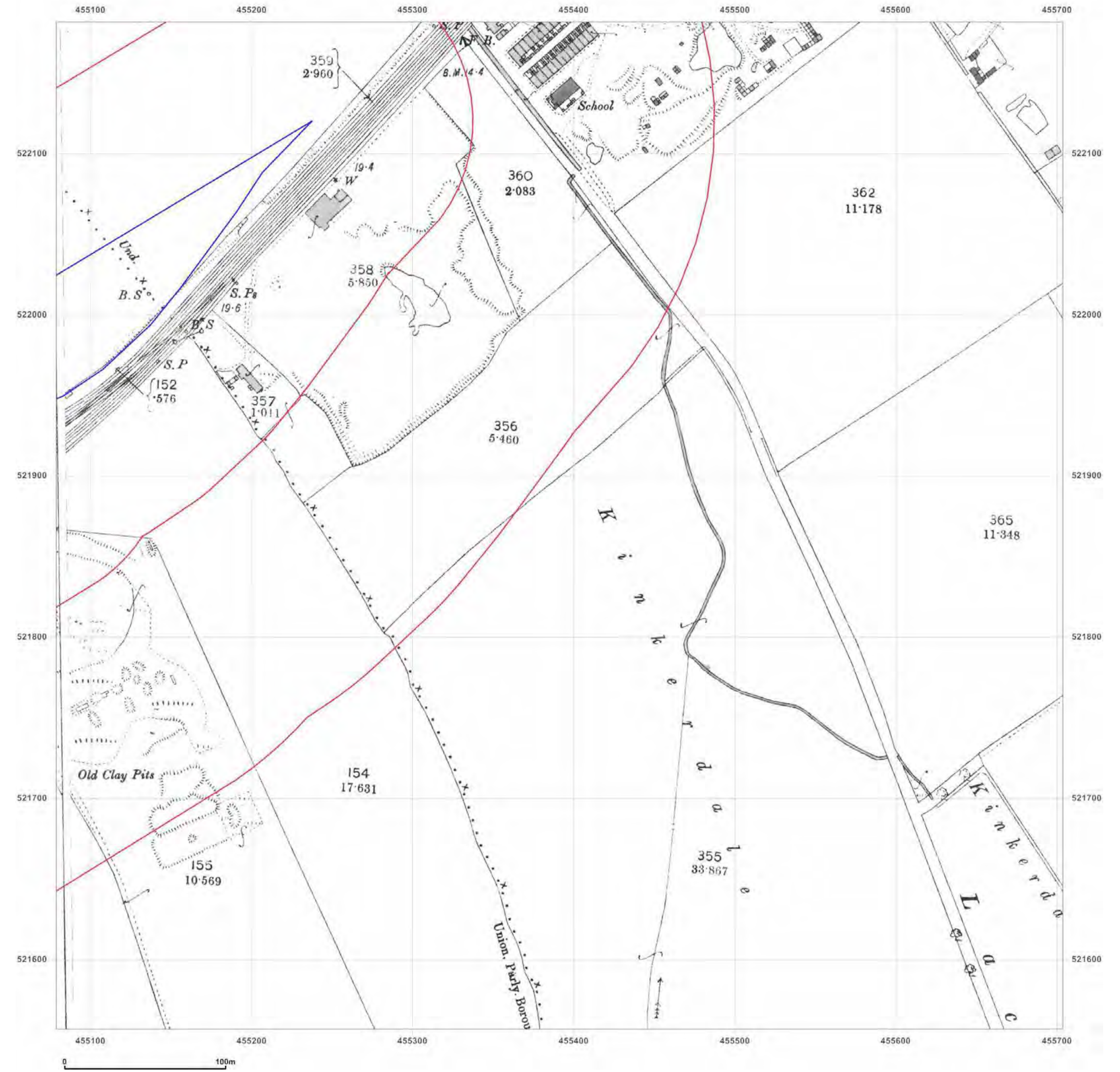
Printed at: 1:2,500

Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



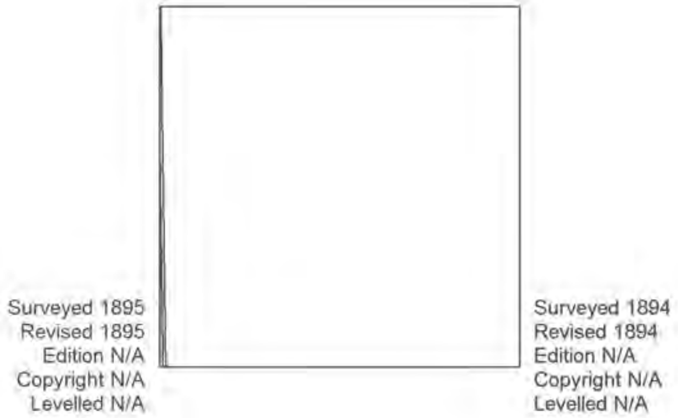
emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_5_2
Grid Ref:	455391, 521869

Map Name:	County Series
Map date:	**1894-1895**
Scale:	1:2,500
Printed at:	1:2,500



Groundsure INSIGHTS

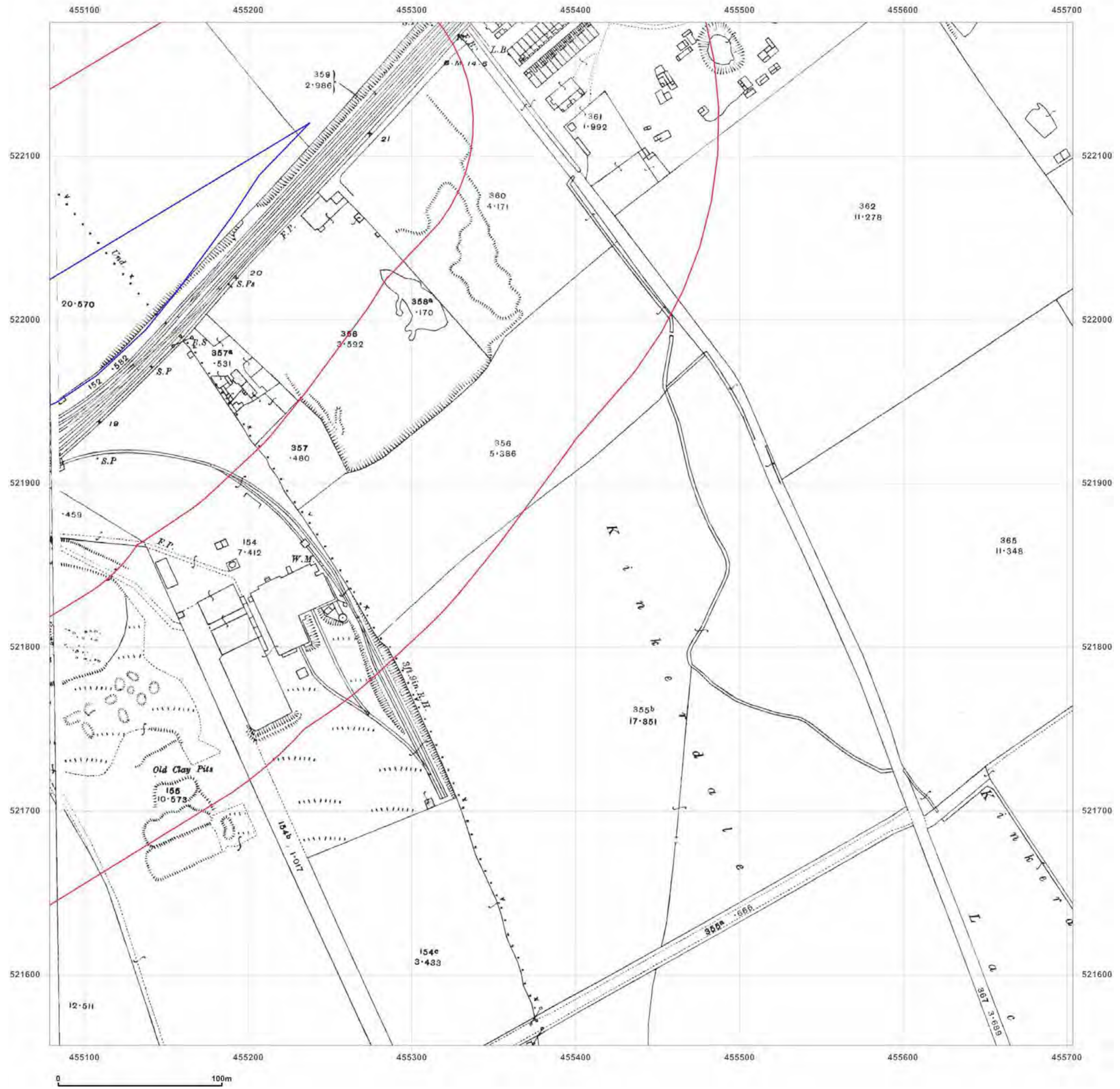
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

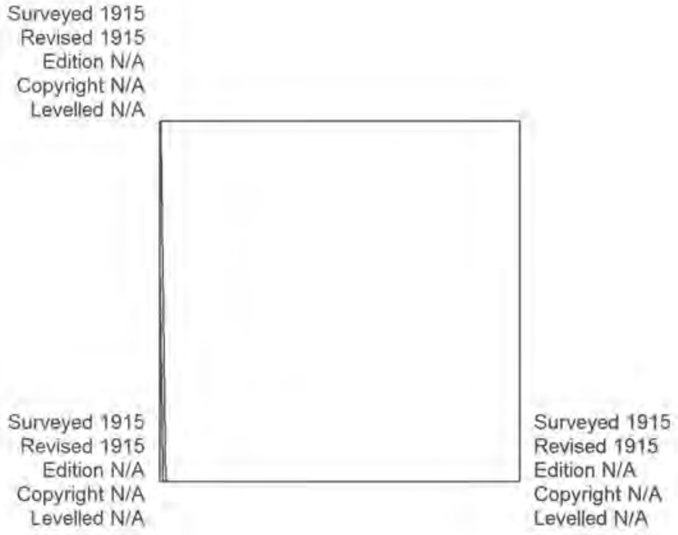
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_2
Grid Ref: 455391, 521869

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

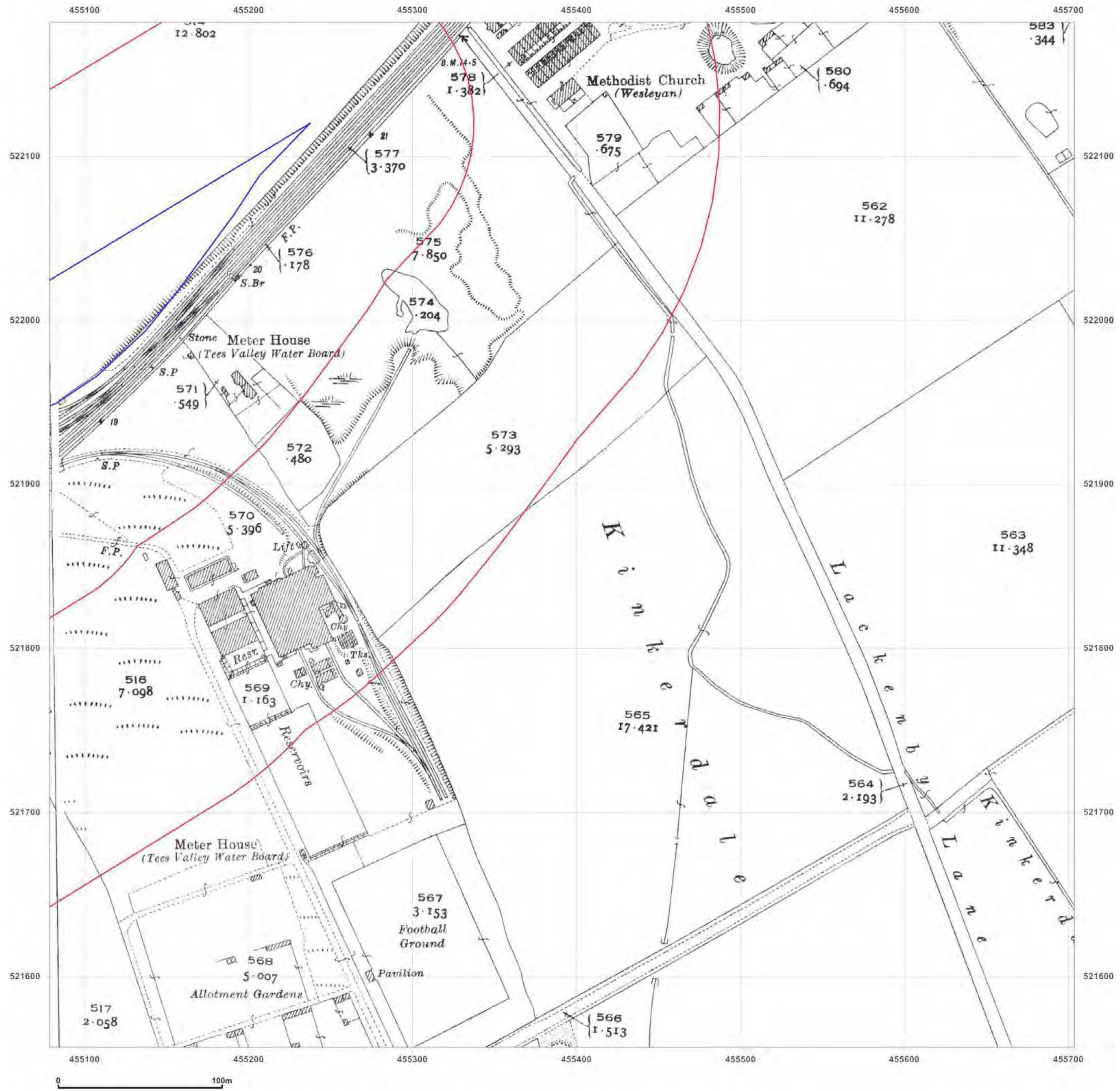


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

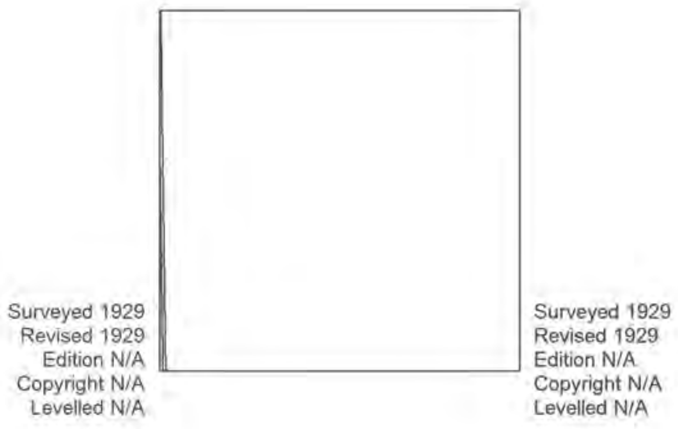
Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_5_2
Grid Ref:	455391, 521869

Map Name:	County Series
Map date:	**1929**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S



Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_2
Grid Ref: 455391, 521869

Map Name: National Grid

Map date: **1952**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1952
Revised 1952
Edition 1954
Copyright N/A
Levelled 1948

Surveyed 1952
Revised 1952
Edition 1954
Copyright N/A
Levelled 1948

Groundsure INSIGHTS

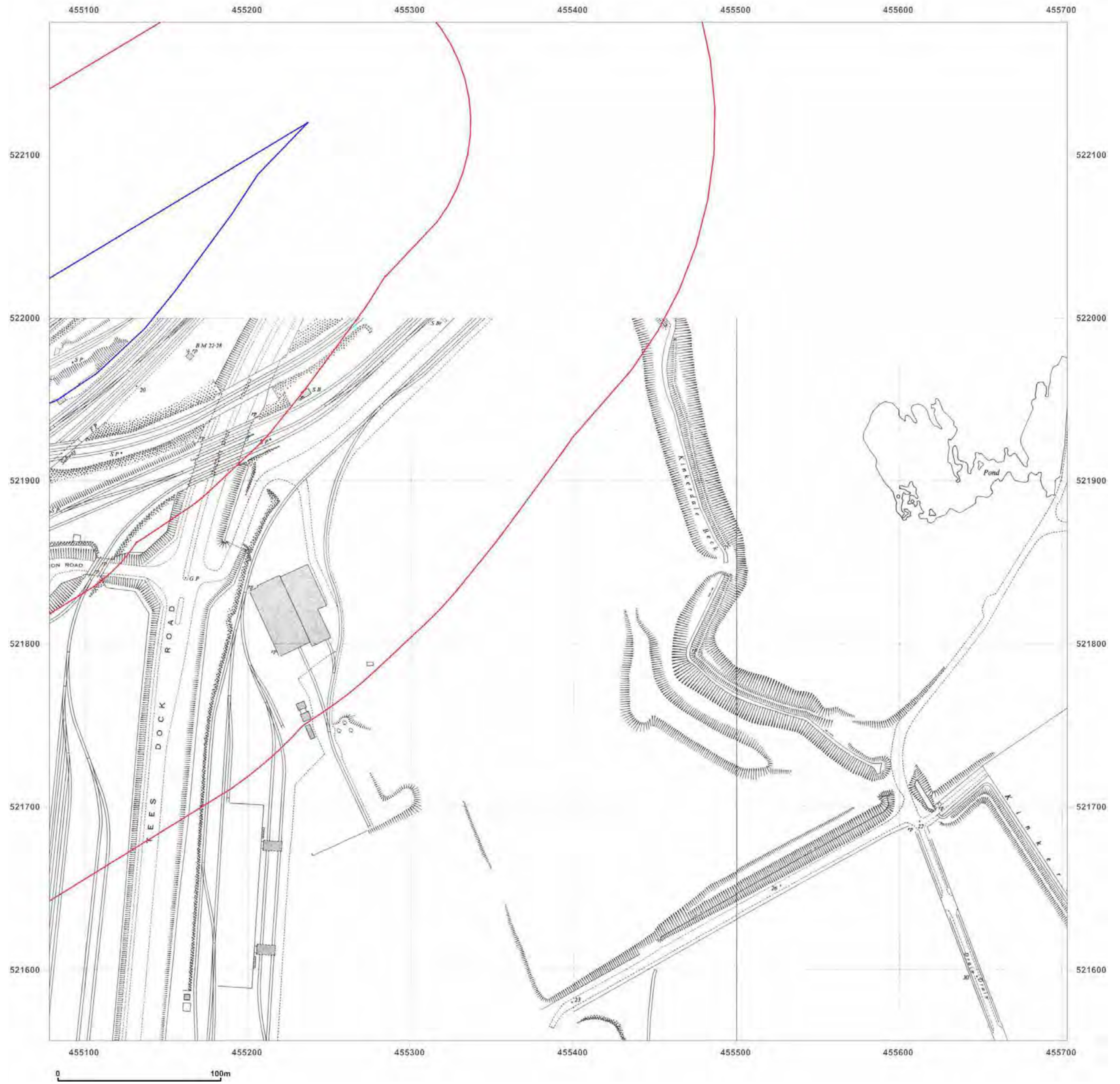
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref:	EMS_546959_736025
Report Ref:	EMS-546959_736025_LS_5_2
Grid Ref:	455391, 521869
Map Name:	National Grid
Map date:	**1960**
Scale:	1:2,500
Printed at:	1:2,500

N
W E
S

Surveyed 1959
Revised 1959
Edition 1960
Copyright 1960
Levelled 1948

Groundsure INSIGHTS

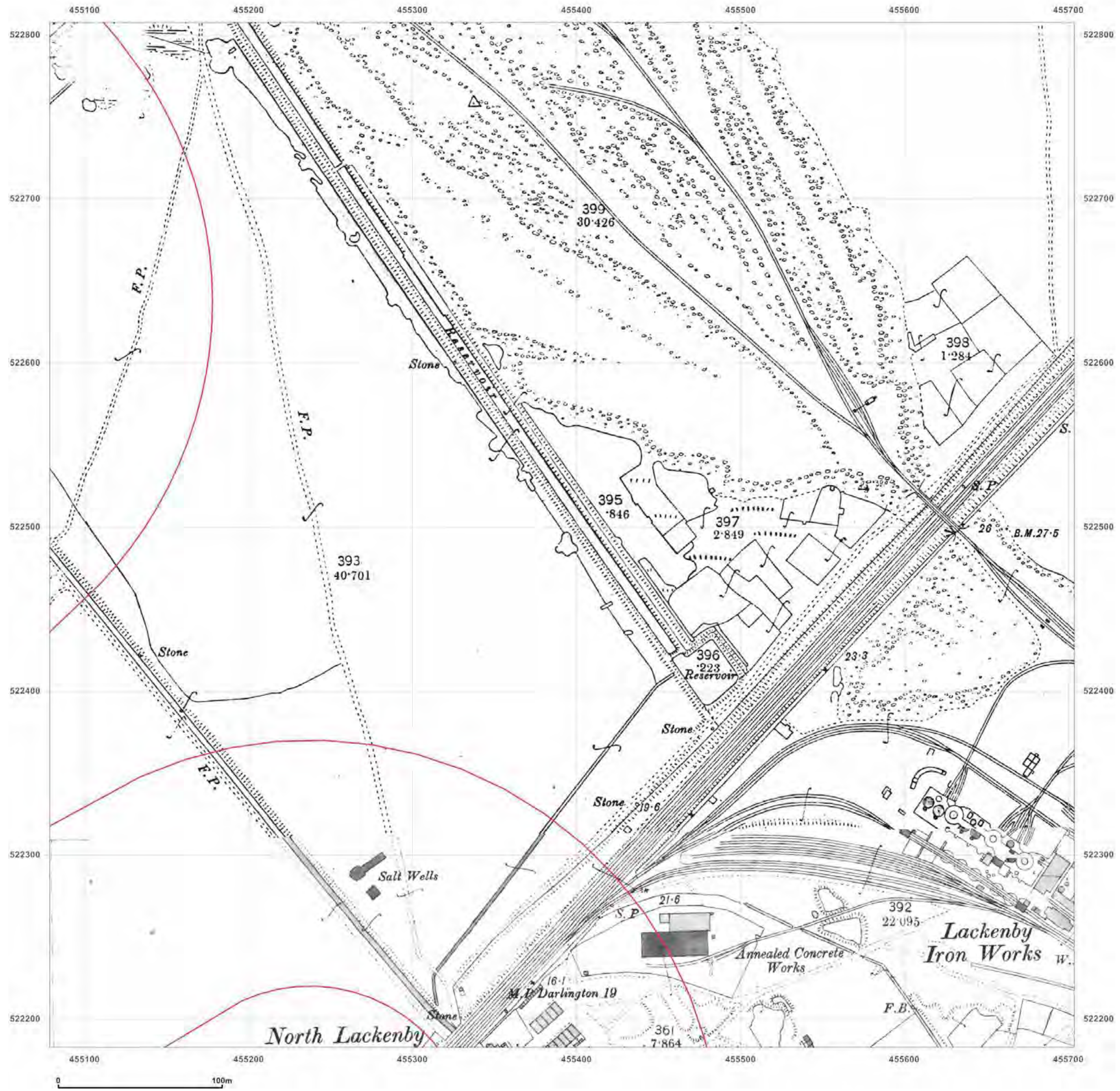
Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

South Tees Development

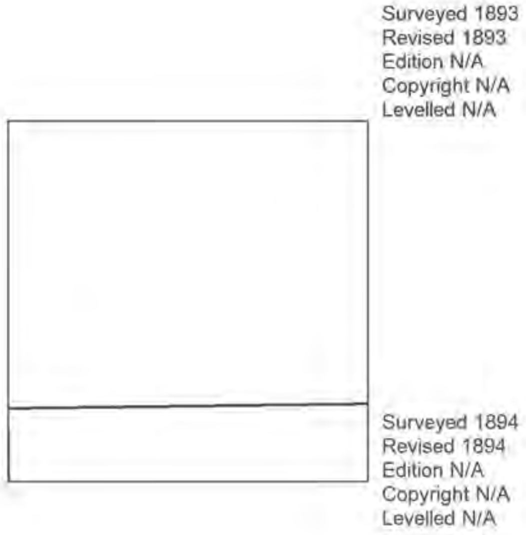
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_3
Grid Ref: 455391, 522495

Map Name: County Series

Map date: **1893-1894**

Scale: 1:2,500

Printed at: 1:2,500



Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_3
Grid Ref: 455391, 522495

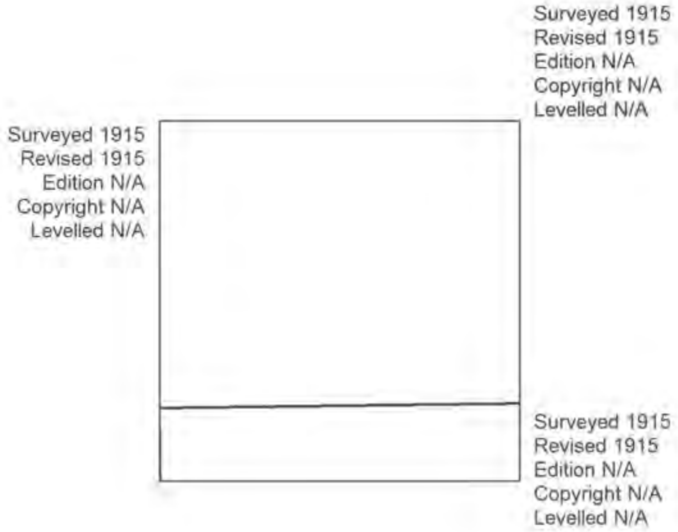
Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

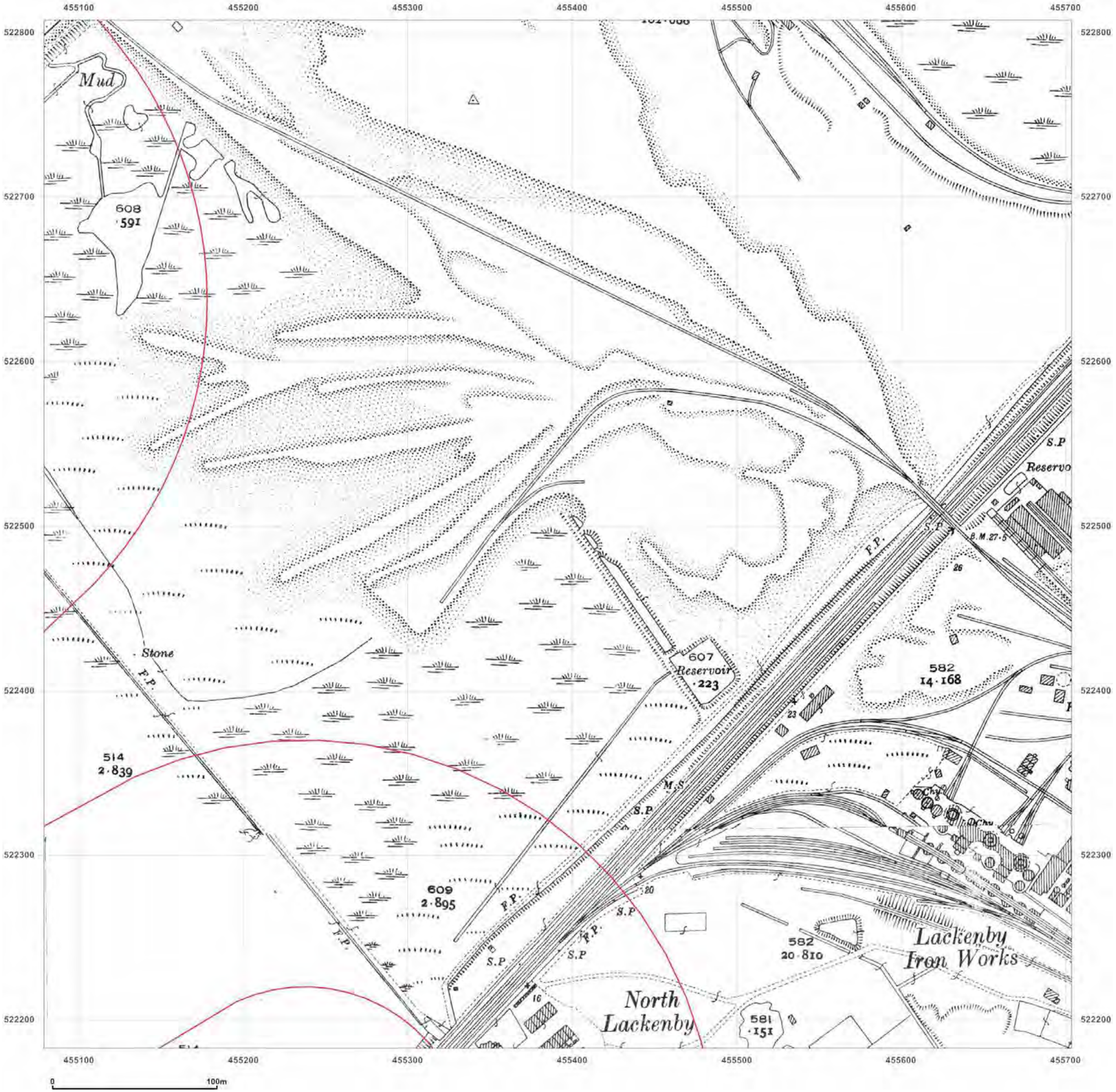


Produced by
Groundsure Insights
www.groundsure.com

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

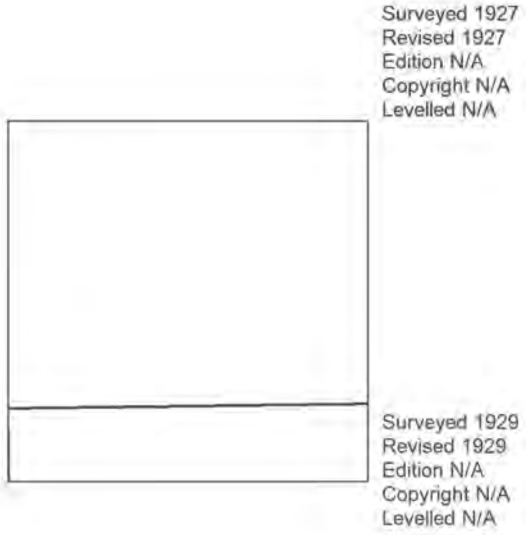
Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_3
Grid Ref: 455391, 522495

Map Name: County Series

Map date: **1927-1929**

Scale: 1:2,500

Printed at: 1:2,500



Groundsure INSIGHTS

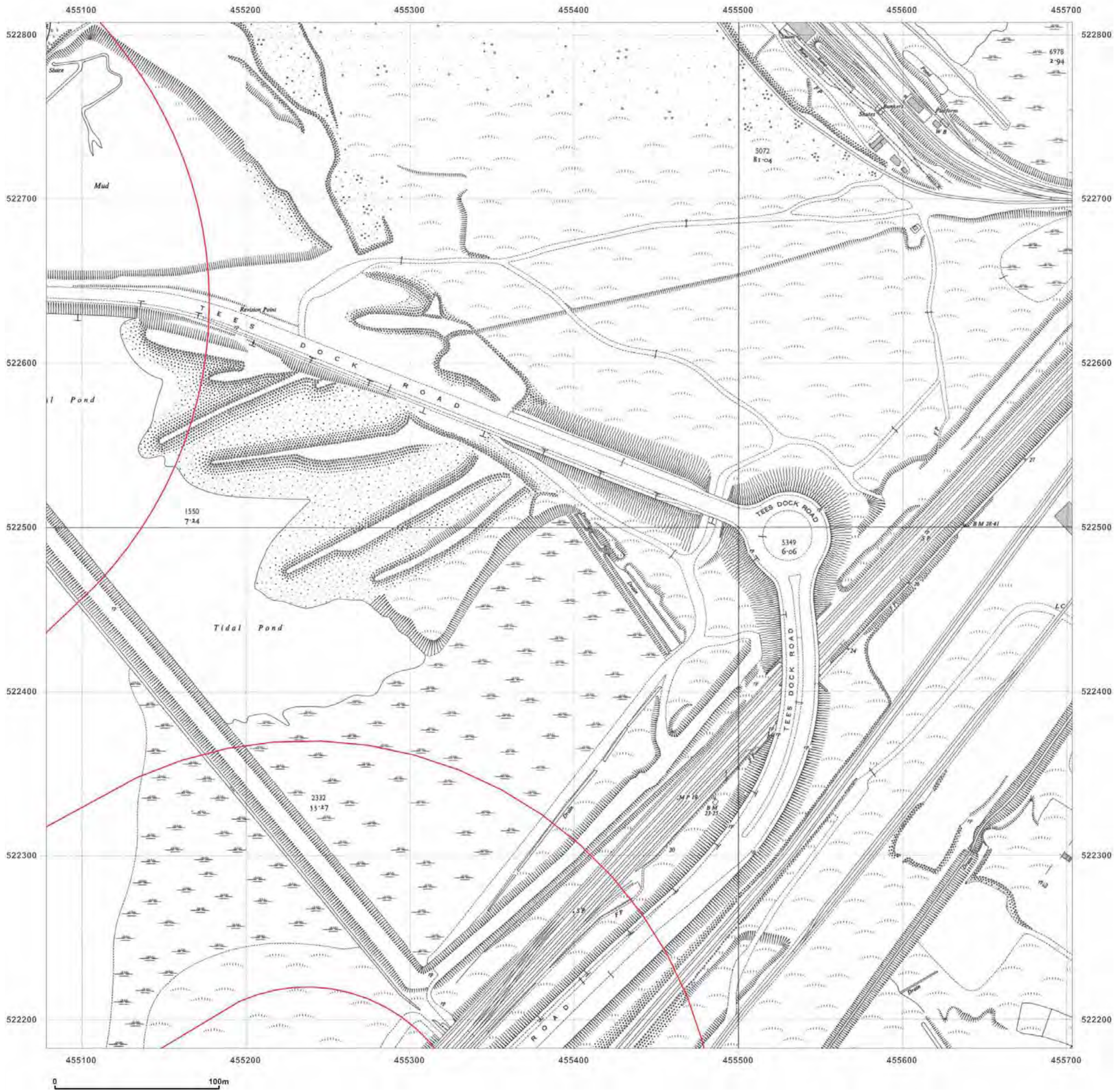
Produced by
Groundsure Insights
www.groundsure.com

Powered by

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



emapsite™

Site Details:

South Tees Development

Client Ref: EMS_546959_736025
Report Ref: EMS-546959_736025_LS_5_3
Grid Ref: 455391, 522495

Map Name: National Grid

Map date: **1952**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1952
Revised 1952
Edition 1954
Copyright N/A
Levelled 1948

Groundsure INSIGHTS

Produced by
Groundsure Insights
www.groundsure.com

Powered by OS

Supplied by:
www.emapsite.com
sales@emapsite.com

Production date: 03 June 2019

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Appendix D

D – Historical British Geological Survey (BGS) Logs and Logs from Previous Ground Investigations

RECORD OF BOREHOLE AS 2

Ground level: 6.15m above O.D. (Newlyn)

Dia. of boring: 0.25m to 9.60m;
0.20m to 23.15m

Method of boring: Shell & Auger

Lining tubes: 0.25m to 9.60m;
0.20m to 19.00m

Daily Progress	Samples		Change of Strata			Description of Strata
	Depth	Type	Legend	Depth	O.D. Level	
	0.20	BD	▩			FILL (cobbles and boulder size fragments of grey blast furnace slag with silt to medium sand size fragments of ash and fine to medium gravel size fragments of clinker. Occasional traces of iron. Ash and clinker, containing medium gravel size fragments of blast furnace slag predominating above 1.50m)
13.8.73						
	2.20	BD				
14.8.73						
	3.75 - 4.05	C(108)				
	4.75 - 5.05	C(110)				
	5.60	BD				
	5.75 - 6.05	C(101)		5.80	0.35	
	6.60	BD	⁘			Medium dense, occasionally dense, bedded black silty fine SAND containing lenses or layers of silty clay and clayey silt. Occasional shells and fine to medium gravel
	6.75 - 7.05	C(52)				
15.8.73	7.80	BD				
	7.95 - 8.25	C(32)				
	8.80	BD				
	8.95 - 9.25	C(43)				
	9.50	BD				
	9.95 - 10.25	C(57)		10.20	-4.05	
	10.50 - 10.80	U(4) ‡	▤			Stiff, becoming very stiff, fissured red-brown sandy silty CLAY with fine to medium gravel
	10.85	D				
	11.50	D				
	12.00 - 12.45	U(4)				
	12.45	D		12.90	-6.75	
	13.00	D	▤			Hard fissured dark brown sandy silty CLAY with fine to medium gravel. Becoming sandier with depth and with occasional large gravel. Stratum soft to stiff at 17.50m (approx.)
	13.50 - 13.95	U(4)				
16.8.73	13.95	D				
	14.50	D				
	15.00 - 15.45	U(4)				
	15.45	D				
	16.00	D				
	16.50 - 16.95	U(4)				
	16.95	D				
	17.50	D				
	18.00 - 18.45	U(4)				
	18.45	D				
17.8.73	19.00	D				

Key to type of sample:

U(4)	—102mm (4in.) dia. undisturbed sample
D	— disturbed sample
BD	— bulk disturbed sample
V	— vane test
S ( )	— standard penetration test
C ( )	— dynamic cone penetration test

Figure in brackets is No. of blows for penetration given in depth column (see Notes, page 1).

Remarks: (Observations on ground-water, etc.)

Lab. Ref. No. S/10020	MIDDLESBROUGH - TEES CROSSING	FIG. 7

RECORD OF BOREHOLE AS 2 (Sheet 2)

Ground level:

Dia. of boring:

Method of boring:

Lining tubes:

Daily Progress	Samples		Change of Strata			Description of Strata
	Depth	Type	Legend	Depth	O.D. Level	
	19.50 - 19.90 19.95	U(4) ‡ D	▨	20.25	-14.10	See previous sheet
	20.50 21.00	D BD	▨	21.15	-15.00	Stiff fissured red-brown silty CLAY containing fine gravel size fragments of extensively weathered mudstone and large gravel at base of stratum. Stratum laminated in places
18.8.73 20.8.73	21.00-21.00 21.200-21.264 22.15 22.150 - 22.214 23.150 - 23.214 23.15	U(4) †* C(50)* BD C(50)* C(50)● BD	▤	23.15	-17.00	Bedded and jointed grey-green and red-brown bands of weathered LIMESTONE and MUDSTONE with soft silty clay in partings and joints. Stratum extensively weathered at top

Remarks: (Observations on ground-water, etc.)

The borehole was started by hand excavation to a depth of 1.20m to check for services. Chiselling was used to advance the borehole from 1.50m to 5.80m depth, and between 21.15m to 23.15m.

Water was added to assist boring from 1.00m to 3.60m below ground level and drained rapidly away through the fill material. Water was again added between 15.00m and 23.15m below ground level.

Ground-water was first encountered at a depth of 4.60m below ground level and rose to 4.35m below ground level. A sample was taken. Lining tubes sealed off the ground-water at a depth of 10.40m below ground level.

Ground-water was again encountered and sampled at a depth of 20.20m below ground level and rose to 18.40m below ground level.

The table below shows the depth to ground-water measured at the start, end and before and after the lunch period of each days work.

Date	a.m.	Lunch		p.m.
		Before	After	
15.8.73	-	-	-	6.20
16.8.73	3.80	8.40	4.65	Dry
17.8.73	13.40	14.20	14.20	18.40
18.8.73	18.10	17.40	17.40	16.20
20.8.73	7.20	10.90	9.80	13.50

After withdrawal of the lining tubes the depth to ground-water was measured at 4.10m below ground level

‡ Incomplete recovery

† No recovery

* Full penetration of sampler not attained

● Seating blows only

Key to type of sample:

U(4) —102mm (4in.) dia. undisturbed sample
D -- disturbed sample
BD — bulk disturbed sample
V -- vane test
S ( ) -- standard penetration test
C ( ) -- dynamic cone penetration test
Figure in brackets is No. of blows for penetration given in depth column (see Notes, page 1).

Lab. Ref. No. s/10020

MIDDLESBROUGH - TEES CROSSING

FIG. 7 (Cont'd)

RECORD OF BOREHOLE AS 8

Ground level: 6.40m above O.D. (Newlyn)

Dia. of boring: 0.25m to 9.65m; 0.20m to 21.00m

Method of boring: Shell & Auger

Lining tubes: 0.25m to 9.65m; 0.20m to 19.00m

Daily Progress	Samples		Change of Strata			Description of Strata
	Depth	Type	Legend	Depth	O.D. Level	
	1.00 1.000 - 1.131	BD C(88)●	▨			FILL (light grey occasionally, jointed, boules of blast furnace slag containing traces of iron)
22.8.73	2.00 2.000 - 2.300	BD C(139)⊕				
23.8.73	3.00 3.15 - 3.45	BD C(104)				
	4.00 4.15 - 4.45	BD C(81)				
24.8.73	5.00 5.15 - 5.45	BD C(63)				
	6.00 6.15 - 6.45	BD C(17)		6.20	0.20	
	7.00 7.15 - 7.45	BD S(24)	░			Medium dense laminated black, dark grey and grey-brown silty fine SAND containing lenses or layers of clayey silt and silty clay particularly at top of stratum.
	8.00 8.15 - 8.45	BD S(24)				
	9.00 9.15 - 9.45	BD S(21)		9.60	-3.20	
	10.00 - 10.45 10.45	U(4) D	▤	10.20	-3.80	Laminated brown silty CLAY
	11.00	D	▤			Stiff, becoming hard, fissured red-brown, dark brown in places, silty sandy CLAY with fine and occasional medium gravel. Very sandy in places particularly at base of stratum
	11.50 - 11.95 11.95	U(4) D				
28.8.73	12.50	D				
	13.00 - 13.45 13.45	U(4) D				
	14.00	D				
	14.50 - 14.95 14.95	U(4) D				
	15.80	BD		15.80	-9.40	
			○	16.10	-9.70	Brown clayey sandy fine to coarse GRAVEL with cobbles
29.8.73	16.10 - 16.55 16.55	U(4) D	▤			Hard dark brown fissured silty very sandy CLAY with fine to medium gravel
	17.00	D				
	17.50 - 17.95 17.95	U(4) D				
	18.50	D		18.90	-12.50	
	19.00	BD				

Key to type of sample:

U(4) —102mm (4in.) dia. undisturbed sample
D — disturbed sample
BD -- bulk disturbed sample
V — vane test
S ( ) — standard penetration test
C ( ) — dynamic cone penetration test

Figure in brackets is No. of blows for penetration given in depth column (see Notes, page 1).

Remarks: (Observations on ground-water, etc.)

Lab. Ref. No. s/10020	MIDDLESBROUGH - TEES CROSSING	FIG. 10

RECORD OF BOREHOLE AS 8 (Sheet 2)

Ground level:

Dia. of boring:

Method of boring:

Lining tubes:

Daily Progress	Samples		Change of Strata			Description of Strata
	Depth	Type	Legend	Depth	O.D. Level	
	19.000 - 19.222	C(115)*	▤			Bedded and jointed red-brown and occasionally grey, weathered MUDSTONE with occasional bands of limestone. Occasional thin partings and veins of gypsum. Stratum extensively weathered to very silty clay with mudstone fragments at top of stratum
30.8.73	20.00 20.000 - 20.038	BD C(50)*	▤			
31.8.73	21.000 - 21.100	C(88)+	▤	21.00	-14.60	

Key to type of sample:

U(4) —102mm (4in.) dia. undisturbed sample
D — disturbed sample
BD — bulk disturbed sample
V — vane test
S ( ) — standard penetration test
C ( ) — dynamic cone penetration test
Figure in brackets is No. of blows for penetration given in depth column (see Notes, page 1).

Remarks: (Observations on ground-water, etc.)

The borehole was commenced by hand excavation and chiselling was used to advance it to a depth of 5.50m below ground level. Chiselling was again employed from 14.50m to 15.00m below ground level and from 19.00m to 21.00m below ground level.

Water was added from 1.20m to 4.20m below ground level to assist boring.

Ground-water was first encountered at 4.20m below ground level. A sample was taken. The lining tubes partially sealed off the inflow of ground-water at 10.00m below ground level.

Ground-water was again encountered at a depth of 15.80m and showed a slight tendency to rise.

The table below shows the depth to water in the borehole measured at the start, end and before and after the lunch period of each days work.

Date	a.m.	Lunch		p.m.
		Before	After	
24.8.73	-	-	-	4.20
28.8.73	3.50	8.40	5.30	9.90
29.8.73	6.90	Dry	13.20	8.60
30.8.73	4.10	5.40	4.20	4.50
31.8.73	4.80	-	-	-

On completion, a Casagrande type piezometer was installed in the borehole.

* Includes seating blows

\+ No penetration

Lab. Ref. No. s/10020

MIDDLESBROUGH - TEES CROSSING

FIG. 10 (Cont'd)

Corus UK
Swinden Technology Centre, Moorgate
Rotherham, South Yorkshire S60 3AR
Telephone: 01709 825 521
Fax: 01709 825 400

BOREHOLE LOG

Project Reference Data Collection		Business Division		BOREHOLE No **2B2**
Job No 7129.19	Date 12-06-07	Ground Level (m) 0.00	Co-Ordinates (E 453,562.3 N 522,693.8)	
Business Unit		Site	Zone	Sheet 1 of 2

SAMPLES & TESTS		Water	STRATA				Instrument/ Backfill
Depth	Sample Ref		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
				▨		Grey slag Fill	
0.50	7/L/G/51						
						0.60 - 1.00 Red brick	
1.00	7/L/G/52						
						1.50 Fused slag	
2.00	7/L/G/53						
2.70	7/L/G/54					2.70 Fused slag	
					(8.50)		

GENERAL REMARKS

All dimensions in metres Scale 1:50	Contractor	Method/ Plant Used	Logged By RH

Corus UK
Swinden Technology Centre, Moorgate
Rotherham, South Yorkshire S60 3AR
Telephone: 01709 825 521
Fax: 01709 825 400

BOREHOLE LOG

Project	Business Division	BOREHOLE No
Reference Data Collection		**2B2**

Job No	Date	Ground Level (m)	Co-Ordinates
7129.19	12-06-07	0.00	(E 453,562.3 N 522,693.8)

Business Unit	Site	Zone	Sheet
			2 of 2

SAMPLES & TESTS		Water	STRATA				Instrument/ Backfill
Depth	Sample Ref		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
			-8.50	▨	8.50	Grey slag Fill	
			-10.00		(1.50) 10.00	Grey black silty SAND (Alluvium)	
						BH terminated at 10 m	

GENERAL REMARKS

All dimensions in metres Scale 1:50	Contractor	Method/ Plant Used	Logged By RH

BOREHOLE LOG

Project Reference Data Collection		Business Division		BOREHOLE No **2B3**
Job No 7129.19	Date 13-06-07	Ground Level (m) 0.00	Co-Ordinates (E 453,700.7 N 522,718.5)	
Business Unit		Site	Zone	Sheet 1 of 2

SAMPLES & TESTS		Water	STRATA				Instrument/ Backfill
Depth	Sample Ref		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
				▨		Gravel and boulders of slag	▨
0.50	7/L/G/55			▨			■
1.00	7/L/G/56			▨			■
2.00	7/L/G/57			▨			■
3.00	7/L/G/58			▨			■
				▨	(9.50)		■

GENERAL REMARKS

All dimensions in metres Scale 1:50	Contractor	Method/ Plant Used	Logged By RH

Corus UK
Swinden Technology Centre, Moorgate
Rotherham, South Yorkshire S60 3AR
Telephone: 01709 825 521
Fax: 01709 825 400

BOREHOLE LOG

Project Reference Data Collection		Business Division		BOREHOLE No **2B3**
Job No 7129.19	Date 13-06-07	Ground Level (m) 0.00	Co-Ordinates (E 453,700.7 N 522,718.5)	
Business Unit	Site	Zone		Sheet 2 of 2

SAMPLES & TESTS		Water	STRATA				Instrument/ Backfill
Depth	Sample Ref		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
			-9.50		9.50	Gravel and boulders of slag	
			-13.00		(3.50) 13.00	Brown to light grey sandy GRAVEL of slag and concrete with cobbles and boulders of slag (MADE GROUND)	
						BH terminated at 13 m	

GENERAL REMARKS

All dimensions in metres Scale 1:50	Contractor	Method/ Plant Used	Logged By RH

Borehole Log

Soil Mechanics

Drilled GB Logged RW Checked JT	Start 06/05/2004 End 06/05/2004	**Equipment, Methods and Remarks** Dando 2000	Depth from 0.00m to 10.00m Diameter 150mm Casing Depth 10.00m

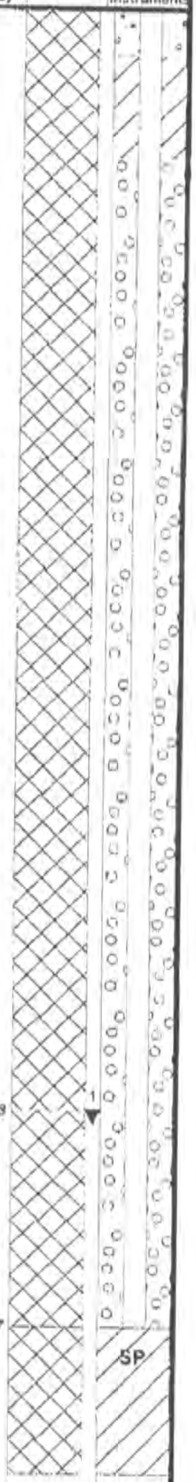
Ground Level	+8.73 mOD
Coordinates National Grid	E 53698.68 N 22740.01
Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
6.00-6.50	B 1			
8.00-8.40	B 2			
9.50-10.00	B 3			
			06/05/2004 10.00	6.20

Strata

Description	Depth, *Level* (Thickness)
MADE GROUND: Grey silty very sandy angular to subangular fine to coarse GRAVEL size fragments of slag. With occasional angular to subangular cobbles of slag.	(7.50)
MADE GROUND: Blue grey slightly sandy angular to subangular fine to coarse GRAVEL size fragments of slag. With occasional angular to subangular cobbles of slag.	7.50 *+1.23* (1.50)
MADE GROUND: Dark grey slightly silty slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine and medium fragments of slag and clinker. Slight ammonia odour noted.	9.00 *-0.27* (1.00)
EXPLORATORY HOLE ENDS AT 10.00 m	



Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	7.50	-	-

Depth Related Remarks *
From to (m)

Chiselling

Depths (m)	Time	Tools used
4.00 -4.30	45 mins	
5.10 -5.30	30 mins	
5.90 -6.10	30 mins	
6.40 -6.70	30 mins	
7.00 -7.30	30 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

Project	CORUS TEESSIDE
Project No.	B4009
Carried out for	Enviros Consulting Limited

Borehole

3AB2
Sheet 1 of 1

Borehole Log

Soil Mechanics

Drilled GB **Logged** **Checked** JT	**Start** 07/05/2004 **End** 07/05/2004	**Equipment, Methods and Remarks** Dando 2000 Borehole terminated on an obstruction at 3.40m.	**Depth from** 0.00m **to** 3.40m **Diameter** 150mm **Casing Depth** 3.40m	**Ground Level** +9.66 mOD **Coordinates** E 53627.05 **National Grid** N 22552.00 **Chainage**

Samples and Tests

Strata

Depth	Type & No	Records	Date Casing	Time Water	Description	Depth,*Level* (Thickness)	Legend	Backfill/ Instruments
					MADE GROUND: Slag fill. (Driller's description).	(3.40)	▨	■
			07/05/2004 3.40	dry		3.40 *+6.26*		
					EXPLORATORY HOLE ENDS AT 3.40 m			
Depth	Type & No	Records	Date Casing	Time Water				

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
None observed (see Key Sheet)			

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
3.00 -3.40	120 mins	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column

Scale 1:50 [illegible] AGS

Project	**CORUS TEESSIDE**
Project No.	**B4009**
Carried out for	**Enviros Consulting Limited**

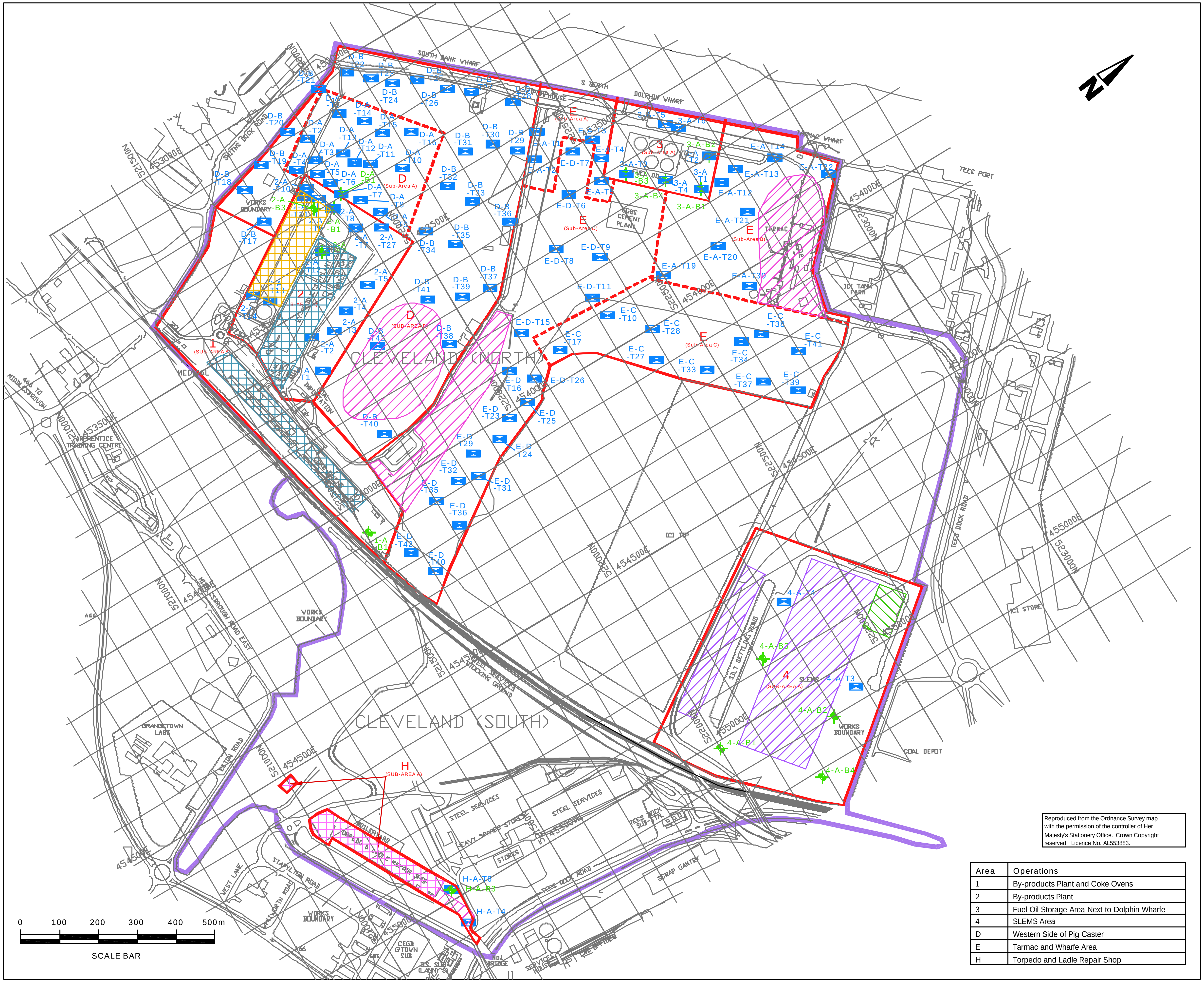
Borehole

3AB3

Sheet 1 of 1

Appendix E

E – Figures from Previous Ground Investigations



Reproduced from the Ordnance Survey map
with the permission of the controller of Her
Majesty's Stationery Office. Crown Copyright
reserved. Licence No. AL553883.

Area	Operations
1	By-products Plant and Coke Ovens
2	By-products Plant
3	Fuel Oil Storage Area Next to Dolphin Wharfe
4	SLEMS Area
D	Western Side of Pig Caster
E	Tarmac and Wharfe Area
H	Torpedo and Ladle Repair Shop

KEY:

▬	Proposed Teesco Boundaries
╍	Enviros Sampling Boundaries
✛	Borehole
⊠	Trial Pit
▨	Area of Plant
▨	Area of Plant, Buildings and Mobile Tools
▨	Area of Mobile Tools and Stockpiles
▨	Access Constricted
▨	Above ground services
▨	Concrete Hardstanding

NOTES:

REV.	*DESCRIPTION*	*DATE*

CORUS

CLEVELAND

FIGURE 5

EXPLORATORY HOLE LOCATION PLAN

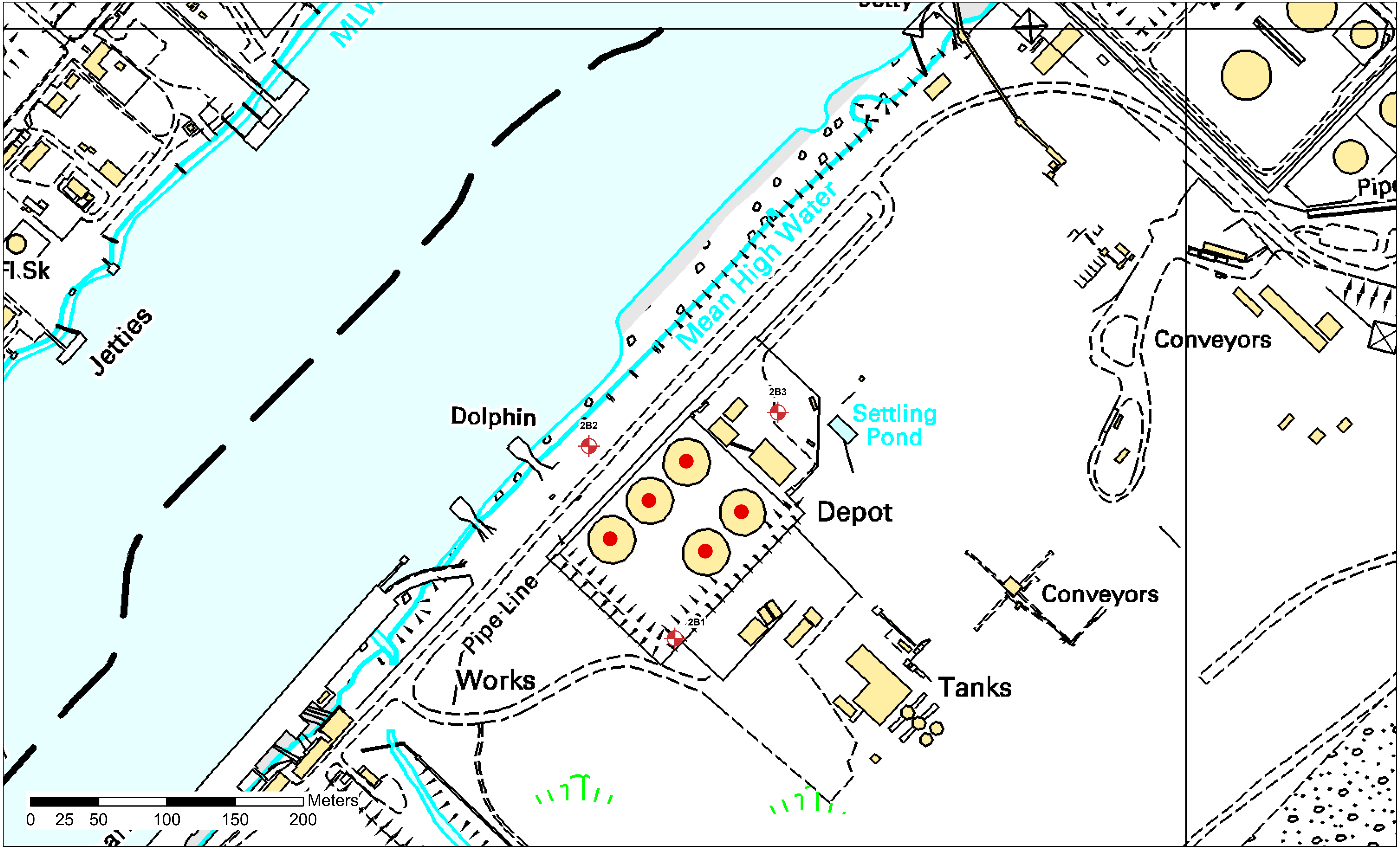
SCALE 1:6,500	CAN CO0520017A
CONTENT RLP	DRAWN JSF
CHECKED	DATE JUNE 2004

ENVIROS

Ref: I:\DG\CADTEAM\new-cans\CO052\0017a\

Plot date: Jun 22, 2004 - 10:48am

File name: JSF1826.dwg



Legend

- ● Potentially Polluting Substances
- ⊕ BOREHOLES

N

Drawn by:	**Richard Hardeman**
Date:	**11/02/2008**
Scale:	**1:2,500**
Revision No:	**N/A**

Drawing No:	**Figure 2**
Title:	**Exploratory Hole Location Plan- Area 2**
Project:	**Teesside SPMP Reference Data**

NOTES:

1. All units are in metres unless otherwise noted.
2. This drawing has been produced using information taken from South Tees Development Corporation drawings STDC-SCW-XX-PLA-0001 dated May 2019 and STDC-SCW-XX-GEN-0003 dated April 2019.

KEY:

🟦	STDC Land ownership boundaries
🟥	Proposed STDC works red line planning boundaries
🟩	Sirius Wilton site boundary
▨	Areas not included within works

0 km 3 km

Scale 1:50,000 @ A3

REV	DATE		DWN	CHK	APP
P01.1	18/06/19	FIRST ISSUE	AB	MR	MR

REVISIONS

REV	DATE		DWN	CHK	APP
P02	24/06/19	Minor amendments to spot level text	AB	MR	MR

PROJECT TITLE: Former Steel Works
South Tees

DRAWING TITLE: Site Location Plan

SCALES : 1:50,000 @ A3 Original Drawing Size – A3

CLIENT:
South Tees Development Corporation

REF:

Canon Court, Abbey Lawn,
Abbey Foregate,
Shrewsbury SY2 5DE.
Tel: (01743) 342000
Fax: (01743) 342010

wood.

DRAWING No.
41825-WOOD-XX-XX-DR-OC-0002_P02

H:\Projects\41825 South Tees DC Remediation Support\D Design_Technical\Drawings\Wood\AutoCAD\41825-WOOD-XX-XX-DR-OC-0002_S2_P01.1.dwg Originator: ANDY.BANNISTER

Appendix F

F –UXO Risk Map

Zetica

UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 453336,522446

LEGEND

🟥 **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.

🟧 **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.

🟨 **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

Zetica cannot guarantee the accuracy or completeness of the information or data used and cannot accept any liability for any use of the maps. These maps can be used as part of a technical report or similar publication, subject to acknowledgment. The copyright remains with Zetica Ltd.

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

Appendix G

G – Qualitative Human Health & Environmental Risk Assessment Methodology

Qualitative Methodology

Royal HaskoningDHV

Qualitative Methodology

The risk assessment considers the sources and potential receptors identified, together with linking pathways. These linkages are summarised in the Preliminary Conceptual Site Model and Qualitative Risk Assessment within the report, where the associated environmental risk is assessed for a given source and the end-use of the site. This assessment also takes account of specific chemicals of concern or groups of similar chemicals of concern. The column designated as 'Potential Consequence of Source- Pathway – Receptor-Linkage' in the Preliminary Conceptual Site Model and Qualitative Risk Assessment gives an indication of the sensitivity of a given receptor to a particular source/chemical of concern being considered. It is a worst-case classification and is based on full exposure via the particular linkage being examined. The derivation of the classes used to rank this particular aspect is as follows based on CIRIA 552 'Contaminated Land Risk Assessment, A Guide to Good Practice' 2001:

Classification	Human Health	Controlled Water	Ecological	Built Environment	Amenity
Severe	Acute risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990, Part 2A	Substantial pollution of sensitive water resources	Significant change to the number of one or more species or ecosystems	Catastrophic damage to buildings, structures or the environment	Irreversible damage to human health
Moderate	Chronic damage to human health ('significant harm').	Pollution of sensitive water resources	Change to population densities of non-sensitive species	Damage to sensitive buildings, structures or the environment	Non-permanent health effects to humans
Mild	Harm but not necessarily significant harm to humans	Pollution to non-sensitive water resources	Some change to population densities but with no negative effects on the function of the ecosystem	Easily repairable effects of damage to buildings or structures	Slight short-term health effects to humans
Minor	Harm but not necessarily significant harm to humans which can easily be prevented with the use of PPE.	Slight pollution to non-sensitive water resources	No significant changes to population densities in the environment or in any ecosystem	Very slight non-structural damage or cosmetic harm to buildings or structures	No measurable effects on humans

Subsequently, in the column designated 'Likelihood of PCL, an assessment is made of the probability of the selected source and receptor being linked by the identified pathway. This assessment is ranked based on-site specific conditions as follows:

Classification of probability	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 even could occur. However, it is by no means certain that even over a longer period such 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 in the very long term

The 'Risk Classification' column is an overall assessment of the actual risk, which considers the likely consequence of a given risk being realised and the likelihood of that risk being realised. The risk classifications are assigned using the following consequence/likelihood matrix:

Matrix				
Severe	Moderate to low	Moderate	High	Very High
Medium	Low	Moderate to Low	Moderate	High
Mild	Very Low	Low	Moderate to Low	Moderate
Minor	Very Low	Very Low	Low	Moderate to Low
Likelihood	**Unlikely**	**Low likelihood**	**Likely**	**High likelihood**

Overall risks are described as follows:

Very Low	The presence of the identified source does not give rise to the potential to cause unacceptable harm.
Low	It is possible that harm could arise to a designated receptor from an identified source, however, this is unlikely to be unacceptable.
Moderate	It is possible that harm could arise to a designated receptor from an identified source, but it is likely that such harm would be relatively localised or non-permanent - remedial action may be necessary.
High	A designated receptor is likely to experience unacceptable harm from an identified source without remedial action.
Very High	There is a high probability that severe unacceptable harm could arise to a designated receptor from an identified source without appropriate remedial action.

In cases of physical features, such as foundations and underground services, harm is defined as impact which would result in non-serviceability of the identified receptor or extra over build costs associated with redevelopment.

With its headquarters in Amersfoort, The Netherlands, Royal HaskoningDHV is an independent, international project management, engineering and consultancy service provider. Ranking globally in the top 10 of independently owned, nonlisted companies and top 40 overall, the Company's 6,000 staff provide services across the world from more than 100 offices in over 35 countries.

Our connections

Innovation is a collaborative process, which is why Royal HaskoningDHV works in association with clients, project partners, universities, government agencies, NGOs and many other organisations to develop and introduce new ways of living and working to enhance society together, now and in the future.

Memberships

Royal HaskoningDHV is a member of the recognised engineering and environmental bodies in those countries where it has a permanent office base.

All Royal HaskoningDHV consultants, architects and engineers are members of their individual branch organisations in their various countries.

Integrity

Royal HaskoningDHV is the first and only engineering consultancy with ETHIC Intelligence anti-corruption certificate since 2010.

ETHIC Intelligence
CERTIFICATE ANTI-CORRUPTION COMPLIANCE SYSTEM

royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

Appendix 8

Underwater noise assessment

Royal HaskoningDHV

Submitted to:

Steven Rayner
HaskoningDHV UK Ltd
Rightwell House
Bretton
Peterborough
PE3 8DW
UK

E-mail: steven.rayner@rhdhv.com
Website: www.royalhaskoningdhv.com

Submitted by:

Tim Mason
Subacoustech Environmental Ltd
Unit 2, Muira Industrial Estate
William Street
Southampton
SO14 5QH
UK

Tel: +44 (0)23 80 236 330

E-mail: tim.mason@subacoustech.com
Website: www.subacoustech.com

Underwater Noise Impact Assessment – South Bank, Tees Estuary

Tim Mason

05 October 2020

Subacoustech Environmental Report No. P276R0102

Document No.	*Date*	*Written*	*Approved*	*Distribution*
P276R0101	*23/09/2020*	*T Mason*	*R Barham*	*M Vural (HaskoningDHV)*
P276R0102	*05/10/2020*	*T Mason*	*R Barham*	*S Rayner (HaskoningDHV)*

This report is a controlled document. The report documentation page lists the version number, record of changes, referencing information, abstract and other documentation details.

List of contents

1 Introduction

1.1 Project background and scope

South Tees Development Corporation (STDC) is proposing to construct a new quay at South Bank (Tees estuary) to support its landside proposals for general industry and storage or distribution uses within part of the South Industrial Zone. Some parts of the development of this new facility will require works that could generate underwater noise in the adjacent River Tees. This has the potential to affect river or marine species that are present in this stretch of the river.

The general layout of the site, in reference to the river, is shown in Figure 1-1. The River Tees at this location is approximately 300 m wide.

Figure 1-1 Overview site plan of South Bank development on the River Tees (NTS)

This technical note reviews the risk of transmission of underwater noise into the river from a piled quay wall and the potential impacts of this noise on the sensitive receptors present in the river. The species of interest are salmon, sea trout, eel, lamprey and smelt. There is the potential presence of seals in the river and these will also be considered.

1.2 Introduction to underwater acoustics

The following basic acoustical concepts provide the basis of this assessment.

1.2.1 Decibels and sound pressure level (SPL)

The decibel (dB), by which a level of sound is described, is a ratio measure and as such requires a reference sound pressure to compare with the noise level under consideration. In underwater noise this is conventionally 1 micropascal (1 µPa), as a minimum pressure level that could be present. Noise levels presented in this technical note are all referenced to this value and are thus a sound pressure level (SPL) “re 1 µPa”. Please note that this is different to the reference used for airborne noise, which is 20 µPa, and airborne and underwater noise levels should not be directly compared.

SPL is normally used to characterise noise and vibration of a continuous nature such as drilling, boring, or background sea and river noise levels. To calculate the SPL, the variation in sound pressure is measured over a specific time period to determine the root-mean square (RMS) level of the time varying acoustic pressure. The SPL_{RMS} can therefore be considered to be a measure of the average unweighted level of the sound over the measurement period. The SPL is calculated using the following formula where p is the sound pressure in Pascals (Pa), and p_{ref} is the reference sound pressure, which is typically 1 µPa for underwater sound as noted above.

$$SPL = 20\log_{10}\left(\frac{p}{p_{ref}}\right)$$

Other measures include the ‘peak’ or ‘peak-to-peak’ SPL, which are relevant for impulsive noise as is expected for percussive piling. These are described below.

The attenuation of sound in the water as it propagates from the noise source must be considered in an impact assessment. As the measurement or receiver point moves away from the source, the sound pressure measured will decrease due to spreading. To standardise all source levels, regardless of where they are measured, they are referred back to a conceptual point 1 m away from the point of origin of the noise. Consequently, source levels should be presented with units of ‘dB re 1 µPa @ 1 m’.

Unless stated otherwise, all noise levels referenced in this document are “re 1 µPa”.

1.2.2 Peak sound pressure level (SPL_{peak})

Peak SPLs are often used to characterise transient sounds from impulsive sources, such as percussive impact piling and seismic airgun sources. SPL_{peak} is calculated using the maximum variation of the pressure from positive to zero within the wave. This represents the maximum change in positive pressure (differential pressure from positive to zero) as the transient pressure wave propagates.

A variation of this is the peak-to-peak SPL ($SPL_{peak\text{-}to\text{-}peak}$) where the maximum variation of the pressure from positive to negative within the wave is considered. Where the wave is symmetrically distributed in positive and negative pressure, the peak-to-peak level will be twice the peak level, or 6 dB higher.

1.2.3 Sound Exposure Level (SEL)

The SEL sums the acoustic energy over a measurement period, and effectively takes account of both the SPL of the sound source and the duration for which the sound is present in the acoustic environment. Where the RMS can be thought of as an average noise level, the SEL is accumulative exposure and its value will increase in time where the noise level continues. Where the SPL is a measure of the average level of the noise, the SEL sums the cumulative noise energy.

The SEL is used in contemporary underwater noise assessments to estimate the potential impact by noise on marine species by both Southall *et al.* (2019)[1] for marine mammals and Popper *et al.* (2014)[2] for fish, in terms of adverse effects on hearing and injury.

---

[1] Southall B L, Finneran J J, Reichmuth C, Nachtigall P E, Ketten D R, Bowles A E, Ellison W T, Nowacek D P, Tyack P L (2019). *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*. Aquatic Mammals 2019, 45(2), 125-232, DOI 10.1578/AM.45.2.2019.125.

[2] Popper A N, Hawkins A D, Fay R R, Mann D A, Bartol S, Carlson T J, Coombs S, Ellison W T, Gentry M B, Løkkeborg S, Rogers P H, Southall B L, Zeddies D G, Tavolga W N (2014). *Sound exposure guidelines for fishes and sea turtles. Springer Briefs in Oceanography*. DOI 10. 1007/978-3-319-06659-2.

1.3 Proposed activities

This technical note considers a proposed new quay wall, which will be installed using percussive piling in the worst case. It will require up to 1.3 km worth of piles at South Bank. All piles will be driven on land. The closest piling is approximately 20 m from the river edge. There are no piling works proposed within the water.

The driving activity is predicted to take a maximum of 10 minutes per pile, with one pile driven per day at a rig. There could potentially be four rigs in use at the site at any one time and thus there is a worst case of up to 40 minutes of piling per day.

The activities required to undertake the above works will generate noise, and this has the potential to be transmitted as underwater noise into the surrounding water to the adjacent River Tees. The piles to be used for the quay wall are understood to be driven with a percussive technique.

2 Noise levels affecting the River Tees

2.1 Baseline noise levels

The baseline noise level in the river or other body of water is dependent on the existing natural or anthropogenic noise sources. In an entirely natural setting, the ambient noise is affected by: the water conditions, including the turbulent free-flowing water and the surface over which it flows, such as loose gravel; weather-dependent or tidal movement of the water surface; and bubbles. In some locations marine or river life will also contribute to the overall soundscape. Any vessels present will increase the noise level in the water significantly, as can some industrial units and any other machinery in the water. Due to the flow of water, in the absence of any man-made noise, the higher water flow rate in rivers tends to make them noisier overall than open sea.

Subacoustech Environmental undertook baseline underwater noise measurements in 2014[3] at a location just to the north-east of the opening to Tees Dock, which showed background levels generally between 103 dB and 115 dB re 1 µPa SPL_{RMS}, in the absence of any clear anthropogenic noise sources such as passing vessels. Measurements typically were seen to increase to 130 and 150 dB SPL_{RMS} with passing vessels, which was not uncommon. Although only a snapshot was possible, approximately two hours on each of two consecutive days, it gives a reasonable expectation of the sorts of noise levels that are typically found in this location on the River Tees.

2.2 Noise associated with piling equipment

The piling is proposed to be undertaken with a percussive technique. These piles will be installed on the bank of the river with no part of the pile or machinery in contact with the water. The nearest point of pile installation is approximately 20 m away from the River Tees. In order for the sound to be transmitted to the River Tees, where the sensitive species are present, the energy produced by the piling must be transmitted from the piling rig, into the surrounding ground and from there into the water.

The prediction of sound production and transmission from percussive pile driving is well studied and Subacoustech has undertaken numerous campaigns to measure the underwater noise present in the water around piling over the last 15 years. However, these are almost entirely where the piling and monitoring are both directly in the water, giving a direct 'line of sight' between the noise source and receiver location. In the case of the piling at South Bank, all piling will be on land.

Sound propagates most efficiently via a single, uninterrupted medium. Where it must pass through multiple media (i.e. mixed sand/silt and water), then the transmission of noise is reduced. In the situation at South Bank, vibration is transferred from the pile and hammer and distributed into the substrate, and out into the river. Situations involving groundborne noise transmission are complex due to the variety and layers of media. Every situation is different and the calculation of how, and how much, noise is transmitted is much more difficult than a simple calculation of transmission directly through air or water. The ground type in every situation must be taken into account. As such, it is most accurately identified by direct measurement. When it comes to prediction, the detail of analysis in calculation should be commensurate with the level of risk, and this relates to the level of noise present at source (i.e. the noise-generating activity) and the sensitivity of the receptor.

Due to the complexity of the groundborne noise transmission calculation, reference is made to measurements of other similar machinery used directly in water as a worst case. Measurements of percussive piling by a river have been taken by Subacoustech Environmental[4] from a survey in the

---

[3] A Collett, T Mason (2014). *York Potash Project Harbour Facilities: Underwater Noise Impact Assessment*. Subacoustech Environmental report number E473R0205

[4] F Midforth, S East (2016). *Monitoring of underwater noise prior to and during piling operations on the River Thames*. Subacoustech Environmental report number E541P0201.

River Thames with percussive piling of tubular piles, similar to those to be installed for the proposed combi-wall at South Bank, using a BSP CX-85 pile driving hammer. A summary of measurements is given in Table 2-1. Due to number of piles monitored and measurements taken, an overall average at these ranges is given.

Range	SPL_{peak}	$SPL_{RMS,0.125s}$	SEL_{ss}
100 m	189 dB	172 dB	166 dB
200 m	178 dB	161 dB	155 dB
300 m	173 dB	156 dB	150 dB
400 m	170 dB	154 dB	147 dB

Table 2-1 Measurements of underwater percussive piling, in water, in the River Thames, City of London, 2016

The largest (worst case) piling hammer assumed to be used at South Bank is an IHC S150, which is larger than the one used in the piling above and could lead to an increase of approximately 2 dB more than the measured noise levels above, using the correction noted by Bellman *et al.* 2000[5].

It must be reiterated that the measured noise levels presented in Table 2-1 were taken in the water, with the piling equipment also operating directly in the water. The piling at South Bank will occur on land.

Although every groundborne to underwater noise transmission situation is different, an example is offered to show the difference that this transition can make. In 2017, Subacoustech sampled the underwater noise produced by percussive piling to install sheet piles on the beach at Hill Head, near Portsmouth[6]. The River Meon was approximately 200 m from the piling and the noise levels were measured in the river. Based on previous measurements of similar equipment piling directly in the water, it was found that the piling noise (during piling on the beach) measured in the River Meon was 5 dB lower than the piling in the water. It is recognised that this is a rather different situation to that here; however the 9 m layer of made ground that the pile will be driven into at South Bank, rather than the consolidated material on the coast at Hill Head, groundwater and the river, would lead to greater losses (reductions) in noise at South Bank than for the River Meon example.

5 dB is therefore suggested as the minimum loss in noise level expected between the working area and the river. Table 2-2 shows conservative noise level predictions across the River Tees, based on Table 2-1, taking into account the 2 dB maximum noise level increase for the larger hammer that could be used and 5 dB attenuation by the piling on land.

Range	SPL_{peak}	$SPL_{RMS,0.125s}$	SEL_{ss}
100 m	186	169	163
200 m	175	158	152
300 m	170	153	147
400 m	167	151	144

Table 2-2 Predictions of underwater noise levels during percussive piling in the River Tees

---

[5] Bellmann M. A., Brinkmann J., May A., Wendt T., Gerlach S. & Remmers P. (2020) *Underwater noise during the impulse pile-driving procedure: Influencing factors on pile-driving noise and technical possibilities to comply with noise mitigation values*. Supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU)), FKZ UM16 881500. Commissioned and managed by the Federal Maritime and Hydrographic Agency (Bundesamt für Seeschifffahrt und Hydrographie (BSH)), Order No. 10036866

[6] T Mason (2018). *Transmission of noise into water from coastal piling at Hill Head, Hampshire*. Subacoustech Environmental report number P211R0101

3 Assessment criteria

The focus for impacts on underwater receptors in the River Tees is fish, specifically salmon, sea trout, eel, lamprey and smelt. The sensitivity criteria used to assess these species will be representative of effects on any other fish species within the river. There is the potential for grey and common seals to be present. These species will be considered in outline.

3.1 Fish

The effects of noise on fish have been assessed using criteria from Popper *et al*. (2014)[2], which gives specific criteria for various stimuli. The following criteria are relevant for impulsive (percussive) pile driving noise:

Fish	**Mortality & potential mortal injury**	**Recoverable injury**	**TTS**	**Masking**	**Behaviour**
Swim bladder	>219 dB SEL_{cum} or >213 dB peak	>216 dB SEL_{cum} or >213 dB peak	>>186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder not involved in hearing	>210 dB SEL_{cum} or >207 dB peak	203 dB SEL_{cum} or >207 dB peak	>186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder involved in hearing	>207 dB SEL_{cum} or >207 dB peak	203 dB SEL_{cum} or >207 dB peak	186 dB SEL_{cum}	(N) High (I) High (F) Low	(N) High (I) High (F) Moderate

Table 3-1 Summary of the qualitative effects on fish from impulsive pile driving sources (Popper et al. 2014) (N=Near field, I=Intermediate field, F=Far field)

Of the species under consideration, it is understood that the most sensitive to sound, salmon and sea trout, have a swim bladder that is not involved with hearing. Thus, the second category will be used, although numerically the difference between this and the most sensitive category will not have a material effect on the assessment.

Additionally, Woodbury and Stadler (2008)[7] and more recently Caltrans (2015)[8] referenced a noise level of 150 dB 1 μPa SPL (RMS assumed) for behavioural response for fish. Although Popper *et al*. (2019)[9] state concerns with this figure, including that the basis for it is unknown, or exactly what behaviour it relates to, in the absence of any alternative numerical criteria for behavioural effects, the noise levels produced by piling will be compared to this.

3.2 Marine mammals

The Southall *et al*. (2019) paper[1] on the effects of underwater noise on marine mammals is effectively an update of the previous Southall *et al*. (2007) criteria and gives identical thresholds to those from the NMFS (2018) guidance for marine mammals. The Southall *et al*. (2019) guidance grouped marine mammals into groups of similar species and applied filters to the unweighted noise to approximate the hearing sensitivity of the wider receptor group. Of these groups, only phocid carnivores in water (true seals) are potentially significant in this location.

---

[7] Woodbury, D., & Stadler, J. (2008). *A proposed method to assess physical injury to fishes from underwater sound produced during pile driving*. Bioacoustics, 17, 289–297.

[8] Caltrans (2015). *Technical guidance for assessment and mitigation of the hydroacoustics effects of pile driving on fish.* p. 532. Sacramento, CA.

[9] Popper AN, Hawkins AD. *An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes*. J Fish Biol. 2019;1–22. https://doi.org/10.1111/jfb.13948

Southall *et al*. (2019) gives individual criteria based on whether a noise source is considered impulsive or non-impulsive. The piling noise is considered non-impulsive as it is a steady state noise. The Southall *et al*. (2019) criteria used for assessing marine mammals is presented in Table 3-2, and presents unweighted SPL_{peak} and weighted cumulative sound exposure criteria (SEL_{cum}) for both permanent threshold shift (PTS), where unrecoverable hearing damage may occur, and temporary threshold shift (TTS), where a temporary reduction in hearing sensitivity may occur in individual receptors.

Group	PTS criteria	TTS criteria
Phocid carnivores in water (PCW)	218 dB SPL_{peak} re 1 µPa	212 dB SPL_{peak} re 1 µPa
	185 dB SEL_{cum} (weighted) re 1 µPa²s	170 dB SEL_{cum} (weighted) re 1 µPa²s

Table 3-2 Assessment criteria for seals from Southall et al. (2019) for impulsive noise.

Note that these criteria must have a weighting reduction applied to any noise level to account for the species group.

4 Assessment

4.1 Fish

Based on the criteria defined in Popper *et al.* (2014), the lowest quantitative threshold in respect of a piling sound sources is for potential TTS in the most sensitive species. This threshold is 186 dB SEL_{cum} exposure over multiple pulses from percussive piling.

For the cumulative exposure calculations, a stationary animal calculation has been used. This assumes that the receptor, when exposed to high noise levels, will remain in place for a worst-case estimation of exposure. This is a worst-case assumption as the receptors are migratory and expected to be highly mobile and are unlikely to remain static in the water near to the noise source, and would move away in the event of a noise that would be considered disturbing or hazardous. An assumption has been used that the receptor remains in the middle of the river closest to the piling for 10 minutes, considered to be a worst case for the length of time that a pile could take to be driven.

The noise level identified as the maximum expected in the river from percussive piling is 159 dB SEL_{ss} in the middle of the river, at 150 m from directly opposite the piling. Based on the above assumption, this is equivalent to 185 dB SEL_{cum}. As this is under the lowest quantitative threshold, and itself expected to be a significant over-estimation of the actual noise exposure to an individual, no risk of any injury or temporary threshold shift to even the most sensitive species of fish from noise from percussive piling on land is anticipated. The lowest SPL_{peak} threshold, 207 dB, is more than 20 dB higher than the level predicted at 100 m and is unlikely that a fish could be exposed to this level at any position in the river.

It should be noted that this noise level is directly opposite a piling location in the River Tees and will attenuate further up or down the river. This level of 158 dB SPL_{RMS} at 200 m is somewhat higher than the background noise levels that have been found in the River Tees in the South Bank location. This was of the order of 105 dB to 115 dB SPL_{RMS} at lowest, but often subject to levels of up to 150 dB SPL_{RMS} when vessels pass, or other noise sources are present. Based on the predicted piling noise levels at the greatest distance in Table 2-2 (151 dB SPL_{RMS} at 400 m), the noise level at the furthest 'line of sight' of the piling (around Middlesbrough Dock) using a reasonable estimation for noise attenuation in the water (15.log(r) geometric spreading), the noise level would drop to 139 dB SPL_{RMS}. This would still be above the background noise levels and thus likely to be audible.

The noise level predicted at the opposite side of the river (~300 m), 153 dB SPL_{RMS}, is slightly over the behavioural reaction threshold of 150 dB SPL_{RMS}. As this threshold is only for a "behavioural reaction" rather than the somewhat stronger response of aversive behaviour that would lead to an effective barrier in the river, and the relative insensitivity of the fish under consideration, it is thought that the noise from piling on land is unlikely to impede their passage during piling.

It is worth noting that any motorised vessel present in the river will produce noise levels considerably in excess of background noise and be of a similar order or greater than the noise level produced during this construction activity for much of the stretch of river on which South Bank lies.

4.2 Marine mammals

The potential presence of seals is noted. Any individual marine mammal is unlikely to be in the vicinity of South Bank or remain there for extended periods, but for the purposes of an assessment, it has been assumed that an individual would remain stationary for half an hour in the middle of the river directly opposite the piling location.

Based on a predicted noise level of 159 dB SEL_{ss} at 150 m from a pile, this is approximately equivalent to 85 dB SEL_{cum} re 1 $\mu Pa^2 s$ (unweighted), as for the fish assessment. Using the sound exposure level metric required by Southall *et al.* (2019), to correctly assess risk of injury (PTS or TTS) to marine mammals, a weighting should be applied to each species hearing group. For seals (phocid carnivores) exposed to percussive piling noise at this range, the weighting is approximately equivalent to 21 dB, which means that the cumulative exposure would be 164 dB SEL_{cum} (PCW). This is 6 dB lower than the assessment criteria for TTS for impulsive noise for seals shown in Table 3-2 and 21 dB below the PTS threshold, despite the worst case assumptions applied.

The lowest SPL_{peak} threshold of 212 dB (unweighted) for TTS in seals is 26 dB higher than the noise level predicted at 100 m and is not expected to be reached at any position in the river during piling.

5 Conclusions

The potential impact of underwater noise produced by the percussive piling activities of the proposed quay wall at South Bank on fish (salmon, sea trout, eel, lamprey and smelt) and seals in the River Tees has been assessed. All piling will be undertaken on land, out of the water. Due to the complexity of the propagation of sound through the ground and into water, assumptions based on measured data have been made to estimate a conversion factor between source-to-receiver direct transmission and indirect transmission from piling on land. Based on criteria for potential injury to fish (Popper *et al.* 2014) and phocid carnivores (Southall *et al.* 2019), the risk from noise passing through the bank and into the River Tees and adversely affecting sensitive receptors is unlikely, even under highly precautionary assumptions.

Noise levels during piling will be below those that could potentially cause temporary threshold shift (short-term adverse effects on hearing) of fish or marine mammals, even under worst case conditions. The noise levels are predicted to reach approximately 153 dB SPL_{RMS} directly opposite the piling, based on previous measurements of piling noise in similar conditions. This is slightly above the suggested threshold for behavioural reactions of fish, noting that there is significant caution in the generalised use of this threshold.

The species under consideration are recognised as not being highly sensitive to noise. As the percussive piling, the noisiest expected activity, is expected to occur for up to 10 minutes a day, in up to four locations, the risk of any potential impacts, behavioural or otherwise, from piling on land is unlikely to lead to a barrier to passage for these species. The majority of the day would be subject to normal background noise conditions.

Report documentation page

- This is a controlled document.
- Additional copies should be obtained through the Subacoustech Environmental librarian.
- If copied locally, each document must be marked “Uncontrolled copy”.
- Amendment shall be by whole document replacement.
- Proposals for change to this document should be forwarded to Subacoustech Environmental.

Document No.	Draft	Date	Details of change
P276R0100	2	16/09/2020	First draft and internal review
P276R0101	-	23/09/2020	Issue to client
P276R0102	-	05/10/2020	Minor revisions, inclusion of SPL_{peak} criteria

Originator’s current report number	P276R0102
Originator’s name and location	T Mason; Subacoustech Environmental Ltd.
Contract number and period covered	P276; September-October 2020
Sponsor’s name and location	HaskoningDHV UK Limited
Report classification and caveats in use	COMMERCIAL IN CONFIDENCE
Date written	September 2020
Pagination	Cover + i + 10
References	
Report title	Underwater Noise Impact Assessment – South Bank, Tees Estuary
Translation/Conference details (if translation, give foreign title/if part of a conference, give conference particulars)	
Title classification	Commercial in confidence
Author(s)	Tim Mason
Descriptors/keywords	
Abstract	
Abstract classification	Unclassified

Appendix 9

Navigation Risk Assessment

Royal
HaskoningDHV

TEES VALLEY COMBINED AUTHORITY

TEES SOUTH BANK NAVIGATION RISK ASSESSMENT

Report Number:	20UK1650
Issue:	Draft B
Date:	15 October 2020

MARINE AND RISK CONSULTANTS LTD

TEES VALLEY COMBINED AUTHORITY

TEES SOUTH BANK NAVIGATION RISK ASSESSMENT

Prepared for: Tees Valley Combined Authority

Cavendish House
Teesdale Business Park
Stockton-on-Tees
Tees Valley
TS17 6QY

Author(s): Richard Marlow, Rebecca Worbey

Checked By: William Heaps

Date	Release	Prepared	Authorised	Notes
02-10-2020	Draft A	RM, RW	AC	Draft Issued for Comments
15-10-2020	Draft B	RM, RW	AC	Draft B Following Comments

Marine and Risk Consultants Ltd
Marico Marine
Bramshaw
Lyndhurst
Hampshire
SO43 7JB
United Kingdom

Tel. + 44 (0) 2380 811133

15/10/2020

EXECUTIVE SUMMARY

Tees Valley Combined Authority requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment to assess the impact of the construction and operation of the South Tees development project to the existing navigation risk profile of the River Tees.

The proposed development will act as a staging and construction hub for offshore wind business to the River Tees, including servicing of the Dogger Bank zone. Once operational, the facility will accommodate an associated manufacturing facility for blades, steel structures, cables and nacelles[1]. Although the current focus is on offshore wind energy, the quay will have a 50-year design life and will be adaptable to cater for alternative future uses.

PD Teesport is the Statutory Harbour Authority for the River Tees, with responsibility for vessel traffic management and ensuring safe navigation. The study area for assessment was determined to be the river risk area as established within the Port NRA[2], in order that direct comparisons could be made with the existing PD Ports risk assessment.

The NRA was undertaken in accordance with the International Maritime Organisation’s Formal Safety Assessment methodology informed by; stakeholder consultation feedback, AIS data analysis and historical incident data. The assessment considered two distinct development phases which are as follows:

- The Construction Phase including:
    - Demolition of the existing wharf and construction of a new 1,035m long quay; and
    - Forty-one-week dredging campaign of the channel, turning area and berthing pockets.
- The Operation Phase including:
    - Additional vessel movements associated with operational site activities; and
    - Berthing of project vessels at proposed South Bank berths.

Both the construction and operation phases of the Project were assessed, and all hazards were scored to be ‘As Low As Reasonably Practicable’ or lower and therefore, acceptable in terms of risk, with the Project determined to have minimal effect on the existing navigation risk profile.

PD Teesport has effectively implemented a suite of embedded mitigation measures ensuring that the risk profile remains at acceptable levels. Compliance with embedded mitigation and regulations

---

[1] PC1084-RHD-SB-ZZ-RP-ME-1304_Value Engineering Assessment.pdf (Royal HaskoningDHV)

[2] 17UK1312_Teesport_NRA_Issue01

governing; movements, pilotage, towage, VTS and procedures should ensure activities are managed and risks contained.

Possible additional mitigation measures were identified to further reduce risk which are outlined below.

ID	Risk Control Measure	Phase	Description
1	Marking and lighting of overhanging blades	O	For example, via temporary special marks or flood lighting. Promulgated via Notice to Mariners (NtM) and VTS broadcasts.
2	High-air draught vessels / vessels carrying large cargoes to use downstream berth only.	O	To deconflict large vessels and cargoes with the overhead cables located to the south of the project site.
3	Introduction of a safety zone in vicinity of overhead cables.	O	Whereby vessels may not enter if they or their load exceeds the given height restrictions. Pylon minimum height is 93.2m plus additional 5.3m safety factor (referenced as 87m from Chart Datum on navigational chart).
4	Review of tug operations and towage requirements	C/O	For example: - Use of additional towage for high-air draught vessels / vessels carrying large cargoes navigating to and from berthing pocket - Use of additional tugs for turning on to Sabic berths Guidance to be determined by the port.

It is recommended that consideration is given to the implementation of the possible additional risk control measures to further reduce the hazards to which they apply.

CONTENTS

FIGURES

TABLES

ANNEXES

ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
BHD	Backhoe Dredger
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COMAH	Control of Major Accident Hazards
EGD	Enclosed Grab Dredger
EIA	Environmental Impact Assessment
FSA	Formal Safety Assessment
HLV	Heavy Lift Vessel
HW	High Water
ICW	In Collision With
IMO	International Maritime Organisation
INS	Information Service
LOA	Length Over-All
m	Metre
Marico Marine	Marine and Risk Consultants Ltd
ML	Most Likely
NAS	Navigational Advice Service
nm	Nautical Mile
NRA	Navigation Risk Assessment
PMSC	Port Marine Safety Code
PWC	Personal Watercraft
RHIB	Ridged Hulled Inflatable Boat
SHA	Statutory Harbour Authority
SHB	Split Hopper Barge
SMS	Safety Management System
TOS	Traffic Organisation Service
TSHD	Trailing Suction Hopper Dredger
TVCA	Tees Valley Combined Authority
VTS	Vessel Traffic Service
WC	Worst Credible

1 INTRODUCTION

Tees Valley Combined Authority (TVCA) requested Marine and Risk Consultants Ltd (Marico Marine) undertake a Navigation Risk Assessment to assess the impact of the construction and operation of the South Tees development project to the existing navigation risk profile of the River Tees.

The proposed development will include the demolition of the existing wharf and the construction of a 1,035m long quay on the South Bank of the River Tees and will be completed in two phases:

- Phase 1: Partial demolition of the existing berth and construction of a new 450m berth; and
- Phase 2: Demolition of remaining berth and construction of an additional berth length of approximately 585m.

The construction phase requires dredging of the Tees Dock Turning Area the Navigable Channel adjacent to the proposed berths and the proposed Berth Area to enable the accommodation of vessels at the new facility.

The development aims to attract offshore wind business to the River Tees, including servicing of the Dogger Bank zone. Once operational as a staging hub, the facility will accommodate an associated manufacturing facility for associate infrastructure. Although the current focus is on offshore wind energy, the quay will have a 50-year design life and adaptable to cater for future uses.

1.1 REFERENCE DOCUMENTS AND GUIDANCE

The NRA has been undertaken drawing on the input data and documents outlined within **Table 1**.

Table 1: Reference Documents

Document Reference	Description
PC1084-RHD-SB-ZZ-RP-ME-1304_Value Engineering Assessment.pdf	A review of the value engineering opportunities that have been investigated for the South Bank site on the River Tees
PC1084-RHD-SB-ZZ-RP-Z-1303_DFS Basis of Design.pdf	Definitive Feasibility Study Basis of Design
PC1084-RHD-SB-DN-RP-ME-1353_P01_Dredging Study.pdf	Methodology and principal parameters adopted for the design development of the maritime elements related to the approach and accommodation of vessels at the proposed berth facility at South Bank
PC1084-RHD-SB-DN-DR-C-1381_P01 Dredging Plan.pdf	Concept Design Dredging Plan
PC1084-RHD-SB-ZZ-SH-PM-1513-P02-South Bank Quay Construction Schedule.pdf	Tees South Bank Construction Schedule
PC1084-RHD-SB-ZZ-LT-Z-1516_Construction Vessels P02.xlsx	Vessel movements associated with the construction phase including dredging and deliveries
PC1084-RHD-SB-ZZ-LT-Z-1515_Operational Vessels.xlsx	Vessel movements associated with the operational phase
17UK1312_Teesport_NRA_Issue01	PD Ports Navigation Risk Assessment

1.2 GUIDANCE

The NRA has been conducted based on the Formal Safety Assessment (FSA)[3] approach to risk assessment utilising a combination of data analysis and stakeholder/expert judgement to determine risk levels.

Applicable guidance that has informed the assessment of risk is given within **Table 2**.

Table 2: Guidance

Guidance	Description
Port Licencing Procedures.	PD Ports works licensing procedures
IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2	Guidelines for undertaking International Maritime Organisation (IMO), Formal Safety Assessment compliant Navigation Risk Assessments
International Regulations for Preventing Collisions at Sea 1972 (as amended) (COLREGs)	Guidance to prevent collisions at sea
Marine Works EIA (Environmental Impact Assessment) Regulations 2007 No.1518	Regulations governing EIA's for marine works license consent.

---

[3] IMO (2018) Revised Guidelines for Formal Safety Assessment (FSA) MSC-MEPC.2/Circ.12/Rev.2

2 PROJECT DESCRIPTION

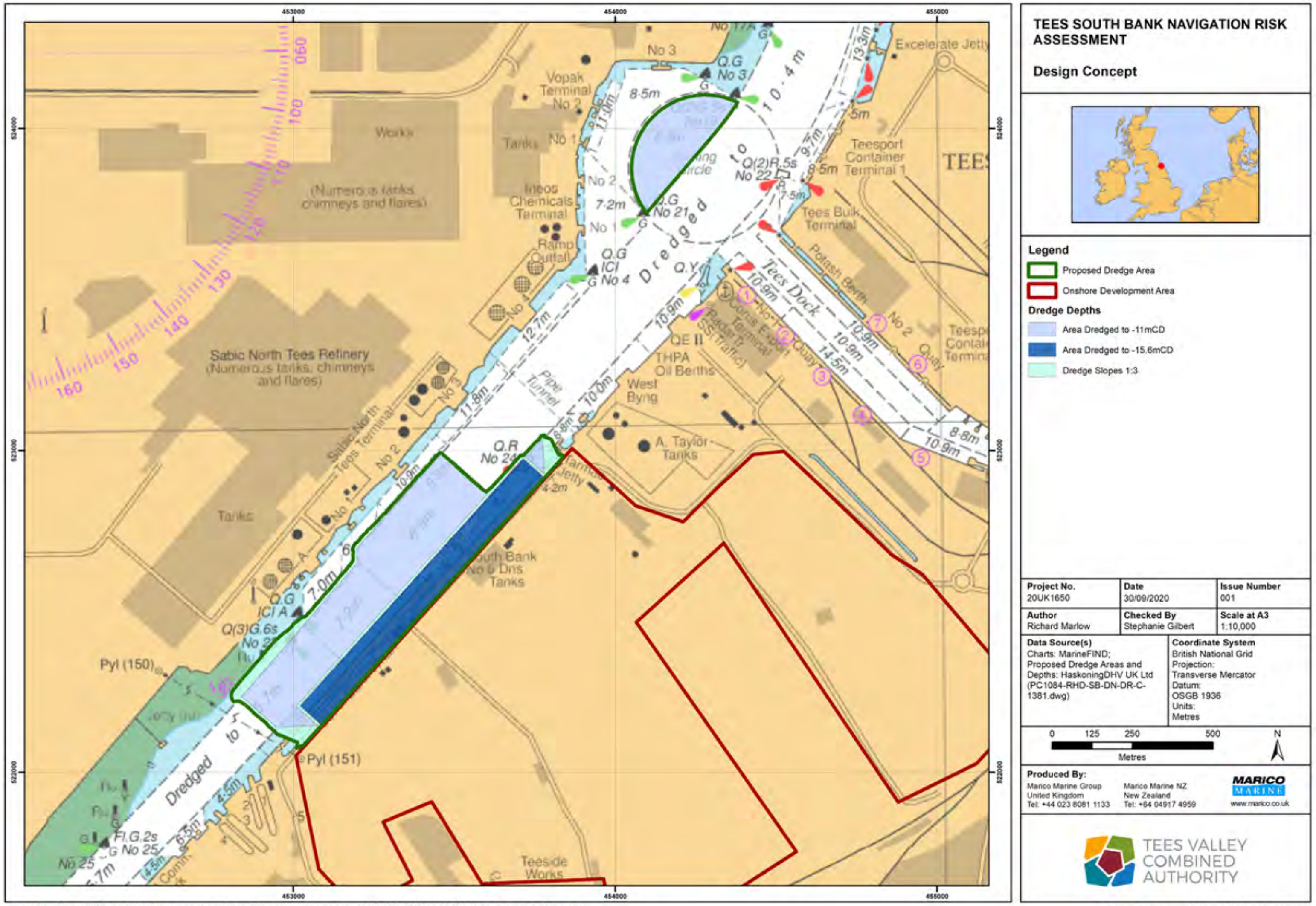
2.1 STUDY AREA

The proposed South Tees development project and associated dredging areas are shown within **Figure 1**.

PD Ports maintains an up-to-date NRA as part of its Safety Management System (SMS) in compliance with Port Marine Safety Code (PMSC) requirements. The Port NRA considers three distinct risk areas; the river, Hartlepool and the offshore risk area and provides a risk baseline from which to assess the change in risk as a result of the construction and operation of the Project. The study area is, therefore, determined to be the river risk area as established within the Port NRA[4]. This approach was chosen, in order that direct comparisons could be made with the existing PD Ports risk assessment scores and the risks scores associated with the construction and operation of the Project.

---

[4] 17UK1312_Teesport_NRA_Issue01



TEES SOUTH BANK NAVIGATION RISK ASSESSMENT

Design Concept

Legend

- 🟩 Proposed Dredge Area
- 🟥 Onshore Development Area

Dredge Depths

- ▨ Area Dredged to -11mCD
- ▨ Area Dredged to -15.6mCD
- ▨ Dredge Slopes 1:3

Project No. 20UK1650	**Date** 30/09/2020	**Issue Number** 001
Author Richard Marlow	**Checked By** Stephanie Gilbert	**Scale at A3** 1:10,000

Data Source(s)
Charts: MarineFIND;
Proposed Dredge Areas and Depths: HaskoningDHV UK Ltd (PC1084-RHD-SB-DN-DR-C-1381.dwg)

Coordinate System
British National Grid
Projection:
Transverse Mercator
Datum:
OSGB 1936
Units:
Metres

0 125 250 500
Metres
N

Produced By:
Marico Marine Group
United Kingdom
Tel: +44 023 8081 1133

Marico Marine NZ
New Zealand
Tel: +64 04917 4959

MARICO MARINE
www.marico.co.uk

TEES VALLEY COMBINED AUTHORITY

Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Design_Concept

Figure 1: South Tees Development Project Area.

2.2 LIFECYCLE AND PHASING

The NRA has considered two distinct development phases:

- The Construction Phase (see **Chapter 2.2.1**), including:
  - Demolition of the existing wharf and construction of a new 1,035m long quay; and
  - Dredging of the; turning area, berthing pocket and adjacent approach channel (**Figure 1**).
- The Operation Phase (see **Chapter 2.2.2**), including:
  - Additional vessel movements associated with operational site activities; and
  - Berthing of project vessels at the proposed South Tees berth.

2.2.1 Construction Phase

The construction of the quay facility will be completed in two phases:

- Phase 1 (Downstream): Construction of a 450m berth; and
- Phase 2 (Upstream): Construction of an additional berth length of approximately 585m, to provide an overall facility length of 1,035m.

The primary activity associated with the construction phase is the dredge campaign which will include the dredging of a section of the River Tees approach channel and turning area to depths of -11m CD and a berthing pocket of -15.6m CD (see **Figure 1**). The dredge campaign will utilise an Enclosed Grab Dredger (EGD), a Backhoe Dredger (BHD) and a Trailing Suction Hopper Dredger (TSHD) each supported by two barges. The estimated duration, number of movements and dredge volumes are given in **Table 3**.

Table 3: Estimated Construction Vessel Movements and Dredge Volumes

Dredging	No. of Weeks		Movements		Total Dredge Volume (m^3)
	Phase 1	Phase 2	Average/Week	Max/Week	
EGD/BHD: 2 Barges (Contaminated Material)	6	6	16	21	180,000
BHD: 2 Barges (Soft Material)	1	3	77	102	1,090,000
TSHD (Soft Material)	5	7	66	88	
BHD: Barge (Hard Material)	6	7	30	40	330,000

Construction materials supplied to the facility by ship will be delivered to either an existing berth on the Tees and transported to site by truck or delivered direct to a completed section of the quay. A summary of the estimated deliveries is provided in **Table 4**.

Table 4: Estimated Deliveries

Materials	Vessel Type	No. of Deliveries	
		Phase 1	Phase 2
Piles to Stockyard	5000t Coaster	6	6
Rock Blanket Material	Sea-Going Barge	6	7
Fenders / Bollards	5000t Coaster	1	1
Tie Rods	5000t Coaster	1	1

Demolition of the existing infrastructure will last for approximately 56 weeks. On completion, the dredging campaign will commence which is scheduled to run for 41 weeks as shown in **Table 5** (Phase 1 for 18 weeks, Phase 2 for 23 weeks). Phase 2 dredging is scheduled to commence approximately 24 weeks after completion of Phase 1 dredging.

Soft and hard materials will be loaded into barges at the dredge site and then transported to licensed disposal site Tees Bay C and unloaded. Contaminated materials will be treated at a receiving facility for use across wider site or disposed to designated landfill sites.

2.2.2 Operation Phase

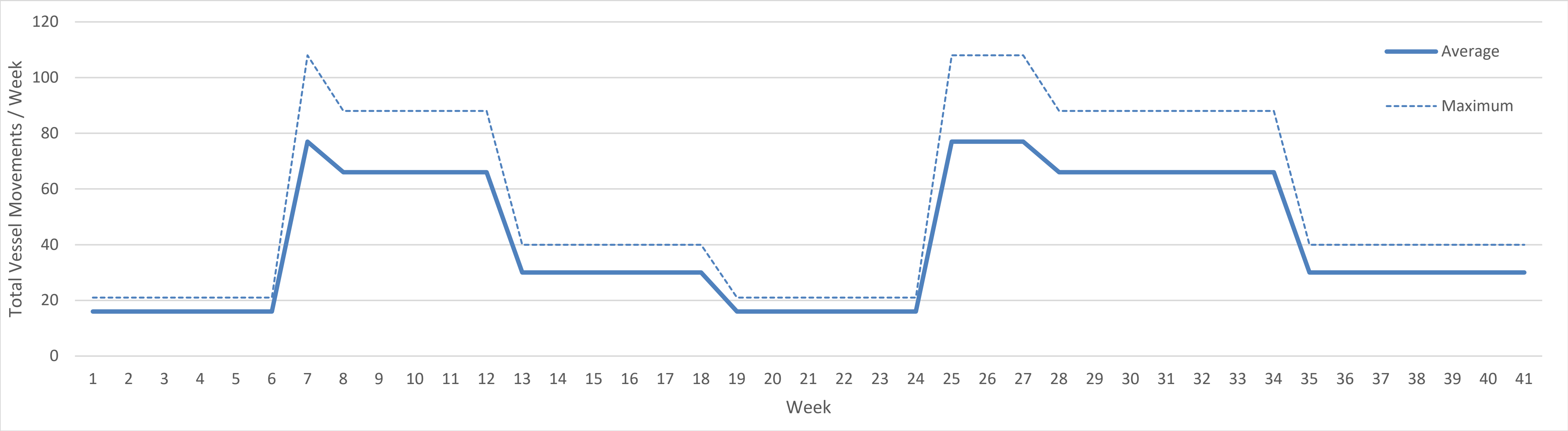
During the operation phase, offshore wind components will be transported via Heavy Lift Vessels (HLV) and jack-up installation vessels which are assumed to be loaded and unloaded using vessel cranes. General cargo may also utilise the berth for imports or exports when the berths are not occupied for renewable operations.

Turbine blades from installation vessels will protrude into the navigation channel. The design concept assumes a 5m standoff between the quayside and installation vessel and a 15m clearance between the end of the blades and passing vessels. The total protrusion into the channel would be 37m (approximately 25% of the navigable channel width) for a 107m long blade.

The estimated number of additional vessel movements during the operational phase is 8 movements per week. For each offshore wind development, overhanging blades on jack-up vessels would be present at the quay typically 1.5 days every 1-2 weeks over a 9-month period, at any time of year. Up to two developments may be served by the South Bank facility simultaneously, totalling 50 visits over 9 months.

Table 5: Construction Phase Dredging Vessel Movements

Equipment	Application	Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19*	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
THSD	Dredging/Disposal	Average Daily Movements	0	0	0	0	0	0	0	66	66	66	66	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	66	66	66	66	66	66	0	0	0	0	0	0	0
BHD	Operating Onsite Only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barge 1	Transport to Disposal		8	8	8	8	8	8	38	0	0	0	0	0	15	15	15	15	15	15	8	8	8	8	8	8	38	38	38	0	0	0	0	0	0	0	15	15	15	15	15	15	15
Barge 2	Transport to Disposal		8	8	8	8	8	8	39	0	0	0	0	0	15	15	15	15	15	15	8	8	8	8	8	8	39	39	39	0	0	0	0	0	0	0	15	15	15	15	15	15	15
Total Average Vessel Movements/Week			**16**	**16**	**16**	**16**	**16**	**16**	**77**	**66**	**66**	**66**	**66**	**66**	**30**	**30**	**30**	**30**	**30**	**30**	**16**	**16**	**16**	**16**	**16**	**16**	**77**	**77**	**77**	**66**	**66**	**66**	**66**	**66**	**66**	**66**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Total Maximum Vessel Movements/Week			**21**	**21**	**21**	**21**	**21**	**21**	**108**	**88**	**88**	**88**	**88**	**88**	**40**	**40**	**40**	**40**	**40**	**40**	**21**	**21**	**21**	**21**	**21**	**21**	**108**	**108**	**108**	**88**	**88**	**88**	**88**	**88**	**88**	**88**	**40**	**40**	**40**	**40**	**40**	**40**	**40**



*Phase 2 dredging to commence approximately 24 weeks after completion of Phase 1 dredging.

3 BASELINE NAVIGATION SCENARIO

PD Teesport is the Statutory Harbour Authority (SHA) for the River Tees, with responsibility for vessel traffic management and ensuring safe navigation on the River Tees. Vessel Traffic Service (VTS) provides 24/7 coverage for the port and provides an Information Service (INS), Traffic Organisation Service (TOS) and Navigational Advice Service (NAS) to all traffic using the port.

Teesport handles 28 million tonnes of goods per year[5] including general cargo (bulks and unitised cargoes), offshore modules, heavy lift and project cargoes and hazardous liquid/gas cargoes. The Port currently serves 58% of the UK's chemical sector, subsequently, there are a number of high Control of Major Accident Hazards (COMAH) sites along the river. Pilotage is compulsory for all vessels carrying dangerous and polluting goods and for all other vessels of over 80m Length Over-All (LOA) in the upper reaches of the river.

The Port has seen a reduction in tonnage throughput in recent years from a peak of 40 million tonnes in 2014, owing primarily to the decline of the UK steel industry and the loss of coal and iron ore inputs and steel exports[6].

The River Tees provides lock-free access to deep-water berths. Although there is a tidal influence, tidal stream rates are low, typically 1.5 knot ebb stream. Indicative tidal heights for September 2020 are shown in **Table 6.**

---

[5] PD Teesport (https://www.pdports.co.uk/locations/teesport/)

[6] Department for Transport: UK Port Freight Statistics: 2016

Table 6: Indicative Tidal Heights – River Tees Entrance: 14th–20th September 2020 (Admiralty Total Tide)

Date	High	Height (m)	Low	Height (m)
14/09/2020	00:38	4.4	07:12	1.7
	13:16	4.7	19:39	1.8
15/09/2020	01:34	4.8	08:05	1.2
	14:07	5.0	20:27	1.4
16/09/2020	02:20	5.2	08:52	0.8
	14:52	5.3	21:11	1.1
17/09/2020	03:03	5.5	09:36	0.5
	15:34	5.6	21:53	0.9
18/09/2020	03:43	5.8	10:19	0.2
	16:16	5.7	22:33	0.7
19/09/2020	04:24	5.9	11:00	0.1
	16:58	5.8	23:13	0.7
20/09/2020	05:06	6.0	11:42	0.2
	17:41	5.7	23:53	0.7

3.1 DATA GATHERING

Data gathering has been undertaken in order to inform the assessment of the baseline navigation profile and NRA. The following input data has been utilised for the assessment:

- Stakeholder consultation feedback;
- 4 weeks AIS (Automatic Identification System) Data: 2nd – 15th February 2019 & 03rd to 16th August 2019 (provided by PD Ports); and
- 17 years historical incident data (provided by PD Ports).

AIS data from 2019 was used to represent the existing traffic profile to account for any impact upon the traffic baseline as a result of COVID-19 in 2020.

3.2 STAKEHOLDER CONSULTATION

Information was gathered through remote consultation due to COVID-19 restrictions with key local stakeholders including the Harbour Master to establish the baseline risk profile and inform impact and hazard identification.

The stakeholders consulted are listed in **Table 7**. The minutes of the stakeholder meetings are contained within **Annex B**.

Table 7: Stakeholder Consultation Meetings

Date Response Received	Consultee
08 September 2020	Tees Bay Pilots
08 September 2020	Cleveland Emergency Planning Unit
16 September 2020	PD Ports
18 September 2020	Tees Licensed Foyboatmen
23 September 2020	Svitzer

Key impacts identified from stakeholder consultation are described in **Section 4.**

3.3 VESSEL TRAFFIC ANALYSIS

AIS data was provided by PD Ports, as detailed in **Section 3.1**, to enable the assessment of the current baseline traffic profile in vicinity of the Project and to undertake quantitative analysis to establish any potential impacts the Project may have upon the existing navigation profile.

The following was assessed through the analysis of AIS:

- Frequency, types and sizes of vessels presently passing the Project;
- Proximity of the Project to vessels operating to and from high COMAH sites and carrying hazardous cargoes;
- Vessel traffic density within the river risk area; and
- Swept paths of manoeuvring activities (e.g. berth swings).

Vessels were subdivided into categories befitting vessel operations within Teesport. The assessed vessel categories are identified within **Table 8.** It should be noted that, while recreational activities are rare within the River Tees, recreational vessels may be present in small numbers in the vicinity of

Bran Sands / South Gare towards the mouth of the estuary. For this purpose and for consistency with PD Port's existing NRA, recreational vessels have, therefore, been included within the NRA.

Table 8: Vessel Categories

Category	Description
Tankers	Including product tankers, crude oil tankers, gas carriers.
General Cargo Vessels	Including general cargo, containers, non-liquid bulk carriers, ferries.
Project Cargo Vessels	Including project cargo vessels, for example; oil rigs for hot / cold lay-up, wind farm construction vessels and project powered barges transporting wind farm infrastructure, for example; monopiles and jackets and vessels cold moved to dock.
Workboats	Including; project and port dredgers, tugs, pilot boats, workboats, PD Ports vessels, windfarm support vessels and fishing vessels (not engaged in fishing).
Recreational Vessels	Sailing yachts, motor yachts, sailing dinghies, Rigid Hull Inflatable Boats (RHIB), Personal Watercraft (PWC) etc.

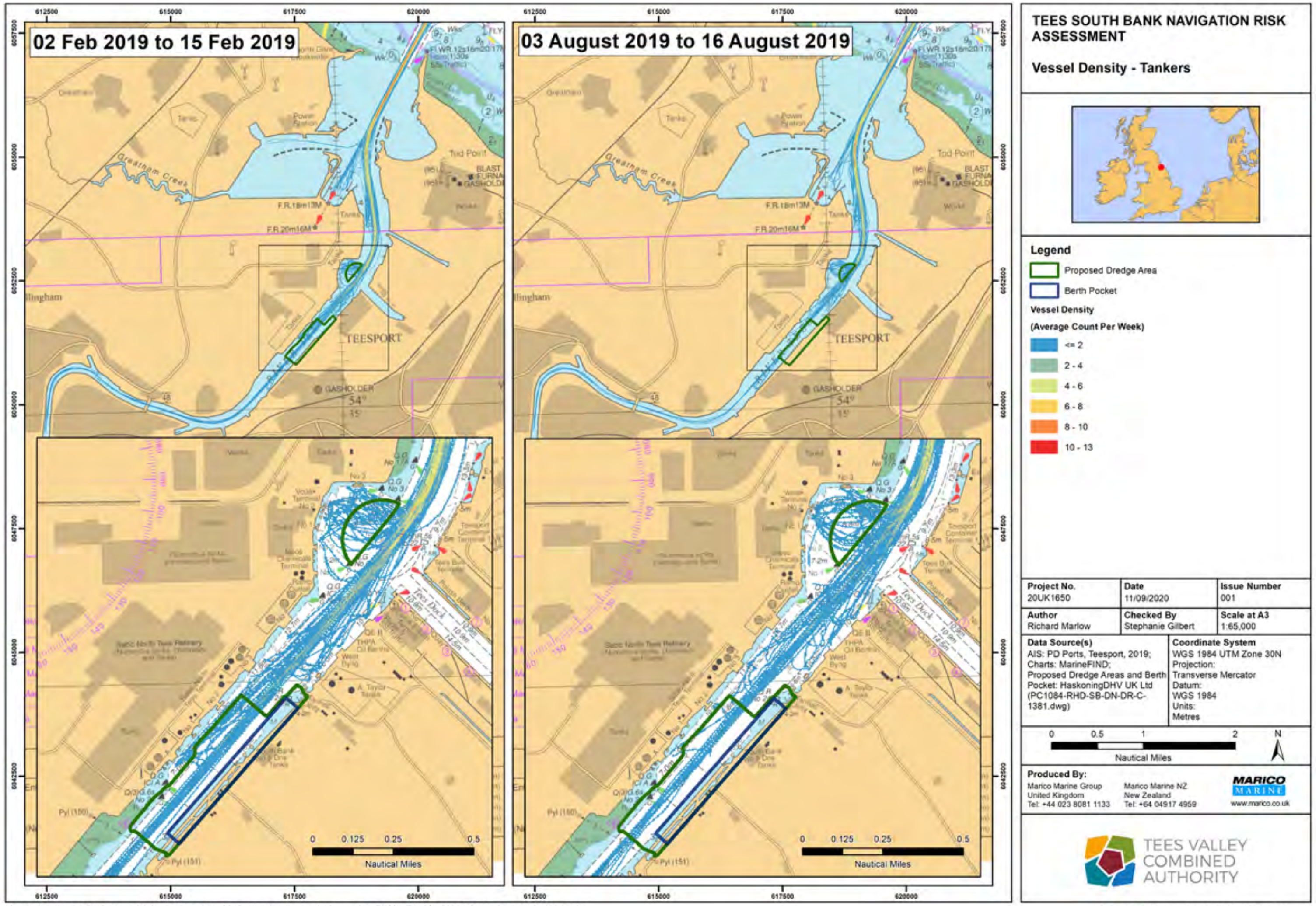
3.3.1 Analysis by Vessel Type

Vessels have been analysed according to vessel type in **Figure 2** to **Figure 5** and **Figure 11.** Density analysis, a measure of the number of individual vessel transits through a localised area, was utilised to identify any local traffic hotspots.

A two-week representative data period from both summer and winter has been assessed (see **Section 3.1**) to ensure any seasonal variations are captured. The density analysis results are presented in **Figure 2** to **Figure 5**.

The most common vessel types to transit past the site are tugs and workboats. An increase in tug density is noted, particularly in summer, in the vicinity of Teesport Commercial Park, whereas, workboats show consistent seasonality and distribution, occupying a greater channel width due to their decreased draught.

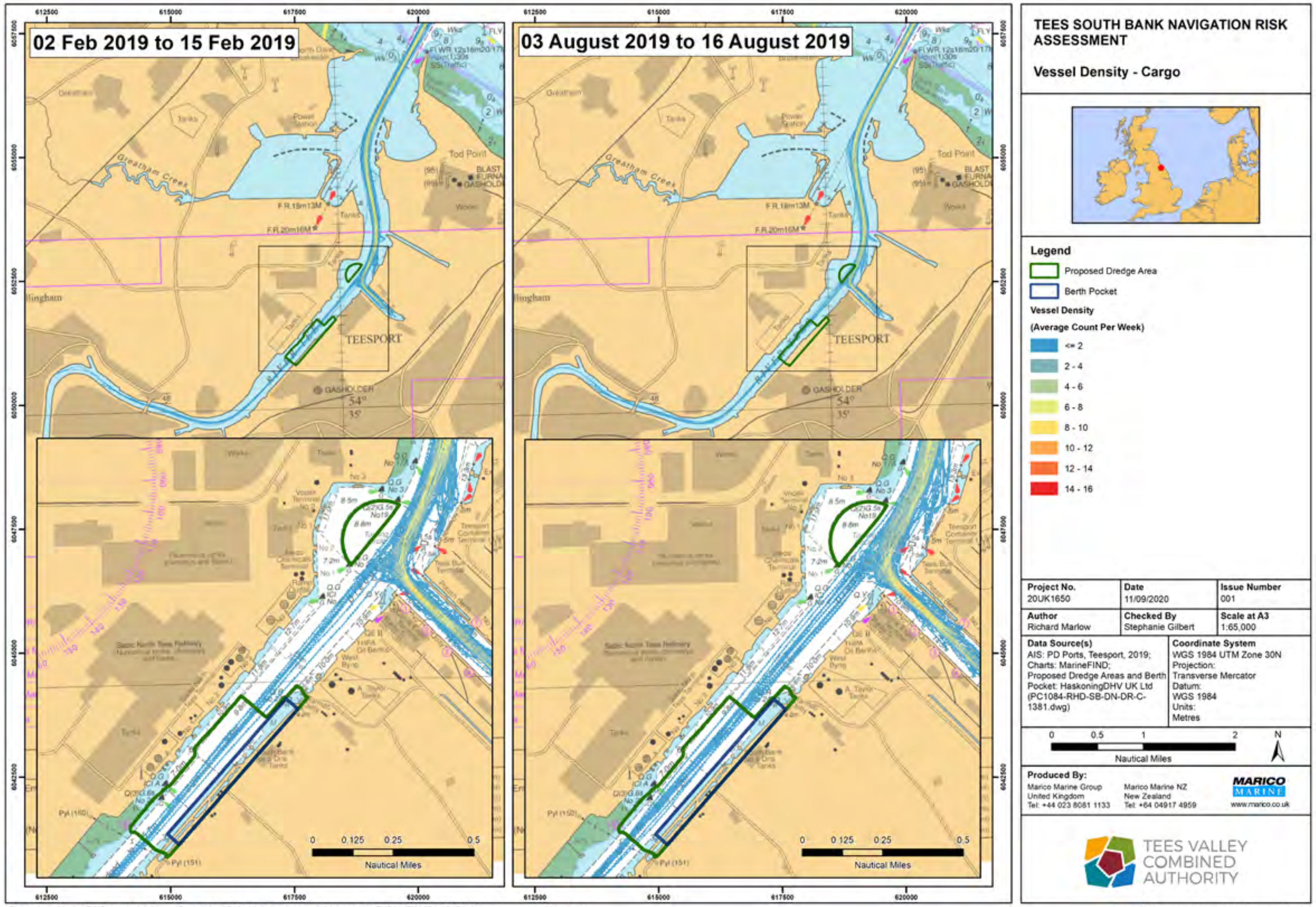
Tankers and cargo vessels are evident passing the project site in comparatively low densities, with the majority berthing down river of the Project. Tankers are noted turning on to West Byng, the Sabic berths opposite to the Project site and to Teesport Commercial Park (see also **Figure 6**).



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Tankers_Density

Figure 2: Tanker Density Analysis – Summer and Winter 2019



Project No.	Date	Issue Number
20UK1650	11/09/2020	001
Author	**Checked By**	**Scale at A3**
Richard Marlow	Stephanie Gilbert	1:65,000

Data Source(s)
AIS: PD Ports, Teesport, 2019;
Charts: MarineFIND;
Proposed Dredge Areas and Berth Pocket: HaskoningDHV UK Ltd (PC1084-RHD-SB-DN-DR-C-1381.dwg)

Coordinate System
WGS 1984 UTM Zone 30N
Projection:
Transverse Mercator
Datum:
WGS 1984
Units:
Metres

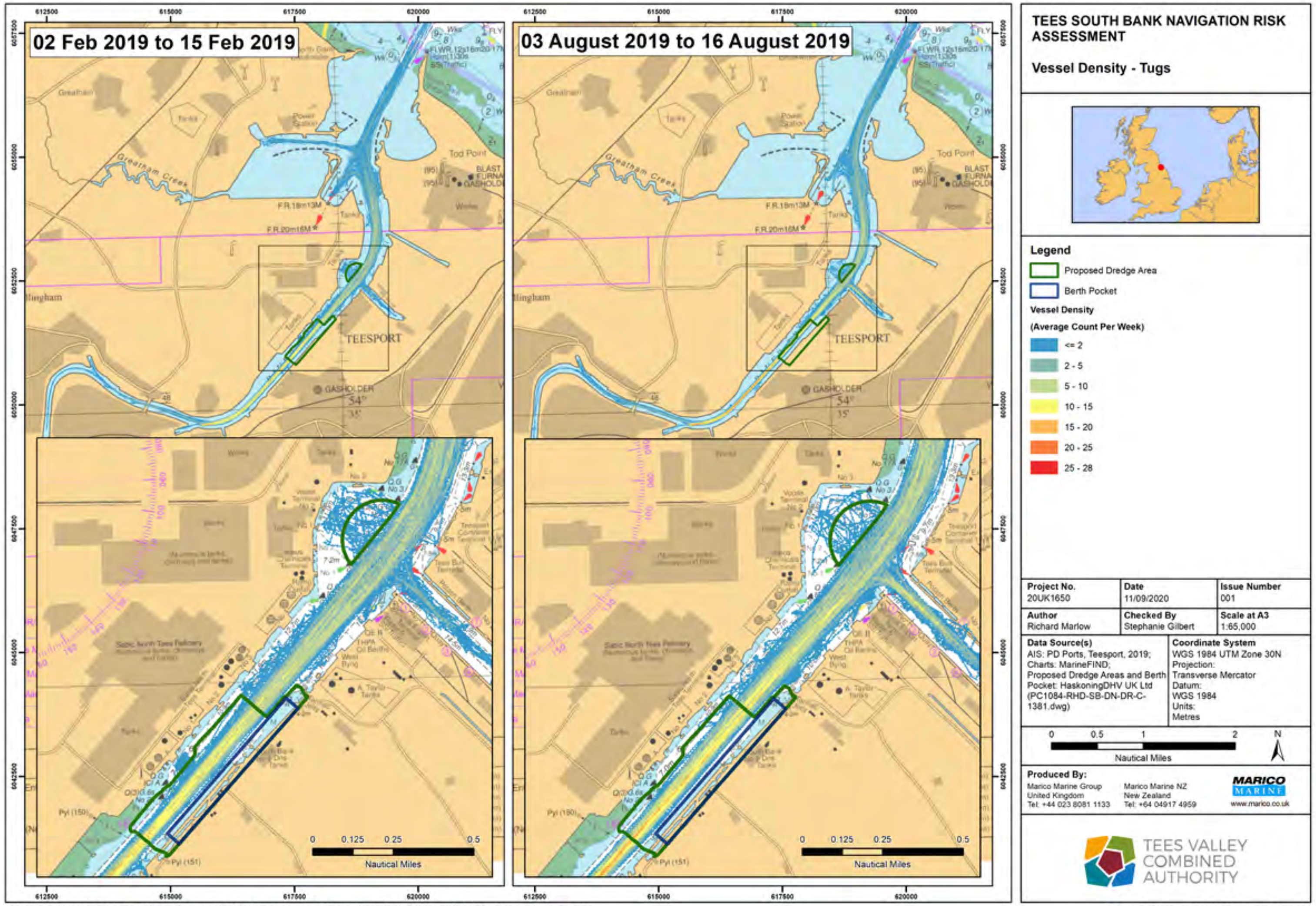
Produced By:
Marico Marine Group
United Kingdom
Tel: +44 023 8081 1133

Marico Marine NZ
New Zealand
Tel: +64 04917 4959

Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Cargo_Density

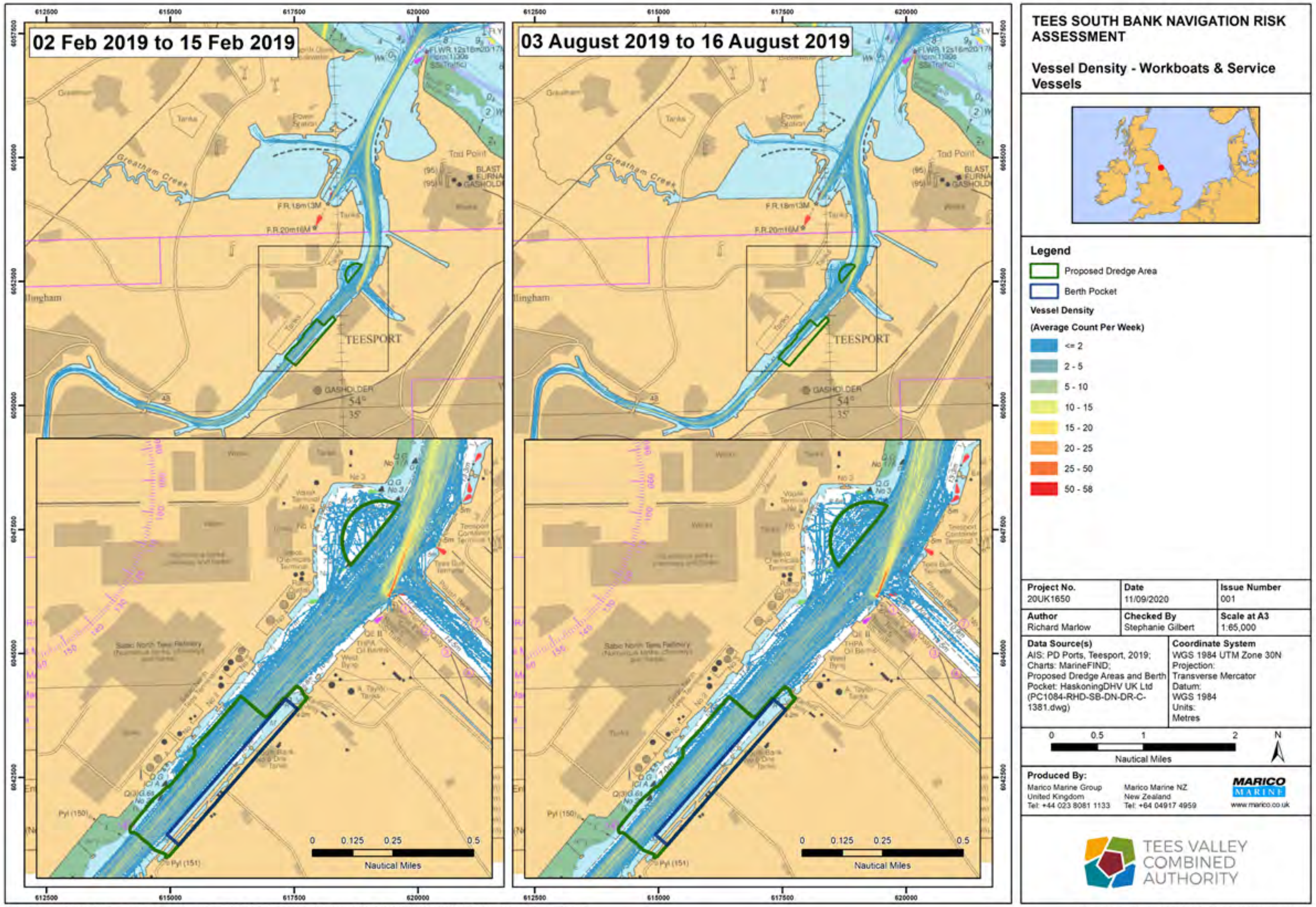
Figure 3: Cargo Vessel Density Analysis – Summer and Winter 2019



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Tugs_Density

Figure 4: Tug Density Analysis – Summer and Winter 2019



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

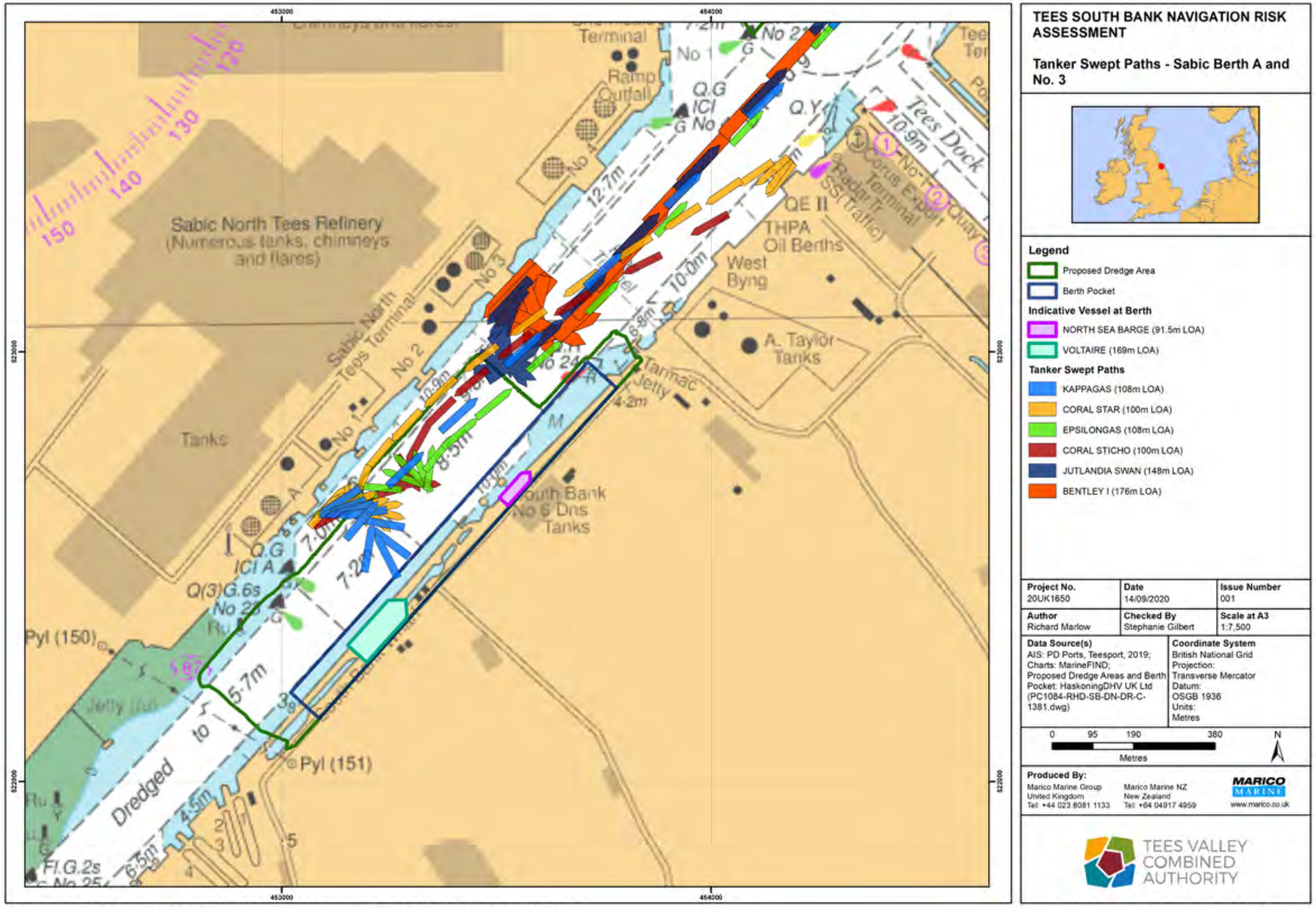
Figure Reference: 20UK1650_ServiceVessel_Density

Figure 5: Workboat / Service Vessel Density Analysis – Summer and Winter 2019

3.3.2 Swept Path Analysis

Owing to its proximity to the Project and the nature of cargoes utilising the berths, further analysis has been undertaken to assess activities at the Sabic berths. Swept path analysis was utilised to assess the swing patterns and manoeuvring of tankers on to the berths. Representative swept paths are shown in **Figure 6**. The largest tankers, for example, JUTLANDIA SWAN (148m LOA) and BENTLEY (176m LOA) were noted utilising the Sabic No.3 berth downstream of the Project, whereas, smaller tankers (between 100m and 108m LOA) which utilise the Sabic A berth immediately opposite to the proposed Project berths. All assessed tankers manoeuvred clear of the proposed Project berths, with the exception of 108m LOA KAPPAGAS which encroached upon the boundary of the proposed berth.

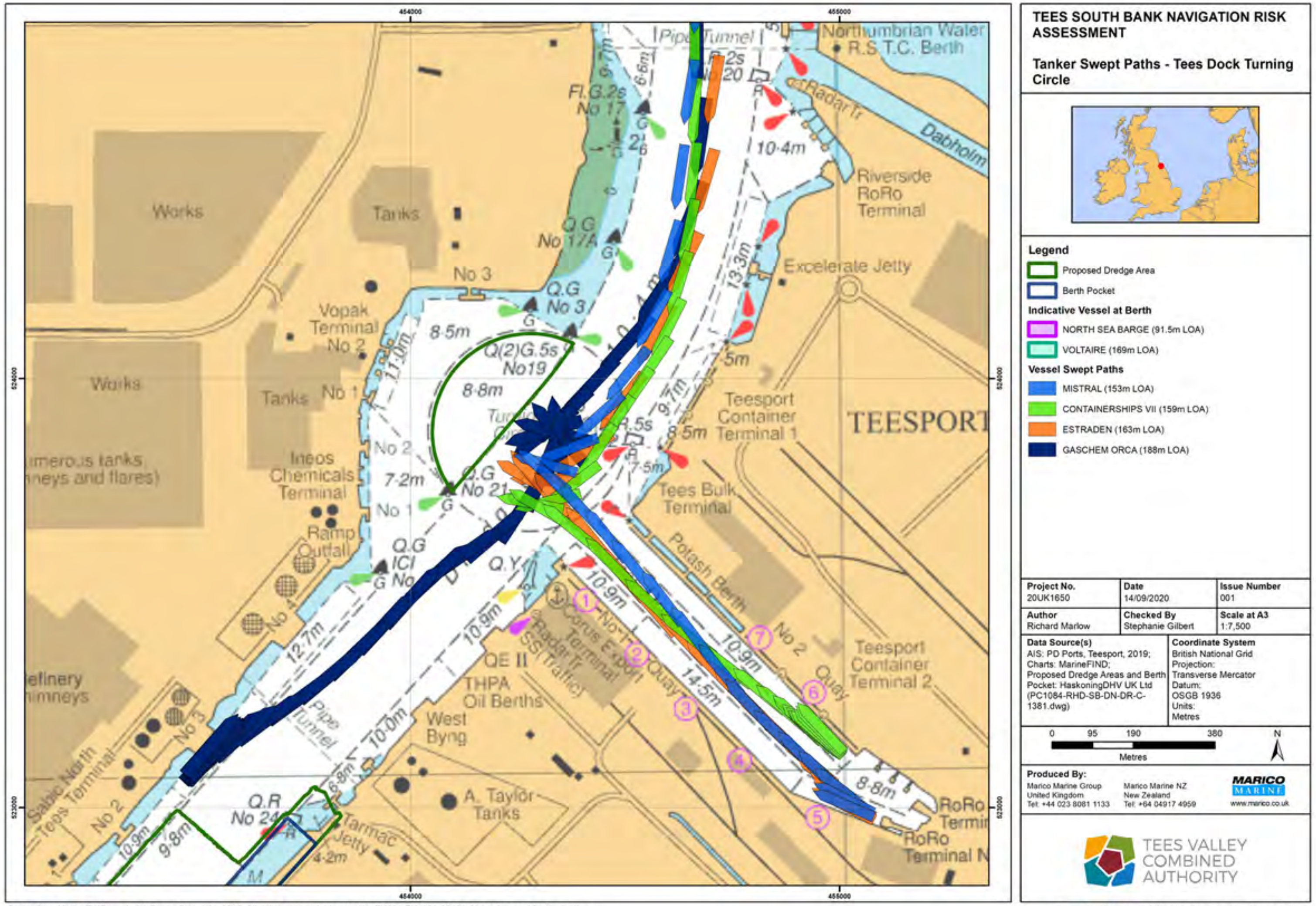
The swept paths of vessels utilising the Tees Dock turning circle were also modelled and are depicted within **Figure 7.** The majority of which are cargo vessels on route to Teesport Container Terminal 2 and the RoRo Terminals. All assessed vessels completed turning within the limits of the navigation channel dredged to 10.4m.



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_SweptPaths_Berth_Area

Figure 6: Example Tanker Swept Paths – Sabic Berths



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_SweptPaths_Turning_Area

Figure 7: Example Swept Paths – Tees Dock Turning Circle

3.3.3 Gate Analysis

Gate analysis is a tool used by Marico Marine to examine the frequency and direction of vessel traffic through a linear channel. A transect is created perpendicular to the channel, through which the frequency and direction of intersecting vessel tracks are assessed.

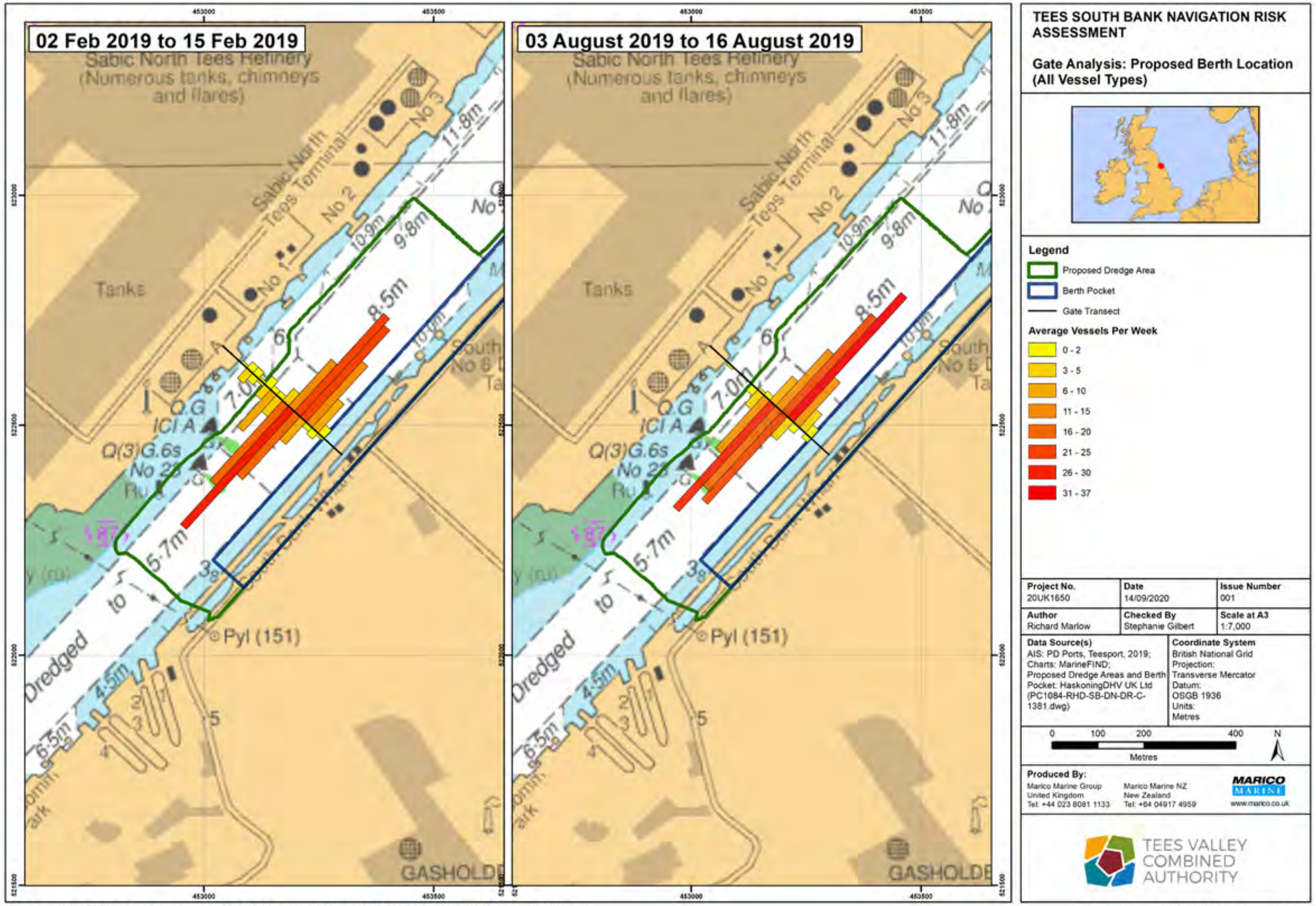
Two transects were assessed, one immediately adjacent to the Project (Gate A) and the other on the downstream approach to the Tees Dock turning circle (Gate B), the results of which are shown in **Figure 8** and **Figure 9** respectively. As suggested by **Figure 7,** there is a noticeable reduction in frequency through Gate A with many vessels, particularly cargo vessels, transiting to berths downstream of the Project.

Transits through Gate A have been further analysed in **Figure 10** to **Figure 12 to** establish the traffic profile in the immediate vicinity of the Project. A total of 382 transits occurred through the gate during the assessed 2-week winter period and 375 in the assessed two-week summer period, equating to approximately 27 transits per day.

Figure 10 indicates that during both summer and winter, peak movements occur between 06:00 and 12:00. This is likely schedule driven, with tidal influence not determined to be a contributory factor (See **Table 6**).

Over 90% of transits were by tugs and workboats, as shown in **Figure 11,** with tankers, the next most common vessel category, accounting for only 7% of transits in the sample winter data (or approximately 2 movements per day) and 3% (or less than one movement per day) in the sample summer data.

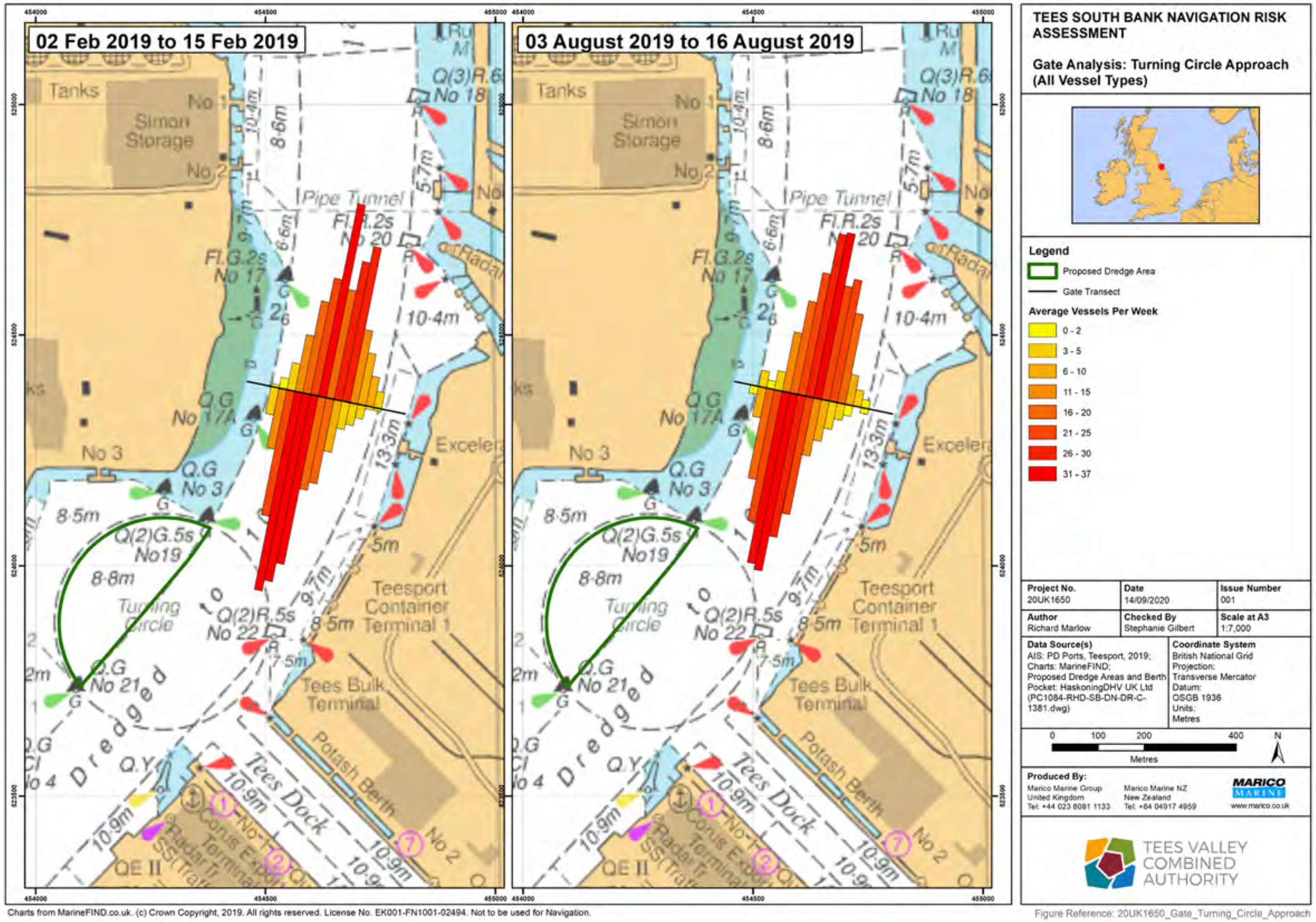
Vessels have been assessed by Length Over-All (LOA) in **Figure 12.** The most common vessels transiting past the Project, accounting for 58% of all transits are between 20 – 39m LOA. These lengths are consistent with tugs and workboats and corroborate the determination of **Figure 11** that tugs and workboat transits are dominant in this section of the River Tees.



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Gate_Proposed_Berth

Figure 8: Gate A – In Vicinity of South Tees Development Area – All Vessels – Summer and Winter 2019.



TEES SOUTH BANK NAVIGATION RISK ASSESSMENT

Gate Analysis: Turning Circle Approach (All Vessel Types)

Project No. 20UK1650
Date 14/09/2020
Issue Number 001
Author Richard Marlow
Checked By Stephanie Gilbert
Scale at A3 1:7,000

Data Source(s)
AIS: PD Ports, Teesport, 2019;
Charts: MarineFIND;
Proposed Dredge Areas and Berth Pocket: HaskoningDHV UK Ltd (PC1084-RHD-SB-DN-DR-C-1381.dwg)

Coordinate System
British National Grid
Projection:
Transverse Mercator
Datum:
OSGB 1936
Units:
Metres

Produced By:
Marico Marine Group
United Kingdom
Tel: +44 023 8081 1133

Marico Marine NZ
New Zealand
Tel: +64 04917 4959

www.marico.co.uk

Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Gate_Turning_Circle_Approach

Figure 9: Gate B – In Vicinity of Tees Dock Turning Circle – All Vessels – Summer and Winter 2019.

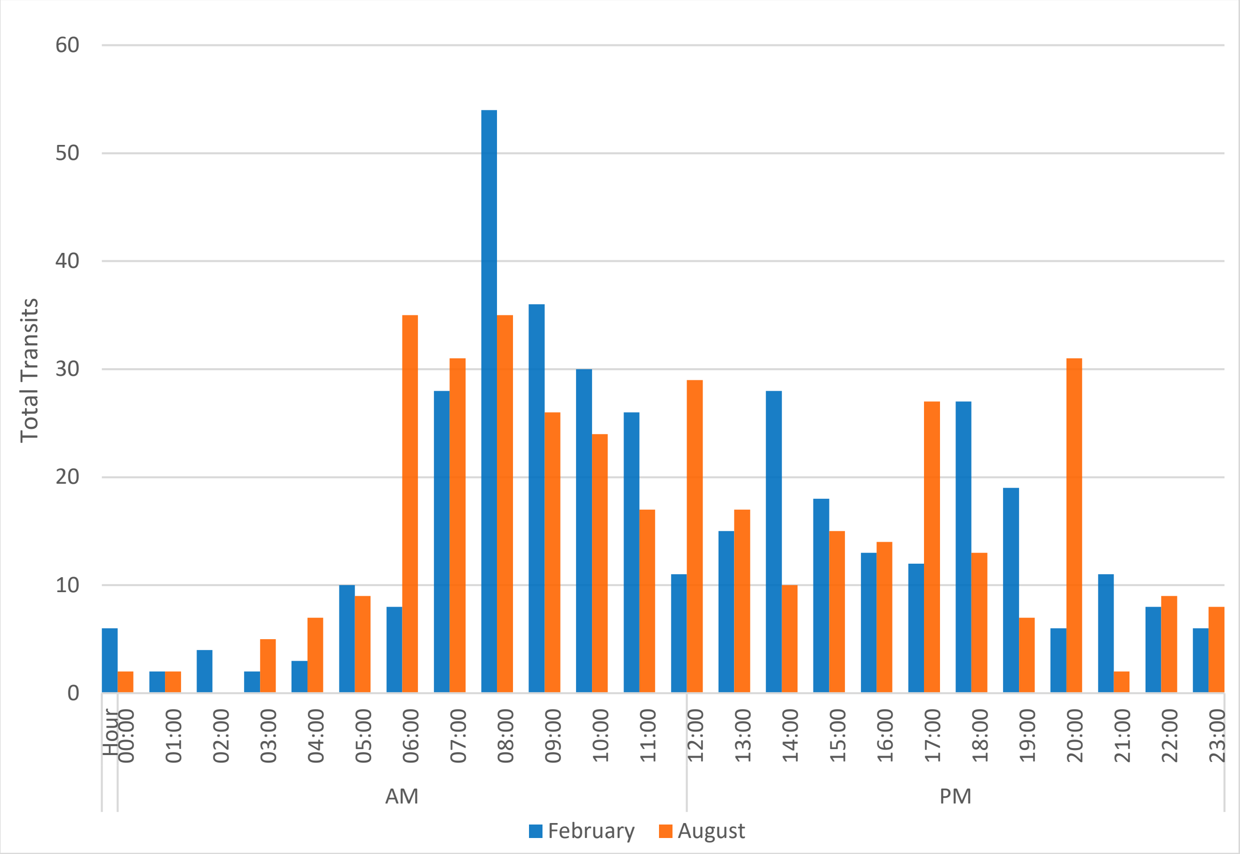


Figure 10: Gate A – Transits by Time of Day – All Vessel Types – Summer and Winter 2019.

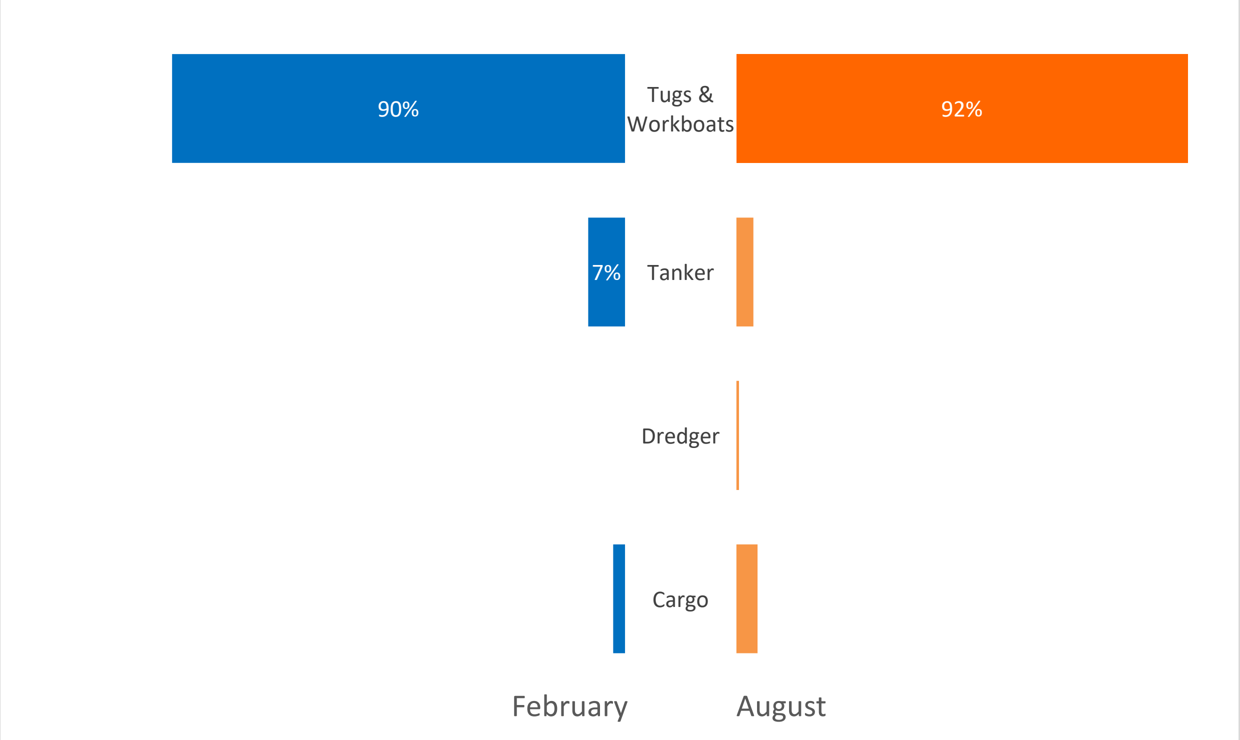


Figure 11: Gate A – Transits by Vessel Type– Summer and Winter 2019.

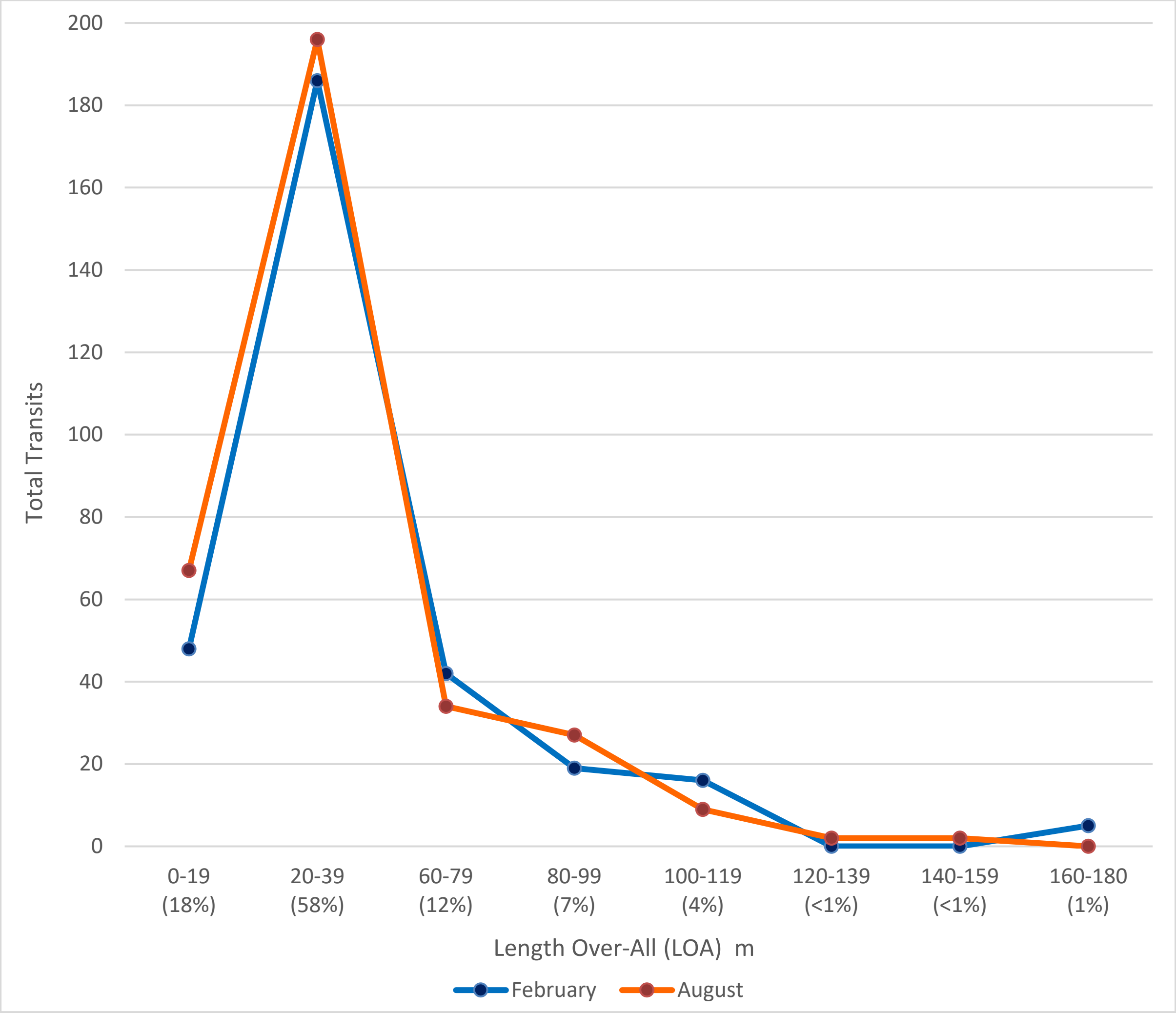


Figure 12: Gate A - Transits by Length Over-All (LOA)

3.4 HISTORIC INCIDENTS

PD Teesport maintains a database of reported accidents/incidents (collectively referred to as events). A summary of events was provided (See **Chapter 3.1**) upon which, quantitative analysis was undertaken to inform the assessment of the baseline risk profile on the River Tees.

Events were categorised as either accidents or incidents as follows:

- **Accident**: a navigational event involving one or more vessels that has adverse consequences including; collisions, contacts, groundings, foundering / swamping and mooring incidents.
- **Incident:** an event that is outside of accepted safe practice and has the potential to become a navigation accident.

Accidents were further classified by location and timestamp as evidenced in **Figure 17**, and as follows:

- **Location**: Accidents were divided into 12 locations, occurring in the lower river reaches between UK Docks / Teesport Commercial Park (upstream limit) and Numbers 5 and 6 Buoys (downstream limit).
- **Timestamp**: Occurring within the last 10 years between 01/01/2010 and 01/09/2019.

A total of 978 events were reported during the assessed period, of which 112 (<12 per year) were classified as navigationally significant accidents (11%) and 864 (89%) were classified as incidents **(Figure 13)**. The highest number of total events and accidents occurred within 2018, and the highest number of incidents occurred within 2017.

Navigationally significant accidents were further analysed in **Figure 14** and **Figure 15.** The most common accident type was contact which accounted for 70% of all accidents, followed by mooring incident, which accounted for 27%. Few foundering / swamping and grounding incidents occurred accounting for less than 2% of all accidents respectively. **Figure 14** shows an increase in mooring incidents since 2014, likely due to increased event reporting.

Accidents by vessel type are shown in **Figure 16.** The most common recorded vessel type to be involved in an accident is tankers accounting for 49% of the total, of which 60% were contacts and 38% were mooring incidents. Next most common was cargo at 38% followed by workboats at 13%.

The locations of the assessed incidents are shown in **Figure 17**. The most common accident location was Tees Dock, which accounted for 29% of all accidents, followed by the area in the vicinity of the ConocoPhillips Inset Dock which accounted for 15%.

Eight Accidents were reported in the vicinity of the Sabic berths, directly opposite the Project, of which 5 were tanker mooring incidents, 2 were tanker contacts (one jetty contact in 2012 and one moored tanker contact in 2019) and 1 was a grounding by a workboat.

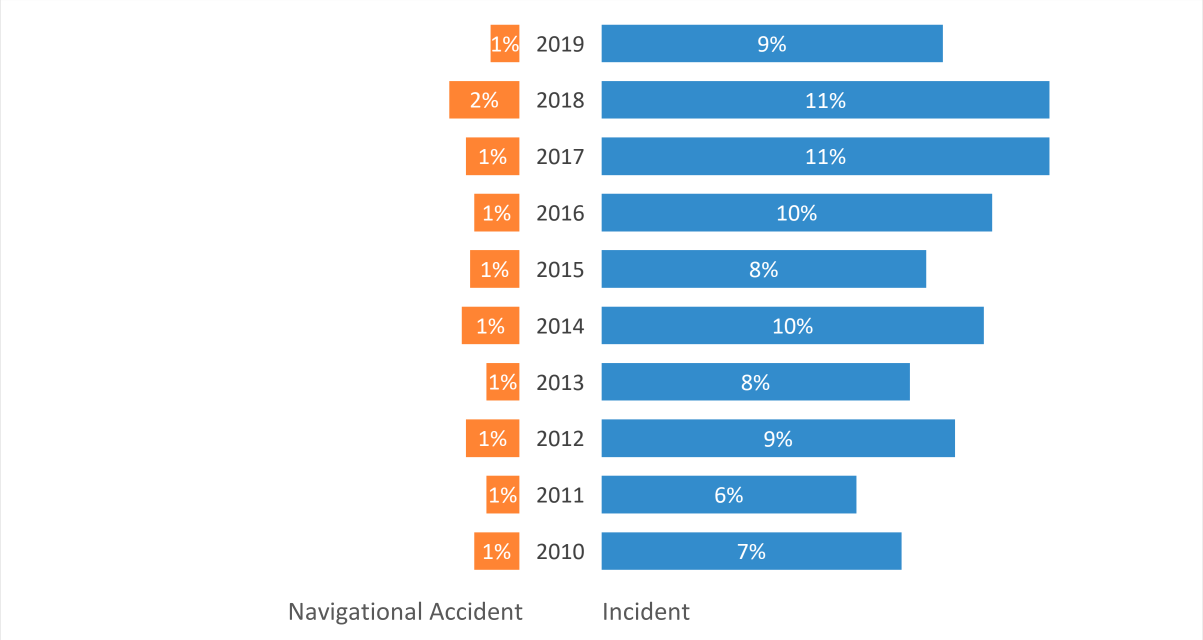


Figure 13: Navigational Accidents and Incidents - 01/01/2010 and 01/09/2019

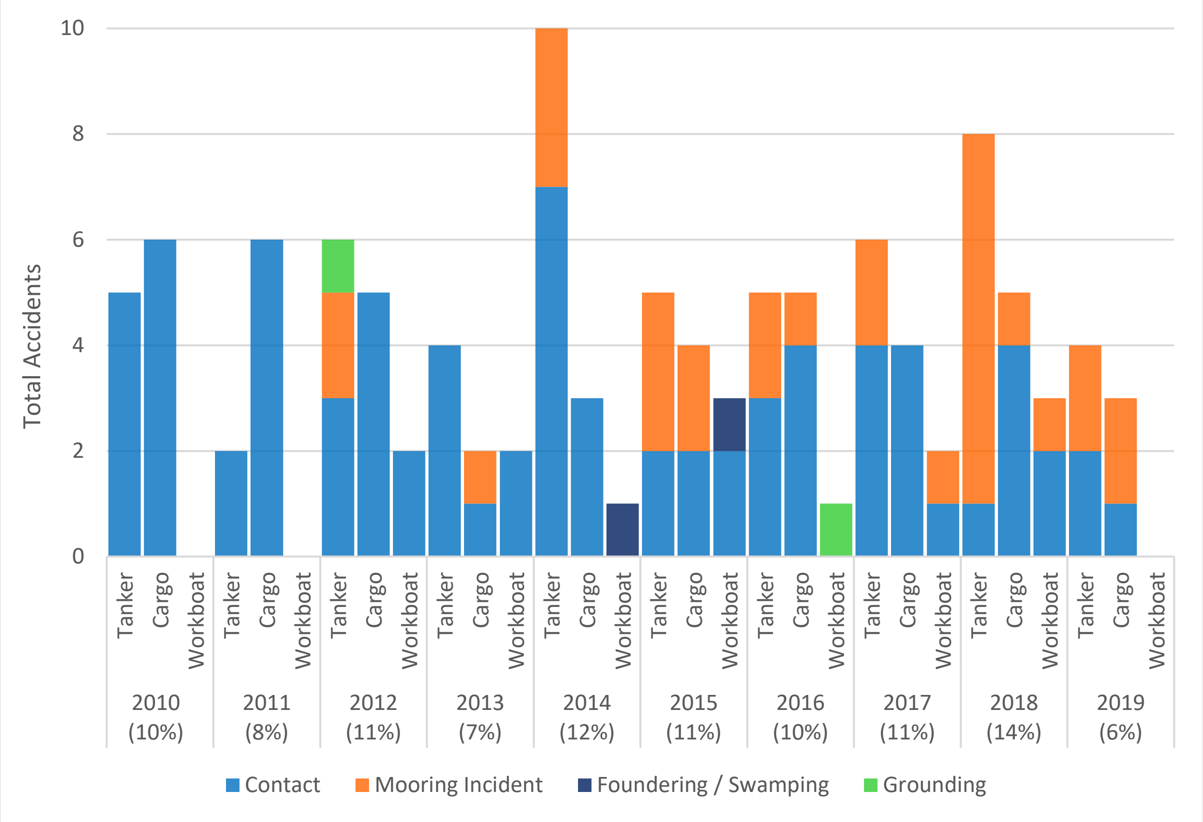


Figure 14: Navigational Accidents per Year by Accident and Vessel Type - 01/01/2010 and 01/09/2019

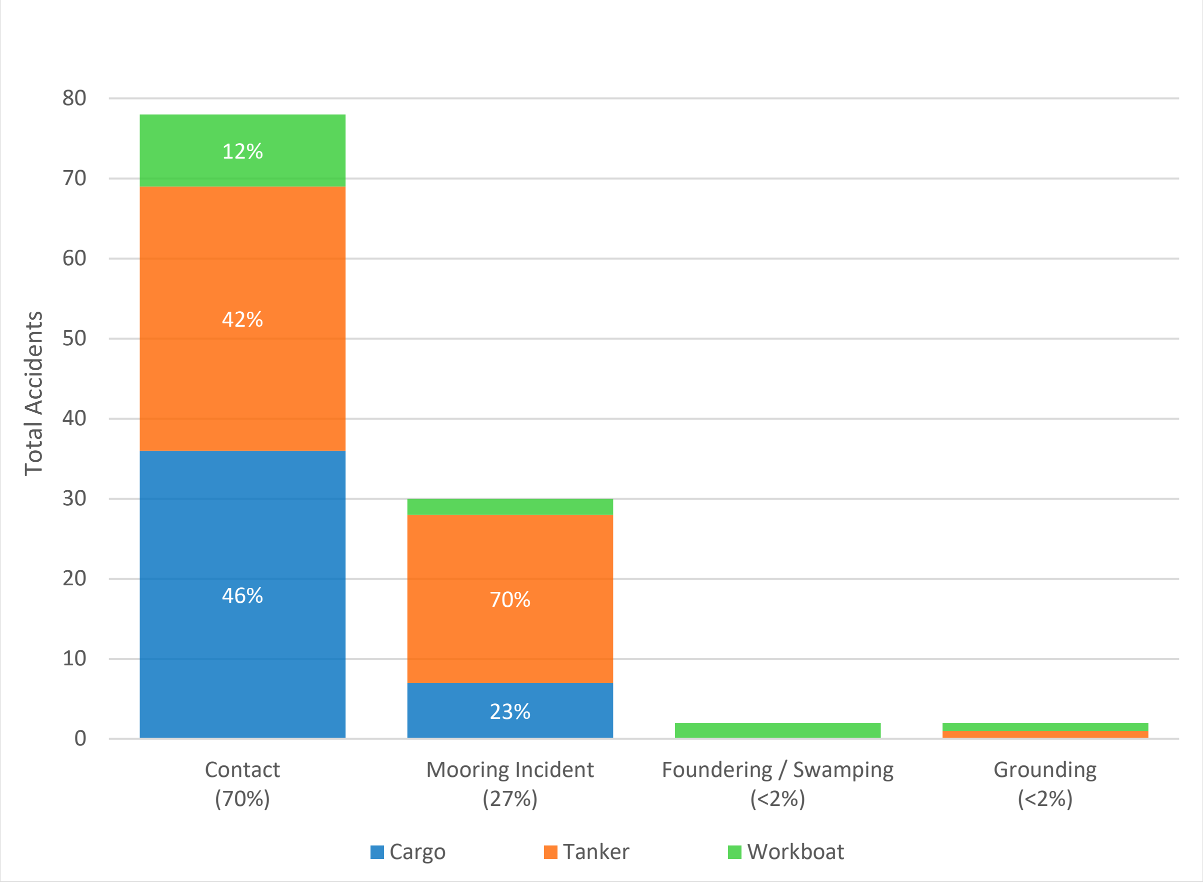


Figure 15: Navigational Accidents per Year by Accident Type - 01/01/2010 and 01/09/2019

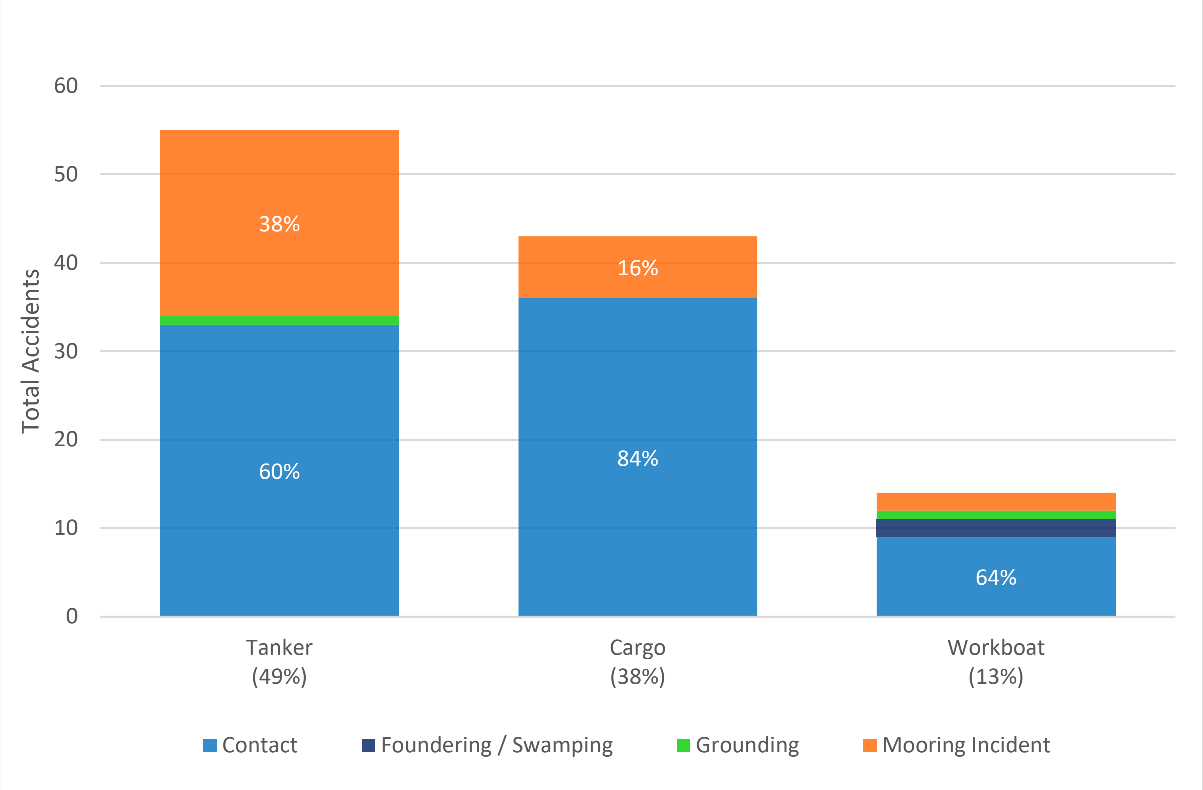
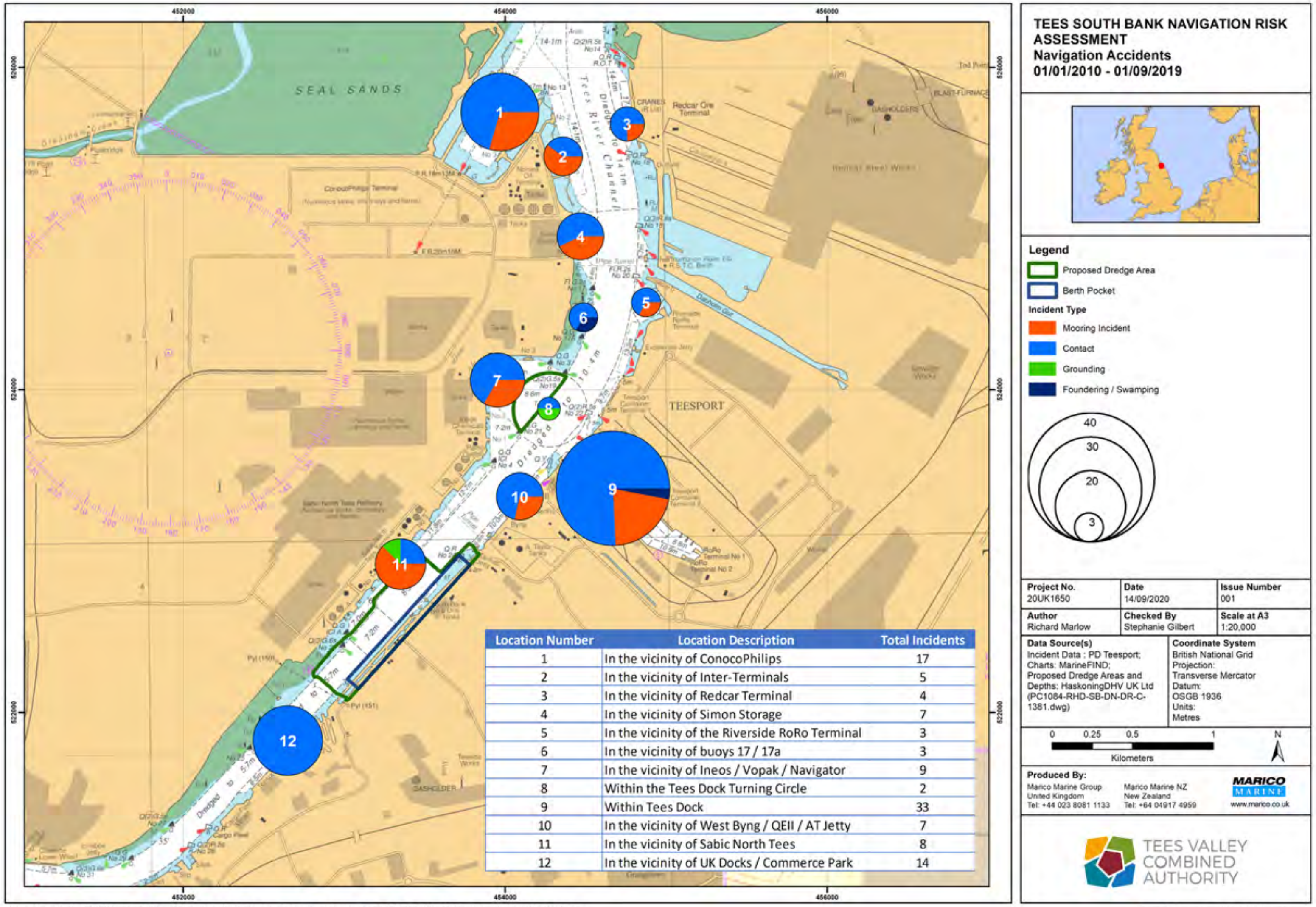


Figure 16: Navigational Accidents by Vessel Type - 01/01/2010 and 01/09/2019



Location Number	Location Description	Total Incidents
1	In the vicinity of ConocoPhilips	17
2	In the vicinity of Inter-Terminals	5
3	In the vicinity of Redcar Terminal	4
4	In the vicinity of Simon Storage	7
5	In the vicinity of the Riverside RoRo Terminal	3
6	In the vicinity of buoys 17 / 17a	3
7	In the vicinity of Ineos / Vopak / Navigator	9
8	Within the Tees Dock Turning Circle	2
9	Within Tees Dock	33
10	In the vicinity of West Byng / QEII / AT Jetty	7
11	In the vicinity of Sabic North Tees	8
12	In the vicinity of UK Docks / Commerce Park	14

Project No. 20UK1650	Date 14/09/2020	Issue Number 001
Author Richard Marlow	Checked By Stephanie Gilbert	Scale at A3 1:20,000

Data Source(s)
Incident Data : PD Teesport; Charts: MarineFIND; Proposed Dredge Areas and Depths: HaskoningDHV UK Ltd (PC1084-RHD-SB-DN-DR-C-1381.dwg)

Coordinate System
British National Grid
Projection:
Transverse Mercator
Datum:
OSGB 1936
Units:
Metres

Produced By:
Marico Marine Group
United Kingdom
Tel: +44 023 8081 1133

Marico Marine NZ
New Zealand
Tel: +64 04917 4959

MARICO MARINE
www.marico.co.uk

Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Incidents

Figure 17: Navigationally Significant Accidents – Lower River Tees - 01/01/2010 and 01/09/2019

4 HAZARD IDENTIFICATION

IMO Guidelines define a hazard as ‘something with the potential to cause harm, loss or injury’, the realisation of which results in an accident. Hazards relating to navigation were identified through stakeholder consultation meetings / workshops and informed by vessel traffic and incident analysis (**Section 3.1**).

A summary of the key impacts identified during stakeholder consultation are outlined in **Annex B.**

The hazard categories identified for assessment within the NRA are given in **Table 9**. Hazard categories were combined with the vessel categories identified in **Table 8** to establish a list of individual hazards for risk assessment. In total, 48 hazards were identified for assessment in both the construction and operation phase, as detailed in **Table 9**.

Table 9: Identified Hazard Categories.

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	14
2	Contact	Berth	One or more vessels makes contact with a berth, pier or jetty.	5
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	5
		Navigation Buoy	One or more vessels makes contact with a navigation buoy. Also known as striking.	5
		Overhead Power Cables[7]	One or more vessels makes physical contact with the overhead power cables.	2
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	5
4	Foundering / Swamping	All Vessel Types	A vessel fills with water for any reason including capsize, and when overwhelmed, sinks.	2
5	Mooring Incident / Breakout	All Vessel Types	A vessel ranges (moves excessively) whilst alongside the berth or when one or more mooring lines fail resulting in the vessel unintentionally breaking away from its moored position.	5
6	Tug Girting / Towing Incident	Tugs Only.	A tug in difficulty/girts during towage operations (for example during a project cargo operation).	1

---

[7] New hazard. Introduced to for individual assessment due to nature of proposed Project activities.

4.1 CUMULATIVE IMPACT IDENTIFICATION

Cumulative effects refer to the effects upon receptors arising from the South Tees development project when considered alongside other proposed or in-construction projects. Projects of comparable effect upon the River Tees and its stakeholders have been considered which are detailed within **Table 10.**

In assessing the potential cumulative impacts, it is important to bear in mind that proposed projects may or may not actually be taken forward. For this reason, all identified relevant projects are considered to be operational for the purpose of risk assessment to represent worst case future development scenario.

Cumulative impacts for assessment have been identified within **Table 11**. The results of the cumulative assessment are detailed within **Section 8.3**.

Table 10: Identified Cumulative Projects

ID	Status	Project	Estimated additional project moves	Description
1	Proposed	Northern Gateway Project	Expecting one additional move per day, or 7 per week. Project currently on hold.	Initially conceived in 2000. Container terminal dredged to 15m berth pocket. 1,035m long berth (2 vessels) to handle medium sized (approximately 12,000 TEU) vessels. Planned commencement date unknown.
2	Proposed	York Potash	Approximately 200 moves per year, equating to an average of approximately 4 vessels per week.	Use of the old Redcar bulk terminal berth Initially, before extending to the south. Panamax vessels 70-80,000 tonnes to be utilised transporting approximately 10 million tonnes per year. Planned commencement date unknown.
3	Under-Construction	MGT Power	2 vessels per week from Q2 2020.	Biomass plant at Number One berth, Tees Dock. Re-use of existing berth expected.

Table 11: Cumulative Impact Identification

ID	Impact	Impact Detail	Justification for Assessment
1	Cumulative Impact due to increased vessel movements.	Approximately 8 additional vessel movements estimated per week.	Potential for increase in collision risk due to potential for interaction of project vessels.
2	Cumulative Impact due to reduction in navigable channel.	Additional vessels to be moored along river wall at project sites.	Potential for increase in contact risk due to increased utilisation of the river wall and increase in in channel vessel manoeuvres.

5 EMBEDDED MITIGATION

Embedded mitigation measures describe those measures to which adherence is required by regulation / are already enforced by the local SHA. Embedded mitigation measures are assumed to be in place prior to assessment. **Table 12** lists embedded mitigation measures considered within this NRA. Following risk assessment, possible additional risk control measures may be identified with a view to further reducing residual risk (see **Section 8.4**).

Table 12: Embedded Mitigation Measures

ID	Risk Control Measure	Phase	Description
1	Adherence to risk control measures listed within the current Port Navigation Risk Assessment.	C & O	Including international, national and local regulations. As listed in PD TeesPort – River NRA.
2	TOS / VTS		This will be particularly important in construction phase if the dredgers are very large.
3	Movements associated with barges carrying windfarm cargos treated as project moves.	O	In accordance with PD Ports procedures.
4	Post dredge surveys and promulgation.	C & O	Charts to be updated to include new berths and berthing pockets and in-channel dredge depths.
5	Notice To Mariners and Communication.		Hold regular meetings with dredge contractors during dredging operations. Issue Notice To mariners prior to intended works commencing.
6	Review of marking and lighting.	O	Review navigation aids in vicinity of project berths as directed by PD Ports.
7	Blade safety zone	O	15m safety zone on riverside of stowed blades.

6 ASSUMPTIONS

The following assumptions are applicable to this NRA:

- All international, national and local regulations and procedures are adhered to.
- When considering risk control measures, it is assumed that embedded risk controls are in place (see **Section 5**) and they are effective in meeting their intended goal (i.e. the NRA does not take into consideration failure to comply with regulations).
- This NRA is concerned with navigation related hazards and does not consider other non-navigational hazards including those related to a health and safety of marine operations such

as slips, trips and falls, or those hazards which are not directly related to navigation, such as fire and explosion, except where they can be a consequence of a navigation hazard.

- This NRA treats the Phase 1 and Phase 2 developments as a single construction phase.

7 NAVIGATION RISK ASSESSMENT METHODOLOGY

The NRA process is based on Formal Safety Assessment (FSA) methodology as adopted by the International Maritime Organisation (IMO) and follows the guidance set out in International best practise. A detailed description of the methodology is provided in **Annex A**.

7.1 OVERVIEW

A standard 5x5 risk matrix was used and each hazard was assessed twice. Firstly, to determine the risk associated with the most likely outcome of the hazard and secondly to determine the risk associated with the worst credible outcome for each hazard. The results were then combined to give a total risk score for each hazard.

This approach provides a thorough assessment of risk, which reflects the reality that comparatively few accidents result in the worst credible outcome.

7.1.1 Assessment of Frequency and Consequence

The assessment of frequency was combined with assessments of typical consequences to people, property, environment and business. The frequency and consequence bands used for this NRA are shown in **Annex A.**

The frequency and consequence assessments were largely based on the data/information collected during Stage 1 of this NRA, and in particular:

- Stakeholder consultation meetings;
- Quantitative vessel traffic analysis; and
- Review of the incident database.

This information was supplemented by expert judgement and specialist knowledge provided by the assessment team, who have considerable experience in undertaking NRAs of this type in ports/harbours all around the world.

7.1.2 Risk Scores

The frequency and consequence scores were then assessed to give two distinct risk scores;

- The average risk score of the categories in the most likely set;
- The average risk score of the categories in the worst credible set;
- The maximum risk score of the four categories in the most likely set; and

- The maximum risk score of the four categories in the worst credible set.

These scores were then combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) (see **Annex A**), following which, the final risk scores were sorted into a ranked hazard list.

Hazard risk scores were categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, as per **Table 13**, where ALARP represents a level of risk that is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level (see **Section 8.4**).

Table 13: Risk Scoring.

Risk Score	Risk Definition	Action Taken
0 - 1.99	Negligible	The risk is acceptable and at level where operational safety is unaffected.
2 - 3.99	Low	The risk is acceptable and at level where operational safety is assumed.
4 - 6.99	ALARP	The risk is neither acceptable nor unacceptable. Risks in the ALARP band are to be managed to a level which is "As Low As Reasonably Practicable", based on the cost-effectiveness of implementing additional risk control measures. These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
7 - 8.99	Significant	The risk is unacceptable and additional risk control measures shall be identified and implemented as soon as possible (or the activity / operation temporarily suspended). These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.
9 - 10	High	The risk is unacceptable and additional risk control measures shall be identified and implemented immediately (or the activity / operation permanently suspended). These hazards and associated risk control measures shall be regularly reviewed as part of the Safety Management System.

Each identified baseline hazard log was scored twice, once for the construction phase and again for the operational phase resulting in two separate risk assessments and hazard logs. Each log was then re-assessed applying proposed possible additional mitigation measures (**Section 8.4**) to assess the residual risk scores and their effectiveness should they be implemented.

8 NAVIGATION RISK ASSESSMENT RESULTS

8.1 CONSTRUCTION PHASE – BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for construction phase NRA is shown within **Table 14**. The full hazard log is provided in **Annex C.** The assessment assumes the implementation of all embedded risk control measures identified within **Section 5.**

All hazards were scored as ALARP or lower, with the highest scoring individual hazard assessed to be ‘Contact Berth: Tanker’ which scored 5.10: ALARP.

Figure 18 provides a summary of the average hazard category scores for the construction phase. The highest scoring overall hazard category was ‘Collision’ with an average risk score of 2.96 closely followed by ‘Contact Berth’ which scored 2.92. The lowest scoring overall hazard category in the construction phase was ‘Contact: Navigation Buoy’ which was scored as 0.72; negligible, driven by its low consequence.

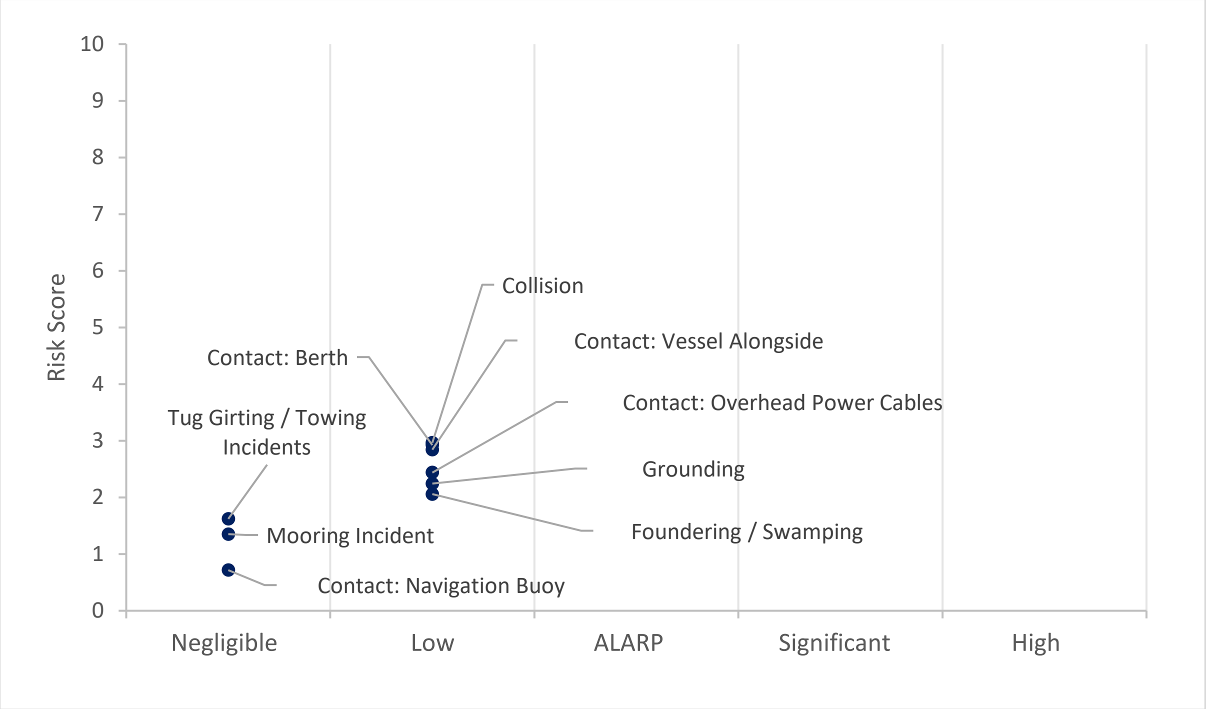


Figure 18: Average Risk Score by Hazard Category – Construction Phase

Table 14: Summary Ranked Hazard List – Construction Phase.

ID	Category	Hazard Title	Risk Score
21	Contact	Contact berth - Tanker	5.10
27	Contact	Contact vessel alongside berth - General Cargo Vessel	4.22
22	Contact	Contact berth - General Cargo Vessel	4.12
10	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	4.07
26	Contact	Contact vessel alongside berth - Tanker	3.92
2	Collision	Collision - Tanker ICW General Cargo Vessel	3.84
3	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	3.79
7	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	3.79
28	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	3.53
11	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	3.16
23	Contact	Contact berth - Workboat (Including Dredgers)	3.16
1	Collision	Collision - Tanker ICW Tanker	3.14
6	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	3.07
33	Grounding	Grounding - Tanker	3.00
4	Collision	Collision - Tanker ICW Project Cargo	2.91
8	Collision	Collision - General Cargo Vessel ICW Project Cargo	2.84
36	Grounding	Grounding - Project Cargo	2.78
34	Grounding	Grounding - General Cargo Vessel	2.68
31	Contact	Contact Overhead Power Cables- General Cargo vessel	2.52
43	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	2.38
32	Contact	Contact Overhead Power Cables - Project Cargo	2.36
12	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	2.24
5	Collision	Collision - Tanker ICW Recreational Vessel	2.21
9	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	2.21
14	Collision	Collision - Recreational Vessel ICW Recreational Vessel	2.12
13	Collision	Collision - Project Cargo ICW Recreational Vessel	2.10
35	Grounding	Grounding - Workboat (Including Dredgers)	2.07
29	Contact	Contact vessel alongside berth - Project Cargo Vessel	1.84
38	Mooring Incident	Mooring Incident - Tanker	1.81
39	Mooring Incident	Mooring Incident - General Cargo vessel	1.81
44	Foundering	Foundering / Swamping - Recreational Vessel	1.74
18	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	1.67
15	Tug Girting	Tug Girting / Towing Incidents	1.62
24	Contact	Contact berth - Project Cargo Vessel	1.54
40	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	1.31
41	Mooring Incident	Mooring Incident - Project Cargo	1.26
19	Contact	Contact - Project Cargo with Navigation Buoy	0.76
25	Contact	Contact berth - Recreational Vessel	0.69
30	Contact	Contact vessel alongside berth - Recreational Vessel	0.69
37	Grounding	Grounding - Recreational Vessel	0.69
16	Contact	Contact - Tanker with Navigation Buoy	0.58
17	Contact	Contact - General Cargo Vessel with Navigation Buoy	0.58
42	Mooring Incident	Mooring Incident - Recreational Vessel	0.56
20	Contact	Contact - Recreational Vessel with Navigation Buoy	0.00

8.2 OPERATION PHASE - BASELINE WITH EMBEDDED MITIGATION

A summary of the ranked hazard list for operation phase NRA is shown within **Table 15**. The full ranked hazard list is provided in **Annex D.** The assessment assumes the implementation of all embedded risk control measures identified within **Section 5.**

All hazards were scored as ALARP or lower, with the highest scoring hazard assessed to be 'Contact Berth: Tanker' which scored 5.50: ALARP.

Figure 19 provides a summary of the average hazard category scores for the operation phase. The highest scoring overall hazard category was 'Contact: Vessel Alongside' with an average risk score of 3.76 driven by a high consequence. This was followed by 'Contact Berth' and 'Contact: Overhead Power Cables' which scored 3.30 and 3.27 respectively, driven by the introduction of additional vessels berthing at South Bank, the narrowing of the river for tankers turning on to the Sabic berths and the proximity of Project Cargo vessels to overhead cables upstream of the berth. The lowest scoring overall hazard category in the construction phase was 'Contact: Navigation Buoy which was scored as 0.5; negligible, driven by its low consequence.

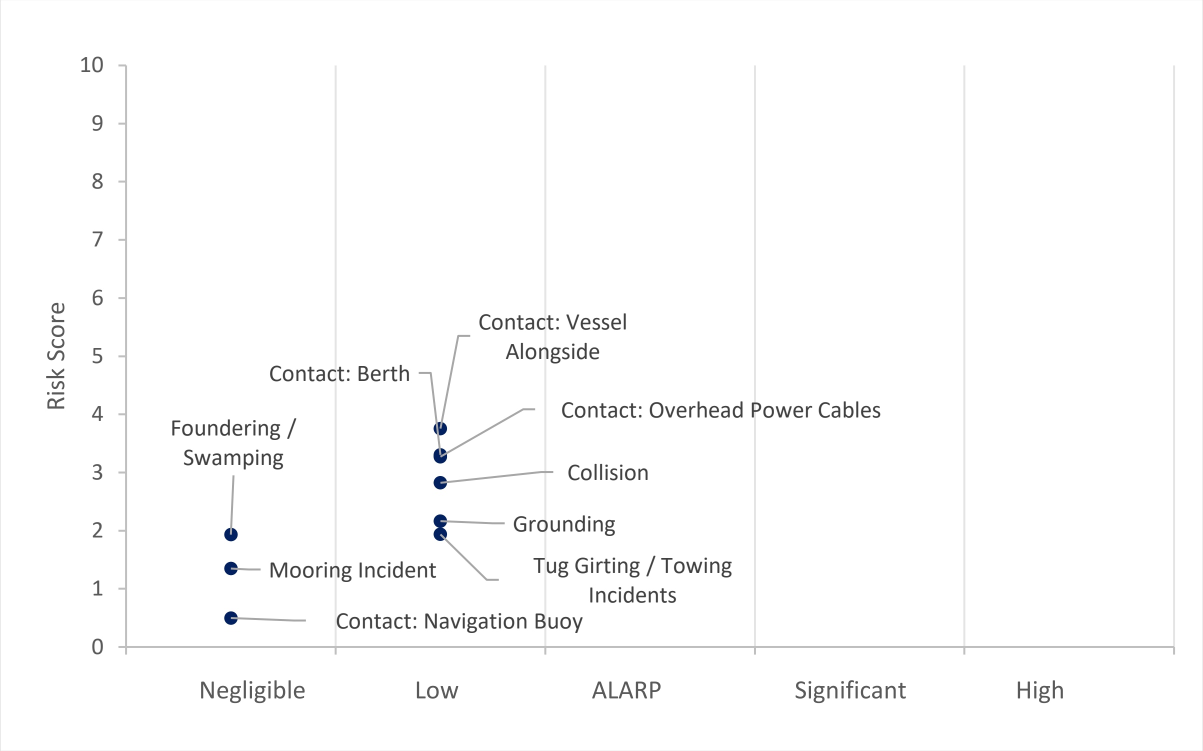


Figure 19: Average Risk Score by Hazard Category – Operation Phase

Table 15: Summary Ranked Hazard List – Operation Phase.

ID	Category	Hazard Title	Risk Score
21	Contact	Contact berth - Tanker	5.50
29	Contact	Contact vessel alongside berth - Project Cargo Vessel	5.18
26	Contact	Contact vessel alongside berth - Tanker	5.05
27	Contact	Contact vessel alongside berth - General Cargo Vessel	4.72
22	Contact	Contact berth - General Cargo Vessel	4.51
32	Contact	Contact Overhead Power Cables - Project Cargo	4.03
2	Collision	Collision - Tanker ICW General Cargo Vessel	3.67
3	Collision	Collision - Tanker ICW Workboat	3.50
7	Collision	Collision - General Cargo Vessel ICW Workboat	3.50
23	Contact	Contact berth - Workboat	3.16
28	Contact	Contact vessel alongside berth - Workboat	3.13
36	Grounding	Grounding - Project Cargo	3.13
6	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	3.07
1	Collision	Collision - Tanker ICW Tanker	3.05
4	Collision	Collision - Tanker ICW Project Cargo	3.05
8	Collision	Collision - General Cargo Vessel ICW Project Cargo	2.97
11	Collision	Collision - Workboat ICW Project Cargo	2.95
33	Grounding	Grounding - Tanker	2.86
10	Collision	Collision - Workboat ICW Workboat	2.76
24	Contact	Contact berth - Project Cargo Vessel	2.66
34	Grounding	Grounding - General Cargo Vessel	2.60
31	Contact	Contact Overhead Power Cables- General Cargo vessel	2.52
12	Collision	Collision - Workboat ICW Recreational Vessel	2.24
13	Collision	Collision - Project Cargo ICW Recreational Vessel	2.24
5	Collision	Collision - Tanker ICW Recreational Vessel	2.21
9	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	2.21
43	Foundering	Foundering / Swamping - Workboat	2.13
14	Collision	Collision - Recreational Vessel ICW Recreational Vessel	2.12
15	Tug Girting	Tug Girting / Towing Incidents	1.94
38	Mooring Incident	Mooring Incident - Tanker	1.81
39	Mooring Incident	Mooring Incident - General Cargo vessel	1.81
44	Foundering	Foundering / Swamping - Recreational Vessel	1.74
41	Mooring Incident	Mooring Incident - Project Cargo	1.65
35	Grounding	Grounding - Workboat	1.54
40	Mooring Incident	Mooring Incident - Workboat	0.91
19	Contact	Contact - Project Cargo with Navigation Buoy	0.76
25	Contact	Contact berth - Recreational Vessel	0.69
30	Contact	Contact vessel alongside berth - Recreational Vessel	0.69
37	Grounding	Grounding - Recreational Vessel	0.69
16	Contact	Contact - Tanker with Navigation Buoy	0.58
17	Contact	Contact - General Cargo Vessel with Navigation Buoy	0.58
18	Contact	Contact - Workboat with Navigation Buoy	0.58
42	Mooring Incident	Mooring Incident - Recreational Vessel	0.56
20	Contact	Contact - Recreational Vessel with Navigation Buoy	0.00

Little variation in hazard risk scores is noted between the construction and operation phase assessments for non-contact hazard categories, as demonstrated by **Figure 20**. However, with the exception of 'Contact: Navigation buoy', contacts show a higher level of variation. An overall increase in contact risk in the operation phase is noted owing mainly to the introduction of new third-party contact hazards introduced by the proposed development.

Average risk scores by vessel category are analysed in **Figure 21**. The highest scoring overall vessel category is tanker with an average risk score of 3.0. The lowest scoring vessel category was recreational, scoring 1.7 driven by frequency. The greatest variation in risk scores between the construction and operation phases is by project cargo vessels driven by increased frequency in the operation phase followed by workboats, driven by an increase in frequency of dredgers in the construction phase.

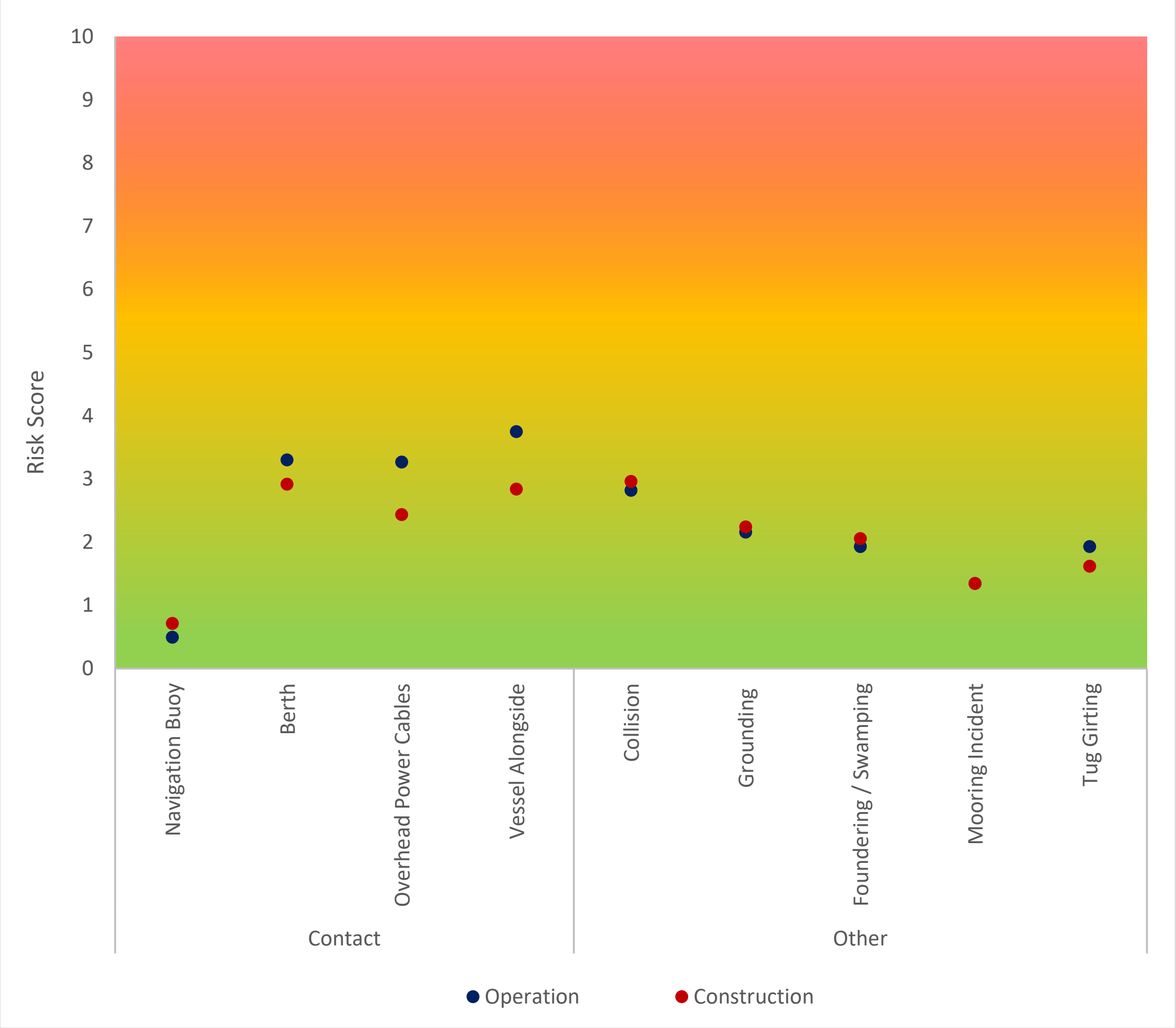


Figure 20: Average Risk Score by Hazard Category

Figure 21: Average Risk Score by Vessel Category

8.3 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact assessment was assessed to be a factor of the likelihood of the impact occurring and the consequence, should it occur. The assessment considered all cumulative projects, identified in **Section 4.1**. The criteria of frequency and consequence and risk score definitions are outlined within the risk assessment methodology (**Annex A**).

The results of the cumulative impact assessment are given in **Table 16**. All impacts were assessed to be acceptable with all scoring Negligible or Low, with the exception of the impact on ship contact risk, which was assessed to be ALARP, due to the reduction in overall channel width when vessels are alongside. This determination was driven by frequency due to the increased usage of berths in the lower reaches of the river by up to panamax sized vessels (**Table 10**) and informed by existing reported contact accident rates within the River Tees (**Section 3.4**).

Table 16: Cumulative Impact Assessment

Identified Impact	Hazard Description	Likelihood	Consequence	Impact
Cumulative Impact due to increased vessel movements.	Impact on ship collision risk;	Unlikely	Moderate	Low
	Impact on grounding risk;	Unlikely	Moderate	Low
	Impact on foundering / swamping risk.	Unlikely	Minor	Negligible
Cumulative Impact due to reduction in overall channel width when vessels alongside.	Impact on ship contact risk;	Possible	Moderate	ALARP
	Impact on grounding risk;	Unlikely	Moderate	Low
	Impact on mooring / breakout risk	Unlikely	Minor	Negligible

8.4 POSSIBLE ADDITIONAL RISK CONTROL MEASURES

A number of additional risk control measures were identified, informed by stakeholder consultation, aimed at further reducing the residual risk during the construction and operation phases of the Project.

Table 17 provides a description of each of the proposed mitigation measures. The individual hazards to which they apply are indicated within **Table 18** and the hazard logs in **Annex E** and **Annex F**. While all hazards have been assessed to be ALARP or lower, it is recommended that consideration is given to their implementation with a view to further reducing risk.

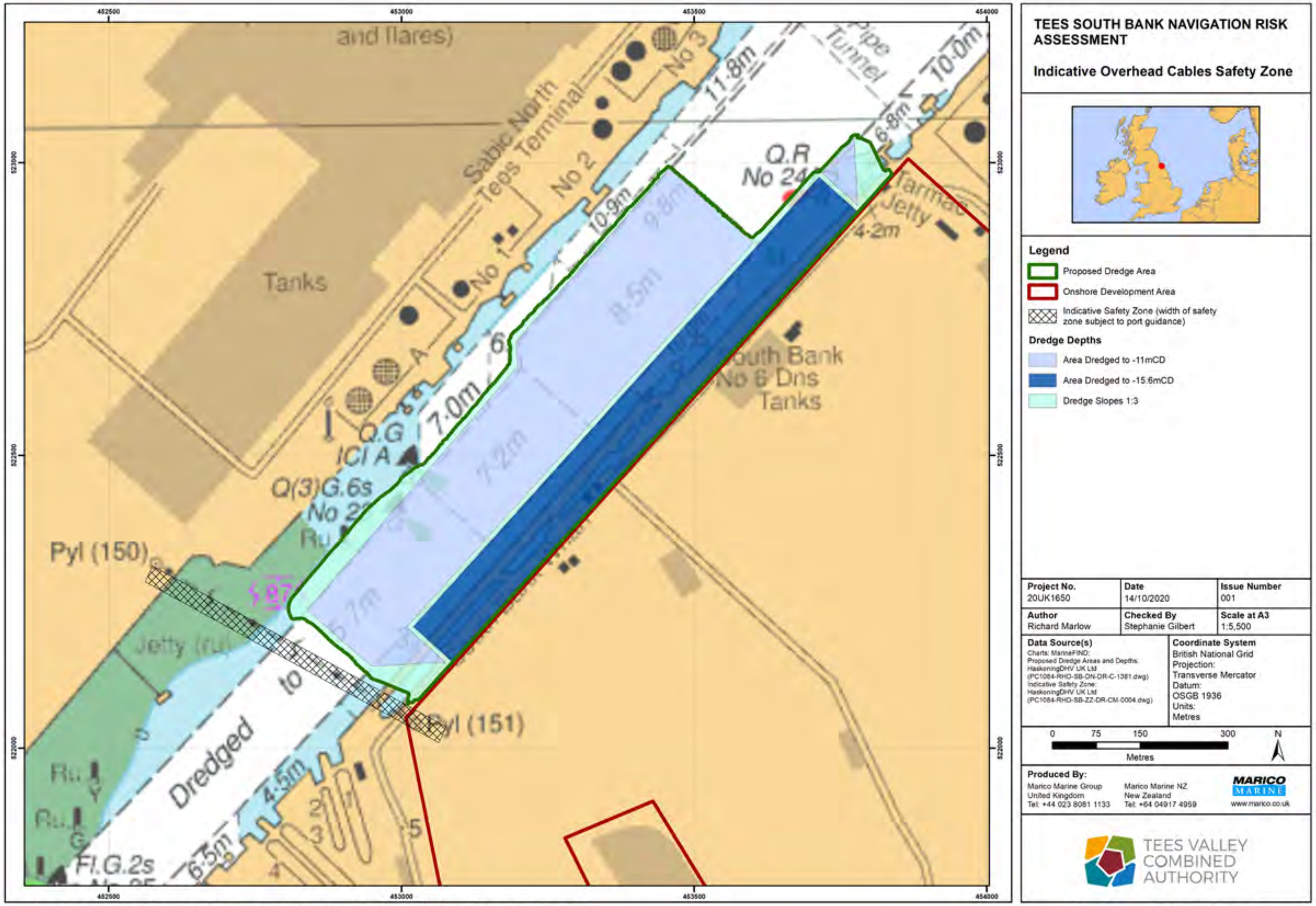
The hazards to which additional risk control measures apply and their effectiveness are shown in **Table 18**. Risk control measures showed a risk reduction effectiveness for 10 hazards in the operation phase and 2 in the construction phase.

The majority of risk controls are aimed at the protection third party property such as overhead cables and overhanging blades and, therefore, show little effectiveness on the majority of pre-existing hazards (which are carefully managed and mitigated through the implementation of embedded risk control measures and procedures by PD Ports), the recommended additional mitigation measures are effective in the reduction of those hazards introduced to for individual assessment due to nature of proposed Project activities (See **Table 9**).

The hazard showing the greatest risk reduction in the construction phase was ‘Contact berth – Tanker’ with an effectiveness of 11% driven by risk control measure 4. The hazard showing the greatest risk reduction in the operation phase was ‘Contact Overhead Power Cables - Project Cargo’ with a reduction of 38% driven by the implementation of risk controls 2, 3 and 4.

Table 17: Possible Additional Risk Control Measures

ID	Risk Control Measure	Phase	Description
1	Marking and lighting of overhanging blades	O	For example, via temporary special marks or flood lighting. Promulgated via Notice to Mariners (NtM) and VTS broadcasts.
2	High-air draught vessels / vessels carrying large cargoes to use downstream berth only.	O	To deconflict large vessels and cargoes with the overhead cables located to the south of the project site.
3	Introduction of a safety zone in vicinity of overhead cables (**Figure 22**).	O	Whereby vessels may not enter if they or their load exceeds the given height restrictions. Pylon minimum height is 93.2m plus additional 5.3m safety factor (referenced as 87m from Chart Datum on navigational chart).
4	Review of tug operations and towage requirements	C/O	For example: - Use of additional towage for high-air draught vessels / vessels carrying large cargoes navigating to and from berthing pocket - Use of additional tugs for turning on to Sabic berths Guidance to be determined by the port.



Charts from MarineFIND.co.uk. (c) Crown Copyright, 2019. All rights reserved. License No. EK001-FN1001-02494. Not to be used for Navigation.

Figure Reference: 20UK1650_Indicative_Safety_Zone

Figure 22: Indicative Overhead Cables Safety Zone

Table 18: Additional Risk Control Effectiveness

ID	Hazard Title	Phase	Risk Score	Risk Controls	Risk Score	Risk Reduction	Effectiveness
21	Contact berth - Tanker	Construction	5.10	4: Review of tug operations and towage requirements	4.54	0.56	-11%
		Operation	5.50	4: Review of tug operations and towage requirements	5.10	0.40	-7%
22	Contact berth - General Cargo Vessel	Operation	4.51	4: Review of tug operations and towage requirements	4.12	0.39	-9%
24	Contact berth - Project Cargo Vessel	Operation	2.66	4: Review of tug operations and towage requirements	2.27	0.39	-15%
26	Contact vessel alongside berth - Tanker	Construction	3.92	4: Review of tug operations and towage requirements	3.73	0.19	-5%
		Operation	5.05	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.45	0.60	-12%
27	Contact vessel alongside berth - General Cargo Vessel	Operation	4.72	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.45	0.27	-6%
28	Contact vessel alongside berth - Workboat	Operation	3.13	1: Marking and lighting of overhanging blades	2.00	1.13	-36%
29	Contact vessel alongside berth - Project Cargo Vessel	Operation	5.18	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements	4.90	0.28	-5%
30	Contact vessel alongside berth - Recreational Vessel	Operation	0.69	1: Marking and lighting of overhanging blades	0.69	0.00	0%
31	Contact Overhead Power Cables- General Cargo vessel	Operation	2.52	2: High-air draught vessels / vessels carrying large cargoes to use downstream deep-water berth only; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.	2.43	0.09	-3%
32	Contact Overhead Power Cables - Project Cargo	Operation	4.03	2: High-air draught vessels / vessels carrying large cargoes to use downstream end of berth; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.	2.52	1.51	-38%

9 CONCLUSIONS AND RECOMMENDATIONS

PD Port's Teesport is experienced in the handling of large and hazardous cargoes, and through its Marine Safety Management system (MSMS) has effectively implemented a suite of embedded mitigation measures ensuring that the risk profile remains at acceptable levels.

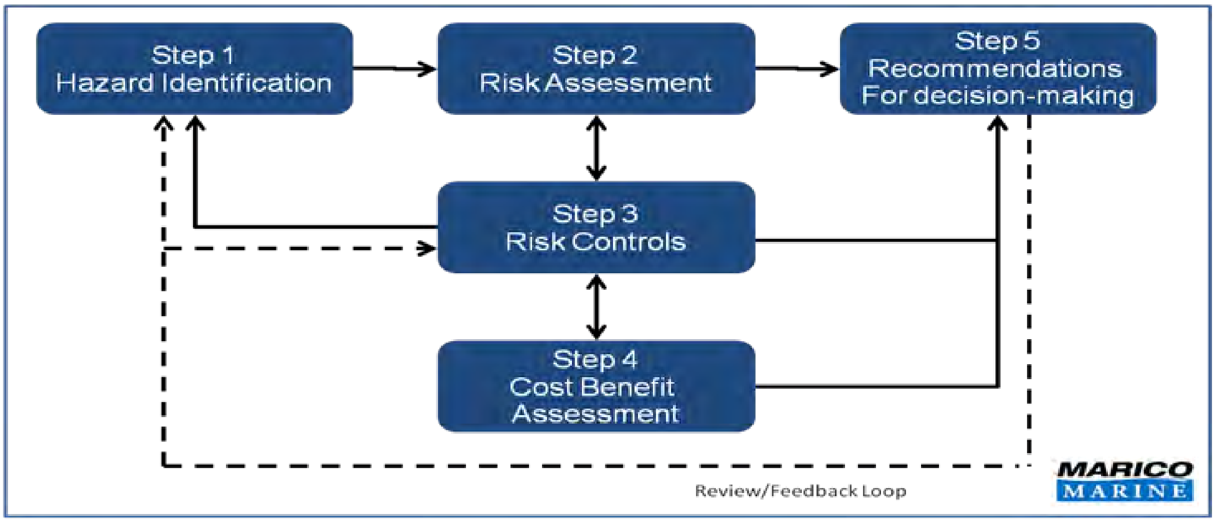
The proposed activities associated with the Project have been assessed and it has been concluded that the Project should have a minimal effect on the existing risk profile which would be managed and contained assuming compliance with embedded mitigation and regulations covering movements, pilotage, towage, VTS and procedures.

The possible additional mitigation measures identified are largely to protect third party property, for example; overhead power cables, other shipping and overhanging blades. Although all hazards were scored as ALARP or lower, it is recommended that consideration is given to the implementation of the recommended possible additional risk control measures to further reduce the hazards to which they apply, particularly those within the ALARP band which should be reduced unless there is a disproportionate cost to the benefits obtained.

Annex A Navigation Risk Assessment Methodology

RISK ASSESSMENT METHODOLOGY

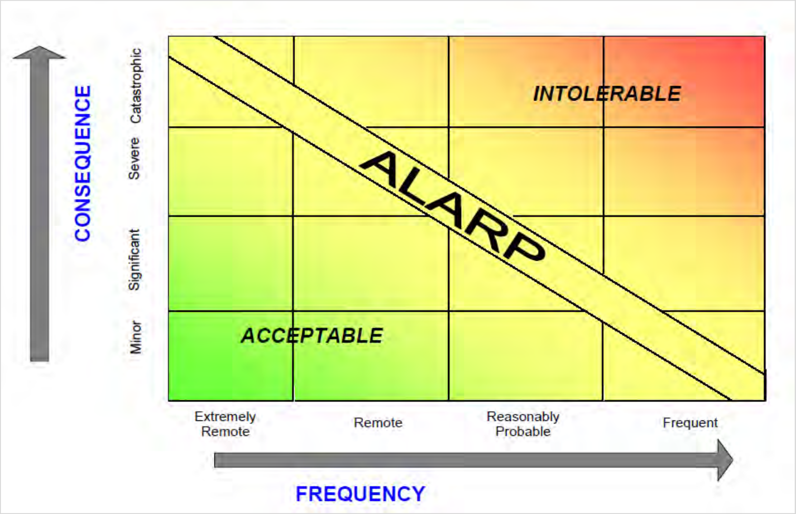
The Navigation risk assessment methodology was based on the Formal Safety Assessment methodology as adopted by IMO. It also follows the guidance set out within the Port Marine Safety Code. Marico Marine uses a form of risk assessment that has been specifically adapted for navigational use. It is unique to Marico and is fundamentally based on concepts of "Most Likely" and "Worst Credible", which reflect the range of outcomes arising from a shipping accident. This approach matches marine incident data that is customarily available. It is relevant that incident data often shows a high frequency of "Most Likely" events, separated from a much lower frequency of "Worst Credible" events.



Formal Safety Assessment Risk Assessment Process.

IMO Guidelines define a hazard as "*something with the potential to cause harm, loss or injury*", the realisation of which results in an accident. The potential for a hazard to be realised can be combined with an estimate or known consequence of outcome. This combination is termed "risk". Risk is therefore a measure of the frequency and consequence of a particular hazard. One way to compare risk levels is to use a matrix approach as illustrated below. At the lowest end of the scale, frequency is extremely remote and consequence insignificant such that a risk can be said to be negligible. At the high end, where hazards are defined as frequent and the consequence catastrophic, then risk is termed intolerable. Between the two lies an area known "As Low As Reasonably Practicable" (ALARP).

The IMO guidelines allow the selection of definitions of frequency and consequence to be made by the organisation carrying out the risk assessment. This is important, as it allows risk to be applied in a qualitative and comparative way. To identify high risk levels in a purely mathematically quantitative way would require a large volume of casualty data, which is rarely available in the maritime context. ALARP can be accepted as being "Tolerable", if the further reduction of the risk is impracticable, or if the cost of such reduction would obviously be highly disproportionate to the improvement. It can also be considered “Tolerable”, if the cost of reducing the risk is greater than any improvement gained.



Frequency / Consequence Chart.

This NRA used accident categories to organise hazards for assessment. The hazard categories identified as relevant to this study were as follows

Hazard Categories

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
1	Collision	All Vessel Types	Two or more vessels impact each other whilst manoeuvring.	14
2	Contact	Berth	One or more vessels makes contact with a berth, pier or jetty.	5
		Vessel Alongside Berth	One or more vessels makes contact with a stationary / berthed vessel. Also known as striking.	5
		Navigation Buoy	One or more vessels makes contact with a navigation buoy. Also known as striking.	5
		Overhead Power Cables[8]	One or more vessels makes physical contact with the overhead power cables.	2
3	Grounding	All Vessel Types	A vessel unintentionally makes contact with the seabed.	5

---

[8] New hazard. Introduced to for individual assessment due to nature of proposed Project activities.

Ref	Hazard Category	Hazard Detail	Comments	Individual Assessed Hazards
4	Foundering / Swamping	All Vessel Types	A vessel fills with water for any reason including capsize, and when overwhelmed, sinks.	2
5	Mooring Incident / Breakout	All Vessel Types	A vessel ranges (moves excessively) whilst alongside the berth or when one or more mooring lines fail resulting in the vessel unintentionally breaking away from its moored position.	5
6	Tug Girting / Towing Incident	Tugs Only.	A tug in difficulty/girts during towage operations (for example during a project cargo operation).	1

Each hazard was reviewed with respect to cause and effect. Frequencies were then derived for notional “Most Likely” and “Worst Credible” hazard events in each case, using the frequency bands defined below.

Frequency Criteria.

Scale	Description	Definition
F1	Rare	An event that could happen or has happened beyond 10 years
F2	Unlikely	An event that could happen or has happened between 1 to 10 years.
F3	Possible	An event that could happen or has happened between 6 months to 1 year.
F4	Likely	An event that could happen or has happened between 1 and 6 months.
F5	Frequent	An event that could happen or has happened in 1 month.

Assessment of Consequence

Using the assessed notional frequency for the "*most likely*" and "*worst credible*" scenarios for each hazard, an assessment was made for the consequences to people, property, environment and business, using the criteria outlined below.

Consequence Criteria.

Cat	People	Property	Environment	Business
1	Negligible Possible very minor injury (e.g. bruising)	Negligible Costs <10k	Negligible No effect of note. Tier1 may be declared but criteria not necessarily met Costs <10k	Negligible Costs <10k
2	Minor (single minor injury)	Minor Minor damage Costs 10k –100k	Minor Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity CEAS Site warning Costs 10K–100k	Minor Bad local publicity and/or short-term loss of revenue Costs 10k – 100k
3	Moderate Multiple minor or single major injury	Moderate Moderate damage Costs 100k - 1M	Moderate Tier 2 spill criteria reached but capable of being limited to immediate area within site COMAH site evacuation Costs 100k -1M	Moderate Bad widespread publicity Temporary suspension of operations or prolonged restrictions Costs 100k - 1M
4	Major Multiple major injuries or single fatality	Major Major damage Costs 1M -10M	Major Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release COMAH local evacuation Costs 1M - 10M	Major National publicity, Temporary closure Costs 1M -10M
5	Catastrophic Multiple fatalities	Catastrophic Catastrophic damage Costs >10M	Catastrophic Tier 3 oil spill criteria reached. International support required. Widespread shoreline contamination. Serious chemical or gas release. Significant threat to environmental amenity. COMAH major area evacuation Costs >10M	Catastrophic International media publicity. Operations and revenue seriously disrupted for more than two days. Ensuing loss of revenue. Costs >10M

Note that the Oil Pollution Preparedness, Response Co-operation Convention[9] defines the following response levels for oil spills in the United Kingdom:

- Tier 1 Local (within the capability of the operator on site): A Tier 1 response is the lowest response level and requires resources to be available locally. Depending on the characteristics of the oil this may or may not include the use of dispersants. By definition these resources must be at or near the incident site. It is expected that these resources will be deployed as quickly as operational circumstances allow.
- Tier 2 Regional (beyond the in-house capability of the operator): For larger pollution incidents, local resources may be insufficient to deliver a proper response. In these cases it may be that resources from a regional centre will be required. A key component of UK offshore Tier 2 response is that operators are expected to have this capability mobilised and applied within 2 to 6 hours of an oil pollution incident.
- Tier 3 National (requiring national resources): For very large pollution incidents, resources supplied from national and international sources may be required. A key component of UK offshore Tier 3 response is that operators are expected to have this capability mobilised and applied within 6 to 18 hours of an oil pollution incident.

Using the assessed notional frequency for the “Most Likely” and “Worst Credible” scenarios for each hazard, the probable consequences associated with each were assessed in terms of damage to:

- People - Personal injury, fatality etc.;
- Property – including third party;
- Environment - Oil pollution etc.; and
- Business - Reputation, financial loss, public relations etc.

The magnitude of each is then assessed using the consequence categories as shown in the table below. These have been set such that the consequences in respect of property, environment and business have similar monetary equivalent outcomes.

---

[9] The Merchant Shipping (Oil Pollution Preparedness, Response Co-operation Convention) Regulations 1998, Statutory Instrument 1998 No. 1056

Project Risk Matrix.

Consequences	**Cat 5**	5.1	5.9	7.0	8.3	10.0
	Cat 4	4.1	4.9	5.9	7.4	9.4
	Cat 3	2.9	3.5	4.4	5.9	8.3
	Cat 2	1.5	1.8	2.4	3.5	5.9
	Cat 1	0	0	0	0	0
	Frequency	**>10 years**	**1-10 years**	**6 months to 1 year**	**1 to 6 months**	**Within 1 month**

Navigation hazards are identified by the project team and scored for “frequency” and “consequence” and in terms of a “Most Likely” and “Worst Credible” outcome, with results documented in a “Hazard Log”.

Risk bands

Matrix Outcome	**Risk Definition**	**Action Taken**
0 – 1.99	Negligible Risk	A level where operational safety is unaffected.
2 -3.99	Low risk	A level where operational safety is assumed.
4 – 5.99	As Low As Reasonably Practicable (ALARP)	A level defined by study at which risk control in place is reviewed. It should be kept under review in the ensuing SMS.
6 – 7.99	Significant Risk	A level where existing risk control is automatically reviewed and suggestions made where additional risk control could be applied if appropriate. Significant risk can occur in the average case or in individual categories. New risk controls identified should be introduced in a timescale of two years.
8 - 10	High Risk	A level requiring immediate mitigation.

The frequency and consequence scores are assessed to give two distinct risk scores;

- The average risk score of the categories in the “most likely” set;
- The average risk score of the categories in the “worst credible” set;]

These scores are combined using a weighted average to produce a single numeric value representing the final risk score for each hazard, between 0 (negligible) and 10 (high) following which, the final risk scores are sorted into a ranked hazard list.

Hazard risk scores are categorised as either negligible, low, As Low as Reasonably Practicable (ALARP), significant or high, where ALARP represents a level of risk is neither acceptable nor unacceptable and for which further investment of resources for risk reduction may or may not be justifiable – i.e. risks which fall within the ALARP band should be reduced unless there is a disproportionate cost to the benefits obtained.

Navigation hazards with a risk score of significant or high are deemed unacceptable and, as such, additional risk control measures must be implemented to reduce the risk to an acceptable level.

Annex B Stakeholder Consultation Minutes

Minutes from Remote Consultation – Tees Bay Pilots

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	08/09/2020
From:	Richard Marlow (Marico Marine)
To:	Jonathan Nuttall (Tees Bay Pilots)

Item	Notes for the Record	Actions
1	**Introduction**	
	MM introduced the project: • Project layout, navigation chart and vessel movement / dredge schedule reviewed. • AIS vessel traffic plots reviewed.	
2	**General Observations**	
	<u>Dredging</u> • 3-week berth dredge will require pilotage. The vessels utilised for the rest of the dredging campaign will not require pilotage. Windfarm/ heavy lift vessels during the operational phase will require pilotage. • Dredge to 23-buoy would allow 11m draught vessels to manoeuvre. The existing dredge plan would not allow deep draught vessels to manoeuvre in vicinity of the proposed berths. <u>Vessel Length Considerations</u> • The project will impact SABIC's operations on the opposite side of the river. While a tanker is at one of SABIC's berths it would not be possible to swing a 200m barge end on. All vessels >200m would need to be swung in the turning circle. • It was questioned whether the turning circle would be dredged? If the project is intending to turn large deep draught vessels here then it will need to be dredged. The turning circle is currently dredged to 8.8m. If the turning circle is not dredged the existing Teesport regulations will maintain navigation safety but may affect the arrival and departure times of deep draught vessel using the proposed berth. • Vessels taken into North Tees Terminal 4 are limited to either side of High Water (HW) to obtain appropriate water depths (currently 8.5m). • AV Dawson's, based upriver of the transporter bridge, currently has a 200m berth limit, however there is intention to take larger vessels in the future. Cable layers, barges and cargo ships are all successfully taken into this berth.	
3	**Hazard Identification**	

Generally, does not consider the project to add any additional risks that cannot be effectively mitigated through enforcement of existing procedures. The location is fitting to serve such a purpose.

Construction Phase

Collision

- Using TOS and traffic control will reduce the risk. This worked well during the previous dredging campaign undertaken within the river. It was sometimes difficult to get the hopper dredgers to move out of the way, as once the legs are down they are reluctant to move. This would be an issue particularly in the turning area which is considered to be the highest risk area. This will be particularly important if the dredgers are very large.

Contact

- The consequence of a contact will increase if there are multiple people on board the dredgers and construction vessels.

Grounding

- The risk of / resulting from grounding are not considered to increase as, within the channel dredging will increase water depths, and existing regulations would prevent turning large deep-draught vessels in the turning circle at its current dredge levels.

Breakout

- Break-out of a barge may lead to grounding.
- High-sided ships should be included within the risk assessment.

Operational Phase

Collision

- No increase in risk.

Contact

Narrower channel may increase contact risk.

- Currently management standards do not include swing instructions. Given the narrowing, it may be that additional tugs are required to swing on to the SABIC berths.
- Potential for contact with pylon over-head wires was discussed. It was suggested that a ‘safety zone’ should be enforced whereby vessels may not enter if they or their load exceeds the given height restrictions.
- Towage may also be utilised to prevent break-out into the overhead wires. – The closest (12m) berth should use additional towage. Building this into port regulation would ensure it is enacted, make it easier to enforce and prevent disputes (for example by vessels with DP).
- Review tug operations and towage requirements.
- Treating each windfarm vessel move as a ‘project move’, initially at least, would reduce the risk of contact.

Grounding

- No increased risk.

Snagging

	• The two pipelines within the project area were discussed. Vessels do not anchor in these areas. Vessels would use anchors further downstream. • NTM would prevent people using anchors near to the pipelines. Maintaining communication should mitigate this risk. • Vessels occasionally use anchors to assist manoeuvring in the river.	
4	**Other**	
	Marking and Lighting • No additional lighting would be required. – LEDs are so bright they can hinder rather than aid navigation. • May be worth establishing a buoy marking the downstream approaches to the proposed berth. • Other berths have white stripes marking the limits. • 24 buoy could be relocated to up-river, as it occasionally can obstruct navigation, and a winker buoy could be used to mark the berths.	
5	**Actions**	
	• Requested that the project drawings and project information be sent through for sharing internally. • Questioned the exact width of the berths.	

Minutes from Remote Consultation – Cleveland Emergency Planning Unit

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	08/09/2020
From:	Richard Marlow (Marico Marine)
To:	Tim Shurmer (Cleveland Emergency Planning Unit)

Item	Notes for the Record	Actions
1	**Introduction**	
	MM introduced the project: • Project layout, navigation chart and vessel movement / dredge schedule reviewed. • AIS vessel traffic plots reviewed.	
2	**Hazards / Issues**	
	Immediately opposite the planned quay development are two high tier COMAH sites. Navigator marine terminals and SABIC. On the south side immediately adjacent is SABIC Teesport a lower tier COMAH site. • Tanker berths with vessel moored transporting goods to and from high level COMAH site. There is a pipeline corridor (containing multiple major accident hazard pipelines), the South Tees Linklines, lies under the dredge area at the downstream end of the site. SM is unaware of the depth of the pipelines beneath the riverbed. Cembcorp maintains the Linkline corridor. <u>Hazard Identification</u> <u>Construction Phase</u> • Personal Safety for construction vessel crews in vicinity of COMAH sites in the event of a COMAH release (aware that Port does have some means of warn and inform but advised that there would be value in linking in reference relay of warnings / advice from sites to shelter etc). • Potential for collision between construction vessels / dredgers with tankers carrying chemicals. • Contact with tankers moored alongside at the berth opposite or with tanker jetty, particularly loading arms, potential leading to oil, chemical or gas release / spill. • Barge break-out leading to potential contact. • Risk of damaging pipeline during dredging operations. <u>Operational Phase</u> • Personal Safety for construction vessel crews in vicinity of COMAH sites in the event of a COMAH release.	

	• Potential for collision between project vessels with tankers carrying chemicals. • Contact with tankers moored alongside at the berth opposite or with tanker jetty, particularly loading arms, potential leading to oil, chemical or gas release / spill. • Barge break-out leading to potential contact. • Contact with the National Grid transmission lines at the upstream end of the site. Questioned the height of the transmission lines. Checked charts but it was noted that only the pylon height, which does not account for catenary, was specified. Marico to follow up with PD Ports to establish catenary / clearance height.	
	Other	
	• It was mentioned there was a positive tidal surge in 2013 which lead to flooding in the vicinity of the project development area. Pipeline under river downstream of the turning area: • Flagged as an additional consideration as proposed dredging in line with Tees Dock is closer to this tunnel than the Able project	

Minutes from Remote Consultation – PD Ports, Teesport

Project:	South Bank Development Project
Email Sent:	08/09/2020
Feedback Received Via:	Teams Meeting
Date of Meeting:	16/09/2020
Marico Marine:	Richard Marlow, William Heaps
PD Port, Teesport:	Paul Brooks, Chris Stocks

Item	Notes for the Record	Actions
1	**Introduction**	
	MM introduced the risk assessment methodology: • Dredging / construction phase and post-works operation phase to be assessed independently. • Teesport requested that the final hazard logs be passed to Teesport on completion.	
2	**Project**	
	Dredging programme discussed. • Teesport – considered the extra 20 movements per day to be manageable. Recent experience of dredging showed that VTS (TOS) liaison and timing was effective. • Training wall opposite upstream end of the South Bank development site is a SSSI and the dredge comes very close to the training wall. • Channel dredge goes over the top of two pipeline tunnels, depth of upstream tunnel is around 6m (operated by SembCorp). It is expected that hopper barges will be under the PEC limit. Pilotage is compulsory for all vessels greater than 95m LOA. Power cable height was discussed – Teesport confirmed that minimum height was 93.2m plus additional 5.3m safety factor. The effective safe height is, therefore, 87.9m. Agreed to add as new hazard to the log. COMAH Incidents • Covered in the PD Port's Emergency plan, COMAH berth operators plan, including offsite plan. Vessels underway are warned by VTS. Marking and Lighting • Navaids are under review. • Number 23 expected to remain in position. • Number 24 buoy will be required at least for the first phase of the dredging. • Lights on the berth yet to be decided.	

	In-Combination sites Northern Gateway (PD Ports) • Initially conceived in 2000. Container terminal dredged to 15m berth pocket. 1,000m long berth (2 vessels) to handle medium sized (approximately 12,000 TU) vessels. Expecting one move per day. Project currently on hold. York Potash • Initially use the old Red Car bulk terminal berth, then extend to the south. Panamax vessels 70-80,000 tonnes. 10 million tonnes per year. Approximately 200 move per year. MGT Power • Biomass plant at number one berth Tees Dock. Re-use of existing berth expecting 2 vessels per week from Q2 2020.	
3	**Hazard Identification**	
	Overall Teesport considered the hazard profile would increase slightly over the construction phase, before reverting back to similar risk profile during the established operational phase. It is considered that while the frequency of the identified hazards in the Teesport Navigation Risk Assessment may increase, the consequences will largely remain the same. Construction Phase • Collision risk highest in vicinity of Tees Dock and turning circle. • Dredger should show RAM shapes / lights. • Collison risk frequency increases with both the additional hopper traffic plus the manoeuvring in and around the barge. • Contact increased frequency due to increase in traffic plus manoeuvring. • Grounding unchanged. • Break-out increase due to risk of hoppers breaking loose from dredger while loading. Operational Phase • Hazard risk scores only marginally increased from current levels. • Barge movements will initially be treated as project moves using PD Ports procedures. (PD Ports are experienced in handling large project moves). • Current movements are 2/3 of those in 2005, therefore, increased level of movements should easily be contained (business as usual). • Overhanging blades from vessels - Can be mitigated. Need some clarification on the number of ships per year	
4	**Risk Controls**	
	• Review regulations concerning using anchor to manoeuvre in river due to the reduction of river bed clearance over tunnels following dredging.	

	• Hold regular meetings with dredge contractors during dredging operations. • No additional risk control measures anticipated at this stage as current RC's considered to be sufficient.	
	Other	
	• Pilotage - Tees Bay Pilots requested clarification on whether pilotage would be required for the suction dredger works. Teesport confirmed that this would be the case • Downstream Tunnel – In their consultation response, Cleveland Emergency Planning Unit commented on the pipeline tunnel running under the river downstream of the turning area as an item to be considered. Teesport confirmed that there is no risk to this tunnel from this project as its proximity is away from the proposed works area.	

Minutes from Remote Consultation – Tees Licensed Foyboatmen Association

Project:	South Bank Development Project
Email Sent:	08/09/2020
Email Feedback Received on:	18/09/2020
From:	Richard Marlow (Marico Marine)
To:	Lee Scott (Tees Licensed Foyboatmen Association)

Item	Notes for the Record	Actions
1	**Introduction**	
	MM introduced the project • Project layout, navigation chart and vessel movement / dredge schedule reviewed. • AIS vessel traffic plots reviewed.	
2	**TLFA Operations**	
	• TLFA operate both workboats and linesmen ashore with 42 staff in total – 21 per day, 14 on watch at any given time with a 06:00-14:00, 14:00-22:00, 22:00-06:00 shift pattern. • TLFA vessels do not carry AIS. • Some projects/ vessels past A-jetty require workboat assistance, however, TLFA rarely take workboats beyond A-jetty. • TLFA shore crew will require workboats to run lines when mooring large vessels on the new quay. • TLFA provides a complete mooring service for the majority of project ships and barges, although projects may utilise their own staff ashore. • Taking jackets on and off the berth would be man-power heavy requiring 8-10 personnel for a wind-farm construction vessel. Lead times would be important if these services are required.	
3	**Hazard Identification**	
	• TLFA commented that the river is not busy and can easily handle additional traffic. • TLFA does not consider there to be a significant increase in hazards. • TLFA is unaware of any issues with the split barges during the 2-year dredging in the Tees dock. • The biggest risk to TLFA would be if activities associated with the project (such as channel dredging) cause operational delays (for example at the opposite tanker berth), resulting in working time directive issues if staff run over their shift hours.	

Minutes from Remote Consultation – Svitzer

Project:	South Bank Development Project
Email Sent:	08/09/2020
Feedback Received Via:	Teams Meeting
Date of Meeting:	23/09/2020
Marico Marine:	Richard Marlow, William Heaps
Svitzer:	Steve Hosie, Gavin Girling, Richard Spalding

Item	Notes for the Record	Actions
1	**Introduction**	
	MM introduced the project: • Project layout, navigation chart and vessel movement / dredge schedule reviewed. • AIS vessel traffic plots reviewed.	
2	**Svitzer Operations**	
	• Svitzer operate 5 tugs based on the Tees (2 x 65tbp, 3 x 40 tbp) plus 3 tugs (1 x70, 1 x 65 and 1 x 40) at the Tyne (allow 2.5 to 3 hours between ports). • In poor weather, Svitzer provides towage to windfarm vessels, even though they are self-propelled. • Svitzer commented that it is able to accommodate additional demand, however, lead times will be necessary to plan / schedule.	
3	**Hazard Identification**	
	• The busiest areas are downstream of the proposed berth. • Svitzer commented that, even with the additional movements the port will still be less busy that when the steelworks were operational. SV operations decreased by 30% when the steelworks closed. **Construction Phase** Collison • Slight increase in risk from current levels, however, can be effectively managed by NTM and VTS. Contact • Slight increase due to increased traffic to South Bank and turning in river. Grounding • No change (risk should decrease following dredging). **Operational Phase** • Risk profile should remain similar to current profile. Break-out	

	• Discussed impact of power cable/ pylons upstream of the site and high air draught cargoes. Use of deep-water downstream berth for high air-draught vessels and cargoes would help deconflict with pylons. • Review of towage guidelines was recommended for high air draught vessels. Project move standard operating procedures should consider this hazard. • A tug could be used to push barges while they are unloading to prevent them from breaking out and drifting towards wires. Navigation Aids • No comments Anchoring • The use of anchors to manoeuvre in the river is rare and only used in an emergency.	
4	**Risk Controls**	
	• Communication is considered to be key to prevent impacts to existing operations. NTM will ensure all river users are aware of the intended works. • Existing mitigation measures enacted by the Tees Port should be sufficient to mitigate any risk increase. • New berths should be charted.	
5	**Other**	
	• Svitzer questioned if any of the river would be shut -off during dredging operations - Marico explained that to its knowledge closure of the river was not being considered and that operations will be controlled through VTS. Continued access is Svitzer's priority. • Svitzer questioned if project vessels will utilise the turning circle? Overhanging blade marking and lighting: • Svitzer - Will overhanging blades be lit during the night? • Marico – Mitigation will be proposed during the assessment – lighting at night, marking during the day Overhanging blade height: • Svitzer - Will tugs be able to navigate under the overhang? • Marico – This should not be an issue due to the height of the jack-up Vessel types: • Svitzer - What types/sizes of jack-up vessels are anticipated • Marico - Example is Voltaire, 160m x 60m	
6	**Actions**	
	• SV requested to be kept up to date with project developments and the project schedule as it evolves. • Svitzer requested to be sent project information to share with the wider team.	

Annex C Construction Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	4	5	1.0	3.14	
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.5	4	4	4	5	2.0	3.84	
3	River	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	Tanker collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	4	5	1.0	2.91	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	River	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	General Cargo Vessel collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79	
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	3	5	1.0	2.84	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
10	River	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	Workboat (Including Dredgers) collides with another Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	One of the Workboats sinks. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	5.0	3	3	1	1	4.0	4.07	
11	River	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	Workboat (Including Dredgers) collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.5	3.16	
12	River	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	Workboat (Including Dredgers) collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	1.0	4	3	1	2	1.0	2.10	
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted).Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	1.0	1.62	

								Most Likely Consequence					Worst Credible Consequence						
ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	Risk Score	Possible Additional Risk Controls
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
18	River	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	A Workboat (Including Dredgers) contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	4.0	1	2	1	1	2.0	1.67	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76	
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00	
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	3.5	5.10	4: Review of Tug Operations and Towage Requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12	
23	River	Contact	Contact berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16	
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	3.0	3	3	2	2	2.0	1.54	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	3.5	2	4	3	4	2.0	3.92	4: Review of Tug Operations and Towage Requirements
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.0	4.22	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
28	River	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	4.0	3.53	
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	2	1	2.0	3	3	2	2	1.0	1.84	
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52	
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.0	4	3	1	4	1.0	2.36	
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.5	1	4	4	5	1.0	3.00	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.5	1	4	3	5	1.0	2.68	
35	River	Grounding	Grounding - Workboat (Including Dredgers)	A Workboat (Including Dredgers) runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	3	1	1	4.0	2.07	
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	1.0	2.78	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
40	River	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	A Workboat (Including Dredgers) is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	4.0	1.31	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	2.0	3	3	2	2	1.0	1.26	
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
43	River	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	A Workboat (Including Dredgers) founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.5	2.38	
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74	

Annex D Operation Phase Risk Assessment Hazard Log – Baseline with Embedded Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05	
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	2.0	3.67	
3	River	Collision	Collision - Tanker ICW Workboat	Tanker collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
7	River	Collision	Collision - General Cargo Vessel ICW Workboat	General Cargo Vessel collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50	
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	3	5	1.0	2.97	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
10	River	Collision	Collision - Workboat ICW Workboat	Workboat collides with another Workboat	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	4.0	3	3	1	1	3.0	2.76	
11	River	Collision	Collision - Workboat ICW Project Cargo	Workboat collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.0	2.95	
12	River	Collision	Collision - Workboat ICW Recreational Vessel	Workboat collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24	
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted).Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	2.0	1.94	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	
18	River	Contact	Contact - Workboat with Navigation Buoy	A Workboat contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76	
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00	
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	4.0	5.50	4: Review of tug operations and towage requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	4.0	4.51	4: Review of tug operations and towage requirements
23	River	Contact	Contact berth - Workboat	A Workboat contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16	
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	2	2	4.0	2.66	4: Review of tug operations and towage requirements

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Catastrophic damage to property (e.g. blades); Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	5	3	4	3.0	5.05	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	3.0	4.72	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements

								Most Likely Consequence					Worst Credible Consequence						
ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	Risk Score	Possible Additional Risk Controls
28	River	Contact	Contact vessel alongside berth - Workboat	A Workboat contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	3.0	3.13	1: Marking and lighting of overhanging blades
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor injuries or a single major injury; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	3	5	3	4	3.0	5.18	1: Marking and lighting of overhanging blades 4: Review of tug operations and towage requirements
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	1: Marking and lighting of overhanging blades

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
31	River	Contact	Contact Overhead Power Cables-General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52	2: High-air draught vessels / vessels carrying large cargoes to use downstream deep-water berth only; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	4.0	4	3	1	4	3.0	4.03	2: High-air draught vessels / vessels carrying large cargoes to use downstream end of berth; 3: Introduction of Safety Zones in vicinity of overhead cables; 4: Review of tug operations and towage requirements.
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	4	5	1.0	2.86	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.0	1	4	3	5	1.0	2.60	
35	River	Grounding	Grounding - Workboat	A Workboat runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	2	3	1	1	3.0	1.54	
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	2.0	3.13	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69	
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
40	River	Mooring Incident	Mooring Incident - Workboat	A Workboat is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	3.0	0.91	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Minor impact on environment Tier 1 to Tier 2 criteria reached but capable to being limited to immediate area within site. Temporary suspension of operations or prolonged restrictions.	1	1	1	1	3.0	3	3	2	3	2.0	1.65	
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56	

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score	Possible Additional Risk Controls
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency		
43	River	Foundering	Foundering / Swamping - Workboat	A Workboat founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.0	2.13	
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74	

Annex E Construction Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	1.0	3.14
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.5	4	4	4	5	2.0	3.84

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
3	River	Collision	Collision - Tanker ICW Workboat (Including Dredgers)	Tanker collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	4	5	1.0	2.91
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07
7	River	Collision	Collision - General Cargo Vessel ICW Workboat (Including Dredgers)	General Cargo Vessel collides with a Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.5	4	3	1	3	3.0	3.79
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	1.0	4	4	3	5	1.0	2.84

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
10	River	Collision	Collision - Workboat (Including Dredgers) ICW Workboat (Including Dredgers)	Workboat (Including Dredgers) collides with another Workboat (Including Dredgers)	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	One of the Workboats sinks. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	5.0	3	3	1	1	4.0	4.07
11	River	Collision	Collision - Workboat (Including Dredgers) ICW Project Cargo	Workboat (Including Dredgers) collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.0	4	4	2	2	2.0	3.16

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
12	River	Collision	Collision - Workboat (Including Dredgers) ICW Recreational Vessel	Workboat (Including Dredgers) collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	1.0	4	3	1	2	1.0	2.10
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel / dredging operations. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted).Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	1.0	1.62
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.5	1	2	1	1	2.0	0.58
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.5	1	2	1	1	2.0	0.58
18	River	Contact	Contact - Workboat (Including Dredgers) with Navigation Buoy	A Workboat (Including Dredgers) contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	1	1	1	4.0	1	2	1	1	2.0	1.67

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	4.5	2	3	3	4	3.5	4.54

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12
23	River	Contact	Contact berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	3.0	3	3	2	2	2.0	1.54

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	3.5	2	4	3	4	1.5	3.73
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.0	4.22

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
28	River	Contact	Contact vessel alongside berth - Workboat (Including Dredgers)	A Workboat (Including Dredgers) contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	5.0	2	2	1	1	4.0	3.53
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	2	1	2.0	3	3	2	2	1.0	1.84
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.0	4	3	1	4	1.0	2.36
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.5	1	4	4	5	1.0	3.00

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.5	1	4	3	5	1.0	2.68
35	River	Grounding	Grounding - Workboat (Including Dredgers)	A Workboat (Including Dredgers) runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	3	1	1	4.0	2.07
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	1.0	2.78

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel / dredging operations. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
40	River	Mooring Incident	Mooring Incident - Workboat (Including Dredgers)	A Workboat (Including Dredgers) is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	4.0	1.31
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Tier 1 to Tier 2 criteria reached; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	2.0	3	3	2	2	1.0	1.26
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
43	River	Foundering	Foundering / Swamping - Workboat (Including Dredgers)	A Workboat (Including Dredgers) founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.5	2.38
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel / dredging operations. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74

Annex F Operation Phase Risk Assessment Hazard Log – Residual with Possible Additional Mitigation

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
1	River	Collision	Collision - Tanker ICW Tanker	Tanker collides with another Tanker	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker breaks away from berth and lies across river. Collides with Tanker on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05
2	River	Collision	Collision - Tanker ICW General Cargo Vessel	Tanker collides with a General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker or General Cargo Vessel breaks away from berth and lies across river or collides with Tanker or General Cargo Vessel on river passage. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	3.0	4	4	4	5	2.0	3.67
3	River	Collision	Collision - Tanker ICW Workboat	Tanker collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Tanker collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tanker collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50
4	River	Collision	Collision - Tanker ICW Project Cargo	Tanker collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	4	5	1.0	3.05

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
5	River	Collision	Collision - Tanker ICW Recreational Vessel	Tanker collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
6	River	Collision	Collision - General Cargo Vessel ICW General Cargo Vessel	General Cargo Vessel collides with another General Cargo Vessel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Two General Cargo Vessels collide whilst passing in the river. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Two General Cargo Vessels collide whilst passing in the river. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.5	4	4	3	5	1.0	3.07
7	River	Collision	Collision - General Cargo Vessel ICW Workboat	General Cargo Vessel collides with a Workboat	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	General Cargo Vessel collides with a ship assist tug or other Workboat on river passage. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	4.0	4	3	1	3	3.0	3.50
8	River	Collision	Collision - General Cargo Vessel ICW Project Cargo	General Cargo Vessel collides with a Project Cargo move	Mechanical defect / failure. Master error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision. Multiple major injuries or single fatality; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	2	2	1	1	2.0	4	4	3	5	1.0	2.97

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
9	River	Collision	Collision - General Cargo Vessel ICW Recreational Vessel	General Cargo Vessel collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	2	1	1	1	2.0	4	3	1	3	1.0	2.21
10	River	Collision	Collision - Workboat ICW Workboat	Workboat collides with another Workboat	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	4.0	3	3	1	1	3.0	2.76
11	River	Collision	Collision - Workboat ICW Project Cargo	Workboat collides with a Project Cargo move	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Pilot boarding and disembarkation operations. Tug ship towage operations. Fire and explosion.	Glancing blow (in particular tug whilst towing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on collision or Workboat being overrun. Multiple major injuries or single fatality; Major damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	3.5	4	4	2	2	2.0	2.95
12	River	Collision	Collision - Workboat ICW Recreational Vessel	Workboat collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24

								Most Likely Consequence					Worst Credible Consequence					
ID	**Area**	**Category**	**Hazard Title**	**Hazard Detail**	**Possible Causes**	**Most Likely Outcome**	**Worst Credible Outcome**	**People**	**Property**	**Environment**	**Business**	**Frequency**	**People**	**Property**	**Environment**	**Business**	**Frequency**	**Risk Score**
13	River	Collision	Collision - Project Cargo ICW Recreational Vessel	Project Cargo move collides with a Recreational Vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Recreational vessel most damaged. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sunk. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	2	1	1	2.0	4	3	1	2	1.0	2.24
14	River	Collision	Collision - Recreational Vessel ICW Recreational Vessel	Recreational Vessel collides with another Recreational Vessel	Mechanical defect / failure. Skipper error. Result of avoiding action with 3rd party vessel. Traffic control failure. Reduced visibility. Sailing vessel taking additional risks during racing. Visiting vessels unfamiliar with local regulations. Fire and explosion.	Glancing blow (especially during racing). Single minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel sinks. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	2	1	1	1	2.0	4	3	1	2	1.0	2.12
15	River	Tug Girting	Tug Girting / Towing Incidents	A tug in difficulty/girts during towage operations (for example during a project cargo operation)	Mechanical defect / failure (tug or vessel being assisted). Master / Skipper error (tug or vessel being assisted).Adverse weather. Fire and explosion.	Tug overrun during towage operation. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Tug girts. Multiple major injuries or single fatality; Major damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	4.0	4	4	1	2	2.0	1.94
16	River	Contact	Contact - Tanker with Navigation Buoy	A Tanker contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
17	River	Contact	Contact - General Cargo Vessel with Navigation Buoy	A General Cargo Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58
18	River	Contact	Contact - Workboat with Navigation Buoy	A Workboat contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	1	2	1	1	2.0	0.58
19	River	Contact	Contact - Project Cargo with Navigation Buoy	A Project Cargo contacts a navigational buoy in the approach channel	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Navigation buoy is sunk. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	1	2	1	1	3.0	0.76
20	River	Contact	Contact - Recreational Vessel with Navigation Buoy	A Recreational Vessel contacts a navigational buoy in the approach channel	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Recreational Vessel is most damaged. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	1	1	1	1	1.0	0.00

								Most Likely Consequence					Worst Credible Consequence					
ID	**Area**	**Category**	**Hazard Title**	**Hazard Detail**	**Possible Causes**	**Most Likely Outcome**	**Worst Credible Outcome**	**People**	**Property**	**Environment**	**Business**	**Frequency**	**People**	**Property**	**Environment**	**Business**	**Frequency**	**Risk Score**
21	River	Contact	Contact berth - Tanker	A Tanker contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	2	2	1	5.0	2	3	3	4	3.5	5.10
22	River	Contact	Contact berth - General Cargo Vessel	A General Cargo Vessel contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse regional publicity. Temporary suspension of commercial activities and/or prolonged restrictions.	1	2	1	1	5.0	2	3	2	3	3.5	4.12
23	River	Contact	Contact berth - Workboat	A Workboat contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	2	1	1	5.0	2	2	1	1	4.0	3.16
24	River	Contact	Contact berth - Project Cargo Vessel	A Project Cargo contacts a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing at speed. Multiple minor or single major injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	2	2	3.5	2.27

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
25	River	Contact	Contact berth - Recreational Vessel	A Recreational Vessel contacts a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Heavy berthing at slow speed. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Uncontrolled berthing. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
26	River	Contact	Contact vessel alongside berth - Tanker	A Tanker contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Catastrophic damage to property (e.g. blades); Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.5	4.45
27	River	Contact	Contact vessel alongside berth - General Cargo Vessel	A General Cargo Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	2	4	3	4	2.5	4.45
28	River	Contact	Contact vessel alongside berth - Workboat	A Workboat contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	2	2	1	1	4.0	2	2	1	1	2.0	2.00

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
29	River	Contact	Contact vessel alongside berth - Project Cargo Vessel	A Project Cargo contacts a vessel alongside a berth	Restriction of navigable channel by overhanging blades. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Moderate damage to property; Tier 1 – Tier 2 criteria reached. Small operational (oil) spill with little effect on environmental amenity; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Multiple minor injuries or a single major injury; Catastrophic damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse national publicity. Medium-term suspension of operations or prolonged restrictions, major disruption to commercial activities.	1	3	2	1	4.0	3	5	3	4	2.5	4.90
30	River	Contact	Contact vessel alongside berth - Recreational Vessel	A Recreational Vessel contacts a vessel alongside a berth	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Glancing blow. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Head-on contact. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
31	River	Contact	Contact Overhead Power Cables- General Cargo vessel	A General Cargo Vessel contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	1.5	4	3	1	4	1.0	2.43
32	River	Contact	Contact Overhead Power Cables - Project Cargo	A Project Cargo contacts the Overhead Power Cables.	Incorect assessment of air-draught. Incorrect assessment of HOT. Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel.	Light contact from upper-works (mast/aerial). Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Bad local publicity. Temporary power disruption during cable inspection.	Heavy contact with overhead wire downing cable. Multiple major injuries or single fatality; Moderate damage to vessel. Tier 1 may be declared but criteria not necessarily met; Adverse national publicity. Medium-term suspension of operations or prolonged impact to regional power supplies, major disruption to commercial activities.	2	2	1	2	2.0	4	3	1	4	1.0	2.52

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
33	River	Grounding	Grounding - Tanker	A Tanker runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 3 criteria reached with pollution requiring national support. Chemical spillage or small gas release (COMAH); Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	4	5	1.0	2.86
34	River	Grounding	Grounding - General Cargo Vessel	A General Cargo Vessel runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	2.0	1	4	3	5	1.0	2.60
35	River	Grounding	Grounding - Workboat	A Workboat runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	2	3	1	1	3.0	1.54
36	River	Grounding	Grounding - Project Cargo	A Project Cargo runs aground	Mechanical defect / failure. Master error. Pilot / PEC holder error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Very minor injury; Major damage to property; Tier 2 spill criteria reached but capable of being limited to immediate area within site; Adverse international publicity. Long-term suspension of operations, prolonged restrictions, and/or termination of commercial activities.	1	2	1	1	3.0	1	4	3	5	2.0	3.13

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
37	River	Grounding	Grounding - Recreational Vessel	A Recreational Vessel runs aground	Mechanical defect / failure. Skipper error. Adverse weather. Reduced visibility. Result of avoiding action with 3rd party vessel. Fire and explosion.	Vessel touches the bottom and refloats. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel heavily aground. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	2	2	1	1	2.0	0.69
38	River	Mooring Incident	Mooring Incident - Tanker	A Tanker is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
39	River	Mooring Incident	Mooring Incident - General Cargo vessel	A General Cargo Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Adverse local publicity. Short-term loss of revenue including minor disruption to commercial activities.	1	1	1	1	5.0	3	3	1	2	3.0	1.81
40	River	Mooring Incident	Mooring Incident - Workboat	A Workboat is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	5.0	2	2	1	1	3.0	0.91

ID	Area	Category	Hazard Title	Hazard Detail	Possible Causes	Most Likely Outcome	Worst Credible Outcome	Most Likely Consequence					Worst Credible Consequence					Risk Score
								People	Property	Environment	Business	Frequency	People	Property	Environment	Business	Frequency	
41	River	Mooring Incident	Mooring Incident - Project Cargo	A Project Cargo is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Multiple minor or single major injury; Moderate damage to property; Minor impact on environment Tier 1 to Tier 2 criteria reached but capable to being limited to immediate area within site. Temporary suspension of operations or prolonged restrictions.	1	1	1	1	3.0	3	3	2	3	2.0	1.65
42	River	Mooring Incident	Mooring Incident - Recreational Vessel	A Recreational Vessel is ranged or breaks away from its mooring	Failure of ship's mooring gear. Failure of fixed mooring gear. Inadequate seamanship / watch keeping. Extreme weather. Excessive wash or draw-off. Water surge caused by large vessel moving in the port (Especially at low water). Vandalism. Fire and explosion.	Mooring line parts. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	All mooring lines part and vessel breaks away from the berth. Single minor injury; Minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	2.0	2	2	1	1	1.0	0.56
43	River	Foundering	Foundering / Swamping - Workboat	A Workboat founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	4.0	4	3	1	1	3.0	2.13
44	River	Foundering	Foundering / Swamping - Recreational Vessel	A Recreational Vessel founders or is swamped by a passing vessel	Mechanical defect / failure. Master / Skipper error. Pilot / PEC holder error. Result of avoiding action with 3rd party vessel. Excessive speed. Fire and explosion.	Vessel takes on water whilst unattended. Very minor injury; Very minor damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	Vessel founders or is swamped whilst in service. Multiple major injuries or single fatality; Moderate damage to property; No effect of note. Tier 1 may be declared but criteria not necessarily met; Very short-term disruption to services with ensuing loss of revenue.	1	1	1	1	3.0	4	3	1	1	2.0	1.74

Appendix 10

Transport Statement

Royal
HaskoningDHV

REPORT

South Bank Quay

Transport Statement

Client: Tees Valley Combined Authority

Reference: PC1084-RHD-SB-EN-RP-EV-1112
Status: Final/P01
Date: 07 October 2020

Royal HaskoningDHV
Enhancing Society Together

HASKONINGDHV UK LTD.

Rightwell House
Rightwell East
Bretton
Peterborough
PE3 8DW
Transport & Planning
VAT registration number: 792428892

+44 1733 334455 **T**
+44 1733 262243 **F**
info.peterborough@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

Document title: South Bank Quay

Document short title:
Reference: PC1084-RHD-SB-EN-RP-EV-1112
Status: P01/Final
Date: 07 October 2020
Project name: South Bank quay
Project number: PC1084
Author(s): Jimoh Ibrahim

Drafted by: Jimoh Ibrahim

Checked by: Sam Taylor

Date: 07.10.2020

Approved by: Andrew Ross

Date: 07.10.2020

Classification
Project related

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
ISO 45001

Unless otherwise agreed with the Client, no part of this document may be reproduced or made public or used for any purpose other than that for which the document was produced. HaskoningDHV UK Ltd. accepts no responsibility or liability whatsoever for this document other than towards the Client. Please note: this document contains personal data of employees of HaskoningDHV UK Ltd.. Before publication or any other way of disclosing, this report needs to be anonymized.

Contents

Tables

Figures

1 Introduction

1.1 Background

1.1.1 This Transport Statement (TS) has been prepared by Royal HaskoningDHV on behalf of Tees Valley Combined Authority (TVCA) in support of a planning application and marine licence application to construct a new quay at South Bank (Tees estuary) (referred to as the proposed scheme hereafter).

1.1.2 The new quay would support South Tees Development Corporation's (STDC's) landside proposals for general industry and storage, or distribution uses within part of the South Industrial Zone (SIZ).

1.1.3 The proposed scheme comprises demolition of the existing wharf, jetties and other minor infrastructure along the intertidal and on the river bank at South Bank (including an electrical substation), capital dredging (to deepen the northern half of the Tees Dock turning circle, a section of the existing approach channel and to create a berth pocket), offshore disposal of dredged sediments and construction and operation of a new quay (to be set back into the riverbank). The location of the proposed scheme is shown in **Figure 1**.

1.1.4 A separate planning application has been submitted to Redcar and Cleveland Borough Council (RCBC) for the landside proposals at the South Industrial Zone (Planning ref: R/2020/0357/OOM) (referred to hereafter as the landside works). The planning application for the landside works was supported by an Environmental Statement (ES) and a Transport Assessment (TA).

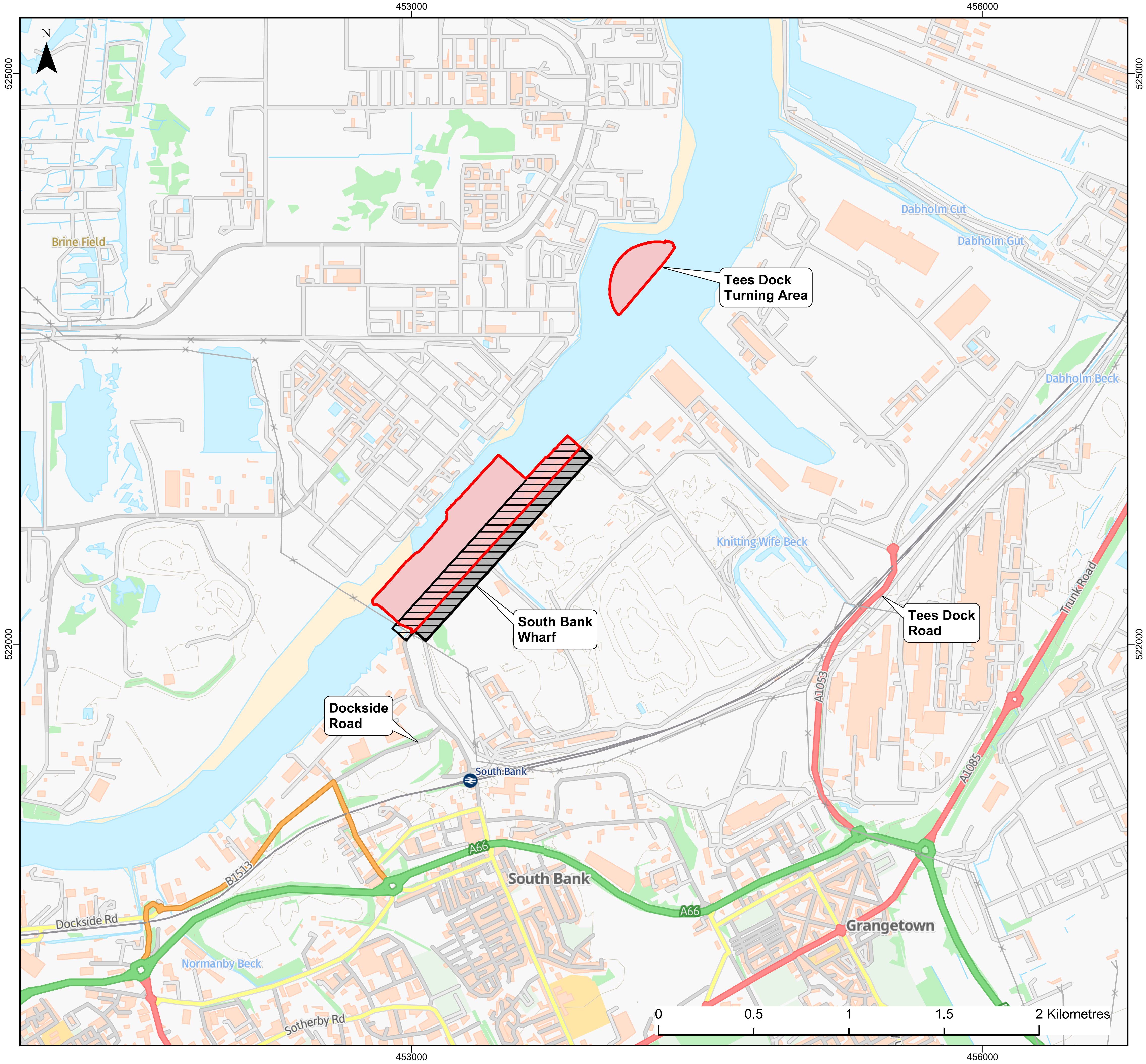
1.2 Scope

1.2.1 The proposed new quay at South Bank would be required to support the landside works at the SIZ. The TA submitted in support of the planning application for the landside works included a detailed assessment of the operational impacts.

1.2.2 The TA for landside works identifies that when fully operational, there could be up to 3,870 employees at the SIZ. It is forecast that up to 10 employees would be required to operate the new quay.

1.2.3 The TA for the SIZ contains a comprehensive assessment of traffic impacts generated by operational traffic movements. It is therefore implicit that the 10 employees (for the proposed new quay) would have been contained within the bounds of the assessed outcomes of the SIZ TA and are therefore not a material consideration within this TS. The scope of this TS therefore focusses upon impacts of the construction of the new quay only.

1.2.4 The TA for the landside works stated that the specifics of construction were not known at the time of writing and as such made a commitment to produce a Construction Traffic Management Plan (CTMP) to assess the construction impacts of the landside proposals.



Legend

- 🟥 Proposed Dredge and Excavation Envelope (including side slopes)
- ▨ Proposed Quay Envelope
- ▤ Proposed Demolition Area

Client: Tees Valley Combined Authority

Project: South Bank Quay

Title: Site Location

Figure: 1

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	29/10/2020	TC	JI	A3	1:20,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

1.2.5 The purpose of this TS is to quantify the potential impacts associated with the construction of the proposed quay at South Bank. It is envisaged that this information would then allow the CTMP for the landside works to include a detailed assessment of the potential for cumulative construction impacts with the new quay.

1.3 Consultation

1.3.1 **Table 1.1** provides a summary of the consultation responses provided by consultees to the planning application for the landside works. These are considered to be pertinent to the traffic and transport parameters of the proposed scheme. **Table 1.1** details how this TS has been developed in response to the comments received on the landside application.

1.3.2 This TS has been created in accordance with the landside application consultation dialogue. The consultee responses have been considered in the proposed scheme.

Table 1.1: Summary of comments received on the landside proposals

Consultee	Consultee response	TS reference
RCBC Transport Officer 17th July 2020	*"The Teesdale Way historic trail runs along the opposite side of the railway line along the southern boundary of the site. This should not be affected by the proposed works. There are no PROW objections."*	**Section 4** details the proposed scheme including the associated construction traffic. The proposed scheme does not affect the Teesdale Way historic trail.
Highways England 7th August 2020	Recommended that planning permission should not be granted for a specific period (a holding objection): *"To ensure that the A174 & A1053 Trunk Roads continue to serve their purpose as part of a national system of routes for through traffic in accordance with Section 10(2) of the Highways Act 1980 by minimising disruption on the trunk road network and in the interests of road safety.* *The recommendation shall be maintained until 7 November 2020 or until sufficient information has been received to enable Highways England to reach an alternative view at which point a further notice will be issued."*	**Section 4** details the proposed scheme including the associated construction traffic. There are no significant impacts upon the A174 and A1053.
Network Rail 19th August 2020	*"Network Rail would be keen to ensure that there was no impact on railway assets from construction traffic associated with the site. Any Environmental Impact Assessment should include details of the haulage routes in the Transport Assessment and a traffic management plan associated with the marine construction works"*	**Section 4** details the proposed scheme including the associated construction traffic. There are no impacts predicted on the railway assets as a result of the proposed scheme.

1.4 Report structure

1.4.1 This TS details the transport context of the existing site and provides a summary of the forecast construction traffic on the local highway network.

1.4.2 Following this introduction, the TS is structured as follows:

- **Section 2** provides a summary of the relevant national and local policy guidelines, specific to the proposed scheme;

- **Section 3** describes the existing transport situation at and in the vicinity of the existing site, including details of sustainable transport provision and road safety;
- **Section 4** outlines the construction vehicular traffic generation from the proposed scheme; and
- **Section 5** provides a summary and conclusion.

2 Planning context

2.1 Introduction

2.1.1 There are a number of overarching national and local items of policy and guidance applicable to the proposed scheme. The following subsections focus on key policy and guidance pertinent to the proposed scheme.

2.2 National planning policy

National Planning Policy Framework

2.2.1 The National Planning Policy Framework (NPPF) was published in March 2012 by the Ministry of Housing, Communities and Local Government and is the primary source of national planning guidance in England. The NPPF was last updated in June 2019.

2.2.2 The NPPF contains the Government's strategies for economic, social and environmental planning policies in England and it is designed to be a single, tightly focused document.

2.2.3 **Table 2.1** provides details of the relevant transport policies contained within the NPPF.

Table 2.1: Relevant NPPF Policies

NPPF Reference	Policy Requirements	TS Reference
Chapter 9 – Promoting Sustainable Transport	Paragraph 109: *"Development should only be prevented or refused on highways grounds if there would be an inacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe."*	**Section 3** details the existing highway network including road safety. **Section 4** details the proposed scheme's construction traffic demand.
	Paragraph 111: *"All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed."*	**Section 4** details the proposed scheme's construction traffic demand.

2.3 Local planning policy

2.3.1 The development's proposals fall under the jurisdiction of Redcar and Cleveland Borough Council and Middlesbrough Council. The local planning documents relevant to the proposed scheme are:

- Redcar and Cleveland Local Plan;
- Redcar and Cleveland Local Transport Plan (LTP 3);
- Redcar and Cleveland South Tees Area Supplementary Planning Document (SPD); and
- Middlesbrough Local Plan.

Redcar and Cleveland Local Plan

2.3.2 The Redcar and Cleveland Local Plan adopted in May 2018 is a statutory document that sets out the vision and overall development strategy for the borough and how it will be achieved for the period until 2032. The Plan provides the policy framework to meet these challenges and to deliver sustainable development across the borough.

Redcar and Cleveland Local Transport Plan 3 (LTP3)

2.3.3 The Redcar and Cleveland Local Transport Plan 3 (LTP3), was submitted in March 2011 to the Department for Transport (DfT). The LTP was developed in partnership with key stakeholders and neighbouring authorities to reflect the external factors that are affecting service delivery. A timescale of 2021 was adopted for the long-term transport strategy.

Redcar and Cleveland South Tees Area Supplementary Planning Document (SPD)

2.3.4 The Supplementary Planning Document (SPD), adopted in May 2018 was prepared to support the adopted planning policies to guide and inform future planning applications that will support both the expansion of existing business operators and future employment opportunities who wish to locate to the South Tees Area.

Middlesbrough Local Plan

2.3.5 The Local Plan is a series of development plan documents that set policies and proposals for the use of land in Middlesbrough. It includes the Housing Local Plan, a Core Strategy, and Regeneration DPD.

2.3.6 The Council is currently preparing a new Local Plan for Middlesbrough. The new Local Plan will set out a vision for the future development of Middlesbrough in relation to housing, the economy, the environment, community facilities and infrastructure, up to 2037. The new Local Plan, when adopted, will replace the existing planning policy documents, and provide a basis for determining planning applications within Middlesbrough. The council consulted on its publication Local Plan in 2018 and this TS considers the publication as the appropriate local plan.

2.3.7 **Table 2.2** provides details of the local planning policy documents and the policies contained within which are relevant to the parameters of the proposed scheme.

Table 2.2: Relevant local planning policies

Policy reference	Policy requirements	TS consideration
Redcar and Cleveland Local Plan (May 2018)		
Policy TA1 – Transport and New Development	The Council and its partners will ensure that the transport requirements of new development, commensurate to the scale and type of development, are taken into account and seek to promote sustainable travel to minimise environmental impacts and support residents' health and wellbeing. Applicants will need to demonstrate that existing or proposed public transport services can accommodate development proposals, or, where appropriate, demonstrate how public transport improvements will be delivered.	**Section 4** details the proposed scheme's construction traffic demand.

Policy reference	Policy requirements	TS consideration
Middlesbrough Publication Local Plan (October 2018)		
Policy INFRA 1 – Integrated Transport Strategy	A 21st century sustainable transport network will reduce the need for and dependency on car borne travel by improving non car connectivity within and beyond Middlesbrough. This would be achieved by enhancing and extending the accessibility to, and quality of, a safe pedestrian and cycle network (including Public Rights of Way) by Ensuring development proposals provide high quality access and integration into strategic routes together with appropriate storage facilities.	**Section 3** details the existing highway network including an audit of the sustainable transport infrastructure.
Policy DM1 – General Development Principles	When assessing the suitability of development, it will be permitted where it: • Will not adversely impact on highway safety or lead to unacceptable provision of car parking; • Achieves accessibility by a choice of sustainable transport modes.	**Section 3** details the existing highway network including a review of road safety and car parking. **Section 4** details the proposed scheme's traffic generation for construction.

2.4 Planning guidance

Planning Practice Guidance (PPG)

2.4.1 Planning Practice Guidance (PPG) 'Travel Plans, Transport Assessment and Statements' (henceforth referred to as the Transport PPG) sets out the key principles to be adopted when developing a TS as follows:

- Proportionate to the size and scope of the proposed development to which they relate and build on existing information wherever possible;
- Established at the earliest practicable possible stage of a development proposal;
- Be tailored to particular local circumstances (other locally determined factors and information beyond those which are set out in this guidance may need to be considered in these studies provided there is robust evidence for doing so locally); and
- Be brought forward through collaborative ongoing working between the Local Planning Authority / transport authority, transport operators, rail network operators, Highways Agency (now Highways England) where there may be implications for the strategic road network and other relevant bodies.

2.4.2 The Transport PPG principles have shaped the development of this TS and can be seen throughout the document.

3 Baseline conditions

3.1 Introduction

3.1.1 This section of the report sets out the context of the existing site, in relation to the local transport infrastructure and accessibility.

3.2 Local highway context

3.2.1 The proposed scheme footprint is located within the STDC area, a part of the South Industrial Zone. The landside parts of the proposed scheme are located on the south bank of the River Tees, approximately 7km to the west of Redcar town centre and 5km to the east of Middlesbrough town centre.

3.2.2 Vehicular access to the proposed scheme footprint is currently provided from Tees Dock Road and Dockside Road, existing access roads to the east and west of the proposed scheme respectively.

3.2.3 Tees Dock Road is predominantly a single-lane single carriageway that runs south from the west of the site to its roundabout with the A1053. The road is subject to the National Speed Limit until its approach to the access gate where it is subject to a 30mph speed limit. A continuous footway on the left side of the road are present along the road. There is no street lighting along the road.

3.2.4 The A1053 is a two-way dual carriageway road to the south of its roundabout with the A66 to its roundabout with the A174 within proximity of the proposed scheme footprint and is subject to the National Speed Limit. Street lighting is present along the entirety of the road whilst a continuous footway and cycleway is present along the length of the road between the A66 and the A1085. .

3.2.5 Dockside Road is a single carriageway road that runs east from The Leeway (within proximity of the Riverside Stadium) through its roundabouts with Works Road and Old Station Road to its roundabout with Smith's Dock Road. The majority of the road is subject to a 50mph speed limit with the exception of the approaches to Old Station Road and Smith's Dock Road which are subject to a 30mph speed limit. Street lighting and a continuous footway on the northern side of the road are present along the road.

3.2.6 Similarly, Old Station Road is a single carriageway road that runs south of its roundabout with Dockside Road to its roundabout with the A66. The road is subject to a 30mph speed limit with street lighting, and continuous footways present along the road.

3.2.7 The A66 is a two-way dual carriageway road that east of its junction with the A171 to its roundabout with the A1053 within proximity of the site and is subject to a 50mph speed limit. Street lighting is present along the length of the road.

Baseline traffic flows

3.2.8 Due to the COVID-19 pandemic, it was not possible to obtain representative baseline survey data from new traffic counts. To establish the baseline traffic flows, the following data sources have therefore been utilised:

- Annual Average Daily Flows (AADF) data from Department for Transport (DfT) traffic counts[1]; and
- 2016 Manual Classified Counts (MCC) data (07:00 to 10:00 and 15:00 to 18:00) publicly available online for the planning application for the new roundabout at Smith's Dock Road[2]

3.2.9 Growth factors extracted from the Trip End Model Presentation Program (TEMPro) v7.2 have been used to factor up the MCC 2016 baseline traffic counts to a 2018 base year to correlate with the date of the DfT traffic counts. The factors used were for a car driver on an average day based on the National Transport Model (NTM) AF15 dataset for all urban roads in Middlesbrough and Redcar and Cleveland.

3.2.10 **Table 3.1** details the baseline traffic flows for the local highway network.

Table 3.1: Baseline traffic flows

Road	Source	2018 AADF	
		All vehicles	HGVs
Tees Dock Road	2018 DfT (7490)	4,830	1,486
Old Station Road	MCC Data*	5,013	795
Dockside Road	MCC Data*	5,446	776
A66 (East)	2018 DfT (8673)	47,977	3,763
A66 (West)	2018 DfT (9799)	22,383	2,999
A1053	2018 DfT (48684)	22,378	1,736
* MCC Data converted to AADF based on factors derived from the traffic profile of the A66.			

3.3 Accessibility

Accessibility by walking

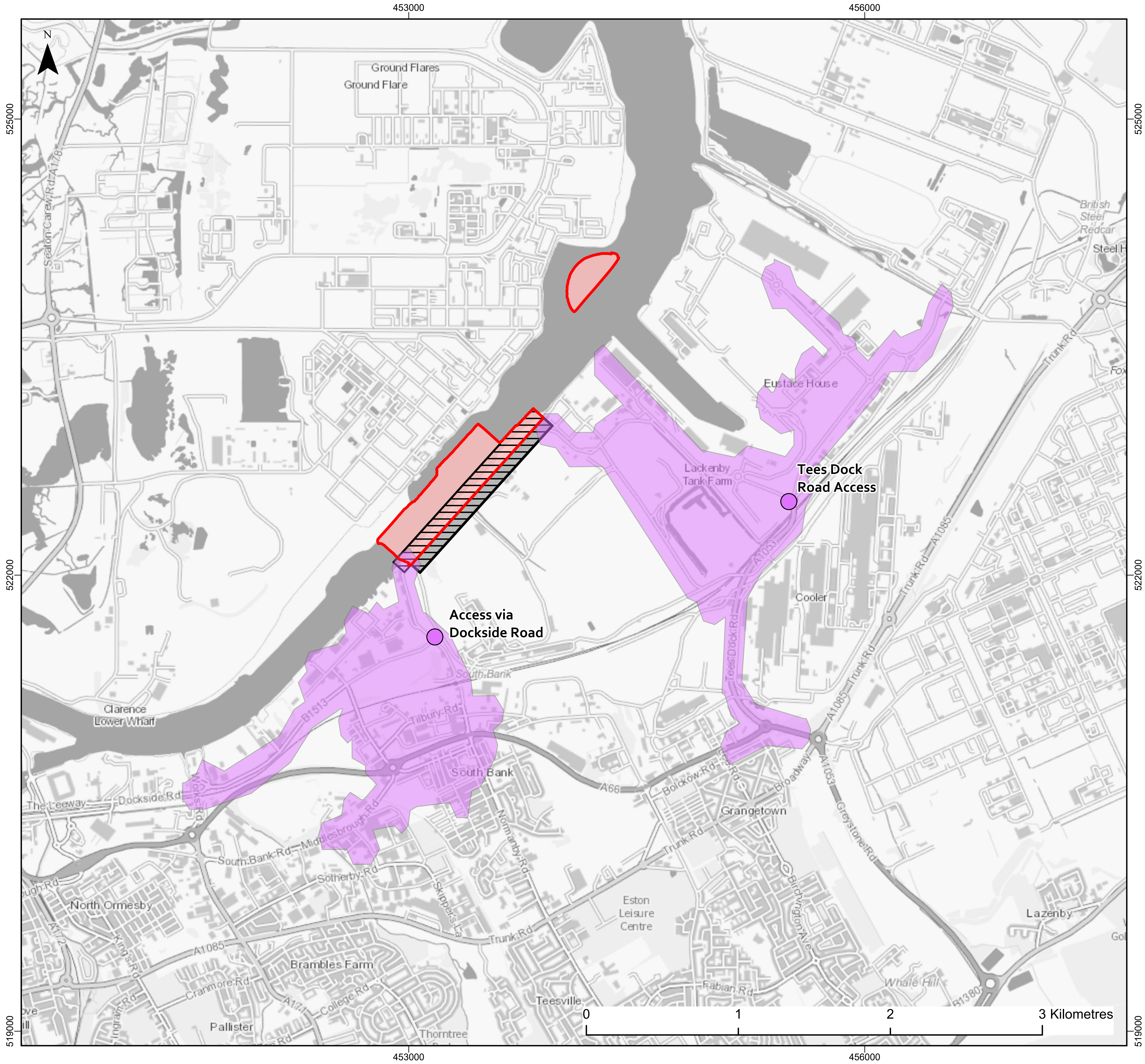
3.3.1 The Chartered Institution of Highways and Transportation (CIHT) document 'Guidelines for Providing for Journeys on Foot', notes that an average walking speed of three miles per hour could be assumed. By this measure, in 15 minutes, a pedestrian could walk approximately 1,200 metres (m) (1.2km) and in 25 minutes, up to 2,000m (2km). **Figure 2** depicts the 2km walking cordon to the proposed scheme footprint.

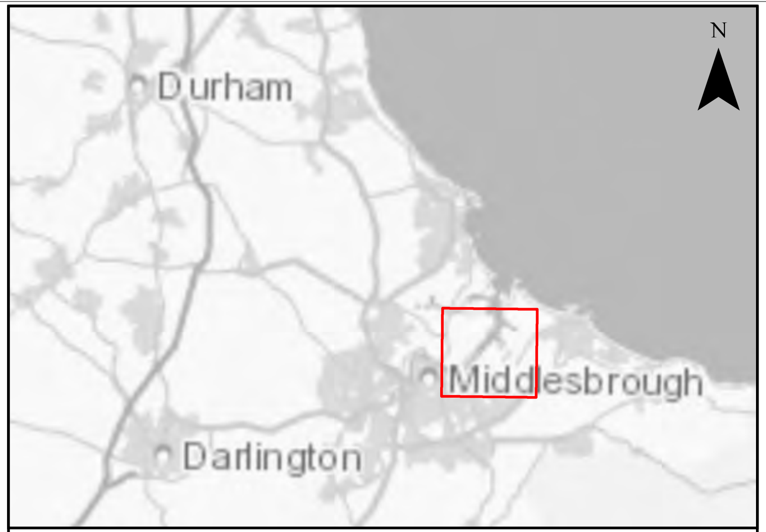
3.3.2 Adopting the 2km parameter (shown in **Figure 2**), the northern region of South Bank is walkable from the proposed scheme. Within this cordon it is possible to walk to a bus stop, a rail station and local amenities.

---

[1] *AADF values based on 2018 DfT data, source: https://roadtraffic.dft.gov.uk/#16/53.4416/-2.9969/basemap-countpoints*

[2] *Planning ref R/2017/0788/FF: https://planning.redcar-cleveland.gov.uk/Planning/Display?applicationNumber=R%2F2017%2F0788%2FFF*





Legend

- 🟥 Proposed Dredge and Excavation Envelope (including side slopes)
- ▨ Proposed Quay Envelope
- ☐ Proposed Demolition Area
- 🟪 2km Walking Cordon
- ● Road Access Point

Client: Tees Valley Combined Authority

Project: South Bank Quay

Title: Walking Catchment

Figure: 2

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	29/10/2020	TC	JI	A3	1:25,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

Accessibility by cycling

3.3.3 The CIHT guidance 'Cycle Friendly Infrastructure, Guidelines for Planning and Design' states that three quarters of journeys by all modes are 8km (less than 5 miles) and that this distance could be cycled comfortably by a fit person. This distance corresponds to an approximate 25-minute travel time. It is concluded therefore, that 8km represents a maximum realistic range for cycling trips. **Figure 3** depicts the 8km cycling cordon of the site.

3.3.4 Adopting the 8km parameter (shown in **Figure 3**), the majority of Middlesbrough is within comfortable cycling distance. In addition, the north western region of Redcar and Cleveland are also within commutable cycling distance.

Accessibility by bus

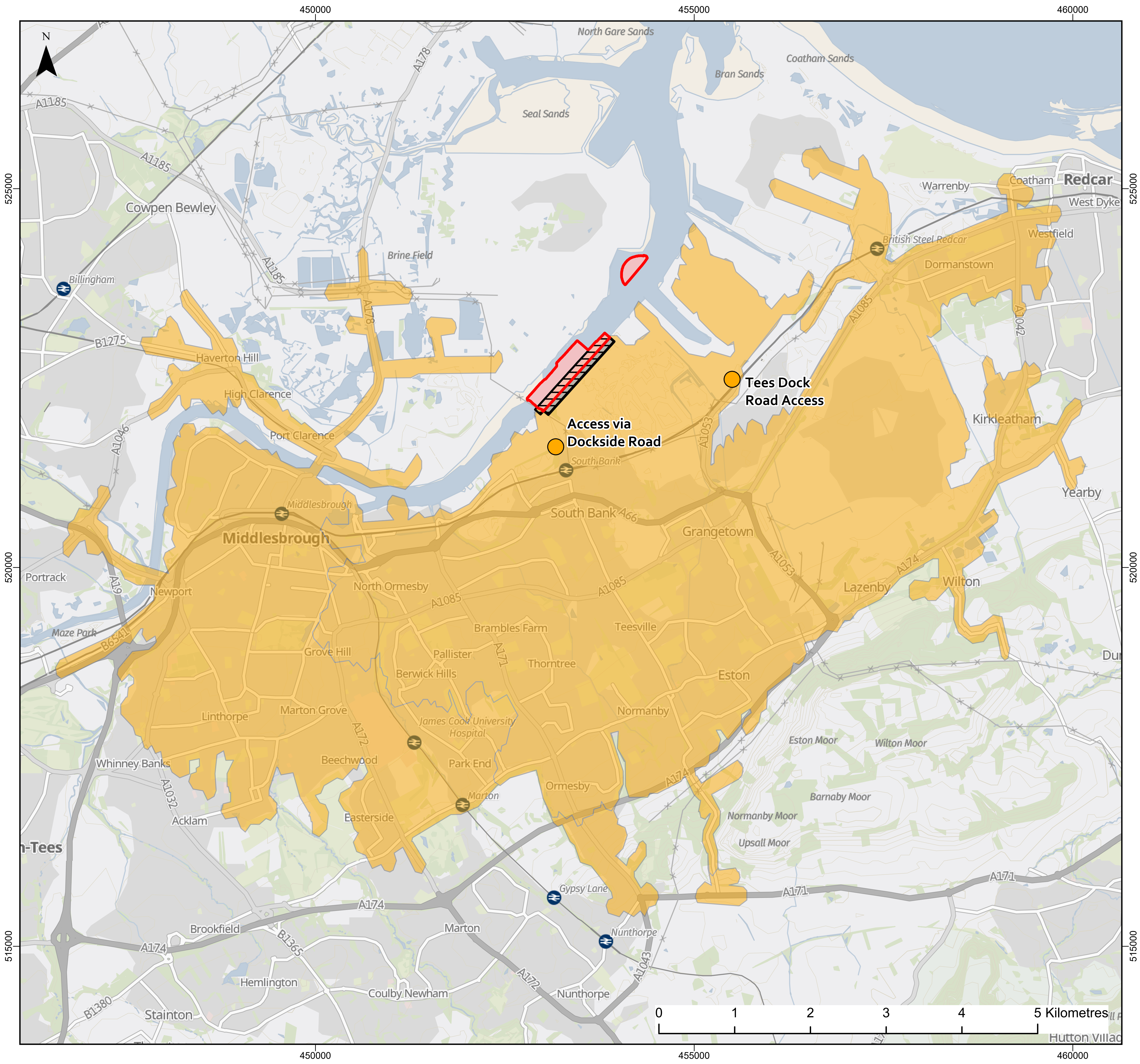
3.3.5 The nearest bus stops to the proposed scheme footprint are the South Bank King George's Square bus stops located on the Normanby Road, an approximate walking distance of 800m from the Smith's Dock Road access. A summary of the bus services accessible from the nearby bus stops, including approximate service frequencies, is provided in **Table 3.2**.

Table 3.2: Summary of bus services and approximate daytime frequencies

Service	Route	Approximate daytime frequency								
		Monday - Friday			Saturday			Sunday		
		First	Freq	Last	First	Freq	Last	First	Freq	Last
64	Grangetown (Teesside) - Middlesbrough	05:45	30 mins	18:49	05:45	30 mins	18:49	No service		
64	Middlesbrough - Grangetown (Teesside)	06:37	30 mins	17:34	08:30	30 mins	18:20			
64A	Middlesbrough - Grangetown (Teesside)	07:10	30 mins	23:00	08:10	30 mins	23:00	09:47	60 mins	18:47
64A	Grangetown (Teesside) - Middlesbrough	07:34	30 mins	22:33	07:24	30 mins	22:33	11:24	60 mins	19:24
64B	Lazenby - Middlesbrough Bus Station	06:26	30 mins	06:56	06:26	30 mins	06:56	No service		

Accessibility by rail

3.3.6 The CIHT document "Planning for Walking" states that "People will walk up to 800 metres to get to a railway station, which reflects the greater perceived quality or importance of rail services".



Legend

🟥 Proposed Dredge and Excavation Envelope (including side slopes)

⬛ Proposed Quay Envelope

▤ Proposed Demolition Area

🟨 8km Cycling Cordon

● Road Access Point

Client:	Project:
Tees Valley Combined Authority	South Bank Quay

Title:

Cycling Catchment

Figure: 3

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	29/10/2020	TC	JI	A3	1:50,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

3.3.7 South Bank railway station is approximately 380m from the Smith's Dock Road access. The station is managed by Northern Trains, a major franchise serving the North of England. Hourly services are provided by the station throughout the day from Monday to Sunday. These services provide links to Middlesbrough, and Redcar Central. Middlesbrough and Redcar Central provide wider connections on a national and city level.

Summary of accessibility

3.3.8 It is demonstrated that the existing scheme footprint benefits from a level of pedestrian and cycle accessibility, as well as bus and rail services which could facilitate connections to the wider area.

3.3.9 However, due to the relatively remote location of the scheme footprint and the nature of the construction activities, it is envisaged that sustainable transport would not be a prominent mode of transport to the site. Typical of a construction workforce, it is envisaged that employees would choose to travel to the site by car.

3.4 Road safety

3.4.1 In order to establish whether there are any inherent safety issues on the highway network within the immediate vicinity of the existing site, personal injury collision data from CrashMap[3] for the most recent five-year period available (January 2014 to September 2018) has been reviewed. **Table 3.3** provides a summary of the types of collisions identified within the study area.

Table 3.3: Summary of collisions identified

Location*	Collisions				Summary of collisions
	Slight	Serious	Fatal	Total	
A66 / A171 Roundabout	17	0	0	17	Within the last five years there have been 17 collisions. Of the 17 slight collisions, seven occurred on the A66 approaches to the roundabout. A potential pattern of collisions on the A66 approaches to the roundabout is identified.
A66 between A171 roundabout and B1513 roundabout	2	0	0	2	Within the last five years there have been two collisions. There is no pattern to the location of these collisions.
A66 / B1513 Roundabout	7	0	0	7	Within the last five years there have been seven collisions. As the collisions are spread across the roundabout, there is no pattern to the location of these collisions.
A66 between B1513 roundabout and Normanby Road junction	1	0	0	1	Within the last five years there has been one collision.
A66 / Normanby Road Junction	7	2	0	9	Within the last five years there have been nine collisions of which seven were slight and two were serious. All the collisions occurred at the crossroad junction, hence a potential pattern of collisions at the junction is identified.
A66 between Normanby Road junction and Eston	2	0	0	2	Within the last five years there have been two collisions. There is no pattern to the location of these collisions.

---

[3] *Source: CrashMap website: www.crashmap.co.uk/*

Location*	Collisions				Summary of collisions
	Slight	Serious	Fatal	Total	
Road junction					
A66 / Eston Road Junction	3	2	0	5	Within the last five years there have been five collisions of which three were slight and two were serious. All the collisions occurred at the crossroad junction, hence a potential pattern of collisions at the junction is identified.
A66 between Eston Road junction and A1053 roundabout	0	0	0	0	No collisions identified.
A66 / A1053 Roundabout	1	0	0	1	Within the last five years there has been one collision.
A1053 between A66 roundabout and A1085 roundabout	1	0	0	1	Within the last five years there has been one collision.
A1053 / A1085 Roundabout	3	0	0	3	Within the last five years there have been three collisions. There is no pattern to the location of these collisions.
Tees Dock Road	0	1	0	1	Within the last five years there has been one collision.
Smith's Dock Road	0	0	0	0	No collisions identified.
Dockside Road	0	0	0	0	No collisions identified.
Old Station Road	0	0	0	0	No collisions identified.
*Includes a 50m buffer for junctions					

3.4.2 **Table 3.3** identifies that there are no potential road safety issues on all roads and junctions within the immediate vicinity of the existing scheme footprint accesses. There are four potential clusters of collisions at junctions along the A66 which are typical of the nature of the locations.

3.4.3 In order to inform a judgement regarding potential impact significance of these clusters **Section 4** outlines the proposed additional construction traffic movements.

4 Construction traffic demand

4.1 Introduction

4.1.1 This section of this TS provides an overview of the construction phase of the proposed scheme. The construction programme is set out in **Appendix A**.

4.2 Description of construction activities

Demolition

4.2.1 The site of the proposed scheme is currently occupied by a dilapidated wharf approximately 750m in length, two jetties immediately downstream, a further jetty at the extreme downstream end of the proposed scheme footprint and various buildings and structures on the riverbank and the adjacent hinterland (including a live substation).

4.2.2 Demolition works to be undertaken as part of the proposed scheme which is the subject of this TS are limited to the dilapidated wharf, the three jetties, a live electrical substation on the hinterland and pipework which previously abstracted water from the Tees estuary associated with the pumping station. In addition, it has been assumed that underground utilities and pipework infrastructure would need to be grubbed out / excavated / diverted / capped as part of the demolition process prior to construction of the quay.

4.2.3 During demolition, best practice demolition techniques and working methods would be adopted to ensure that transport of debris into the Tees is minimised.

Quay construction

4.2.4 The proposed scheme requires the construction of a new solid piled quay structure. Although the useable surface of the quay itself would be up to 30m wide, the overall footprint of the quay would be up to 50m wide due to the proposals to construct an anchor structure further inland of the quay deck. The exact alignment of the quay is unknown at this stage and therefore for the purposes of assessment, a maximum quay envelope of 1,300m x 75m has been assessed.

4.2.5 It is proposed that land-based plant would predominantly be utilised for the quay construction.

Excavation of soils

4.2.6 There would be a requirement for the excavation of approximately 275,000m^3 of existing soils behind the proposed combi-wall in order to install tie rods. Such material would be removed using long reach excavators. At this stage, it is envisaged that the excavated material could be re-used on site, avoiding the requirement for offsite disposal.

4.2.7 There is also a requirement to excavate soils/landside materials within the riverbank in order to create the berth pocket (as the berth line has been set approximately 90m inland from the edge of the channel). It is anticipated that such material would be excavated using standard long reach excavators working from the land. This material to be excavated is additional to that which is to be excavated behind the proposed combi-wall in order to install the tie rods to the anchor wall. The total volume of soils / landside materials to be excavated to create the berth pocket is predicted to be 1,140,000m^3 (440,000m^3 during Phase 1 and 700,000m^3 during Phase 2). It has been assumed that such material would be re-used either on site or within the wider STDC development footprint.

Site access, transportation of materials to site and parking

4.2.8 Given the proposals to utilise land-based plant for the proposed quay construction, it is envisaged that access to site for construction plant and personnel will be via Smiths Dock Road and / or Tees Dock Road.

4.2.9 All construction materials are predicted to be transported to site by road, with the exception of the following which are anticipated to arrive on site by vessel:

- steel required for piling – delivered using up to six vessels in Phase 1 and six vessels in Phase 2 (12 vessels in total);
- rock required for the rock blanket in the berth pocket – delivered using up to six vessels in Phase 1 and seven vessels in Phase 2 (13 vessels in total); and,
- tie rods – delivered using up to one vessel per phase of development (two vessels in total).

4.2.10 It is anticipated that the vessels transporting the steel and tie rods would arrive to site by sea, with vessels likely to berth in Tees Dock or at a suitable berth along the river channel. The piles and tie rods would then be offloaded onto HGVs and transported to site using the existing road network. Rock for the rock blanket is anticipated to be placed directly into position on the riverbed.

4.2.11 Based on the indicative construction phase costs and the construction phase programme, it is anticipated that a peak of approximately 110 employees would be required to construct the proposed scheme. It is envisaged that the employees would adopt a 24-hour working pattern. Of the 110 employees, 10 would be associated with offshore dredging and would therefore not travel to the site.

4.2.12 Within the site, there are sufficient areas of hardstanding which could be utilised as employee parking areas.

4.3 Construction traffic generation

4.3.1 The construction traffic generation that has informed this TS has been derived by way of a ‘first principles’ approach. The first principles approach generates traffic volumes from an understanding of construction material quantities and personnel numbers.

4.3.2 **Table 4.1** summarises the predicted material quantities (for those materials to be delivered by road) and associated number of HGVs deliveries and two-way movements envisaged to be required during the construction phase.

Table 4.1: HGV movements associated with the construction phase

Key item	Duration (weeks)	Duration (months)	Tonnage	HGVs*	2021			2022												2023			
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Marine demolition																							
Demolition of tarmac and dolphin jetties	8	2	3,584	179	90	90																	
Demolition of South Bank Wharf (Phase 1)	12	3	7,872	394			131	131	131														
Demolition of South Bank Wharf (Phase 2)	30	7.5	23,616	1,181					157	157	157	157	157	157	157	157							
Quay wall																							
King piles and spigot piles	26	6.5	17,443	623		96	96	96	96	96	96	96											
Sheet piles	24	6	1,733	62			10	10	10	10	10	10											
Anchor piles	24	6	3,704	132				22	22	22	22	22	22										
Surfacing	20	5	31,392	1570									314	314	314	314	314						
Rock blanket	6	1.5	Import by sea																		0	0	
Dredging																							
Dredging	20	4	By sea											0	0	0	0						
Total deliveries per month					**90**	**185**	**237**	**259**	**417**	**286**	**286**	**286**	**493**	**471**	**471**	**471**	**314**	**0**	**0**	**0**	**0**	**0**	**0**
Total deliveries per day (assume 24 days per month)					**4**	**8**	**10**	**11**	**17**	**12**	**12**	**12**	**21**	**20**	**20**	**20**	**13**	**0**	**0**	**0**	**0**	**0**	**0**
Total two-way movements per day					**7**	**15**	**20**	**22**	**35**	**24**	**24**	**24**	**42**	**39**	**39**	**39**	**26**	**0**	**0**	**0**	**0**	**0**	**0**
*Assumes an HGV capacity of 20t																							

4.3.3 It can be seen from **Table 4.1** that there would be a peak of 21 HGV deliveries per day (42 two-way movements).

4.3.4 With regards to construction staff, in order to consider a worst-case scenario, no car sharing or use of sustainable transport has been considered for staff movements. On this basis, the 100 staff working onshore would equate to 200 two-way movements daily (100 arrivals and 100 departures).

4.3.5 The shift pattern cannot be informed by early contractor involvement as the procurement process has not commenced at this stage. Taking into consideration the 24-hour working period, this TS adopts a conservative assumption of a two-shift pattern which would translate to 100 two-way movements during a shift change over period (50 arrivals and 50 departures).

4.4 Construction traffic distribution

4.4.1 The supply chain for materials and workforce cannot be informed by early contractor involvement as the procurement process has not commenced at this stage. Taking into consideration the connectivity of Dockside Road and Tees Dock Road to the wider highway network, there are a number of suitable routes for the contractor to choose from. On this basis, it is envisaged that the construction traffic distribution would be similar to that of the background flows. **Table 4.2** details the background flows and the potential distribution for the construction traffic.

Table 4.2: Background flows and distribution

Description	2018 Base AADF	Distribution A*	Distribution B**	Distribution C***	Maximum distribution per link
Tees Dock Road	4,830	100%	0%	0%	100%
Old Station Road	5,013	100%	0%	0%	100%
Dockside Road	5,446	100%	0%	0%	100%
A66 (East)	47,977	0%	68%	0%	68%
A66 (West)	22,383	0%	32%	50%	50%
A1053	22,378	0%	0%	50%	50%

* Distribution A, assumes all employees go to one access (either Smiths Dock Rd or Tees Dock Road).
** Distribution B, distributes Dockside Road traffic, A66 (E) and A66 (W) based on background flows.
*** Distribution C, distributes Tees Dock Road traffic, A66 (W) and A1053 roundabout based on background flows.

4.5 Summary of construction traffic demand

4.5.1 It is demonstrated that the peak period would generate an AADF of 242 vehicles including 42 HGVs.

4.5.2 Whilst it is proposed that works could occur over a 24 hour period, in order to consider a worst case for deliveries, it is assumed that HGV movements would occur between standard working hours, 07:00 to 17:30. Adopting an even profile for the deliveries between 07:00 and 17:30, the construction of the proposed scheme could result in a peak of four two-way HGV movements per hour.

4.5.3 Adopting a typical working pattern of two shifts in which all employees arrive prior to the start of a shift and leave at the end of a shift, there could be an hourly peak of 50 car movements.

4.5.4 Based on **Table 4.2**, **Table 4.3** details the potential increase of traffic on each highway link as a result of the peak construction traffic.

Table 4.3: Percentage Increase

Description	2018 Base AADF	Construction AADF	Percentage Increase
Tees Dock Road	4,830	242	5%
Old Station Road	5,013	242	5%
Dockside Road	5,446	242	4%
A66 (East)	47,977	177	0%
A66 (West)	22,383	141	1%
A1053	22,378	141	1%

4.5.5 **Table 4.3** identifies that the construction of the proposed scheme could result an increase in background traffic flows of up to 5% on local roads and 1% on the wider A road network.

5 Summary and conclusion

5.1 Summary

5.1.1 This TS has been prepared by Royal HaskoningDHV on behalf of STDC in association with a planning application and marine licence application to construct a new quay at South Bank. The new quay would support its landside proposals for general industry and storage, or distribution uses within part of the South Industrial Zone.

5.1.2 Within the landside application, a TA and ES transport chapter were produced which focused on the operational traffic of that proposed development. The TA outlined that a CTMP would be produced to assess the construction impacts of the landside proposals.

5.1.3 The purpose of this TS is to quantify the potential impacts associated with the construction of a new quay at South Bank. It is envisaged that this information would then allow the CTMP for the landside works to include a detailed assessment of the potential for cumulative construction impacts.

5.1.4 A review of the existing baseline transport conditions has identified that the site is accessible by sustainable modes of transport. It is however, envisaged that sustainable transport would not be the primary mode of transport for the employees due to the nature of the workforce.

5.1.5 A review of the existing road safety conditions identified no local road safety issues. Four potential clusters of collisions at junctions along the A66, however these collision clusters are typical for these kinds of locations. It is envisaged that an increase in traffic of up to 1% on the A66 would not have a significant impact on the road safety.

5.1.6 An assessment of vehicular traffic generation associated with the construction of the proposed scheme has demonstrated that during the development's peak construction phase, the scheme could generate a peak of up to four two-way HGV movements per hour and up to 100 car movements per hour between the shift change period.

5.1.7 The construction of the proposed scheme could result an increase in background traffic flows of up to 5% on local roads and 1% on the wider A road network.

5.2 Conclusion

5.2.1 It is concluded that the forecast demand associated with the proposed scheme would have an indiscernible impact upon the transport network.

5.2.2 In accordance with the NPPF, it has been demonstrated that the proposed scheme would not have a "severe" impact and should not be refused planning permission on transport grounds.

6 References

Agilysis, 2020. Crashmap - UK Road Safety Map. [online] Crashmap.co.uk. Available at: https://www.crashmap.co.uk/ [Accessed 16 September 2020].

Department for Transport, 2020. Map Road Traffic Statistics - Road Traffic Statistics. [online] Roadtraffic.dft.gov.uk. Available at: https://roadtraffic.dft.gov.uk/#6/55.254/-5.284/basemap-regions-countpoints [Accessed 16 September 2020].

Middlesbrough Council, 2018. Local Plan. Middlesbrough: Middlesbrough Council.

Ministry of Housing, Communities & Local Government, 2014. Travel Plans, Transport Assessments and Statements. [online] GOV.UK. Available at: https://www.gov.uk/guidance/travel-plans-transport-assessments-and-statements [Accessed 16 September 2020].

Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework. London: Ministry of Housing, Communities and Local Government.

Redcar & Cleveland Borough Council, 2018. South Tees Area Supplementary Planning Document (SPD). Redcar & Cleveland: Redcar & Cleveland Borough Council.

Redcar and Cleveland Borough Council, 2011. Local Transport Plan (LTP3) 2011 - 2021. Redcar and Cleveland: Redcar and Cleveland Borough Council.

Redcar and Cleveland Borough Council, 2018. Local Plan. Redcar and Cleveland: Redcar and Cleveland Borough Council.

Appendix 11

Air quality assessment method

Appendix 18.1: Construction Phase Dust and Fine Particulate Matter Assessment Methodology

Introduction

The following section outlines an assessment procedure developed by the Institute of Air Quality Management (IAQM, 2016) for the assessment of air quality impacts arising from construction activities. The assessment procedure is divided into four steps and is summarised below.

Step 1: Screening the Need for a Detailed Assessment

An assessment will normally be required where there are human receptors within 350 m of the development site boundary and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s). Designated ecological sites within 200 m of the site boundary or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), are also identified at this stage. A designated ecological site refers to any sensitive habitat that can potentially be affected by dust soiling. For locations with a statutory designation, such as a Sites of Specific Scientific Interest (SSSI), Special Areas of Conservation (SAC) and Special Protection Areas (SPA), consideration should be given as to whether the particular site is sensitive to dust. Some non-statutory sites may also be considered, if appropriate.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is ‘negligible’.

Step 2: Assess the Risk of Dust Impacts

A site is allocated to a risk category based on the scale and nature of the works (Step 2A) and the sensitivity of the area to dust impacts (Step 2B). These two factors are combined in Step 2C to determine the risk of dust impacts before the implementation of mitigation measures. The assigned risk categories may be different for each of the four categories of construction activities outlined by the IAQM (demolition, construction, earthworks and trackout).

Step 2A: Define the Potential Dust Emission Magnitude

The IAQM guidance (IAQM, 2016) recommends that the dust emission magnitude is determined for demolition, earthworks, construction and trackout. The dust emission magnitude is based on the scale of the anticipated works. **Table A18.1** describes the potential dust emission class criteria for each outlined construction activity.

Table A18.1 Criteria used in the determination of dust emission class

Activity	Criteria used to Determine Dust Emission Class		
	Small	Medium	Large
Demolition	Total building volume <20,000m^3 Construction material with a low potential for dust release (e.g. metal cladding or timber) Demolition activities <10m above ground level Demolition during wetter months	Total building volume 20,000 to 50,000m^3 Potentially dusty material (e.g. concrete) Demolition activities 10 - 20m above ground level	Total building volume >50,000m^3 Potentially dusty material (e.g. concrete) On-site crushing and screening Demolition activities >20m above ground level

Activity	Criteria used to Determine Dust Emission Class		
	Small	Medium	Large
Earthworks	Total site area <2,500 m^2; <5 heavy moving earth vehicles active at any one time.	Total site area 2,500 – 10,000 m^2; 5 – 10 heavy moving earth moving vehicles active at any one time.	Total site area >10,000 m^2, >10 heavy earth moving vehicles active at any one time.
Construction	Total building volume <25,000 m^3; Construction material with low potential for dust release.	Total building volume 25,000 – 100,000 m^3; Potentially dusty construction material (e.g. concrete).	Total building volume >100,000 m^3; On site concrete batching.
Trackout	<10 outward HGV trips in any one day; Unpaved road length <50 m.	10 – 50 outward HGV trips in any one day. Unpaved road length 50 – 100 m.	>50 outward HGV trips in any one day; Unpaved road length >100 m.

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area considers the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of receptors;
- the local background PM_{10} concentration; and
- site-specific factors, such as the presence of natural shelters, such as trees, to reduce the risk of windblown dust.

Table A18.2 outlines the criteria used for determining the sensitivity of receptors.

Table A18.2 Criteria for determining sensitivity of receptors

Sensitivity of Receptor	Criteria for Determining Sensitivity		
	Dust Soiling Effects	Health Effects of PM_{10}	Ecological Effects
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown Locations with a national designation where the features may be affected by dust deposition.
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition.

The criteria detailed in **Tables A18.3** to **A18.5** were used to determine the sensitivity of the area to dust soiling effects and human health impacts. **Figure 18.3** details the distance bands, as detailed in **Tables A18.3** and **A18.4**, from the site boundary for use in the construction phase assessment.

Table A18.3 Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	**>100**	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	**>1**	Medium	Low	Low	Low
Low	**>1**	Low	Low	Low	Low

Table A18.4 Sensitivity of the area to human health impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg.m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32µg.m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28µg.m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg.m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
Low	-	>1	Low	Low	Low	Low	Low

Table A8.5 Sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C: Define the Risk of Impacts

The dust emission magnitude and sensitivity of the area are combined and the risk of impacts from each activity (demolition, earthworks, construction and trackout) before mitigation is applied should be determined using the criteria detailed in **Tables A18.6 – A18.9**.

Table A18.6 Risk of dust impacts - demolition

Potential Impact	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A18.7 Risk of dust impacts- earthworks

Potential Impact	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A18.8 Risk of dust impacts- construction

Potential Impact	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A18.9 Risk of dust impacts- trackout

Potential Impact	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Step 3: Site-Specific Mitigation

Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low, medium or high-risk site.

Step 4: Determine Significant Effects

With the implementation of the relevant mitigation measures, the residual impacts from the construction are considered to be **not significant**, in accordance with IAQM guidance.

Appendix 12

Representative viewpoint analysis tables

Viewpoint 1: Looking north west from Eston Nab

Existing View Distance to site boundary: 5.4km	The location, at 234mAOD, provides a dramatic and expansive panoramic view that attracts numerous recreational users. Topography falls sharply away to the north, foreshortening the foreground and drawing the viewers attention to the middle and far distant landscape. Looking north west, the view is across residential areas at Eston and the eastern margins of Middlesbrough. To the north there are views across Tees Bay and coastal margins at Redcar, including the Teesmouth National Nature Reserve. The Teesside Wind Farm is prominent offshore of Coatham Sands and Butterwick Wind Farm is seen in the distance to the north. Although the far horizon comprises predominately of agricultural fields, low hills and woodland corpses, the scene is dominated by urban and industrial features in the middle distance. Large industrial buildings, tall stacks, pylons and silos are highly prominent. Structures are often light coloured and draw the eye. The proposed site is barely perceptible with the adjoining River Tees appearing as a thin 'sliver', often obscured by intervening features. Overall a view with contrasting characteristics, strongly influenced by urban and industrial features.		
Sensitivity	**Value: High** A dramatic and varied panoramic view.	**Susceptibility: High** A popular destination for walkers and other recreational users.	**Sensitivity: High**
Magnitude of Effect	*Operational stage:* the proposed quayside and associated ground level activity will barely be perceptible in the view. Heavy lifting cranes will be more prominent with the crane tower structure appearing more visually 'dense' than the open latticed crane arm that extends high above the quayside. At the tallest height the crane arms will be seen below the far landscape horizon and not in the skyline. The temporary storage of two sets of full wind turbine towers will be prominent in the view. The proposed cranes and stored towers will appear significantly taller than neighboring industrial features, however in context of the expansive panoramic scene the scale of change in the view will be limited, with proposed features appearing similar in character and visually integrating with existing, large scale stacks, silos, pylons and buildings that form both a foreground and backdrop to proposed features. *Future baseline:* development of the SIZ landside site and associated large scale buildings may partially screen views to lower sections of proposed quayside features, although the change in the view will be negligible.	**Year 1** Low medium adverse	**Year 15** Low medium adverse
Significance of Effect	High sensitivity x Low medium magnitude of effect = Minor moderate significance of effect. Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.	**Minor moderate adverse**	**Minor moderate adverse**

Viewpoint 2: Looking north from Argyle Road, Grangetown

Existing View Distance to site boundary: 2.5km	A view from residential properties and open space at Grangetown across a relatively featureless expanse of amenity grassland (former housing). Residential rooftops interspersed with trees along the A66 road form a middle distant horizon. Street lamp columns, tops of existing stacks and pylons are visible and there are large warehouse units to the west but these are not overly intrusive in the skyline. Trees alongside Church Lane form a pleasant backdrop to the west.		
Sensitivity	**Value: Low** An ordinary urban scene that includes visual detractors.	**Susceptibility: High** Residential and recreational receptors	**Sensitivity: Medium**
Magnitude of Effect	*Operational stage:* the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be seen in the skyline above house rooftops and a treed horizon. Upper sections only of the crane tower will be visible with crane arms extending higher into the skyline. Upper sections of stored turbine towers on the quayside will be most prominent in the view. There will be some contrast in the view where proposed features are seen above the treed horizon. In context of the relative distance to site and a scene that includes detracting features, the predicted magnitude of change in the view will be reduced. Proposed tall structures will be quite prominent but appear similar in character to existing urban and industrial features. *Future baseline:* development of the SIZ landside site and associated large scale buildings will have no effect on the view.	**Year 1** Medium adverse	**Year 15** Medium adverse
Significance of Effect	Medium sensitivity x Medium magnitude of effect = Minor moderate significance of effect. Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.	**Minor Moderate Adverse**	**Minor Moderate Adverse**

Viewpoint 3: Looking north east from Cargo Fleet River View Park

<table>
<tr><td>Existing View
Distance to site boundary: 1.4km</td><td colspan="4">View from a public open space on an elevated knoll of land, partially enclosed by dense vegetation on the banked margins. A viewing platform within the park obtains most open views of the River Tees to the west, although vegetation restricts the view. Views toward the site are also mostly screened by vegetation. Industrial structures can seen clearly in the sky above the trees, including very tall electricity pylons (approx. 150mAOD) at the river crossing points, dockside cranes, industrial units and the tall gasometer (87mAOD) at the South Bank Gas Ovens site. Dominating the scene is the MPI offshore jack up vessel docked at Normanby Wharf. The jack up legs are approximately 50m in height. The amenity space has a sense of tranquility, although litter, broken bottles and human waste give a strong sense of neglect and abandonment. Ironically, views towards the river are mostly screened by vegetation.</td></tr>
<tr><td>Sensitivity</td><td>Value: Medium
A view location of local value. Outward views are restricted and unremarkable.</td><td>Susceptibility: High
Dog walkers and other recreational users.</td><td colspan="2">Sensitivity: Medium</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be seen in the skyline in a narrow glimpsed view between existing foreground vegetation. The scale of change in the view will be limited with proposed features appearing similar in character and visually integrating with existing urban and industrial features. Seen in context of other docked installation vessels at Normanby Wharf the perceived magnitude of change in the existing view will be further reduced.
<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will not alter the visual effect on the proposed scheme.</td><td>Year 1
Low adverse</td><td>Year 15
Low adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Medium sensitivity x Low magnitude of effect = Minor negligible significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor Negligible Adverse</td><td>Minor Negligible Adverse</td></tr>
</table>

Viewpoint 4: Looking north from South Bank train station

<table>
<tr><td>Existing View
Distance to site boundary:
860m</td><td colspan="4">The location represents views experienced by commuters using the station and also by recreational footpath users on the England Coast Path / Teesdale Way (locally referred to as the Black Path between Middlesbrough and Redcar) which follows the southern railway boundary. The view is entirely dominated by tall electricity pylons (including the tallest carrying OH cables across the River Tees), tall industrial buildings, a gasometer and Dorman Long Tower and stack at the former steelworks. Scrub vegetation and rank grassland provide greenery but does little to allay the sense of neglect, ‘dereliction’ and heavily industrial character of the scene.</td></tr>
<tr><td>Sensitivity</td><td>Value: Low
Poor urban industrial scene with numerous visual detractors.</td><td>Susceptibility: Medium
Pedestrians using the Black Path for which views are not the primary concern.</td><td colspan="2">Sensitivity: Medium</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be seen in the skyline between the existing gasometer and foreground pylon although appear much lower than those foreground elements. The scale of change in the view will be limited with proposed features appearing similar in character and visually integrating with existing urban and industrial features, particularly the very tall electricity pylons.
<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will potentially screen most of the view to the heavy lifting crane and stored components on the southerly section of the proposed quay.
Longer term removal of the Dorman Long tower and coke works will considerably alter the future skyline although electricity pylons will continue to be significant visual detractors.</td><td>Year 1
Low adverse</td><td>Year 15
Low adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Medium sensitivity x Low magnitude of effect = Minor significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor Adverse</td><td>Minor Adverse</td></tr>
</table>

Viewpoint 5: Looking north from Smith's Dock Road at junction with Dockside Road

<table>
<tr><td>Existing View
Distance to site boundary: 500m</td><td colspan="4">View from the junction of an industrial road network that leads to existing riverside commerce and South Bank train station. The junction will also form an access to the proposed South Industrial Zone development. Electricity pylons (including the very tall pylons at the river crossing point) and large gasometer dominate the horizon. Dockside cranes are seen high in the skyline to the south west. There are sporadic but frequent heavy lorry movements along the road and a background noise of industrial activity. The view towards the proposed scheme is through palisade security fencing and foreshortened by scrubby vegetation in the foreground. A relatively bleak view of ordinary to poor quality.</td></tr>
<tr><td>Sensitivity</td><td>Value: Low
A poor industrial scene with numerous visual detractors.</td><td>Susceptibility: Low
A view experienced by road users and roadside pedestrians.</td><td colspan="2">Sensitivity: Low</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2">The proposed quayside facility and associated features will be seen to the left of the central tall pylon. The close range view across a relatively flat and open area of land will allow views to low level activity and stockpiled components on the quayside and adjoining storage areas. Heavy lifting cranes and full height turbine towers will be highly prominent, seen high in the skyline and appearing more dominant than neighbouring pylons. Docked installation vessels along the quayside will also be seen against the skyline. Proposed features will remain in character with the existing and emerging industrial scene but the scale of tall cranes and stored wind farm components will be both dominant and dramatic features in the view.
<i>Future baseline:</i> development of the SIZ landside site and introduction of large scale buildings in the foreground will foreshorten the existing view to the south of the proposed scheme (to right of the central pylon seen in the image above) but will have the effect of focusing views north, towards proposed tall quayside features.</td><td>Year 1
Medium high adverse</td><td>Year 15
Medium high adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Low sensitivity x Medium high magnitude of effect = Minor moderate significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor moderate adverse</td><td>Minor moderate adverse</td></tr>
</table>

Viewpoint 6: Looking south west from South Gare peninsula

Existing View Distance to site boundary: 4.8km	A coastal view location with dramatic and varied character often visited by walkers and sightseers. Wide open skies with views east to sand dunes on the Teesside and Cleveland Coast and Teesside Wind Farm. Views towards the site are across Paddy's Hole marina and expansive Tees Mouth estuary. Saltholme Nature Reserve at Bran Sands and Teesmouth National Nature Reserve on North Gare Sands are important nature conservation sites in the middle distance. Cabins and huts around the marina are eclectic, ramshackled and characterful. Wooded slopes of Lazenby Bank form a distant horizon south but the scene to the south west is dominated by an unbroken horizon of industrial and dockside development. The skyline is punctuated by a myriad of stacks, chimneys, silos, gasometers and pylons. Tall dockside lifting cranes (approx. 75m in height) at Redcar Wharf are a dominant feature in the middle distance, seen high in the skyline.			
Sensitivity	**Value: Medium** A dramatic industrial scene of diverse character.	**Susceptibility: High** A range of recreational users experiencing the contrasting scenery.	**Sensitivity: Medium**	
Magnitude of Effect	*Operational stage:* the proposed quayside and associated ground level activity will be screened by intervening features. Heavy lifting cranes will be prominent seen high above the quayside in the skyline. The temporary storage of two sets of full wind turbine towers will also be prominent in the distant view with upper sections of installation vessels also visible. Both the cranes and stored towers will appear lower in the skyline than the lifting cranes at Redcar Wharf. The proposed cranes and stored towers will appear significantly taller than most neighboring industrial features, however in context of the distant view and expansive panoramic scene, the overall perceived scale of change in the view will be limited. Proposed features will appear similar in character and visually integrate with existing, dense clustering of numerous stacks, silos, pylons and buildings seen across the central horizon that form both a foreground and backdrop to proposed features. *Future baseline:* development of the SIZ landside site and associated large scale buildings will not alter the visual effect on the proposed scheme.		**Year 1** Low adverse	**Year 15** Low adverse
Significance of Effect	Medium sensitivity x Low magnitude of effect = Minor moderate significance of effect. Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.		**Minor negligible adverse**	**Minor negligible adverse**

Viewpoint 7: Looking south west from Coatham Marsh Local Nature Reserve

<table>
<tr><td>Existing View
Distance to site boundary: 4.5km</td><td colspan="4">Frequented by walkers, cyclists and bird watchers. The location is in close proximity to a section of the Teesdale Way / England Cast Path where it crosses the reserve. Man made landforms support scrub, grassland and bare soil substrates. A wide panoramic scene with vast open skies. Wooded slopes of Lazenby Bank form an elevated distant horizon south but the scene is dominated by a horizon of industrial development and a skyline punctuated by stacks, chimneys, silos, gasometers and pylons. Cooling towers and flare stacks are seen at the Wilton International site to the south. Large towers, conveyors and silos at the former steelworks dominate the skyline to the west and the tall brick Steel House building is prominent to the south west. Large pale blue clad buildings at the Northumbrian Water site are prominent in the central area of the view.</td></tr>
<tr><td>Sensitivity</td><td>Value: Medium
A visually diverse, naturally regenerating scrubland contrasting with an industrial backdrop.</td><td>Susceptibility: High
A range of recreational users experiencing the scenery but often with an inward focus on the nature reserve, ponds and scrubland.</td><td colspan="2">Sensitivity: Medium</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and lower sections of heavy lifting cranes will be screened by intervening features. Temporary storage of two sets of full wind turbine towers will be visible in the skyline, with lower sections partially screened by buildings at the Northumbrian Water site. Crane arms and stored towers will appear relatively higher in the skyline compared to existing neighbouring features. In context of the distant view and expansive panoramic scene, the overall perceived scale of change in the view will be limited. Proposed features will appear similar in character and visually integrate with existing, dense clustering of numerous stacks, silos, pylons and buildings seen across the central horizon that form both a foreground and backdrop to proposed features.
<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will not alter the visual effect on the proposed scheme.</td><td>Year 1
Low adverse</td><td>Year 15
Low adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Medium sensitivity x Low magnitude of effect = Minor moderate significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor negligible adverse</td><td>Minor negligible adverse</td></tr>
</table>

Viewpoint 8: Looking north west from the A1085 Trunk Road

<table>
<tr><td>Existing View
Distance to site boundary:
2.5km</td><td colspan="4">A view from the highways path along the busy A1085 Trunk Road and looking towards a retail park. The location is near a main pedestrian access to recreational open space associated with the Eston Leisure Centre located to the south. A discordant view towards a retail parking area and large retail outlets. Tall lamp columns and highway signage project high into the skyline. Planting within the car park partially screens distant views towards the site although the large gasometer, Dorman Long tower, steel works chimney stack and pylons are clearly visible above the vegetation belt.</td></tr>
<tr><td>Sensitivity</td><td>Value: Low

A generally poor urban scene with numerous visual detractors.</td><td>Susceptibility: Low

A view experienced by road users and roadside pedestrians.</td><td colspan="2">Sensitivity: Low</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes will be prominent with the crane tower structure appearing more visually ‘dense’ than the open latticed crane arm that extends high into the skyline. The temporary storage of two sets of full wind turbine towers will also be prominent in the view. Given the foreground context the scale of change in the view will be limited with proposed features appearing similar in character and visually integrating with existing urban and industrial features.

<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will partially further screen views to lower sections of proposed features, although the change in the view will be of limited visual benefit.
Longer term removal of the Dorman Long tower and coke works will beneficially alter the future skyline although other visual detractors will remain prominent in the view.</td><td>Year 1

Low medium adverse</td><td>Year 15

Low medium adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Low sensitivity x Low medium magnitude of effect = Minor negligible significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor Negligible Adverse</td><td>Minor Negligible Adverse</td></tr>
</table>

Viewpoint 9: Looking north from Uvedale Road, Steele Crescent junction, South Bank

<table>
<tr><td>Existing View
Distance to site boundary: 2.1km</td><td colspan="4">A view from residential properties and open space at South Bank across a relatively featureless expanse of amenity grassland with occasional mature trees breaking the skyline. Litter and areas of rank grassland lend an air of neglect. Residential rooftops interspersed with trees form a middle distant horizon and contrast starkly with a scattered arrangement of highly intrusive industrial structures (large gasometer, Dorman Long tower, steel works chimney stack and pylons) that clutter the skyline.</td></tr>
<tr><td>Sensitivity</td><td>Value: Low
An ordinary urban scene with numerous visual detractors.</td><td>Susceptibility: High
Residential and recreational receptors.</td><td colspan="2">Sensitivity: Medium</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be seen in the skyline between the existing gasometer and brick chimney stack on the South Bank Coke Ovens site. Upper sections of the crane tower will clearly be visible in the skyline although appear lower in the view than other tall industrial features. The crane arms will extend high into the skyline, appearing taller than existing pylons although the comparatively slender, latticed structures will be less visually prominent than the tower sections. Stored turbine towers on the quayside will be highly prominent in the view, the combined effect appearing as two solid ‘blocks’ projecting high into the skyline and appearing taller than the existing gasometer and Dorman Long tower. In context of the existing scene and visually discordant skyline the scale of change in the view will be reduced, with proposed features appearing similar in character and visually integrating with existing urban and industrial features.
<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will have negligible effect on the view to the proposed scheme. Longer term removal of the Dorman Long tower and coke works will considerably alter the future skyline although electricity pylons will continue to be significant visual detractors.</td><td>Year 1
Low medium adverse</td><td>Year 15
Low medium adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">Medium sensitivity x Low medium magnitude of effect = Minor significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor Adverse</td><td>Minor Adverse</td></tr>
</table>

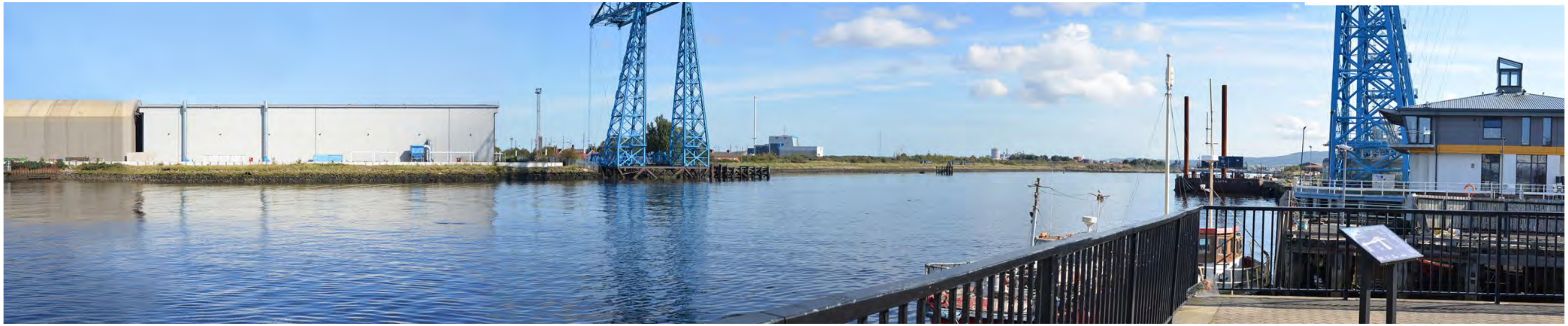
Viewpoint 10: Looking north from the junction of A66 and Normanby Road, South Bank

Existing View Distance to site boundary: 1.3km	A view from the highway junction with the busy A66 road looking towards the Gate 2 entrance of the South Tees Business Parks. A highly discordant view with tall lamp columns and highway signage projecting into the skyline and the large gasometer, Dorman Long tower and tall pylons highly prominent in the cluttered urban scene. There are residential properties in proximity to this location, however, views towards the site are substantially filtered by intervening features, often further limited by property orientation.			
Sensitivity	**Value: Low** An unremarkable, poor urban scene with numerous visual detractors.	**Susceptibility: Low** A view experienced predominantly by road users and roadside pedestrians.	**Sensitivity: Low**	
Magnitude of Effect	*Operational stage:* the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be seen in the skyline either side of the gasometer. The southern most stored turbine towers on the quayside will be most prominent although seen alongside existing tall pylons and partially screened by foreground features. In context of the existing, visually discordant skyline, the scale of change in the view will be limited. Proposed features will appear similar in character and visually integrate with existing urban and industrial features. *Future baseline:* development of the SIZ landside site and associated large scale buildings will further partially screen lower sections of stored turbine towers in the southern quayside area. Longer term removal of the Dorman Long tower and coke works will considerably alter the future skyline with proposed cranes and turbine towers appearing more visually 'isolated' in the skyline and more prominent, although tall electricity pylons will also remain prominent visual detractors.		**Year 1** Low adverse	**Year 15** Low adverse
Significance of Effect	Low sensitivity x Low magnitude of effect = Negligible significance of effect. Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.		**Negligible Adverse**	**Negligible Adverse**

Viewpoint 11: Looking west from Errington Wood, New Marske

<table>
<tr><td>**Existing View**
Distance to site boundary: 8.7km</td><td colspan="4">An attractive elevated view to the north and west across a foreground of rolling arable fields defined by dense, tall hedgerows and woodland. The location is a highly popular destination for recreational pursuits. Rising ground at Lazenby Bank defines the western horizon sweeping down towards the Tees lowland plain and Durham magnesian limestone plateau landscapes stretching into the far north west. The coastline off Redcar is visible to the north with lines of prominent wind turbines at the Teesside offshore wind farm seen above the horizon. The Teesside industrial zones, tall stacks and buildings, remain prominent features in the distance. Cooling towers and flare stacks are seen at the Wilton International site to the west. Tall stacks at the former steel works site to the north can be seen above the distant horizon west of Hartlepool.
Most existing industrial features seen within the Tees valley sit below the distant land horizon, with the exception of off shore wind turbines, taller stacks at the former steel works site and very tall pylons at the River Tees crossing.</td></tr>
<tr><td>**Sensitivity**</td><td>**Value: High**
A dramatic and varied view.</td><td>**Susceptibility: High**
A popular destination for walkers and other recreational users.</td><td colspan="2">**Sensitivity: High**</td></tr>
<tr><td>**Magnitude of Effect**</td><td colspan="2">*Operational stage:* the proposed quayside and associated ground level activity will not be visible. Proposed crane towers will be seen slightly above the distant landed horizon with more delicate crane arm structures projecting higher into the skyline. Tall, temporarily stored full wind turbine towers will be most visually prominent, appearing as two blocks rising above the distant horizon line and noticeably taller than other industrial features.
Proposed taller features will be seen at some distance and in context of an elevated, expansive view that encompasses a more dominant foreground of fields, hedgerows and woodland. The proposed scheme will incur a limited scale of change in the view with proposed features appearing similar in character and visually integrating with existing urban and industrial features that form a concentrated swathe of development through the middle and far distance scene.
Future baseline: development of the SIZ landside site and associated large scale buildings will further screen lower sections of cranes and stored components, although have negligible beneficial effects to views of taller proposed features.</td><td>**Year 1**
Low medium adverse</td><td>**Year 15**
Low medium adverse</td></tr>
<tr><td>**Significance of Effect**</td><td colspan="2">High sensitivity x Low medium magnitude of effect = Minor moderate significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>**Minor Moderate Adverse**</td><td>**Minor Moderate Adverse**</td></tr>
</table>

Viewpoint 12: Looking east from the Tees Transporter Bridge viewing area, Ferry Road.



<table>
<tr><td>Existing View
Distance to site boundary: 3.2km</td><td colspan="4">The Tees Transporter Bridge is a regional landmark with high cultural heritage associations and value. The viewing area is a popular sightseer destination with a spectacular close range view towards the bridge, standing at approximately 68m high. The bridge dominates the foreground scene and is visually set off by the expanse of the River Tees and reflective waters. The setting of the bridge is industrial, there are large warehouse units on the opposite bank and in the surrounding area. Views under the bridge to the east are relatively open in character, across land areas on the north bank of the River Tees. The white clad Teesside Bio Mass building and stack are prominent in the skyline seen with the scrubby riverside bank. Silos and flare stacks can be seen at the Clarence Distillation Works site, the large gasometer at the South Bank Coke Ovens site and tall pylons at the river crossing point. The wooded slopes of Lazenby Bank form a distant horizon glimpsed to the east.</td></tr>
<tr><td>Sensitivity</td><td>Value: High
A popular viewpoint with a dramatic close range view of a local landmark and heritage asset.</td><td>Susceptibility: High
A popular destination for sightseers.</td><td colspan="2">Sensitivity: High</td></tr>
<tr><td>Magnitude of Effect</td><td colspan="2"><i>Operational stage:</i> the proposed quayside and associated ground level activity will not be visible. Heavy lifting cranes and temporary storage of two sets of full wind turbine towers will be visible, set behind the middle distance Teesside Bio Mass building that will substantially screen the northernmost crane and quayside components. Crane towers will appear lower than the biomass building. The steel lattice crane arms will extend higher into the skyline, although these visually ‘lighter’ structures will appear less prominent. Given the relative distance to the site and juxtaposition with the Teesside Bio Mass building the proposed scheme will not incur significant adverse visual effects from this location, with proposed features appearing similar in character and visually integrating with existing industrial features. The focus of the viewer is the view of the Tees Transporter Bridge and the existing character of those views will not be significantly affected.
<i>Future baseline:</i> development of the SIZ landside site and associated large scale buildings will have negligible effect on the view to the proposed scheme. Proposed buildings will be seen slightly above the horizon extending to the right of the view.</td><td>Year 1
Low adverse</td><td>Year 15
Low adverse</td></tr>
<tr><td>Significance of Effect</td><td colspan="2">High sensitivity x Low magnitude of effect = Minor significance of effect.
Effects will be permanent during the operation of the proposed quayside and its use in support of the renewable energy industry.</td><td>Minor adverse</td><td>Minor adverse</td></tr>
</table>

Appendix 13

Landscape and Visual Impact Assessment methodology

Royal HaskoningDHV

Appendix 13

Landscape and Visual Assessment Methodology (DRaW UK Limited)

Landscape and Visual Assessment Methodology (DRaW UK Limited)

Introduction

The purpose of the Landscape and Visual Impact Assessment (LVIA) is to identify the potential effects on the landscape character and the changes to views experienced by the inhabitants.

LVIA is either carried out formally as part of the Environmental Impact Assessment (EIA) process or informally as a contribution to a planning application to provide a general understanding of the environmental effects of a development. In both cases the general principles and approach remain the same, although the approach for a non EIA development may be simplified and classification of significance is not a requirement.

It is important to note that there is a distinction to be made between landscape and visual effects:

- Landscape effects are the result of a change to the fabric, character or quality of the landscape as a result of development. They do not have to be seen; and
- Visual effects result from a change in views or the visual amenity experienced by people.

Guidance and Approach

This assessment methodology has been developed from the guidance provided in the following publications:

- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), Third Edition Landscape Institute & Institute of Environmental Management and Assessment 2013;
- 'An Approach to Landscape Character Assessment' Christine Tudor and Natural England, October 2014.

It should be noted that the above guidance does not dictate a prescriptive methodology, instead it encourages practitioners to develop transparent and logical methods, using standardised terminology and which are proportionate the type and size of development proposed.

The following methodology sets out the general approach to the LVIA process adopted by DRaW (UK) Ltd.

Assessing Landscape Effects

Evaluating Landscape Sensitivity

The method used to categorise landscape sensitivity, is based on Paragraphs 5.39 – 5.47 of GLVIA3.

The sensitivity of a landscape, or its individual components, is defined by a product of its value and its susceptibility to change.

Evaluating Landscape the Value and Susceptibility of a Landscape to Change

Landscape value is defined as the 'value attached to the landscape by society' (Paragraph 5.19 of GLVIA3). It is based on a range of factors as set out in Table A1.

Landscape susceptibility is defined as *"The ability of the landscape (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies"* (Paragraph 5.40 of GLVIA3).

Table A1 Landscape Value and Susceptibility to Change

	Landscape Value	**Susceptibility of the Landscape to Change**
High	**Designations:** Internationally or nationally designated landscape **Condition/Quality:** Landscape is intact and/or in good condition. **Scenic Quality**: High aesthetic appeal. **Rarity:** Rare landscape or rare in a regional or national context. **Representativeness:** The landscape contains many characteristics considered to be important examples. **Conservation Interest:** Rich and/or diverse nature conservation features. **Recreation Value:** A landscape that makes a large contribution to the public's recreational experience. **Perceptual Aspects:** High level of wildness and/or tranquility. **Associations:** High level of historic and/or cultural associations.	**Pattern, complexity and physical susceptibility to change:** A strongly patterned/ textured or a simple but distinctive landscape and/or with high value features and essentially intact. **Visual susceptibility to change:** An open or exposed landscape with extensive inter-visibility and no or very limited visual filtering or enclosure. Prominent visual landmarks may be present, and inter-visibility with designated landscapes may occur. **Experiential susceptibility:** A very tranquil, wild or remote landscape with little or no sense of visual or aural intrusion. A landscape which contains very few light sources and provides dark skies.
Medium	**Designations:** Locally designated landscapes. **Condition/Quality:** Some features or sub-areas are intact and/or in good condition **Scenic Quality:** Of moderate aesthetic appeal. **Rarity:** Distinctive landscape features that are replicated elsewhere in the region. **Representativeness:** The landscape contains some characteristics considered to be important examples. **Conservation Interest:** Some nature conservation features. **Recreation Value:** Makes a moderate contribution to the public's recreational experience. **Perceptual Aspects:** Has some level of wildness and/or tranquillity but also contains some detractive elements. **Associations:** Limited historic and/or cultural associations.	**Pattern, complexity and physical susceptibility to change:** A landscape with mostly intact pattern and/or with a degree of complexity and with features mostly in reasonable condition. **Visual susceptibility to change:** A partially enclosed landscape with some visual containment and filtering, possible limited inter-visibility with visual landmarks and designated landscapes. **Experiential susceptibility:** A partially tranquil landscape with limited visual and/or aural intrusion, some relationship with built development/ infrastructure may be present. A landscape which contains some light sources.
Low	**Designations:** Non-designated landscapes.	**Pattern, complexity and physical susceptibility to change:**

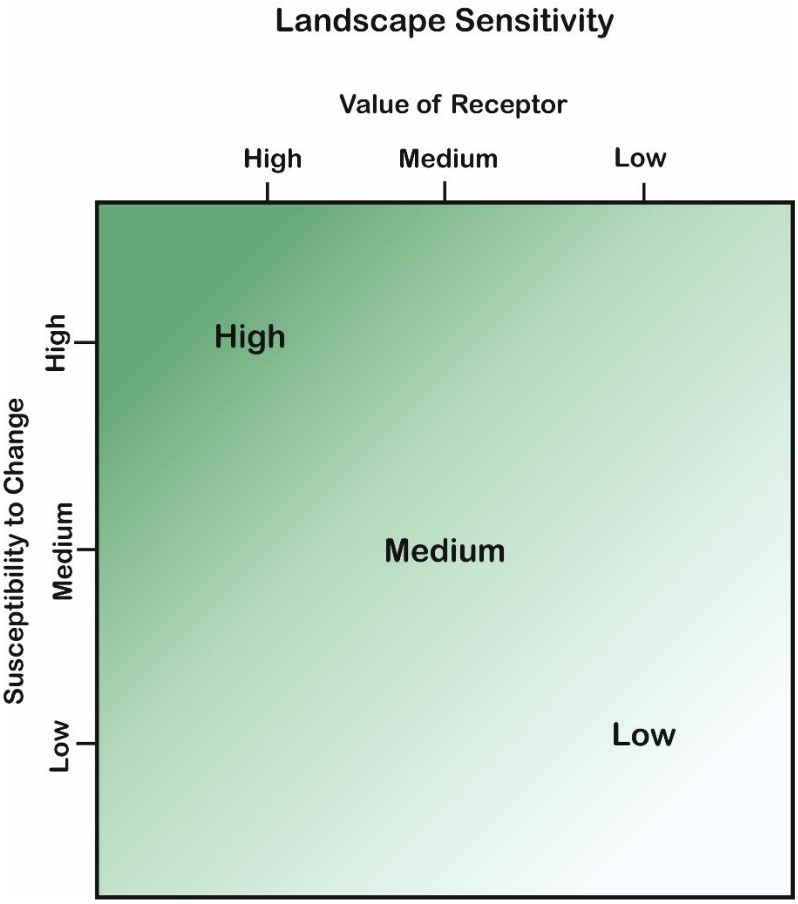
	Condition/Quality: A landscape /features are rarely intact and/or are in poor condition. **Scenic Quality**: Little or no aesthetic appeal. **Rarity:** Few if any, distinctive landscape features or is extensive throughout the region **Representativeness:** The landscape does not contain characteristics considered to be important examples. **Conservation Interest**: Few, if any, nature conservation features. **Recreation Value:** Makes little or no contribution to the public's recreational experience. **Perceptual Aspects:** Little or no level of wildness and/or tranquillity. **Associations:** Without historic and/or cultural associations.	A simple, monotonous and/or degraded landscape with common/ indistinct features and minimal variation in landscape pattern. **Visual susceptibility to change:** A very enclosed landscape which contains or strongly filters views, with an absence of visual landmarks and a lack of inter-visibility with designated landscapes. **Experiential susceptibility:** A landscape with prominent visual and/or aural intrusion and close relationship with large scale built development/ infrastructure. A landscape which contains many light sources and essentially suffers from light pollution.

Evaluating Landscape sensitivity

Criterion used to categorise landscape sensitivity, in relation to Paragraphs 5.39 – 5.47 of GLVIA3, are described in Table A2- Landscape Sensitivity.

The sensitivity of the landscape as a whole, (or components of it), is calculated using Table A2 to correlate 'landscape value' and 'susceptibility to change'.

Table A2 Landscape Sensitivity



Evaluating the magnitude of landscape effects

The ‘magnitude’ of landscape effects resulting from the construction and/or the operation of a particular development is categorised as high, medium, low or negligible. In accordance with the approach advocated in Paragraphs 5.48 – 5.52 of GLVIA3 the magnitude of landscape effect considers the size and scale of the change, the geographical extent over which each landscape effects would be felt and their duration and reversibility.

Criterion used to categorise landscape effect are listed in Table A3 -Magnitude of Landscape Effect.

Table A3 - Magnitude of Landscape Effect

Magnitude of landscape effects	Key Determining Criteria
High	**Size and/or scale:** the extent and relative proportion of the existing landscape element(s) to be changed would be large and/or the landscape element(s) lost or created make a key contribution to landscape character and/or value. Introduction of new landscape elements that would be likely to be perceived as a dominant landscape characteristic. Large scale alteration to the aesthetic and perceptual characteristics of the landscape. **Geographical extent:** effects would be discernible across a large majority or the entirety of the landscape designation or character area. **Duration and reversibility of effects:** effects of the introduction of new landscape features would be long-term i.e. will last for over 15 years or will be permanent. Loss of landscape features that are irreplaceable or can only be replaced in the long-term.
Medium	**Size and/or scale:** the extent and relative proportion of the existing landscape element(s) to be changed would be moderate and/or any landscape elements lost or created make a moderate contribution to landscape character and/or value. Introduction of new landscape elements that would be likely to be perceived as a prominent landscape characteristic. Moderate scale alteration to the aesthetic and perceptual characteristics of the landscape. **Geographical extent:** effects would be discernible across a moderate proportion of the landscape designation or character area. **Duration and reversibility of effects:** effects of the introduction of new landscape features would be medium-term i.e. will last for between 5 and 15 years. Loss of landscape elements that can be fully replaced within the same time period
Low	**Size and/or scale:** the extent and relative proportion of the existing landscape element(s) to be changed would be minor and/or any landscape element(s) lost or created make only a minor contribution to landscape character and/or value. Introduction of new landscape elements that would be likely to be perceived as a small-scale landscape characteristic. Small scale alteration to the aesthetic and perceptual characteristics of the landscape. **Geographical extent:** effects would be discernible across a small proportion of the landscape designation or character area and/or restricted to the close vicinity of the development site. **Duration and reversibility of effects:** effects of the introduction of new landscape features would be short-term i.e. will last for between 1 and 5 years. Loss of landscape elements that can be fully replaced within the same time period.
Negligible	**Size and/or scale:** the extent and relative proportion of the existing landscape element(s) to be changed would be barely perceptible and/or any landscape element(s) lost or created make a minimal or no contribution to landscape character and/or value. Introduction of new landscape elements that will be likely to be imperceptible. Minimal alteration to the aesthetic and perceptual characteristics of the landscape. **Geographical extent:** effects would only be discernible within the development site or immediately alongside it. **Duration and reversibility of effects:** effects of the introduction of new landscape elements would last for less than a year. Any loss of landscape elements can be fully replaced immediately.
None	The proposals would not change any of the landscape elements, or characteristics.

Assessing Visual Effects

“An assessment of visual effects deals with the effects on views available to people and their visual amenity... assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements” (Para 6.1GLIVIA3).

Evaluating Visual Sensitivity

The visual sensitivity is calculated by combining the value attributed to a view with the susceptibility of the viewer. The method used to categorise the sensitivity of visual receptors, is based on Paragraphs 6.30– 6.37 of GLVIA3.

Evaluating Value of a View and Susceptibility of the Viewer to Change

The Value attributed to a view is defined by the criteria listed in in Table A5.

Susceptibility of the viewer is defined by the occupation or activity of the people experiencing the views at particular locations and by the extent to which their attention or interest may be focused on the views as defined by the criteria listed in in Table A5.

Criterion used to categorise visual sensitivity (combination of value and susceptibility), are listed in Table A5 -Visual Sensitivity.

Table A5 - Visual Sensitivity

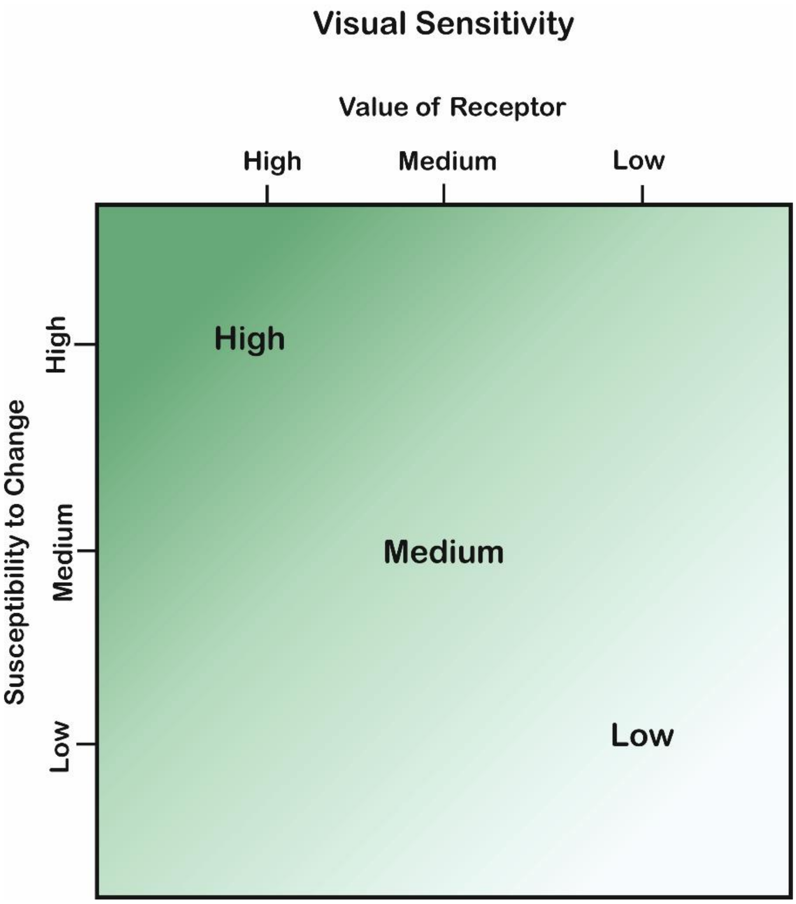
Visual receptor sensitivity	Factors Influencing Value of a View	Susceptibility of the Visual Receptors
High	The view is valued at a national or regional level. The view is of high scenic quality, often protected by planning designations. It is a visitor destination, or heritage asset, where views of the surrounding are an important contributor to the experience. There are references to the view in literature or art, or the view appears in guidebooks or on tourist maps. It is a strategic location or viewpoint which attracts large number of viewers.	Communities or residents at home, where views contribute to the setting or visual amenity of the house or settlement. Travellers on recreational or scenic routes, (including public rights of way) where awareness of views is likely to be high. People who are engaged in outdoor recreation, whose attention or interest is likely to be focussed on the landscape, or on particular views.
Medium	The view is valued at a local level. It is mostly frequented by local people. The view is not publicised or waymarked. It is unremarkable but reasonable pleasant. There are some detracting features in the views.	Travellers on road, rail, or local paths (including public rights of way) for which views are not the primary focus, although they do contribute to the setting of the route.

Low	The view is of limited local value. The view is of low aesthetic quality and may detract from the surroundings. It is not a publically accessible location.	People engaged in activity which does not involve or depend upon appreciation of views of the surrounding landscape. People at their place of work, whose attention may be focussed on their work or activity, not on their surroundings, and where the setting is not important to the quality of life.

Evaluating Viewer Sensitivity

The sensitivity of a visual receptor is calculated using Table A6 to correlate the ‘value of the viewer’ with their ‘susceptibility to change’.

Table A6 Viewer Sensitivity



Evaluating the magnitude of visual effect

The magnitude of visual effect is defined by the size/ scale of change, the geographical extent of the view affected and the duration and reversibility of the change caused by the development/ operation proposed. (Paragraph 5.48 GLVIA3)

The magnitude of visual effect is assessed in relation to the following:

- **Size and Scale:** The scale of change in the view is determined by the loss or addition of features in the view, changes in the composition of view and the proportion of view affected.

- **Geographical Extent:** Is assessed in relation to the Zone of Theoretical Visibility, taking into account the angle of view, the distance from the viewpoint, the extent, or number of receptors affected.
- **Duration and Reversibility:** The duration of the visual change, whether temporary or long term; intermittent or continuous; as well as the role of seasonal changes due to management such as hedgerow trimming and seasonal variations in deciduous leaf cover.

Criterion used to categorise the magnitude visual effect, are listed in Table A7 – Magnitude of Visual Effect.

Table A7 - Magnitude of Visual Effect

Magnitude of visual effect	Key determining criteria
High	**Size and Scale** A complete or very substantial change or obstruction of the view. **Geographical Extent** Extensive receptors affected. Close proximity to the viewer and/or unrestricted direct line-of-sight. **Duration and Reversibility** Change will be permanent or would last between 10 and 25 years or permanent and/or would not be reversible.
Medium	**Size and Scale** An obvious, immediately apparent change or obstruction of the view. **Geographical Extent** Multiple receptors affected. Medium distance view and/or partially restricted line-of-sight. **Duration and Reversibility** Long term change that will be visible for between 5 and 10 years and/or would be theoretically reversible.
Low	**Size and Scale** A perceptible change or obstruction of the view. **Geographical Extent** Small number of receptors affected. Distant view and/or restricted, oblique line-of-sight. **Duration and Reversibility** A change that will last between 1 and 5 years and/or would be fully/ partially reversible.
Negligible	**Size and Scale** A barely perceptible or intermittent change or obstruction of the view. **Geographical Extent** Occasional or Isolated receptor affected. Far distance view and/or largely restricted line-of-sight. **Duration and Reversibility** Short term change that will last less than a year and/or would be fully reversible.
None	The proposals would not change any of the views or visual amenity

Judging the significance of landscape and visual effects

The significance of a landscape or visual effect is determined by correlating the sensitivity of the receptor (high, medium to low) with the magnitude of effect (high to negligible). The evaluation is based on professional opinion using Table A8 as a guide.

Table A8 –Significance of landscape and visual effects.

	Sensitivity of receptor (susceptibility & value)		
Magnitude of change	Low	Medium	High
High	Moderate effect	Moderate major effect	Major effect
Medium high	Minor moderate effect	Moderate effect	Moderate major effect
Medium	Minor effect	Minor moderate effect	Moderate effect
Low medium	Minor negligible effect	Minor effect	Minor moderate effect
Low	Negligible effect	Minor negligible effect	Minor effect
Negligible	Negligible effect	Negligible effect	Minor negligible effect

Appendix 14

Landscape and Visual Impact Assessment figures

Royal
HaskoningDHV

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 1:
Looking north west from Eston Nab

Photograph Parameters

Time & date of photograph: 1:46pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 67.5^0

Camera Location and Orientation

Grid reference: E456844, N518321
Elevation: 242mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 324°
Distance to site boundary: 5.4km

Notes

- The image is presented as a 125% enlargement of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 1: Existing View

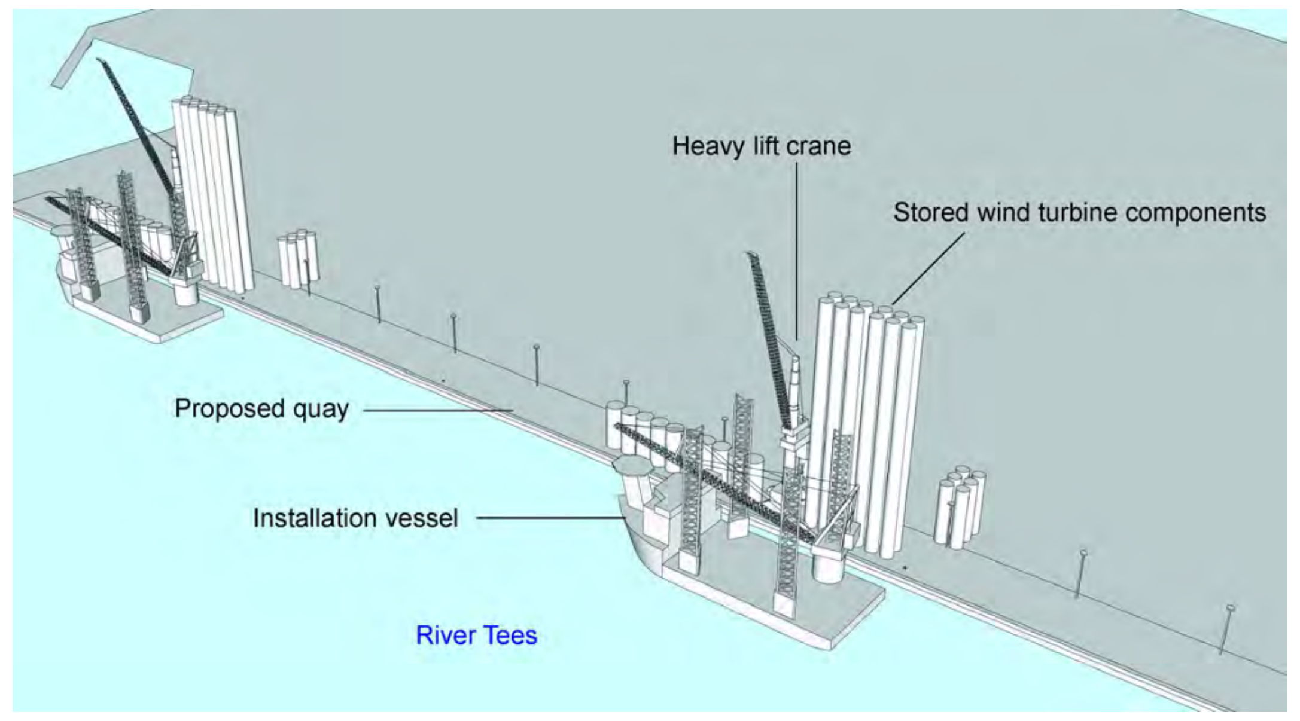
Size	Scale	Date	Created by	Reviewer
A1	NTS	12/10/2020	CL	MCE

Figure Nr.
19.3A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 1:
Looking north west from Eston Nab

Photograph Parameters

Time & date of photograph: 1:46pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 67.5^0

Camera Location and Orientation

Grid reference: E456844, N518321
Elevation: 242mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 324°
Distance to site boundary: 5.4km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals'*, Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 01

Size	Scale	Date	Created by	Reviewer
A1	NTS	25/06/2020	CL	MCE

Figure Nr. **19.3B**

Rev **00**

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 2:
Looking north from Argyle Road, Grangetown

Photograph Parameters

Time & date of photograph: 12:13pm, 29/09/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E454920, N520547
Elevation: 11mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 323°
Distance to site boundary: 2.5km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 2: Existing View

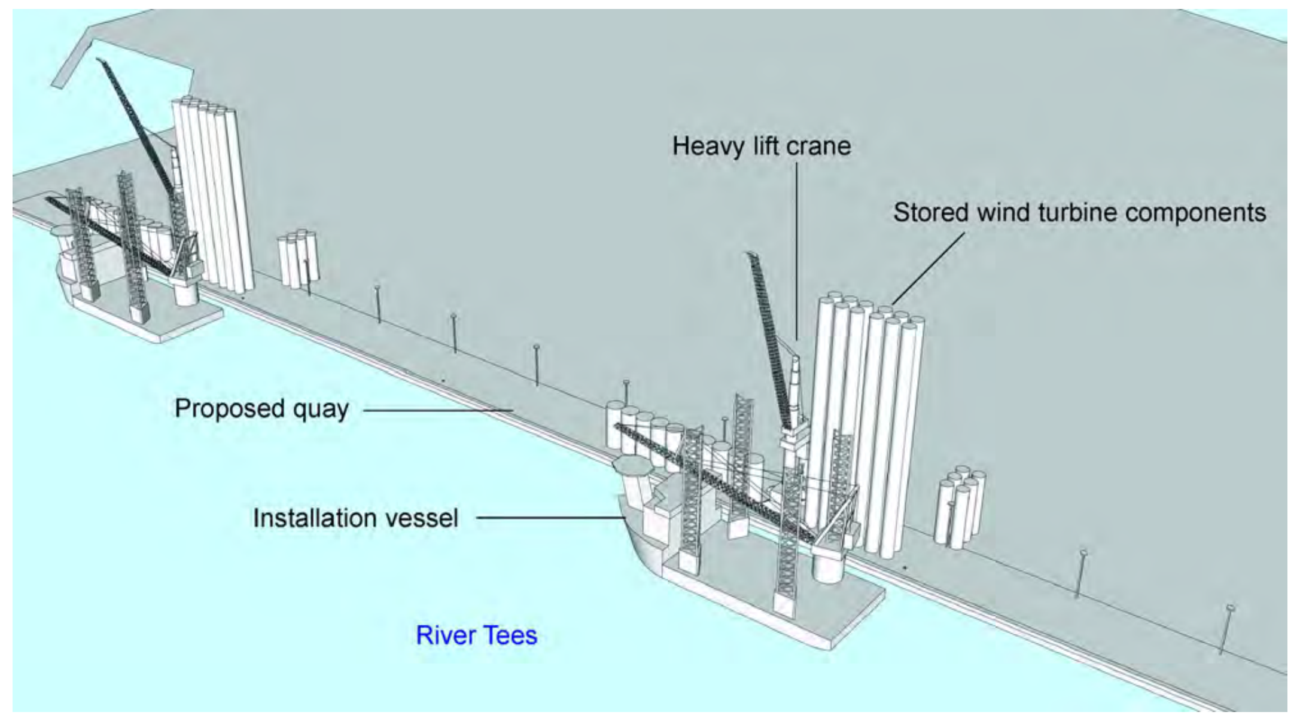
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.4A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 2:
Looking north from Argyle Road, Grangetown

Photograph Parameters

Time & date of photograph: 12:13pm, 29/09/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E454920, N520547
Elevation: 11mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 323°
Distance to site boundary: 2.5km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals'*, Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 02

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.4B

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 3:
Looking north east from Cargo Fleet River View Park

Photograph Parameters

Time & date of photograph: 10:06am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E452140, N521109
Elevation: 19.12mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 43°
Distance to site boundary: 1.4km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 3: Existing View

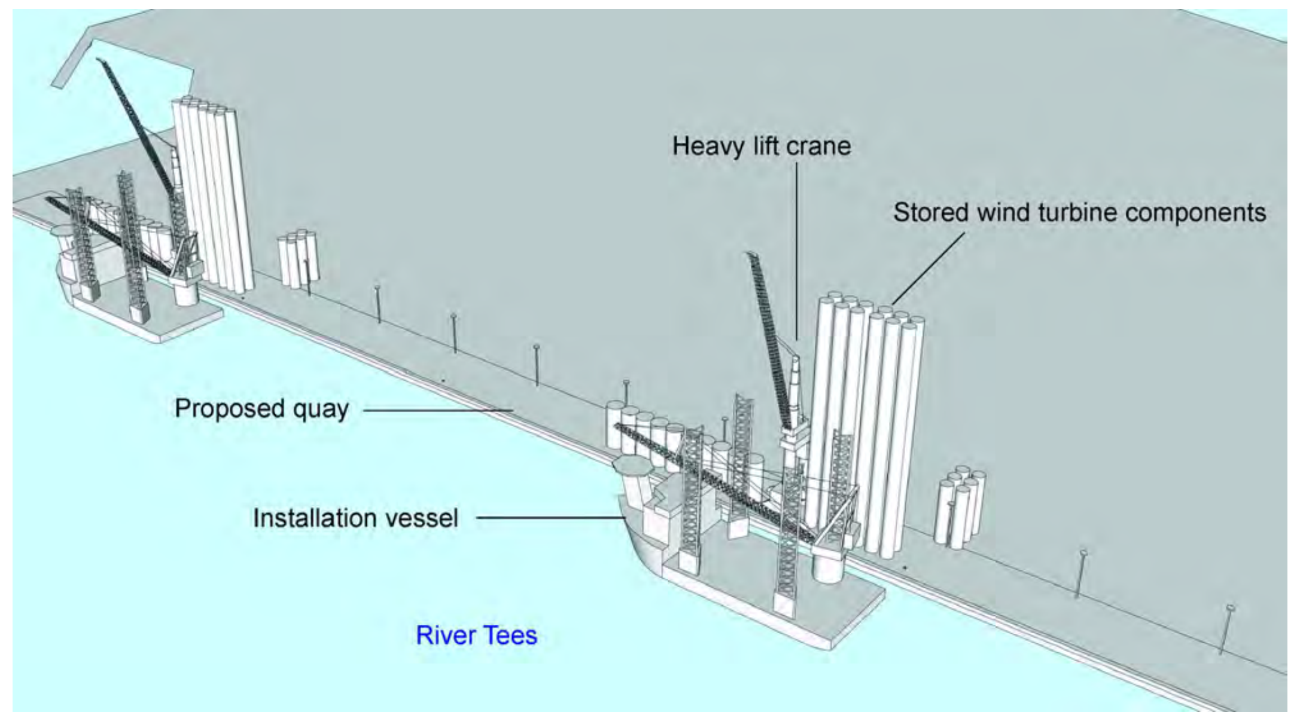
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.5A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 3:
Looking north east from Cargo Fleet River View Park

Photograph Parameters

Time & date of photograph: 10:06am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E452140, N521109
Elevation: 19.12mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 43°
Distance to site boundary: 1.4km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals'*, Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 03

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.5B

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 4:
Looking north from South Bank train station

Photograph Parameters

Time & date of photograph: 09:58am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E453365, N521301
Elevation: 9.53mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 38°
Distance to site boundary: 805m

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 4: Existing View

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.6

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 5:
Looking north east from Dockside Road across junction with Smith's Dock Road

Photograph Parameters

Time & date of photograph: 1:26pm, 17/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E453131, N521556
Elevation: 7mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 18°
Distance to site boundary: 500m

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 5: Existing View

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.7

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 6:
Looking south west from South Gare peninsula

Photograph Parameters

Time & date of photograph: 4:16pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E455620, N527374
Elevation: 8.84mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 196°
Distance to site boundary: 4.8km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 6: Existing View

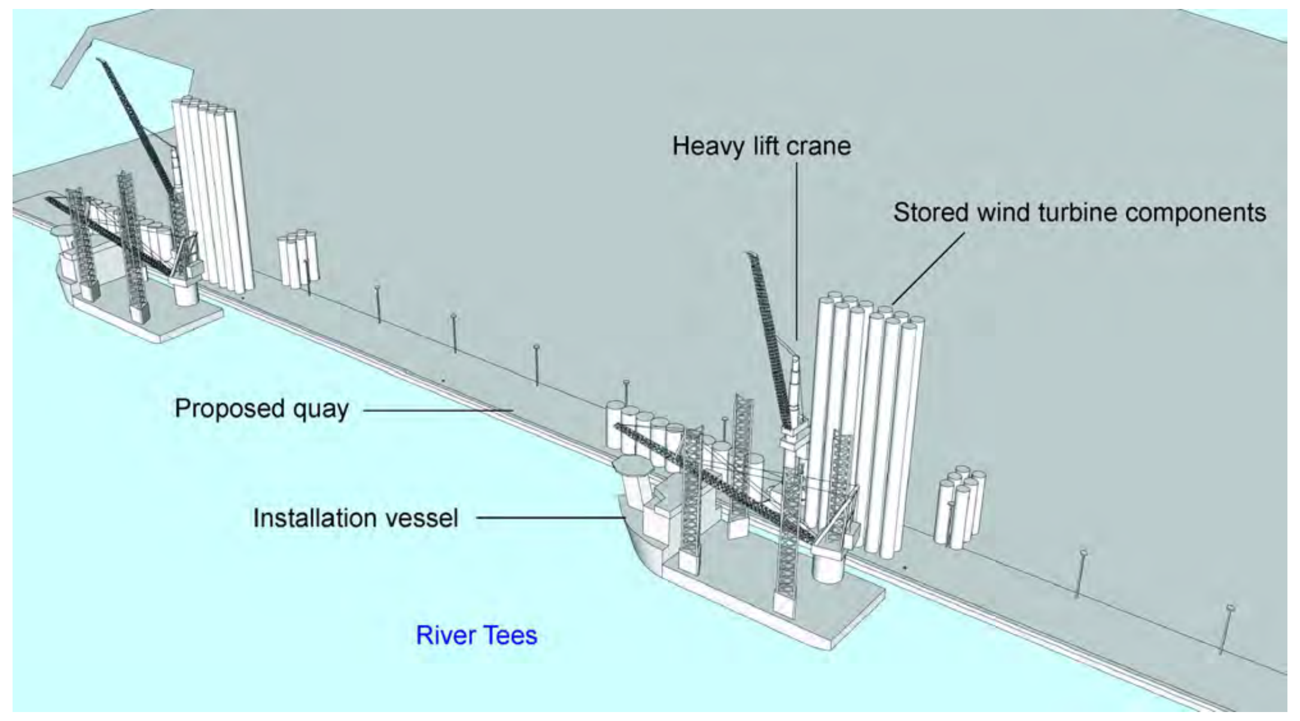
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr. **19.8A**

Rev **00**

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 6:
Looking south west from South Gare peninsula

Photograph Parameters

Time & date of photograph: 4:16pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E455620, N527374
Elevation: 8.84mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 196°
Distance to site boundary: 4.8km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals',* Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 06

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.8B

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 7:
Looking south west from Coatham Marsh Local Nature Reserve

Photograph Parameters

Time & date of photograph: 3:43pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E457970, N524835
Elevation: 21.76mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 243°
Distance to site boundary: 4.5km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 7: Existing View

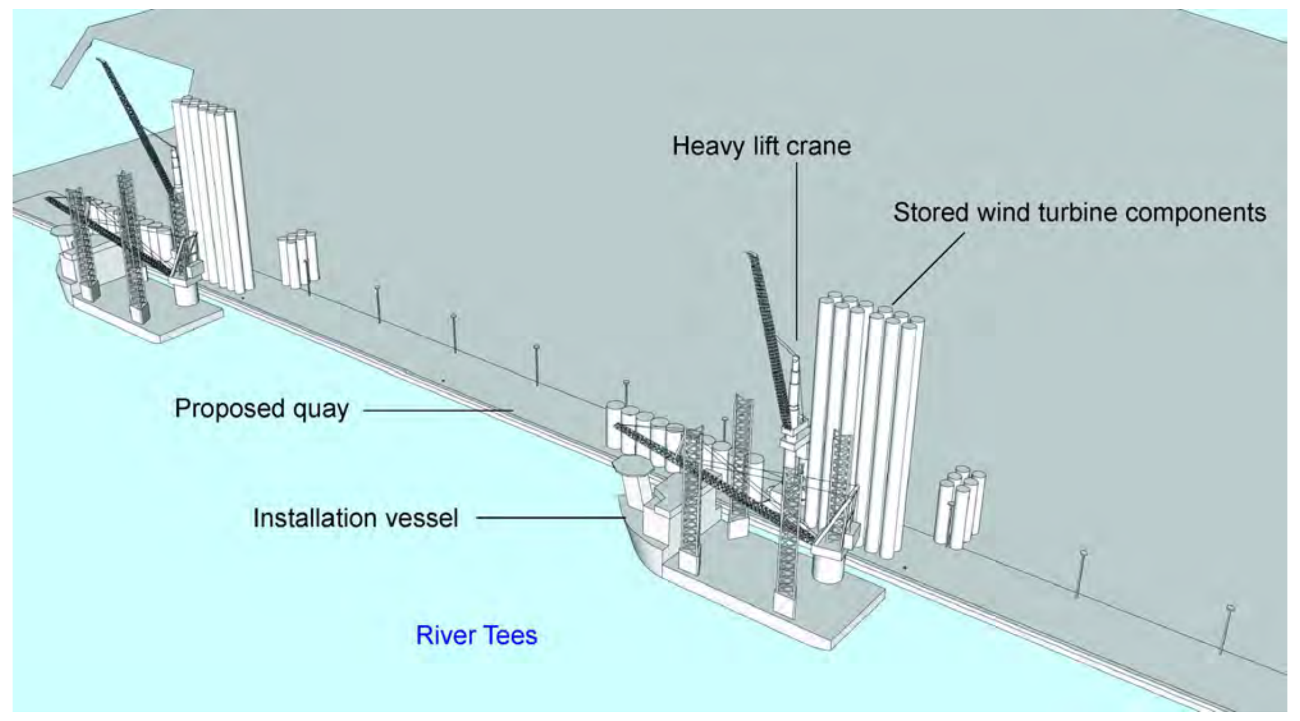
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.9A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW
Design & Assessment

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 7:
Looking south west from Coatham Marsh Local Nature Reserve

Photograph Parameters

Time & date of photograph: 3:43pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E457970, N524835
Elevation: 21.76mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 243°
Distance to site boundary: 4.5km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals'*, Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 07

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.9B

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 8:
Looking north west from the A1085 Trunk Road

Photograph Parameters

Time & date of photograph: 12:03pm, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E454234, N519895
Elevation: 11.84mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 343°
Distance to site boundary: 2.5km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 8: Existing View

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.10

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 9:
Looking north from Uvedale Road, Steele Crescent junction, South Bank

Photograph Parameters

Time & date of photograph: 11:44am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E453850, N520382
Elevation: 9.91mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 11°
Distance to site boundary: 1.8km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 9: Existing View

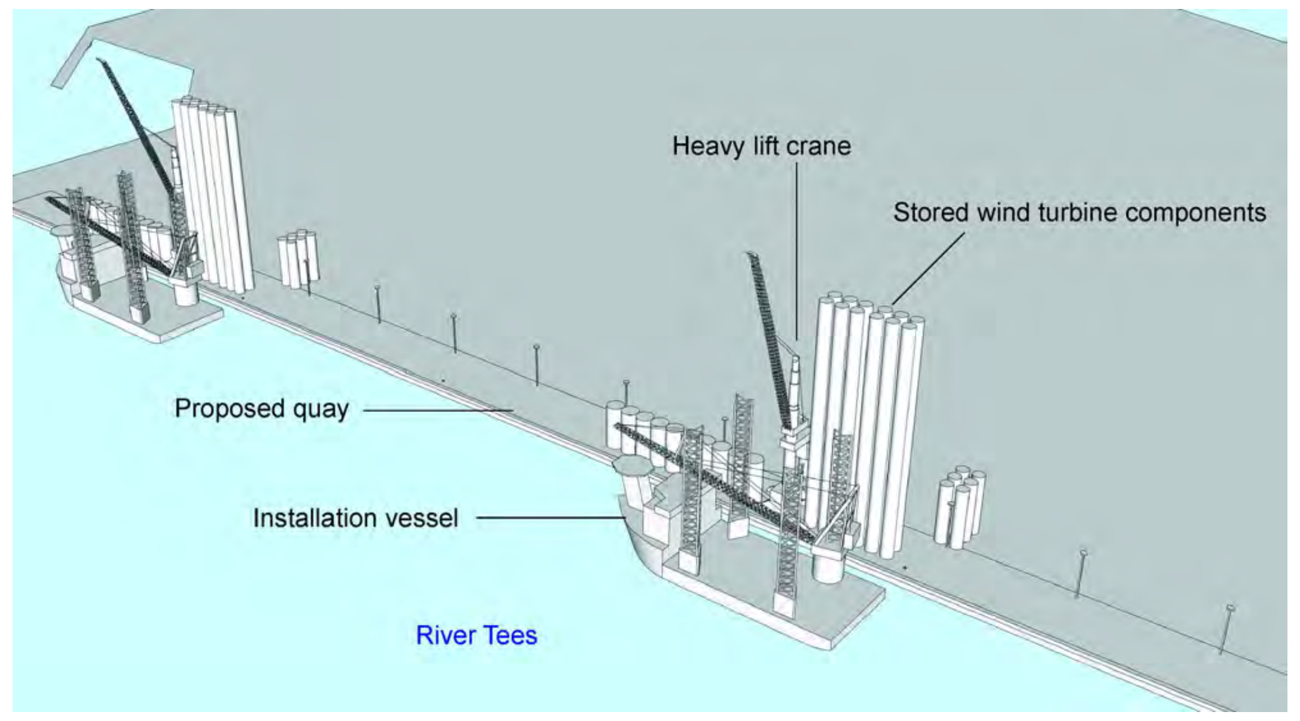
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.11A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 9:
Looking north from Uvedale Road, Steele Crescent junction, South Bank

Photograph Parameters

Time & date of photograph: 11:44am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E453850, N520382
Elevation: 9.91mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 11°
Distance to site boundary: 1.8km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals*', Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 09

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.11B

Rev
00

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 10:
Looking north from the junction of A66 and Normanby Road, South Bank

Photograph Parameters

Time & date of photograph: 11:30am, 08/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 82^0

Camera Location and Orientation

Grid reference: E453408, N520904
Elevation: 10.35mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 1°
Distance to site boundary: 1.3km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 10: Existing View

Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.12

Rev
00

Existing View

DRaW
Design & Assessment

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 11
Looking west from Errington Wood, New Marske

Photograph Parameters

Time & date of photograph: 2:09pm, 23/06/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 67.5^0

Camera Location and Orientation

Grid reference: E461795, N520197
Elevation: 101mAOD
Camera height above ground level: 1.6m
Direction to centre of site: 285°
Distance to site boundary: 8.7km

Notes

- The image is presented as a 125% enlargement of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 11: Existing View

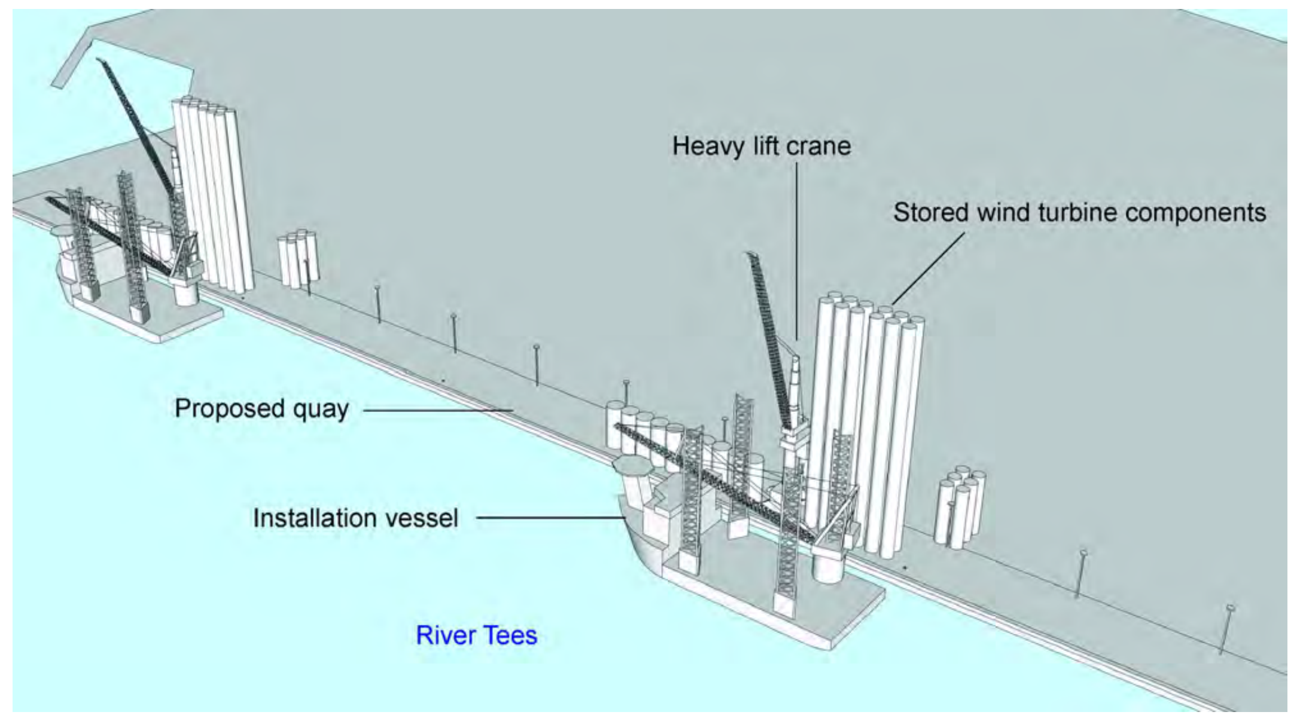
Size	Scale	Date	Created by	Reviewer
A1	NTS	19/06/2020	CL	MCE

Figure Nr.
19.13A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd Morwick Hall York Road Leeds LS15 4TA 0113 8232871 info@draw-ltd.com www.draw-ltd.com	Viewpoint **Viewpoint 11** Looking west from Errington Wood, New Marske	Photograph Parameters **Time & date of photograph:** 2:09pm, 23/06/2020 **Camera:** Nikon D600 (full frame sensor) **Lens:** 50mm prime. **Horizontal Field of View**: 67.5^0	Camera Location and Orientation **Grid reference:** E461795, N520197 **Elevation:** 101mAOD **Camera height above ground level:** 1.6m **Direction to centre of site:** 285° **Distance to site boundary:** 8.7km	Notes • Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals'*, Technical Guidance Note 06/19 (17 September 2019), Landscape Institute • The image is presented as a 125% enlargement of the reference image. • To be printed at A1 size and viewed at comfortable arms length. • For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.	Client Tees Valley Combined Authority Project South Bank quay Environmental Statement	Title Verified View 11 Size A1 · Scale NTS · Date 19/06/2020 · Created by CL · Reviewer MCE Figure Nr. **19.13B** · Rev **00**

Existing View

DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 12:
Looking east from the Tees Transporter Bridge viewing area, Ferry Road

Photograph Parameters

Time & date of photograph: 13:07pm, 29/09/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E449859, N521263
Elevation: 3mAOD
Camera height above ground level: 4.6m
Direction to centre of site: 69°
Distance to site boundary: 3.2km

Notes

- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Viewpoint 12: Existing View

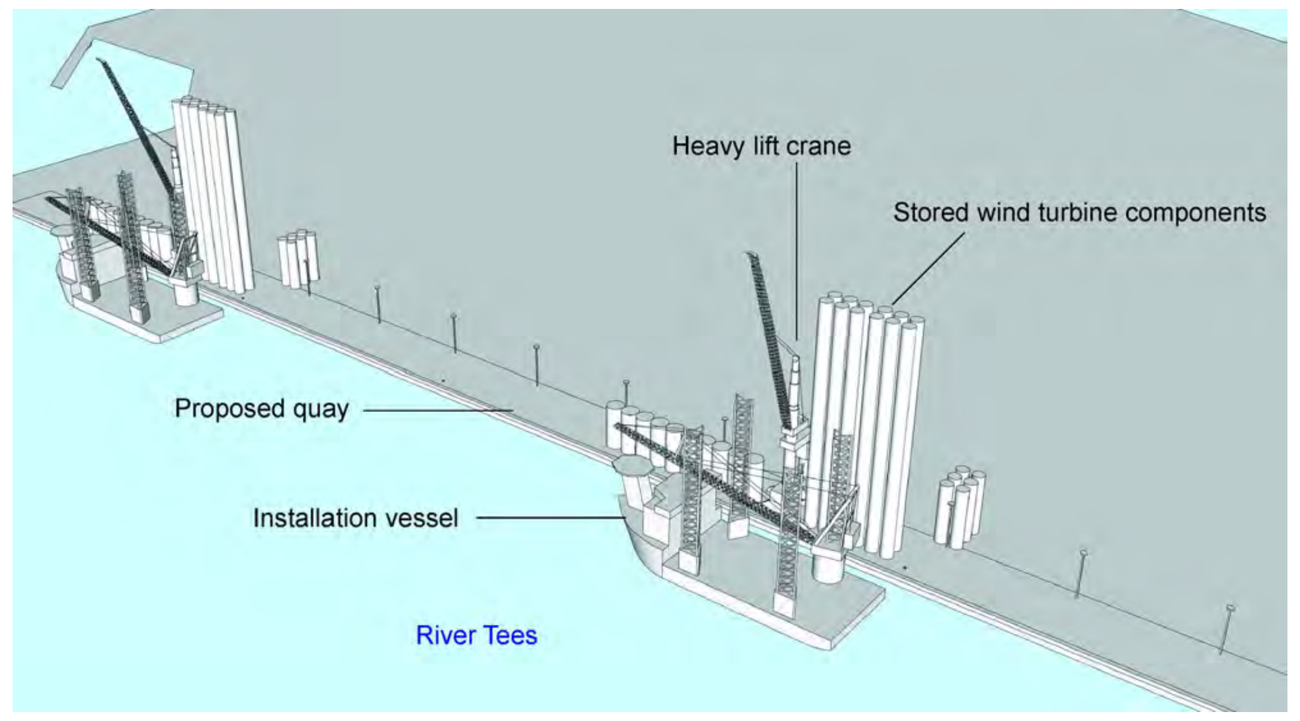
Size	Scale	Date	Created by	Reviewer
A1	NTS	12/10/2020	CL	MCE

Figure Nr.
19.14A

Rev
00

Verified view of the proposed development

Features illustrated in the photomontage view:



DRaW (UK) ltd
Morwick Hall
York Road
Leeds
LS15 4TA
0113 8232871
info@draw-ltd.com
www.draw-ltd.com

Viewpoint

Viewpoint 12:
Looking east from the Tees Transporter Bridge viewing area, Ferry Road

Photograph Parameters

Time & date of photograph: 13:07pm, 29/09/2020
Camera: Nikon D600 (full frame sensor)
Lens: 50mm prime.
Horizontal Field of View: 85^0

Camera Location and Orientation

Grid reference: E449859, N521263
Elevation: 3mAOD
Camera height above ground level: 4.6m
Direction to centre of site: 69°
Distance to site boundary: 3.2km

Notes

- Type 4 Visualisation in accordance with '*Visual Representations of Development Proposals',* Technical Guidance Note 06/19 (17 September 2019), Landscape Institute
- The image is presented at 100% of the reference image.
- To be printed at A1 size and viewed at comfortable arms length.
- For photograph locations refer to *Zone of Theoretical Visibility & Representative Viewpoint Locations*, Figure 19.2.

Client
Tees Valley Combined Authority

Project
South Bank quay
Environmental Statement

Title
Verified View 12

Size	Scale	Date	Created by	Reviewer
A1	NTS	12/10/2020	CL	MCE

Figure Nr.
19.14B

Rev
00

Appendix 15

Flood Risk Assessment

Royal
HaskoningDHV

REPORT

South Bank Quay

Flood Risk Assessment

Client: Tees Valley Combined Authority

Reference: PC1084-RHD-ZZ-XX-RP-Z-0001
Status: S0/P01.01
Date: 20 October 2020

Royal HaskoningDHV
Enhancing Society Together

HASKONINGDHV UK LTD.

Burns House
Harlands Road
Haywards Heath
West Sussex
RH16 1PG
Water
VAT registration number: 792428892

+44 1444 458551 **T**
info.haywards.heath@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

Document title:	South Bank Quay
Document short title:	
Reference:	PC1084-RHD-ZZ-XX-RP-Z-0001
Status:	P01.01/S0
Date:	20 October 2020
Project name:	Tees Study
Project number:	PC1084
Author(s):	Helena Wicks

Drafted by: Paul Sands & Oliver Bowers

Checked by: Helena Wicks

Date: 15/10/20

Approved by: Steven Rayner

Date: 20/10/2020

Classification
Project related

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
ISO 45001

Unless otherwise agreed with the Client, no part of this document may be reproduced or made public or used for any purpose other than that for which the document was produced. HaskoningDHV UK Ltd. accepts no responsibility or liability whatsoever for this document other than towards the Client. Please note: this document contains personal data of employees of HaskoningDHV UK Ltd.. Before publication or any other way of disclosing, this report needs to be anonymized.

Table of Contents

Table of Tables

Table of Figures

Appendices

1 Introduction

Royal HaskoningDHV has been commissioned by Tees Valley Combined Authority (herein ‘TVCA’) to prepare a Flood Risk Assessment (FRA) to support the submission of a planning application and marine licence application for a proposed new quay at South Bank in the Tees estuary (hereafter referred to as “the proposed scheme”).

The purpose of this FRA is to:

- provide the information required to support the aforementioned applications in terms of flood risk, including the application of the Sequential Test and, where appropriate, the Exception Test;
- provide recommendations on potential measures required to reduce flood risk to the proposed scheme, if applicable; and,
- inform potential mitigation options related to resistance and resilience measures.

This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF)[1], Planning Practice Guidance[2] (PPG) for Flood Risk and Coastal Change and the Environment Agency’s Climate Change Allowance[3] guidance. The Climate Change Allowance guidance sets out the Environment Agency’s recommended climate change allowances for development, when considering flood risk and coastal change for planning purposes.

The principal aim of these policies and guidance documents is to avoid inappropriate development in areas at risk of flooding and, wherever possible, to direct development away from areas at highest risk.

A separate FRA has been produced to support the South Tees Development Corporation (STDC) landside proposals for general industry and storage or distribution uses within part of the South Industrial Zone (JBA, 2020), immediately south of the proposed scheme footprint (referred to as the SIZ landside development hereafter). A review of the SIZ landside development FRA has been undertaken to support the production of this FRA.

---

[1] *National Planning Policy Framework, July 2018. Source: Ministry of Housing, Communities & Local Government https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed 19/08/2020)*

[2] *Planning Practice Guidance; Flood risk and coastal change, March 2014. Source: Ministry of Housing, Communities & Local Government. https://www.gov.uk/guidance/flood-risk-and-coastal-change (Accessed 25/08/2020)*

[3] *Flood Risk Assessments: Climate Change Allowances. Environment Agency. (Last updated 03/02/2017) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (Accessed 19/08/2020)*

2 Location and description of the proposed scheme

2.1 Proposed scheme location and existing use

The proposed scheme footprint occupies subtidal and intertidal areas of the Tees estuary, as well as an area of land on the southern bank of the River Tees which comprises currently unused, brownfield land (**Figure 1**). It is understood that the land within the proposed scheme footprint was raised and reclaimed from the River Tees in the 1930/40s and that previous land use at the site includes iron and steel industries.

In terms of estuarine infrastructure, the proposed scheme footprint contains the existing South Bank wharf and three jetty structures located immediately downstream. In addition, a series of pipes are present within the intertidal area which are associated with the pumping station located immediately inland of South Bank wharf, as well as various other smaller infrastructure including outfalls.

The linear strip of land comprises a concrete track running along its length, which provides access to the disused South Bank Wharf. The track continues east and joins with the road infrastructure of the concrete works immediately to the east. Within this linear strip of land there are also a number of small buildings present, including a pumping station and electrical substations.

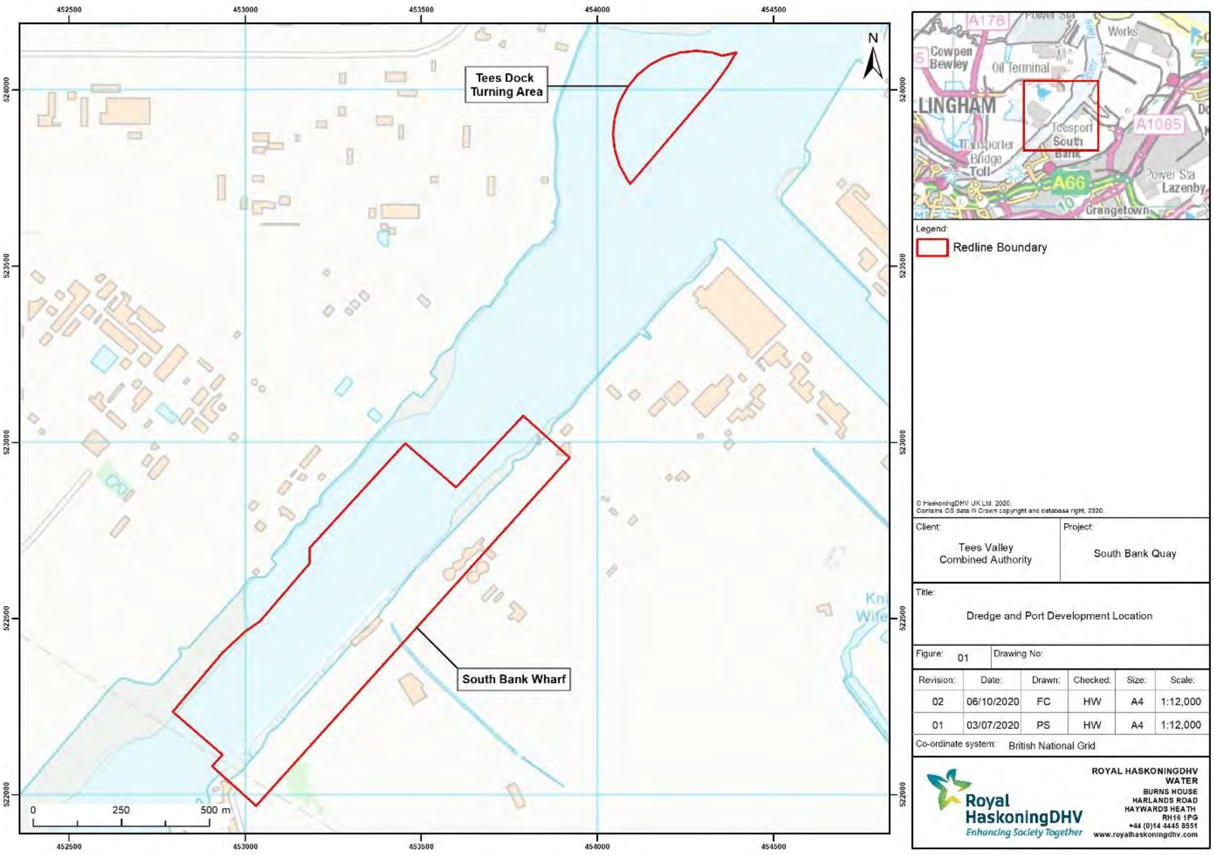


Figure 1 Proposed scheme footprint

2.2 Proposed scheme

The proposed scheme is defined in full within the Environmental Impact Assessment (EIA) Report (Royal HaskoningDHV, 2020) which this FRA supports, however in summary comprises:

- demolition of the existing infrastructure;
- capital dredging (to locally deepen the Tees Dock turning circle and approach channel and to create a berth pocket);
- offshore disposal of dredged sediments; and,
- construction and operation of a new quay that will be set back into the riverbank.

The proposed quay is to be constructed at a level of 8.64m Chart Datum (CD). Chart datum at the proposed scheme footprint is approximately 2.8m below Ordnance Datum (m OD). For the purpose of this FRA the proposed quay is to be 5.84m above Ordnance Datum (m AOD).

It is envisaged that the proposed quay would be utilised predominantly by the renewable energy industry, as well as supporting more general industrial and storage or distribution activities.

2.3 Hydrology

The proposed scheme footprint is located in the Tees Lower and Estuary catchment[4]. The landside parts of the proposed scheme footprint are entirely located on the south bank of the River Tees, a designated Environment Agency Main River. The proposed quay is to located approximately 6km upstream from the river mouth, where the River Tees enters the North Sea. The River Tees is a tidally influenced transitional waterbody as defined by the Water Framework Directive (WFD).

Approximately 10.5km upstream of the proposed scheme footprint, the River Tees is controlled by a tidal barrage. The barrage is operated by the Canal and River Trust and maintains a controlled water level upstream of the structure.

There is one unnamed watercourse that runs through the proposed scheme footprint. This watercourse was the former alignment of the Holme Beck, which has since been diverted along the south eastern boundary of the proposed SIZ landside development also being progressed by STDC. The currently unnamed channel that was formerly the alignment of the Holme Beck flows north through the SIZ landside development site via an open channel, before being culverted underneath the access track present within the proposed scheme footprint and discharging into the River Tees.

Within the wider area there are a number of small watercourses. The closest to the proposed scheme footprint comprise the Cleveland Channel and Lackenby Channel. The Cleveland Channel flows into the Lackenby Channel approximately 1.4km south-east of the proposed scheme footprint. The Lackenby Channel flows perpendicular to the River Tees in an open channel, before being culverted and draining into the River Tees approximately 300m north-east of the proposed scheme footprint via the Lackenby Outfall (JBA, 2020).

Review of Ordnance Survey mapping has not indicated any other watercourses that cross the proposed scheme footprint. The proposed scheme footprint is not identified as being located within a Source Protection Zone[5].

---

[4] *Environment Agency. Online. Catchment Data Explorer: Available at: https://environment.data.gov.uk/catchment-planning/ (Accessed 12/07/2020)*

[5] *DEFRA Magic Map. Online. Source Protection Zones: Available at: https://magic.defra.gov.uk/MagicMap.aspx*

2.4 Existing surface water drainage system

It is understood that there is no formal drainage system from the existing land adjacent to the Tees estuary. It is understood that surface water runoff and drainage from the land is likely to flow directly into the Tees estuary.

2.5 Geology

British Geological Survey (BGS) Maps[6] records the Bedrock geology for the entire proposed scheme footprint as undifferentiated Triassic Rocks. This is a sedimentary Bedrock formed approximately 200 to 251 million years ago in the Triassic Period, where the local environment was previously dominated by hot deserts. The BGS Map records the sole superficial geology for the proposed scheme as Tidal Flat Deposits formed during the Quaternary Period. Error! Reference source not found.

A historic borehole record (ref: NZ52SW15054/AS2 referred to as AS2) located approximately 25m from the Tees estuary has been reviewed. This borehole was located in close proximity to the southwestern corner of the proposed scheme footprint and notes that groundwater was recorded at 4.10m below ground level. This borehole was situated at 6.15m AOD, indicating that the groundwater level could be at approximately 2.05m AOD.

An additional borehole (ref: NZ52SW15054/AS4, referred to as AS4), located approximately 200m from the Tees estuary has been reviewed. This borehole was located 150m to the southeast of the proposed scheme footprint, within the SIZ landside development footprint. It found groundwater at 6.2m below ground level. This borehole was situated at 7.15m AOD, indicating that the groundwater level could be at approximately 0.95m AOD.

A review of the borehole records indicates that the groundwater level is approximately 1.1m deeper at borehole AS4 than AS2, with AS4 situated 175m further inland than AS2. Therefore, it is highly likely that groundwater is linked to tidal levels in the River Tees, with the groundwater levels deepening with distance from the watercourse. Shallower groundwater levels adjacent to the watercourse are likely due to percolation of water through the existing banks into the adjoining ground.

The Groundwater Vulnerability Map[7] shows:

"the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre".

Groundwater vulnerability classification is a product of soil type and the underlying geology; however, the depth to groundwater is not considered. The proposed scheme footprint falls within an area defined as Medium - High Vulnerability. This is the second highest of the five categories.

The Aquifer Designation Map[8] classifies the bedrock geology for the proposed scheme footprint as a 'Secondary B' aquifer. This is defined as:

---

[6] *British Geological Survey, Geology of Britain viewer. Available at http://scans.bgs.ac.uk/sobi_scans/boreholes/918110/images/16767534.html (Accessed 07/07/2020)*

[7] *Environment Agency, Groundwater Vulnerability Map. Available at https://magic.defra.gov.uk/MagicMap.aspx (Accessed 23/01/2020)*

[8] *Environment Agency, Aquifer Designation Map. Available at https://magic.defra.gov.uk/MagicMap.aspx (Accessed 23/01/2020)*

"Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers".

The Aquifer Designation Map[9] classifies the superficial geology for the entire proposed scheme footprint as a 'Secondary undifferentiated aquifer. This is defined for:

"cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type".

2.6 Topography

Much of the former industrial land within and around the proposed scheme footprint is reclaimed, therefore the topography is generally very flat with the exception of the artificial aggregate stores related to the concrete works and the various watercourses, the latter of which have been heavily modified and many are culverted. Remotely sensed topographic LiDAR data[10] at 1m resolution was downloaded from the DEFRA data portal and was used to produce a Digital Terrain Model (DTM), providing a visual representation of elevation (**Figure 2**).

The DTM shows that from the centre of the proposed scheme footprint, levels gently slope away to both the southwest and northeast. This centre point is located at the north-eastern extent of the existing wharf structure, where several buildings are also located. At this centre point, the highest levels are found at approximately 7.15m AOD.

Assessment of the DTM levels confirm that there are several locations along the riverbank, where levels of 6.05m AOD are found. The lowest levels are found on access ramps down to two jetty structures adjacent to the five cylindrical storage tanks and northeast of the South Bank Wharf. In this location the ground levels reduce to 5.30m AOD.

The topographic data indicates that surface water falling on the SIZ landside development to the immediate south of the proposed scheme footprint is likely to naturally flow across the proposed scheme footprint and into the River Tees.

---

[9] *Environment Agency, Aquifer Designation Map. Available at https://magic.defra.gov.uk/MagicMap.aspx (Accessed 23/01/2020)*

[10] *Environment Agency; Survey Open Data, LiDAR. Available at http://environment.data.gov.uk/ds/survey/index.jsp#/survey (Accessed 23/01/2020)*

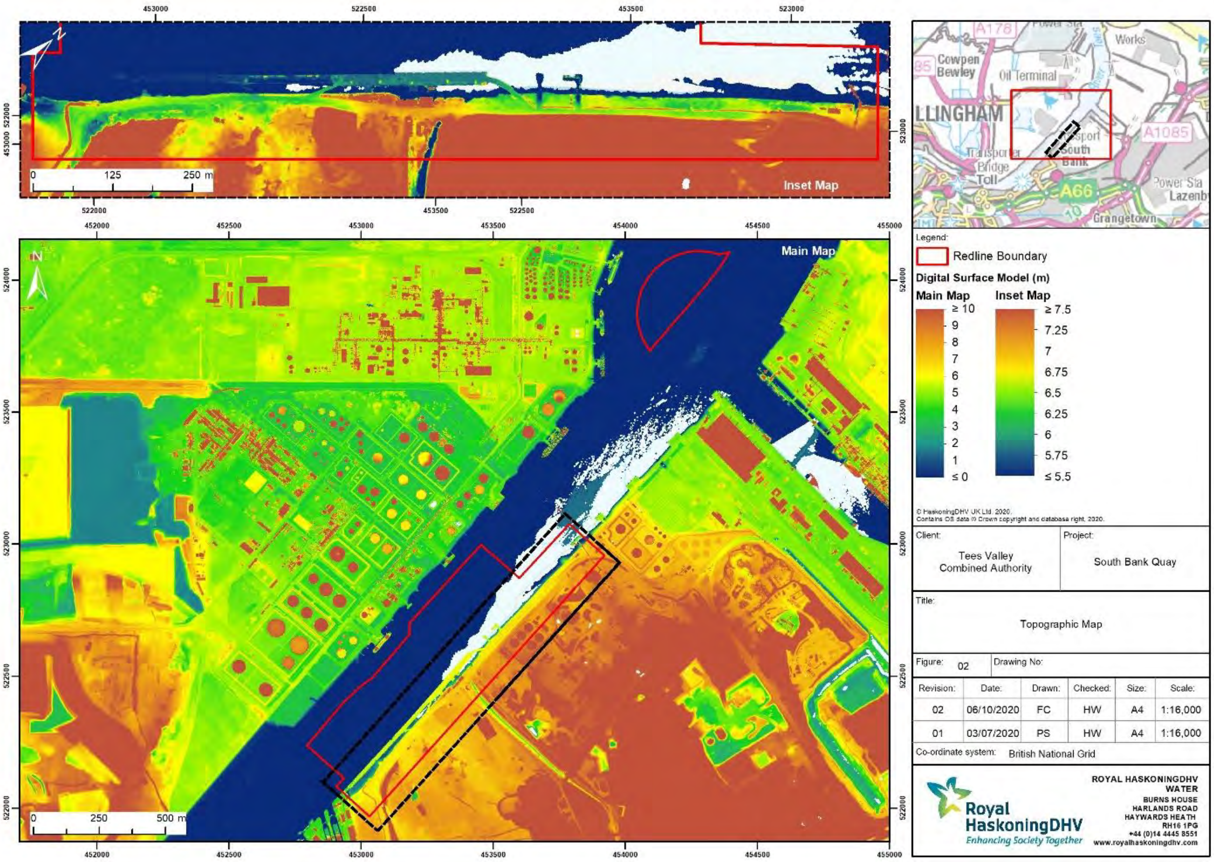


Figure 2 ***Proposed scheme topography (Source: Environment Agency 1m LiDAR; DTM)***

3 Development and flood risk

This section of the FRA outlines all national and local planning policies and documents that have been considered in the assessment of flood risk. **Table 3.1** sets out all referenced documents, which are then discussed in greater detail in relation to the proposed scheme throughout **Section 3.**

Table 3.1 National and Local Planning Policies & Documents referenced in the FRA

National Policies		
Document Name	***Published by***	***Date***
National Planning Policy Framework	Ministry of Housing, Communities & Local Government	2012 updated 2019
Planning Practice Guidance (NPPF PPG) for Flood Risk and Coastal Change	Ministry of Housing, Communities & Local Government	2014
Flood risk assessments: climate change allowances guidance	Environment Agency	2016 updated July 2020
Local Policies		
Document Name	***Published by***	***Date***
River Tees Catchment Flood Management Plan	Environment Agency	2009
Northumbria River Basin Management Plan	Environment Agency	2009
River Tyne to Flamborough Head Shoreline Management Plan 2	North East Coastal Authorities Group	2007
Redcar and Cleveland Borough Council Local Flood Risk Management Strategy	Redcar and Cleveland Borough Council	2017
Tees Tidal Flood Risk Management Strategy	Environment Agency	2009
Tees Tidal Integrated Flood Risk Modelling Study	Environment Agency	2011
Redcar and Cleveland Borough Council Preliminary Flood Risk Assessment	Redcar and Cleveland Borough Council	2011 (updated 2017)
Redcar and Cleveland Borough Council Level 1 Strategic Flood Risk Assessment	Redcar and Cleveland Borough Council	2016
Surface Water Management Plan	Redcar and Cleveland Borough Council	2014
Tees Valley Water Cycle Study	Stockton-on-Tees Borough Council	2012
Tees Valley Investment Plan 2019-29	Tees Valley Combined Authority	2019
South Industrial Zone Environmental Statement Volume 3 Technical Appendices (Water Management and Flooding)	South Industrial Zone: South Tees	2020

3.1 National Planning Policy Framework and Practice Guidance

The NPPF sets out the Government's planning policies for England. The NPPF seeks to ensure that flood risk is considered at all stages of the planning and development process, to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at risk of flooding.

The PPG for Flood Risk and Coastal Change[11] provides direction on how flood risk should be considered at all stages of the planning and development process, with additional guidance on flood risk vulnerability classifications and managing residual risks (**Table 3.3**). The PPG provides further description of Flood Zones, Vulnerability Classifications and Compatibility in order to assess the suitability of a specific site for a certain type of development.

Table 3.2 Summary of flood zone definitions

Flood zone	*Probability of flooding*	*Return periods*
1	Low	Land having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
2	Medium	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%); or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%).
3a	High	Land having a 1 in 100 or greater annual probability of river flooding (≥ 1%); or Land having a 1 in 200 or greater annual probability of sea flooding (≥ 0.5%).
3b	High – Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

The NPPF directs development away from areas at highest risk of flooding via application of the Sequential Test. If, following application of the Sequential Test, it is not possible for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate.

Whilst not a specific requirement within the NPPF, it is critical that FRAs also identify and mitigate against risks of surface water flooding. The Environment Agency provides national datasets on surface water flood risk, classified into four categories; ‘Very low’, ‘Low’, ‘Medium’ and ‘High’ (**Table 3.4**).

Table 3.3 Summary of flood risk from surface water definition

Probability of surface water flooding	*Return periods*
Very low	Land with less than 1 in 1,000 annual probability of surface water flooding (<0.1%).
Low	Land with between 1 in 1,000 and 1 in 100 annual probability of surface water flooding (0.1% - 1%).
Medium	Land with between 1 in 100 and 1 in 30 annual probability of surface water flooding (1% - 3.3%).
High	Land with greater than 1 in 30 annual probability of surface water flooding (>3.3%).

3.2 Flood Risk Assessments: Climate Change Allowances

The Environment Agency’s online advice note ‘Flood Risk Assessments: Climate Change Allowances’, published in February 2016 and last amended in July 2020 has been used to inform this FRA. The latest July 2020 amendments includes guidance on the allowances to be adopted for certain types of development within the sections on peak river flow, sea level rise, wind speed, wave height and storm surge.

This advice note provides guidance on the application of climate change allowances which considers the geographical location, life span of the proposed development, flood zones, vulnerability classification associated with the type of development and critical drainage areas.

---

[11] *PPG for Flood Risk and Coastal Change. March 2014. https://www.gov.uk/guidance/flood-risk-and-coastal-change#site-specific-flood-risk-assessment-allf (Accessed 16/07/2020)*

Guidance is provided for determining appropriate climate change allowances for fluvial events, tidal / sea level rise and peak rainfall intensities. Further information on the application of climate change within this FRA is included in **Section 6**.

3.3 Relevant local policy documents and studies

The Flood and Water Management Act (FWMA) was passed in 2010. It aimed to improve both flood risk management and the way we manage our water resources by creating clearer roles and responsibilities. Redcar & Cleveland Borough Council (RCBC) were delegated as the lead role for Local Authorities, known as the Lead Local Flood Authority (LLFA), responsible for managing local flood risk (from surface water, groundwater and ordinary watercourses) whilst the Environment Agency has a strategic overview role for all flood risk.

The Tees Valley Strategic Flood Risk Management Partnership is made up of an Elected Member from Redcar & Cleveland Borough Council, as well as an elected member from all other Tees Valley Authorities, Environment Agency, Northumbrian Water, and the Tees Valley Emergency Planning Unit. The group's terms of reference are to address flood risk at a Tees Valley regional level, emerging legislation, local priorities, cross boundary working and local standards.

The following sections set out the key policy documents and studies that have been carried out and are of relevance to the proposed scheme.

3.3.1 River Tees Catchment Flood Management Plan (CFMP)

Catchment Flood Management Plans (CFMP) assess inland flood risk including the risk of tidal flooding, but do not assess the risk of coastal flooding, which is covered by Shoreline Management Plans (**Section 3.3.3**). The CFMP helps to understand flood risk and set appropriate policies to inform planning decision in the region.

The Tees Catchment Flood Management Plan[12] (Environment Agency, 2009) area includes three main rivers, divided into eight sub-areas. The proposed scheme footprint sits within the Eastern sub-area of the CFMP. The CFMP states:

"This sub-area contains the majority of the urban development within the Tees CFMP area. In total around 4,750 properties lie within the one per cent undefended floodplain within the sub-area. As an area identified as a growth point there is development pressure in the sub-area which may increase risk of flooding in the future. Under the climate change future flooding scenario risk to properties increases by around 10 per cent in the lower Tees area. In addition to river flooding the urban areas suffer surface water flooding problems from the drainage systems, these are present in this sub-area".

Policy 5 of the CFMP is relevant to the Eastern sub-area:

*"**Area of moderate to high flood risk where we can generally take further action to reduce flood risk.** This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal*

---

[12] *Environment Agency, 2009. Tees Catchment Flood Management Plan. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289194/River_Tees_Catchment_Flood_Management_Plan.pdf (Accessed 24/07/2020)*

to assess whether there are socially and environmentally sustainable, technically viable and economically justified options".

In following Policy 5, the CFMP will look to encourage the development of Surface Water Management Plans and work with the Local Authorities and water companies to reduce surface water flooding. They will also implement the findings of the Tees Tidal Strategy and install defences if economically and environmentally sound and investigate options for providing flood storage to help reduce the risk of flooding.

3.3.2 Northumbria River Basin Management Plan

The Northumbria River Basin Management Plan[13] (2015) provides a framework for protecting and enhancing the benefits provided by the water environment. To achieve this, it also informs decisions on land-use planning. For the Tees catchment, the plan notes that the priority issues this catchment are urban and diffuse pollution, invasive non-native species (INNS) and lost connectivity between estuary and river.

The aims of the plan are to adopt Catchment Based Approach (CaBA) projects to provide enhancements such as natural flood management, habitat improvements, RDP reduction (sediment and nutrients), improving water quality and river habitat, improving fish passage and, where relevant, reducing flood risk. The vision for the Tees Estuary Habitat is to develop and implement a blueprint of improved estuary habitats that link to Teesside tributaries within the thriving industrial heartland.

3.3.3 River Tyne to Flamborough Head Shoreline Management Plan 2 (SMP)

The River Tyne to Flamborough Head Shoreline Management Plan (SMP) 2[14] (2007) provides a large-scale assessment of the risks associated with shoreline evolution, coastal flooding and erosion, and presents a policy framework to address these risks to people and the developed, historic and natural environment in a sustainable manner.

The Tees estuary to the northeast of the proposed scheme falls within SMP management unit MA13 (Tees Bay). The policy plan for this management unit for all three epochs (up to 2025 until 2105) is to 'Hold-the-Line' across the Tees estuary, with areas on either side adopting a 'No-Active-Intervention' approach. For each epoch, the area that is 'Hold-the-Line' across the Tees estuary will gradually reduce, with the 'No-Active-Intervention' areas increasing on either side.

3.3.4 Redcar and Cleveland Borough Council Local Flood Risk Management Strategy (LFRMS)

The Local Flood Risk Management Strategy (LFRMS)[15] was written by RCBC in their role as the LLFA and published in 2017.

Whilst the proposed scheme is located within and on the bank of the River Tees, the primary focus of the LFRMS is on 'local flooding' from surface water, groundwater or ordinary water courses such as streams and ditches. It provides guidance on the flood management authorities and their responsibilities in relation to managing flood risk.

---

[13] *Environment Agency. Northumbria River Basin Management Plan (updated 2015). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718333/Northumbria_RBD_Part_1_river_basin_management_plan.pdf (Accessed 04/09/2020)*

[14] *River Tyne to Flamborough Head SMP 2 (2007). https://democracy.scarborough.gov.uk/mgConvert2PDF.aspx?ID=942 (Accessed 24/07/2020)*

[15] *Redcar and Cleveland Borough Council Local Flood Risk Management Strategy. September 2017. https://www.redcar-cleveland.gov.uk/resident/flooding/Documents/Redcar%20%26%20Cleveland%20Borough%20Council%20Flood%20Risk%20Strategy.pdf (Accessed 24/07/2020)*

It is noted that the River Tees rarely directly causes flooding in the borough, with the biggest impact being the restriction of flow from watercourses that ultimately discharge into the river. None of the ordinary watercourses within or adjacent to the proposed scheme footprint are identified as those most commonly affected by this type of flooding.

The objectives of the LFRMS relevant to the proposed scheme are as follows:

- Objective 1: To reduce flood risk to communities severely affected by recent flooding
- Objective 2: To reduce the incidence of surface water flooding
- Objective 3: To ensure flood risk is managed in new development

It is also noted in the LFRMS that the Tees Dock Road is currently the only access into Teesport and has been subject to frequent flooding which can restrict access. It is understood that there is access to pumps which can be used to discharge water on the road via pre-agreed points.

3.3.5 Tees Tidal Flood Risk Management (FRM) Strategy

The Tees Tidal Flood Risk Management (FRM) Strategy (Environment Agency, 2009) identified the need for improvements or raising of existing flood defences within the Tees estuary, up to the Tees Barrage. This report also highlighted areas which may be at risk of flooding, either at present or in the future. Areas identified as being at risk are those located where ground levels are less than 5.0m AOD. This level relates to a 0.1% (1 in 1,000) probability of a flood event occurring in any one year. A water level with a 0.5% (1 in 200) probability of occurrence in any one year is classified in the Tees Tidal FRM Strategy as being 4.19m AOD (Environment Agency, 2009). The highest recorded flood event along the Tees occurred in 1953 and reached a level of 4.0m AOD.

3.3.6 Tees Tidal Integrated Flood Risk Modelling Study

The Tidal Tees Integrated Flood Risk Modelling Study (Environment Agency, 2011) expanded upon the Tees Tidal FRM Strategy through development and application of an ESTRY-TUFLOW model that covers the Tees estuary from Teesmouth at the coast to its upstream extent at the Tees Barrage.

The report presented updated extents for Flood Zones 2 and 3, associated with the 1 in 1,000 and 1 in 200-year return period events as a result of tidal flooding risk.

Information from this modelling and report has been used to inform the development of the FRA.

3.3.7 Redcar and Cleveland Borough Council Preliminary Flood Risk Assessment (PFRA)

The Preliminary Flood Risk Assessment[16] (PFRA) for Redcar and Cleveland Borough Council was published in 2011 and updated in 2017 in response to the Flood & Water Management Act 2010, which states that a LLFA is required to produce a PFRA under the Flood Risk Regulations 2009.

As part of the Preliminary Flood Risk Assessment (PFRA) process the LLFA is required to determine whether there is a significant risk in their area based on local flooding (surface water, groundwater, ordinary watercourses and canals) and to identify the part of the area affected by these risks. This is then known as the Flood Risk Area.

---

[16] *Redcar and Cleveland Borough Council Preliminary Flood Risk Assessment. 2011. https://webarchive.nationalarchives.gov.uk/20140328164121/http://cdn.environment-agency.gov.uk/flho1211bvio-e-e.pdf (Accessed 24/07/20)*

Based on the evidence that was collected, no past flood events were considered to have had 'significant harmful consequences'. It was therefore concluded that RCBC does not have the evidence to justify the identification of a Flood Risk Area in their administrative area. Therefore, as the LLFA they are not required to produce flood hazard maps, flood risk maps and flood risk management plans for that area.

However, it must be noted that there are a number of locations across Redcar and Cleveland that are subject to frequent flooding from local sources, particularly from surface water. Based on the Environment Agency's national surface water modelling approximately 4,200 properties are estimated to be at risk from flooding to a depth of 0.3m during a rainfall event with a 0.5% annual probability.

The high-level screening exercise compiled information on significant local flood risk from past and potential future flood events for the administrative area. The mapping indicates that the proposed scheme is within a 1km grid square where over 75% of the land is susceptible to groundwater emergence, this is likely due to the proximity to the River Tees.

High level mapping has recorded no historic flood events at the proposed scheme footprint or its surrounding area. It does however show that there are areas of the proposed scheme footprint that may be at some form of surface water flood risk (see **Section 4.3** for more detailed surface water flood risk analysis).

3.3.8 Redcar and Cleveland Borough Council Level 1 Strategic Flood Risk Assessment (SFRA)

The RCBC Level 1 Strategic Flood Risk Assessment (SFRA)[17] was updated in 2016 to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary.

Parts of the proposed scheme footprint are identified in the SFRA mapping as 'Employment Land Developed' with reference code ELD12. This indicates that the proposed scheme footprint has been allocated as part of the local council's development plan as suitable land for development.

3.3.9 Redcar Surface Water Management Plan

The Redcar Surface Water Management Plan was not reviewed as part of this FRA, as it was not publicly available online. However, an extract taken from the RCBC Level 1 Strategic Flood Risk Assessment notes that:

"Part of this study looked at the possibility of upstream flood storage to reduce flooding to areas downstream. It was found that a flood storage scheme at Dormanstown could be feasible utilising a modest dam (of maximum height 2.5 m) to store a significant volume of water (82,626 m^3). A flood storage scheme on Roger Dyke (upstream of the A174) was also examined however this would be at a significant cost (compared to the estimated benefits)."

Due to the distance from the proposed scheme footprint, the potential flood storage scheme at Dormanstown is unlikely to interact with the proposed scheme, should it be constructed.

---

[17] *Redcar and Cleveland Borough Council Level 1 Strategic Flood Risk Assessment. 2016. https://www.redcar-cleveland.gov.uk/resident/planning-and-building/local-plan/Local%20Plan%20Documents/Redcar%20and%20Cleveland%20Strategic%20Flood%20Risk%20Assessment%20(Level%201)/RCBC%20Level%201%20SFRA%20Update%202016.pdf (Accessed 24/07/2020)*

3.3.10 Tees Valley Water Cycle Study

The Tees Valley Water Cycle Study (WCS) was published in December 2012. The objective of the study was to identify any constraints on housing and employment growth planned for the area up to 2026 that may be imposed by the water cycle and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support the proposed development.

In terms of flood risk, the WCS states that flood risk in the region is dominated by the North Sea and the River Tees, although there are areas of Flood Zones 2 and 3 associated with smaller watercourses across the area. This assessment was based on an older version of the EA's Flood Map for Planning i.e. prior to 2012.

3.3.11 Tees Valley Investment Plan 2019-29

The Tees Valley Investment Plan[18] is prioritised across six growth generating themes of: Transport, Education, Employment & Skills, Business Growth, Culture & Tourism, Research, Development & Innovation and Place. The Investment Plan is reviewed annually with a total of £588.2m available to invest over the ten-year plan.

Parts of this Plan which are relevant to the proposed scheme footprint include strategic road investment in the form of the improved east-west connectivity along the A66 corridor from the A1M to Teesport and the rail investment upgrades of the line from Northallerton to Middlesbrough / Teesport, including gauge clearance for freight. Once completed, both of these planned investments will improve transport links to and from the proposed scheme footprint.

3.3.12 Redcar & Cleveland Development Plan (Local Plan)

The Redcar and Cleveland Local Plan[19] was adopted in May 2018. It sets out the vision and overall development strategy for the Council's area and how it will be achieved for the period until 2032. It is the most important planning document in the borough and is the result of a long process of preparation that has involved all parts of the Council.

Increased flood risk is identified as a key issue within the Local Plan. It was noted in Section 1.117 of the Local Plan that the Council has worked closely with the Environment Agency and Northumbrian Water to ensure new development is located in areas which are at least risk of flooding.

Furthermore, Section 1.118 noted that the Council has produced a number of surface water management plans for the highest surface water risk areas within the borough. These plans have identified a number of infrastructure improvement solutions to reduce flood risk in these areas, both for existing properties and new development.

The proposed scheme footprint is situated within Policy Area LS 4 – South Tees Spatial Strategy. As part of this strategy, the Council aims to:

- deliver significant economic growth and job opportunities through the STDC;
- grow the environmental and recycling sector;

---

[18] *Tees Valley Combined Authority. 2019. Tees Valley Investment Plan 2019-29. https://teesvalley-ca.gov.uk/wp-content/uploads/2019/03/Investment-Plan-2019-20-Digital.pdf (Accessed 07/09/20)*

[19] *Redcar & Cleveland Borough Council. 2018. Redcar & Cleveland Local Plan. https://www.redcar-cleveland.gov.uk/resident/planning-and-building/strategic%20planning/Documents/Local%20Plan%20Adopted%20May%202018.pdf (Accessed 07/09/20)*

- investigate opportunities to create a new energy hub to support the offshore wind and sub-sea engineering sectors; and
- support the expansion and protection of the port and logistics sector.

Policy SD 4 of the Local Plan (General Development Principles) highlights that in assessing the suitability of a site or location, development will be permitted where it will not increase flood risk either on site or downstream of the development.

Policy SD 5 of the Local Plan (Developer Contributions) highlights that, subject to economic viability, the Council may secure developer contributions in order to fund necessary infrastructure and other community benefits required as a consequence of development. Planning obligations will be sought where it is not possible to mitigate the impacts of development through the use of a condition and the contributions are fair, reasonable, directly related to the development and necessary to make the development acceptable in planning terms. Examples of matters for which contributions relevant to the nature and scale of the development will be sought will include drainage and flood prevention measures.

Policy SD 7 of the Local Plan (Flood and Water Management) states that: "*Flood risk will be taken into account at all stage in the planning process to avoid inappropriate development in areas at current or future risk*". It is noted that development in areas at risk of flooding will only be granted where:

- The proposal meets the Sequential and Exception Tests (where required) in relation to the National Planning Policy Framework;
- A site-specific flood risk assessment demonstrates that the development will be safe, including the access and egress, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall; and
- New site drainage systems are well designed, taking account of events that exceed the normal design standard.

Further guidance is provided on when an FRA should be provided and the methods of managing surface water runoff. It is noted that:

"where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or River Tees) the peak flow control standards and volume control standards need not apply".

Nevertheless, major developments will be required to submit a drainage plan to show the site drainage can be adequately dealt with. The proposed drainage scheme should incorporate SuDS unless it can be demonstrated that they would be inappropriate. The drainage system must be designed and constructed so surface water discharged does not adversely impact the water quality of receiving water bodies, both during construction and when operational. New development should seek to improve water quality where possible, as well maintaining and enhancing the biodiversity and habitat of watercourses.

3.3.13 South Industrial Zone Environmental Statement Volume 3 Technical Appendices (Water Management and Flooding)

STDC submitted an Environmental Statement (ES) (July 2020) for general industry and storage or distribution uses within the SIZ landside development footprint. The ES assessed the flood risk in a separate FRA[20], undertaken by JBA in July 2020. The SIZ landside development ES and FRA were reviewed in order

---

[20] *JBA. 2020. South Industrial Zone Environmental Statement Volume 3 Technical Appendices (Water Management and Flooding)*

to understand the interactions between this site and the proposed scheme footprint which is the subject of this report.

The SIZ landside development FRA identified that the site of that is situated in Flood Zone 1 and is at very low risk from fluvial flooding. Previous modelling information indicated that there is a moderate risk of tidal / coastal flooding. However, the ground level for the SIZ application site is to be set above the 1 in 200-year tidal flood level, including climate change adjustment until 2100.

Modelling of overland flows within the FRA for the SIZ landside development indicates that there is a moderate risk from surface water flooding, with water pools forming in low spots on the proposed scheme footprint, notably the depressions at the landfill area. However, surface flows are shallow and do not follow any clear overland flow paths.

3.4 Consultation

3.4.1 Environment Agency

The Environment Agency was contacted to request the Product 5 and 8 data packages relevant to the proposed scheme. This was received from the Environment Agency on 22nd July 2020 (**Appendix A**) and included the Tidal Tees Integrated Flood Risk Modelling Study as well as data from the 2011 ISIS-TUFLOW model which covers the Tees estuary from Teesmouth at the coast to the Tees Barrage upstream.

Additionally, consultation was undertaken with the Environment Agency via the September 2020 scoping consultation undertaken to inform the EIA. The Environment Agency confirmed the requirement to consider all sources of flooding, any mitigation measures required to ensure a safe development in a 1 in 200 year event, guidance on the climate change guidelines to be reviewed and information related to the potential consents / permits that may be needed for the proposed scheme. The consultation with the Environment Agency has been used to inform the assessment for this FRA and the flood risk and coastal defence section of the EIA Report (Royal HaskoningDHV, 2020).

3.4.2 Lead Local Flood Authority

Following consultation with the LLFA as part of the September 2020 EIA scoping consultation, which for the proposed scheme is RCBC, they offered no additional comments regarding the contents and methodology outlined in the scoping note with regard to the assessment of flood risk (Royal HaskoningDHV, 2020).

The LLFA commented on the proposed SIZ landside development located to the immediate south of the proposed scheme footprint, which as noted earlier has been subject to a separate FRA. In its response, the LLFA raised no objection to the proposed SIZ landside development. However, the LLFA did make a comment regarding compliance with planning policy, suggesting that an appropriately worded condition would need to be agreed to allow for alterations to be carried out on Holme Beck and Knitting Wife Beck. These are not of direct relevance to the proposed scheme for which this FRA has been developed. No comments were raised with regard to the former course of the Holme Beck which flows through both the SIZ landside development and the proposed scheme footprint.

3.4.3 Northumbrian Water

Northumbrian Water commented on the proposed SIZ landside development planning application, specifically stating that the application did not provide sufficient detail with regards to the management of foul and surface water from the development for Northumbrian Water to be able to assess its capacity to treat the flows from the development. Northumbrian Water requested the following condition on any planning permission issued by RCBC for the SIZ landside development:

"*Development shall not commence until a detailed scheme for the disposal of foul and surface water from the development hereby approved has been submitted to and approved in writing by the Local Planning Authority in consultation with Northumbrian Water and the Lead Local Flood Authority. Thereafter the development shall take place in accordance with the approved details*"

It has been noted that a number of assets cross the boundary of the proposed SIZ landside development. Northumbrian Water have stated that they do not permit buildings over or close to their apparatus. The SIZ landside application has accepted this planning condition and the reserved matters applications will need to take account of apparatus across the proposed scheme footprint. Although this requirement is not of direct relevance to the proposed scheme for which this FRA has been developed, it has been included for completeness given the proximity of the SIZ landside development to the proposed scheme footprint.

4 Definition of flood hazard

An FRA must consider the issues associated with all sources of flooding in accordance with the NPPF and the supporting PPG for Flood Risk and Coastal Change. These have been considered in this FRA with respect to the proposed scheme. The following sections have reviewed publicly available information and relevant planning documents to assess the risk of flooding from tidal, fluvial, surface water, groundwater, reservoirs and other sources.

4.1 Historic flooding

The LFRMS indicates that there have been no recorded flood events for the proposed scheme footprint. However, it should be noted the absence of flood records does not necessarily confirm that no flooding has occurred.

4.2 Flooding from rivers (fluvial)

The Environment Agency Flood Map for Planning (Rivers and Sea) identifies that the proposed scheme footprint is partially located in Flood Zones 1, 2 and 3 (**Figure 3**).

Flood Zone 3 is defined as “*Land having a 1 in 100 or greater annual probability of river flooding (≥ 1%)”.*

Due to the location of the proposed scheme within the Tees estuary downstream of the Tees Barrage where tidal and coastal processes dominate, the risk of fluvial flooding is not significant. The flood risk associated with the River Tees is identified as tidal/coastal and is covered in **Section 4.3**. Therefore, the risk of fluvial flooding to the proposed scheme is low.

4.3 Flooding from the sea (tidal/coastal)

The Environment Agency Flood Map for Planning (Rivers and Sea) identifies that the proposed scheme footprint is partially located in Flood Zones 1, 2 and 3 (**Figure 3**) whereby the in-channel elements are located in either Flood Zone 2 or Flood Zone 3 and the landside elements (i.e. the quay) are located in Flood Zone 1.

Flood Zone 3 is defined as “*Land having a 1 in 200 or greater annual probability of sea flooding (≥0.5%)”.*

Due to the proposed scheme being partially located within the banks of the tidally influenced River Tees, the risk of tidal and coastal flooding is assessed to be high. However, it is noted that as a new quay, the proposed scheme is considered ‘Water Compatible’ under the NPPF.

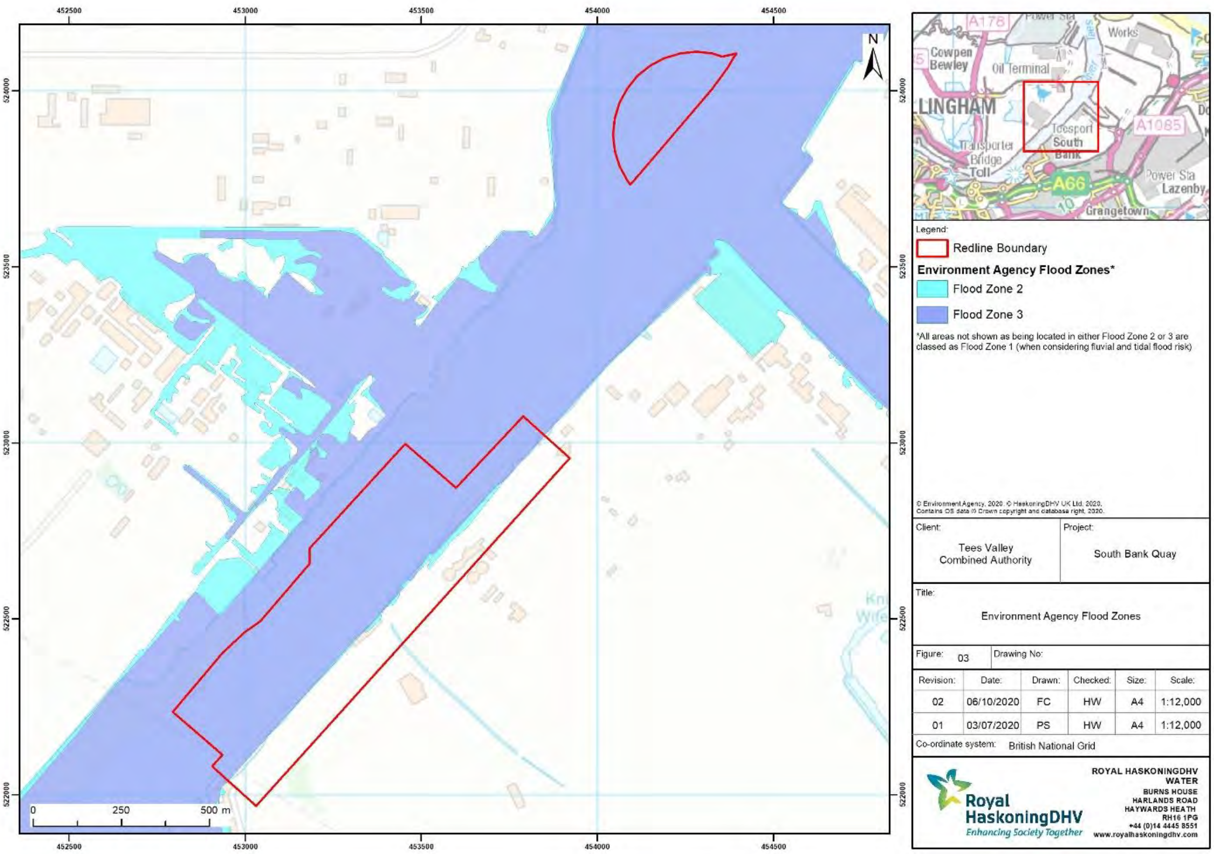


Figure 3 *Environment Agency Flood Map for Planning*

The ISIS-TUFLOW model which forms part of the Tidal Tees Integrated Flood Risk Modelling Study (2011) presented updated extents for Flood Zone 2 (1 in 1,000-year) and Flood Zone 3 (1 in 200-year). **Figure 4** presents the predicted water levels (in m AOD) for the 1 in 200 year and 1 in 1,000-year return periods within and adjacent to the proposed scheme. Three baseline water level measurements were recorded spaced across the entire quay frontage (**Figure 4**) and are presented in **Table 4.1**.

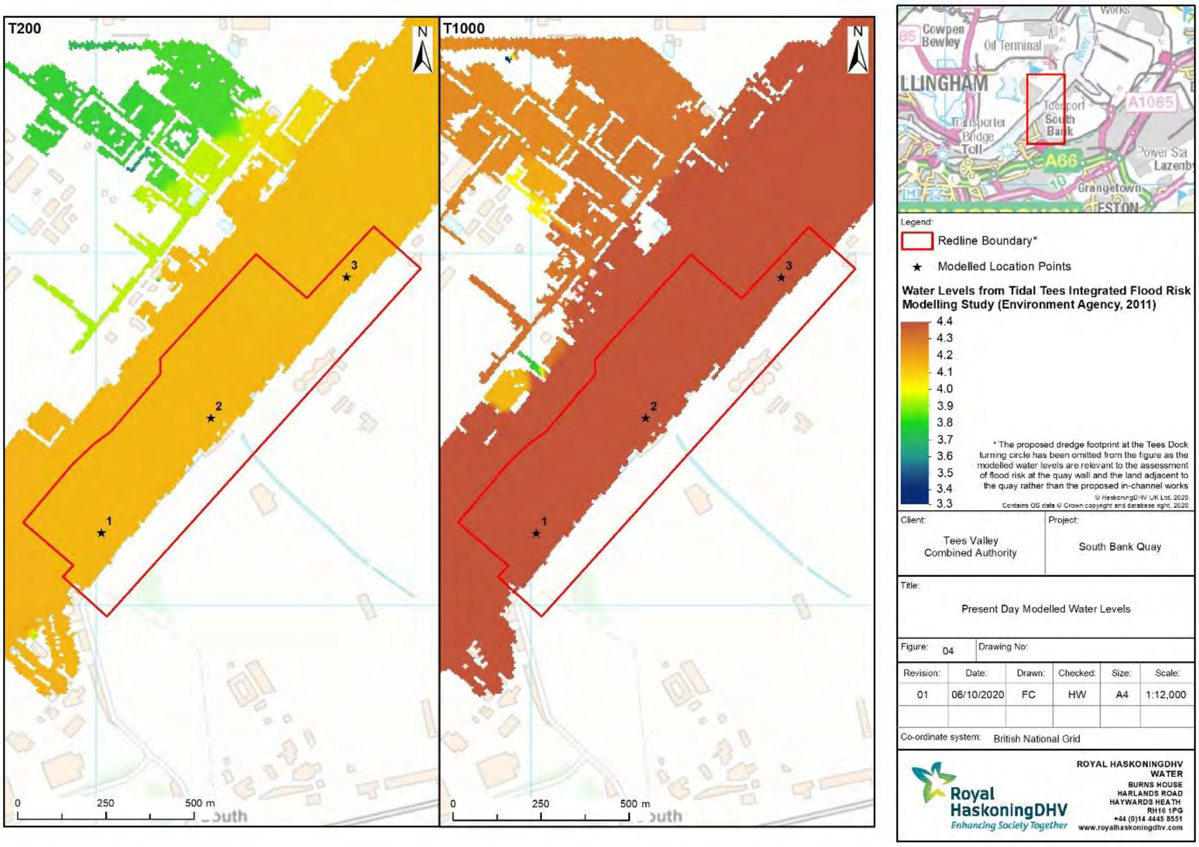


Figure 4 ***Location of the three data points along the quay frontage measuring baseline water levels (m AOD) for a 1 in 200-year (T200) and 1 in 1,000-year (T1000) return period***

For the purposes of this assessment, it is assumed that the baseline water levels relevant to the proposed scheme should be rounded to two decimal places, which for the 1 in 200-year and 1 in 1000-year return periods are 4.13m AOD and 4.39m AOD respectively.

Table 4.1 ***Data taken from the 2011 Tidal Tees Integrated Flood Risk Modelling Study***

Study node point name	*Return period (years)*	*Modelled Water Level (m AOD)*
Point ID 1	200	4.133
	1,000	4.392
Point ID 2	200	4.128
	1,000	4.390
Point ID 3	200	4.125
	1,000	4.386

4.4 Flooding from groundwater

As noted in **Section 2.5**, two publicly available borehole records have been reviewed which were sited within and immediately south of the proposed scheme footprint. The review of groundwater levels from the borehole records indicates that it is highly likely that groundwater levels are linked to tidal levels in the River Tees, with the groundwater level decreasing with distance from the watercourse. There is likely to be percolation of water from the River Tees through the existing banks into the adjacent ground.

The occurrence of groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property and can pose further risks to the environment and ground stability. There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall and high in-bank river levels. Development within areas that are susceptible to groundwater flooding will generally not be suited to some SuDS measures; however, this is dependent on detailed site investigation and risk assessment.

No mapping of Areas Susceptible to Groundwater Flooding were available in the Redcar SFRA. Given the proximity to the River Tees and potential connectivity between tidal and groundwater levels, it is considered that there is a medium risk of groundwater flooding; however, as this is likely to be inherently linked to tidal flooding it would comprise a limited flood risk to the proposed scheme when compared with tidal flood risk.

4.5 Flooding from surface water

The Environment Agency Surface Water Flood Risk map[21] (**Figure 5Error! Reference source not found.**) highlights that the majority of the proposed scheme footprint subject to surface water flooding is predominantly in areas at 'Very Low' risk of surface water flooding (*i.e. less than 1 in 1,000 years*).

There are two areas on the proposed scheme footprint that have an increased risk of surface water flooding:

- The southernmost corner of the proposed scheme footprint includes areas at 'low' (*i.e. between 1 in 1,000 and 1 in 100 years*) and 'medium' risk (*i.e. between 1 in 100 and 1 in 30 years*); and,
- The area of the proposed scheme footprint associated with the oil depots, boiler house and offices (to be removed prior to the proposed scheme) contains areas at 'low', 'medium' and 'high' (*i.e. greater than 1 in 30 years*) risk.

The pockets of low, medium and high surface water risk predominantly represent localised low points within the current topography. It is understood that prior to construction of the proposed scheme, any residual features associated with the prior use of the site will be removed and the site levelled to remove any potential localised areas of ponding. The layout of the proposed scheme, as well as the drainage strategy, will ensure there are no major issues associated with surface water to the proposed scheme.

It is proposed that the quay would be surfaced with crushed stone, allowing surface water to drain into the underlying material without the need for formal drainage. However, the heavy lift areas are proposed to be surfaced with concrete which will require a series of gullies to collect surface water runoff and discharge into the Tees estuary though the quay wall, via an interceptor.

There remains a risk that, should the drainage outfalls from the proposed scheme footprint be at risk of water ingress or blockage due to raised fluvial or tidal levels in the adjacent waterbodies, the discharge of surface water could be restricted in the drainage system and cause flooding. Details relating to the location and elevation of current drainage outfalls are currently unknown and will be determined during the detailed design phase.

It is expected that following construction, the proposed scheme footprint would be predominantly at 'Very Low' risk of surface water flooding, which would negate any isolated areas of medium or high risk that may remain. As such, the proposed scheme is assessed to be at very low risk of surface water flooding.

---

[21] *Environment Agency, Long term flood risk information. Available at https://flood-warning-information.service.gov.uk/long-term-flood-risk/map (Accessed 23/01/2020)*

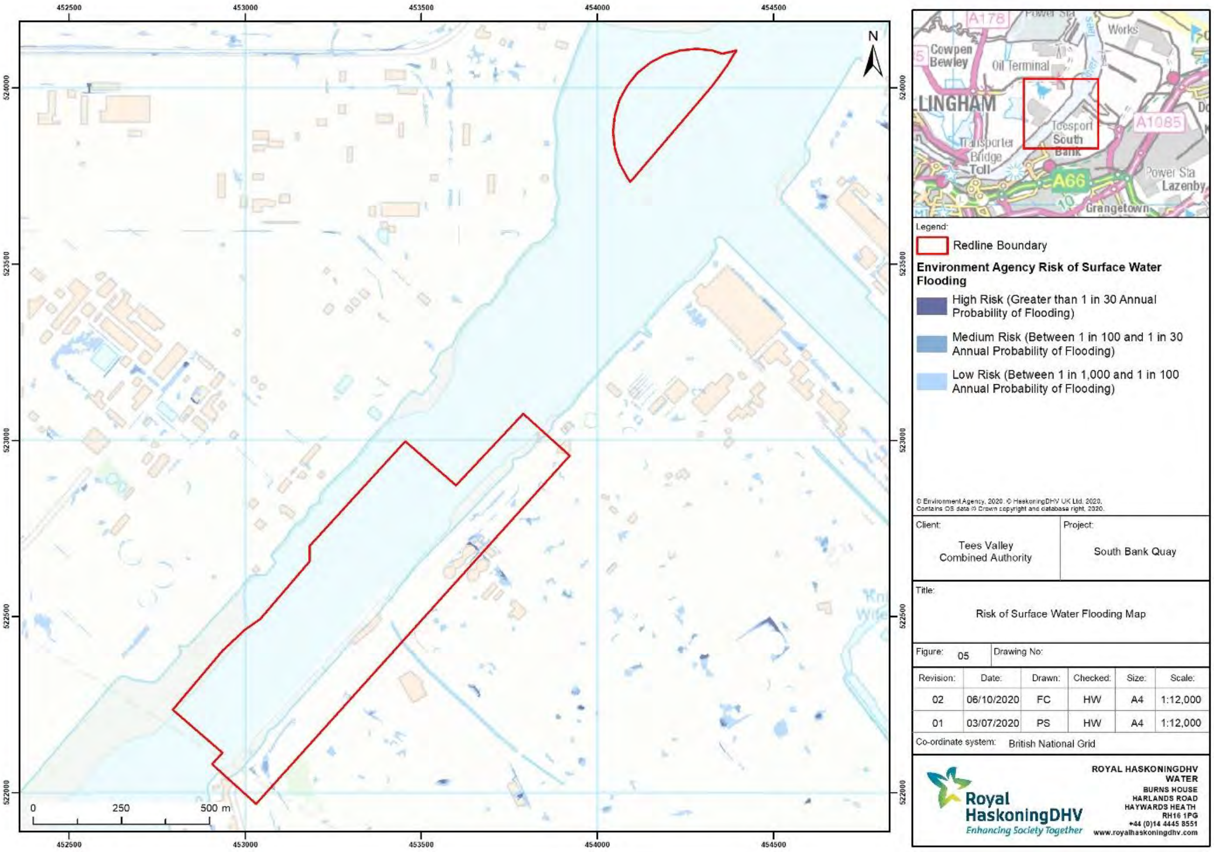


Figure 5 *Risk of surface water flooding to the proposed scheme*

4.6 Flooding from sewers

It is understood that the proposed scheme footprint is not currently connected to the local sewer system. Welfare facilities are not proposed on the quay in order to maximise the available space to support with operations. Therefore, there is no risk of flooding from sewers and this risk is classified as very low.

4.7 Flooding from reservoirs, canals and other sources

The Environment Agency Flood Risk from Reservoirs' Map[21] was developed to identify areas at risk of flooding from large raised reservoir dam breaches. The map identifies the maximum extent of flooding should these dams breach.

Using the Flood Risk from Reservoirs' Map, the proposed scheme footprint has been identified as being within the maximum flood extent for reservoirs. However, the area of risk is confined to an area within the banks of the River Tees and does not cover the small section of land within the proposed scheme footprint. Furthermore, it is noted that reservoirs are subject to legislation requiring regular monitoring and maintenance with the Environment Agency stating that if a location is at risk, flooding from reservoirs is extremely unlikely, with no loss of life in the UK from reservoir flooding since 1925.

A review of Ordnance Survey mapping has identified no additional canals or artificial sources in the local area. Therefore, the risk of flooding from reservoirs, canals and other sources is considered to be low.

4.8 Summary of flood risk

Table 4.2 summarises the risk of flooding from all sources to the proposed scheme. Whilst the proposed scheme footprint is located predominantly within Flood Zone 3 extents, these aspects of the proposed scheme are related to the quay and therefore will be 'Water Compatible' and less affected by flooding. Overall the risk of flooding to the proposed scheme is considered to be low. However, there remains a residual risk of flooding in the event of a defence failure or overtopping and this is discussed further in **Section 7**.

Table 4.2 Summary of flood risk

Source of Flood Risk	Probability of flooding	Description
Fluvial	Low	The proposed scheme footprint is partially located within the River Tees and is therefore situated in either Flood Zone 2 or 3. However, at this location the River Tees is tidally influenced. The remaining elements of the proposed scheme footprint i.e. the proposed quay is located in Flood Zone 1. Therefore, the risk of flooding from fluvial sources is assessed to be low.
Tidal / Coastal	High	The proposed scheme is partially located within the River Tees and is therefore situated in Flood Zone 2 or 3. However, the proposed scheme will be 'Water Compatible' and therefore less affected by tidal flooding. The remaining elements of the proposed scheme i.e. the quay are located in Flood Zone 1.
Groundwater	Medium	Publicly available borehole records have been reviewed which indicate that groundwater was encountered at 2.05mAOD. These findings indicate that groundwater level could be linked to tidal levels in the River Tees. Given the close proximity to the River Tees and potential connectivity between tidal and groundwater levels, it is considered that there is a medium risk of groundwater flooding.
Surface water	Low	The Environment Agency's Surface water flood risk map shows that the proposed scheme is primarily at low surface water flood risk, except a few isolated low-lying pockets. Water falling on the proposed scheme footprint is discharged directly into the River Tees.
Sewers	Very Low	There are currently no sewers present within the proposed scheme footprint. During construction there will be no requirement for a connection to the wider sewer system. Additionally, welfare facilities are not proposed on the quay as part of the proposed scheme during the operational phase. Therefore, there is no risk of flooding from sewers and this risk is classified as very low.
Reservoirs and other sources	Low	The proposed scheme footprint has been identified as within the maximum flood extent for reservoirs. However, the area of risk is confined to within the banks of the River Tees and does not cover the small section of land within the proposed scheme footprint. There are no additional canals or artificial sources in the local area. Therefore, the risk of flooding from reservoirs, canals and other sources is considered to be low.

5 Flood risk vulnerability

5.1 Sequential and Exception Test

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding i.e. Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1 the Local Planning Authority, can consider reasonably available sites in Flood Zone 2. Only when there are no reasonably available sites for development in Flood Zone 1 and 2, should the suitability of sites in Flood Zone 3 be considered.

Following application of the Sequential Test, if it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and,
- a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted. Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

5.2 Vulnerability classification

The vulnerability of different types of development is set out in the PPG for Flood Risk and Coastal Change. The descriptions of Highly Vulnerable, More Vulnerable, Less Vulnerable and Water Compatible are as follows:

- Highly Vulnerable – Buildings used for police, ambulance and fire stations and command centres; basement dwellings; caravans and mobile homes; and installations requiring hazardous substances consent.
- More Vulnerable – Buildings used for hospitals; dwellings and accommodation; residential institutional accommodation; non-residential health services, educational facilities; drinking establishments; nightclubs and hotels.
- Less Vulnerable – Buildings used for shops; financial, professional and other services; restaurants and cafes; hot food and takeaways; offices; general industry and storage etc.
- Water Compatible – Development used for flood control infrastructure; amenity open space, nature conservation and outdoor sports facilities; water / sewerage pumping stations; docks, marinas and wharves; and navigation facilities.

The PPG Flood risk and Coastal Change sets out the appropriateness of different development types based on their Flood Risk Vulnerability and the Flood Zone they would be located within. This table has been reproduced in **Table 5.1**.

Table 5.1 Flood risk vulnerability and flood zone 'compatibility', PPG Table 3

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test required	✓	✓	✓
3a	Exception Test required	X	Exception Test required	✓	✓
3b	Exception Test required	X	X	X	✓

5.3 Site vulnerability assessment

The proposed scheme is primarily located within Flood Zone 3, an area with a high probability of tidal flooding, although the landward parts of the proposed scheme footprint are located in Flood Zone 1. The nature of the proposed scheme is such that under the PPG Flood Risk and Coastal Change, it is classed as ‘Water Compatible’, as the proposed quay is in line with the description for "…docks, marinas and wharves”.

Given the review of the flood zones and the flood risk vulnerability classification, the proposed scheme is considered to be appropriate development in all flood zones. Additionally, it is required to be located within and adjacent to the Tees estuary for operational purposes. Therefore, there is no requirement for the application of the Exception Test.

Notwithstanding the above, the presence of the proposed scheme within and adjacent to Flood Zone 3 means that an assessment of the potential residual risk to it is required and this has been considered and summarised in **Section 7**.

6 Climate change

The risk of flooding from tidal, fluvial and surface water sources will all be amplified in the future as a result of the predicted increase in sea level, storm frequency and rainfall intensity.

Given the potential sources of flooding outlined within **Section 4**, there are two main aspects of climate change likely to impact the proposed scheme in the future, comprising sea level rise and an increase in the duration and intensity of rainfall events likely to affect surface water flooding. Due to the location of the proposed scheme footprint within the Tees estuary where tidal and coastal processes are dominant, the influence of fluvial flows are less critical. As a result, increases in peak fluvial flows as a result of climate change are not considered further.

This FRA draws guidance from the Environment Agency's online advice note 'Flood Risk Assessments: Climate Change Allowances' (Environment Agency, 2020).

6.1 Peak rainfall intensity

Table 6.1 shows the Environment Agency's anticipated changes in extreme rainfall intensity in small and urban catchments. The Environment Agency guidance states both the central and upper end allowances should be assessed to understand the range of impact this could have on a proposed scheme. The proposed scheme is anticipated to have a 50-year lifespan, from 2023 to 2073. As such consideration of a 20% (central) and 40% (upper end) allowance for peak rainfall intensity is considered appropriate.

The peak rainfall intensity is only relevant for the surface water flood risk, for which the proposed scheme is determined to be at low risk under baseline conditions. Appropriate allowances will be applied, where necessary, within the drainage strategy.

Table 6.1 Peak rainfall intensity allowance in small and urban catchments (use 1961-90 baseline) (Source: Table 2, Environment Agency Climate Change Allowances 29/09/20)

Applies across all of England	Total Potential Change Anticipated for the '2020s' (2015-2039)	Total Potential Change Anticipated for the '2050s' (2040-2069)	Total Potential Change Anticipated for the '2070s' (2070-2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

6.2 Sea level rise

The Environment Agency online advice note 'Flood Risk Assessments: Climate Change Allowances' (Environment Agency, 2020) provides sea level rise allowances by river basin district ranging from 2000 to 2115. A higher central and upper end allowance is given and are based on the 70th and 95th percentile respectively.

Table 6.2 presents the predicted total sea level rise of 1.03m for a higher central allowance and 1.43m for an upper end allowance over 100 years to 2115 for the Northumbria river basin district.

Table 6.2 Environment Agency Predicted Sea Level rise allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (Source: Table 3, Environment Agency Climate Change Allowances 29/09/20)

Area of England	Allowance	2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125	Cumulative rise 2000 to 2115 / metres (m)
Northumbria	Higher Central	4.6 (161)	7.5 (225)	10.1 (303)	11.2 (336)	1.03
Northumbria	Upper End	5.8 (203)	10 (300)	14.3 (429)	16.5 (495)	1.43

Table 6.3 outlines the uplift calculations from the baseline (2011) over the lifetime of the proposed scheme (2023-2073), based on the predicted rise per epoch presented in **Table 6.2**.

Table 6.3 Calculated uplift levels (mm) over the lifetime of the proposed scheme for higher central and upper end allowances

	Higher Central		Upper End	
Epoch (years)	**Uplift (mm)**	**Cumulative (mm)**	**Uplift (mm)**	**Cumulative (mm)**
2011 - 2023	55.2	55.2	69.6	69.6
2023 - 2035	55.2	110.4	69.6	139.2
2035 - 2065	225	335.4	300	439.2
2065 - 2073	80.8	416.2	114.4	553.6

The extreme still water levels (m AOD) for the proposed scheme at the start (2023) and end (2073) of its lifetime are shown in **Table 6.4**. This was calculated by taking the baseline (2011) water levels of 4.13m AOD (1 in 200-year) and 4.39m AOD (1 in 1,000-year) (**Table 4.1**) and adding the expected uplift for higher central and upper end allowances (**Table 6.3**).

Table 6.4 Change in still water level across the operational phase of the proposed scheme

Extreme Water Level Analysis Results (m AOD)				
	Higher Central		Upper End	
	1 in 200 year	1 in 1,000 year	1 in 200 year	1 in 1,000 year
Still water level (2011)	4.13	4.39	4.13	4.39
Still water level (2023)	4.19	4.45	4.20	4.46
Still water level (2073)	4.55	4.81	4.68	4.94

The proposed quay would be constructed at a level 5.84m AOD. When reviewing the current baseline modelled water levels with the predicted increase, as a result of sea level rise, the results indicate that the proposed quay would provide suitable protection against the 0.5% (1 in 200) and 0.1% (1 in 1,000) annual exceedance probability event for both the higher central and upper end scenarios throughout the 50-year lifetime of the proposed scheme (i.e. 2023 - 2073).

7 Residual risk and flood risk management measures

There is always a potential for there to be a residual flood risk to people and property due to the failure of systems and defences, more extreme events than those defined in the NPPF, or uncertainties associated with modelled water levels. Residual risk may remain after flood management or mitigation measures have been installed. Therefore, an FRA should consider the residual flood risk and the need for any further measures to ensure the residual risk is managed appropriately. This residual risk is explored in this section with appropriate mitigation measures also discussed.

7.1 Design mitigation

It is proposed that surface water would drain through the crushed stone on the quay deck into the underlying material without the need for a formal drainage system. A drainage system would however be required on the heavy lift areas of the quay, as such areas are proposed to be surfaced with concrete. Such a system would capture surface water runoff from the heavy lift areas through a series of gullies. The collected water will be discharged into the Tees estuary through the quay wall, via an interceptor. This mitigates the potential risk associated with surface water flooding.

Welfare facilities are not proposed on the quay itself in order to maximise the available space to support with operations; there would therefore be no foul sewage, or associated flood risk, generated on the quay itself.

As discussed in the preceding sections, there is a need for the proposed scheme to be located within and adjacent to the channel of the River Tees. The proposed scheme is considered to be 'Water Compatible' development and must "*remain operational and safe for users in times of flood*".

Additionally, the predominant risk of flooding to the proposed scheme footprint (including the quay footprint) is a tidal risk which is mitigated through the design of the revised defence line and the setting of the quay wall at a level of 5.84m AOD.

Whilst the proposed quay wall will provide protection throughout the lifetime of the proposed scheme it is important to consider potential residual risk should the flood defence fail or be overtopped.

7.2 Setting of finished floor levels

The proposed scheme includes the construction of a substation that will be constructed on the quay and as a result, there is a requirement to set finished floor levels 0.3m above ground level or 0.6m above the design flood levels, depending on which is the worst-case scenario.

Taking the worst-case scenario for the proposed scheme, which would be 0.3m above ground level, the finished floor level of the substation should be at least 0.3m above the current ground level of the proposed quay, which is to be constructed at 5.84m AOD. As such, the finished floor level for the substation, or the plant contained within it, should be set at a minimum of 6.14m AOD.

The new quay will be constructed from water resistant and resilient materials given the requirements to provide a durable facility in a tidal location and its operation as a working quay.

7.3 Flood warning

As detailed above, the site of the new quay is at risk from tidal flooding. Since it is positioned relatively upstream within the tidal estuary, it will receive a greater level of protection from tidal inundation than the open coastal frontage. However, there still remains a risk of tidal flooding during extreme events.

It is therefore proposed that during both construction and operation the operators of the quay would sign up to the Flood Warning Service provided by the Environment Agency so that they can be made aware of potential extreme events and prepare accordingly. The flood warning lead time for tidal events is usually in excess of 12 hours, thus ample time is available for non-essential staff and visitors to vacate the proposed scheme footprint safely in the event of a flood warning.

7.4 Flood Risk and Emergency Plan

A Flood Risk and Emergency Plan (FREP) should be developed, both for the construction and operational phase, to ensure that those on site are aware of what to do in the case of a flood or flood warning. A FREP should assess the risk and include a list of steps to be taken in the case of a flood including practical steps for protecting the premises.

In line with the Environment Agency guidance on planning for a flood, the following aspects must be considered:

- a list of important contacts, including Floodline, building services, suppliers and evacuation contacts for staff;
- a description or map showing locations of key property, protective materials and service shut-off points;
- basic strategies for protecting property, preventing operational disruption and assisting recovery; and
- checklists of procedures that can be quickly accessed by staff during a flood.

It is considered likely that access to the quay would be required continuously during operation, even during flood events, so a mechanism for access should be considered within the FREP.

It should also consider timelines prior to predicted onset of flooding, in order to ensure that staff can be safely evacuated (and if safe to do so with adequate warning lead time, vehicles or removable assets).

It is recommended that the following measures are included, as part of the proposed scheme:

- Development of a construction phase FREP.
- Prior to works commencing, all construction workers will undergo site induction training prior to being allowed access to the site. This will include actions required in the event of a flood risk emergency incident, such as those included in the FREP including obtaining flood warnings/alerts, responding to warning sirens and following escape routes in the event of a site evacuation.
- No workers would be allowed on site unless they have undergone a site induction.
- Arrangements will be identified and made for safe access to and from the site.
- In the event of tidal surge and / or significant storm events, prior warning will be given to the site users in order to cease construction works and evacuate site workers to higher ground.

7.5 Access and egress

The proposed scheme spans across Flood Zones 1, 2 and 3, whereby the in-channel elements are located in either Flood Zone 2 or Flood Zone 3 and the landside elements (i.e. the quay) are located in Flood Zone 1.

Whilst the finished quay wall and hardstanding levels provide protection from an extreme tidal event (e.g. 1 in 10,000 years), an egress route is required in an emergency given its proximity to the watercourse.

A review of the adjacent ground levels indicates that the ground rises to the south east away from the tidal frontage, to a natural ground level in excess of 10m AOD. On this basis, it is considered that there is sufficient access away from the quay should an extreme event be forecast.

8 Conclusions

This FRA has reviewed the flood risk to the proposed scheme to support the development of the EIA Report and for submission with the planning application and marine licence application. The following are key conclusions identified as part of the FRA:

- The proposed scheme footprint comprises the construction of a new quay at South Bank in the Tees estuary. As such, the majority of the proposed scheme footprint falls within the River Tees channel. The linear strip of land within the proposed scheme footprint will facilitate the construction of the new quay, which will be set back from the existing defence line.

- The proposed scheme is on land which has previously been subject to development and is therefore classified as a brownfield site.

- The proposed scheme is classified as 'Water Compatible' under the NPPF as development used for docks, marinas and wharves.

- The proposed scheme footprint spans across Flood Zones 1, 2 and 3, whereby the in-channel elements are located in either Flood Zone 2 or Flood Zone 3 and the landside elements (i.e. the quay) are located in Flood Zone 1.

- The nature of the proposed scheme is such that it passes the Sequential Text and there is no requirement for the application of the Exception Test.

- The proposed revised defence line and quay wall provide a design crest level of 5.84m AOD. This ensures that the proposed quay provides continued protection against the 1 in 200-year and 1 in 1,000-year event for both the higher central and upper end scenarios throughout the 50-year lifetime of the proposed scheme (i.e. 2023 - 2073).

- The proposed scheme requires the construction of a substation that is to be situated on the quay. As a result, based on the residual risk to the proposed scheme, the finished floor levels for the substation, or the plant contained within it, should be set 0.3m above the ground level, which is a level of 6.14m AOD.

- During both construction and operation, the operators of the quay will sign up to the Flood Warning Service provided by the Environment Agency so that they can be made aware of potential extreme events and prepare accordingly.

- A FREP should be developed, both for the construction and operational phase, to ensure that those on site are aware of what to do in the case of a flood or flood warning.

- A review of the adjacent ground levels indicates that the ground rises to the south east away from the tidal frontage, to a natural ground level in excess of 10m AOD. On this basis, it is considered that there is sufficient access away from the quay should an extreme event be forecast.

On the basis of the flood risk identified both to and from the proposed scheme and its design i.e. a new quay with a revised defence line, it is considered that the proposed scheme is appropriate in terms of flood risk and is in accordance with the NPPF.

Appendix A: Correspondence related to Environment Agency Product 5 and 8 data package

---

From: Northeast Newcastle, Customer Contact <northeast-newcastle@environment-agency.gov.uk>
Sent: 22 July 2020 15:15
To: Royal HaskoningDHV FloodRisk UK
Subject: 176607. 200705/CLW08 EA Product 5 and 8 data request - River Tees South Bank

Our Ref: 176607

Dear Paul,

Enquiry regarding Product 5 and 8 data request - River Tees South Bank

Thank you for your enquiry which was received on 03 July 2020.

2015 1,000 year + Climate Change ISIS-TUFLOW Report = https://ea.sharefile.com/d-s49a40b66e6c4b32b*

2011 ISIS-TUFLOW Model Report and Plans = https://ea.sharefile.com/d-s4cd2c87bac94abf9*

**These links are active for 20 days. Please download the information before the links expire*

Please note: Our Data team have explained that updated modelling for the above models is currently being reviewed by Evidence & Risk (E&R) following some additional work. We are hoping that this will be the final review and will shortly be in a position to share the model. We will be able to confirm our position within the next couple of weeks. If you require the updated models please contact us again in the future to request this.

We hope we have answered your query. Please see below for details of permitted use:

Name	Product 5 - Report
Description	***2015 1,000 year + Climate Change ISIS-TUFL & 2011 ISIS-TUFLOW Model Report and Plans***
Licence	Environment Agency Conditional Licence
Conditions	1.0 You may use the Information for your internal or personal purposes and may only sublicense others to use it if you do so under a written licence which includes the terms of these conditions and the agreement and in particular may not allow any period of use longer than the period licensed to you. 2.0 Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of 5 years at the end of which it will terminate automatically without notice. 3.0 We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentialities of others. In this instance it is because of third party data. If you contact us in writing (this includes email) we will, as far as

	confidentiality rules allow, provide you with details including, if available, how you might seek permission from a third party to extend your use rights. 4.1 The Information may contain some data that we believe is within the definition of “personal data” under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the conditions above. This personal data comprises names of individuals or commentary relating to property that may be owned by an individual or commentary relating to the activities of an individual. 4.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data. 5.0 The location of public water supply abstraction sources must not be published to a resolution more detailed than 1km2. Information about the operation of flood assets should not be published. 6.1 Where we have supplied model data which may include model inputs or outputs you agree to supply to the Environment Agency copies of any assessments/studies and related outputs, modifications or derivatives created pursuant to the supply to you of the Information, all of which are hereinafter referred to as “the Data”. 6.2 You agree, in the public interest to grant to the Environment Agency a perpetual royalty free non-exclusive licence to use the Data or any part thereof for its internal purposes or to use it in any way as part of Environment Agency derivative products which it supplies free of charge to others such as incorporation into the Environment Agency's Open Data mapping products.
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. May contain Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

Name	Product 8 – Breach Hazard Map
Description	***2015 1,000 year + Climate Change ISIS-TUFL & 2011 ISIS-TUFLOW Model Report and Plans***
Licence	Open Government Licence
Information Warnings	1.0 This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth

	and velocity of floodwater, and maximum values of these are also mapped. 2.0 The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. 3.0 The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains. 4.0 Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.
Information Warning - OS background mapping	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.*
Attribution	Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198. Contains Environment Agency information © Environment Agency and/or database rights.

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning (Flood Zone 2, Flood Zone 3 ,Flood Storage Areas, Flood Defences, Areas Benefiting from Defences, ,)
- Risk of Flooding from Rivers and Sea
- Historic Flood Map
- Current Flood Warnings

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

We now have over 100 datasets available as Open Data. Open Data allows access to our data free of charge and free of restriction, even for commercial use under an Open Government Licence. You can find out about the data we have available our new page on Gov.uk https://www.gov.uk/environmental-data

Please don't hesitate to contact me if you have any further queries.

Kind regards,

Anna

Anna Chadwick
Operations & FCRM Secretary, Customers and Engagement Team **(Working days Monday)**
Customers and Engagement Officer **(Working days Tuesday - Friday)**
Environment Agency | Tyneside House, Skinnerburn Road, Newcastle, NE4 7AR
Ext. 020 7714 2952 Mob. 07775035479

For all Freedom of Information related enquiries please contact: northeast-newcastle@environment-agency.gov.uk
For all business related enquiries please contact ne_amt_support@environment-agency.gov.uk

Creating a better place
for people and wildlife

Please note that all Environment Agency staff are working from home due to the Coronavirus (COVID-19) pandemic. All staff can be contacted via e-mail or telephone as usual. Please accept our apologies in advance for any delays in our service during this time.

Appendix 16

Water Framework Directive compliance assessment

Royal HaskoningDHV

Appendix 28A Scoping tables for surface waters

Completed Scoping Tables for Activity: C1 Demolition of timber wharf and jetties

The following tables summarise the information relevant to the consideration of the requirements of the Water Framework Directive (tables taken from Clearing the Waters for All, Environment Agency 2016). Note that although the answer to the question is sometimes yes, the evidence provided in the notes column allows the issue to be scoped out.

Table A1 Output of WFD scoping for activity C1

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	No	Whilst the spud legs of the jack-up barge, anchors of the vessels and bow thrusters of the vessels as well as the pile removal activities themselves will result in some disturbance to the existing estuary bed, this will be minor and highly localised. Alterations to hydromorphological parameters are not predicted. The works also will be temporary in duration and the baseline conditions will be restored once the vessels have been demobilised from site. See **Section 6.5.1**
Is in a water body that is heavily modified for the same use as your activity	No	Whilst the water bodies are all heavily modified for navigation, ports and harbours and removal of these structures relates to port activities, the removal would not alter hydromorphological parameters of the estuary or stop the mitigation measures identified for the water body being implemented. See **Section 6.5.1**
Biology		
Is 0.5km^2 or larger	No	The removal of the structures would not impact an area greater than 0.5km^2 or be equivalent to 1% of the WFD water body.
Is 1% or more of the water body's area	No	
Is within 500m of any higher sensitivity habitat	No	There are no higher sensitivity habitats within 500m of the removal locations.
Is 1% or more of any lower sensitivity habitat	No	No – the area impacted is considered to be soft intertidal and soft subtidal sediment of which there is 610.31 hectares.

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	See comments in water quality below. There may be temporary sediment resuspension but this is expected to be short term and localised to the working area. Effects on fish migrating through the estuary would therefore not occur.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)		
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.
Water Quality		
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	The concrete deck of the existing jetties and locally on the wharf is likely to be either broken up using a long reach excavator with hydraulic demolition attachments, working from the shore (and supported by a jack-up barge, slave barge and safety/workboat). Alternatively, the demolition may include cutting sections of the deck and lifting them onto the land for disposal. Best practice working methods would be adopted to ensure that transport of debris into the Tees is minimised. Should any debris fall into the river channel during demolition, this would be removed as early as practicable. There are therefore limited risks to water quality in relation to the deck structure removal. The timber parts of the deck of the existing wharf would be removed using a long reach excavator working from the shore, and supported by a jack up barge, slave barge and safety boat. As with the concrete deck, best practice demolition techniques would be adopted to ensure transport of debris into the Tees is minimised, with any debris that does fall into the river being removed as early as practicable. The piles supporting the concrete jetties and the wharf, as well as the pipework feeding the pumping station would all be removed. It is proposed that the piles would be extracted using vibration techniques. It is anticipated that such works would be undertaking using a jack-up barge with crawler crane, a slave barge and a safety/workboat. This marine plant would be supported through the use of divers. There is the possibility of sediment plumes

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
		during the demolition works but these are only expected to be localised to the working area and temporary. Any sediment resuspension is unlikely to last more than a few hours per pile.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No	In the unlikely event of a spill, appropriate spill kits will be available on board the barges and crew will be trained in spill response. In addition, all vessels will ensure that suitable bunding and storage facilities are employed to prevent the release of fuel oils, lubricating fluids associated with the plant and equipment into the marine environment. Sediment samples available from the NGCT project collected in 2019 are likely to contain contaminants above action level 1.There is the possibility of sediment plumes during the demolition works but these are only expected to be localised to the working area and temporary. Any sediment resuspension is unlikely to last more than a few hours per pile. Significant resuspension of contamination is therefore not predicted.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1	No	
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is located within 2km of the activity however the effects predicted are small and localised to the works. Considered in more detail in **Section 29**.
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	Biosecurity measures would be implemented to avoid the importing of non-native invasive species. Equipment, plant and PPE brought to site would be clean and free of material and vegetation. To ensure measures are implemented, biosecurity toolbox talks would be given to all site staff and rigorous inspections would be undertaken of all equipment delivered to site, following the Check Clean and Dry campaign.

Table A2 Output of WFD scoping for activity C2 Capital dredging

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	Yes	Yes, capital dredging could potentially alter hydromorphological parameters in the water body,
Is in a water body that is heavily modified for the same use as your activity	Yes	Yes, the water body in which the activity will occur is heavily modified for navigation, ports and harbours
Biology		
Is 0.5km^2 or larger	Yes	The area to be impacted by dredging equates to 350,000m^2 (0.32km^2) which when multiplied by 1.5 is 0.53km^2. Given the answer to this question is yes, biology is scoped in and consideration of the type of habitat to be disturbed/removed by the capital dredge is required.
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		
Is 1% or more of any lower sensitivity habitat		
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	Yes (water quality effects only)	There is the possibility of sediment plumes during the dredging works. Possibility of underwater noise during dredging impacting on fish is scoped out due to evidence provided by underwater noise modelling undertaken to inform the York Potash Harbour Facilities which indicated that noise levels considered to be potentially harmful only occur for areas less than 20m from the dredger. It is considered unlikely that fish would remain within the injurious zone given the proximity to the vessel that would be required (see **Section 13**).
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)		
Could cause entrainment or impingement of fish	No	Regular maintenance dredging undertaken within the proposed dredge footprint on a year-round basis suggests that the riverbed is likely to be characterised by regular disturbance events, making it unsuitable for spawning activity by any fish/shellfish species and reducing the risk of direct uptake of eggs during the capital dredge (See **Section 13**).

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Water Quality		
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Yes	There is the possibility of sediment plumes during the dredging works
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Yes	Sediment samples are likely to contain contaminants above Cefas Action Level 1 (see Chapter 7)
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in **Section 29**, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	Two individuals of the invasive species *Theora lubrica* were found within the northern half of the turning circle at the entrance to Tees Dock. However given the low numbers it is not expected that significant numbers would be present in the berth area. A biosecurity plan or ballast water management plan would be produced to manage the risk of introduction and spread of invasive species. This plan may include management measures such as filtering or treating of ballast water prior to being discharged into the water when not needed. This plan will be in line with any management measures relating to biosecurity or ballast water management that are already put in place and enforced by PDT.

Table A3 Output of WFD scoping for activity C3 Riverbank excavation

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	Yes (for O1)	Yes, earth excavation could potentially alter hydromorphological parameters in the water body. These effects are considered under O1.
Is in a water body that is heavily modified for the same use as your activity	Yes	Yes, the water body in which the activity will occur is heavily modified for navigation, ports and harbours
Biology		
Is 0.5km^2 or larger	No	The riverbank excavation will increase the subtidal area of the water body by 55,000m^2 .
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		
Is 1% or more of any lower sensitivity habitat		
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	There could be temporary effects associated with riverbank excavation however the majority of material would be removed using land based equipment and backhoe which would reduce sediment spill. Additionally, where possible material would be removed in the dry. Any effects are therefore likely to be localised and temporary.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)		
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.
Water Quality		

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	There could be temporary effects associated with riverbank excavation however the majority of material would be removed using land based equipment and backhoe which would reduce sediment spill. Additionally, where possible material would be removed in the dry. Any effects are therefore likely to be localised and temporary.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No	Site characterisation would be undertaken prior to any works and remediation implemented should it be required - the risk of releasing contamination would be managed.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in Section 29, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	Biosecurity measures would be implemented to avoid the importing of non-native invasive species. Equipment, plant and PPE brought to site would be clean and free of material and vegetation. To ensure measures are implemented, biosecurity toolbox talks would be given to all site staff and rigorous inspections would be undertaken of all equipment delivered to site, following the Check Clean and Dry campaign.

Table A4 Output of WFD scoping for activity C4 Installation of rock blanket

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	Yes	There is the possibility that construction and presence of the rock blanket would impact on hydromorphological parameters.
Is in a water body that is heavily modified for the same use as your activity	Yes	Yes, the water body in which the activity will occur is heavily modified for navigation, ports and harbours
Biology		
Is 0.5km^2 or larger	No	The area of existing subtidal within the WFD water body that would be impacted by the rock blanket would be 50,000m^2. Therefore the effect would not be greater than 0.5km^2 nor will it be greater than 1% of the water body.
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		There are no higher sensitivity habitats within 500m of the proposed activity
Is 1% or more of any lower sensitivity habitat		As above
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	There may be a temporary effect associated with placing the rock blanket on the seabed however this would be localised and temporary.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	No	
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.
Water Quality		

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	There is the possibility that small localised disturbance of sediment could occur as a result of working in the water. However this is likely to be localised to the works and temporary in nature.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Yes	Any marine sediments that are disturbed are likely to have contaminant levels greater than Action Level 1.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in Section 29, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	A biosecurity plan or ballast water management plan would be produced to manage the risk of introduction and spread of invasive species. This plan may include management measures such as filtering or treating of ballast water prior to being discharged into the water when not needed. This plan will be in line with any management measures relating to biosecurity or ballast water management that are already put in place and enforced by PDT.

Table A5 Output of WFD scoping for activity C5 Construction of new quay wall

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	No	The new quay will be built from land, using land-based plant, with no activity in the river. There will therefore be no impacts during construction of the quay on the hydrodynamics and sedimentary regime of the Tees estuary.
Is in a water body that is heavily modified for the same use as your activity	Yes	Yes, the water body in which the activity will occur is heavily modified for navigation, ports and harbours
Biology		
Is $0.5km^2$ or larger	No	No, the proposed quay will be created by the land excavation and therefore there would be no loss of intertidal associated with the construction and operation of the quay wall.
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		There are no higher sensitivity habitats within 500m of the proposed activity
Is 1% or more of any lower sensitivity habitat		N/A
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	The potential risk associated with piling on land and the potential for underwater noise is considered in **Section 13.5.4**. Subacoustech (2020) reviewed the risk of transmission of underwater noise into the river from the piling activities and the potential impacts on migratory fish and calculated the likely reduction in noise levels. For both resident and migratory fish the effect on noise levels was sufficient to reduce noise levels below harmful trigger values (see **Section 13** for further detail).
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	No	
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.
Water Quality		

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	The main effects associated with potential impacts on water quality are considered in river bank excavation, activity C3.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No	The main effects associated with potential impacts on water quality are considered in river bank excavation, activity C3.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in Section 29, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	A biosecurity plan or ballast water management plan would be produced to manage the risk of introduction and spread of invasive species. This plan may include management measures such as filtering or treating of ballast water prior to being discharged into the water when not needed. This plan will be in line with any management measures relating to biosecurity or ballast water management that are already put in place and enforced by PDT.

OPERATION

Table A6 Output of WFD scoping for activity O1 Operational presence of new structures

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	Yes	There is the possibility that the presence of the new quay would impact on hydromorphological parameters.
Is in a water body that is heavily modified for the same use as your activity	Yes	Yes, the water body in which the activity will occur is heavily modified for navigation, ports and harbours
Biology		
Is 0.5km^2 or larger	No	There will be no direct loss of intertidal or subtidal habitat as a result of the quay construction as the quay would be constructed in an area excavated on land.
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		
Is 1% or more of any lower sensitivity habitat		
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	No risk to fish during the operational phase.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	No	
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.
Water Quality		

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	No risk to water quality during operation.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No	No risk to water quality during operation.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in Section 29, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	A biosecurity plan or ballast water management plan would be produced to manage the risk of introduction and spread of invasive species. This plan may include management measures such as filtering or treating of ballast water prior to being discharged into the water when not needed. This plan will be in line with any management measures relating to biosecurity or ballast water management that are already put in place and enforced by PDT.

Table A6 Output of WFD scoping for activity O2 Discharge of surface water

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Hydromorphology		
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No	No, the water body is not at high status (neither are the adjoining water bodies)
Could significantly impact the hydromorphology of any water body	No	No, the discharge of surface water would not impact on hydromorphology.
Is in a water body that is heavily modified for the same use as your activity	No	Whilst the activity relates to port activity, discharge of clean surface water (see water quality below) would not impact on the mitigation measures identified for this water body.
Biology		
Is 0.5km^2 or larger	No	The area potentially impacted by clean surface water would be small and localised to the quay wall. Effects on biological habitats are not anticipated.
Is 1% or more of the water body's area		
Is within 500m of any higher sensitivity habitat		
Is 1% or more of any lower sensitivity habitat		
Biology (fish)		
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	No	During the operational phase the quay would be surfaced with crushed stone. This would allow uncontaminated surface water to drain through the crushed stone into the underlying material without the need for a formal drainage system. Where there is a risk of contamination, a drainage system would be installed which would capture surface water runoff through a series of gullies. This water would then be passed through an interceptor before discharge to the Tees estuary. No foul water would require discharge as part of the operational phase. A drainage system would however be required on the heavy lift areas, as such areas are proposed to be surfaced with concrete. Such a system would capture surface water runoff from the heavy lift areas through a series of gullies. The collected water will be discharged into the Tees estuary through the quay wall, via an interceptor. As a result, activity O2 is screened out of the assessment.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	No	
Could cause entrainment or impingement of fish	No	No risk of entrainment or impingement.

Consider if the footprint of your activity;	Scoped in (yes/no)	Risk Issue
Water Quality		
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No	During the operational phase the quay would be surfaced with crushed stone. This would allow uncontaminated surface water to drain through the crushed stone into the underlying material without the need for a formal drainage system. Where there is a risk of contamination, a drainage system would be installed which would capture surface water runoff through a series of gullies. This water would then be passed through an interceptor before discharge to the Tees estuary. No foul water would require discharge as part of the operational phase. A drainage system would however be required on the heavy lift areas, as such areas are proposed to be surfaced with concrete. Such a system would capture surface water runoff from the heavy lift areas through a series of gullies. The collected water will be discharged into the Tees estuary through the quay wall, via an interceptor. As a result, activity O2 is screened out of the assessment.
Is in a water body with a phytoplankton status of moderate, poor or bad	No	Status is good
Is in a water body with a history of harmful algae	No	No history of issues with harmful algae listed in the WFD water body summary table.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No	No risk to water quality during operation.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if: It disturbs sediment with contaminants above Cefas Action Level 1		
Protected Areas		
Within 2km of any WFD protected area	No	The SPA is within 2km however given it is considered in detail in Section 29, consideration is not required here. Refer to **Section 29.**
Invasive species		
Introduce or spread Invasive Non-native Species (INNS)	No	No risk identified

Appendix B Scoping tables for groundwater bodies

The following tables summarise the information relevant to the consideration of the requirements of the Water Framework Directive (tables modified from Clearing the Waters for All, Environment Agency 2016 to reflect groundwater assets). Note that although the answer to the question is sometimes yes, the evidence provided in the notes column allows the issue to be scoped out.

CONSTRUCTION

Table B1 Completed Scoping Tables for Activity: C1 Demolition of timber wharf and jetties

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	The proposed demolition would not impact on the groundwater body
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	No	The proposed demolition of timber wharfs would not impact on the groundwater body
	Chemical Drinking Water Protected Area		
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test		
Supporting elements	Prevent and limit objectives	No	The proposed demolition of timber wharfs would not impact on the groundwater body

Table B2 Completed Scoping Tables for Activity: C2 Capital dredging

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	Capital dredging would not impact on the groundwater body
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	No	Capital dredging would not impact on the groundwater body
	Chemical Drinking Water Protected Area		

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test		
Supporting elements	Prevent and limit objectives	No	Capital dredging would not impact on the groundwater body

Table B3 Completed Scoping Tables for Activity: C3 River bank excavation

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	The excavation of the river bank would not impact on any quantitative parameters of the ground water body
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	Yes	Ground investigations have indicated the presence of historic contamination which may have an impact the quality of groundwater and result in impacts on water quality. If not addressed during the development, the excavation has the potential to increase the release and migration of contaminants. There is the potential for earthworks and piling activities to disturb pre-existing contamination which may be present within the proposed scheme. The works may result in the migration of contaminants to the underlying aquifers and create new pathways which may impact both groundwater quality and / or usability.
	Chemical Drinking Water Protected Area	No	Not located within 2km
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test	No	None within vicinity of proposed scheme
Supporting elements	Prevent and limit objectives	No	N/A

Table B4 Completed Scoping Tables for Activity: C4 Placement of rock platform

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	The placement of the rock would not impact on the groundwater body.
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	No	The placement of the rock would not impact on the groundwater body.
	Chemical Drinking Water Protected Area		
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test		
Supporting elements	Prevent and limit objectives	No	The placement of the rock would not impact on the groundwater body.

Table B5 Completed Scoping Tables for Activity: C5 Construction of new quay

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	Construction of new quay would not interfere with groundwater levels.
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	Yes	Ground investigations (See Chapter 8) have indicated the presence of historic contamination which may have an impact the quality of groundwater and result in impacts on water quality. If not addressed during the development, the construction phase of the new quay which includes piling, has the potential to increase the release and migration of contaminants. There is the potential for earthworks and piling activities to disturb pre-existing contamination which may be present within the proposed scheme. The works may result in the migration of contaminants to the underlying aquifers and create new pathways which may impact both groundwater quality and / or usability.
	Chemical Drinking Water Protected Area	No	Not located within 2km
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test	No	Not located within the vicinity of the project
Supporting elements	Prevent and limit objectives	No	N/A

OPERATION

Table B6 Completed Scoping Tables for Activity: O1 Presence of new quay wall

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	The presence of the new quay may alter the infiltration of rainwater to ground very locally, however the nature of the natural strata and overlying made ground are such that the current rate of recharge within the footprint of the development is likely to be very small. Therefore quantitative impacts are anticipated to be undiscernible.
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	No	Surface water would be managed and would not infiltrate to underlying groundwater. As a result there is no pathway for effect in the operational phase of the new quay.
	Chemical Drinking Water Protected Area	No	
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test	No	
Supporting elements	Prevent and limit objectives	No	None identified

Table B7 Completed Scoping Tables for Activity: O2 Surface water drainage

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
Qualitative status	Quantitative Dependent Surface Water Body Status	No	The presence of the new quay may alter the infiltration of rainwater to ground very locally, however the nature of the natural strata and overlying made ground are such that the current rate of recharge within the footprint of the development is likely to be very small. Therefore quantitative impacts are anticipated to be undiscernible.
	Quantitative GWDTEs test		
	Quantitative Saline Intrusion		
	Quantitative Water Balance		
Chemical	Chemical Dependent Surface Water Body Status	No	Surface water would be managed and would not infiltrate to underlying groundwater. As a result there is no pathway for effect in the operational phase of the new quay.
	Chemical Drinking Water Protected Area	No	

Consider if the activity could impact on…		Scoped in (yes/no)	Notes
	Chemical Groundwater dependent terrestrial ecosystem (GWDTEs) test	No	
Supporting elements	Prevent and limit objectives	No	None identified