

Appendix G

Photograph Plates

Photo No. 1	Date: 10/11/21	
Direction Photo Taken: Facing southwest		
Description: View of the Sand Wharff located adjacent to the site.		
Photo No. 2	Date: 10/11/21	
Direction Photo Taken: Facing southeast		
Description: Backside of Sand Wharff		

Photo No. 3	Date: 10/11/21	
Direction Photo Taken: Facing South		
Description River Taff		
Photo No. 4	Date: 10/11/21	
Direction Photo Taken: Facing North		
Description River Taff and surrounding land area		

Photo No. 5	Date: 10/11/21	
Direction Photo Taken: Facing West		
Description Hamadryad Welsh Primary School		
Photo No. 6	Date: 10/11/21	
Direction Photo Taken: Facing Northwest		
Description Hamadryad Park		

Appendix H

Zetica (UXO) Pre- Desk Assessment Report

Pre-Desk Study Assessment

Site:	Channel View Footbridge, Grangetown, Cardiff, Wales
Client:	Arcadis
Contact:	Devika Desai
Date:	16 th November 2021
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Cardiff Docks and Penarth Harbour. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort including, munitions factories, engineering, and metal works. ■ Military barracks and training areas.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	During WWII, The Marl, encompassing the western part of the Site, was requisitioned for use as an Air Raid Precautions (ARP) wardens post. By April 1942, 1No. barrage balloon was established on The Marl, approximately 0.2km north of the Site.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Cardiff Docks and Penarth Harbour. ■ Transport infrastructure and public utilities.

	■ Industries important to the war effort, including munitions factories, engineering works, and metal works. ■ Royal Air Force (RAF) Pengam Moors. ■ Military barracks and training areas. ■ Anti-Aircraft (AA) and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	1No. located approximately 4km west of the Site.
WWII Bombing	During WWII the Site was located in the County Borough (CB) which officially recorded 562No. High Explosive (HE) bombs with a bombing density of 40 bombs per 405 hectares (ha). Air raids on Cardiff began in July 1940 and continued until May 1943. The heaviest air raid occurred on the 2nd January 1941, the Cardiff 'Blitz', when over 400No. HE bombs fell across the city. Readily available records have been found to indicate that several HE bombs fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	After WWII, The Marl was derequisitioned and returned to public use.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.
Further information	For information about Zetica's detailed UXO desk studies and other UXO services, please visit our website: www.zeticauxo.com. Details and downloadable resources covering the most common sources of UXO hazard affecting sites in the UK can be found here. If you have any further queries, please don't hesitate to get in contact with us at uxo@zetica.com or 01993 886 682.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.	

Appendix I

Historical Ordnance Survey Maps

Site Details:

CARDIFF WATER ACTIVITY
CENTRE, JIM DRISCOLL WAY,
GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1953

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1953
Edition N/A
Copyright N/A
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Edition N/A
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Site Details:

CARDIFF WATER ACTIVITY CENTRE, JIM DRISCOLL WAY, GRANGETOWN, CARDIFF, CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1954

Scale: 1:1,250

Printed at: 1:2,000



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



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Site Details:

CARDIFF WATER ACTIVITY
CENTRE, JIM DRISCOLL WAY,
GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1972

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1969-1974

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
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Edition N/A
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Levelled 1960

Surveyed 1953
Revised 1969
Edition N/A
Copyright 1970
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Revised 1970
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Client Ref: 14056317_-400_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1974

Scale: 1:1,250

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Site Details:

CARDIFF WATER ACTIVITY
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GRANGETOWN, CARDIFF,
CF11 7HB

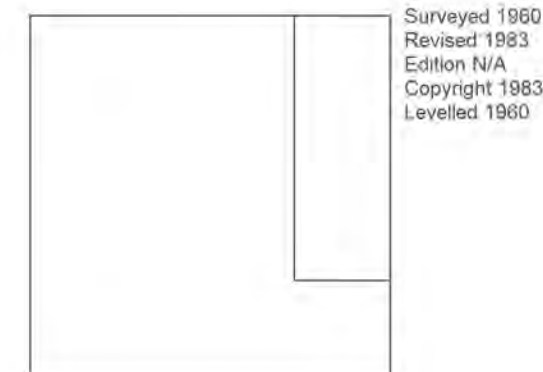
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Grid Ref: 317883, 174116

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Printed at: 1:2,000



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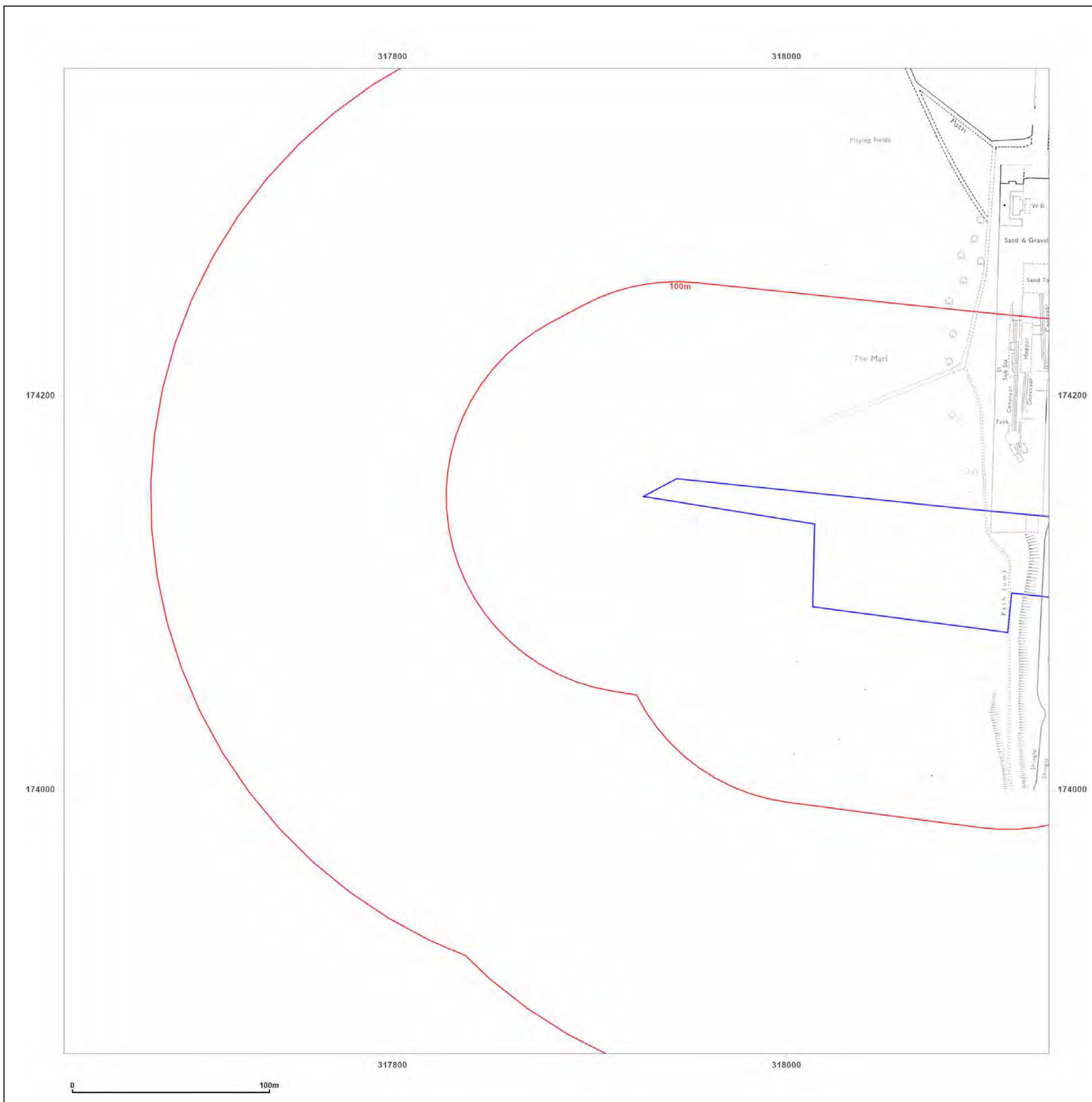


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GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1983-1986

Scale: 1:1,250

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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1984-1989

Scale: 1:1,250

Printed at: 1:2,000



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CF11 7HB

Client Ref: 14056317_-400_Channel_Footbridge
Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1989-1992

Scale: 1:1,250

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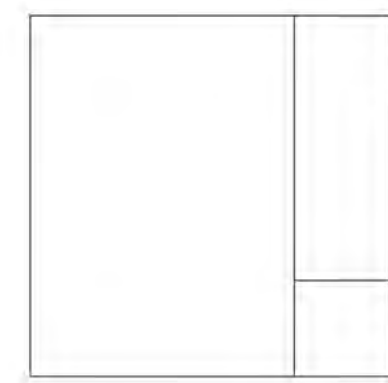
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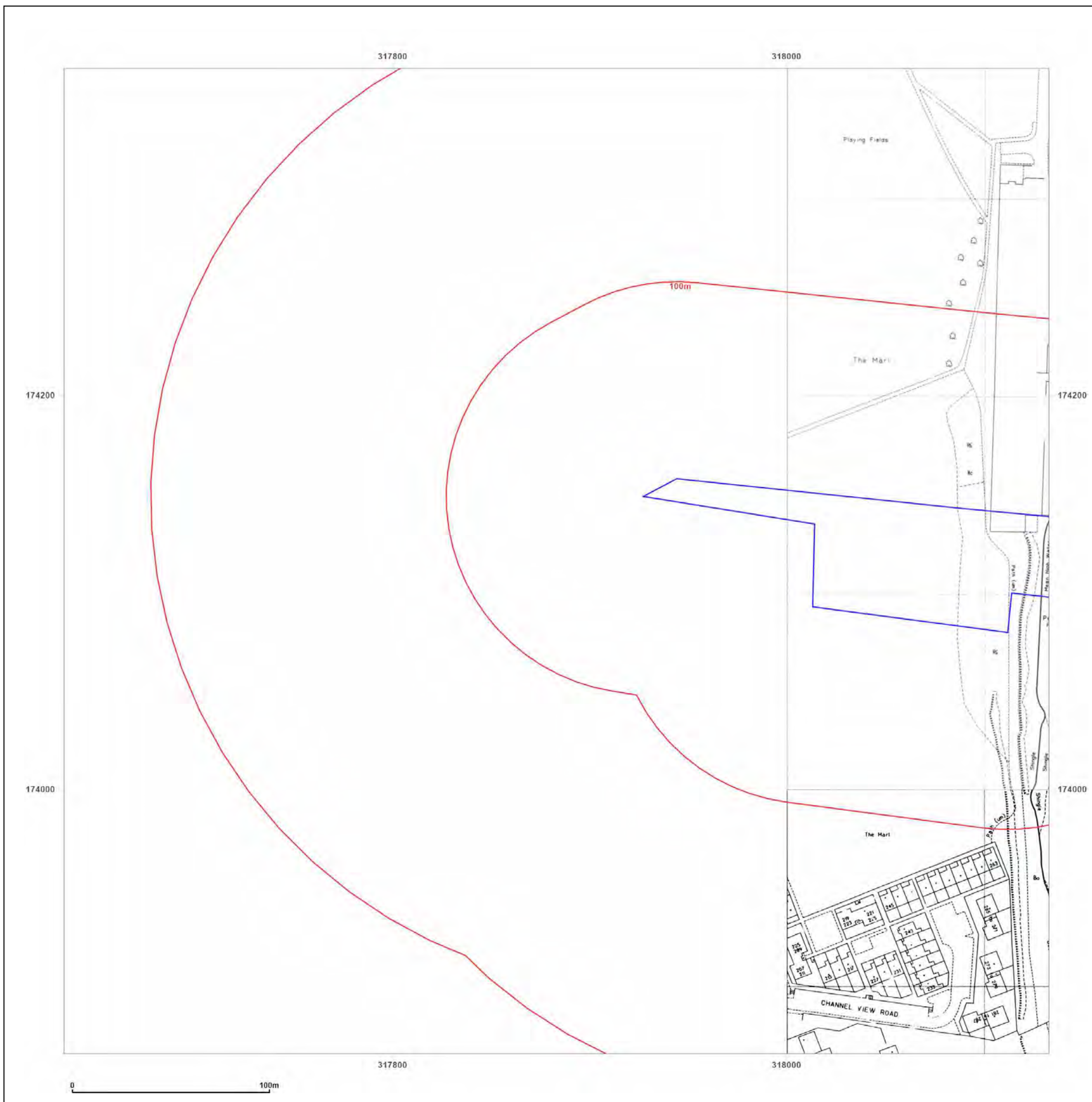


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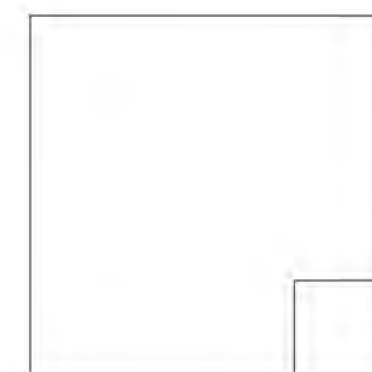
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Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1993

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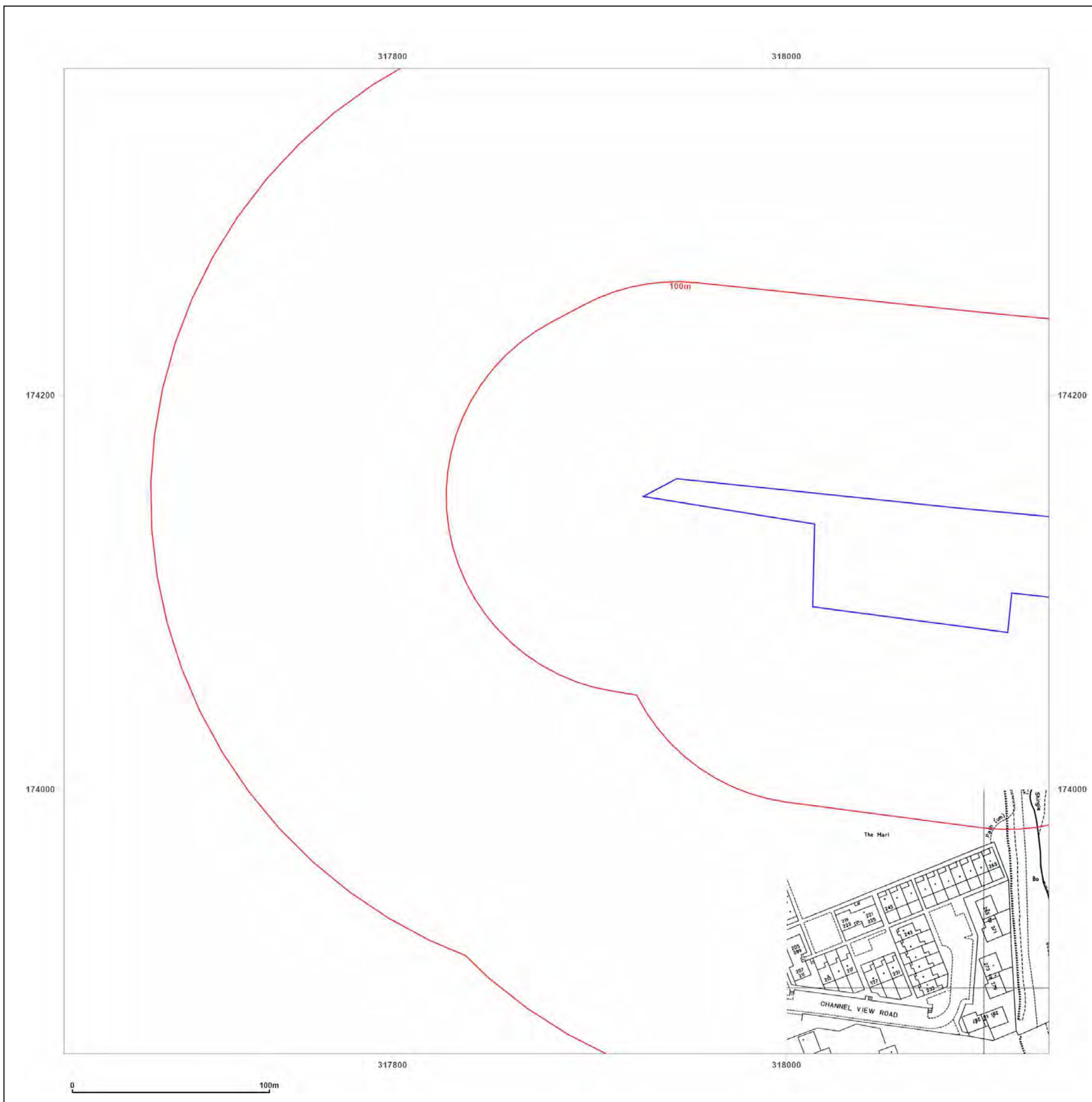


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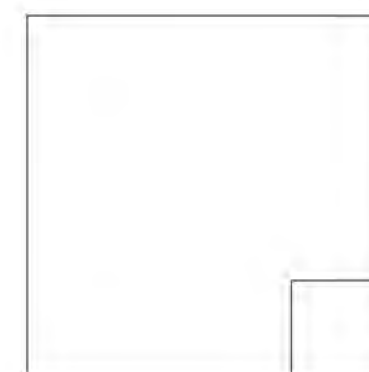
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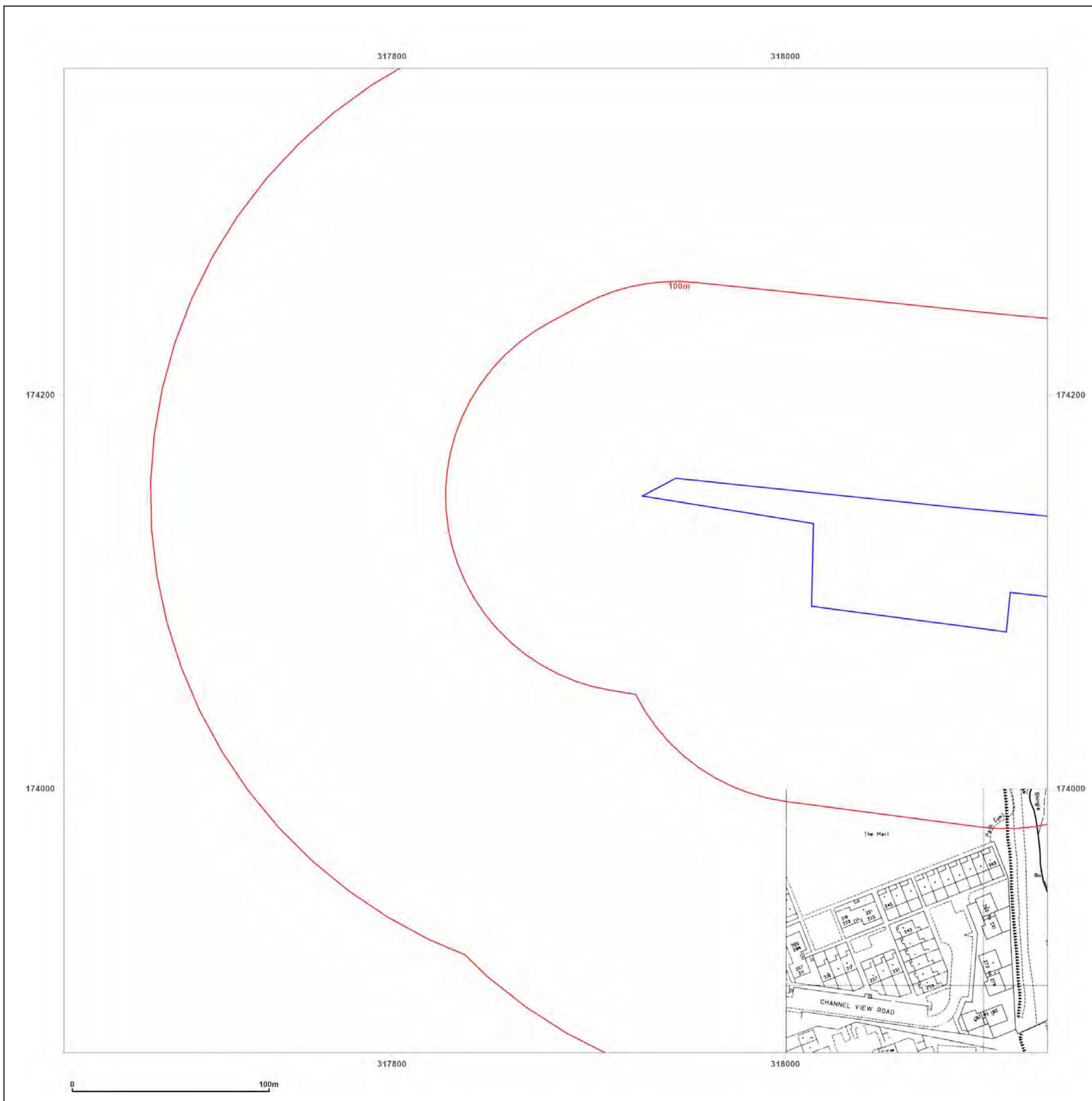


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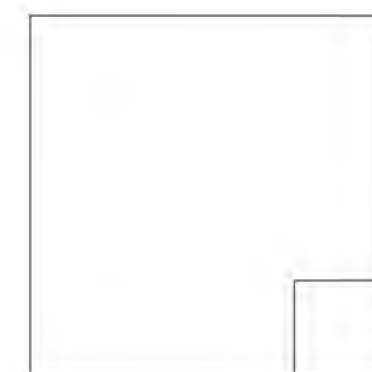
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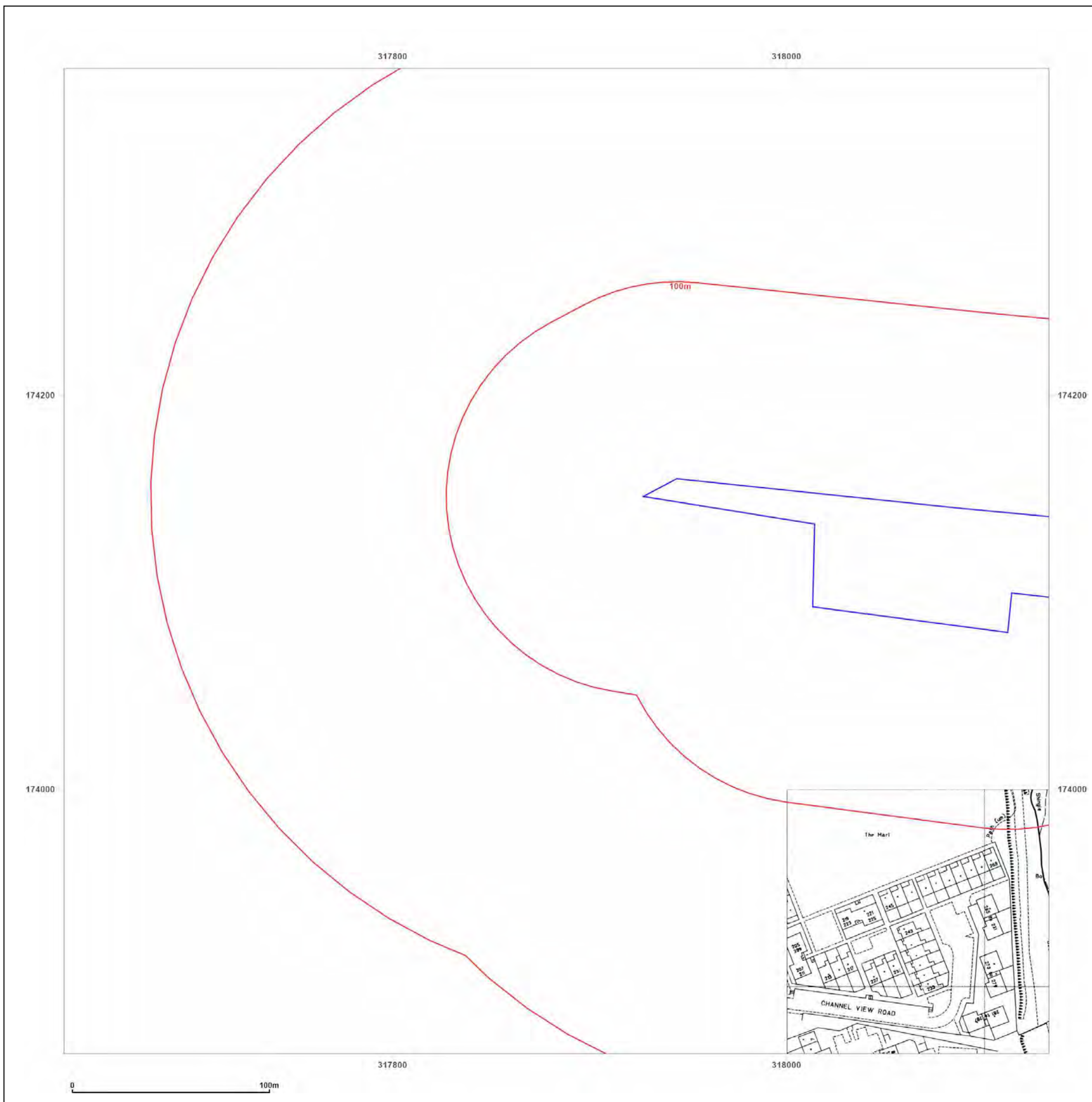


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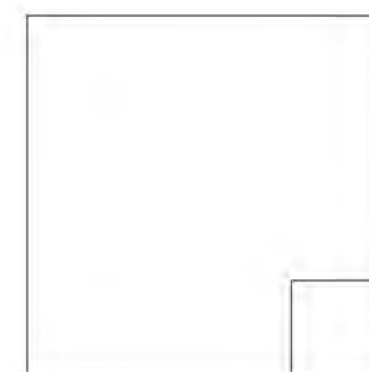
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Map date: 1994

Scale: 1:1,250

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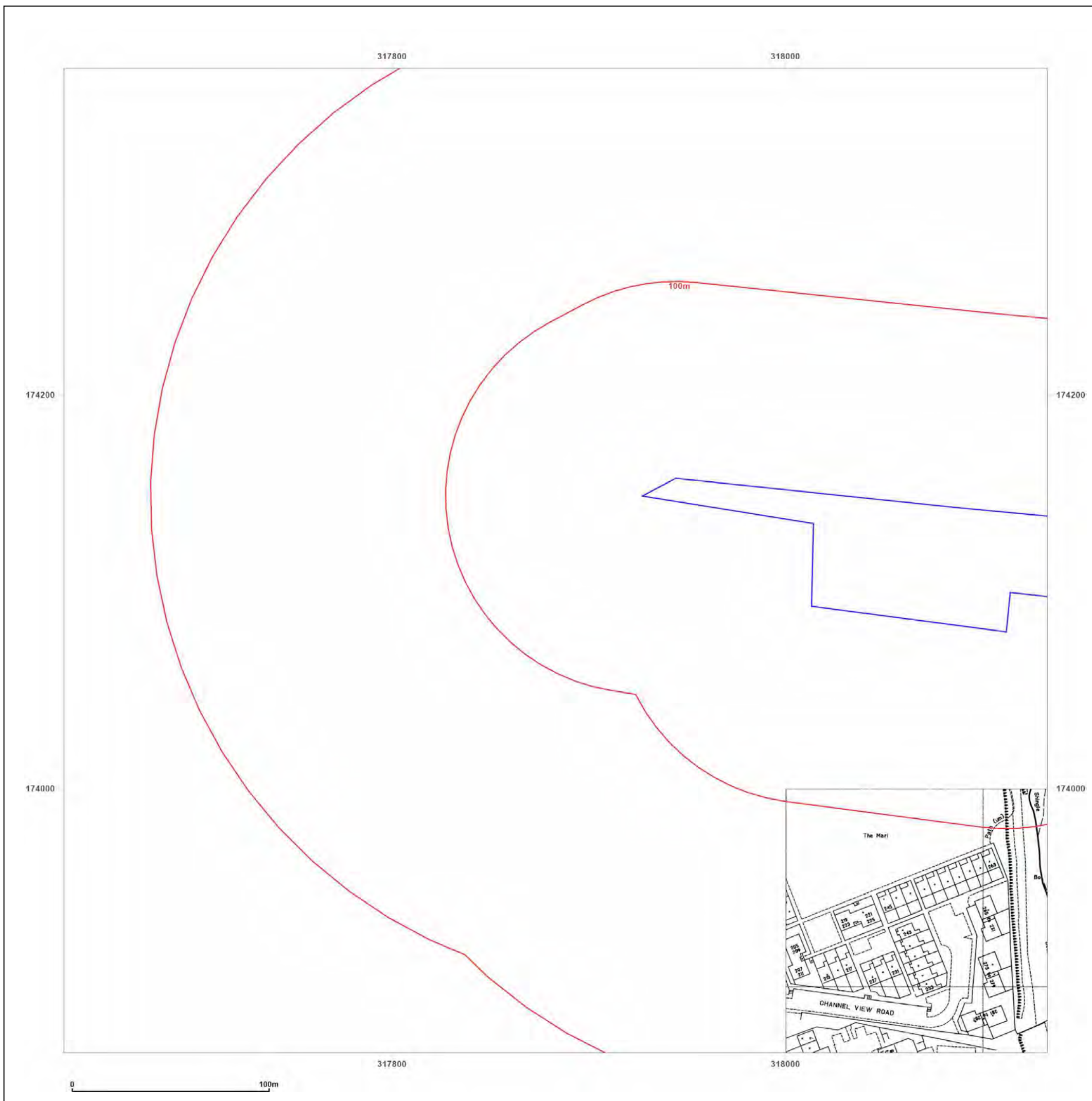


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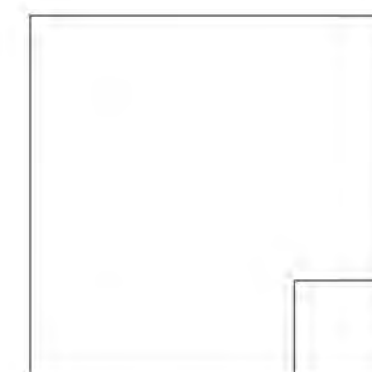
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Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



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Copyright 1994
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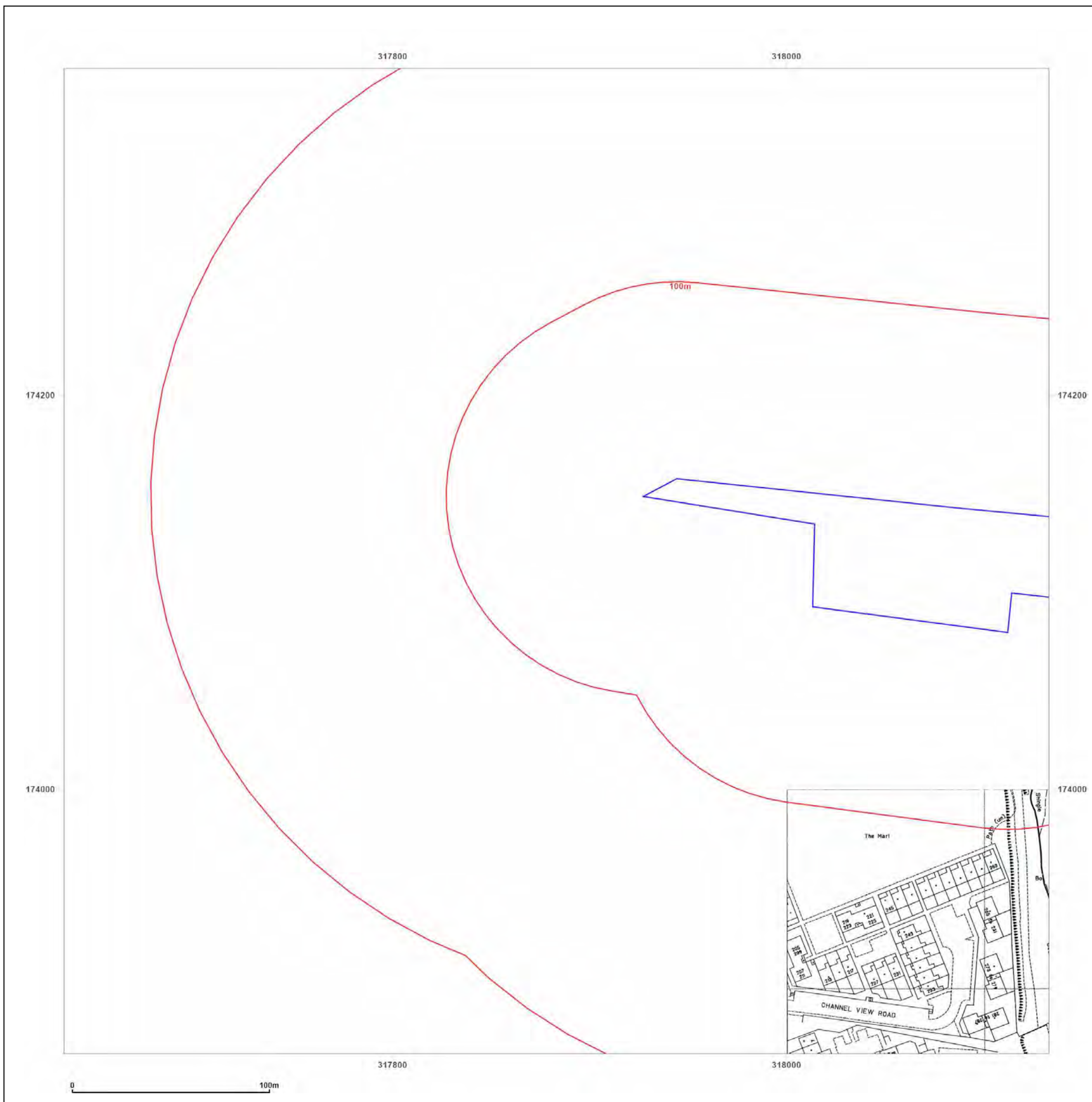


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CF11 7HB

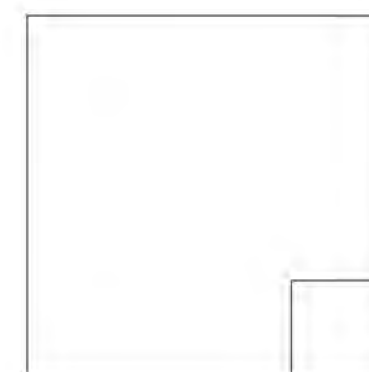
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Report Ref: GS-8323206_1250_1_1
Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1995

Scale: 1:1,250

Printed at: 1:2,000



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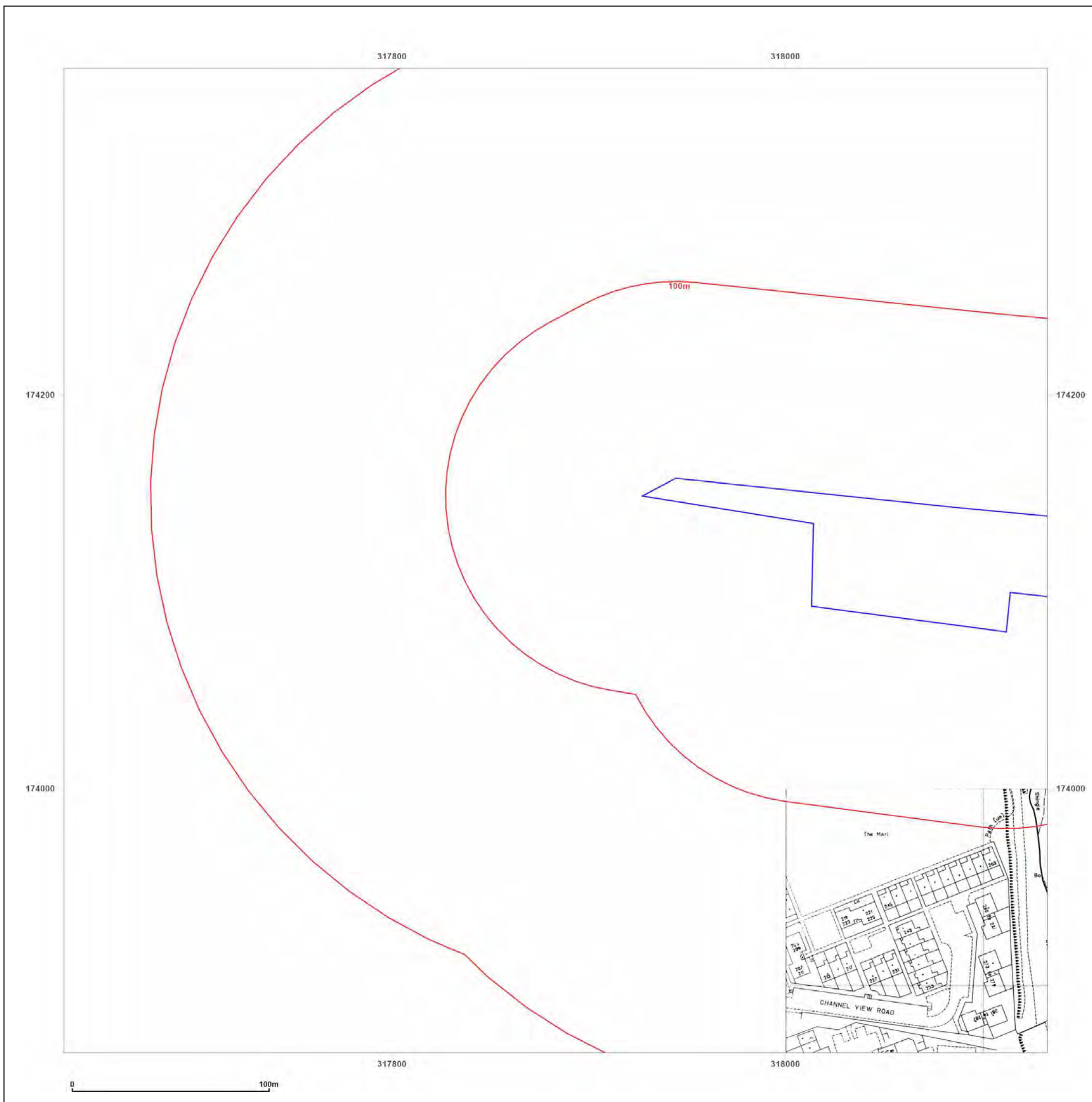


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CF11 7HB

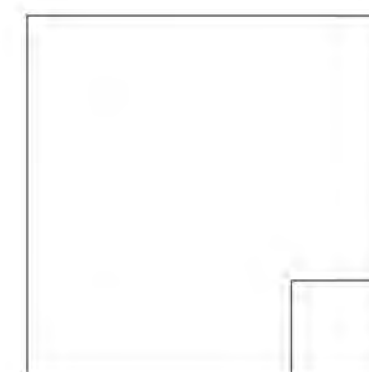
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Grid Ref: 317883, 174116

Map Name: National Grid

Map date: 1995

Scale: 1:1,250

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Edition N/A
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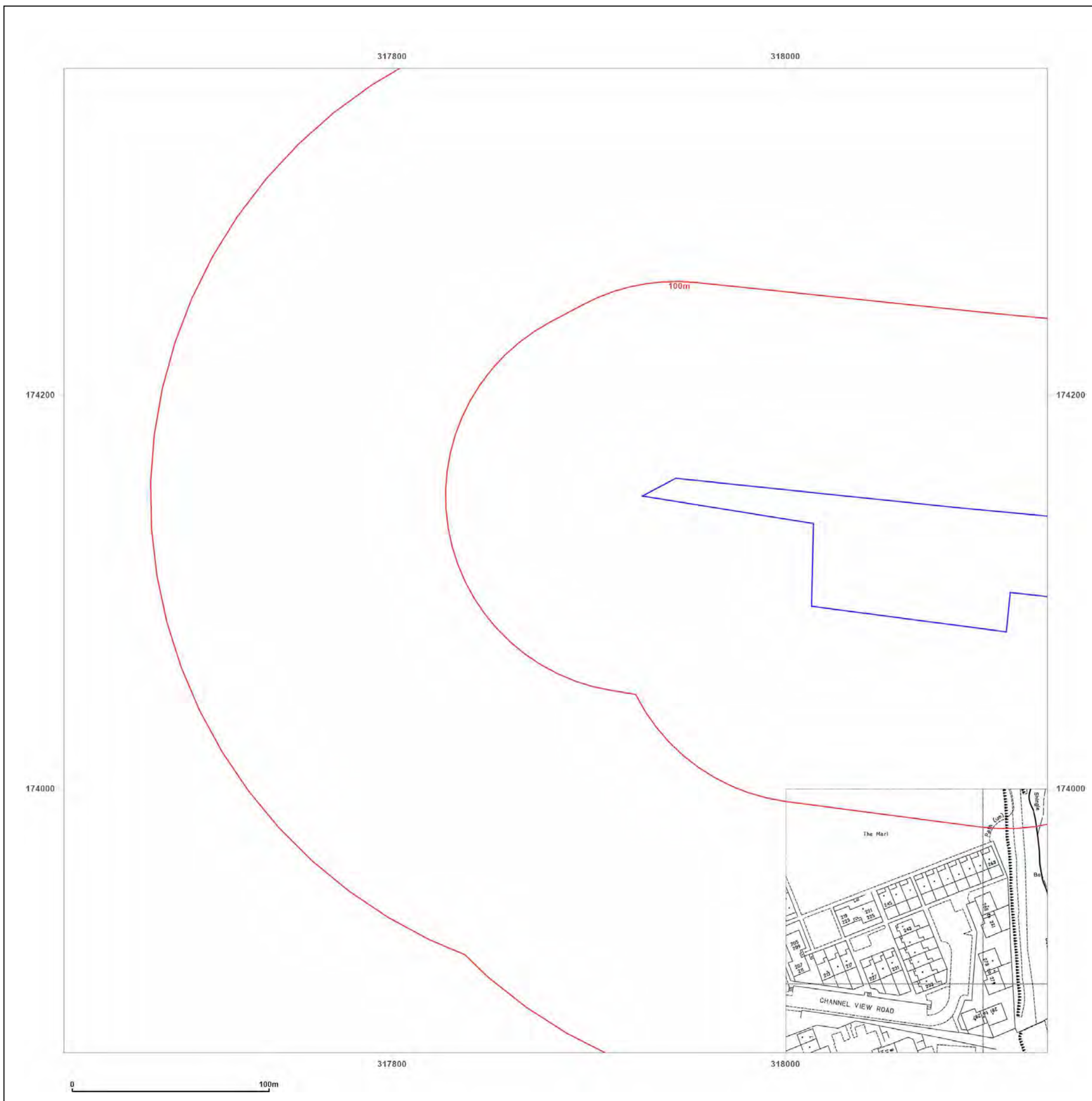


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Site Details:

CARDIFF WATER ACTIVITY
CENTRE, JIM DRISCOLL WAY,
GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1953-1954

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1953
Edition N/A
Copyright N/A
Levelled 1948

Surveyed 1953
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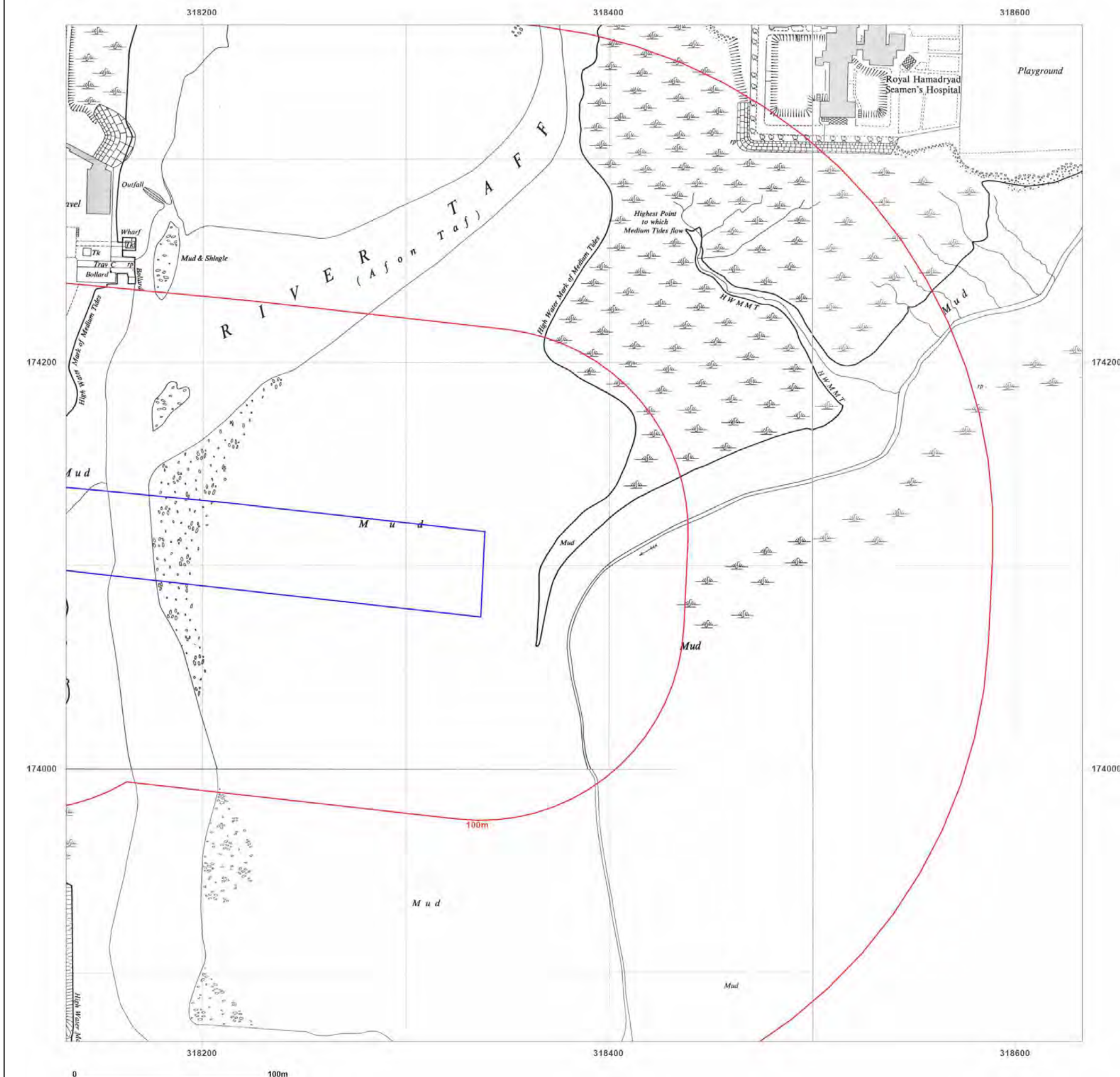


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Site Details:

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GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1954

Scale: 1:1,250

Printed at: 1:2,000



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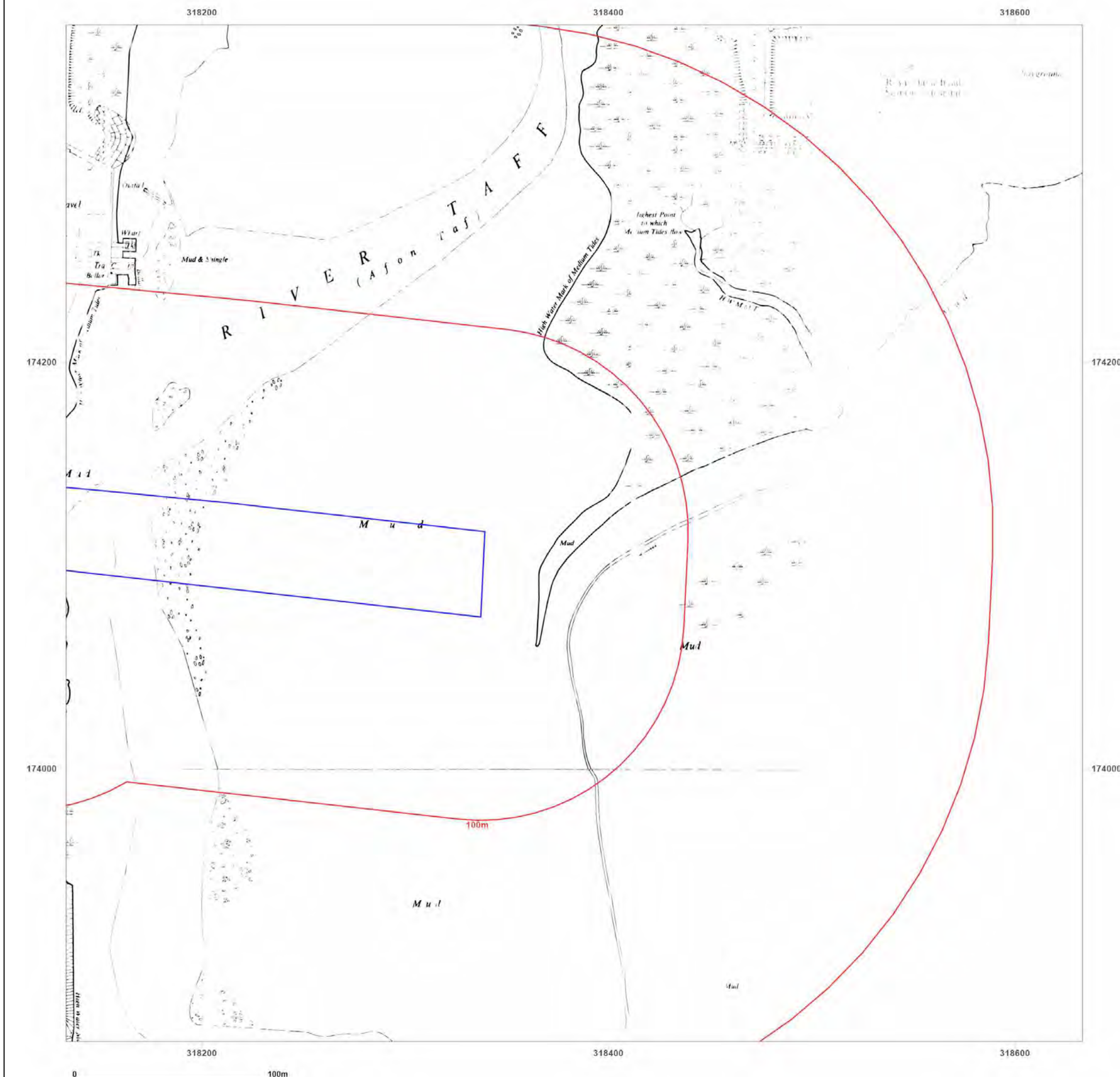


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GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1971-1974

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
Copyright 1974
Levelled 1960

Surveyed 1953
Revised 1970
Edition N/A
Copyright 1971
Levelled 1961

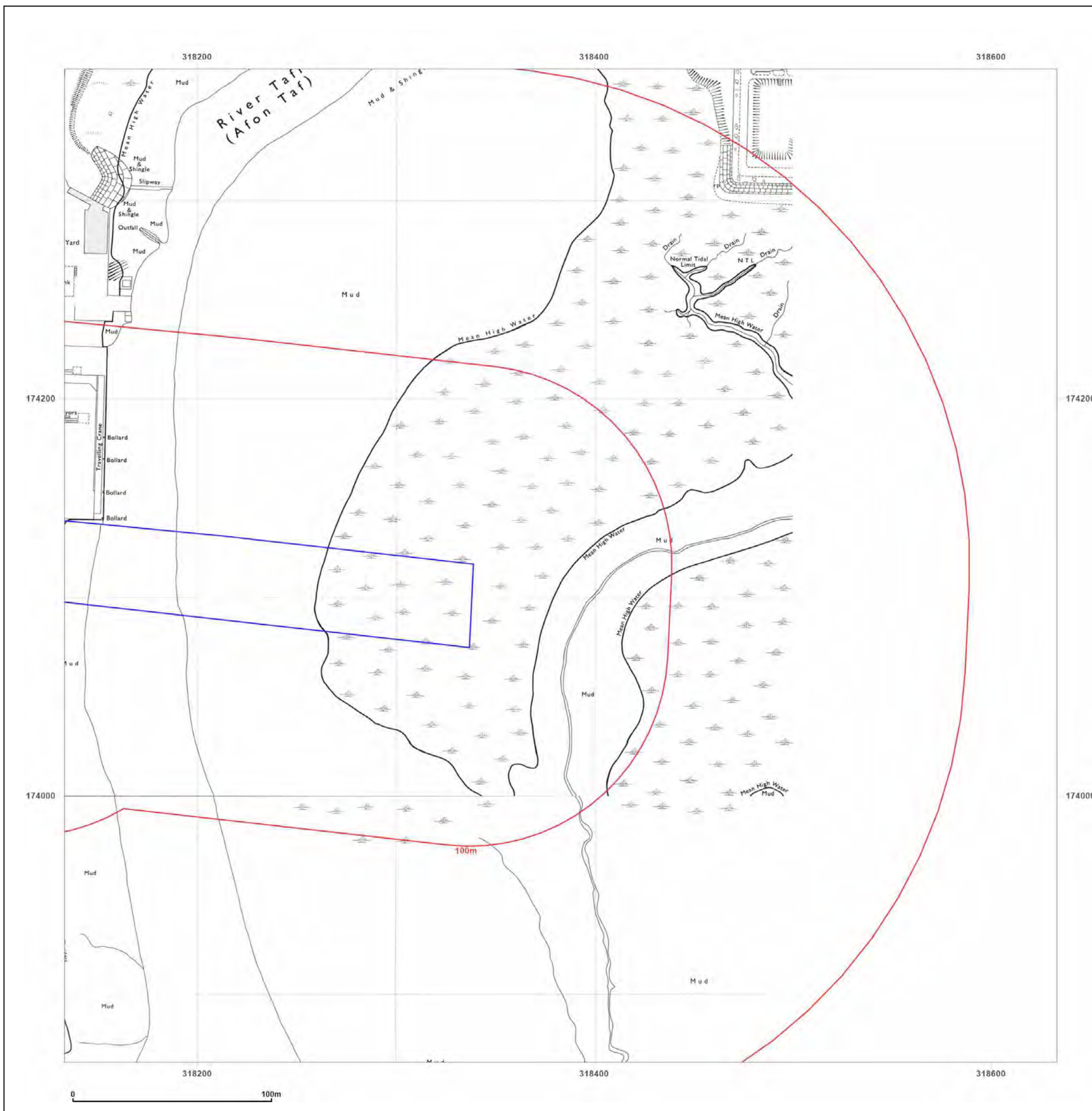


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Site Details:

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GRANGETOWN, CARDIFF,
CF11 7HB

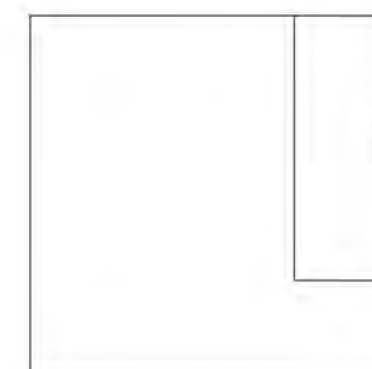
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Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1977

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1953
Revised 1973
Edition N/A
Copyright 1977
Levelled 1960

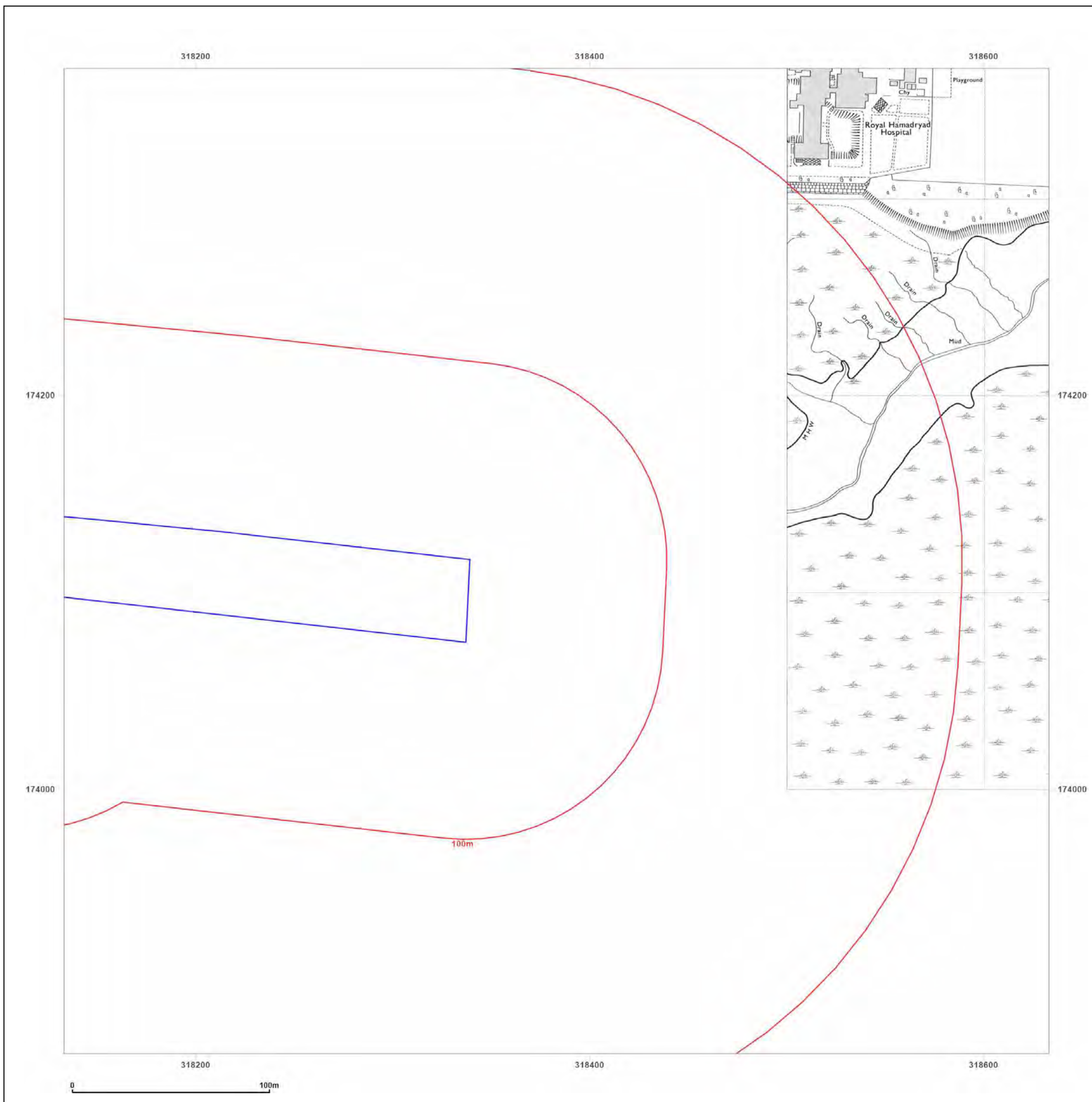


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1983-1986

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1960
Revised 1983
Edition N/A
Copyright 1983
Levelled 1960

Surveyed 1960
Revised 1986
Edition N/A
Copyright 1986
Levelled 1960

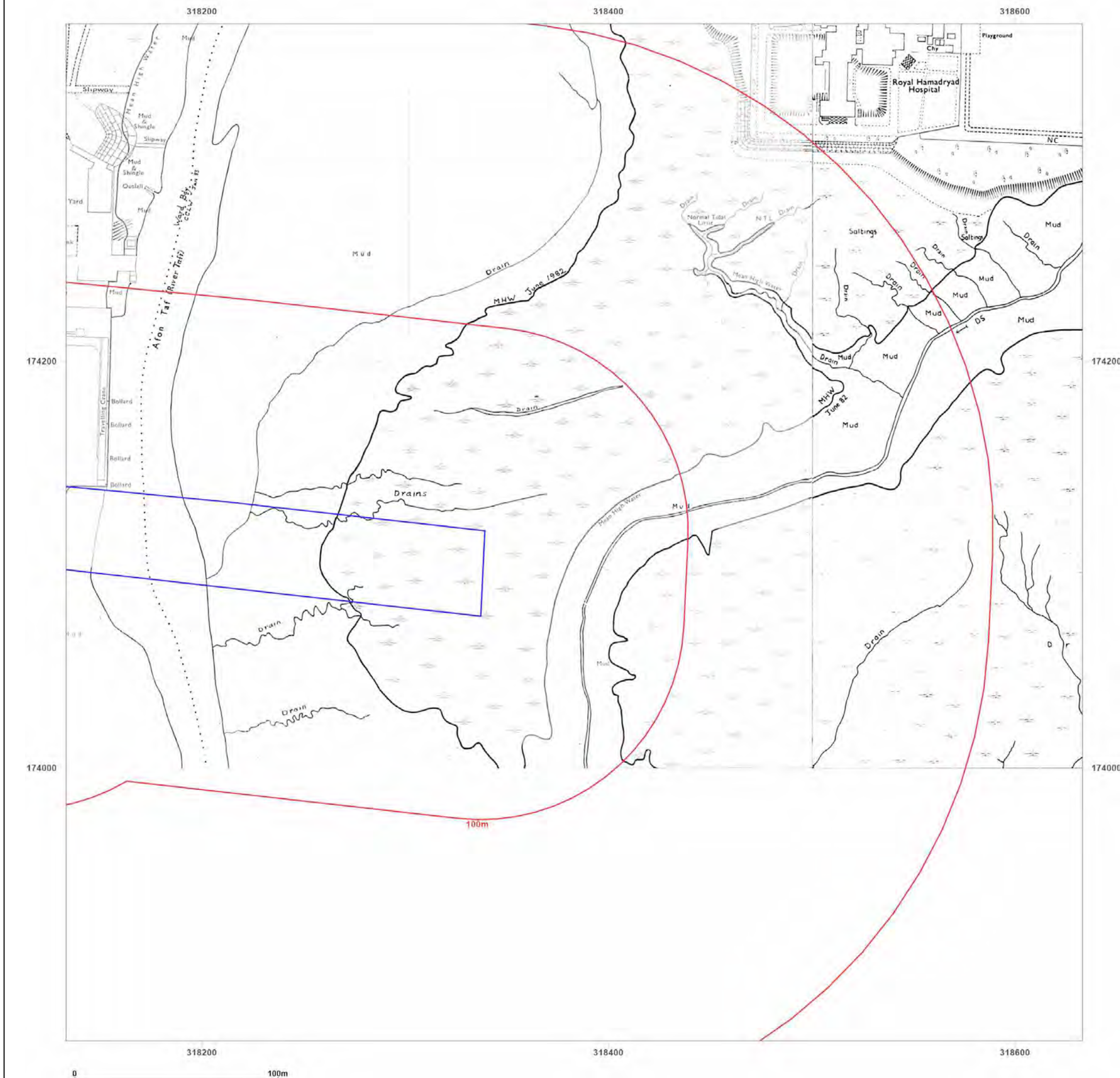


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1984-1989

Scale: 1:1,250

Printed at: 1:2,000



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

Surveyed 1960
Revised 1989
Edition N/A
Copyright 1989
Levelled 1960

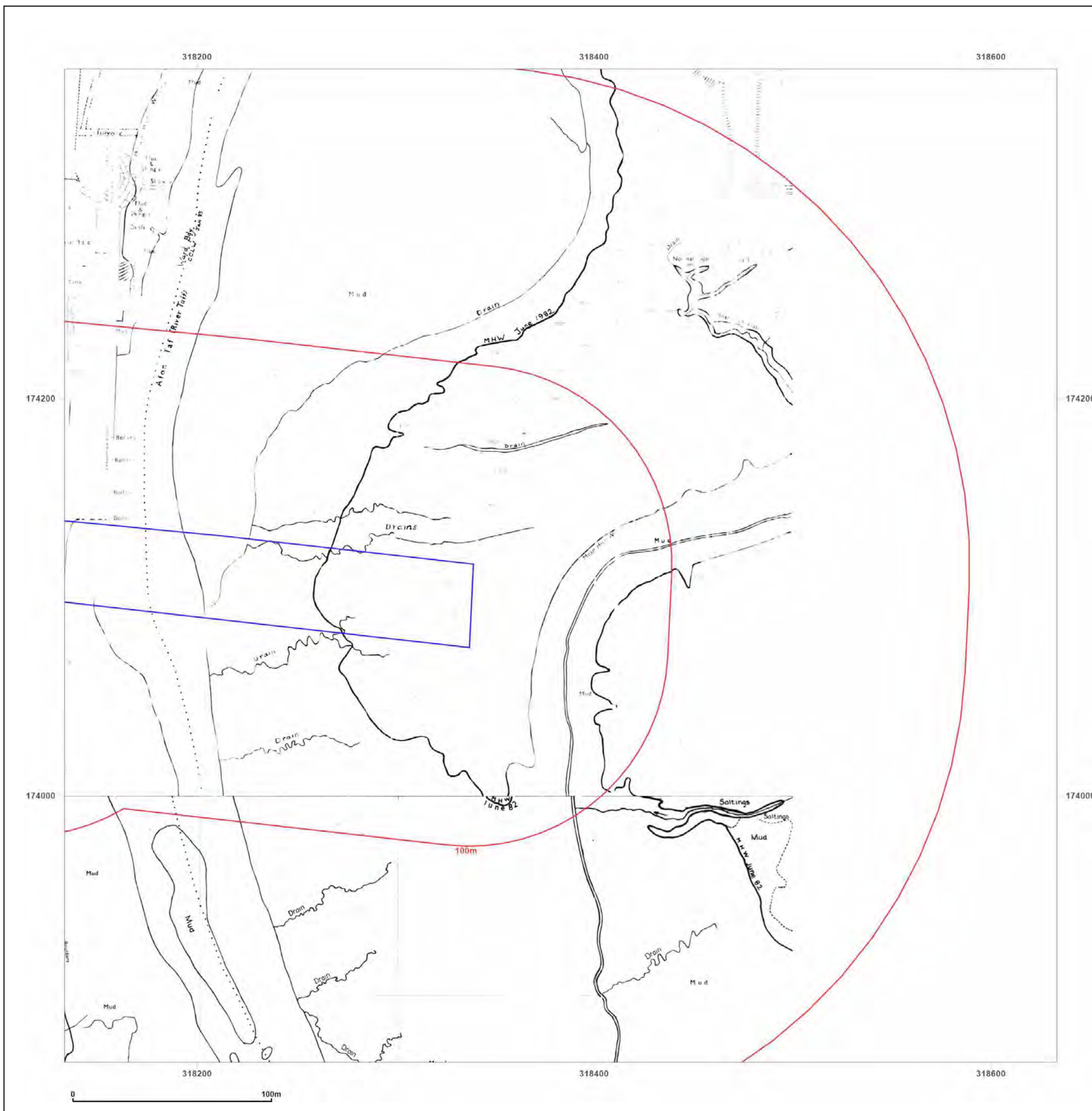


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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1993-1994

Scale: 1:1,250

Printed at: 1:2,000



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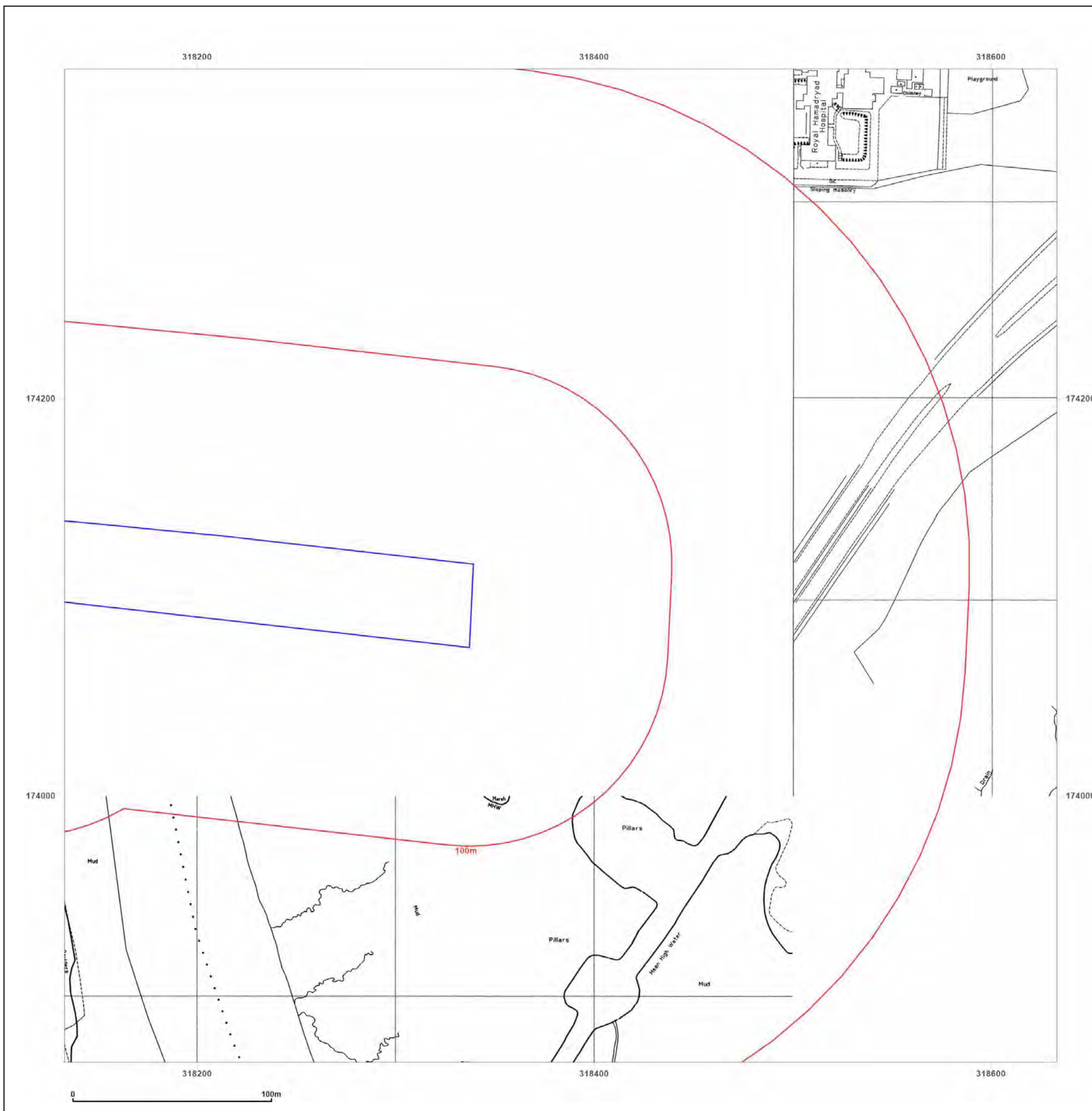


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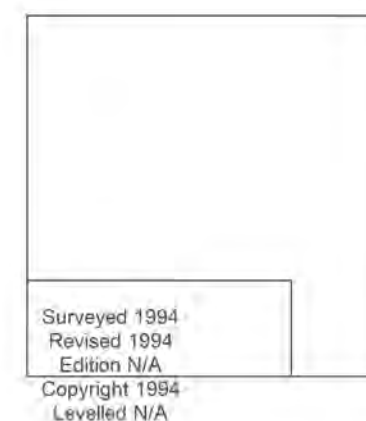
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Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000

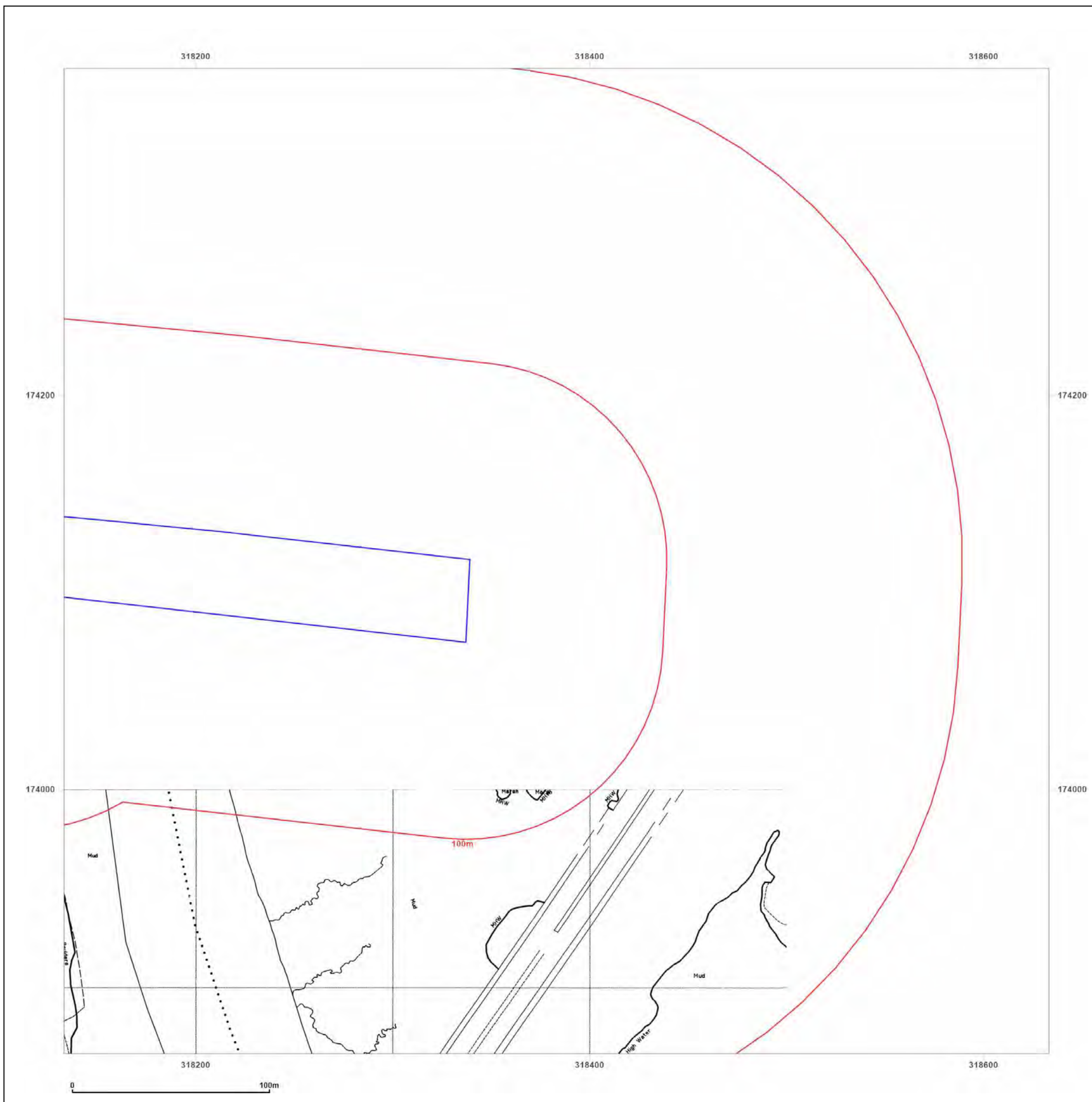


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CF11 7HB

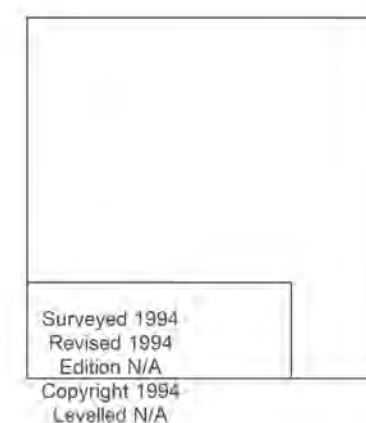
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Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000

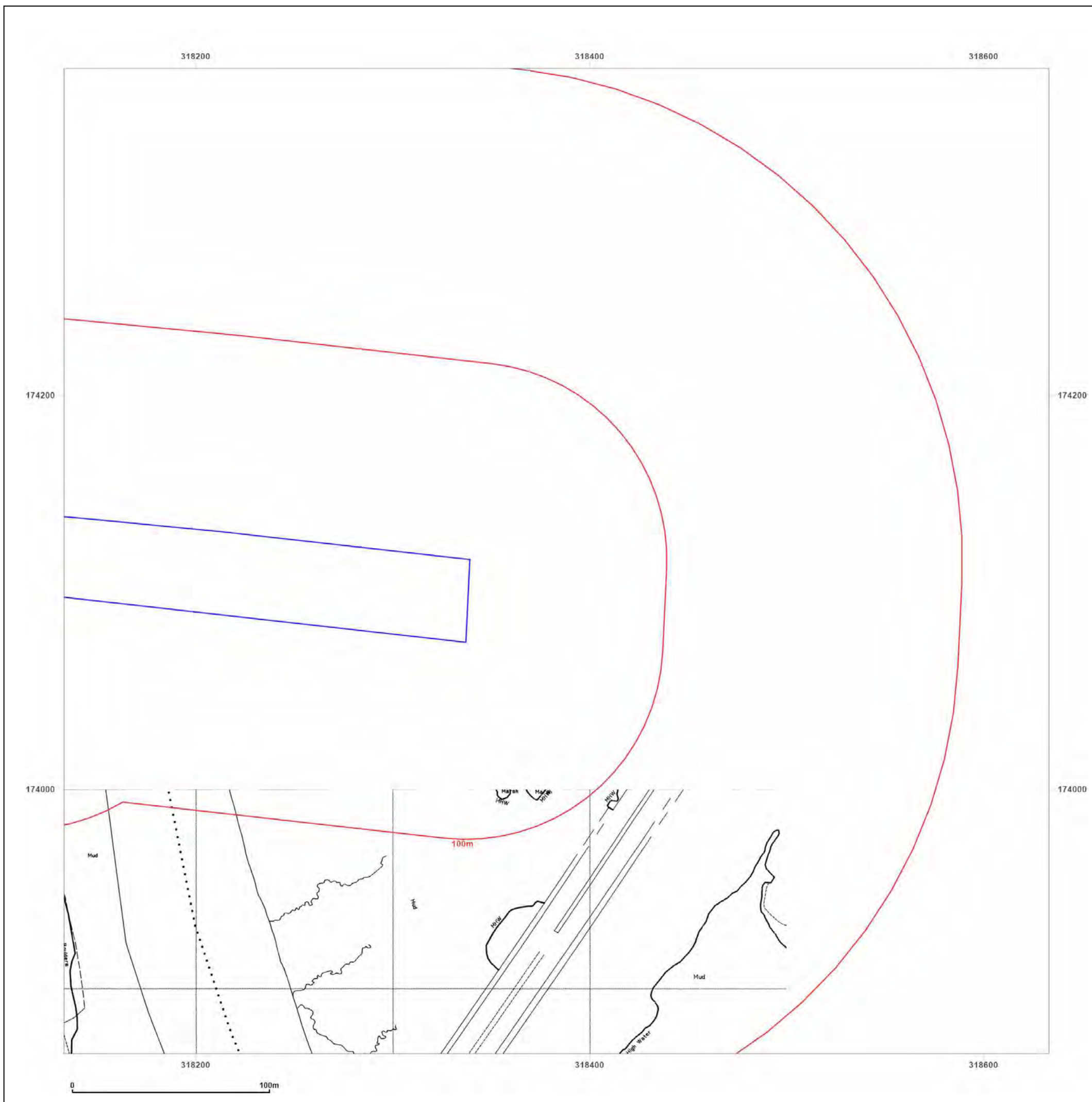


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1994-1995

Scale: 1:1,250

Printed at: 1:2,000



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Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A		

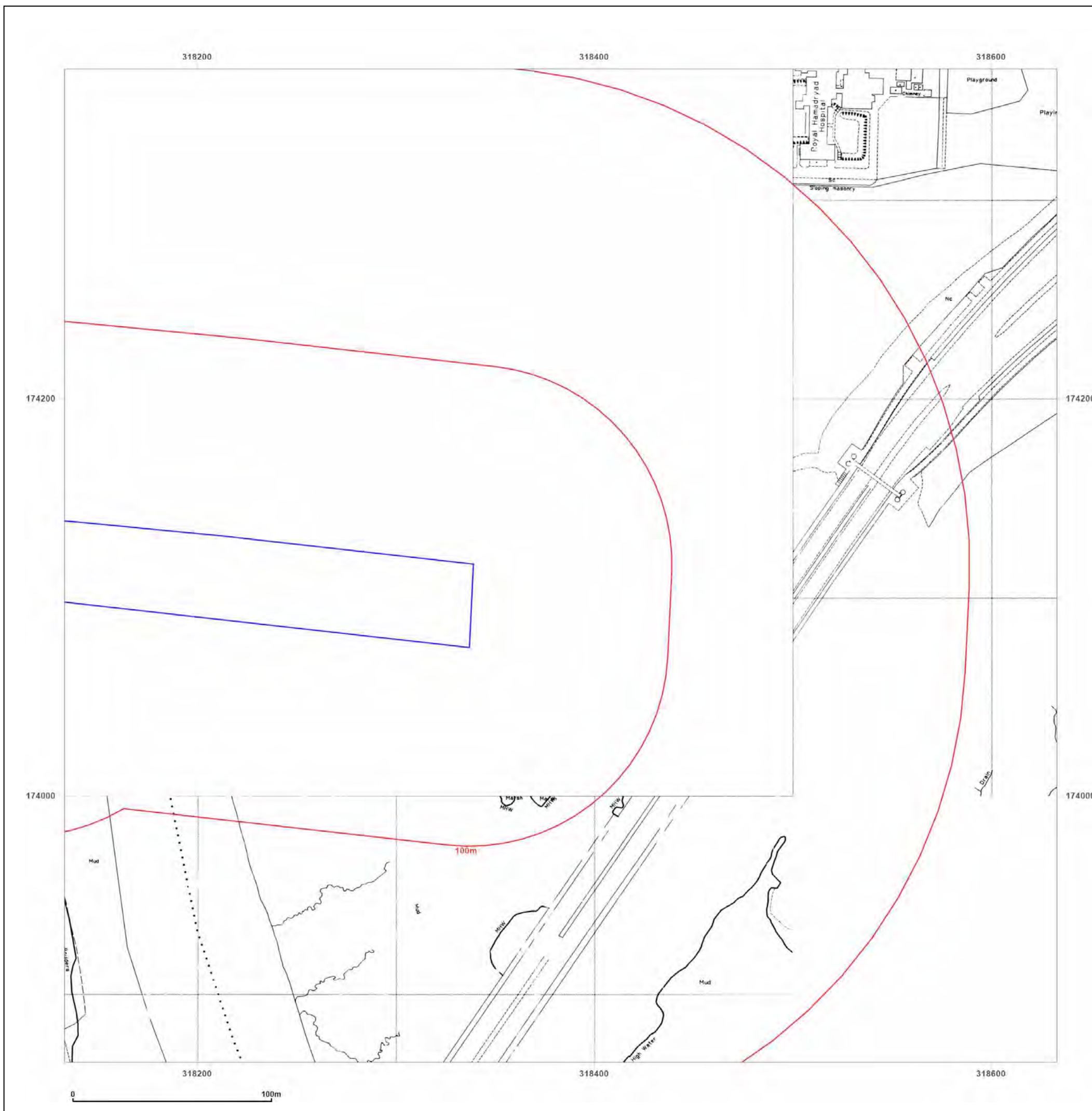


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1994-1995

Scale: 1:1,250

Printed at: 1:2,000



	Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A
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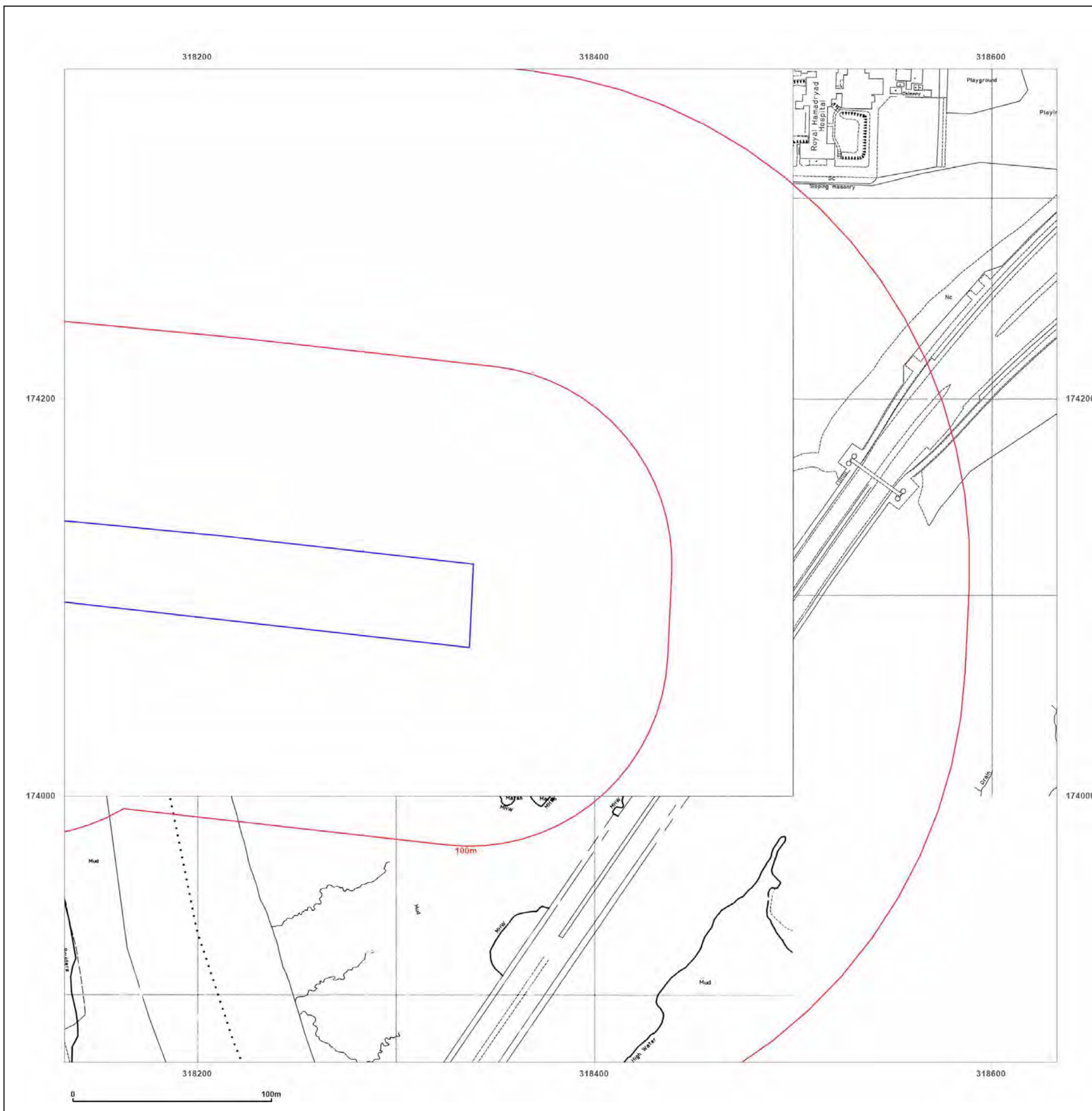


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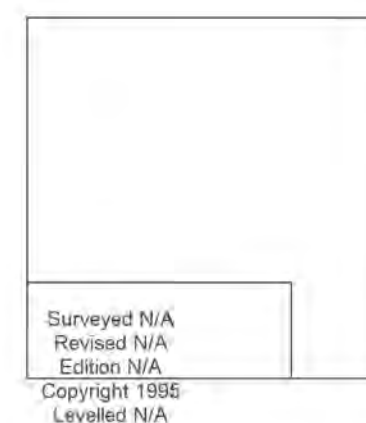
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Report Ref: GS-8323206_1250_2_1
Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1995

Scale: 1:1,250

Printed at: 1:2,000

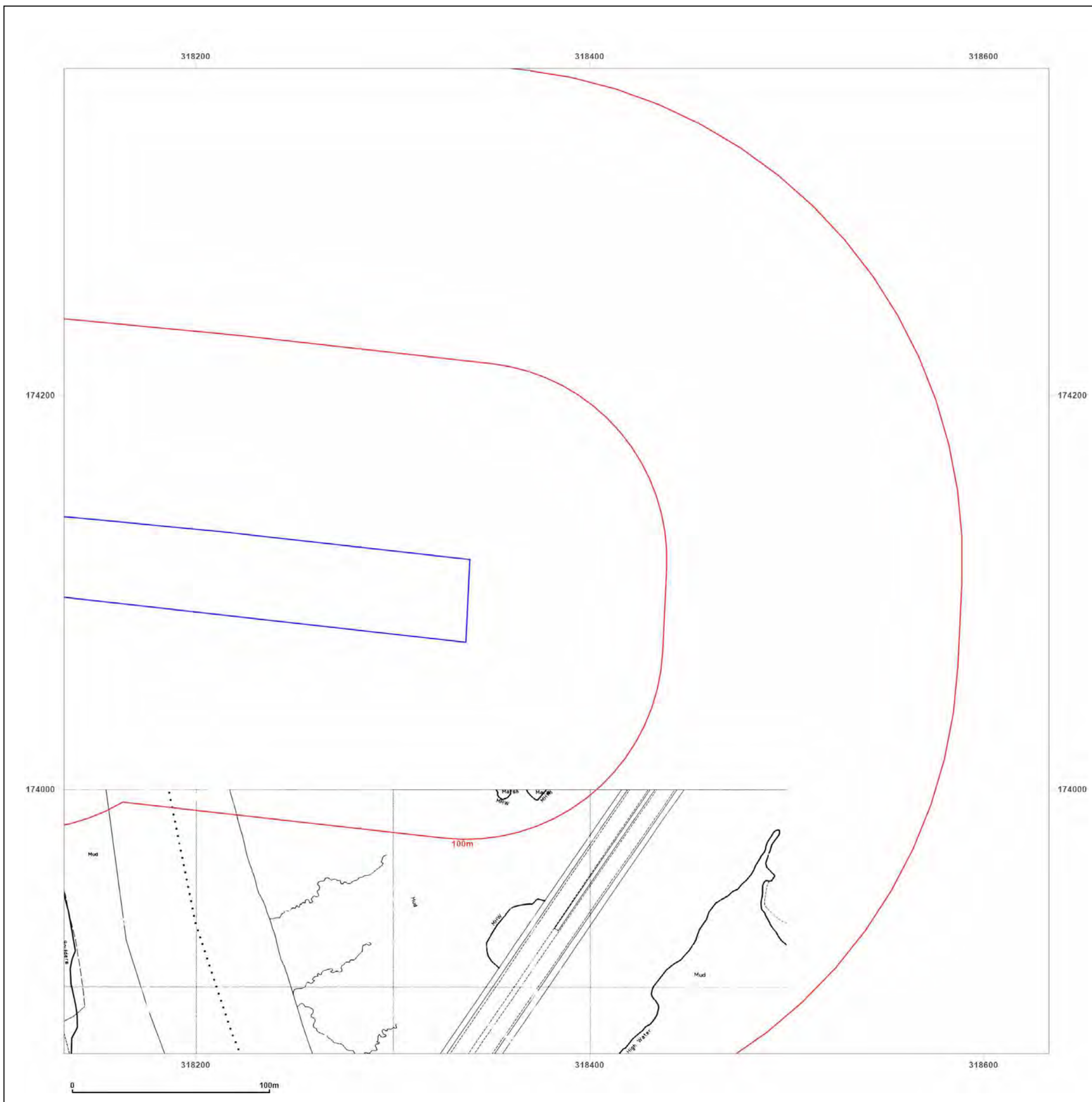


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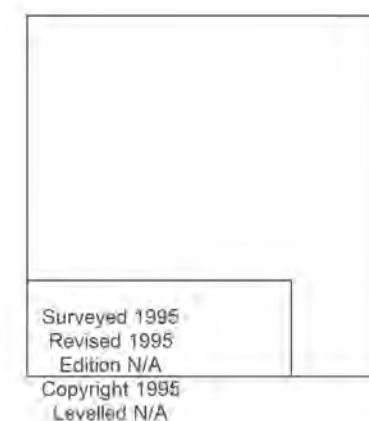
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Grid Ref: 318383, 174116

Map Name: National Grid

Map date: 1995

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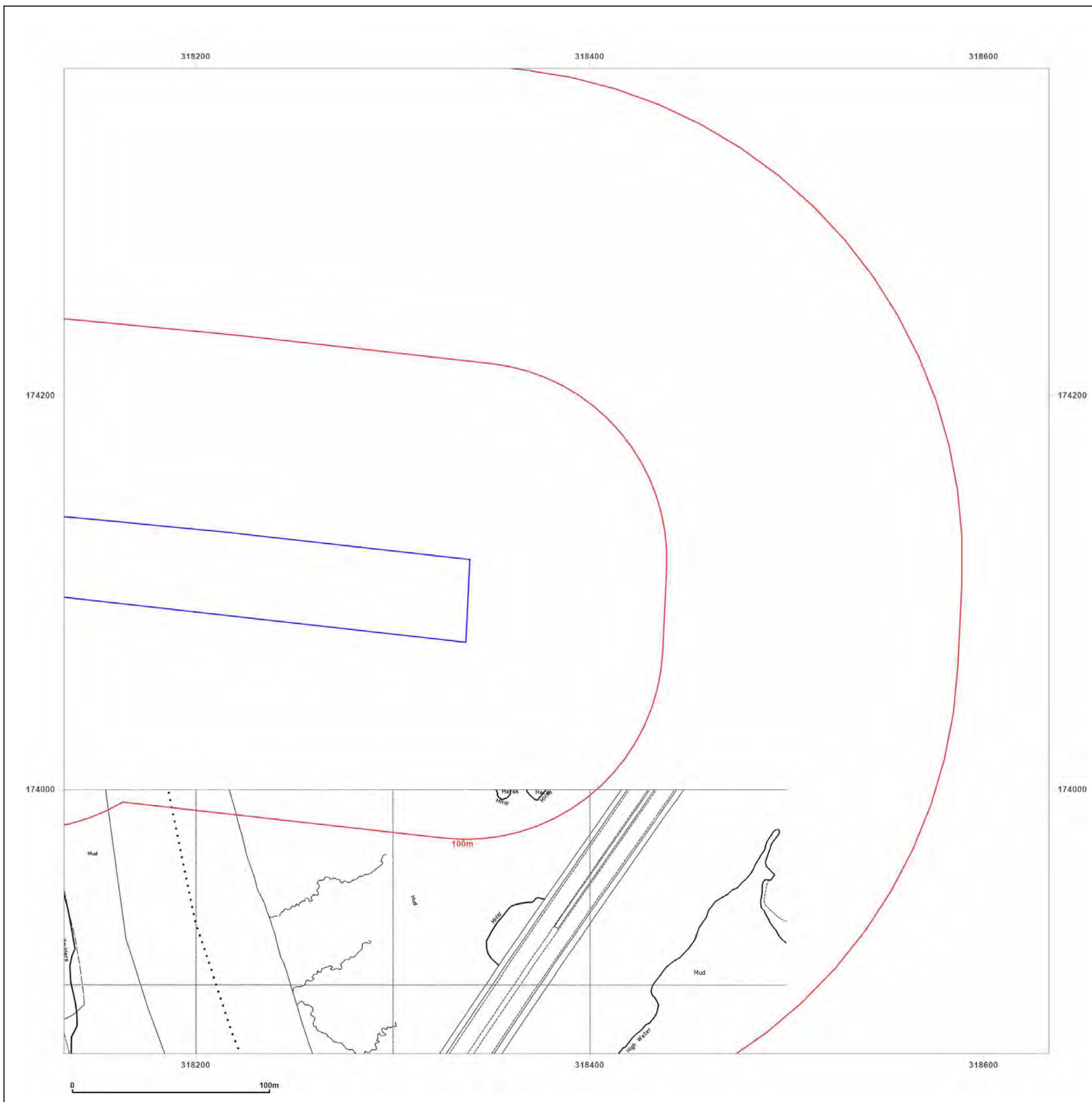


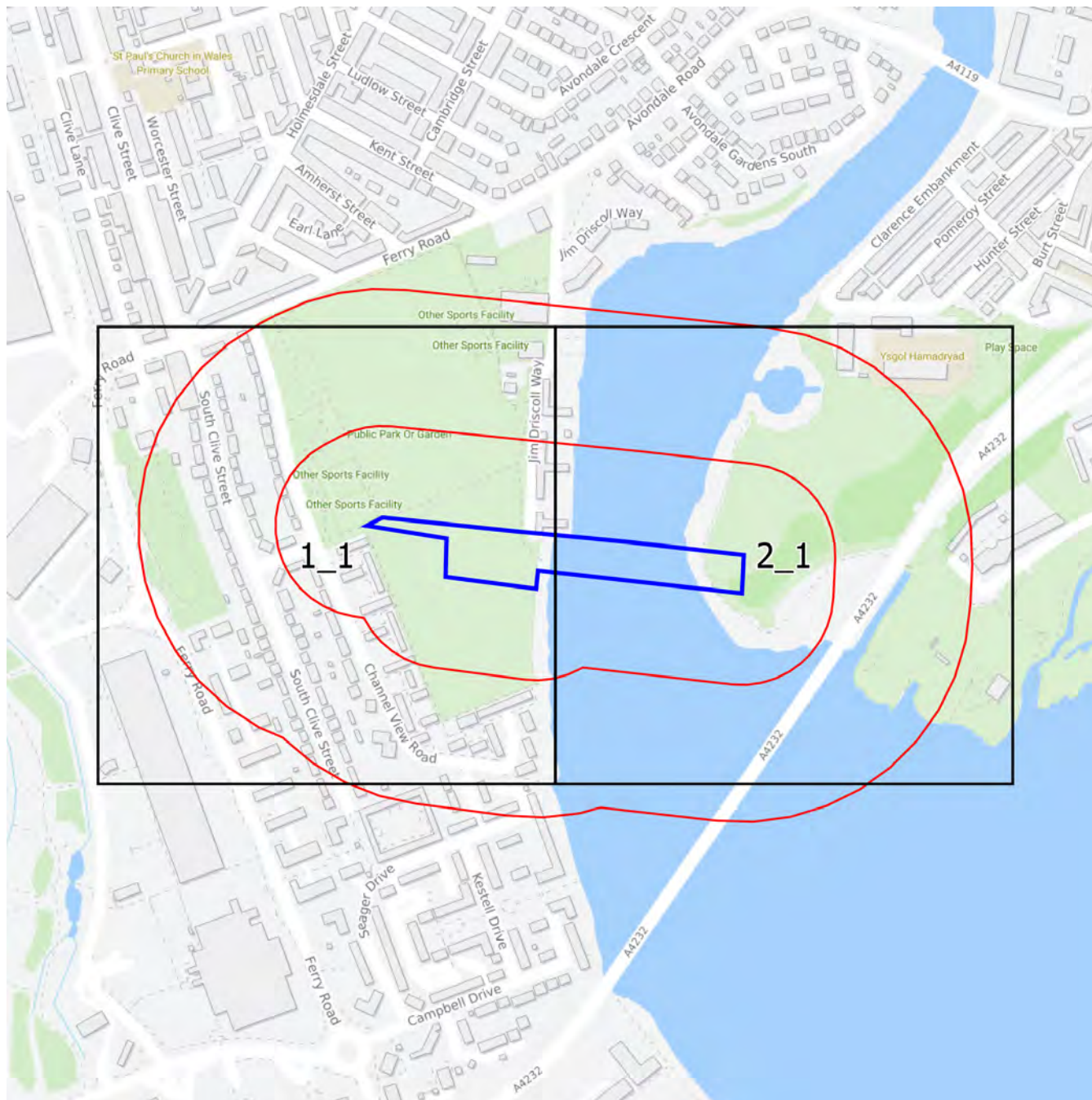
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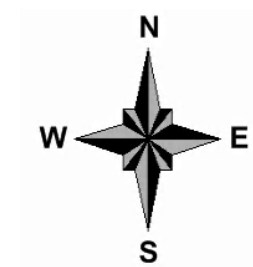
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1:1,250 Scale Grid Index



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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: County Series

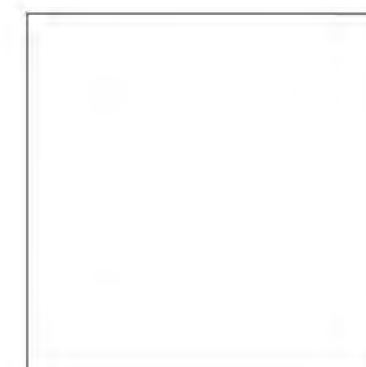
Map date: 1880

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1880
Revised 1880
Edition N/A
Copyright N/A
Levelled N/A

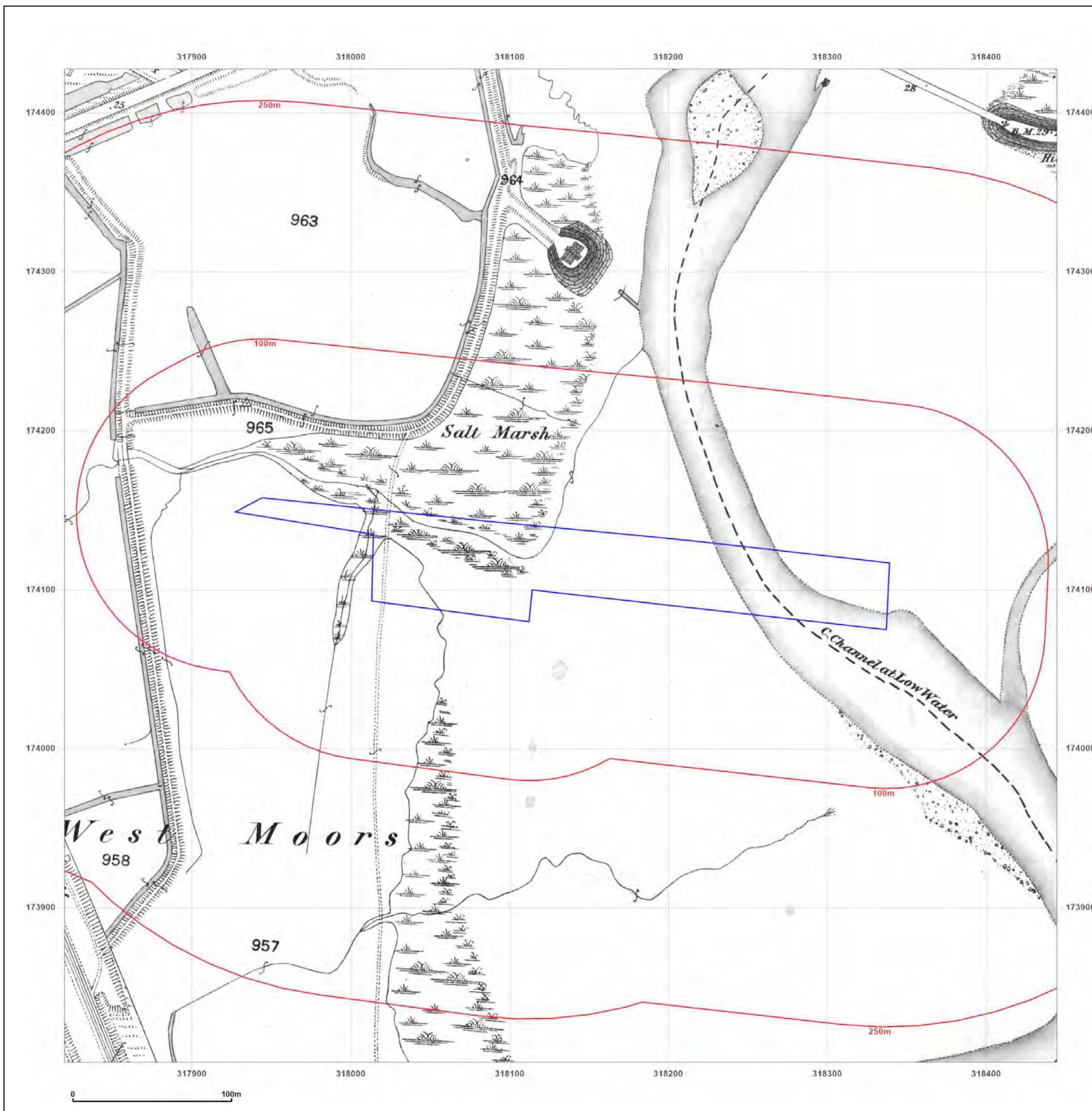


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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: County Series

Map date: 1901

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A

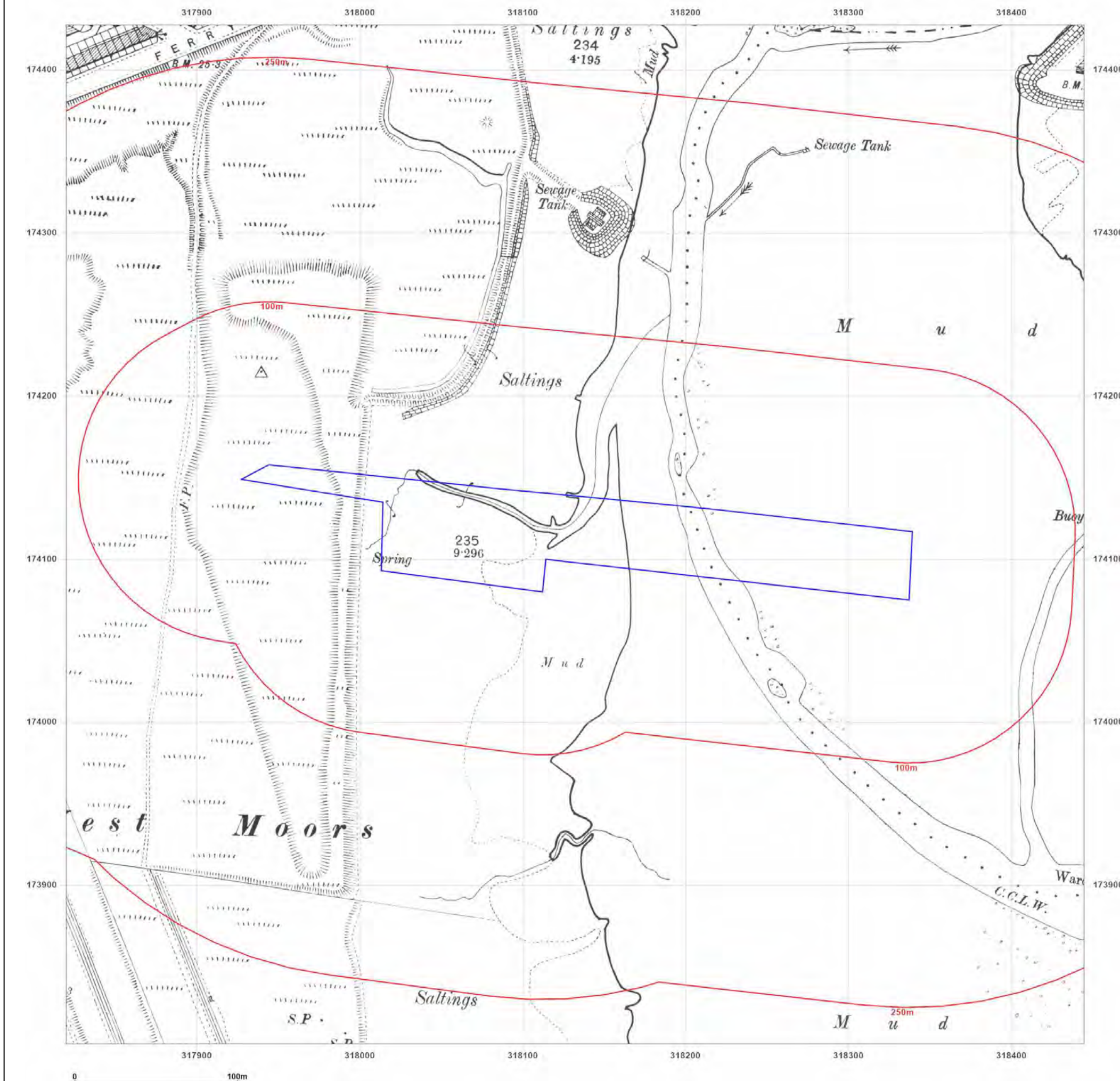


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: County Series

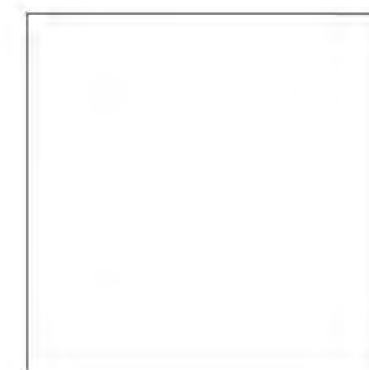
Map date: 1920

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1920
Revised 1920
Edition N/A
Copyright N/A
Levelled N/A

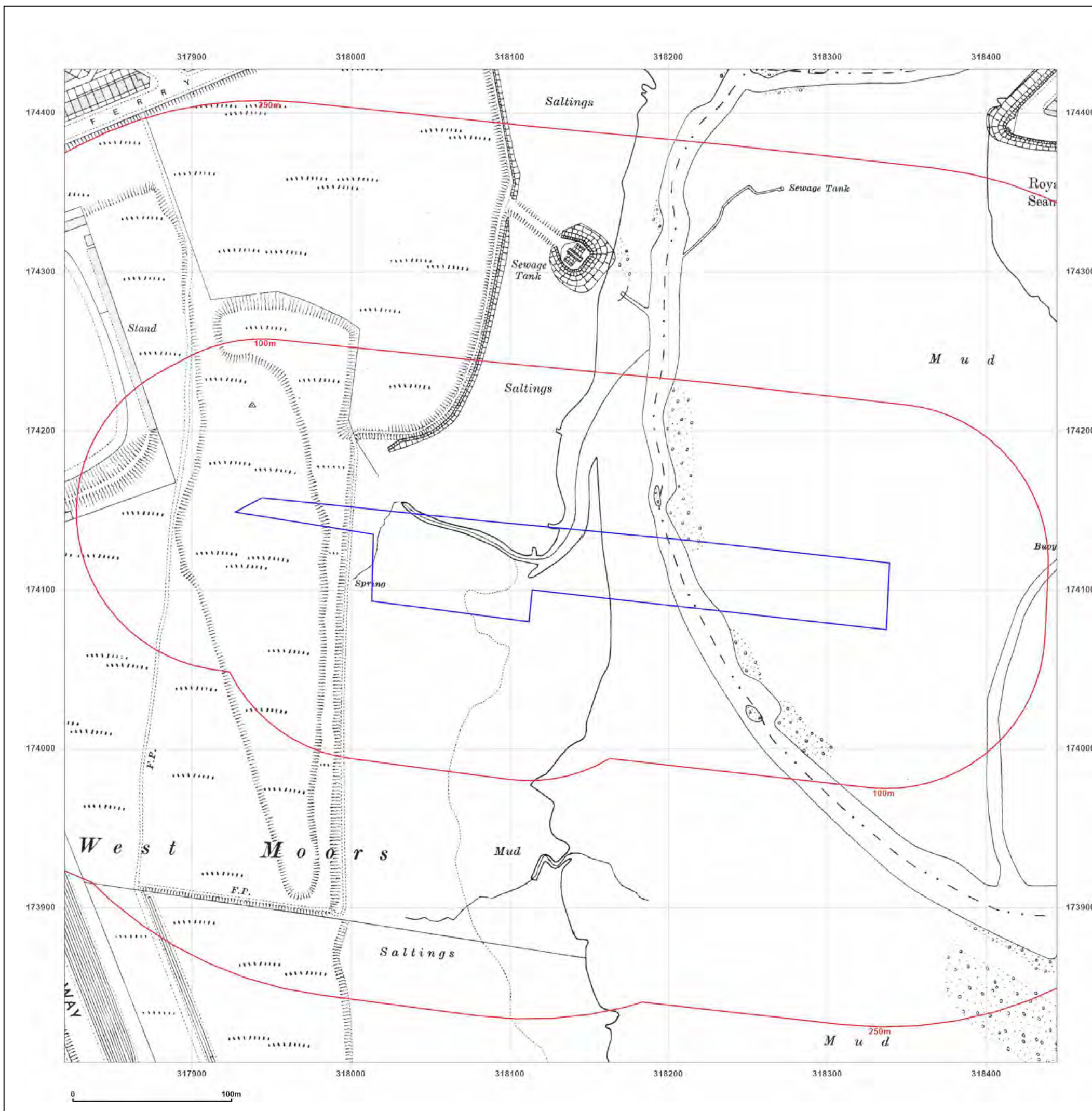


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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: County Series

Map date: 1941

Scale: 1:2,500

Printed at: 1:2,500



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



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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: National Grid

Map date: 1953-1954

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1953
Revised 1953
Edition 1953
Copyright N/A
Levelled 1948

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

Surveyed 1953
Revised 1953
Edition 1955
Copyright N/A
Levelled 1948

Surveyed 1953
Revised 1953
Edition 1954
Copyright N/A
Levelled 1948

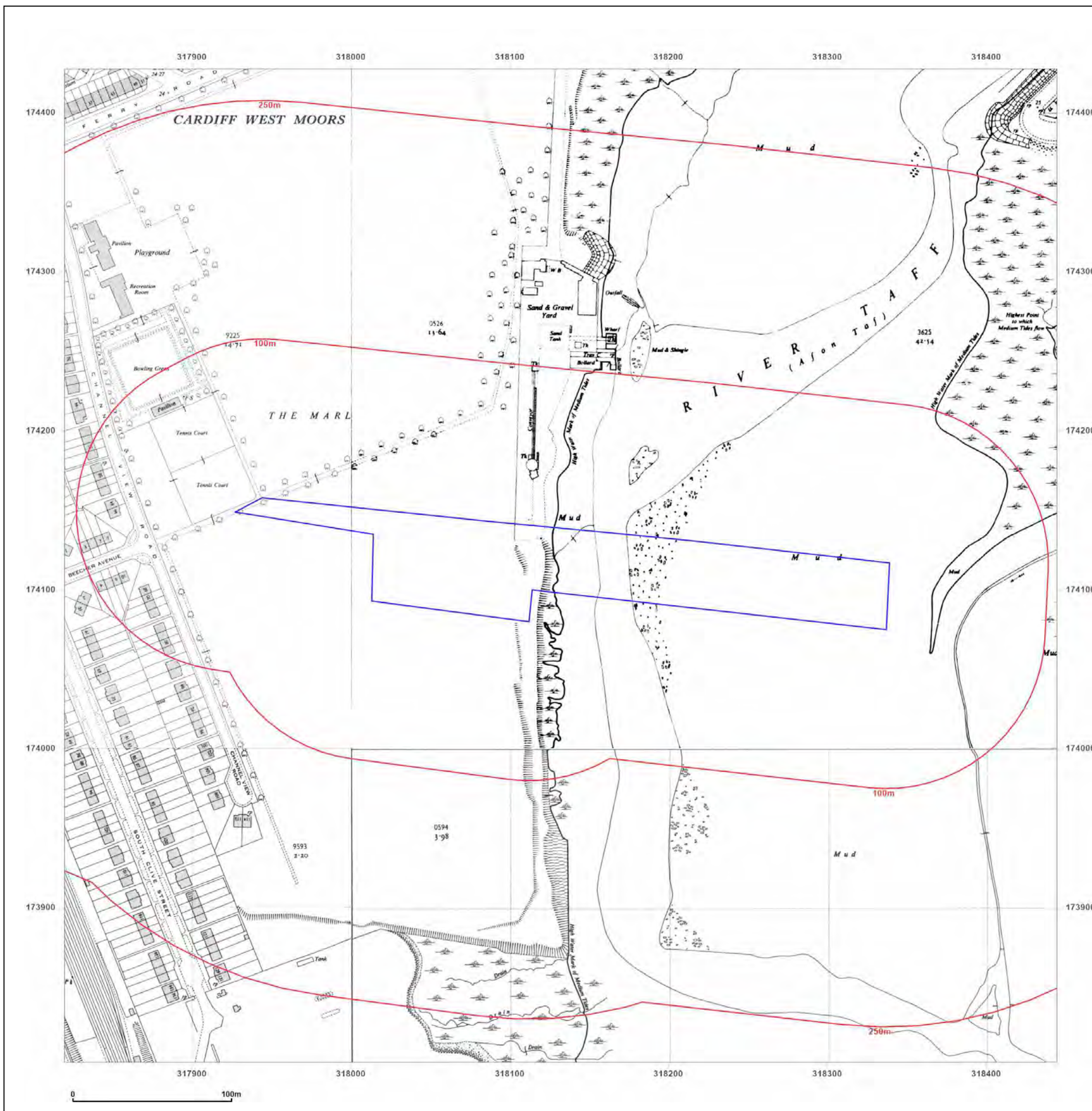


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206_LS_1_1
Grid Ref: 318132, 174115

Map Name: National Grid

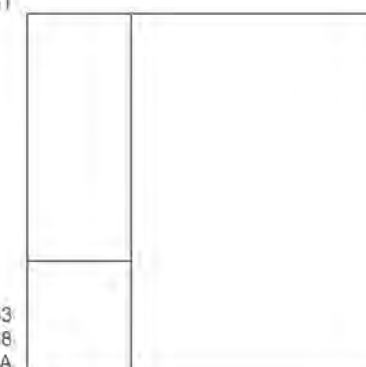
Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1968
Revised 1968
Edition N/A
Copyright 1970
Levelled 1961



Surveyed 1953
Revised 1968
Edition N/A
Copyright 1971
Levelled 1961

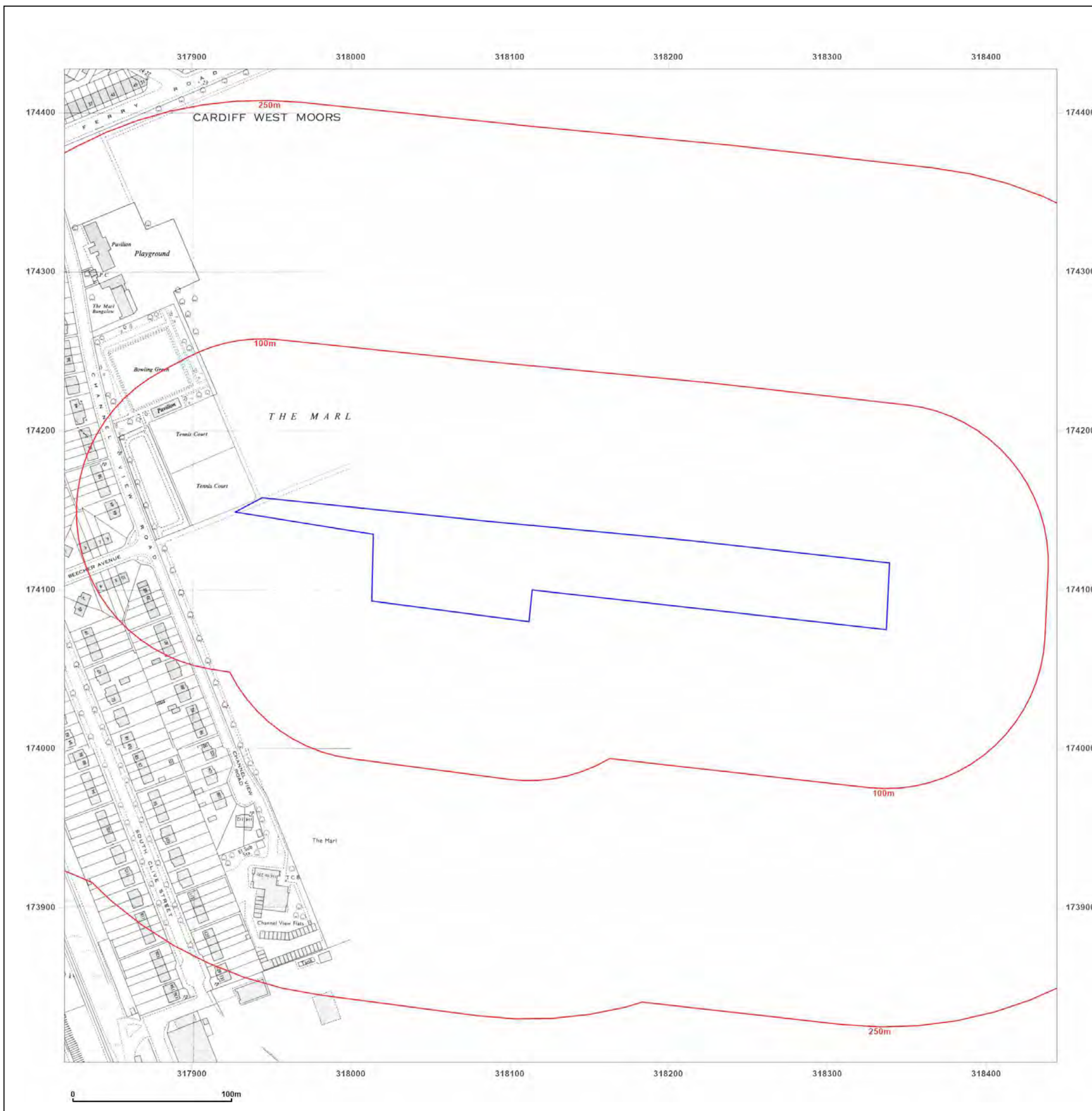


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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

Map date: 1879-1881

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1881
Revised 1881
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1879
Revised 1879
Edition N/A
Copyright N/A
Levelled N/A

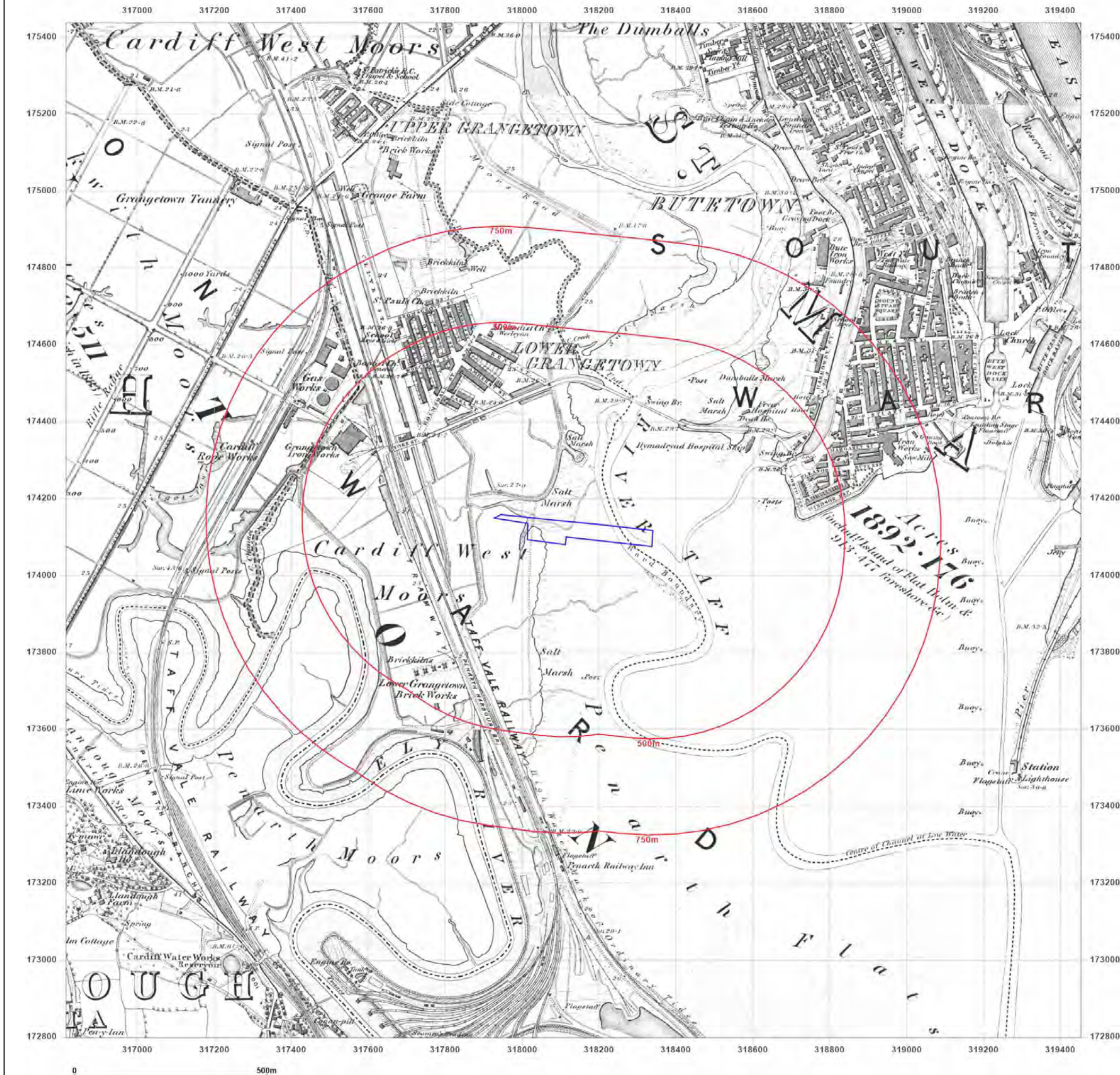


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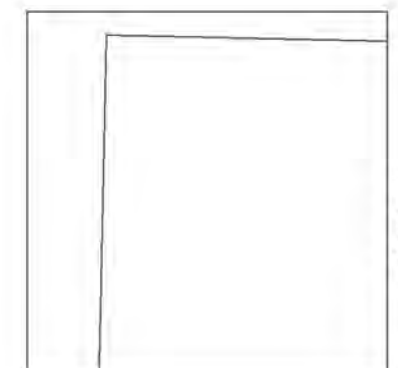
Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

Map date: 1889

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1889
Revised 1889
Edition N/A
Copyright N/A
Levelled N/A

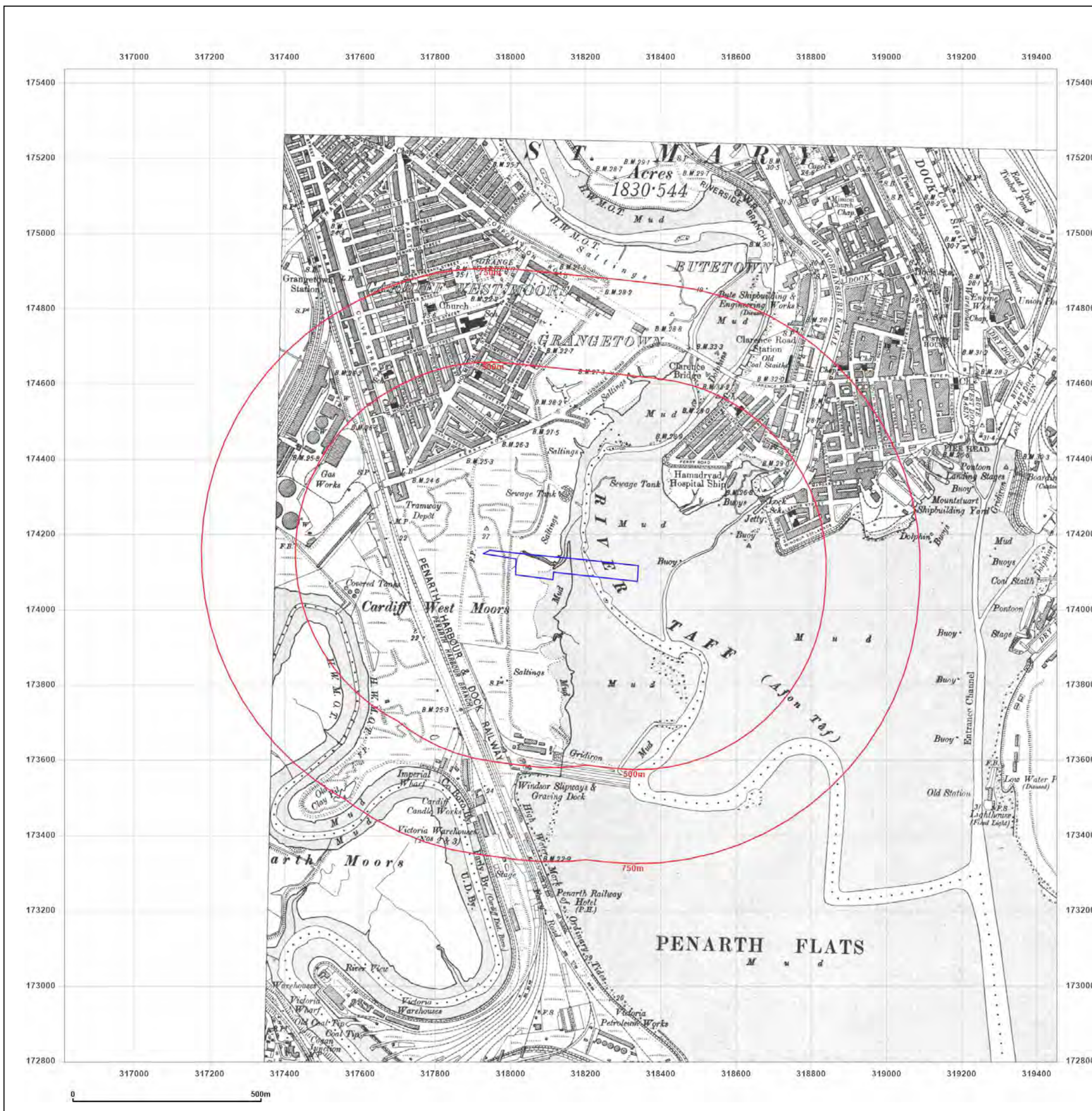


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

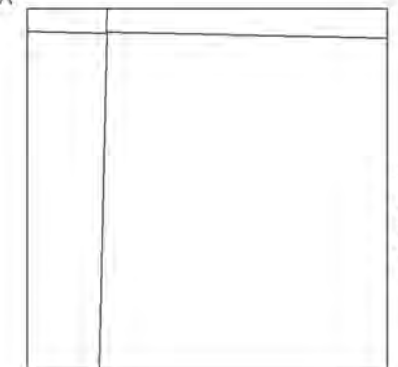
Map date: 1915

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1878
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1878
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

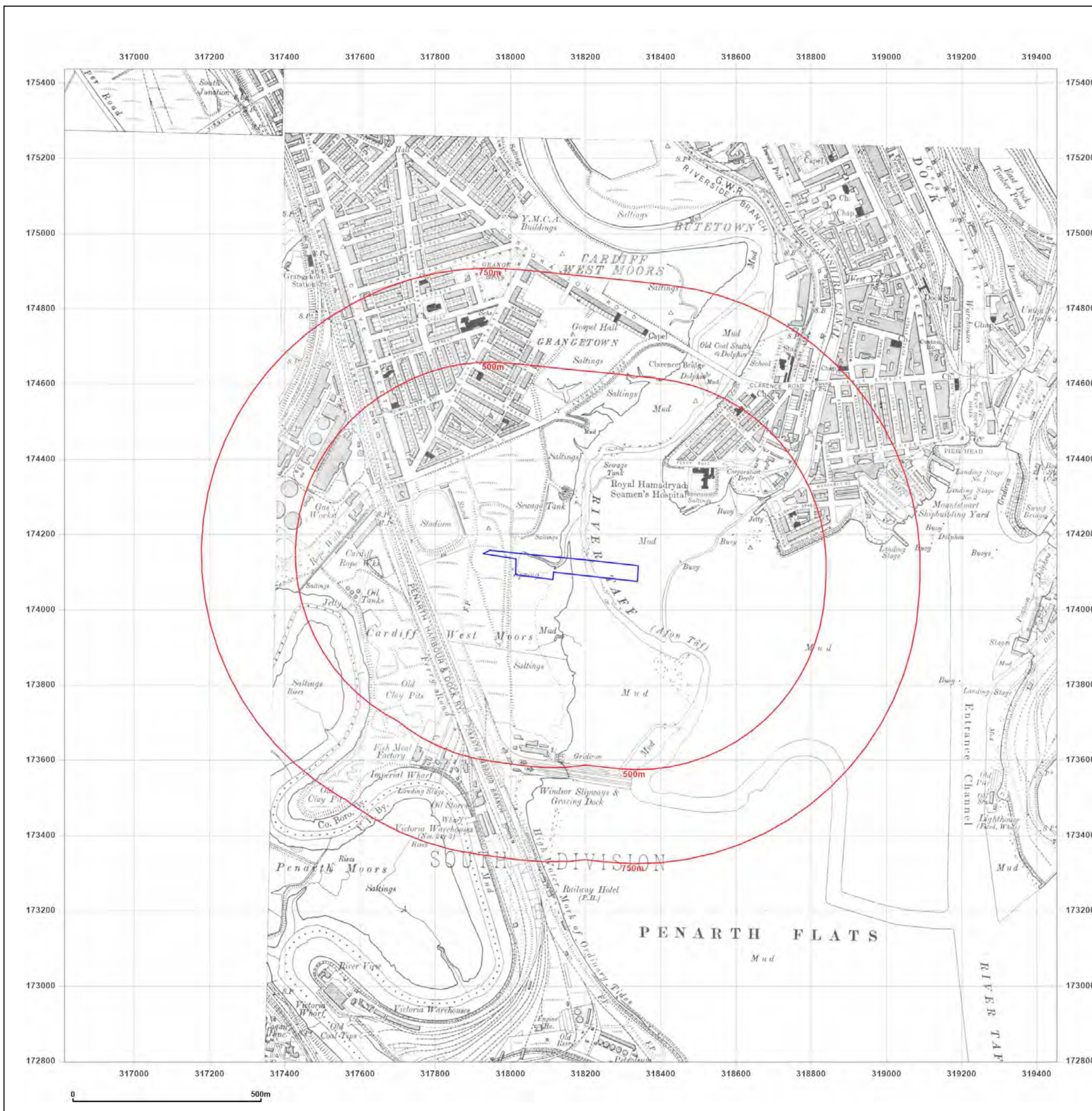


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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

Map date: 1922

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1878
Revised 1922
Edition N/A
Copyright N/A
Levelled N/A

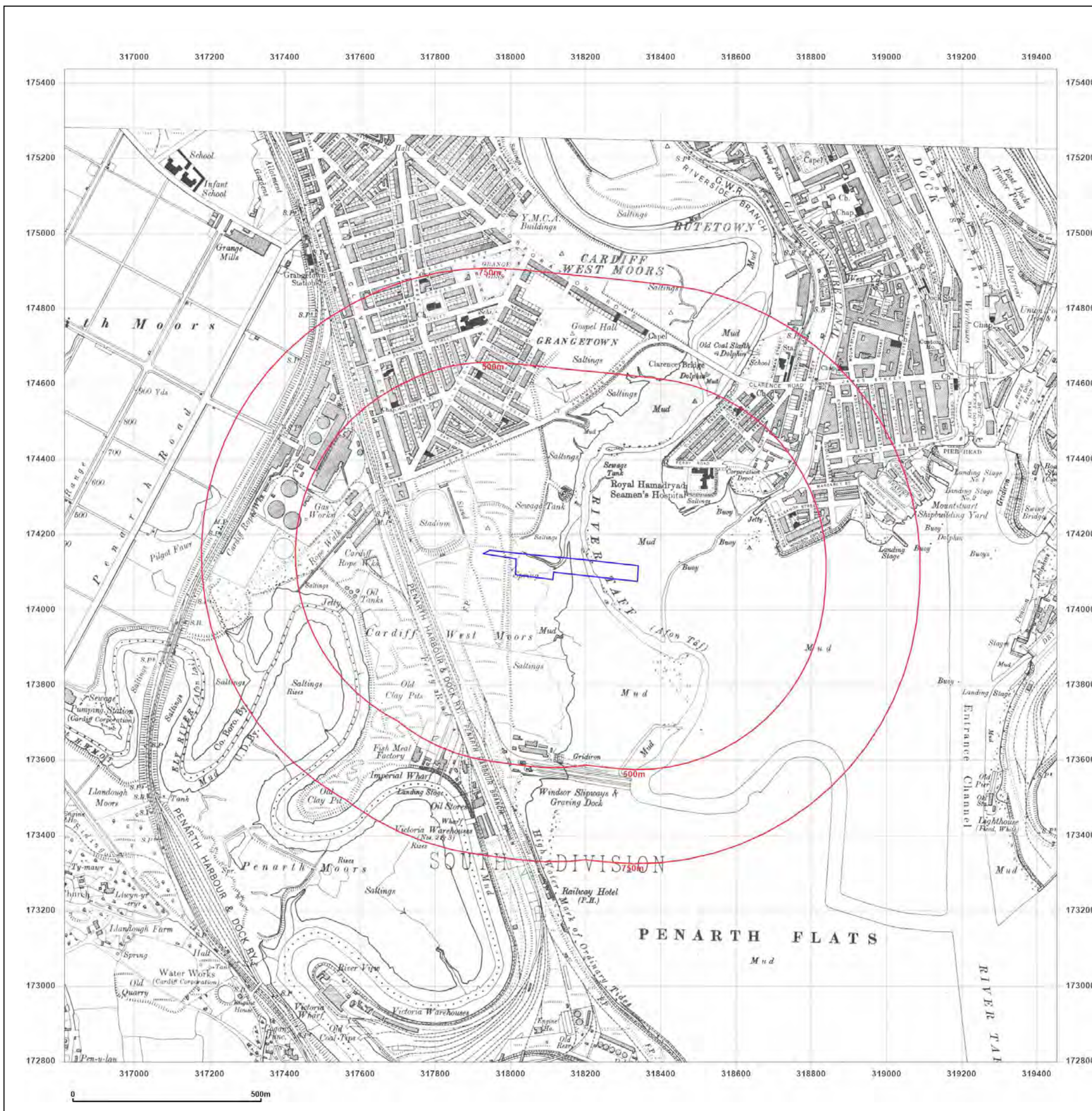


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1878
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1877
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

Surveyed 1878
Revised 1938
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Copyright N/A
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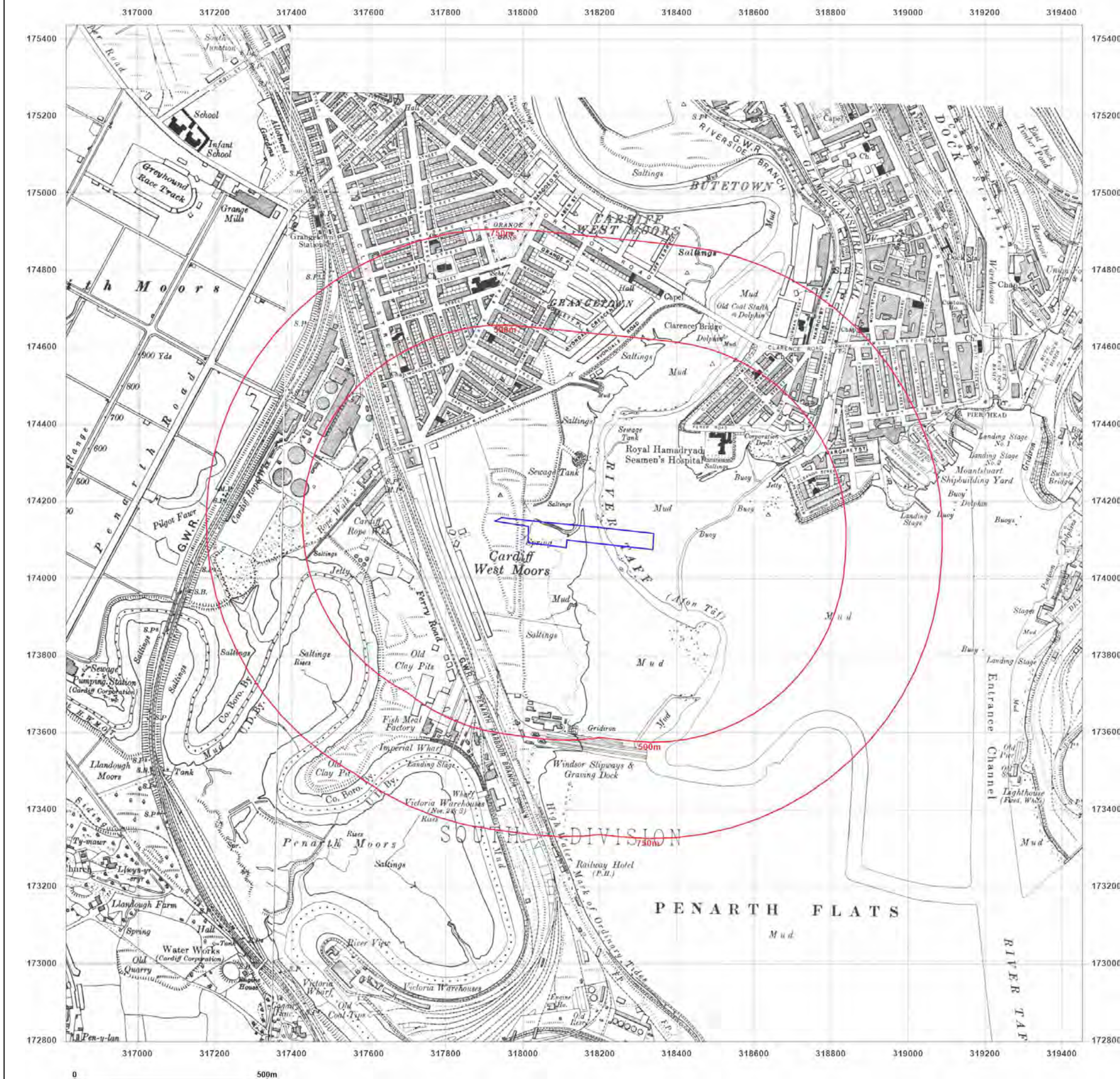


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Site Details:

CARDIFF WATER ACTIVITY
CENTRE, JIM DRISCOLL WAY,
GRANGETOWN, CARDIFF,
CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: County Series

Map date: 1947

Scale: 1:10,560

Printed at: 1:10,560



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Edition N/A
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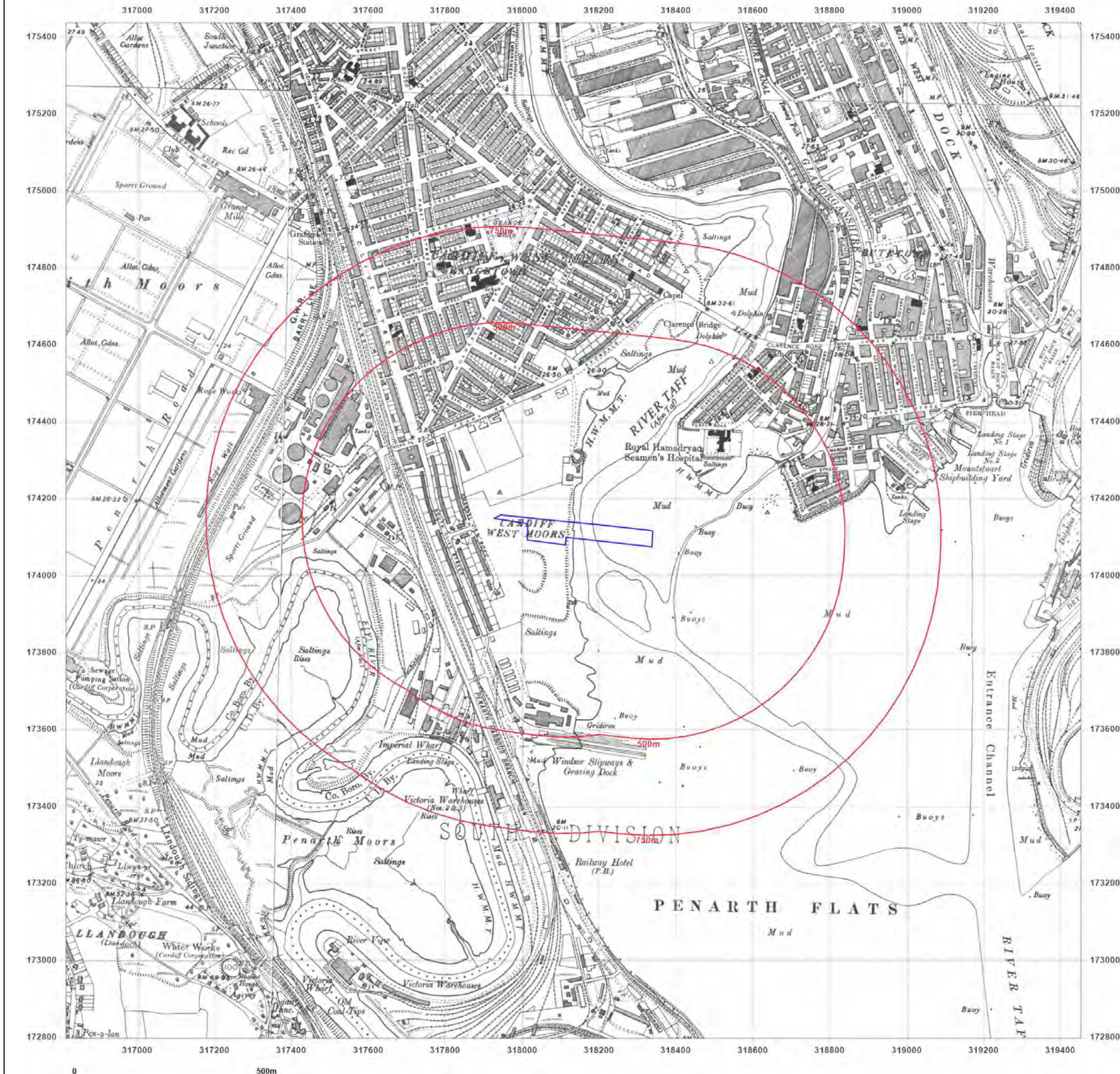


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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: Provisional

Map date: 1965

Scale: 1:10,560

Printed at: 1:10,560



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Edition 1965
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Revised 1964
Edition 1965
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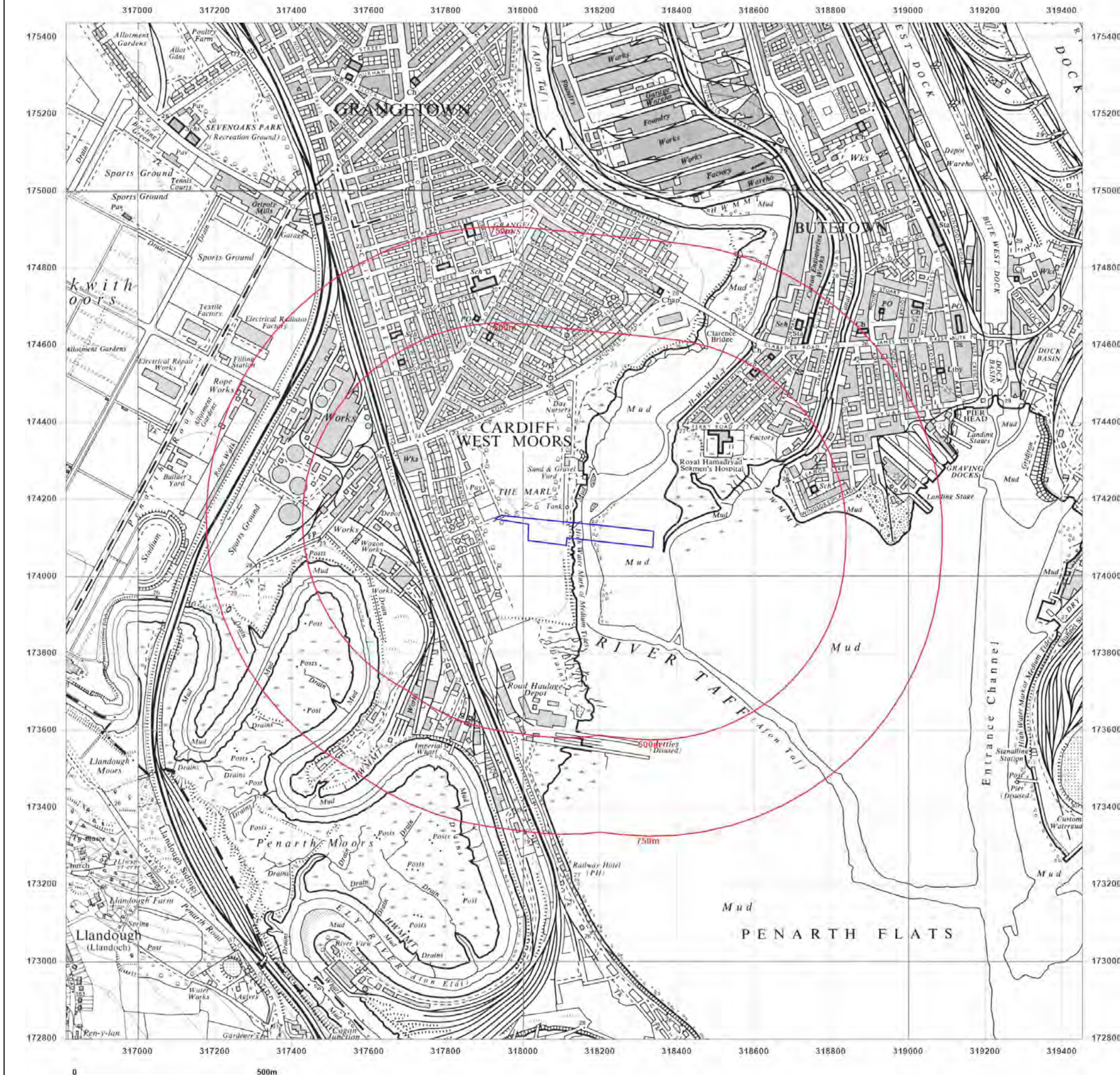


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Site Details:

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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

Map date: 1973-1974

Scale: 1:10,000

Printed at: 1:10,000



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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

Map date: 1983-1984

Scale: 1:10,000

Printed at: 1:10,000



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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

Map date: 1994-1995

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1984
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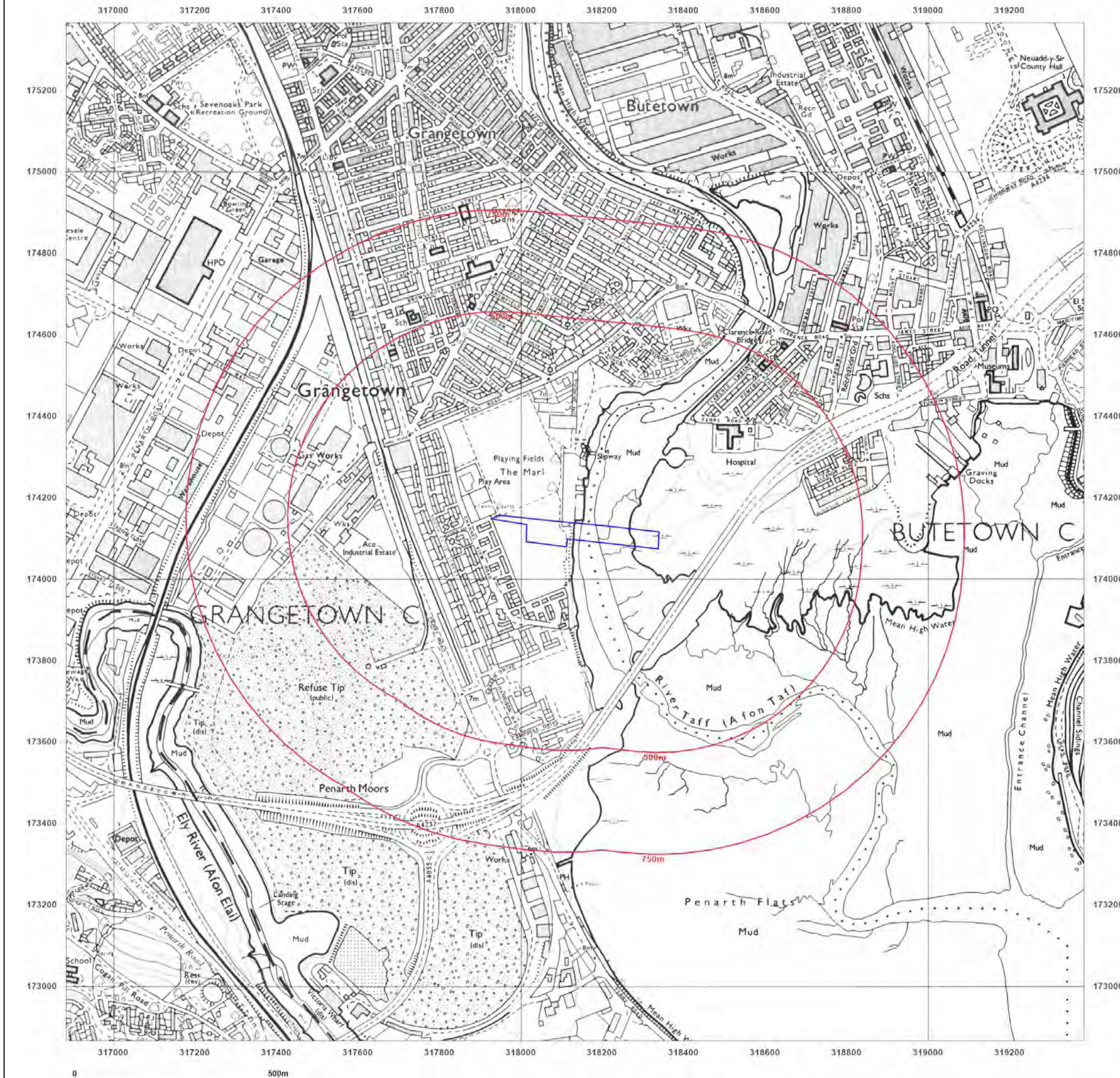


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Site Details:

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CF11 7HB

Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

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Scale: 1:10,000

Printed at: 1:10,000

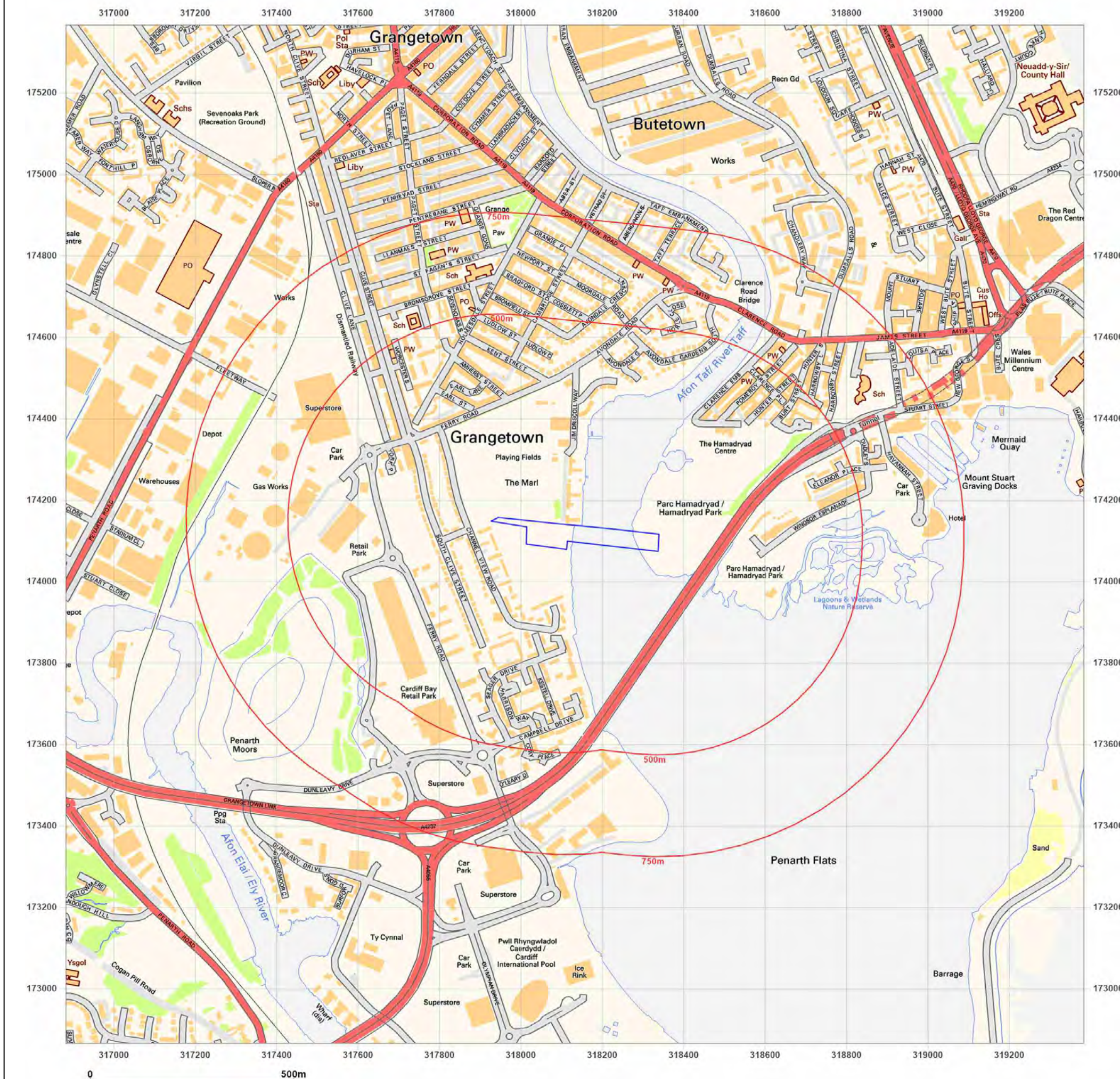


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Site Details:

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Client Ref: 14056317_-400-_Channel_Footbridge
Report Ref: GS-8323206
Grid Ref: 318133, 174116

Map Name: National Grid

Map date: 2021

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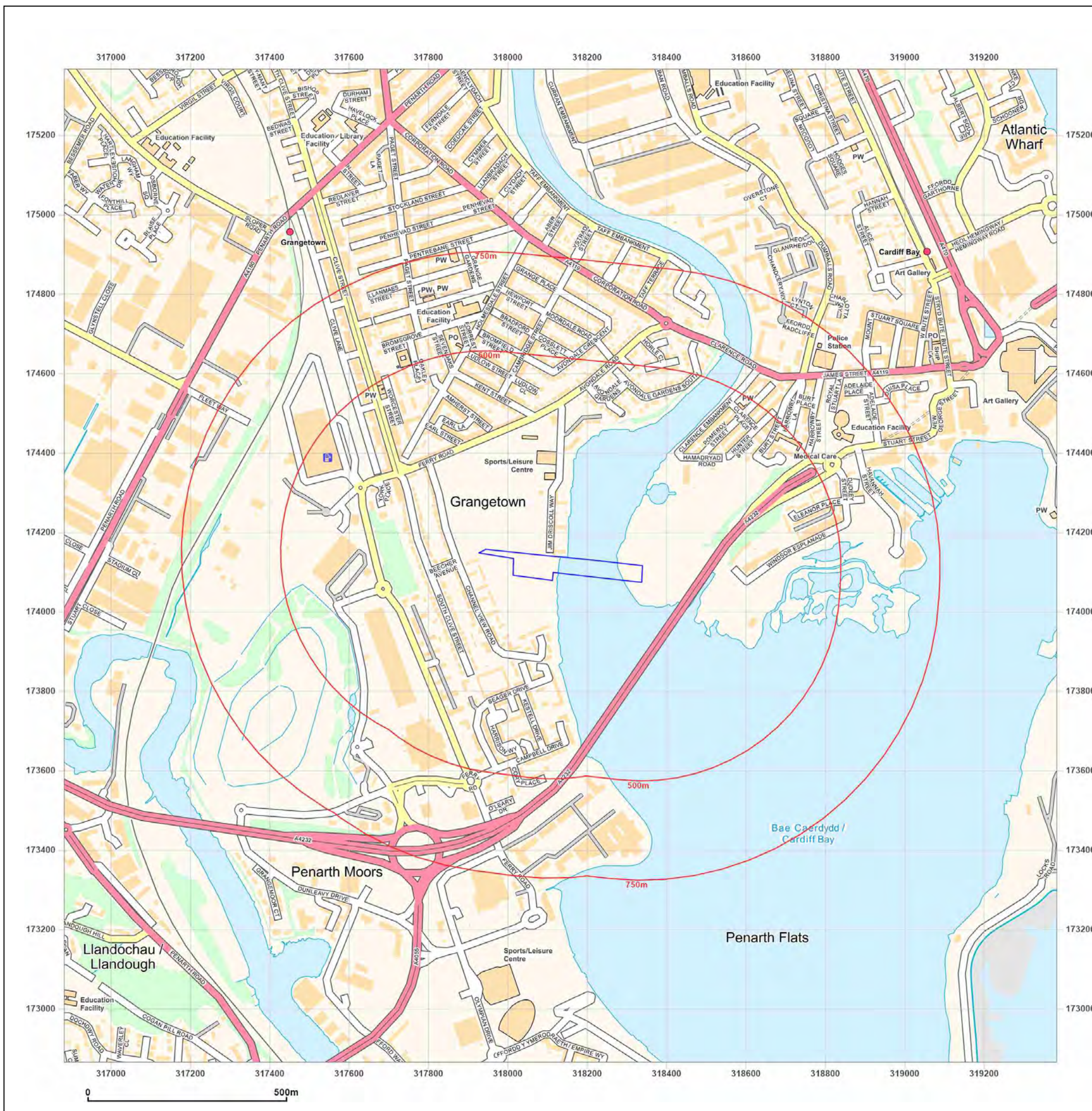


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Appendix J
Risk Register

Risk Register

Summary

A review of the geotechnical and geo-environmental risks associated with the scheme have been undertaken. The risks have been evaluated using the risk evaluation matrix shown below.

Risk Matrix

The below matrix shall be used to help assess the impact and likelihood of a hazard before and after the mitigation measures.

Score		Impact				
		Very Low 1	Low 2	Medium 3	High 4	Very High 5
Likelihood	Very High 5	5	10	15	20	25
	High 4	4	8	12	16	20
	Medium 3	3	6	9	12	15
	Low 2	2	4	6	8	10
	Very Low 1	1	2	3	4	5

Geotechnical Risk Register – Channel View Footbridge

Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
1	Unknown ground conditions.	Localised subsidence leading to injury during construction and/or damage to infrastructure. Foundation failure / breach leading to bad reputation, injury, death, high maintenance costs.	Site wide	5	3	15	Ground Investigation Report (GIR) undertaken to highlight further delineate ground conditions. During construction, Contractor is required to record and inform the detailed design of any areas of unexpected material. Geotechnical design to consider areas of identified poor ground conditions.	5	1	5
2	Peat, organic and cohesive soils	Potential for landings and foundation settlement. Slope stability issues. Ongoing maintenance to mitigate differential settlements. Increased construction costs and delays. Generation of natural ground gases. Foundation failure / breach leading to bad reputation, injury, death, high maintenance costs.	Site wide	4	3	12	Ground Investigation Report (GIR) undertaken to highlight further delineate ground conditions. Removal and replacement of Peat soils where appropriate with a compacted granular fill material during construction, and Inclusion of Peat and organic cohesive soils within bearing capacity and slope stability checks during detailed design.	5	2	10
3	Uncontrolled Made Ground	Foundations constructed within Made Ground. Ambiguity of materials geotechnical properties. Potential for localised weaker points at various depths surrounding the foundations. Difficulty in modelling material. Ambiguity in permeability modelling of material. Foundation failure / breach leading to bad reputation, injury, death, high maintenance costs.	Site wide	4	4	16	Ground Investigation Report (GIR) undertaken to highlight further delineate ground conditions. Cautious estimate of Made Ground Geotechnical parameters is required to be undertaken during design phase. Removal of soft spots required to be undertaken during construction. Materials are required to be replaced with a suitable compacted fill.	5	2	10
4	River course migration	Scour erosion at the toe of the current embankment below the foundations over the course of the features design life. Scour erosion at the base of any potential pier foundations over the course of the features design life. Foundation failure / breach leading to bad reputation, injury, death, high maintenance costs.	Site wide	5	4	20	Hydrological modelling of The River Taff's watercourse is required. Impacts of climate change (i.e. increase of volume of water flow, variations in flow rates, understanding of modifications to watercourse catchment etc), are required to be undertaken over the schemes design life. A clear understanding of the watercourses engineered history is required. Contractual understanding of the extents and remit of geotechnical scope is required. The Client is to be made aware of the risk of river channel migration and its impact on the existing foundations.	5	3	15

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Geotechnical Risk Register – Channel View Footbridge

Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
5	Climate change. Uncertainty in origin of provided future maximum tidal level information (i.e. does this level account for combined tidal and fluvial / river combined storm events). Change in groundwater (non-fluvial / tidal influenced).	Uncertainty in how the existing ground geology will respond to future Marine and River flooding events. Slope instability. Potential for more onerous relative sea level rises during schemes design life leading to an inadequate design. Foundation failure / breach leading to bad reputation, injury, death, high maintenance costs.	Site wide	4	4	16	- BGS mapping indicates the geology of the Site consisting of variable amount of made ground on both sides of the river (consisting of variable composition of ash, brick and clay). This is likely underlain by a cohesive clay layer, above a granular gravel layer (tidal flat deposits consisting of clays, silts and sands). Dense vegetation is present on both banks of the river, it is assumed the banks are stable soil slopes with no added reinforcement. Arcadis recommends assessment of the slope stability and erosion conditions of the banking on either side of the river to ascertain high impact during a possible flood event. - The west and east section of the site has low flood risk from rivers, the sea (ROFRAS) and from surface water, however, the central section of the site falls under high risk from rivers and the sea (ROFRAS). As the development is going to occur in the central section where there is high risk of flooding, it is recommended to a conduct a detailed flood risk study. Based on the slope stability and erosion condition assessment, if the impact of flooding is high, then adequate engineering controls need to be considered for minimizing the risk. Further understanding of the source and contents of any local Climate Modelling information is required.	3	3	9
6	Hydrogeology – no localised permeability testing	Limited information on the permeability of the ground geology and flood protection. Uncertainty in seepage rates and pore water pressure profiles when modelling the new design flood levels. Conservative design for proposed new structures and earthworks under drawdown analysis	Site Wide	3	5	15	Best estimate of permeability of materials to be made based on available data. Residual risk of values used in design are incorrect and cannot be mitigated further.	3	3	9
7	Contaminated soils	Impact to human health and surface waters	Site wide	5	4	15	Made ground with variable composition was noted on both sides of the river. Risk is posed from lack of available data to assess if the site soils are contaminated (including presence of asbestos). Arcadis recommends an intrusive investigation to provide confidence in the make-up and contamination levels of the materials found on site. PPE requirements for future groundworkers. Consideration of mitigation measures e.g. membrane between present soils on site and appropriate imported soils as an extra protection measure. No leachate data for soils is available. Risk is that works effect leaching resulting in an impact to the river. Risk can be mitigated by assessment of soil leachate potential.	5	1	5

Geotechnical Risk Register – Channel View Footbridge

Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
8	Contaminated Groundwater	Impact to surface waters.	Site wide / offsite	5	3	15	No soil leaching nor groundwater data is available and therefore an assessment of potential impact to controlled waters could not be undertaken and therefore a baseline could not be established. Due to the presence of onsite made ground and the proximity of sensitive surface water courses there is a potential risk to controlled waters from contaminants present in the made ground. Groundwater monitoring and sampling is recommended prior and during construction to assess the current baseline and to monitoring any potential effect the development may have on the landfill impacting controlled waters. Appropriate mitigation measures during construction should be adopted to minimize any impact.	5	1	5
9	Ground Gas	Risk of inhalation and asphyxiation to human health. Accumulation and explosion to buildings	Site wide / offsite	5	3	15	No ground gas data is available and therefore an assessment of the ground gas regime of the site and potential affect to offsite receptors (commercial premises) could not be undertaken. Due to the presence of made ground, there is a risk of ground gas generation and that the proposed works would increase gas levels generated from within the landfill creating preferential pathways which may impact offsite receptors. This risk is considered to increase should any changes to the works be made. Ground gas monitoring is recommended in accordance with best practice prior and during construction identify the levels and flow of ground gas and any potential effect the development may have on offsite receptors Appropriate mitigation measures during construction should be adopted to minimize any impact.	5	1	5
10	Areas of soft ground conditions underfoot	Potential shallow groundwater. Weak soils conditions. Excessive settlement.	Site wide	4	3	12	Soft spots to be excavated and replaced with a suitable compacted granular during construction works. Drainage measures to be implemented where relevant. Presence of a competent and experienced geotechnical engineer if recommended to be present during the removal of potential soft spots.	4	2	8
11	Unstable excavation conditions	Sidewall collapse adjacent to excavations on site. Potentially rapid excavation collapse with the presence of groundwater and / or surface water seepages. Health and Safety risk, potential for serious injury or death. Undermining of adjacent structures and buried services. Increase in Project Program.	Site wide	4	4	16	Excavation conditions to be included during design of temporary works and during detailed design (i.e. Safe by Design measures). Groundwater and surface water management measures to be in place where appropriate. Excavation side wall protection measures to be in place during construction works. All excavations requiring personnel to enter must be appropriately shored / supported. Shoring measures are required to be designed and installed by trained and experienced personnel. Excavations are not to be placed adjacent to existing structures or pavements without sidewall protection measures in place. Excavations are to be stopped should undermining of buried services become evident.	4	2	8
12	Encountering existing services during construction	Damage to existing services, proposed infrastructure or injury or death of construction workers	Site wide	5	3	15	Latest statutory services to be used during construction. However, this does not fully mitigate against unrecorded services. Contractor to observe ground surface after stripping to identify made ground which could be in service trenches.	5	2	10

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Geotechnical Risk Register – Channel View Footbridge										
Risk No.	Hazard Description	Potential Consequences	Location	Risk Before Control			Design Mitigation Measures to Manage the Risk	Risk After Control		
				Impact	Likelihood	Rating		Impact	Likelihood	Rating
13	Regulatory Approval	Regulators do not agree or approve the geo-environmental conceptual site model	Scheme wide	4	3	12	Seek regulatory approval and carry out sufficient GI to obtain agreement and approval as necessary	4	1	2
14	Unexploded Ordnance	Damage to proposed infrastructure or injury or death of construction workers	Site wide	5	3	15	Pre-Desk Study assessment by Zetica UXO recommended a detailed desk study to be commissioned to access, and potentially zone, the Unexploded Ordnance (UXO) hazard level on site. Follow specific mitigation identified within detailed risk assessment.	5	2	10
15	Ground Investigation and Construction in riverbed. Below water.	Weak soils conditions. Excessive settlement. Potentially rapid excavation collapse with the presence of groundwater and / or water seepages. Health and Safety risk, potential for serious injury or death. Undermining of adjacent structures. Increase in Project Program. Increased construction costs and delays. Difficulty in modelling material. Ambiguity in permeability modelling of material. Potential for presence of contaminated uncontrolled materials. Waste from river flow can enter site at various times across construction timeline	Bridge pier sites	5	4	20	Monitor and establish a competent ground water and river flow profile prior to any construction work. Manage and construct appropriate temporary water barriers where necessary. Most likely coffer dams or pilling. Ground Investigation and Construction conditions to be included during design of temporary works and during detailed design (i.e. Safe by Design measures). All temporary works requiring personnel to enter must be appropriately shored / supported. Investigations and Construction are to be stopped should any damage or unexpected change occur to the temporary work/Ground Investigation equipment/Construction equipment and/or any risk likelihood be change.	5	3	15

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