



## UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

Former Kempston Hardwick Brickworks  
and adjoining land, Bedford

### Environmental Statement Volume 3

#### Appendix 11.1 - Contaminated Land Preliminary Risk Assessment

#### Part 3/3

Report reference: 4.11.1.0

Revision number: 00

Date: June 2025



#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_3  
**Grid Ref:** 502931, 244282

**Map Name:** County Series

**Map date:** 1901

**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Revised 1901  
 Edition N/A  
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 Revised 1901  
 Edition N/A  
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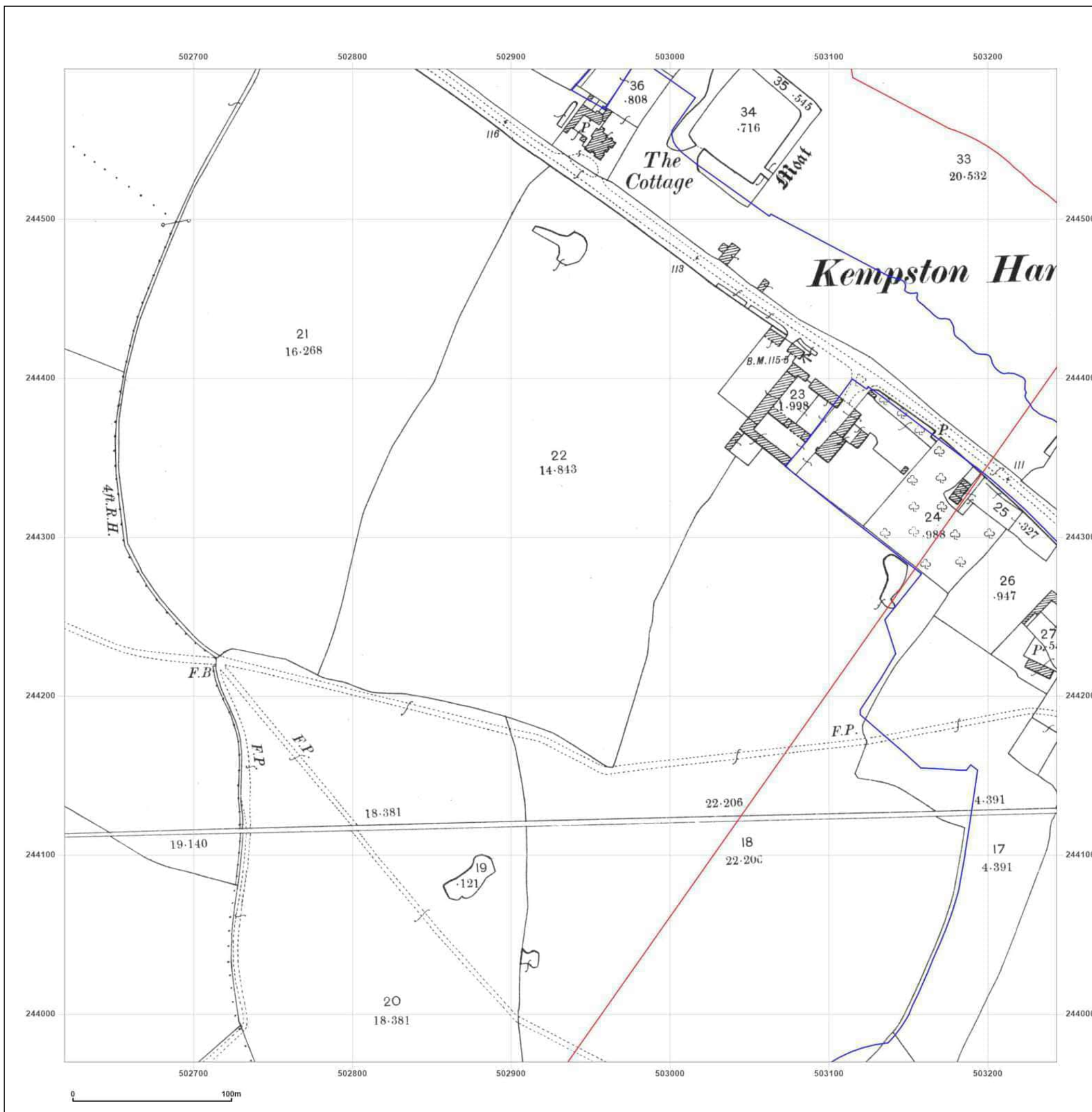


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#### Site Details:

70116516 Rev B

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**Grid Ref:** 502931, 244282

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Edition N/A  
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Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

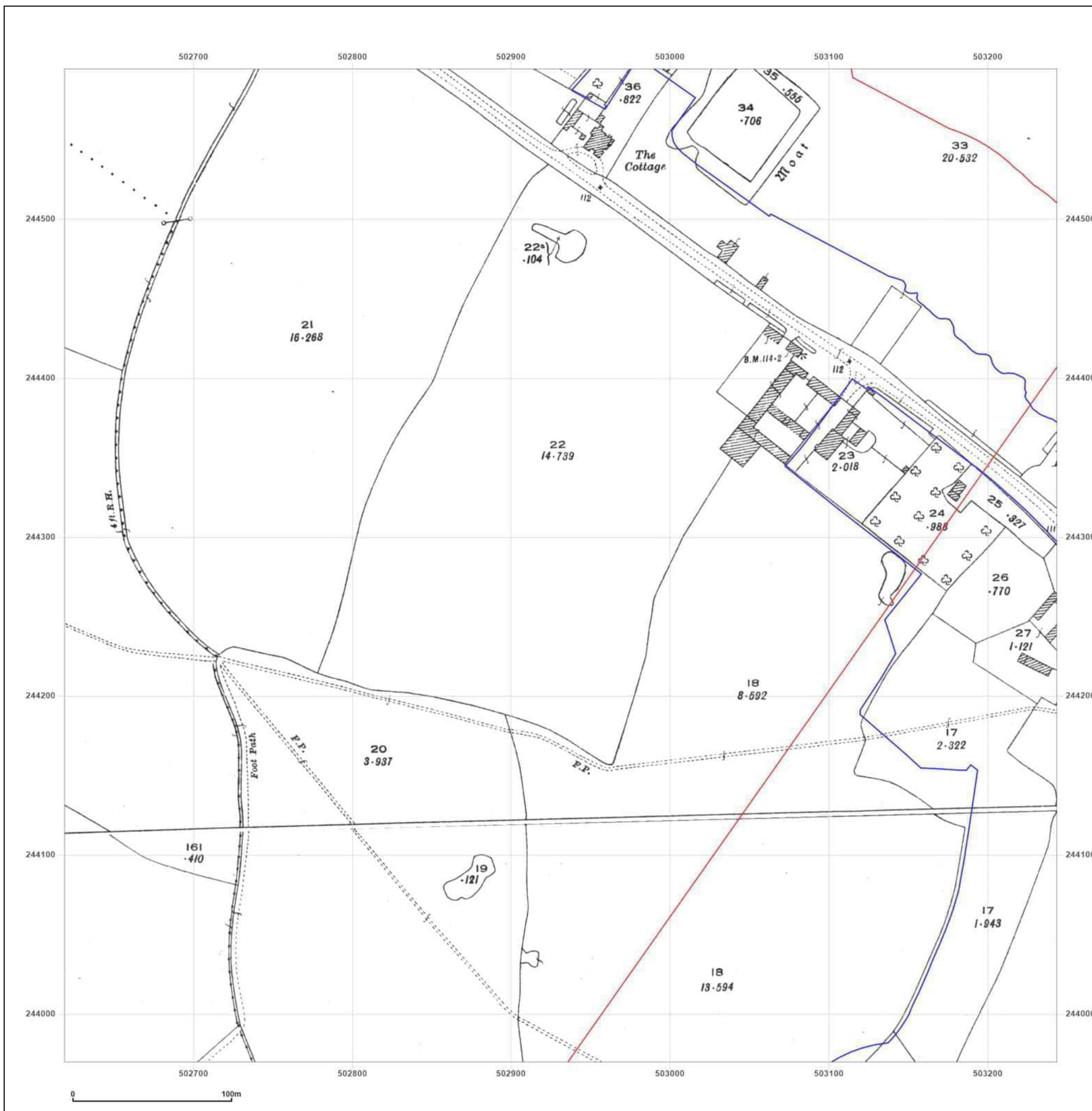


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**Site Details:**

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**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_3  
**Grid Ref:** 502931, 244282

**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:2,500

**Printed at:** 1:2,500



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**Site Details:**

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**Map Name:** National Grid

**Map date:** 1970-1974

**Scale:** 1:2,500

**Printed at:** 1:2,500



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

Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1971

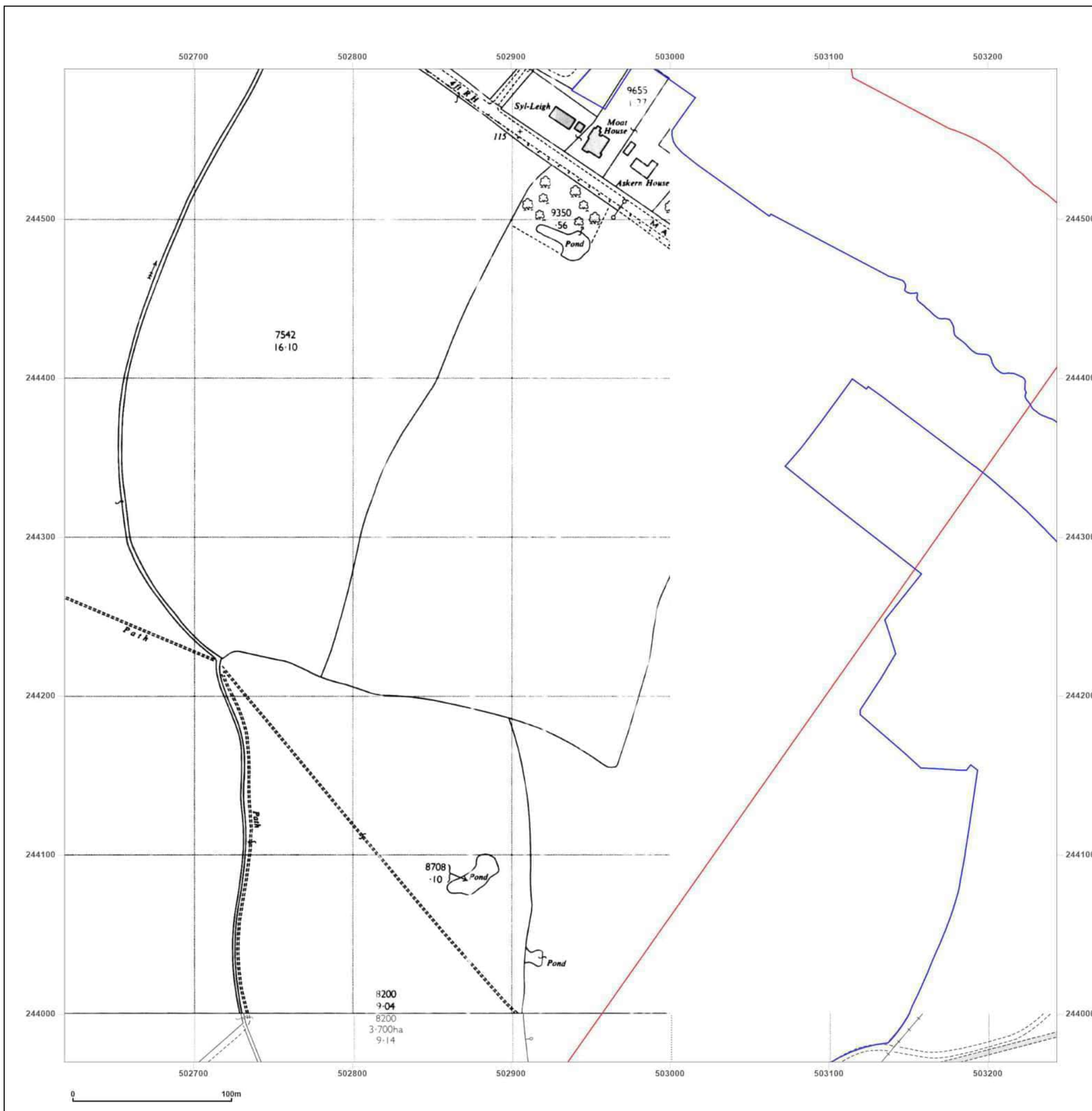


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Site Details:

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Report Ref: GSIP-2024-14754-18112\_LS\_5\_3  
Grid Ref: 502931, 244282

Map Name: National Grid

Map date: 1975-1979

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1979  
Levelled 1972

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

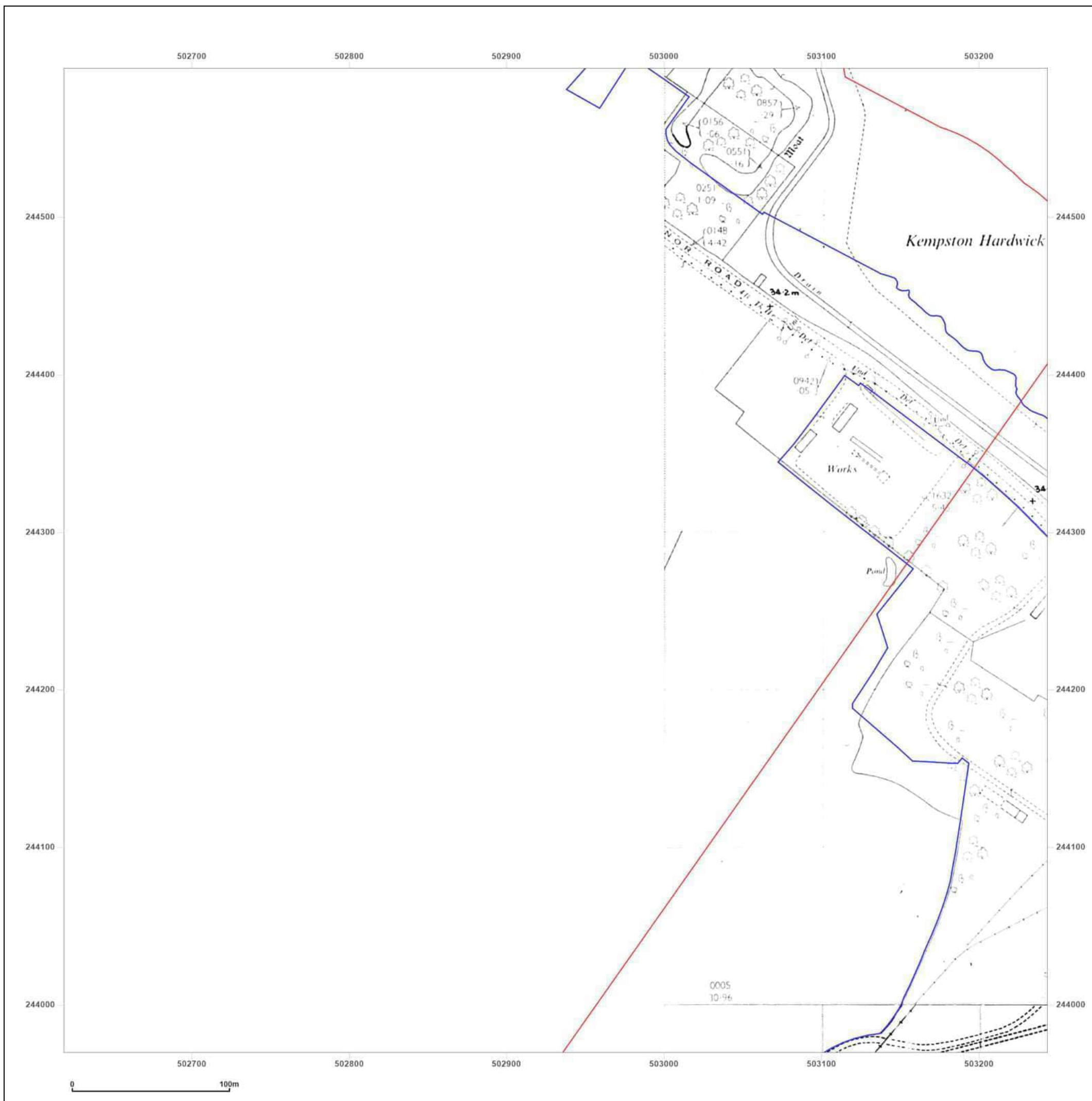


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Site Details:

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Report Ref: GSIP-2024-14754-18112\_LS\_5\_3  
Grid Ref: 502931, 244282

Map Name: National Grid

Map date: 1987

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1987  
Levelled 1971

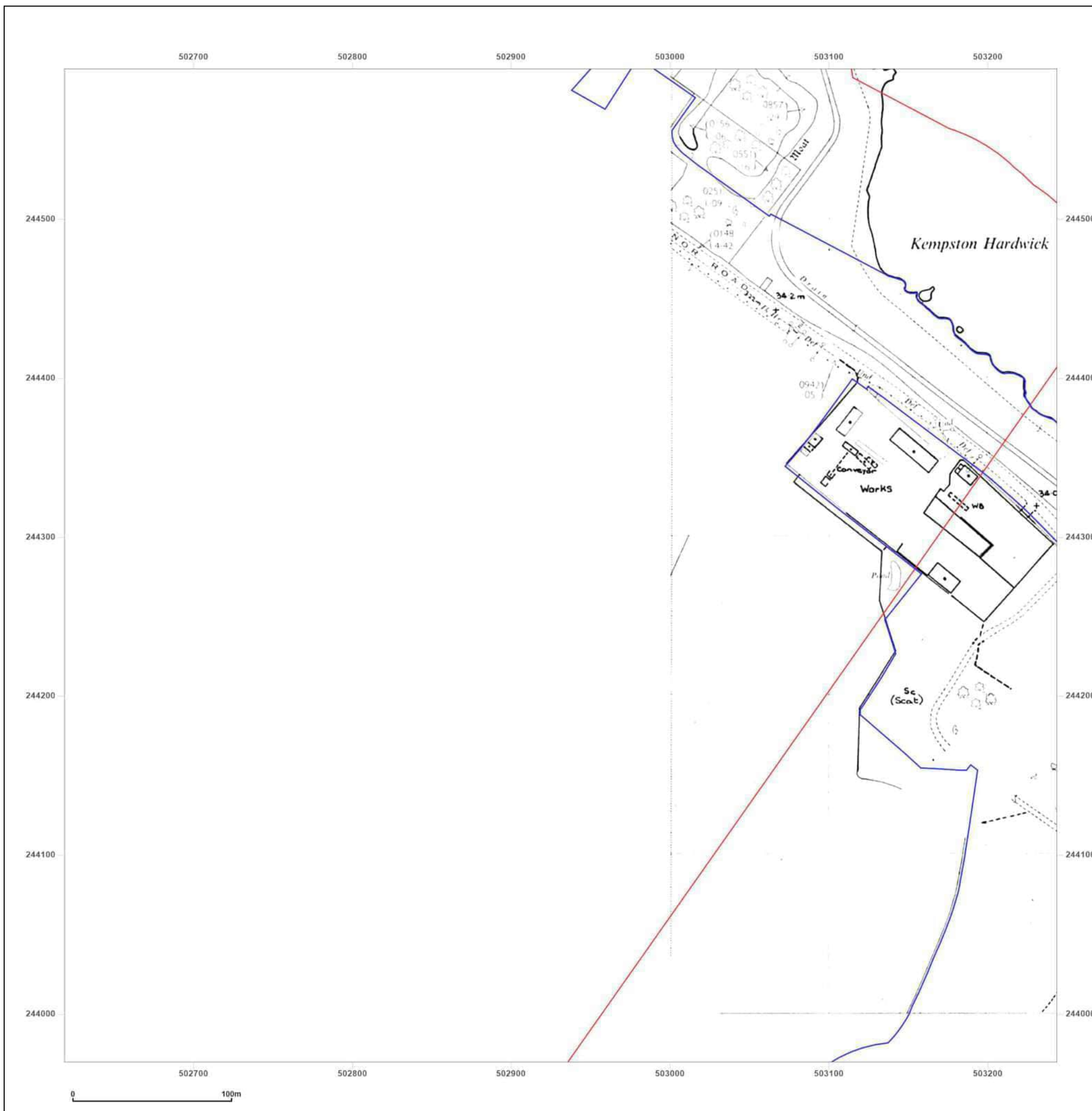


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#### Site Details:

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**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_3  
**Grid Ref:** 502931, 244282

**Map Name:** National Grid

**Map date:** 1988-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1993  
 Revised N/A  
 Edition N/A  
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 Levelled N/A

Surveyed 1971  
 Revised 1988  
 Edition N/A  
 Copyright 1988  
 Levelled 1971

Surveyed 1993  
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 Copyright 1993  
 Levelled N/A

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 Edition N/A  
 Copyright 1993  
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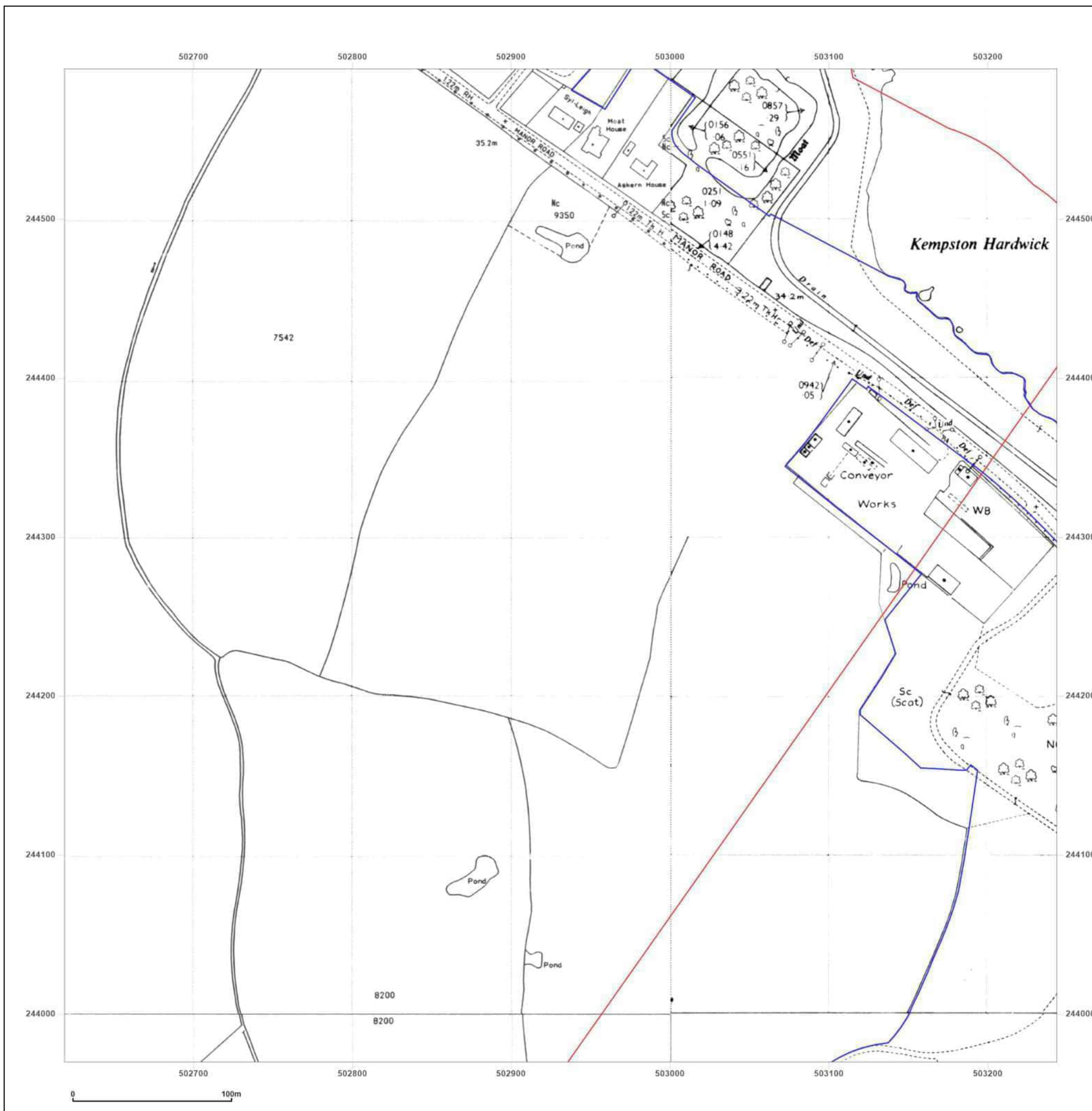


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**Map date:** 1993

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Revised N/A  
Edition N/A  
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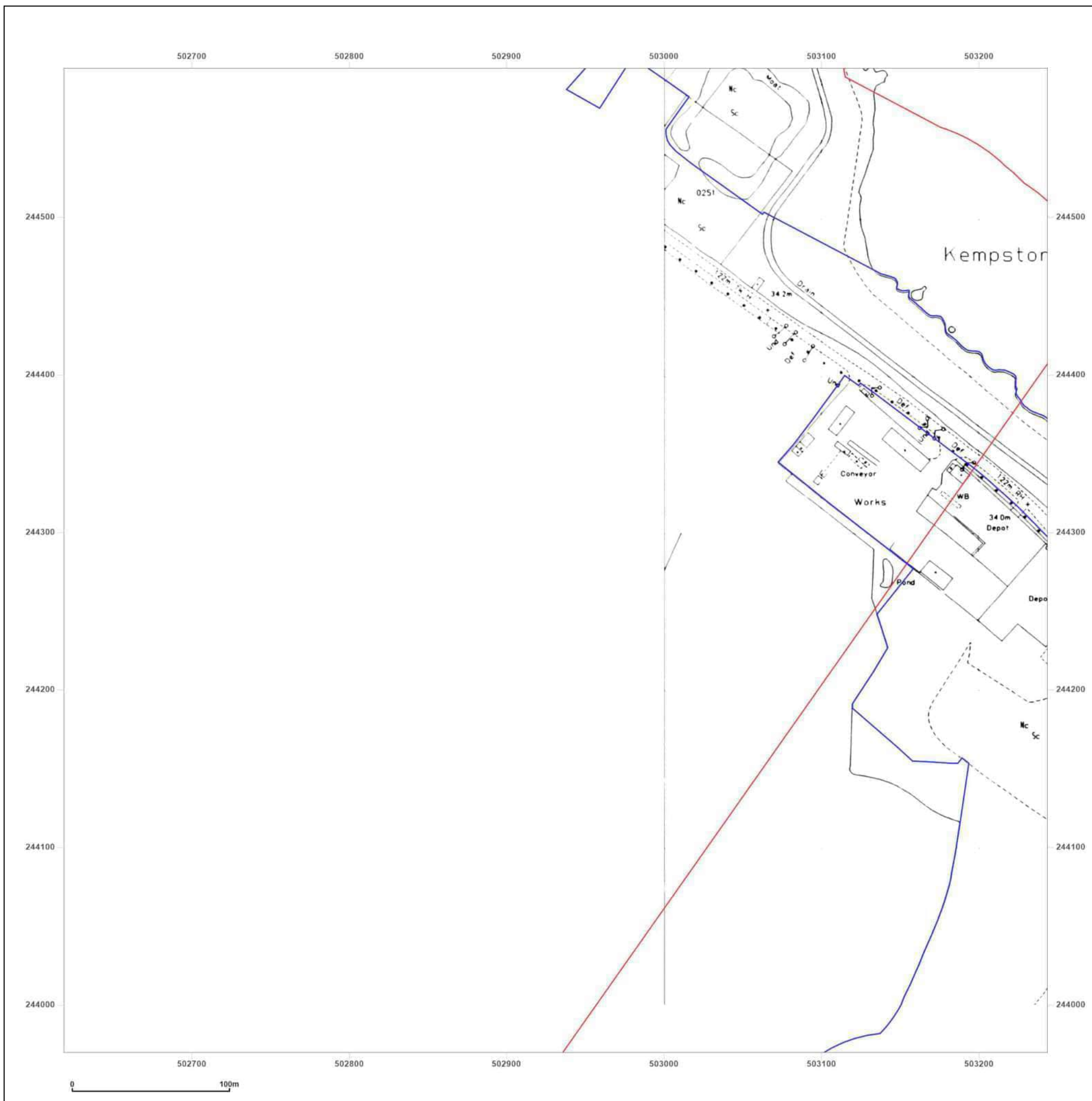


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_4  
**Grid Ref:** 502931, 244907

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

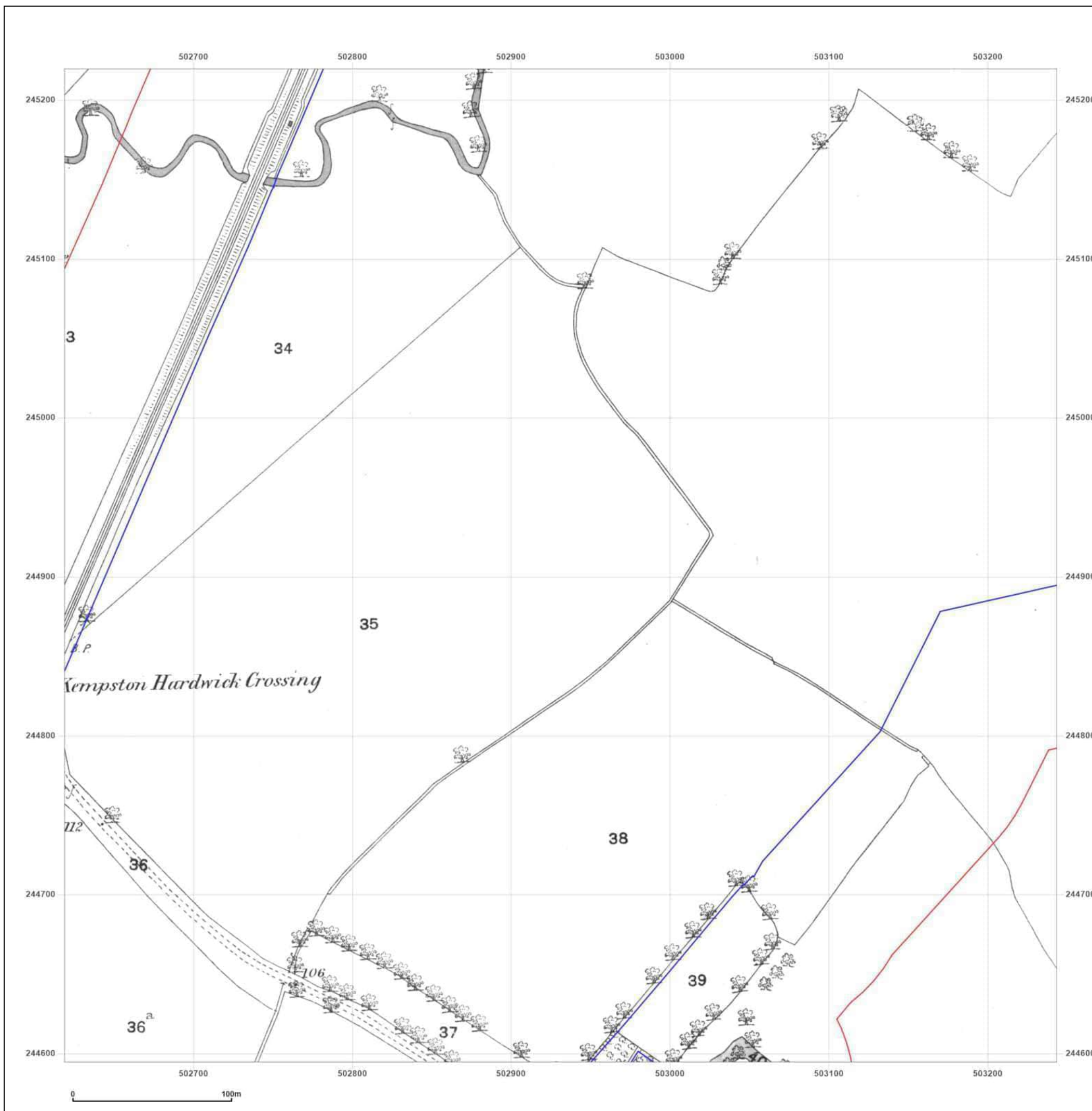


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#### Site Details:

70116516 Rev B

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**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_4  
**Grid Ref:** 502931, 244907

**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

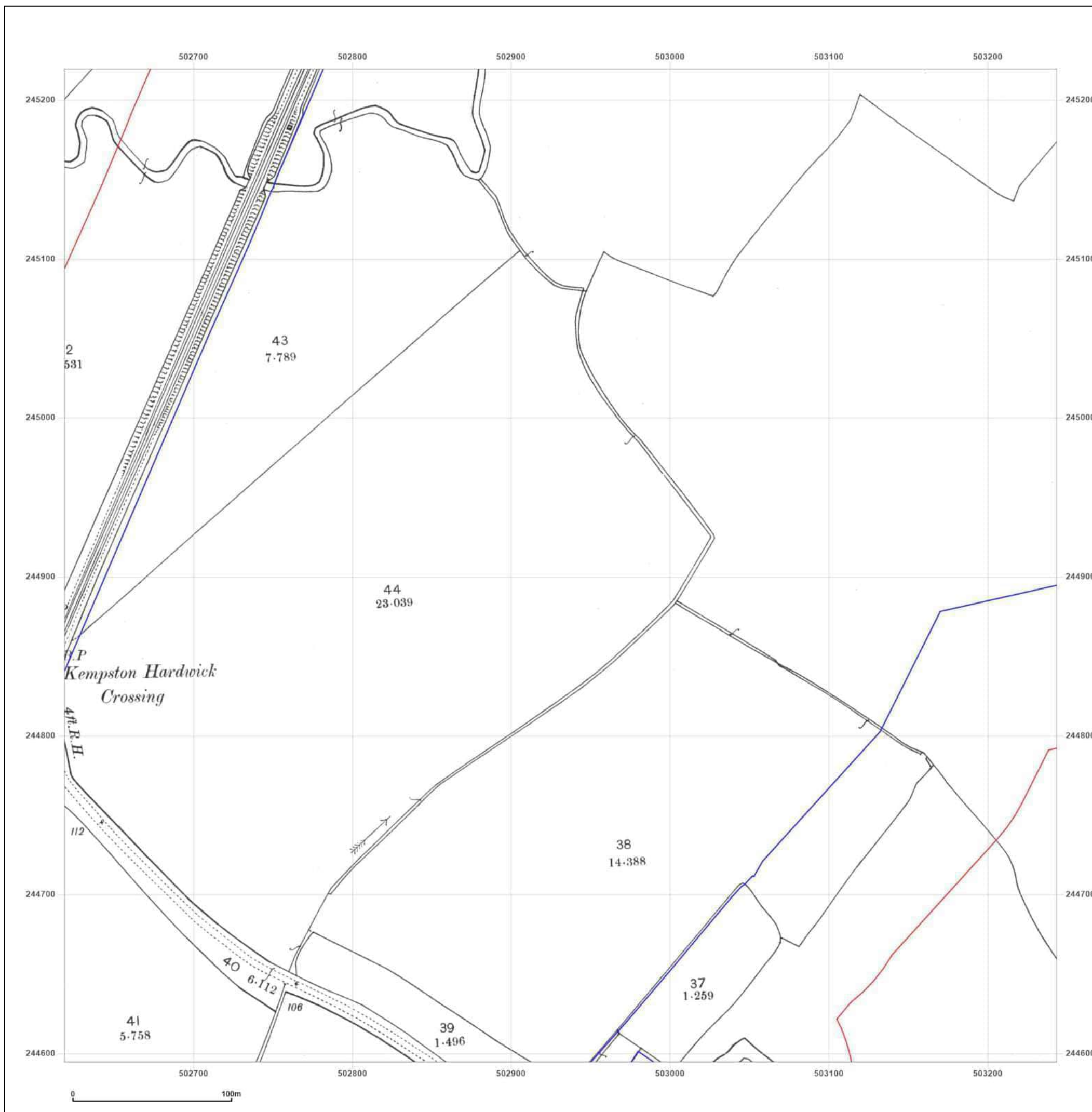


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**Map Name:** County Series

**Map date:** 1926

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 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

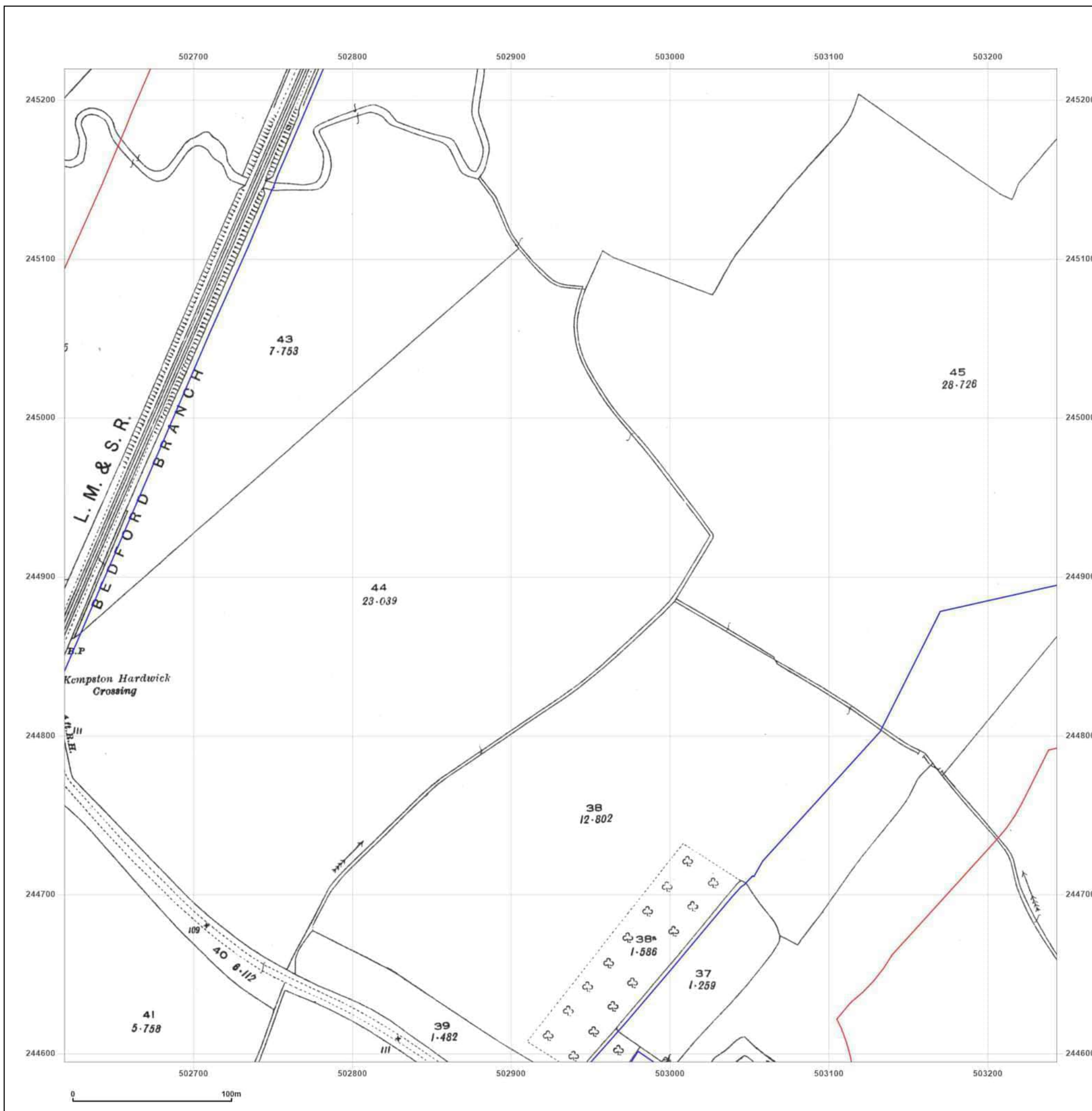


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**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:2,500

**Printed at:** 1:2,500



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**Map Name:** National Grid

**Map date:** 1969-1970

**Scale:** 1:2,500

**Printed at:** 1:2,500



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70116516 Rev B

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70116516 Rev B

Report Ref:

GSIP-2024-14754-18112\_LS\_5\_4

Grid Ref:

502931, 244907

Map Name:

National Grid

Map date:

1979

Scale:

1:2,500

Printed at:

1:2,500

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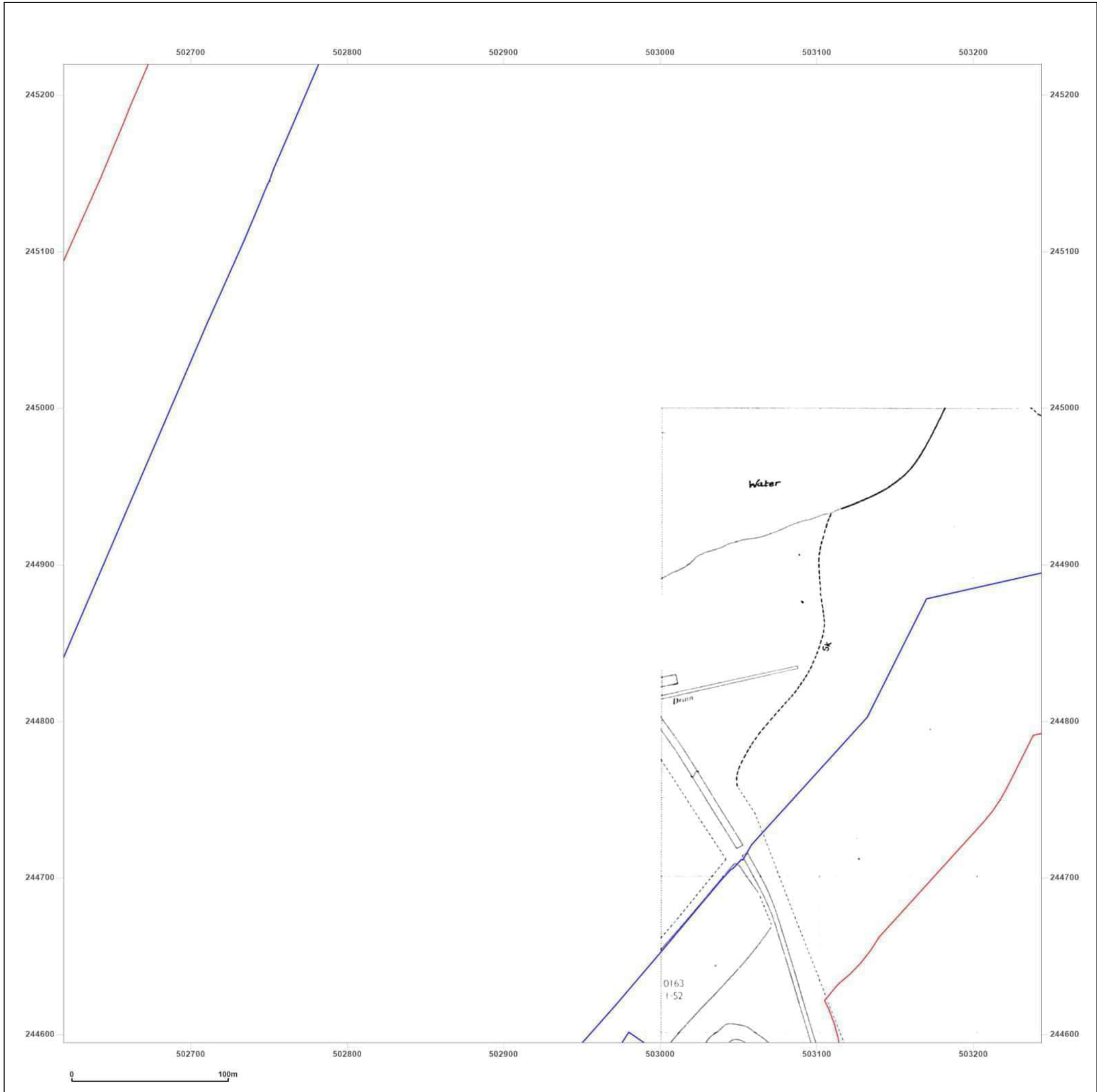
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**Map date:** 1988-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



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Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

Surveyed 1993  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed 1971  
Revised 1988  
Edition N/A  
Copyright 1988  
Levelled 1971



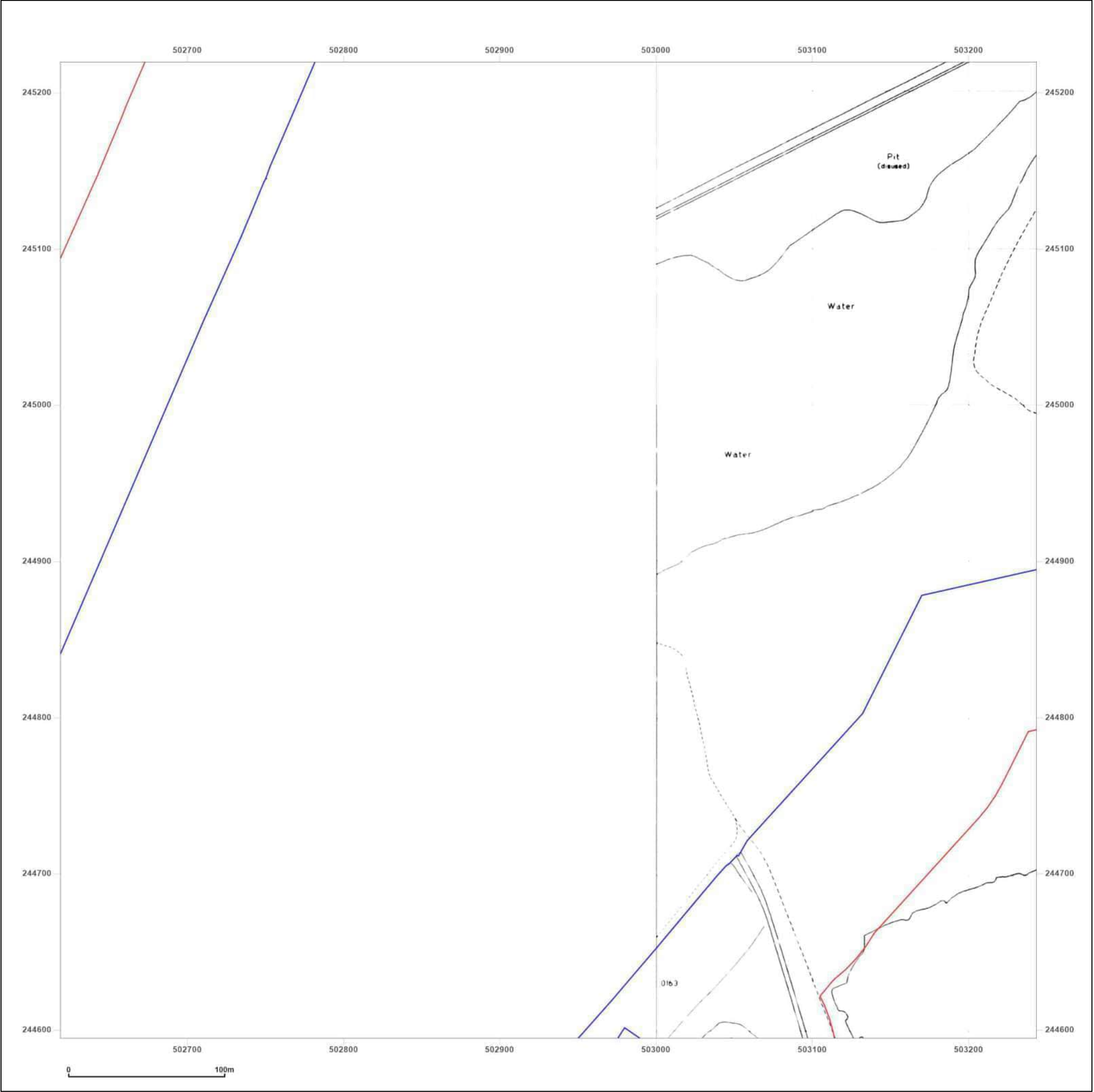
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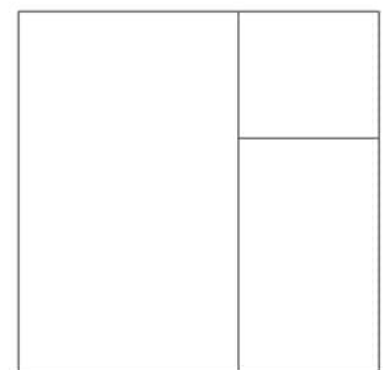
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**Printed at:** 1:2,500



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Revised N/A  
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**Map Name:** County Series

**Map date:** 1883-1884

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1884  
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Edition N/A  
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Surveyed 1883  
Revised 1883  
Edition N/A  
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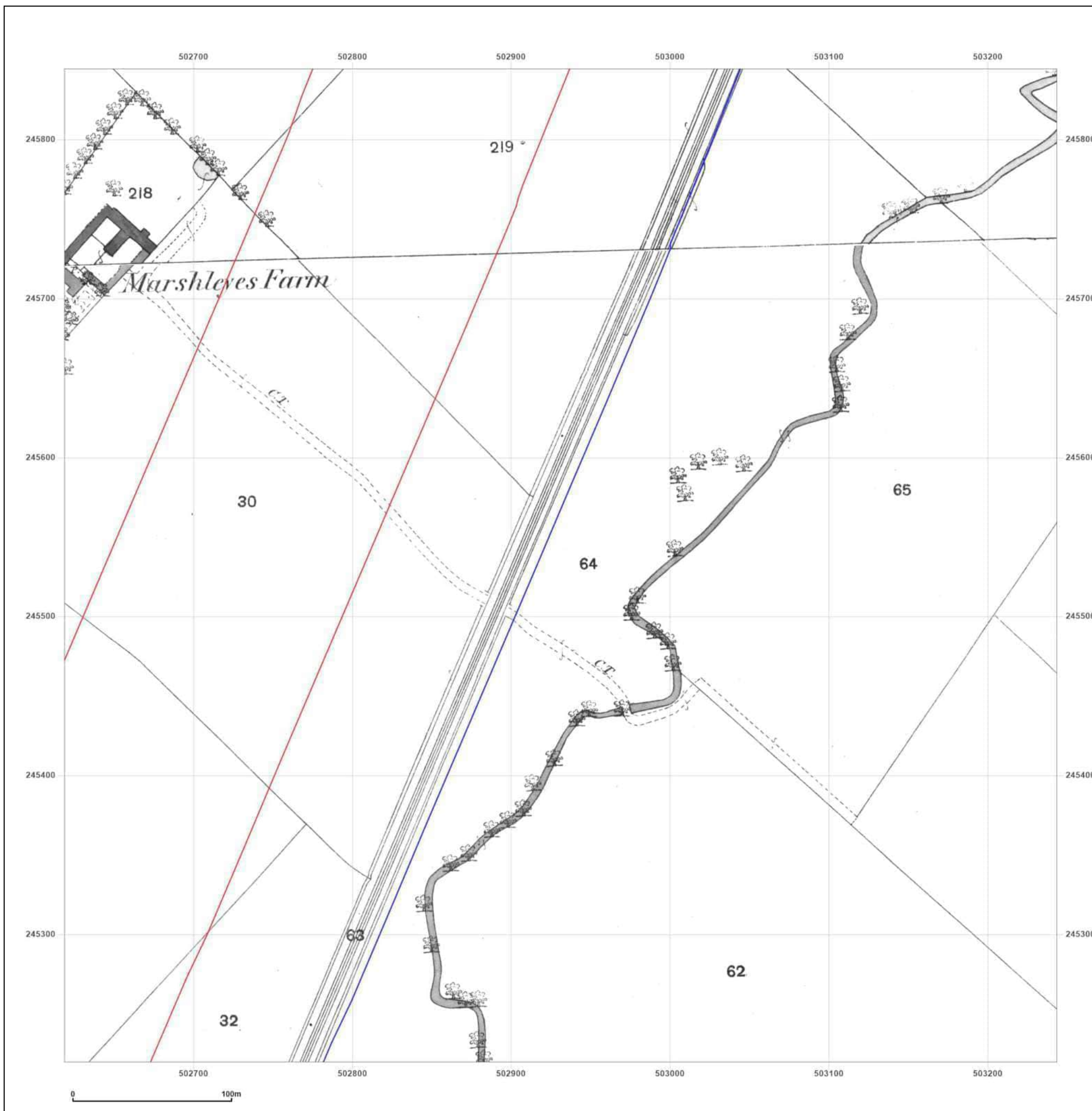


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**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_5  
**Grid Ref:** 502931, 245532

**Map Name:** County Series

**Map date:** 1901

**Scale:** 1:2,500

**Printed at:** 1:2,500



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 Edition N/A  
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 Levelled N/A

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

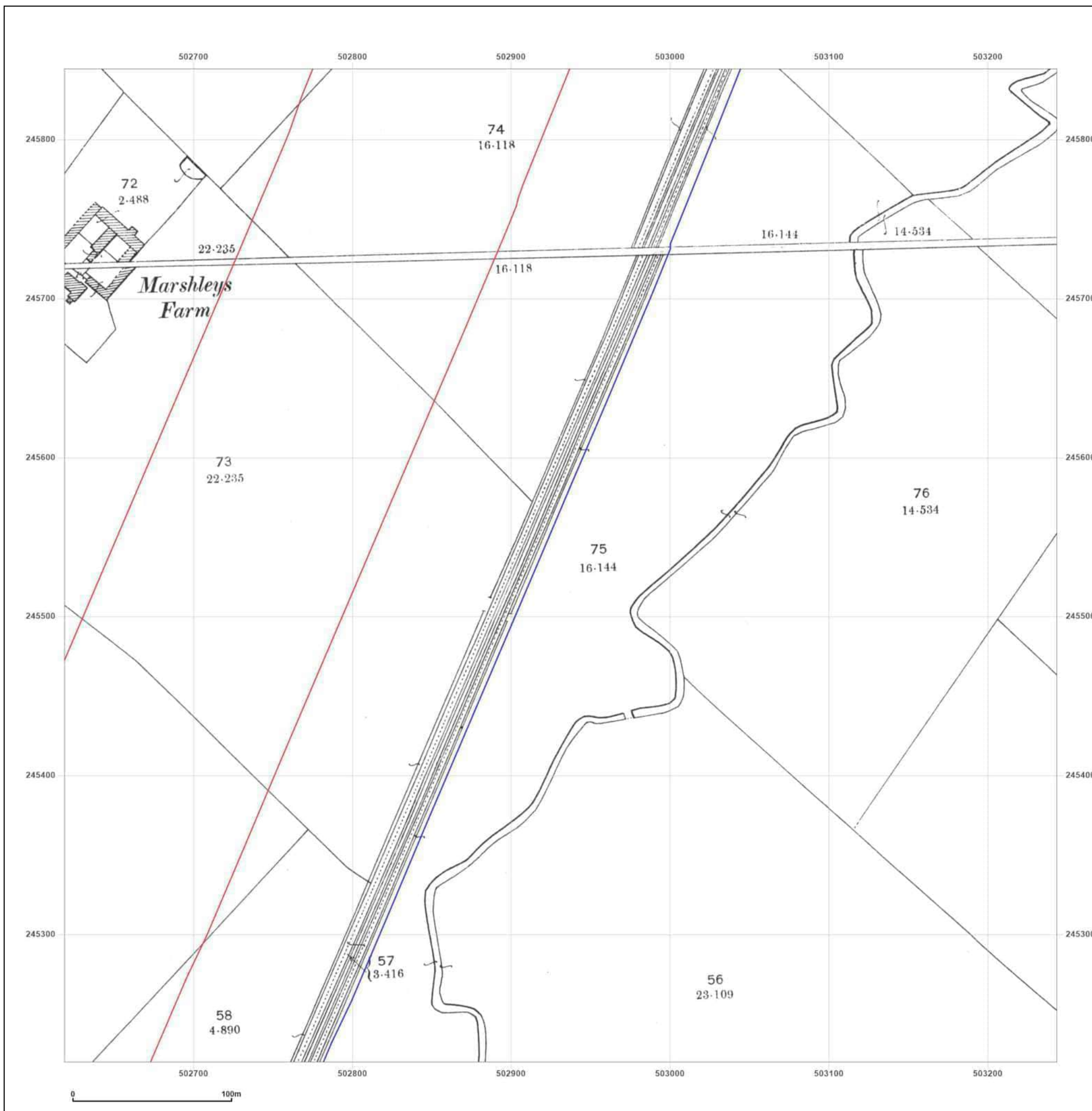


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**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
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Surveyed 1926  
 Revised 1926  
 Edition N/A  
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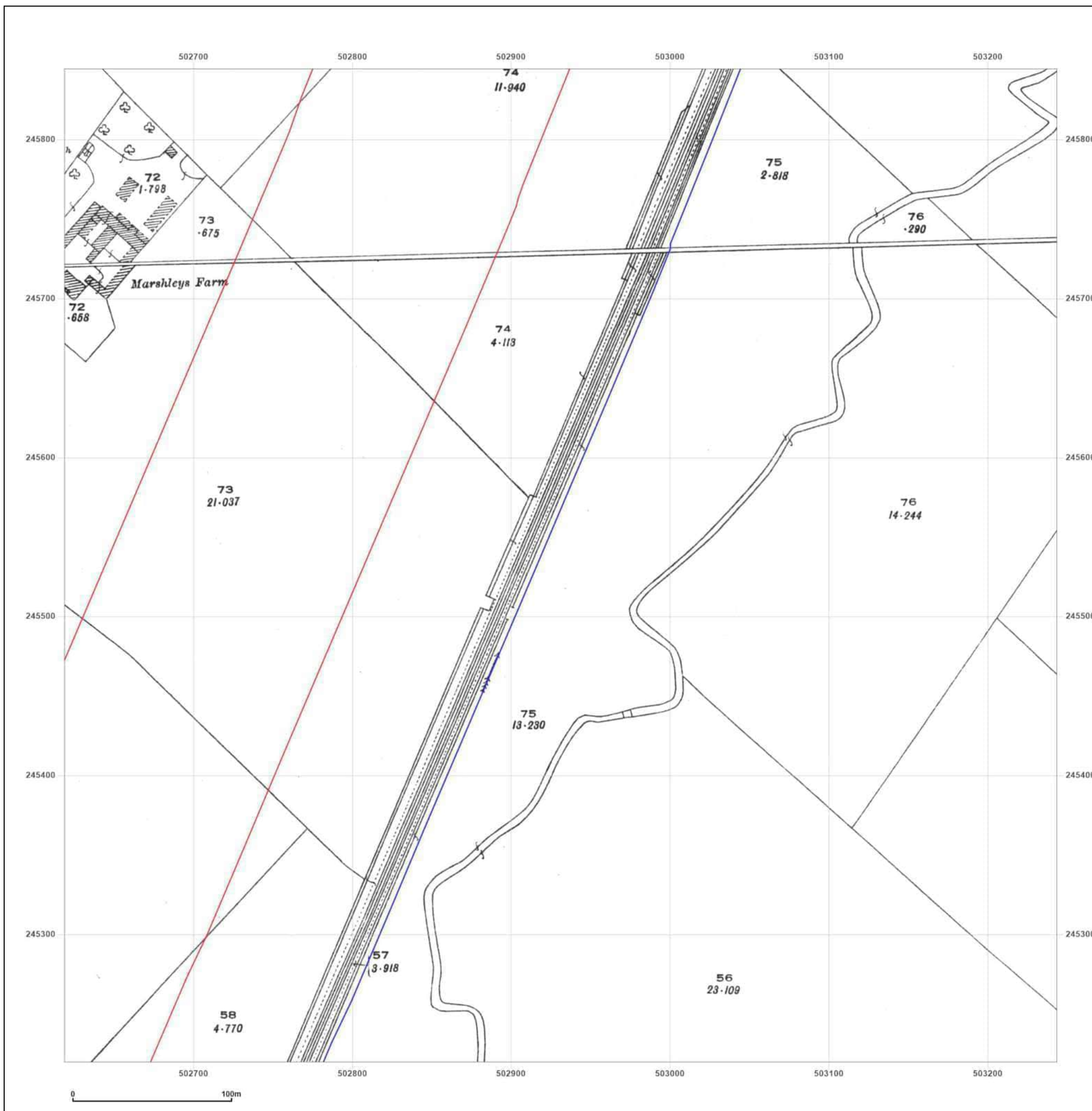


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Site Details:

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Report Ref: GSIP-2024-14754-18112\_LS\_5\_5  
Grid Ref: 502931, 245532

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

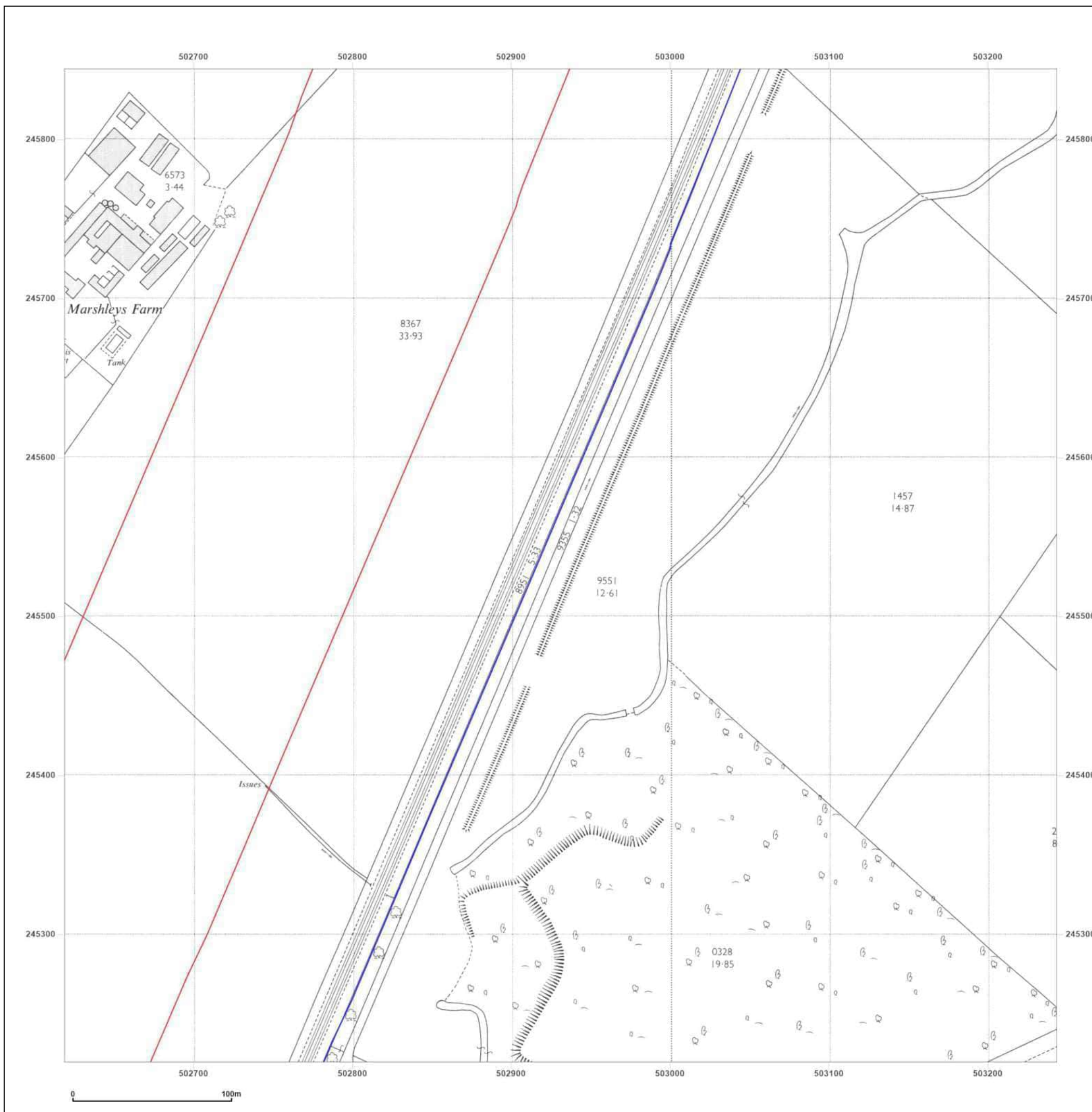


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Site Details:

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Map Name: National Grid

Map date: 1969

Scale: 1:2,500

Printed at: 1:2,500



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

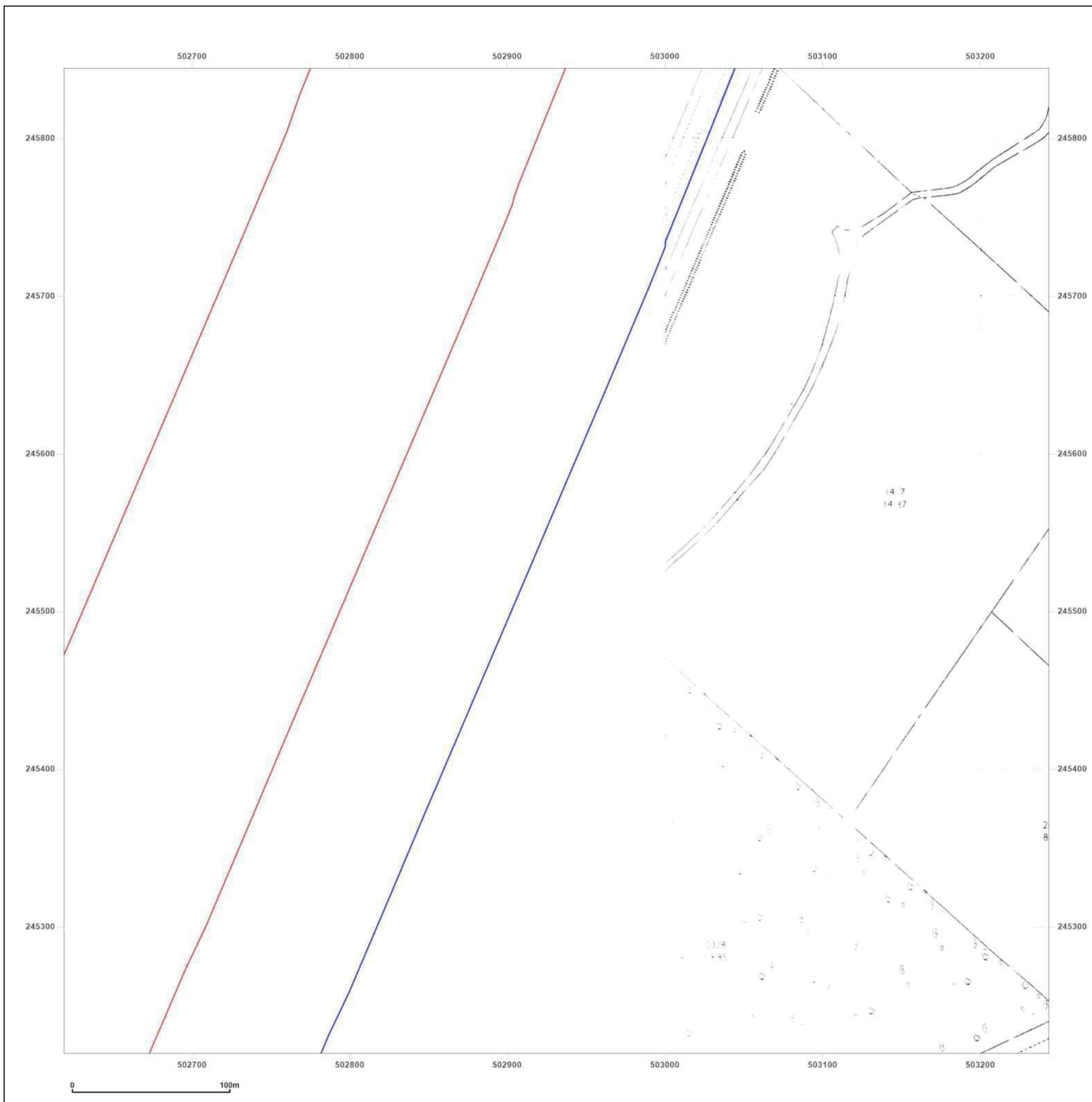


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Map Name: National Grid

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Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

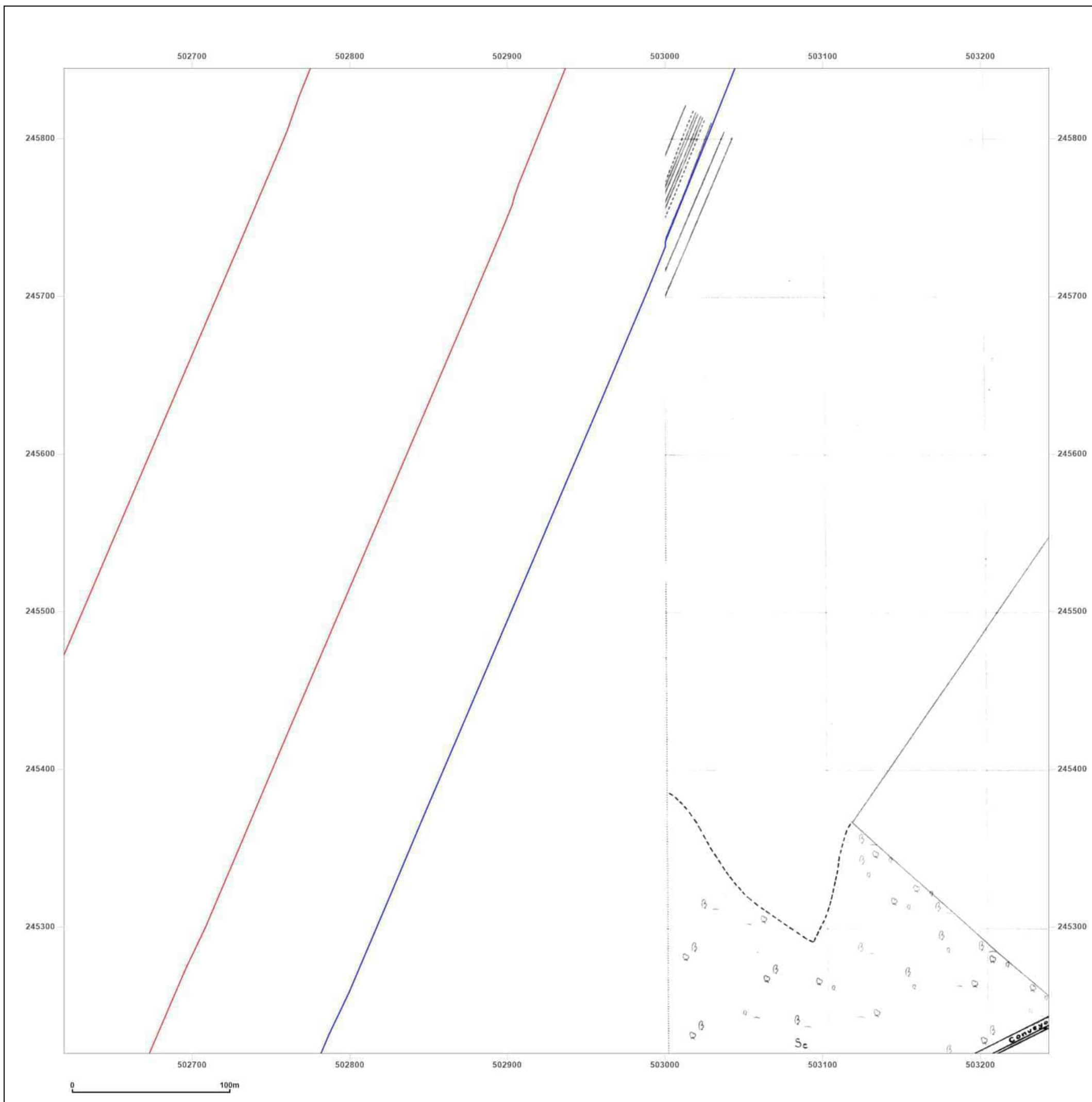


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_5  
**Grid Ref:** 502931, 245532

**Map Name:** National Grid

**Map date:** 1991-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1993  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed 1971  
Revised 1991  
Edition N/A  
Copyright 1991  
Levelled 1971

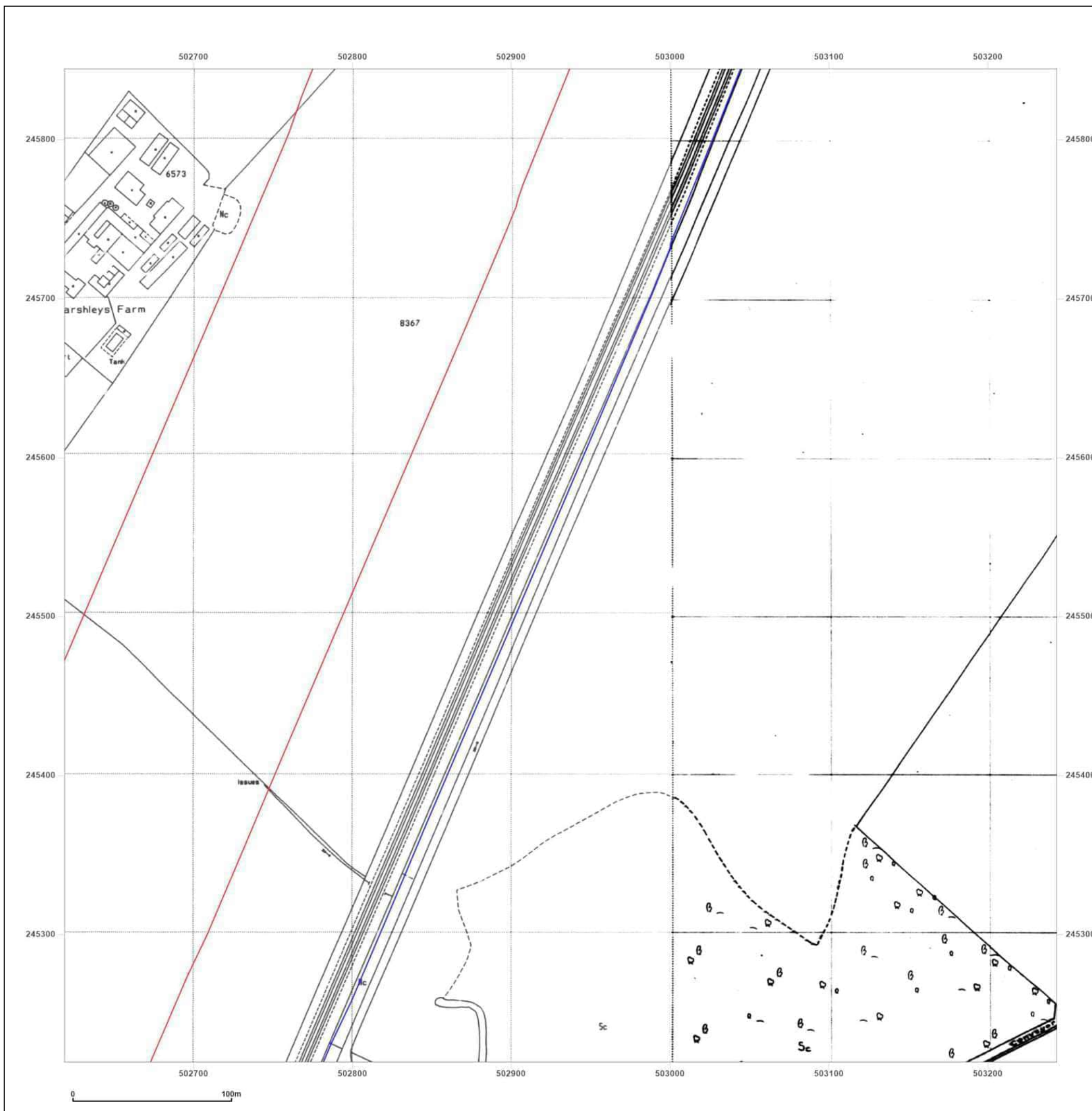


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_5\_6  
Grid Ref: 502931, 246157

Map Name: County Series

Map date: 1884

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1884  
Revised 1884  
Edition N/A  
Copyright N/A  
Levelled N/A

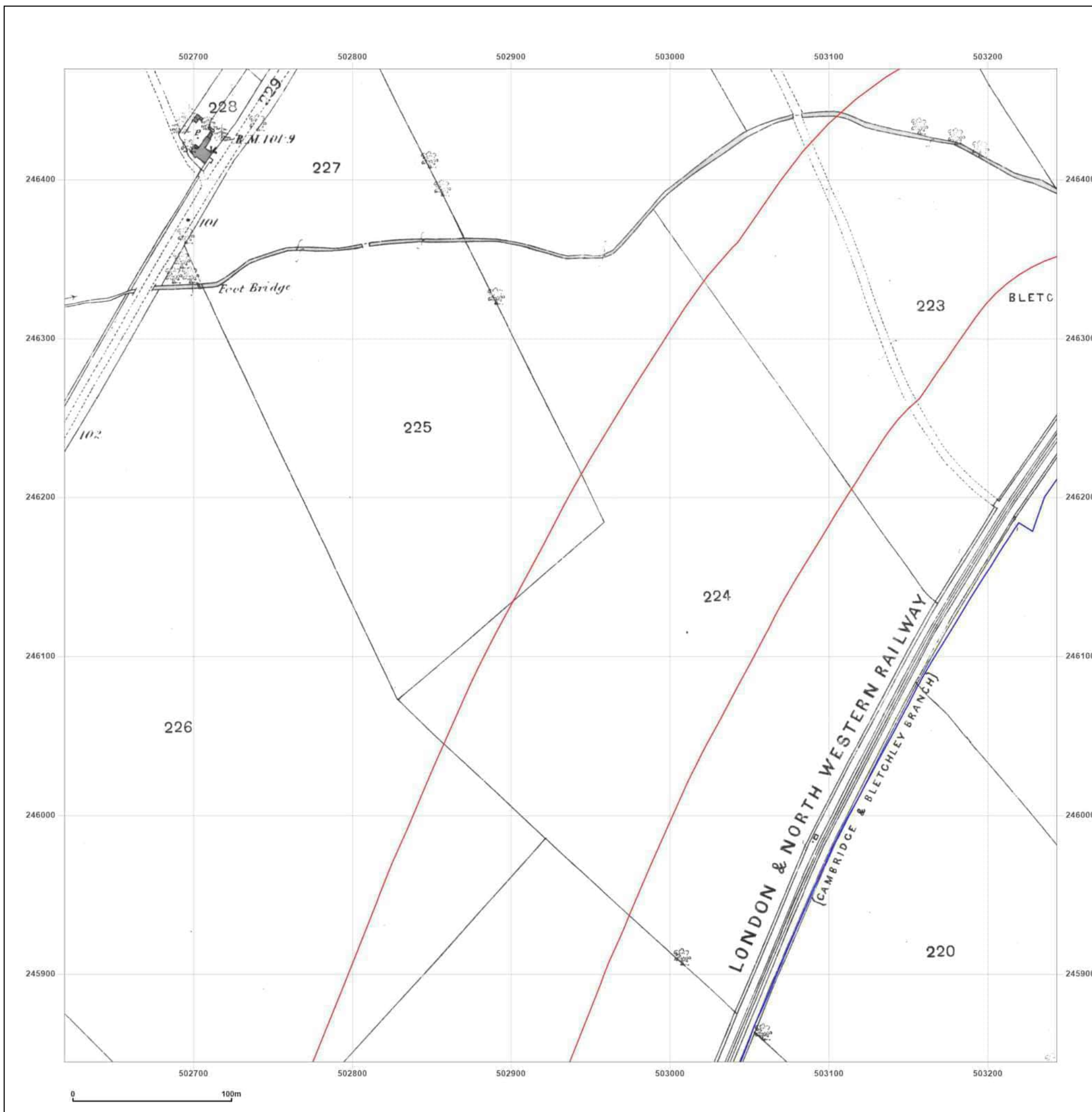


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# Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**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

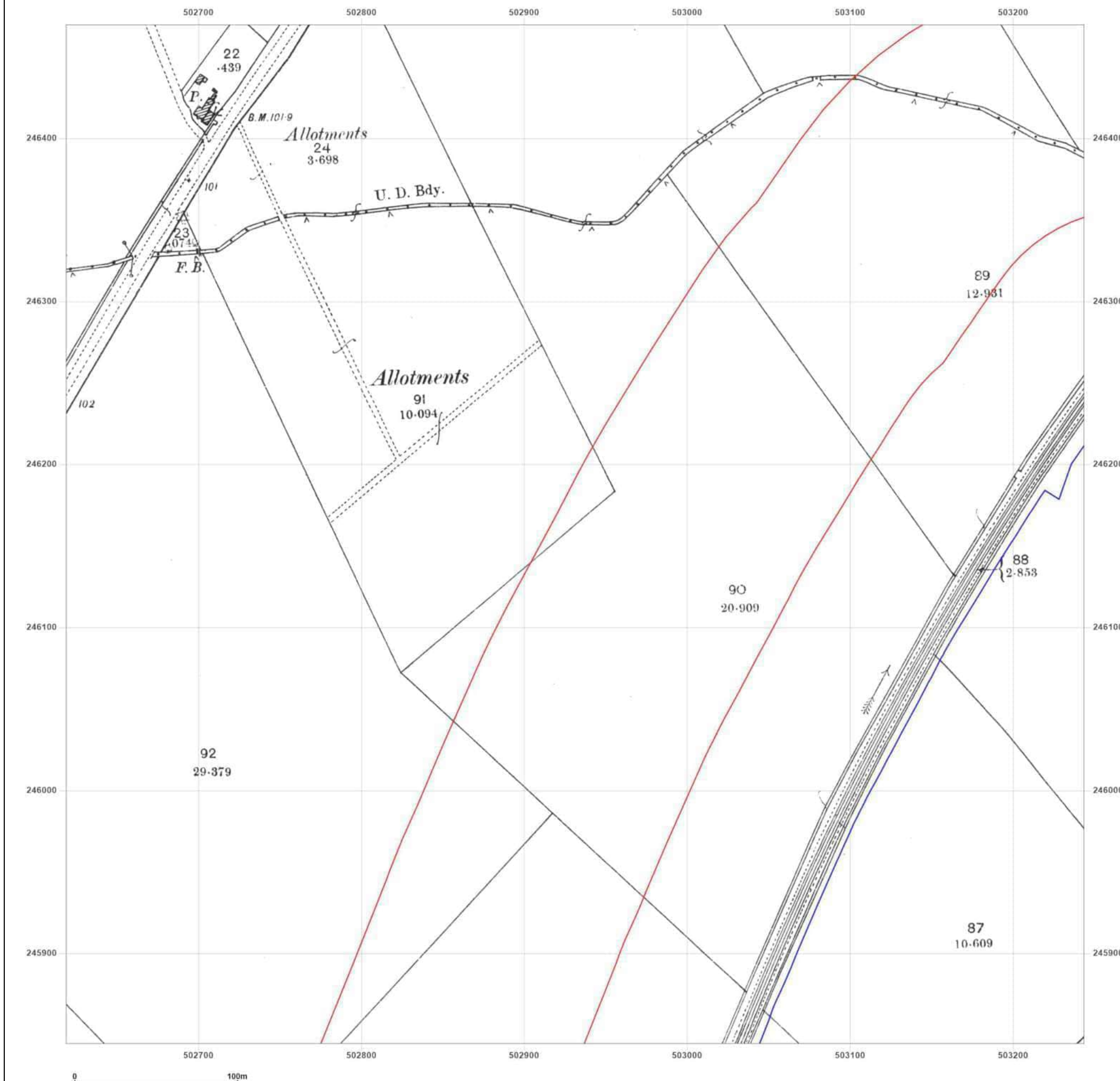


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

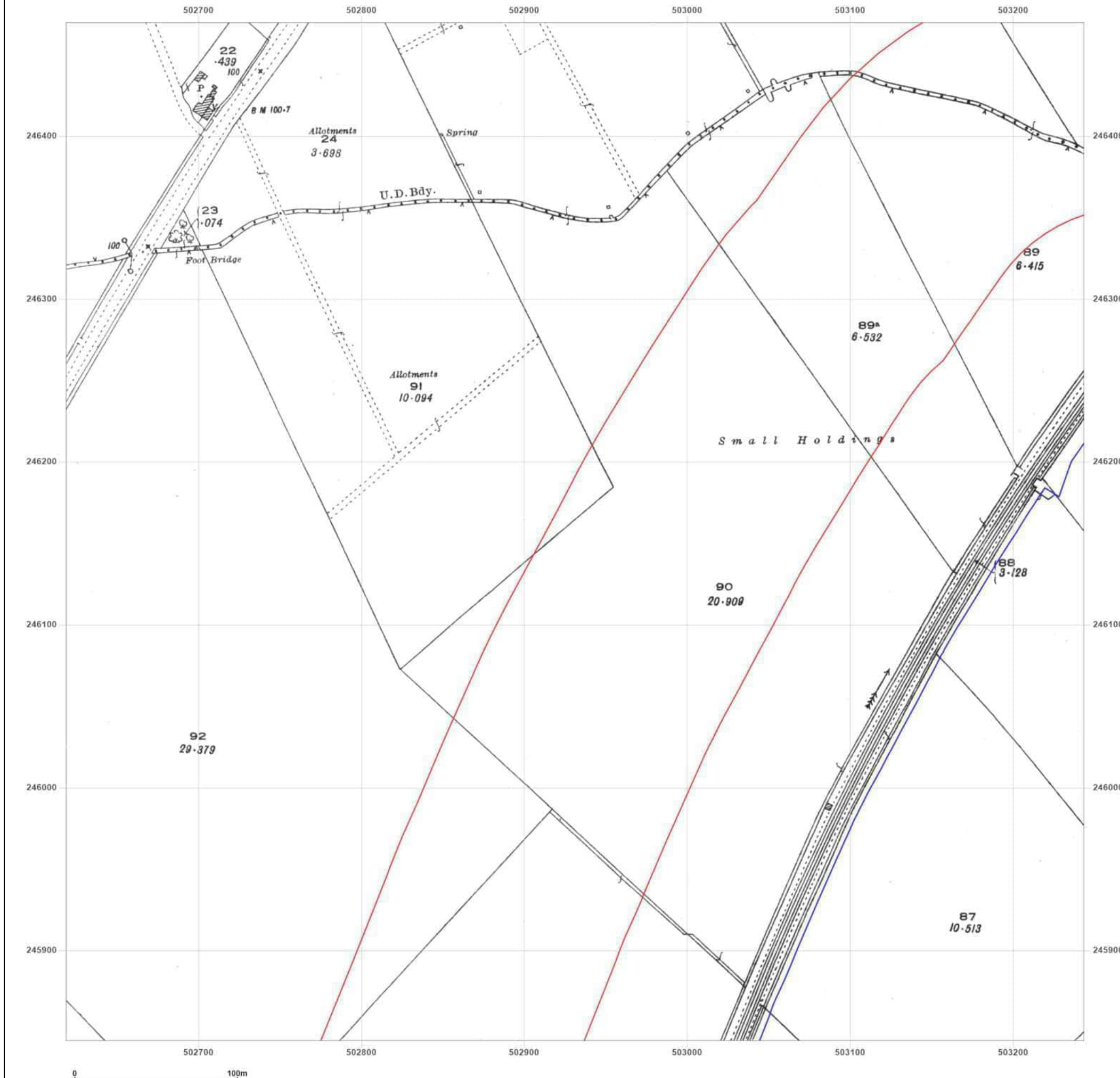


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**Map Name:** National Grid

**Map date:** 1968

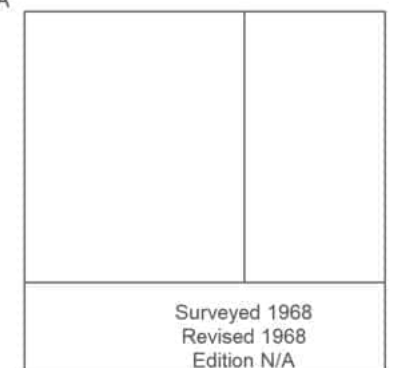
**Scale:** 1:2,500

**Printed at:** 1:2,500



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



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

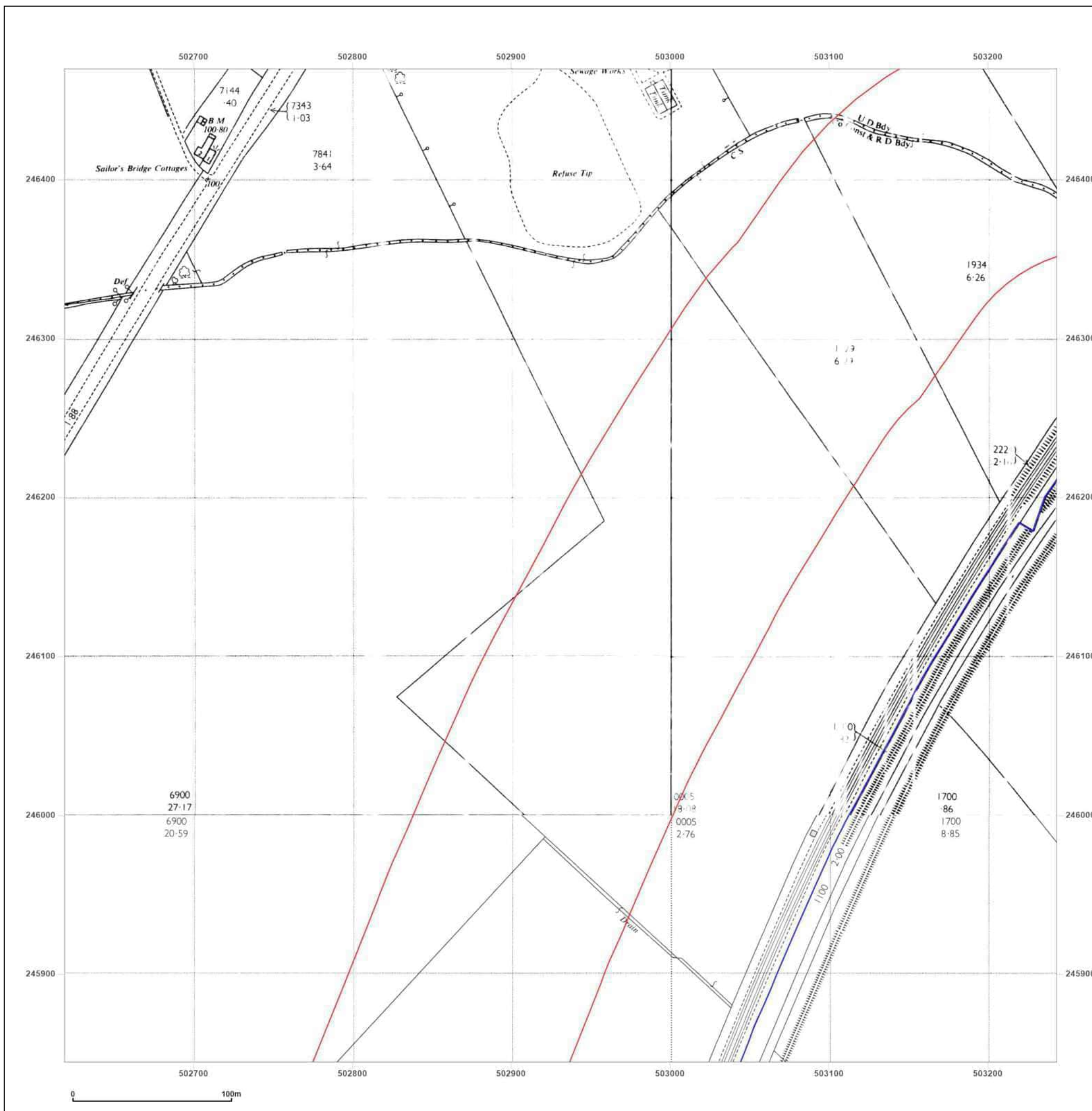


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**Map Name:** National Grid

**Map date:** 1968-1969

**Scale:** 1:2,500

**Printed at:** 1:2,500



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

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

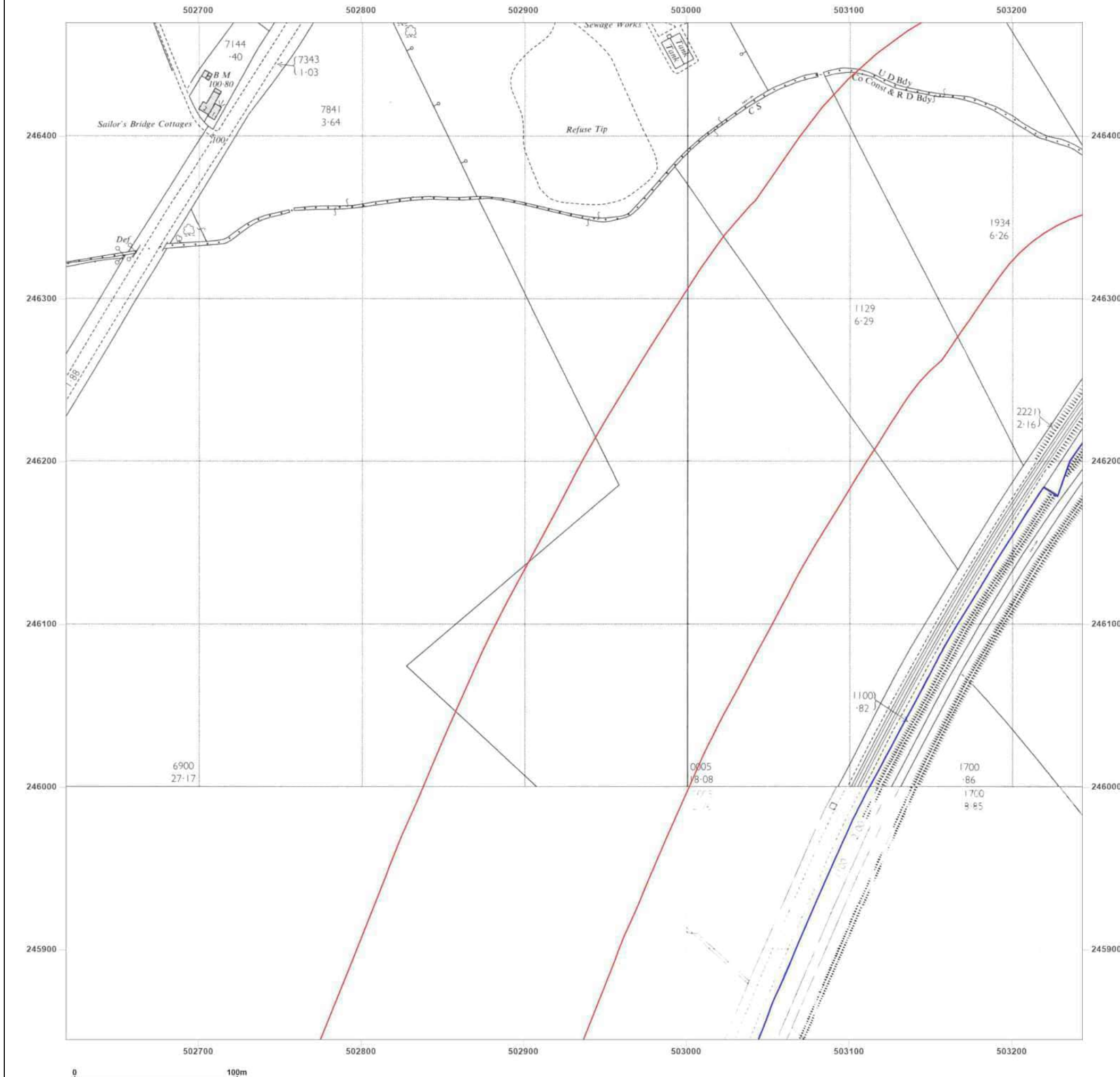


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**Map Name:** National Grid

**Map date:** 1986-1991

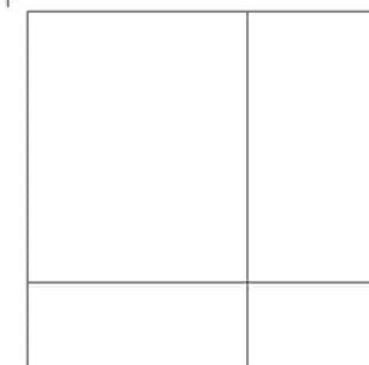
**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1971  
 Revised 1986  
 Edition N/A  
 Copyright 1986  
 Levelled 1971

Surveyed 1971  
 Revised 1990  
 Edition N/A  
 Copyright 1990  
 Levelled 1971



Surveyed 1971  
 Revised 1991  
 Edition N/A  
 Copyright 1991  
 Levelled 1971



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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_5\_6  
**Grid Ref:** 502931, 246157

**Map Name:** National Grid

**Map date:** 1986-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1971  
Revised 1990  
Edition N/A  
Copyright 1990  
Levelled 1971

Surveyed 1971  
Revised 1986  
Edition N/A  
Copyright 1986  
Levelled 1971

Surveyed 1993  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

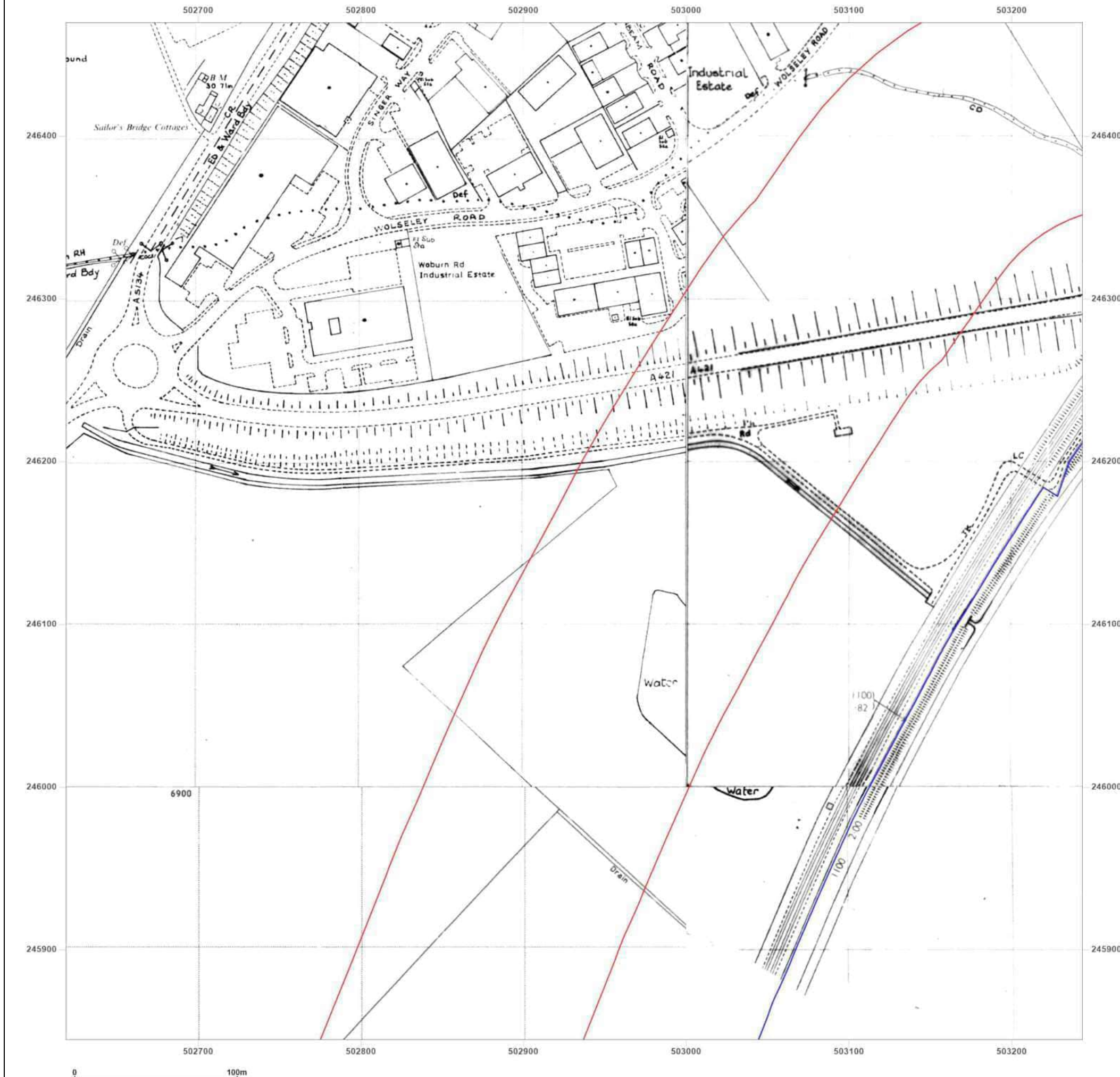


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_2  
**Grid Ref:** 503556, 243657

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A

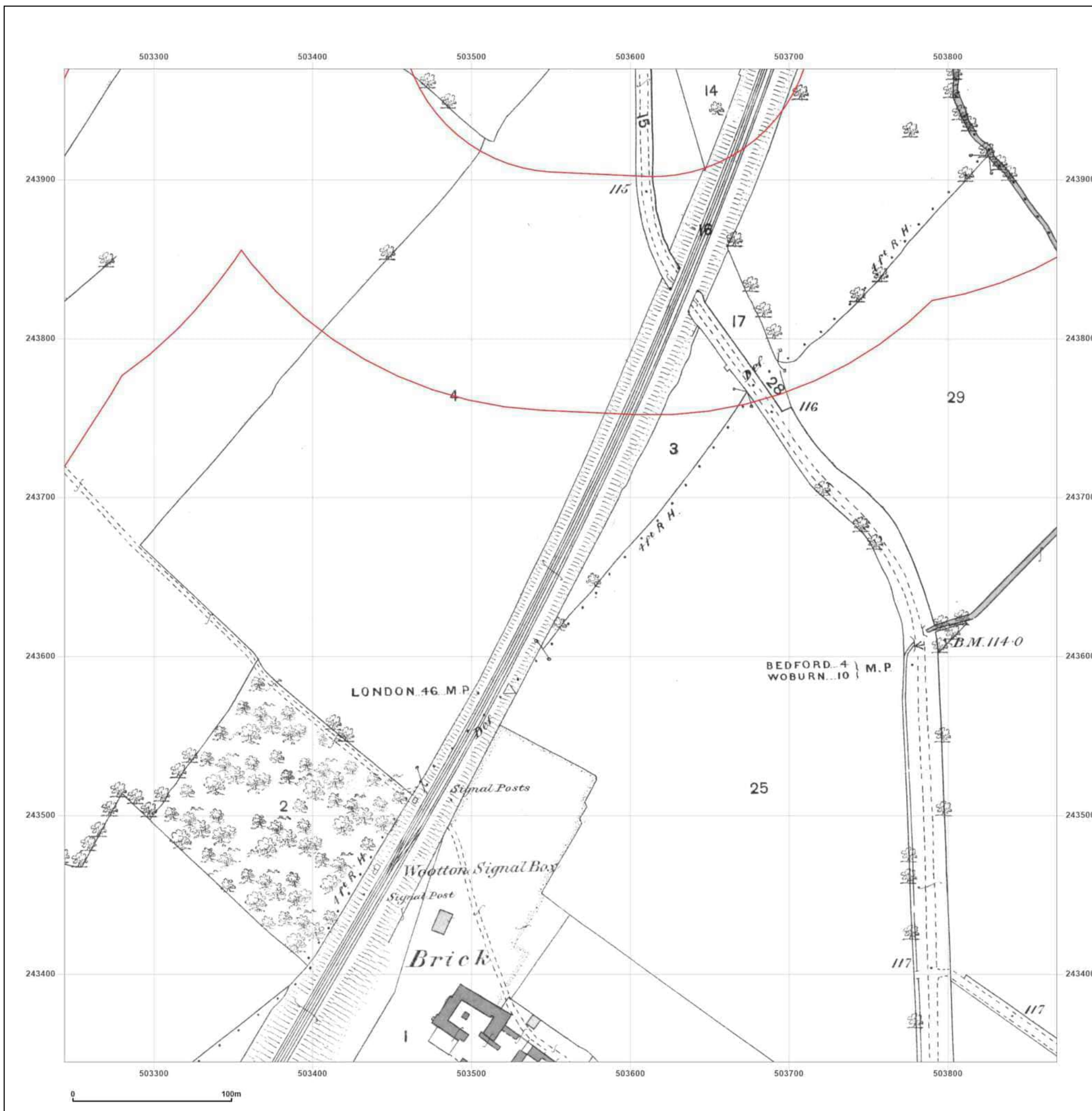


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_2  
**Grid Ref:** 503556, 243657

**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

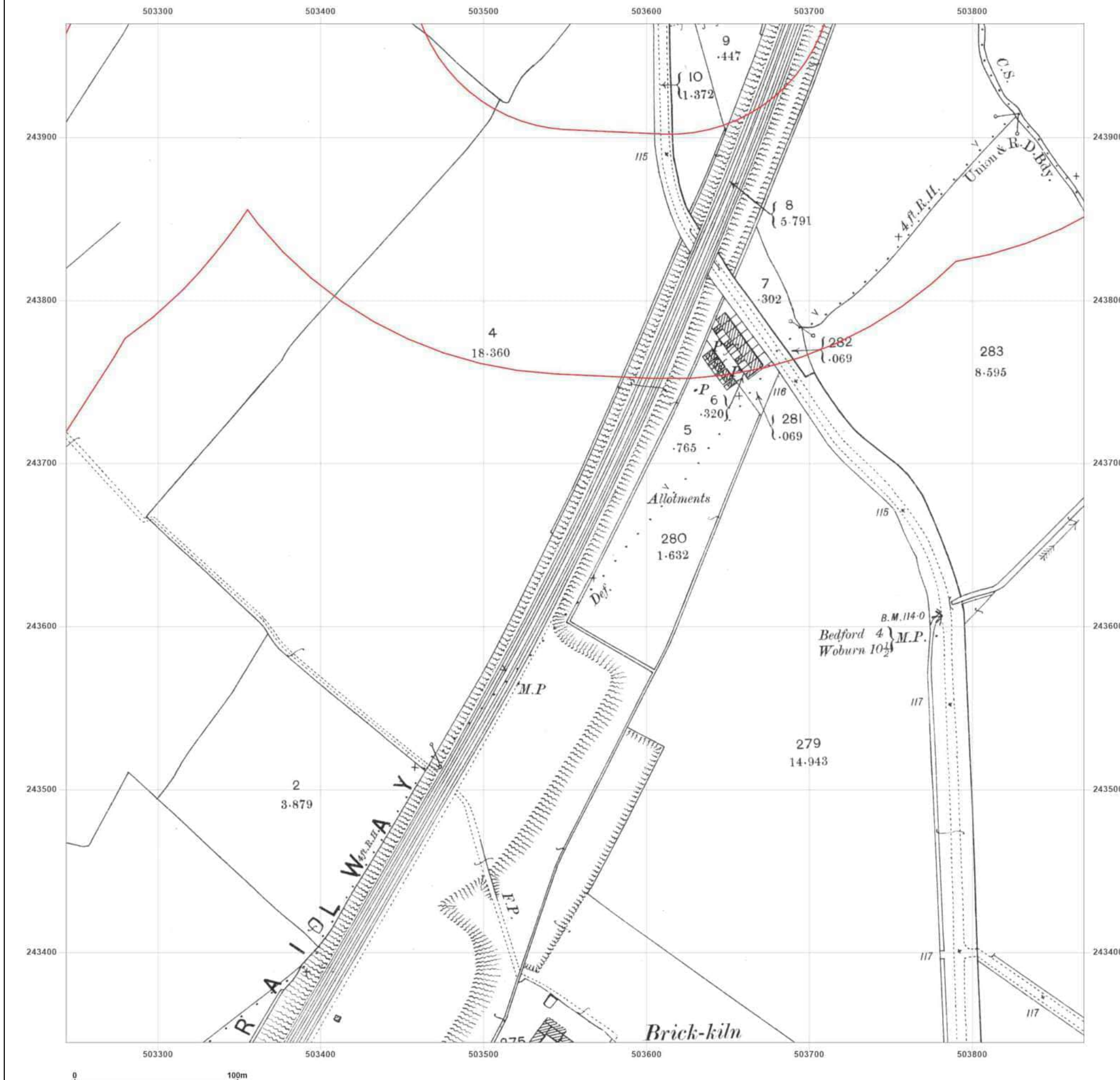


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_2  
**Grid Ref:** 503556, 243657

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
Revised 1926  
Edition N/A  
Copyright N/A  
Levelled N/A

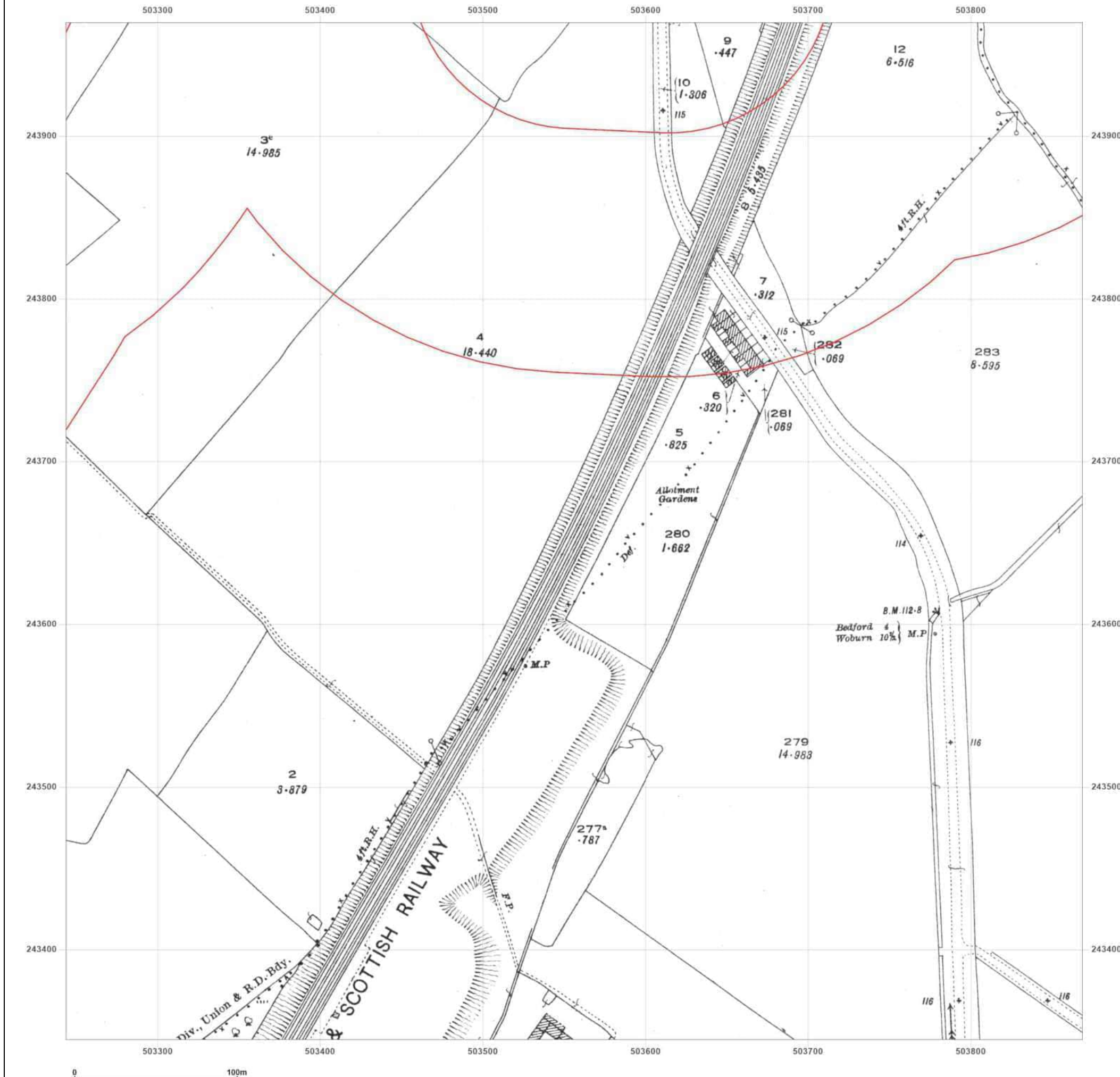


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_2  
**Grid Ref:** 503556, 243657

**Map Name:** National Grid

**Map date:** 1974

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1971

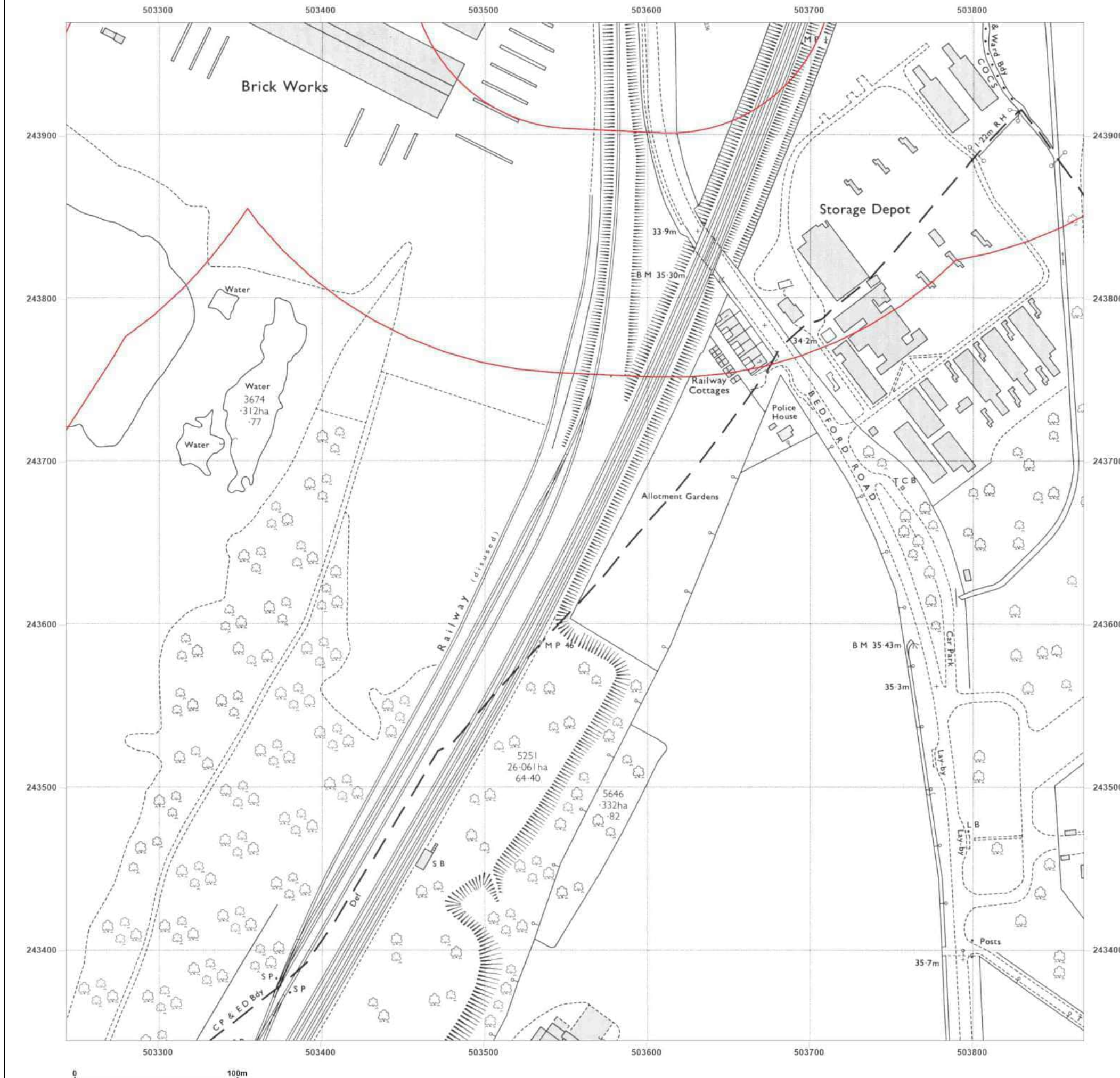


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_2  
Grid Ref: 503556, 243657

Map Name: National Grid

Map date: 1975

Scale: 1:2,500

Printed at: 1:2,500



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



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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_2  
**Grid Ref:** 503556, 243657

**Map Name:** National Grid

**Map date:** 1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A  
 Revised N/A  
 Edition N/A  
 Copyright 1993  
 Levelled N/A

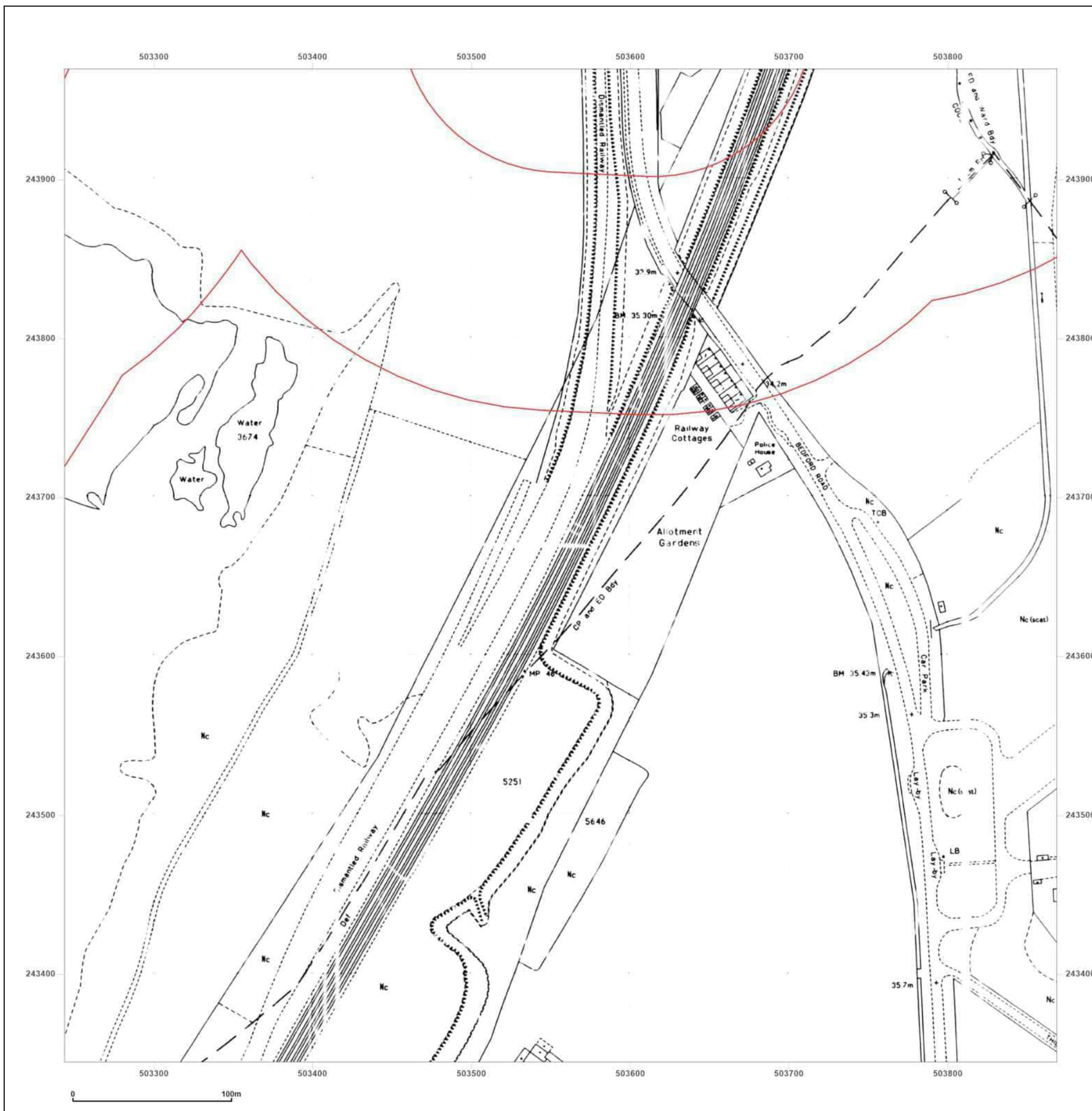


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

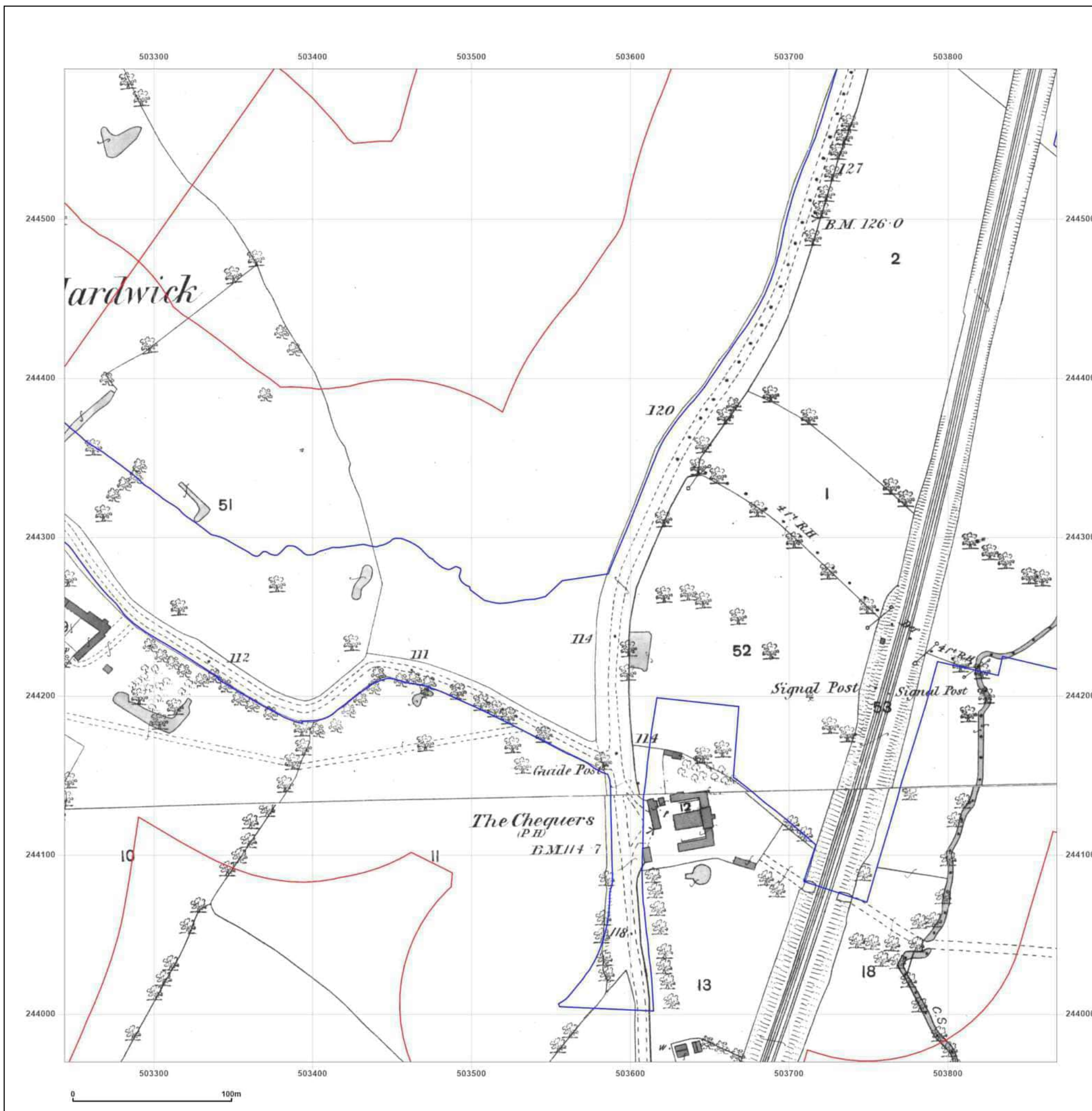


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** County Series

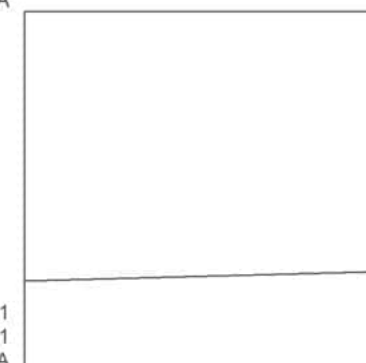
**Map date:** 1901

**Scale:** 1:2,500

**Printed at:** 1:2,500



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



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

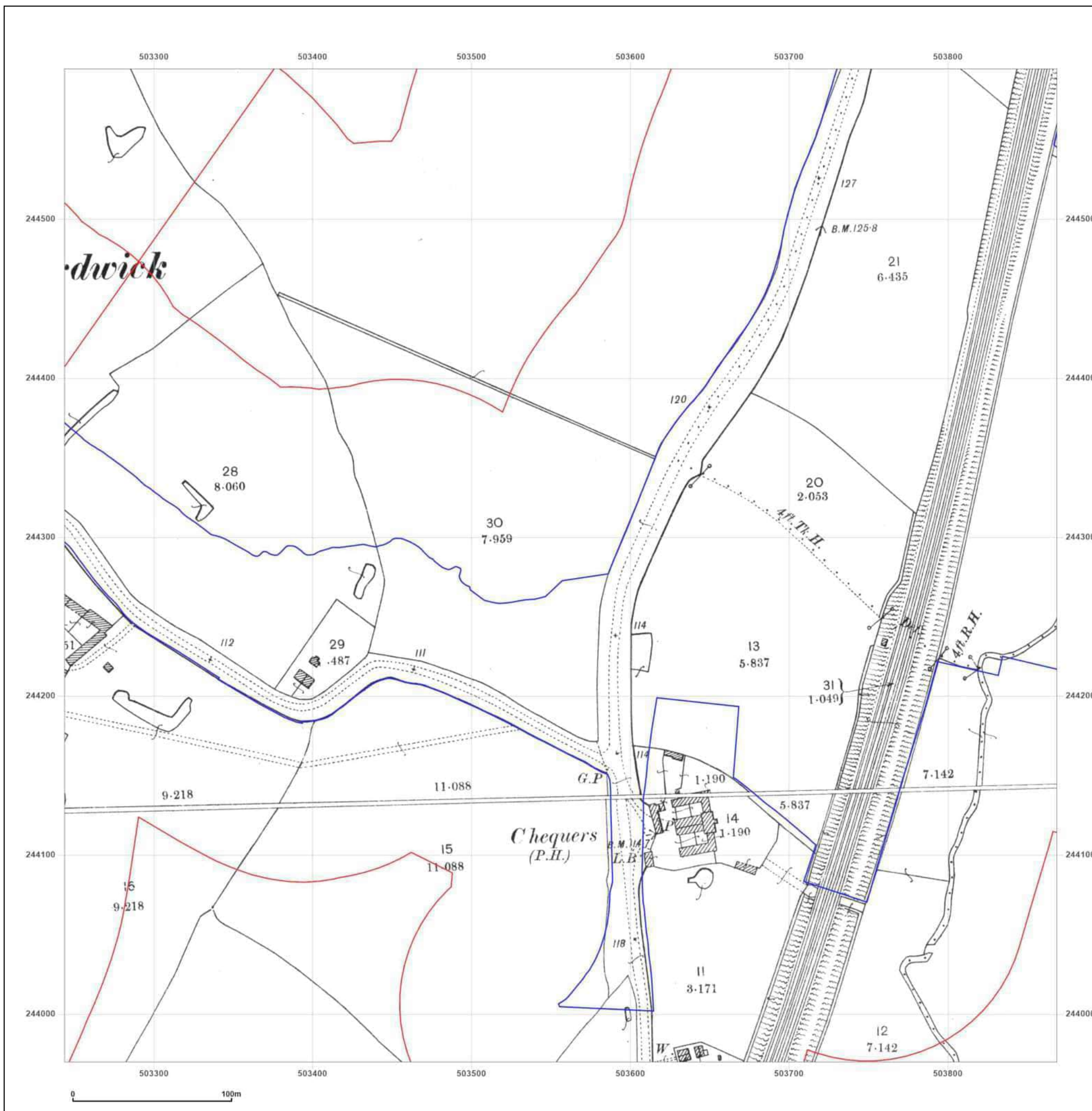


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** County Series

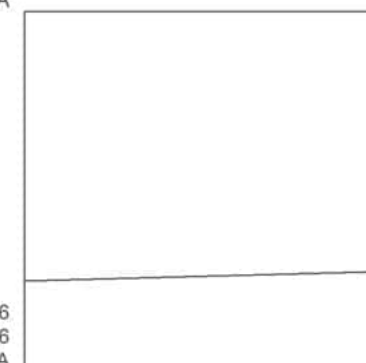
**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

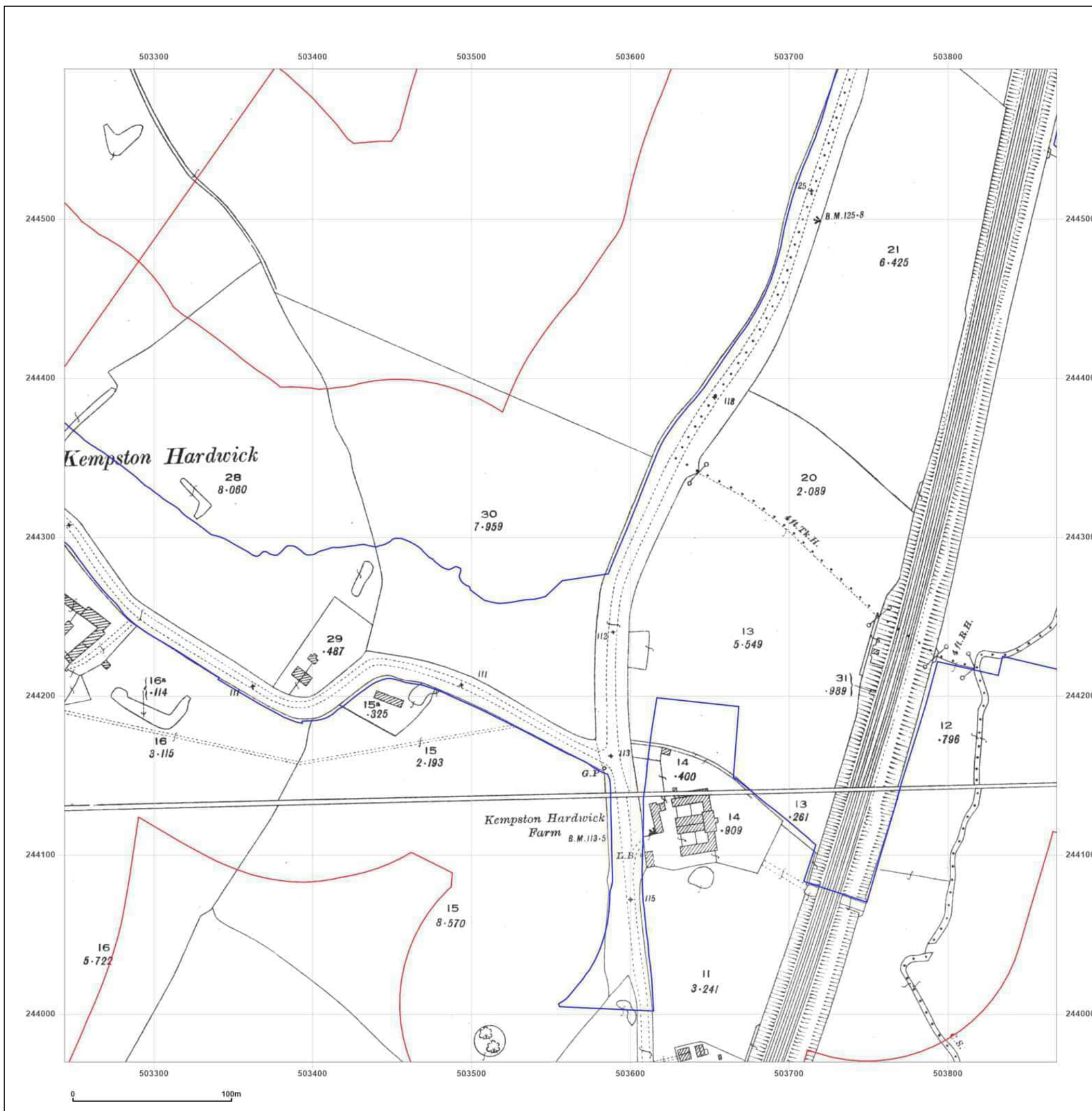


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_3  
Grid Ref: 503556, 244282

Map Name: National Grid

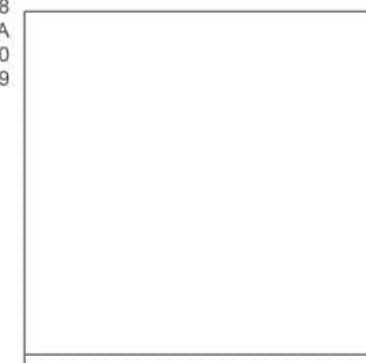
Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1968  
Revised 1968  
Edition N/A  
Copyright 1970  
Levelled 1959

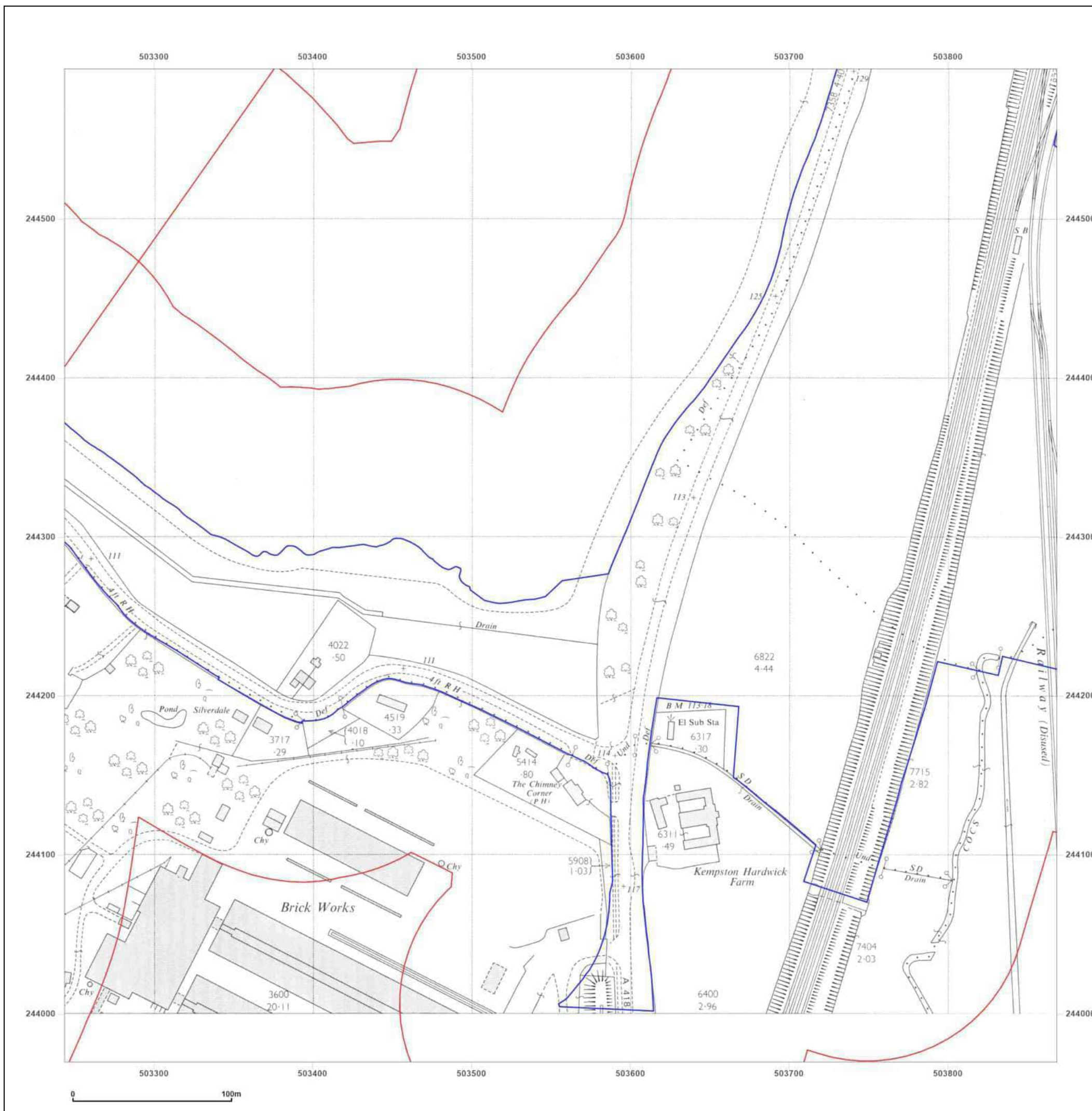


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** National Grid

**Map date:** 1974-1979

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A  
 Revised N/A  
 Edition N/A  
 Copyright 1979  
 Levelled 1972

Surveyed 1974  
 Revised 1974  
 Edition N/A  
 Copyright 1975  
 Levelled 1971

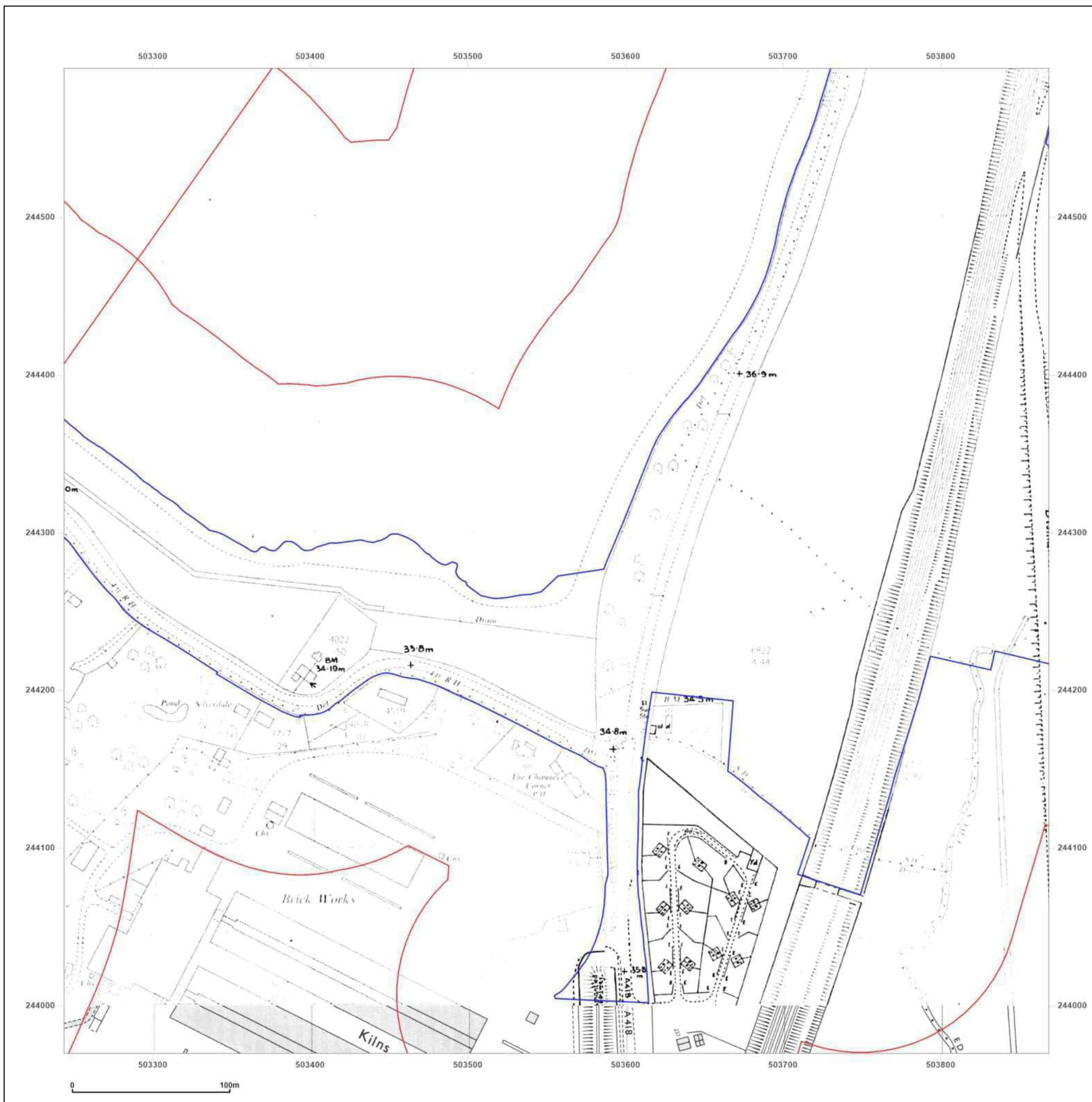


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** National Grid

**Map date:** 1987

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A  
 Revised N/A  
 Edition N/A  
 Copyright 1987  
 Levelled 1971

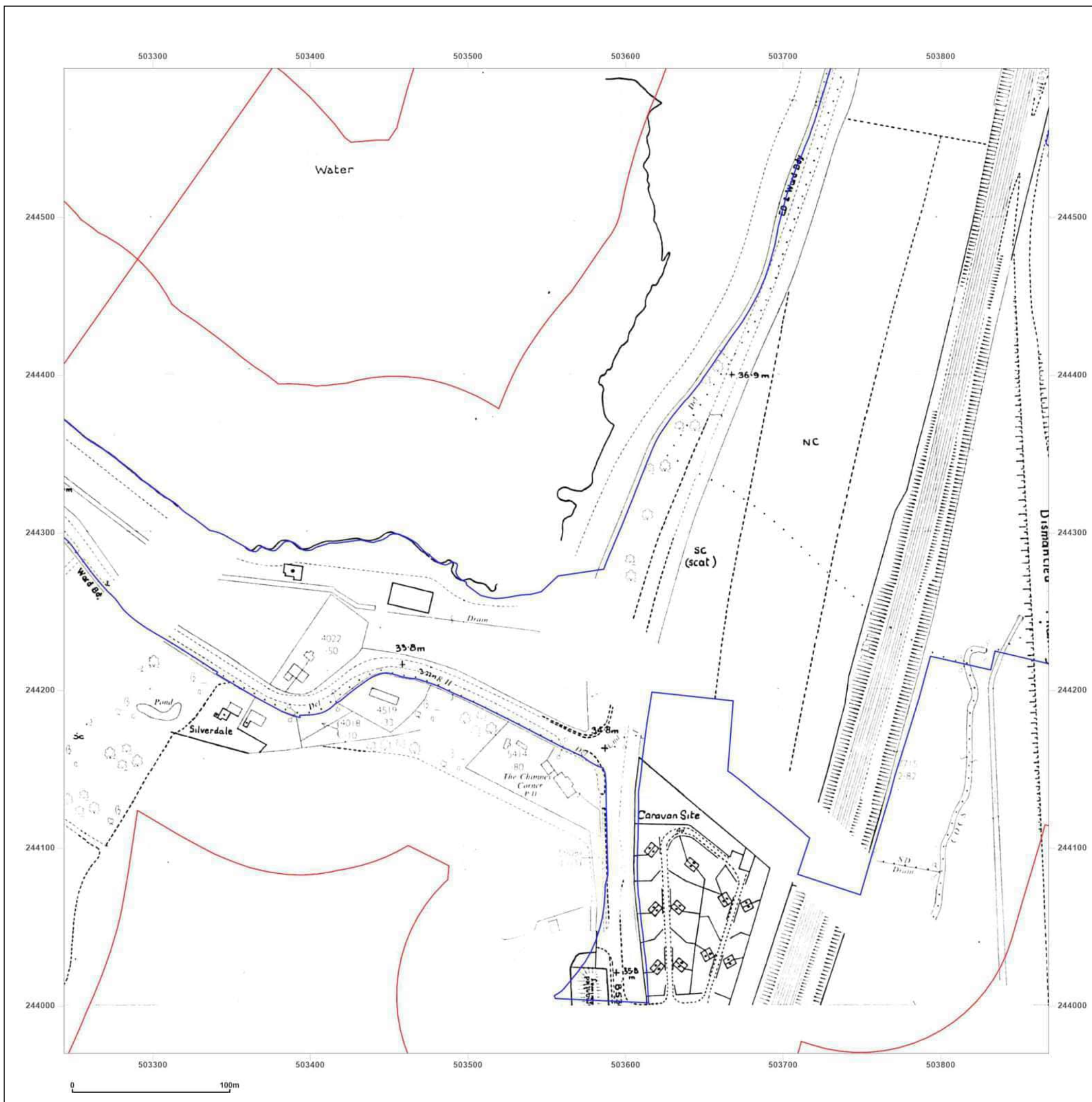


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_3  
**Grid Ref:** 503556, 244282

**Map Name:** National Grid

**Map date:** 1988-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1971  
Revised 1988  
Edition N/A  
Copyright 1988  
Levelled 1971

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

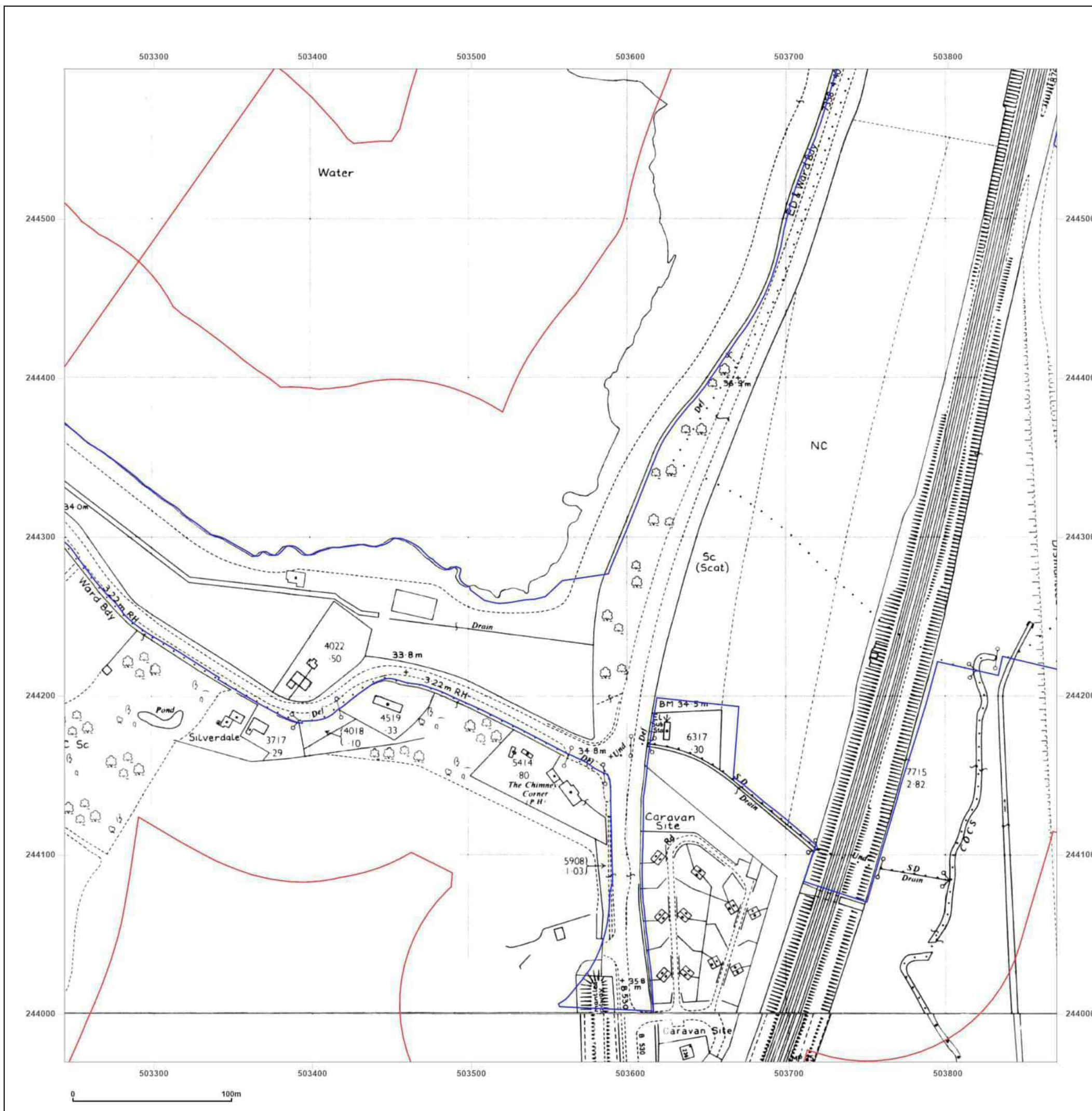


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_3  
Grid Ref: 503556, 244282

Map Name: National Grid

Map date: 1993

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

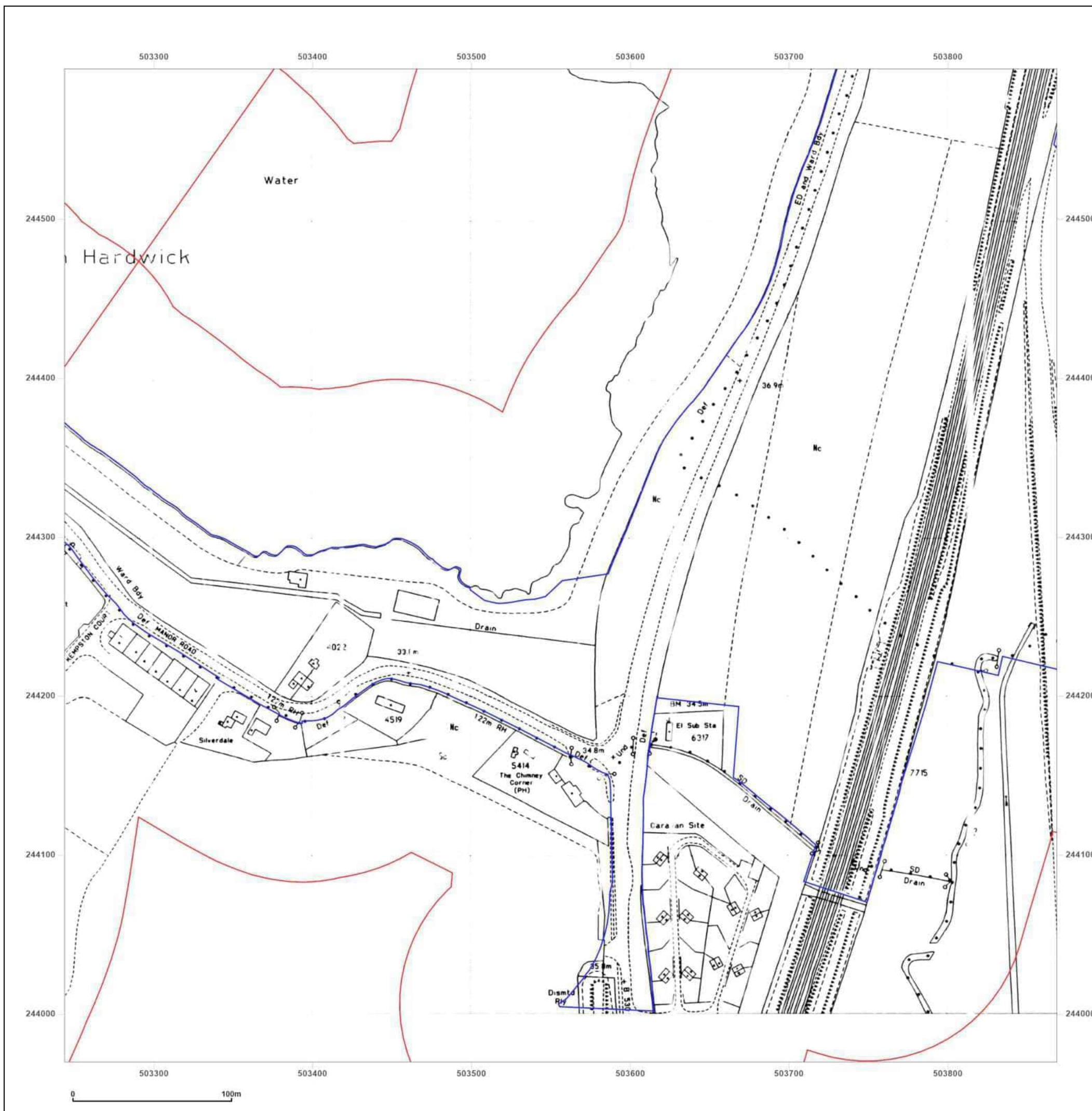


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_4  
**Grid Ref:** 503556, 244907

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
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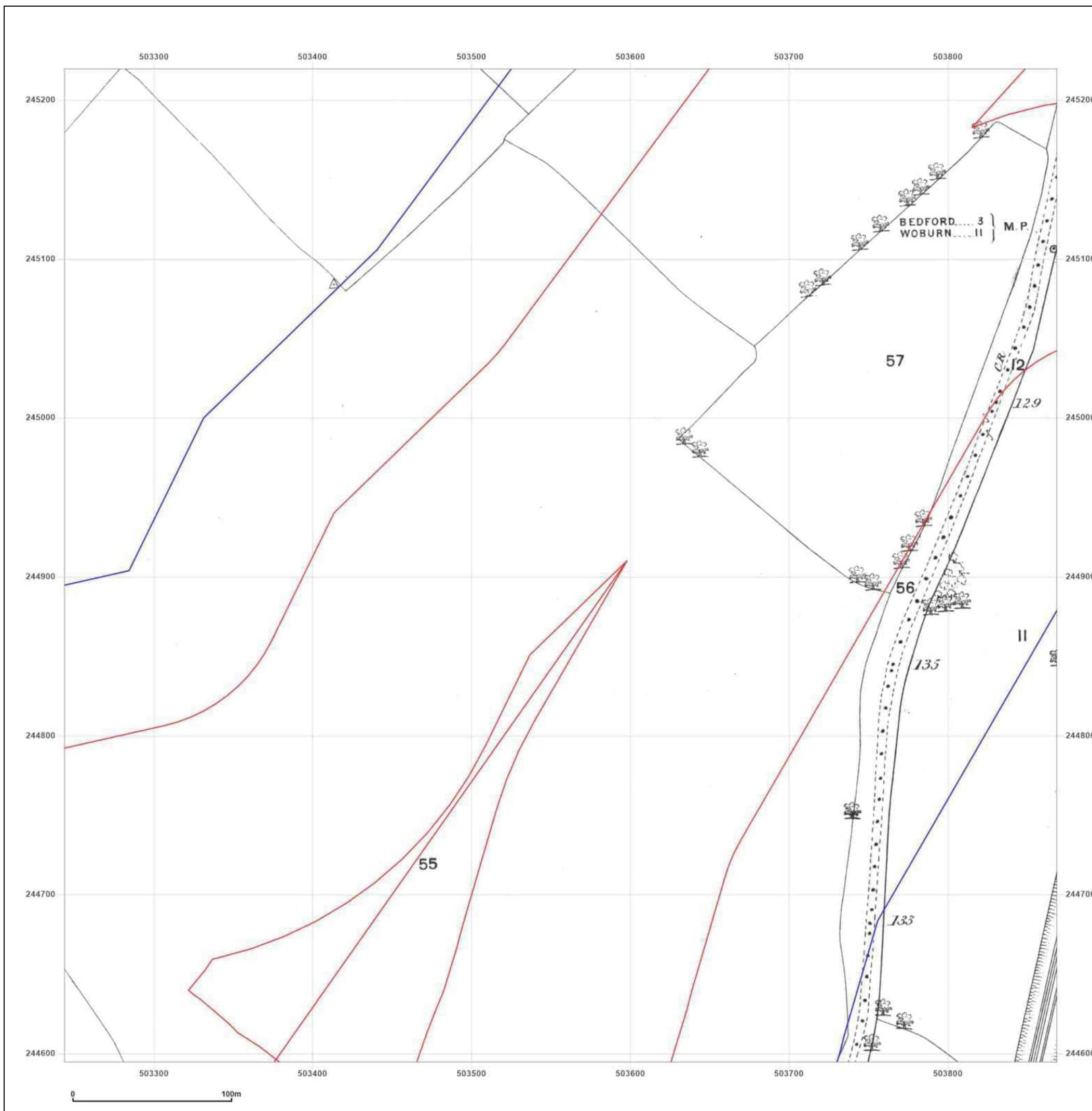


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_4  
**Grid Ref:** 503556, 244907

**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

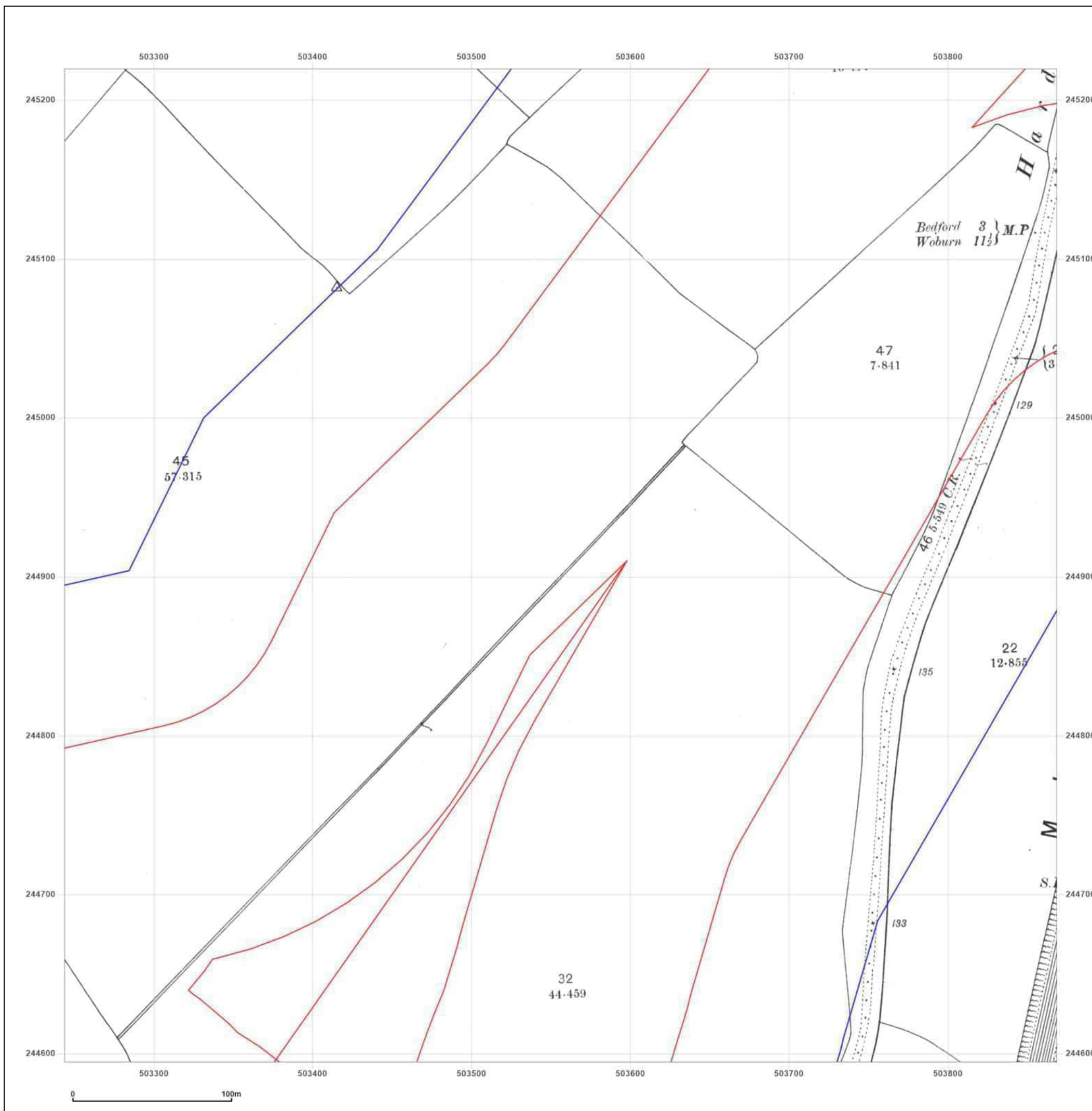


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_4  
**Grid Ref:** 503556, 244907

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

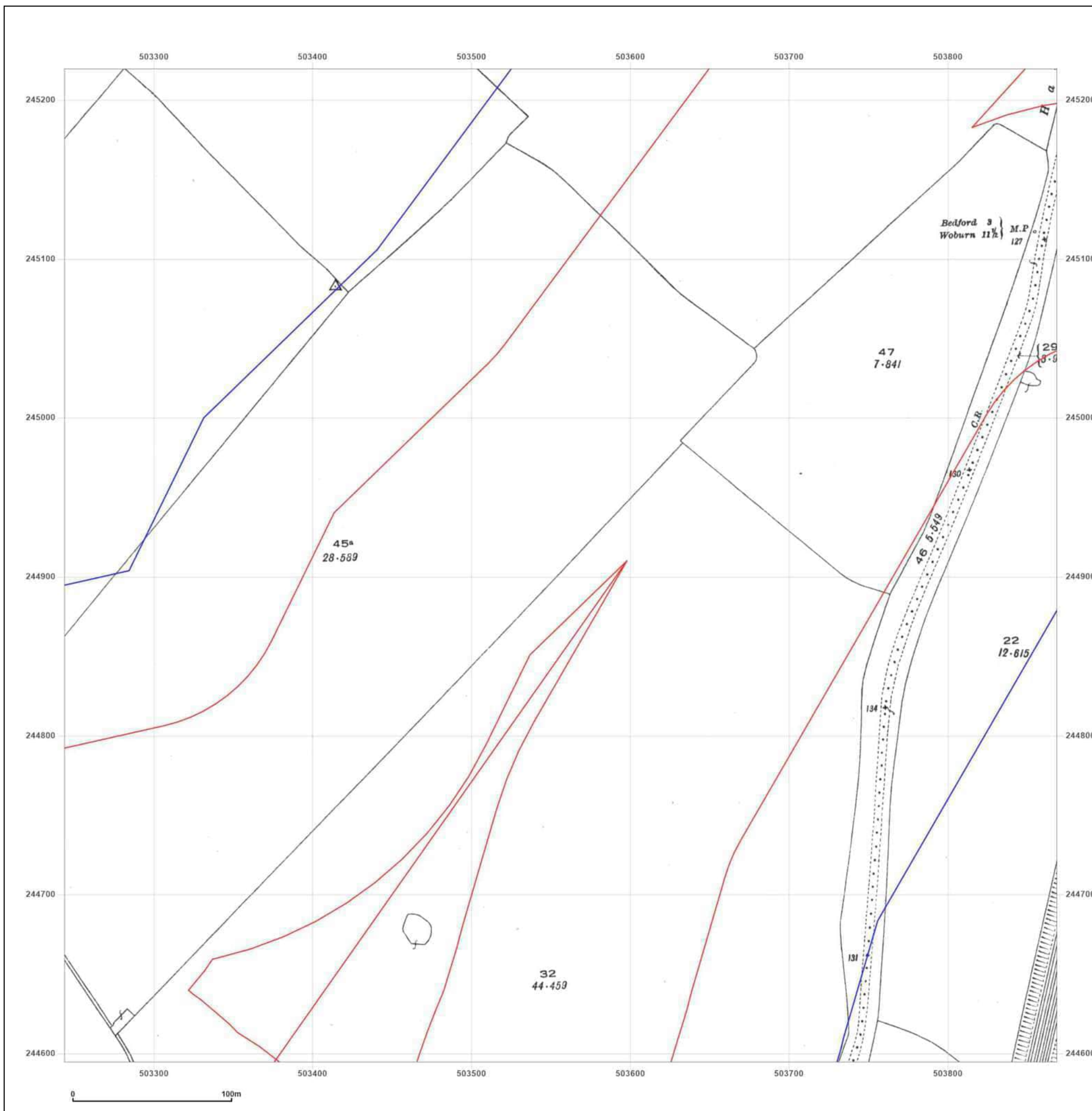


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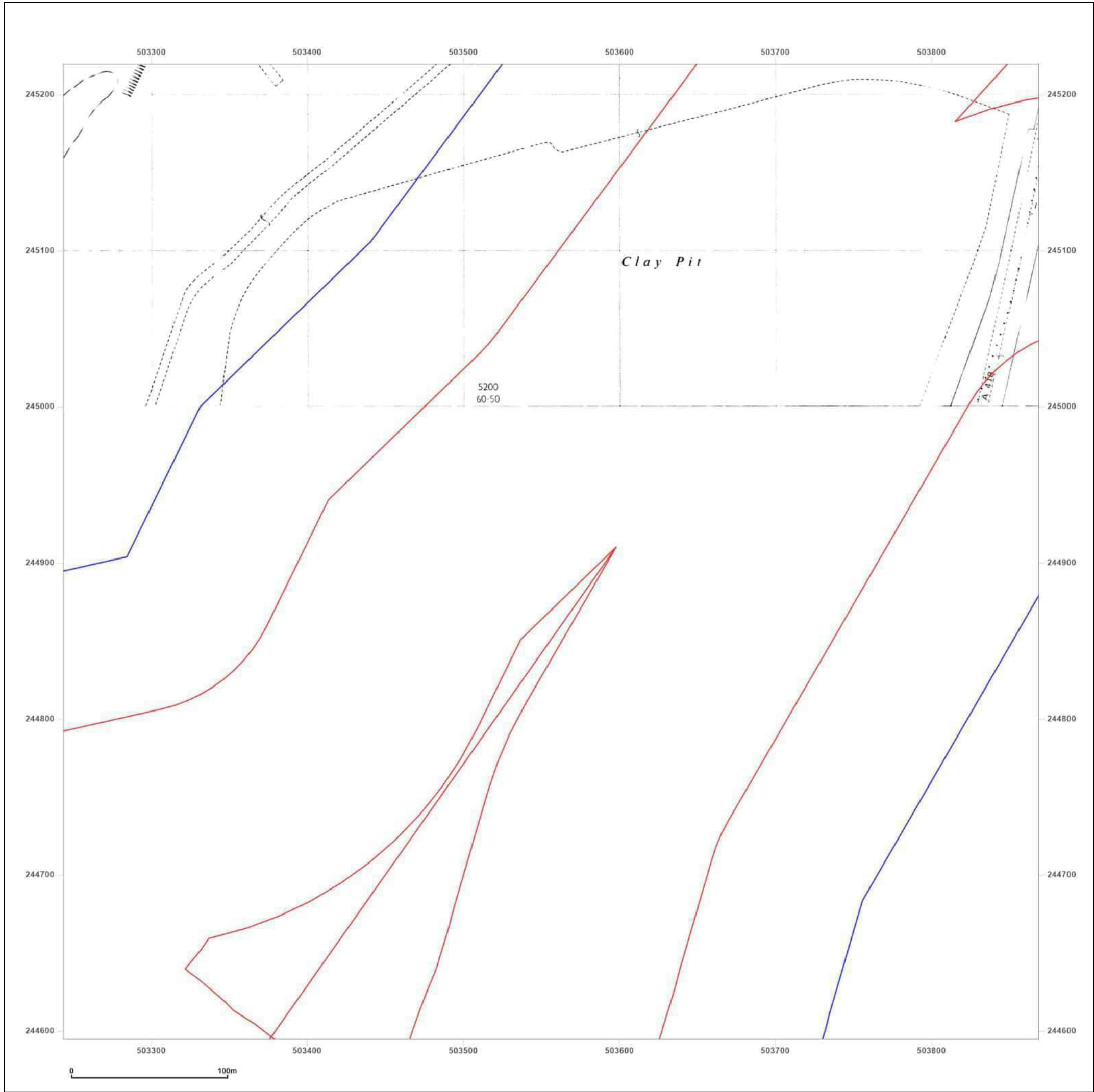
Production date: 10 April 2024

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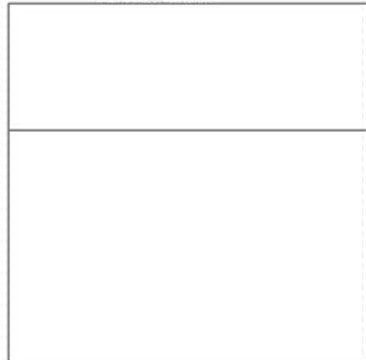



**Site Details:**  
70116516 Rev B

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**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_4  
**Grid Ref:** 503556, 244907

**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  
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**Site Details:**

70116516 Rev B

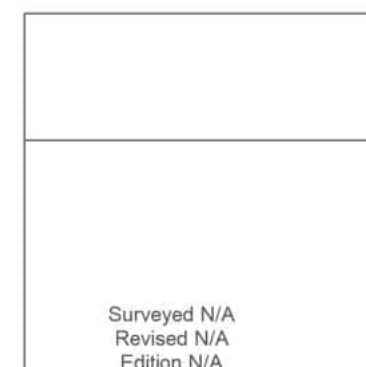
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**Grid Ref:** 503556, 244907

**Map Name:** National Grid

**Map date:** 1979

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1979  
Levelled 1972

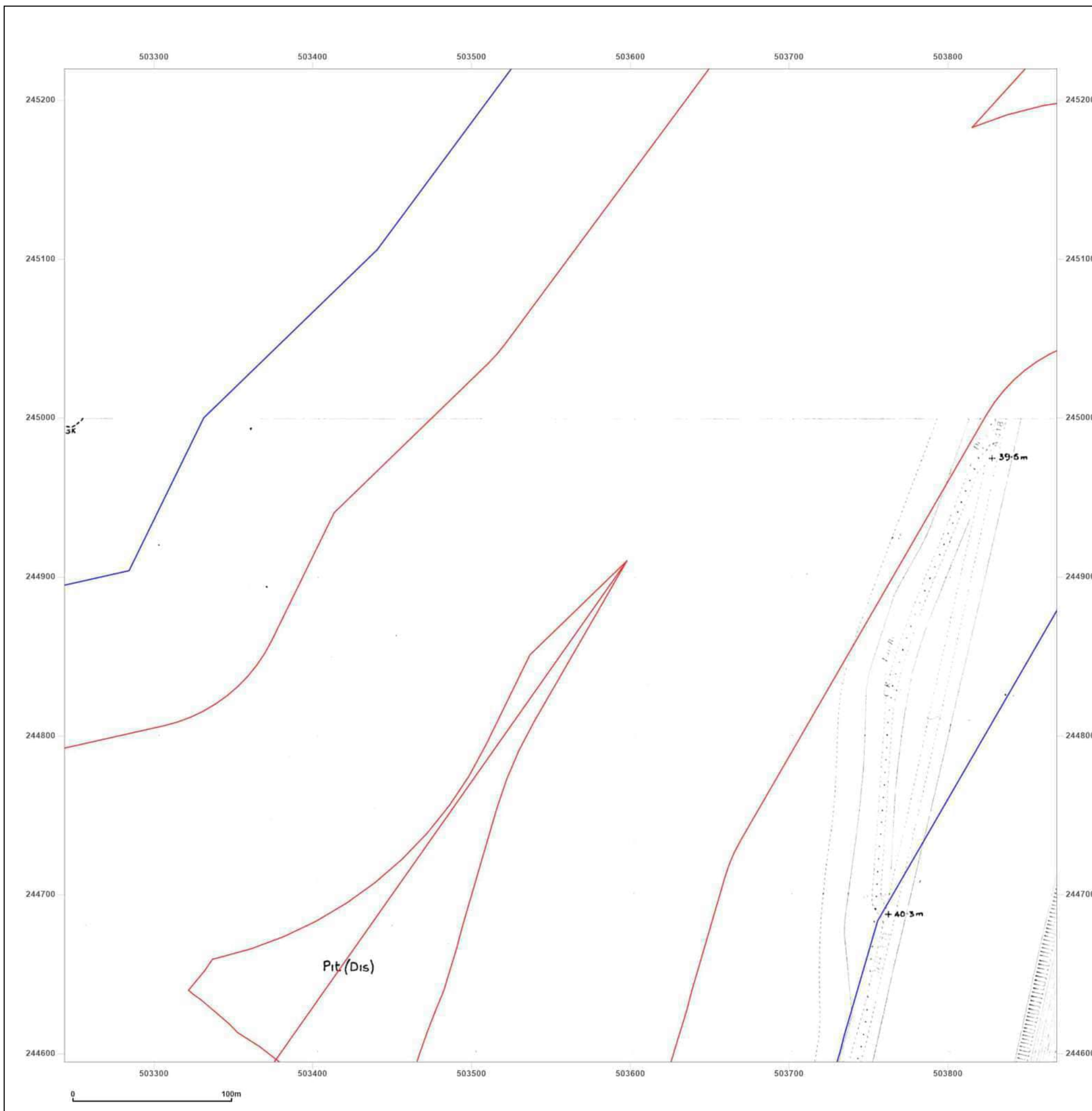


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_4  
Grid Ref: 503556, 244907

Map Name: National Grid

Map date: 1987-1991

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1971  
Revised 1991  
Edition N/A  
Copyright 1991  
Levelled 1971

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1987  
Levelled 1971

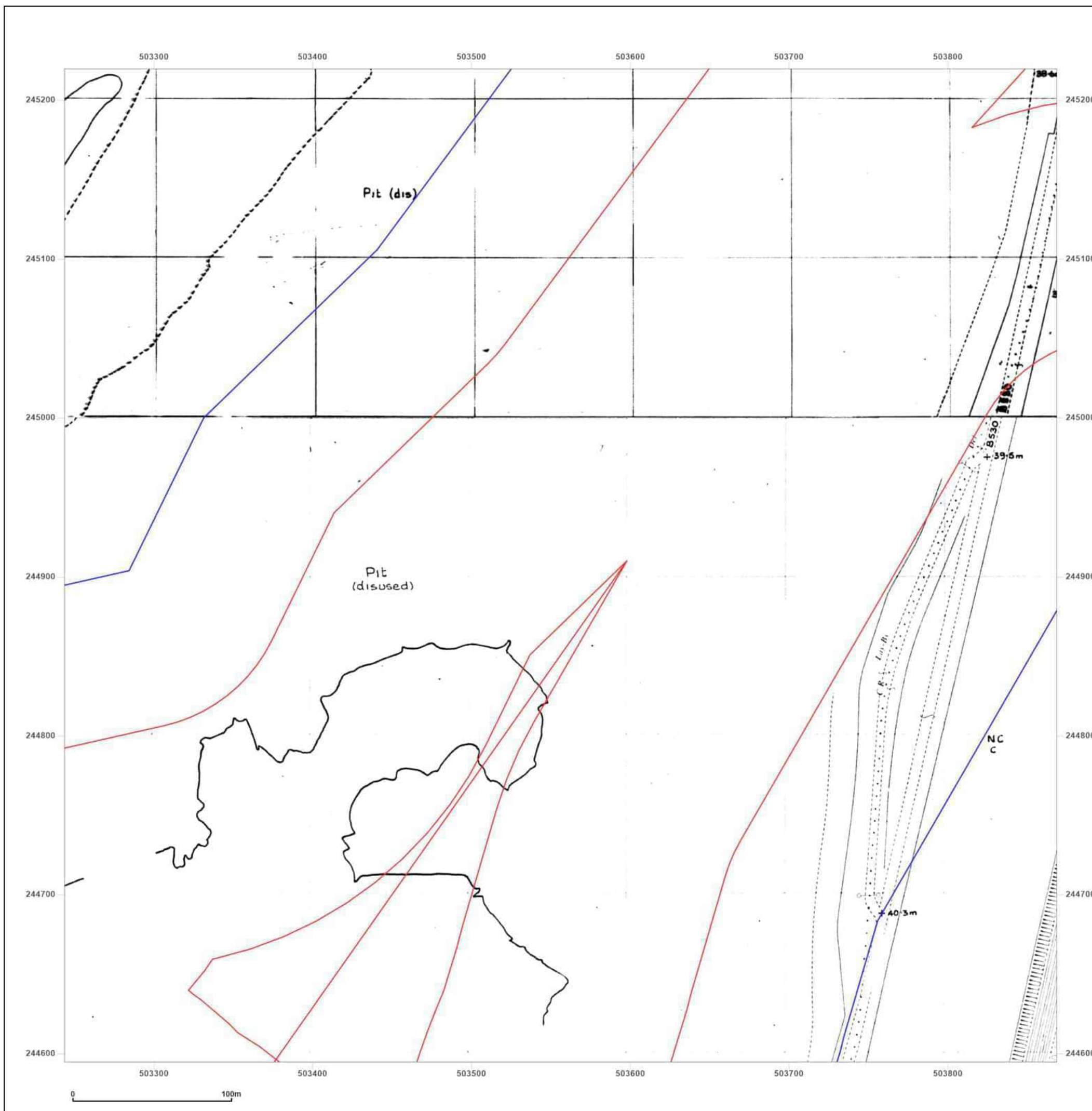


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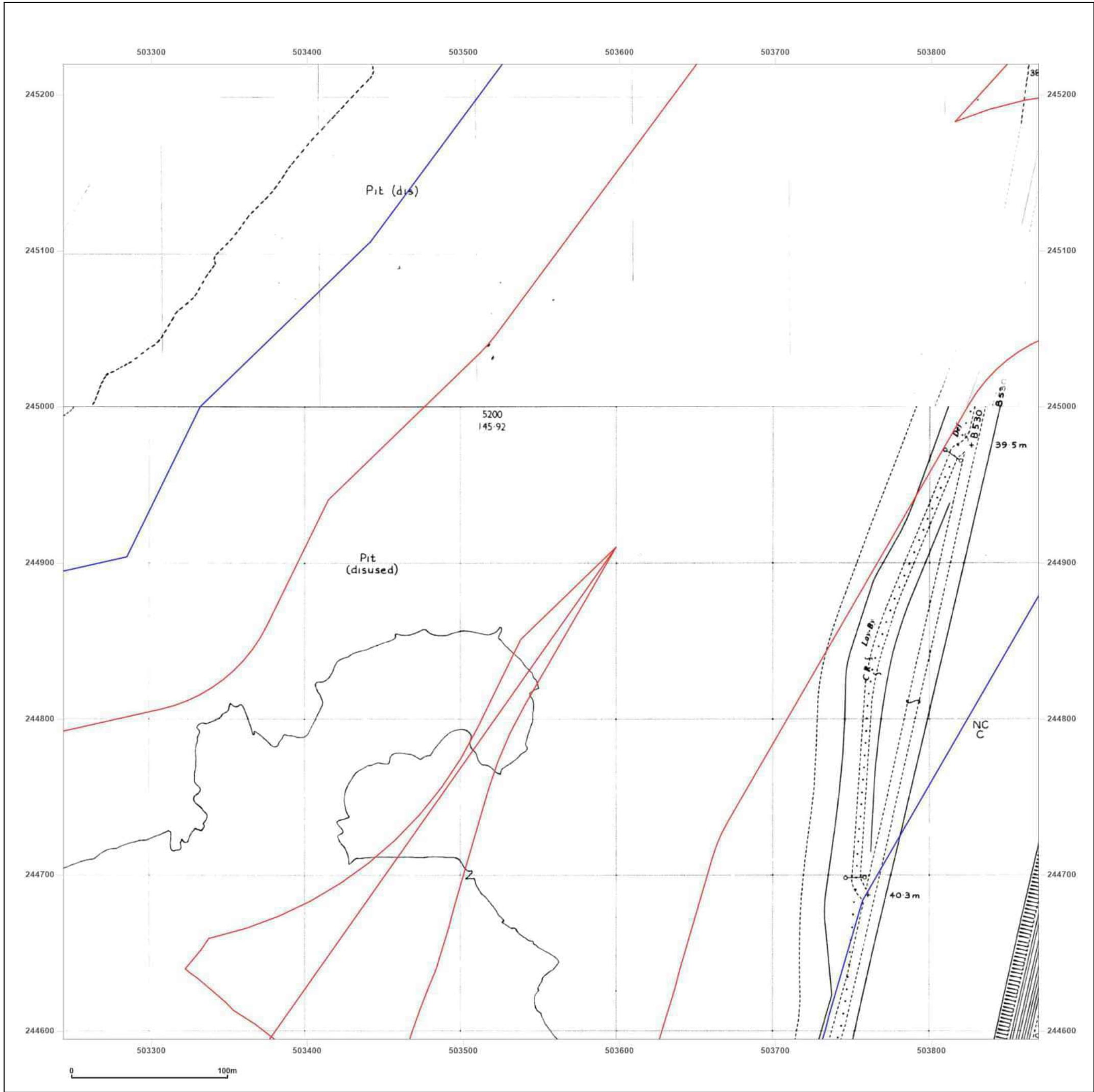
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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
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**Grid Ref:** 503556, 244907

**Map Name:** National Grid  
**Map date:** 1988-1991  
**Scale:** 1:2,500  
**Printed at:** 1:2,500

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W E  
S

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

Surveyed 1971  
Revised 1988  
Edition N/A  
Copyright 1988  
Levelled 1971



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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_4  
Grid Ref: 503556, 244907

Map Name: National Grid

Map date: 1993

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

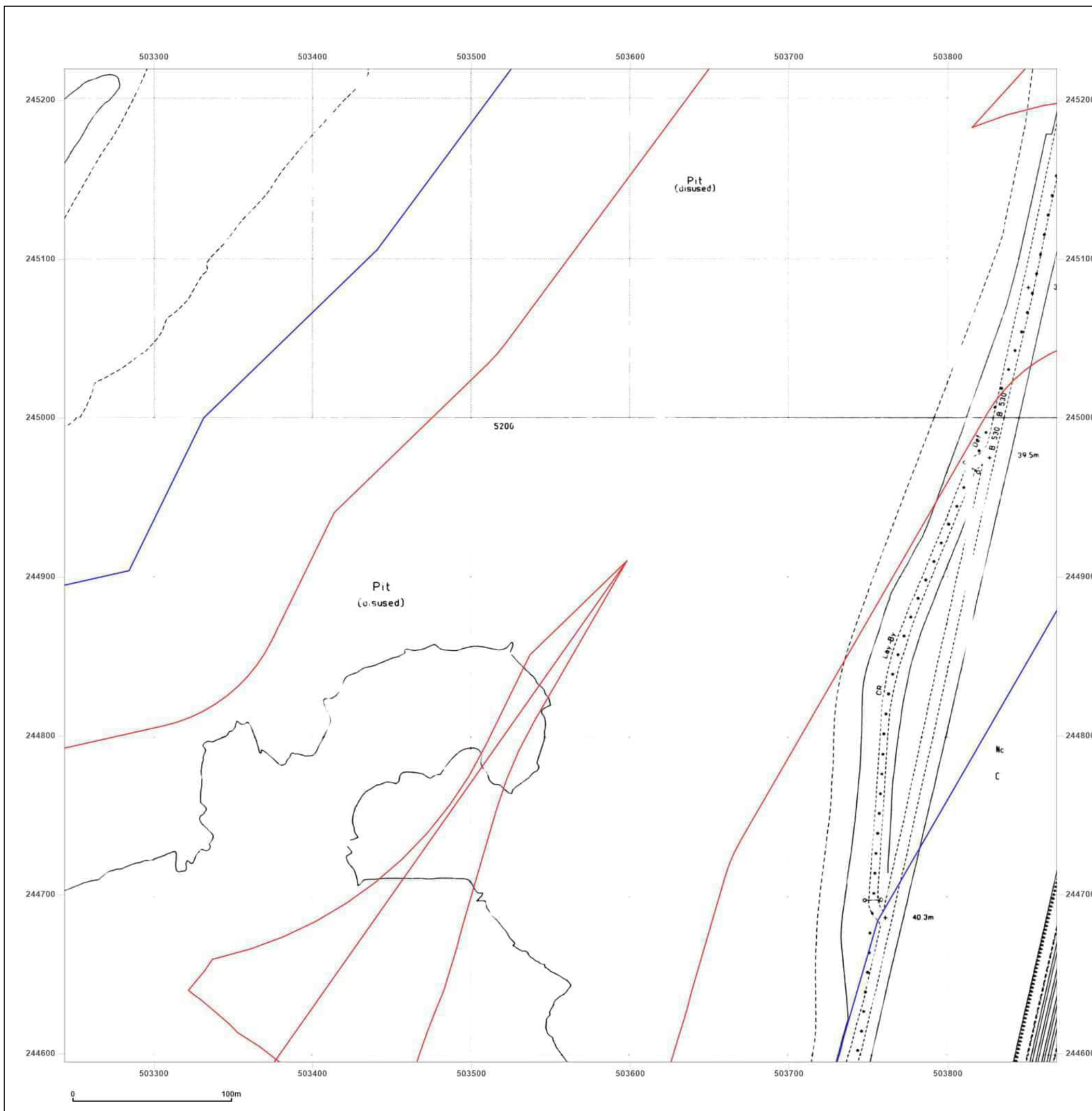


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_5  
**Grid Ref:** 503556, 245532

**Map Name:** County Series

**Map date:** 1883-1884

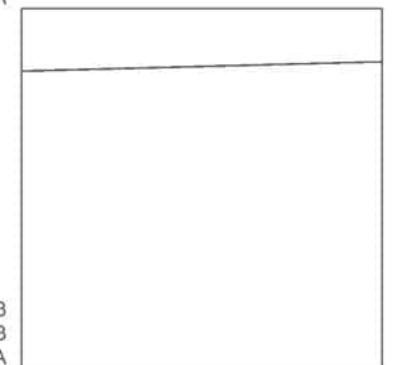
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Surveyed 1884  
Revised 1884  
Edition N/A  
Copyright N/A  
Levelled N/A

Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A

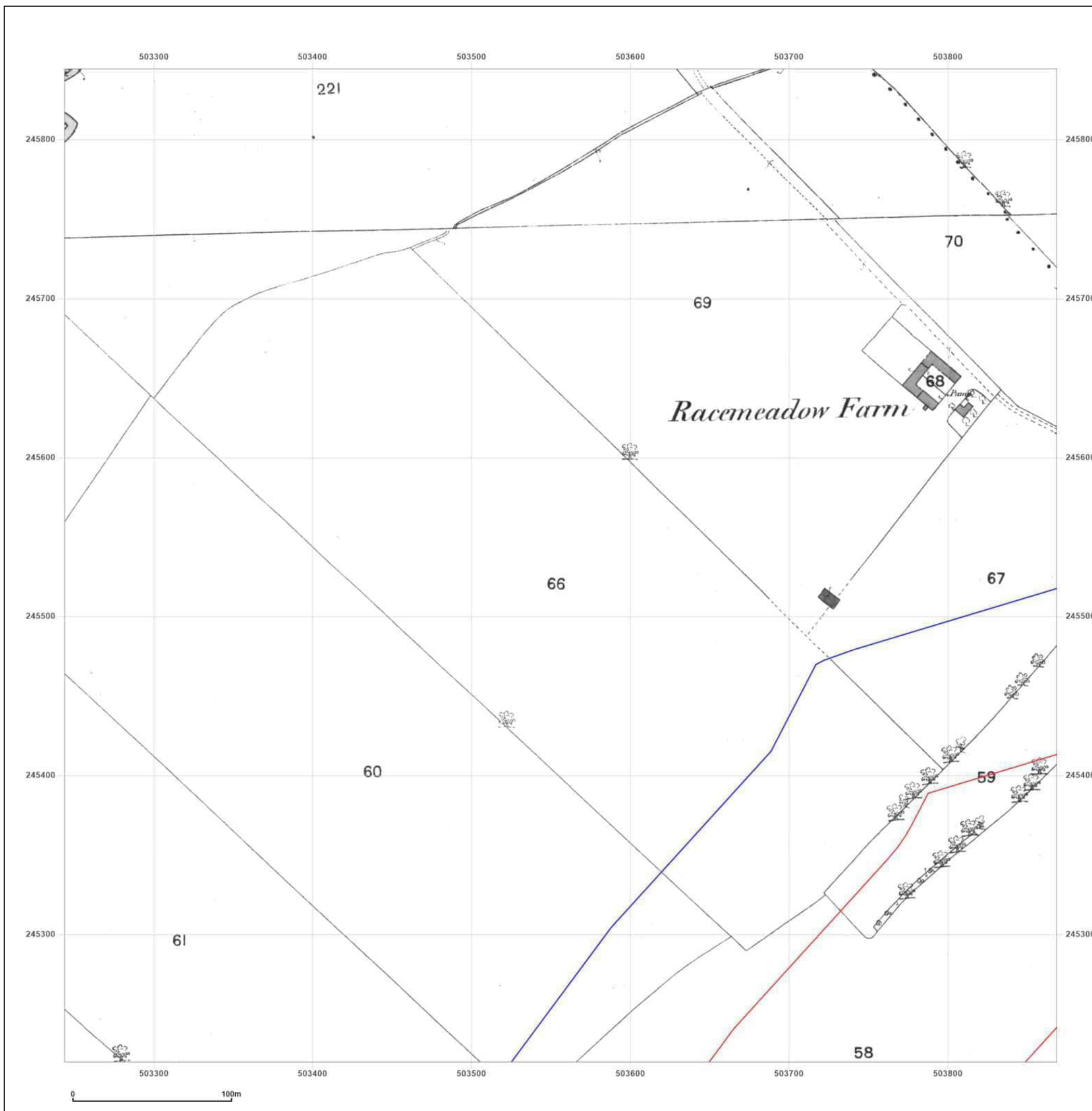


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_5  
**Grid Ref:** 503556, 245532

**Map Name:** County Series

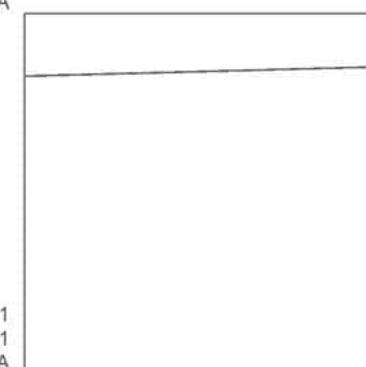
**Map date:** 1901

**Scale:** 1:2,500

**Printed at:** 1:2,500



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



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

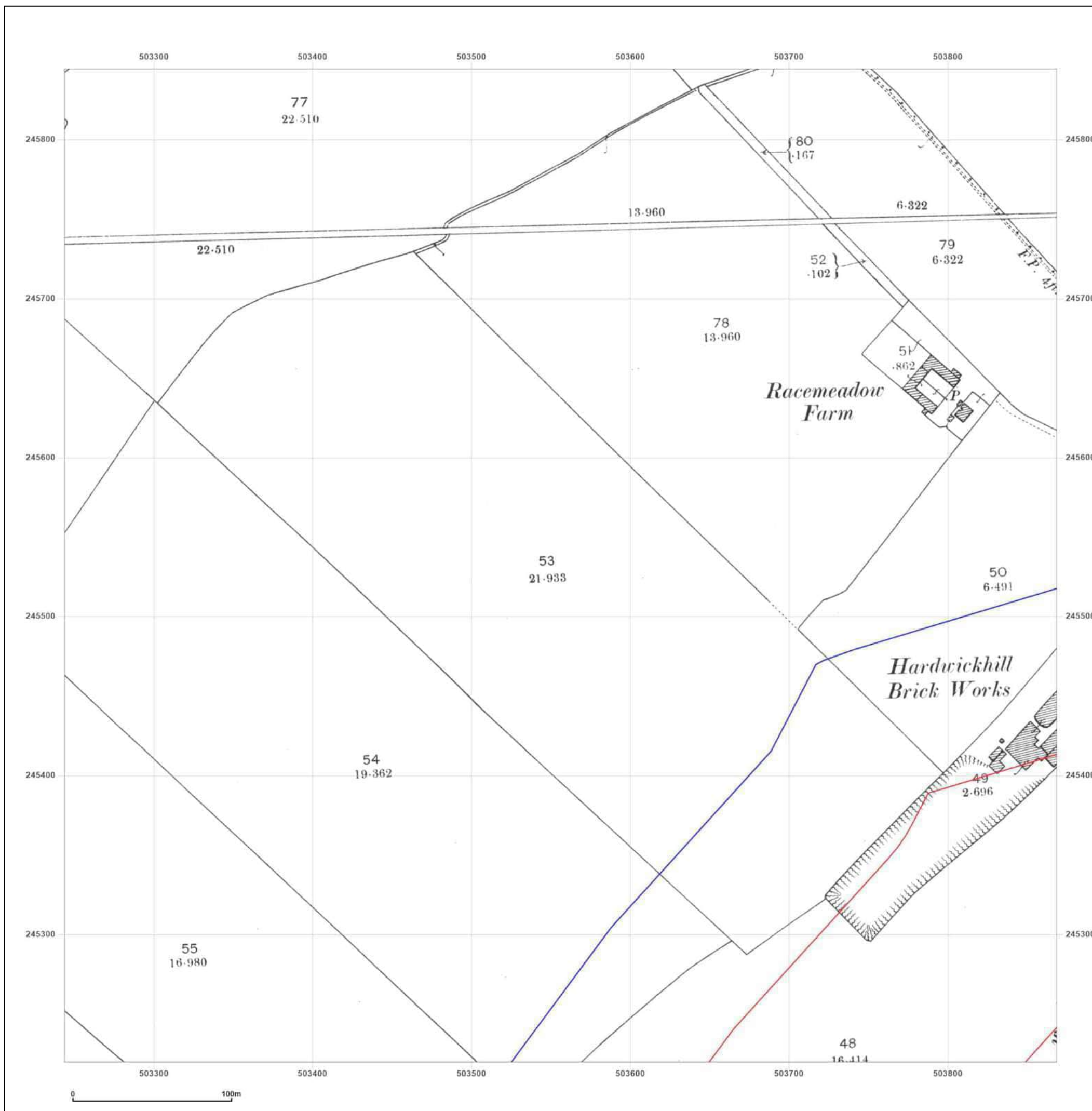


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#### Site Details:

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**Grid Ref:** 503556, 245532

**Map Name:** County Series

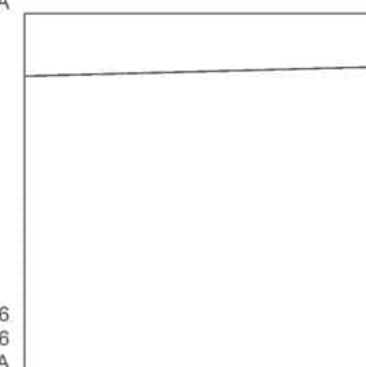
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**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

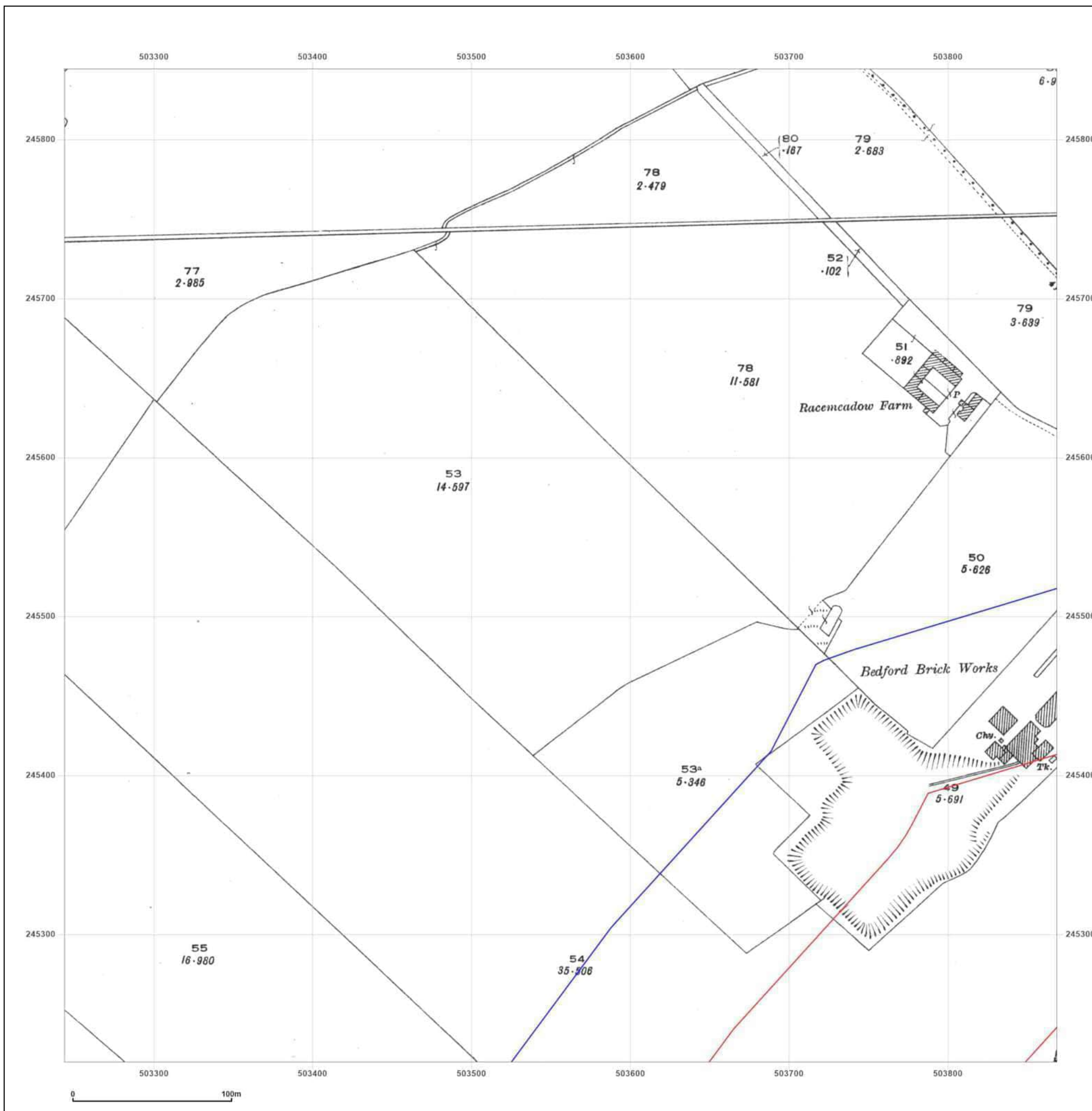


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_5  
**Grid Ref:** 503556, 245532

**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

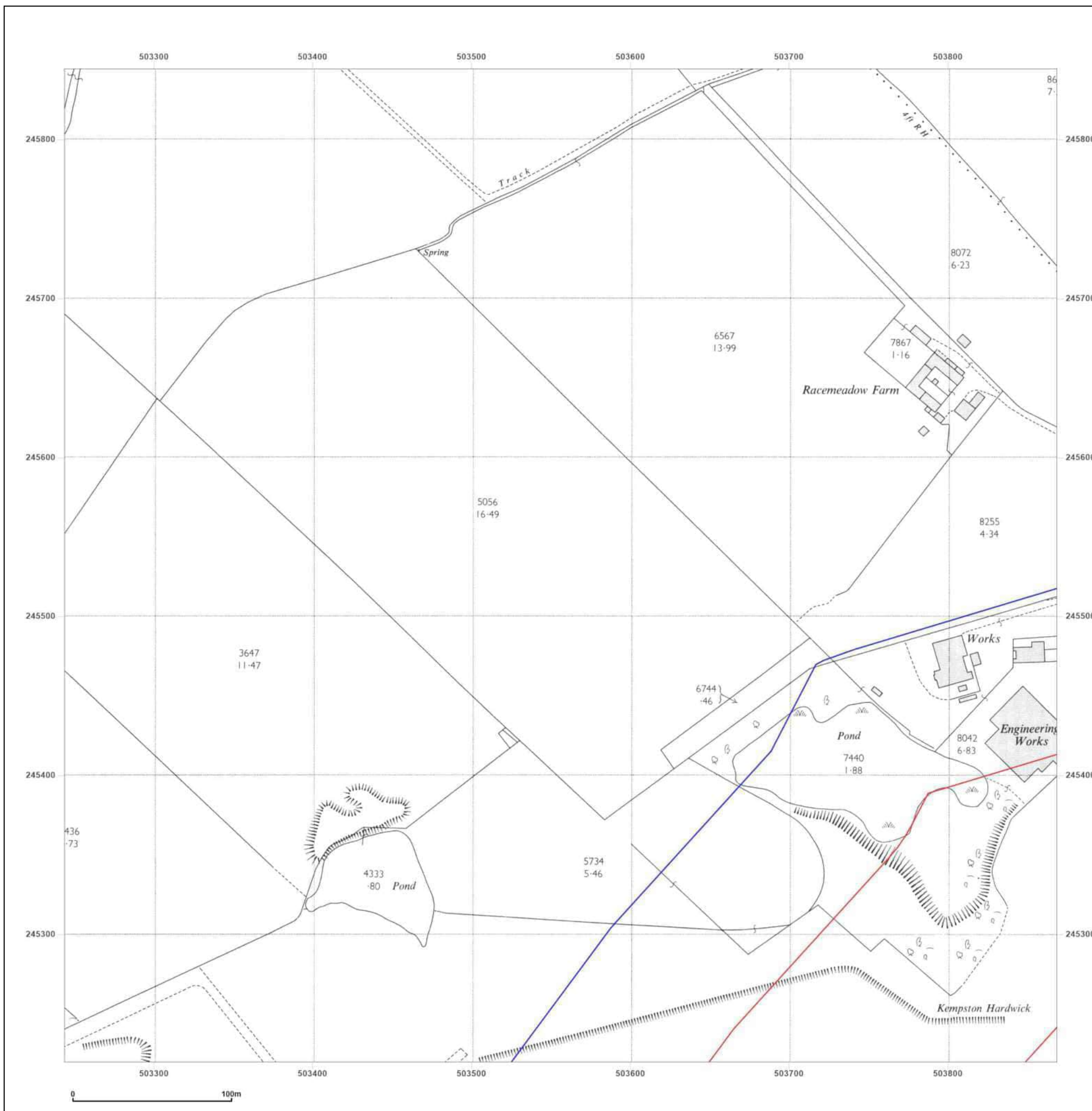


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_5  
**Grid Ref:** 503556, 245532

**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

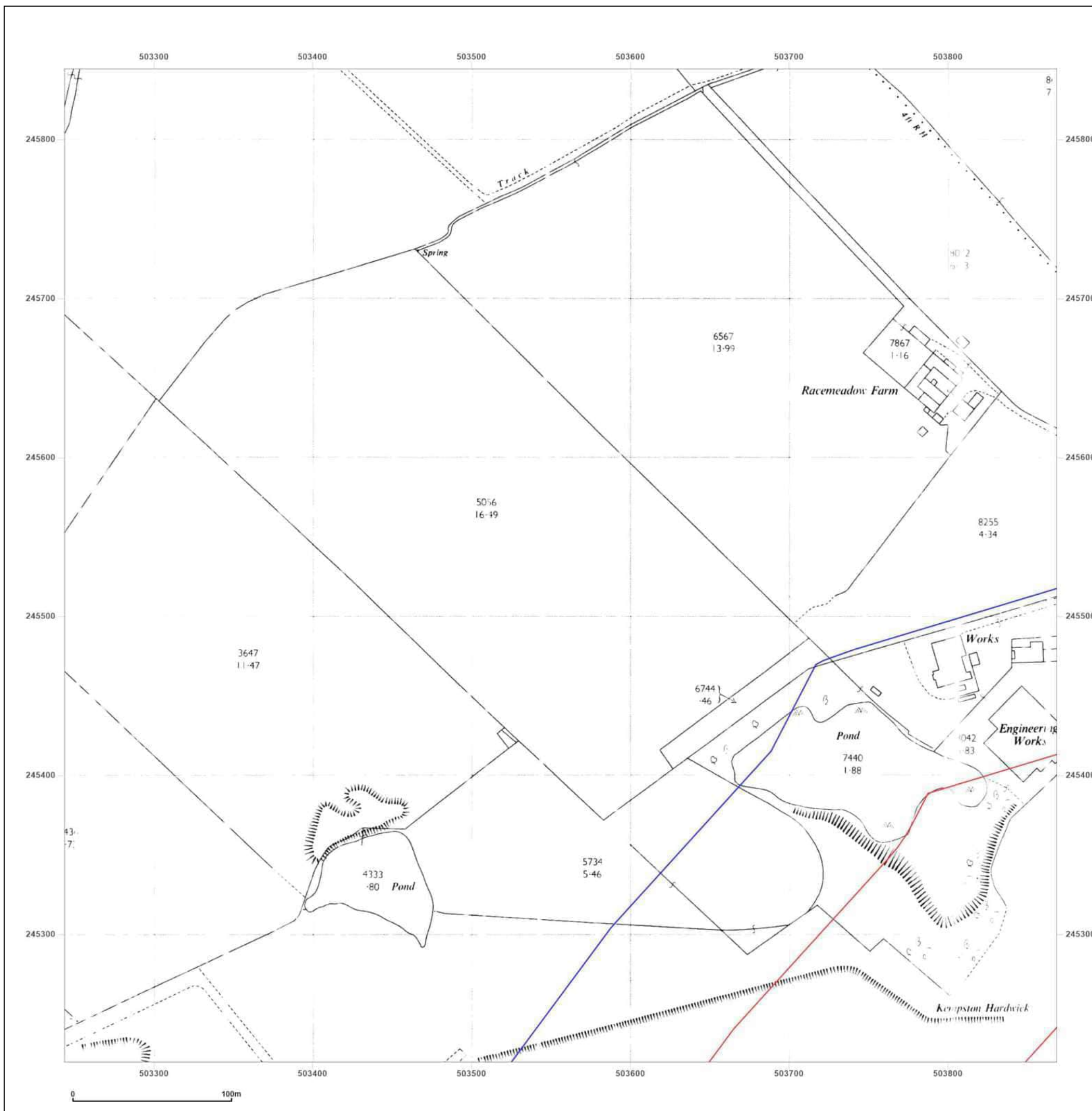


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_5  
**Grid Ref:** 503556, 245532

**Map Name:** National Grid

**Map date:** 1991

**Scale:** 1:2,500

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Surveyed 1971  
Revised 1991  
Edition N/A  
Copyright 1991  
Levelled 1971

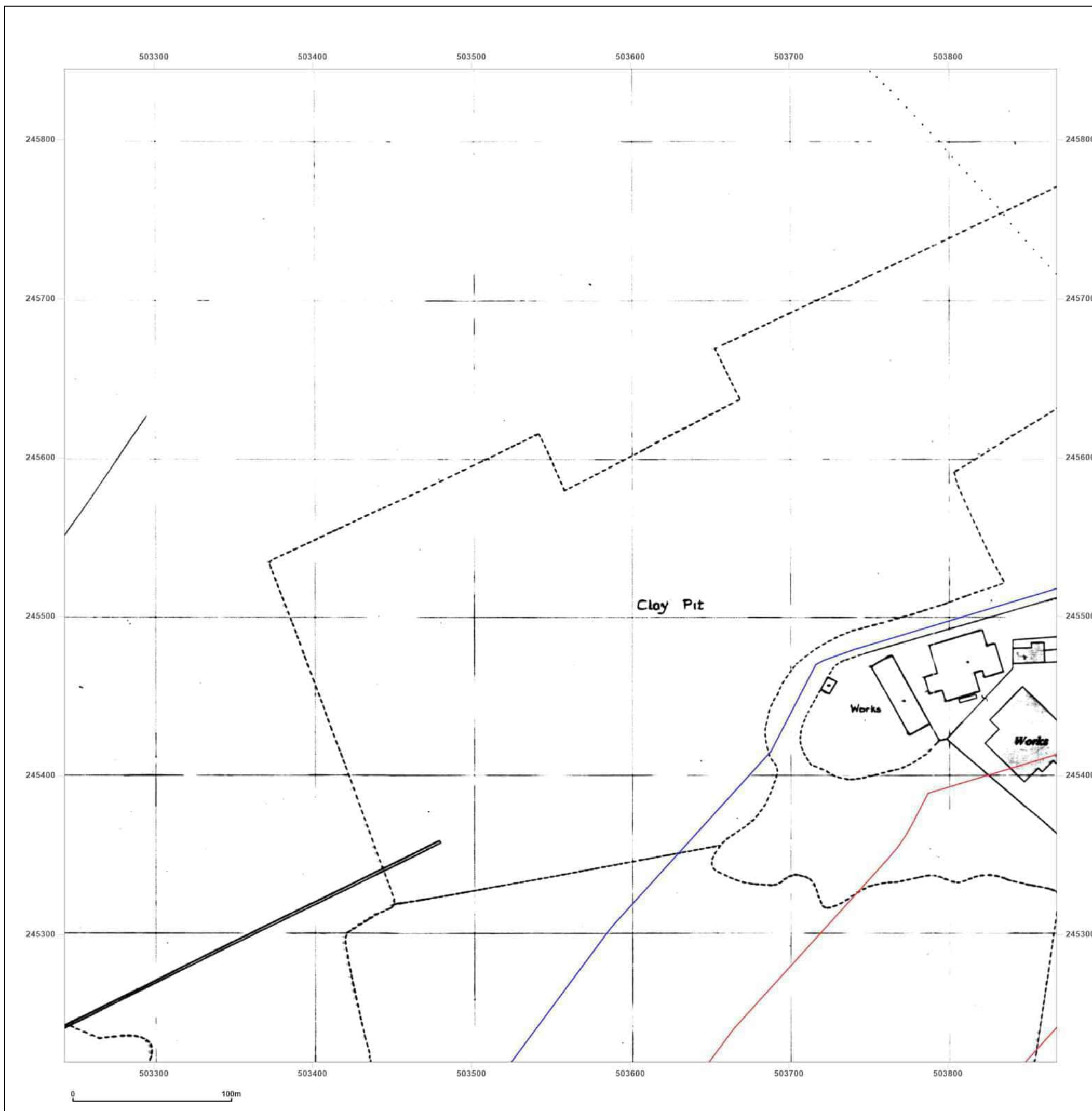


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_5  
Grid Ref: 503556, 245532

Map Name: National Grid

Map date: 1991

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

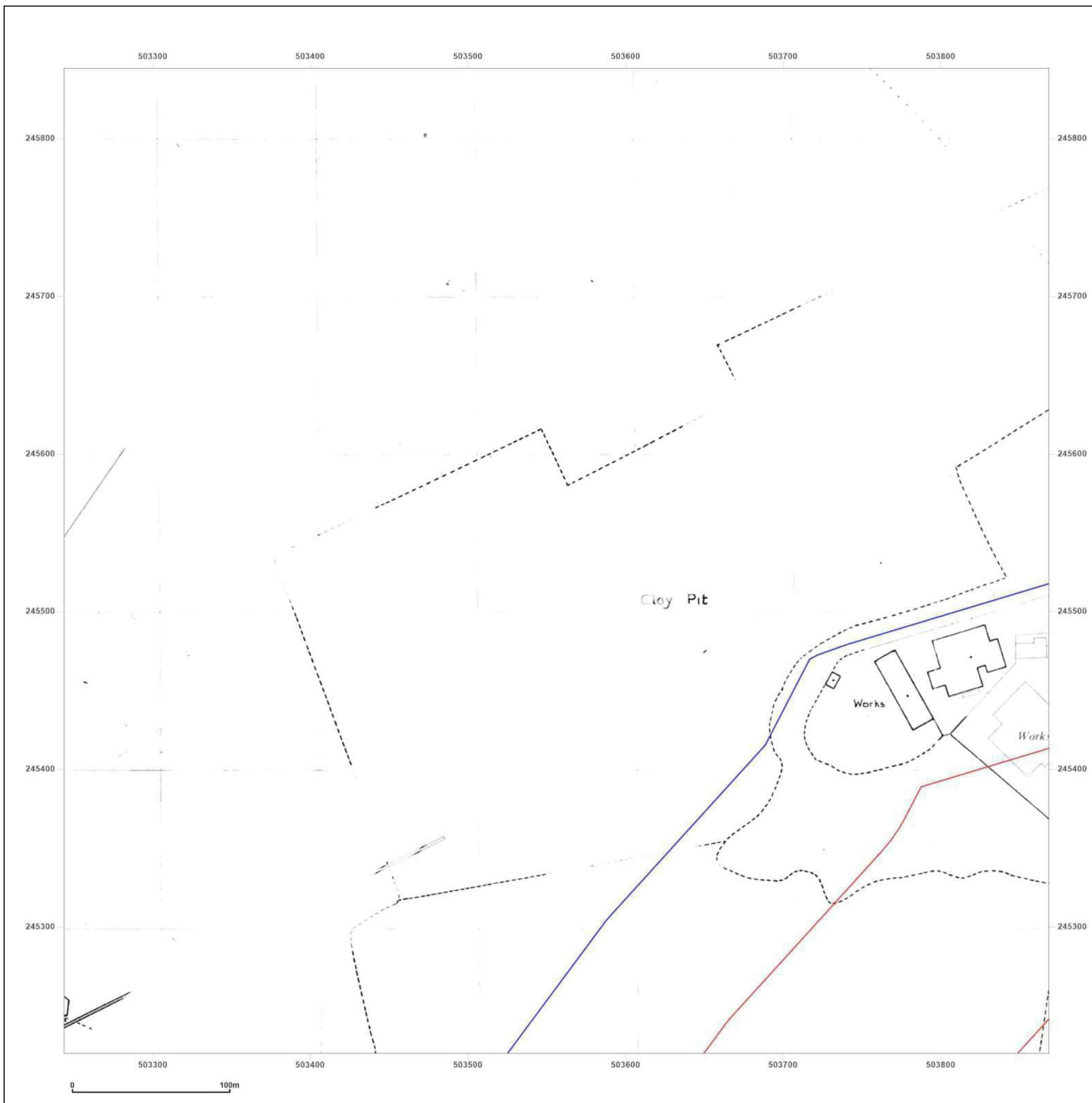


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_5  
Grid Ref: 503556, 245532

Map Name: National Grid

Map date: 1993

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

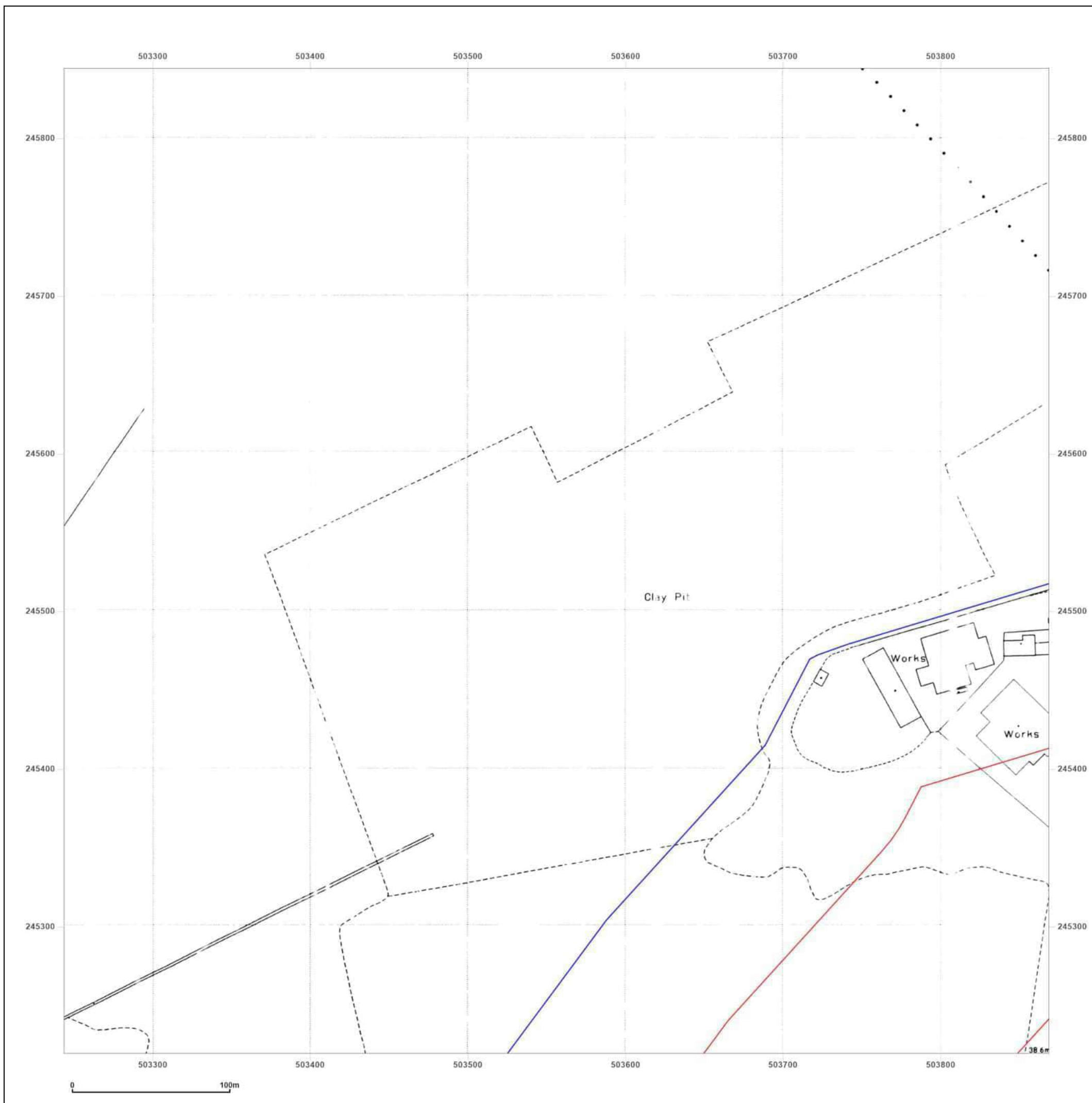


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** County Series

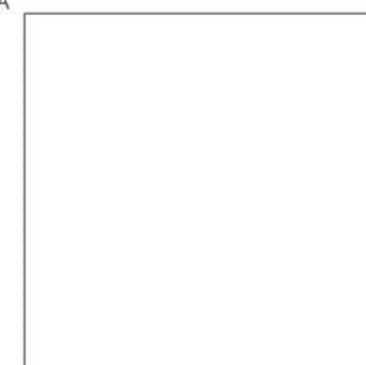
**Map date:** 1884

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1884  
Revised 1884  
Edition N/A  
Copyright N/A  
Levelled N/A

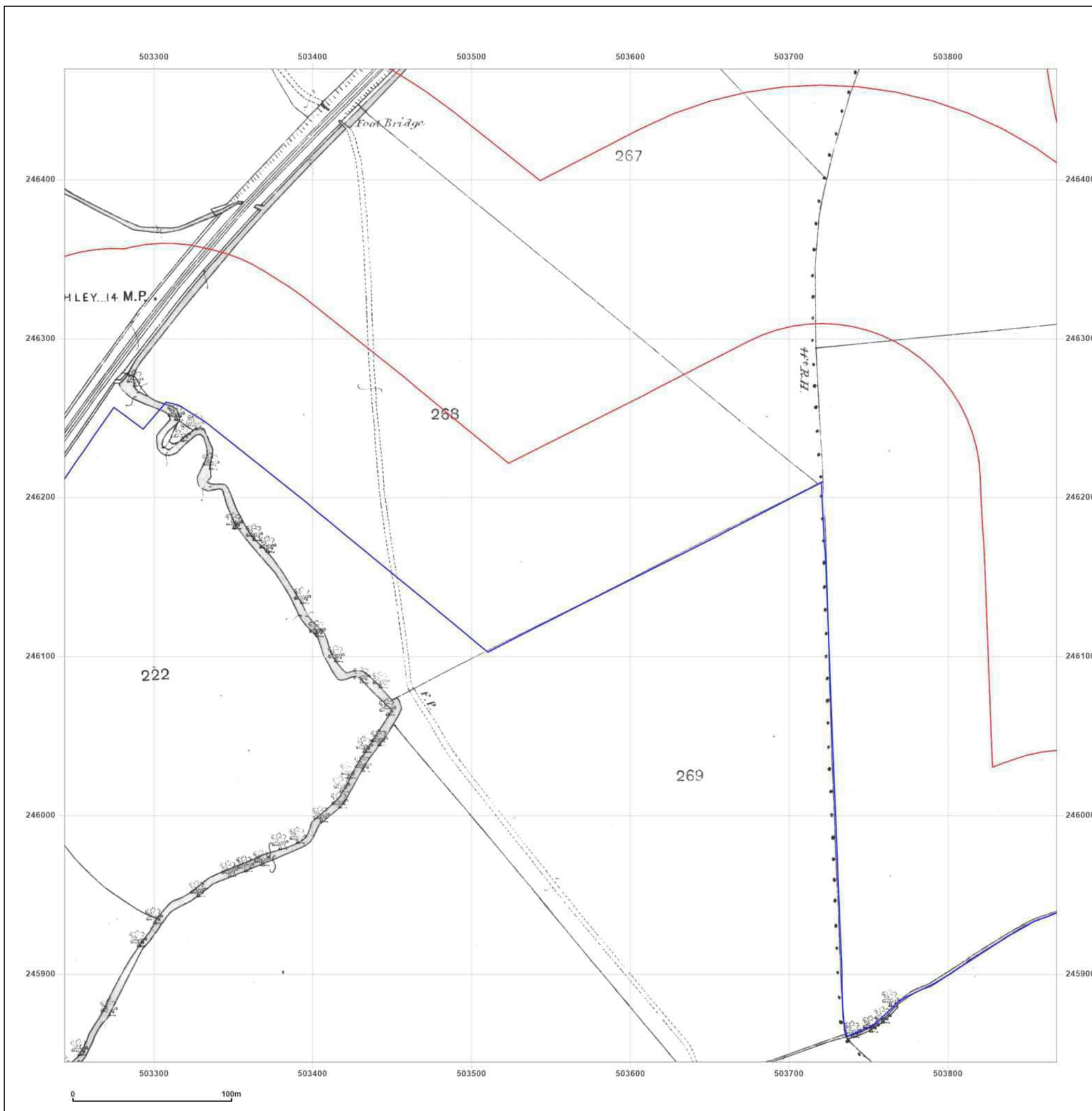


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_6\_6  
Grid Ref: 503556, 246157

Map Name: County Series

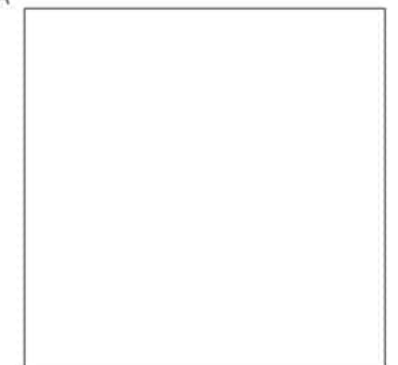
Map date: 1901

Scale: 1:2,500

Printed at: 1:2,500



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

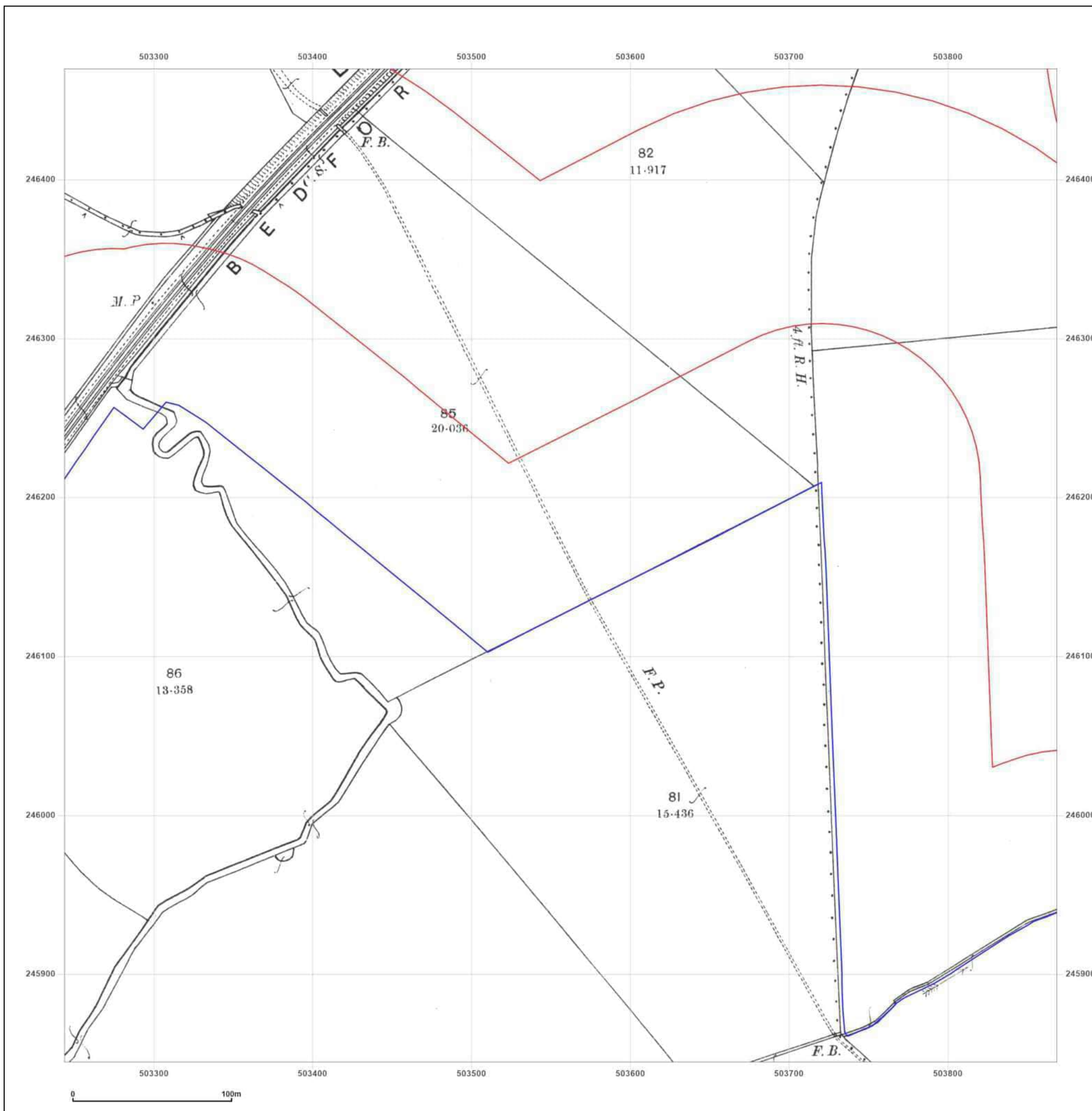


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** County Series

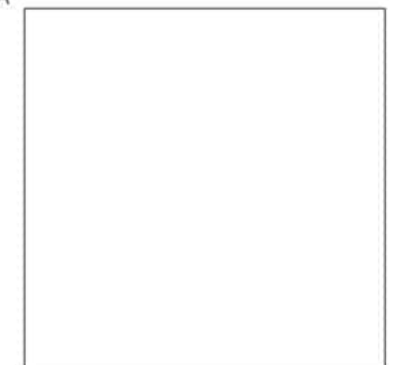
**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
Revised 1926  
Edition N/A  
Copyright N/A  
Levelled N/A

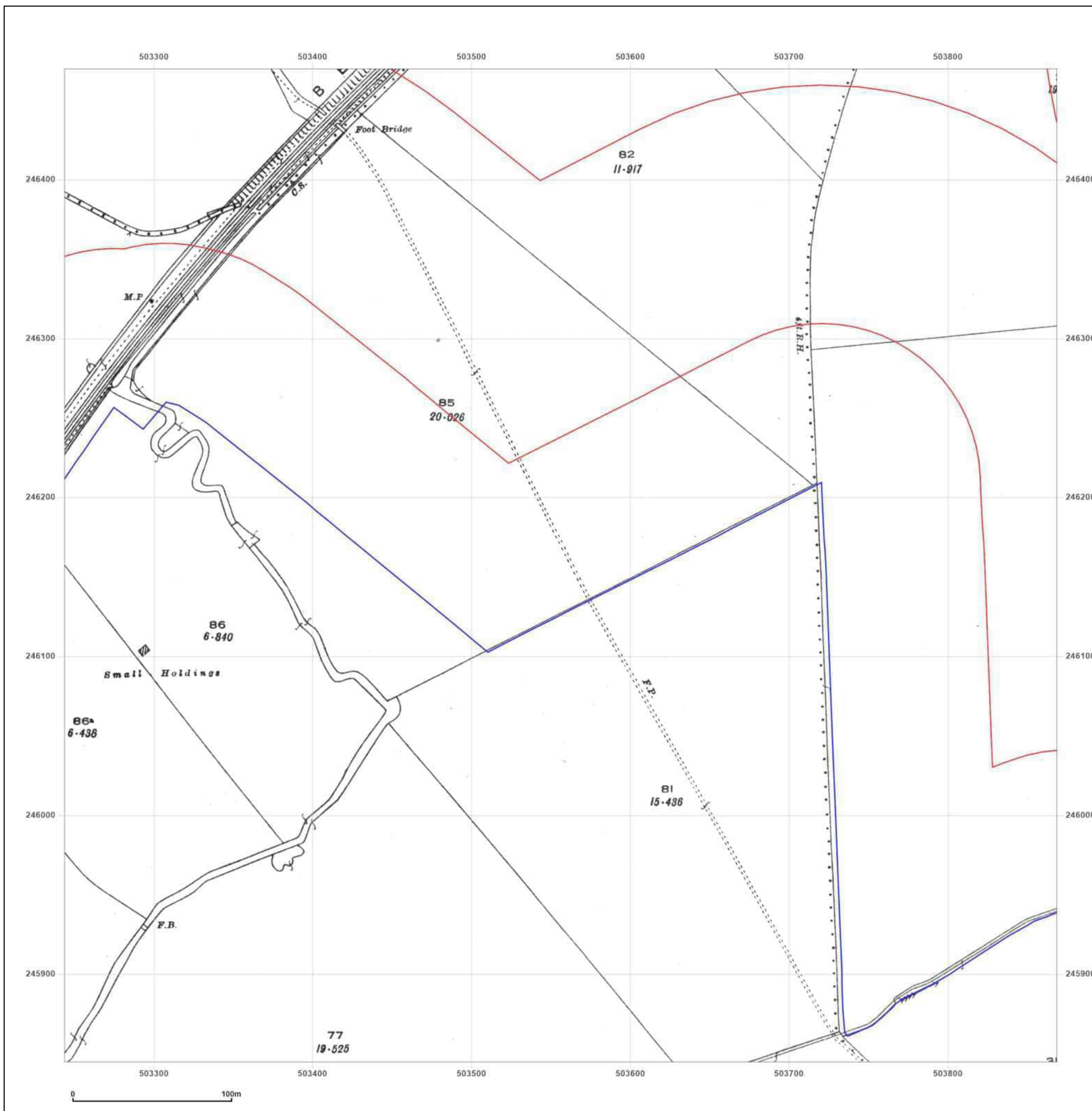


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# Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:2,500

**Printed at:** 1:2,500



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

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

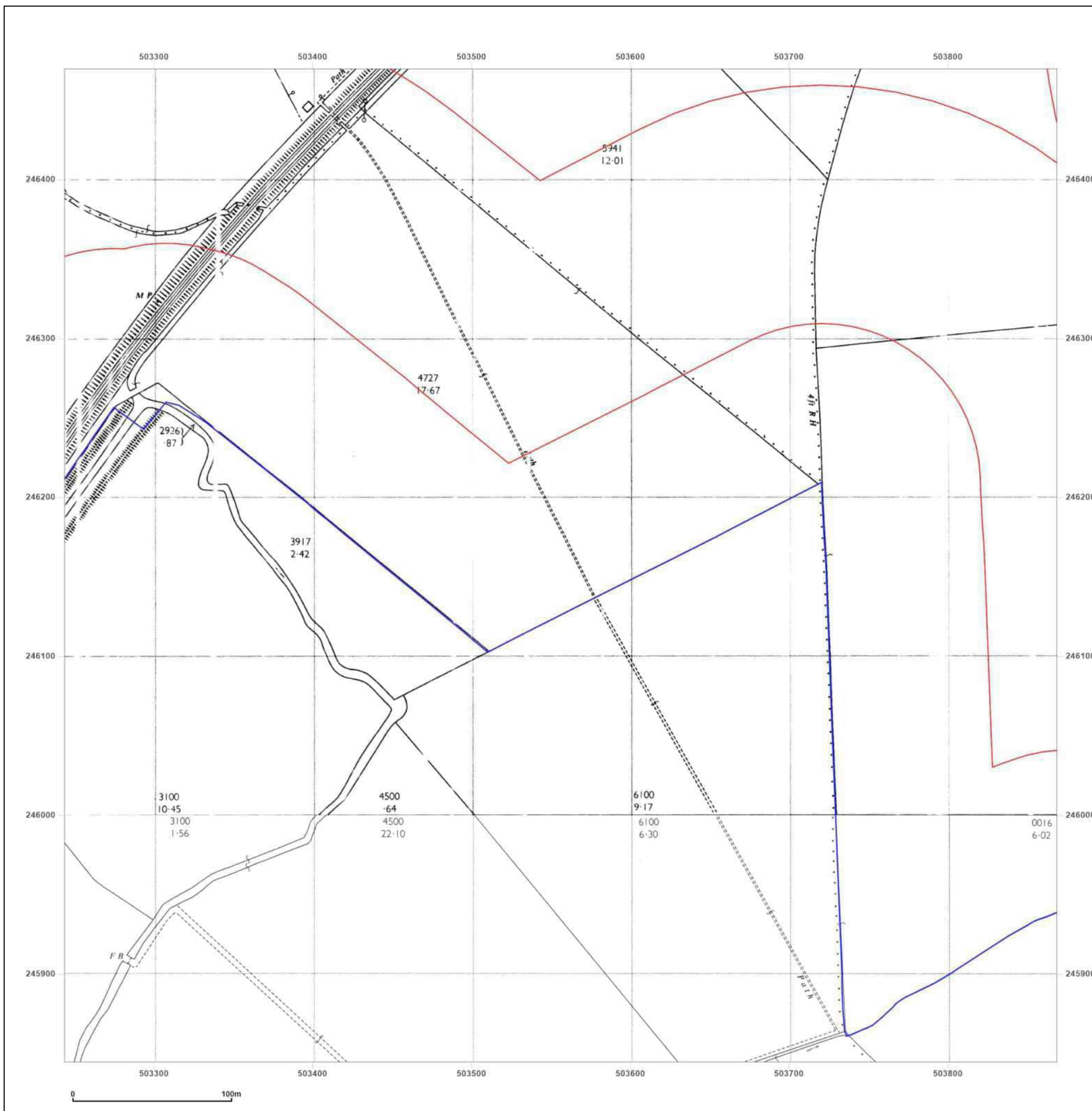


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** National Grid

**Map date:** 1968-1969

**Scale:** 1:2,500

**Printed at:** 1:2,500



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

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

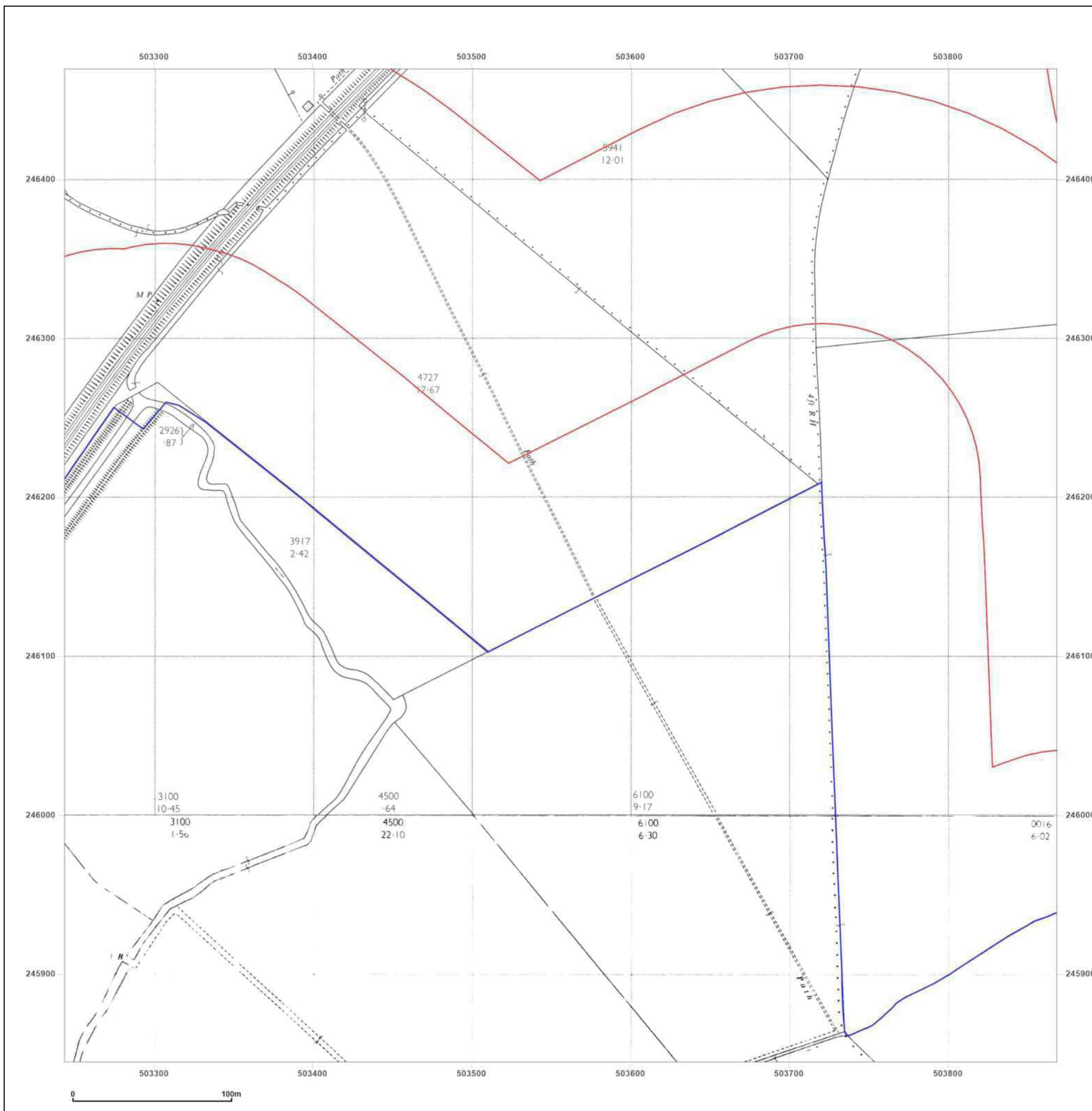


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** National Grid

**Map date:** 1990-1991

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1971  
 Revised 1990  
 Edition N/A  
 Copyright 1990  
 Levelled 1971

Surveyed 1971  
 Revised 1991  
 Edition N/A  
 Copyright 1991  
 Levelled 1971

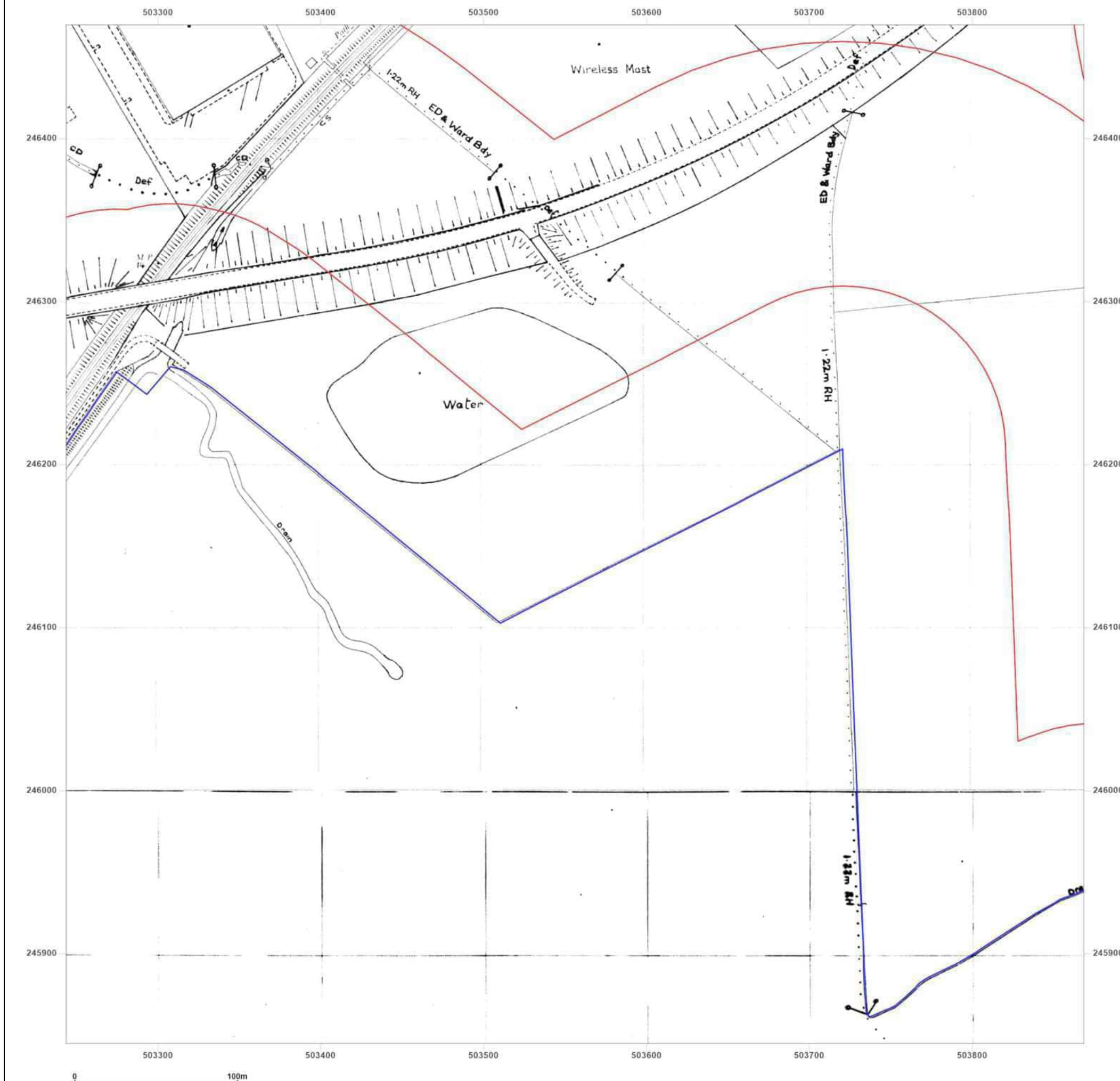


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_6\_6  
**Grid Ref:** 503556, 246157

**Map Name:** National Grid

**Map date:** 1986-1991

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1971  
Revised 1986  
Edition N/A  
Copyright 1986  
Levelled 1971

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

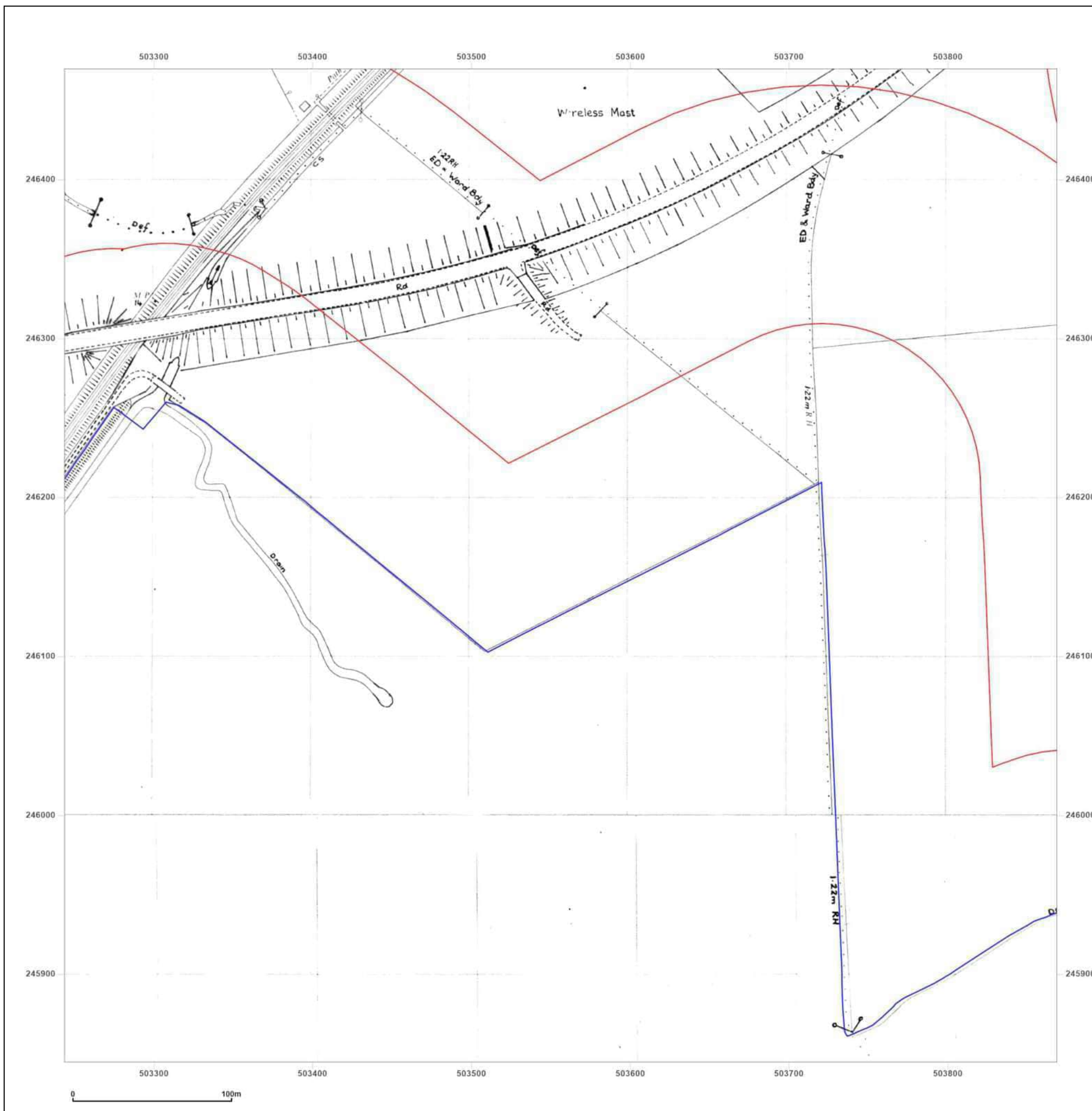


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_3  
**Grid Ref:** 504181, 244282

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1883  
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 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

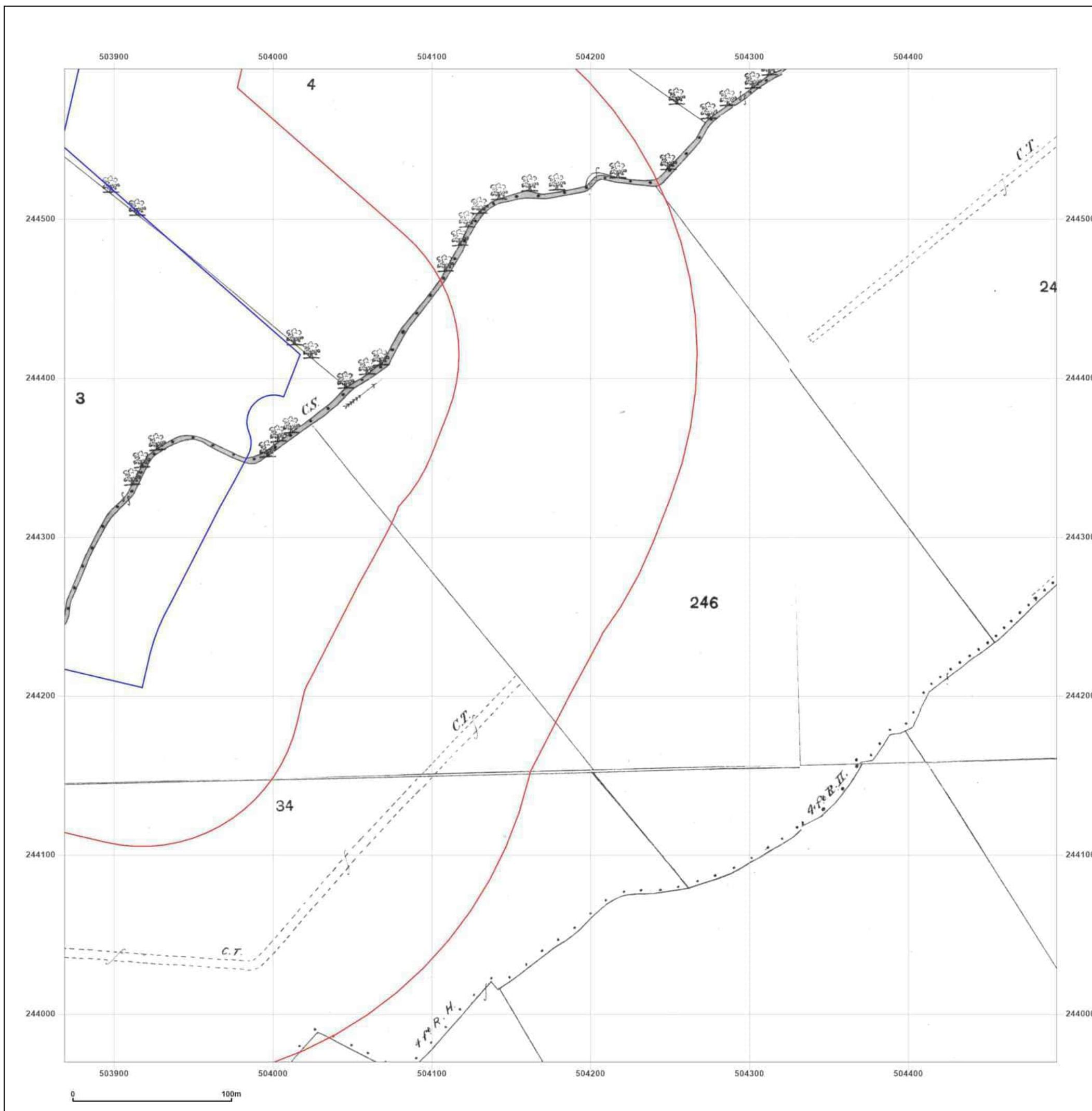


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_3  
**Grid Ref:** 504181, 244282

**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

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

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

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

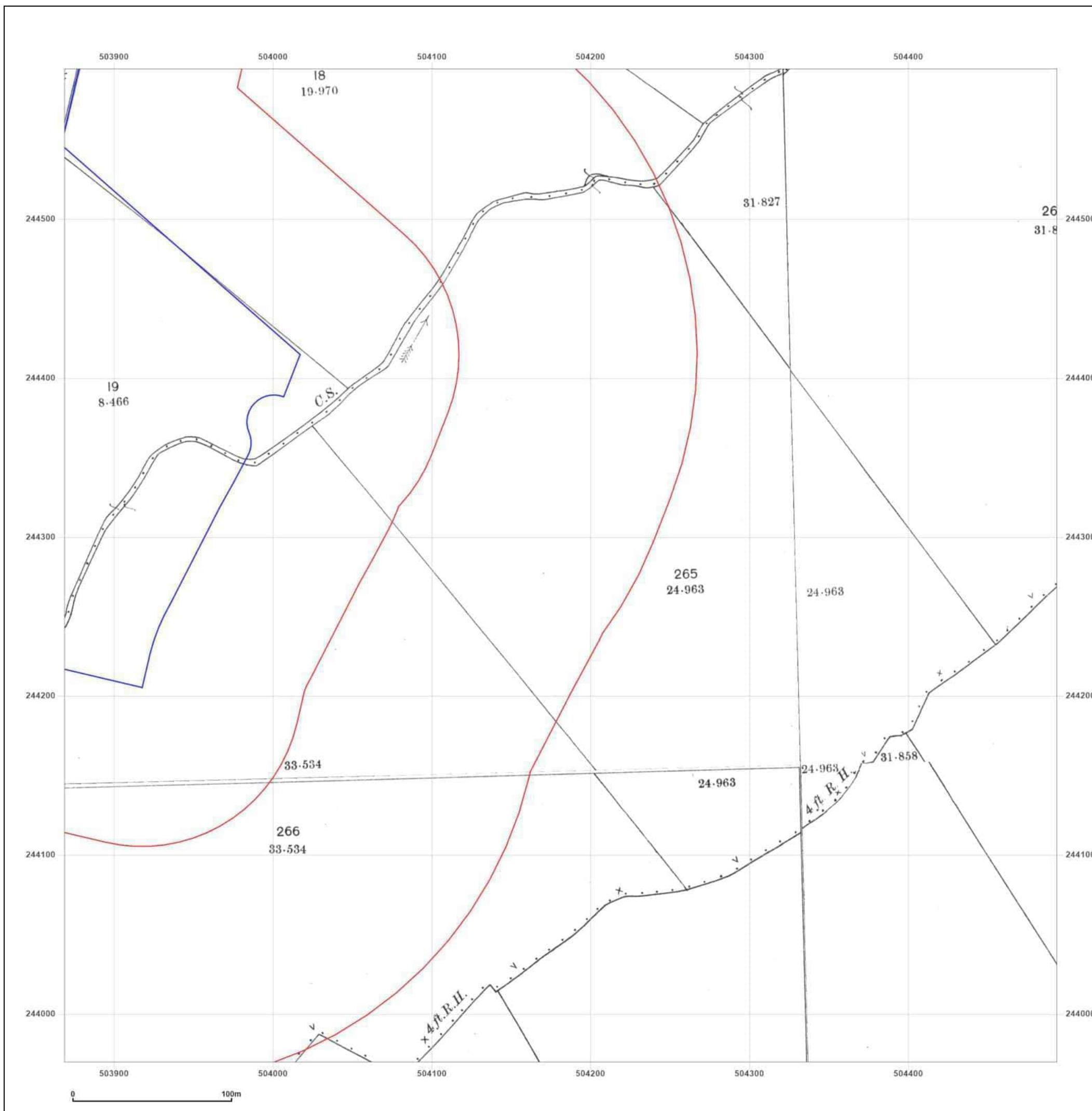


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_3  
**Grid Ref:** 504181, 244282

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1926  
 Revised 1926  
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 Levelled N/A

Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

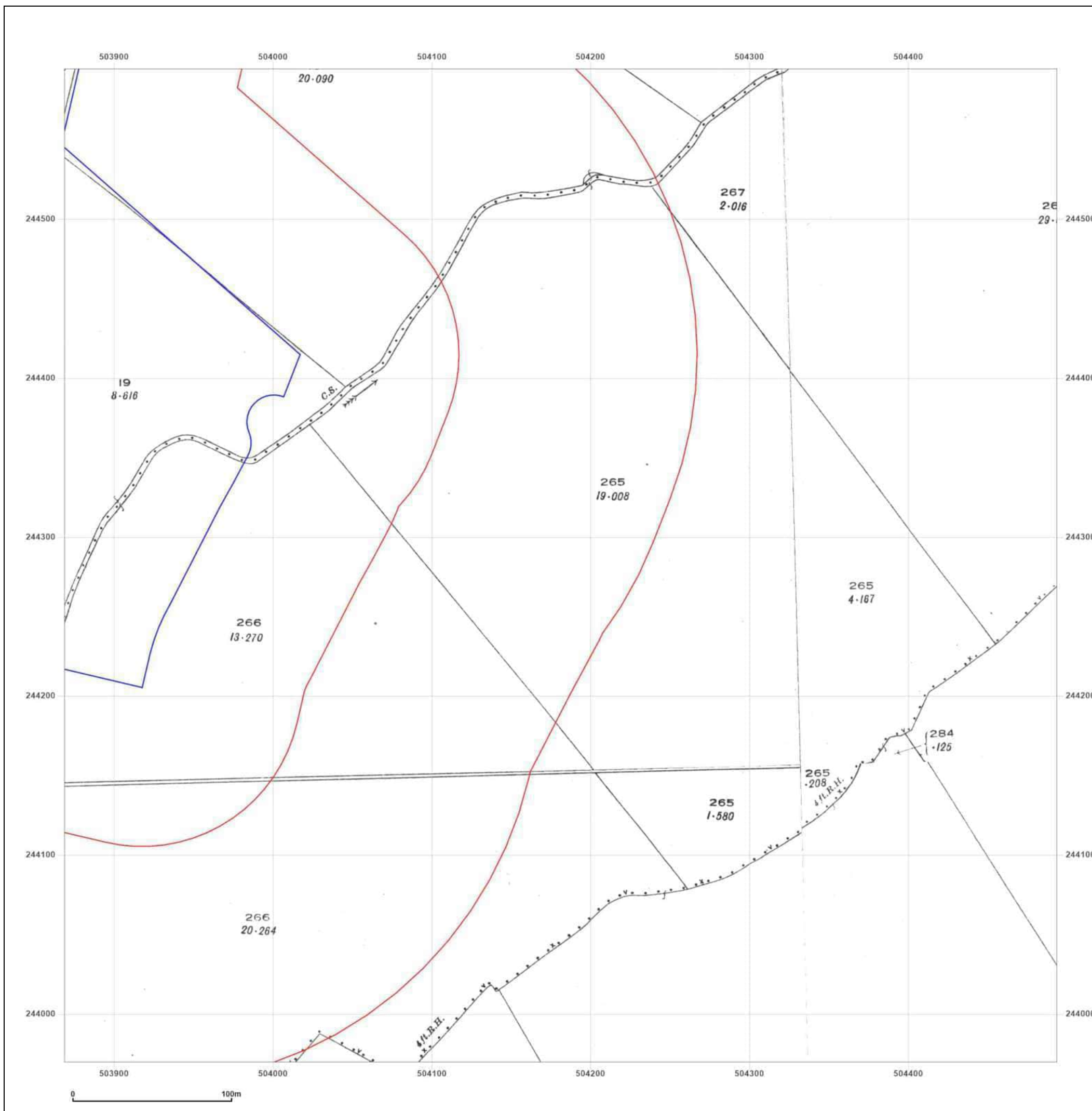


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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_3  
**Grid Ref:** 504181, 244282

**Map Name:** National Grid

**Map date:** 1974-1979

**Scale:** 1:2,500

**Printed at:** 1:2,500



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Revised N/A  
Edition N/A  
Copyright 1979  
Levelled 1972

Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1972

Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1971

Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1972

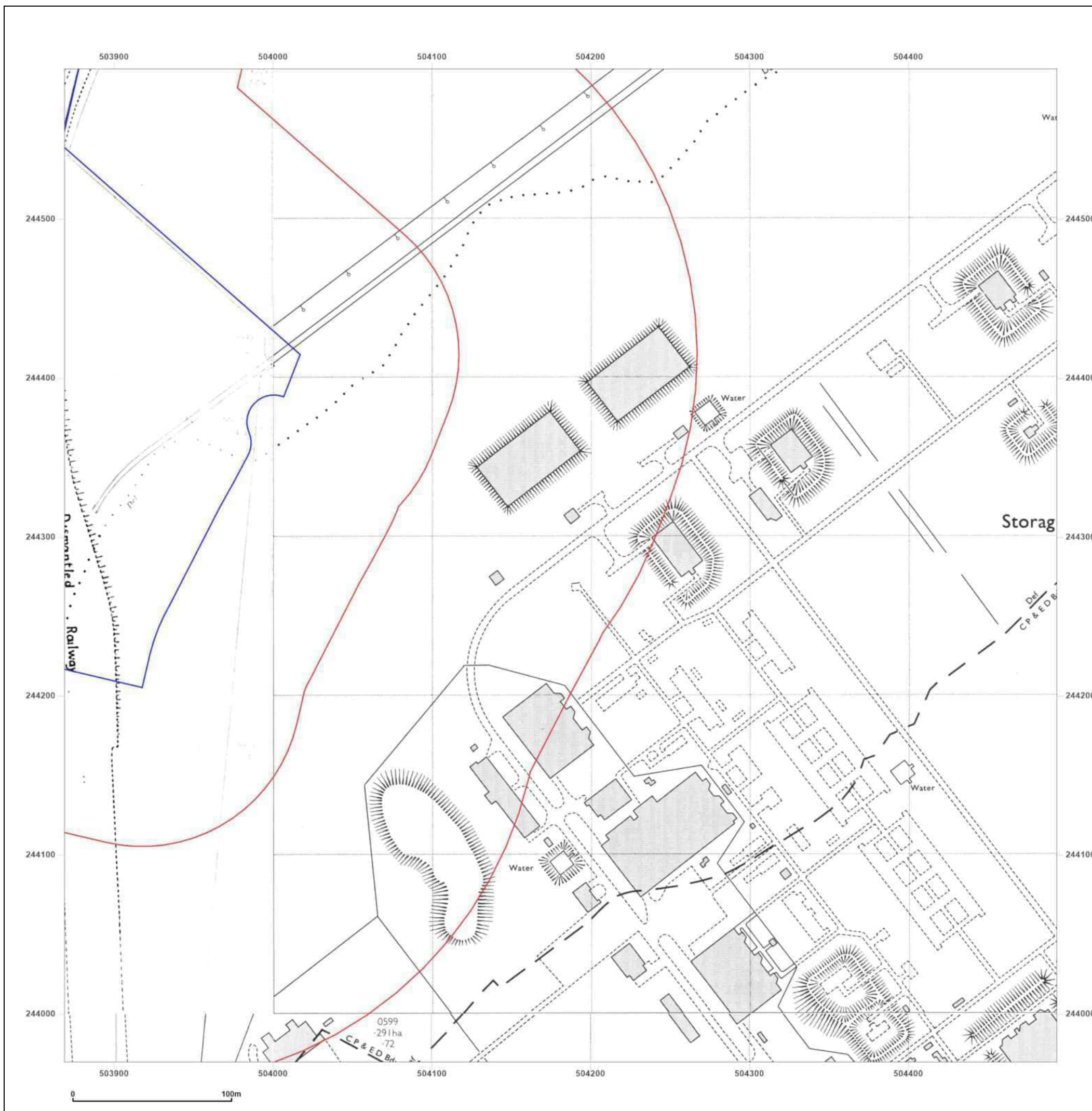


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_7\_3  
Grid Ref: 504181, 244282

Map Name: National Grid

Map date: 1988-1993

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1988  
Edition N/A  
Copyright 1988  
Levelled 1971

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Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed 1993  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

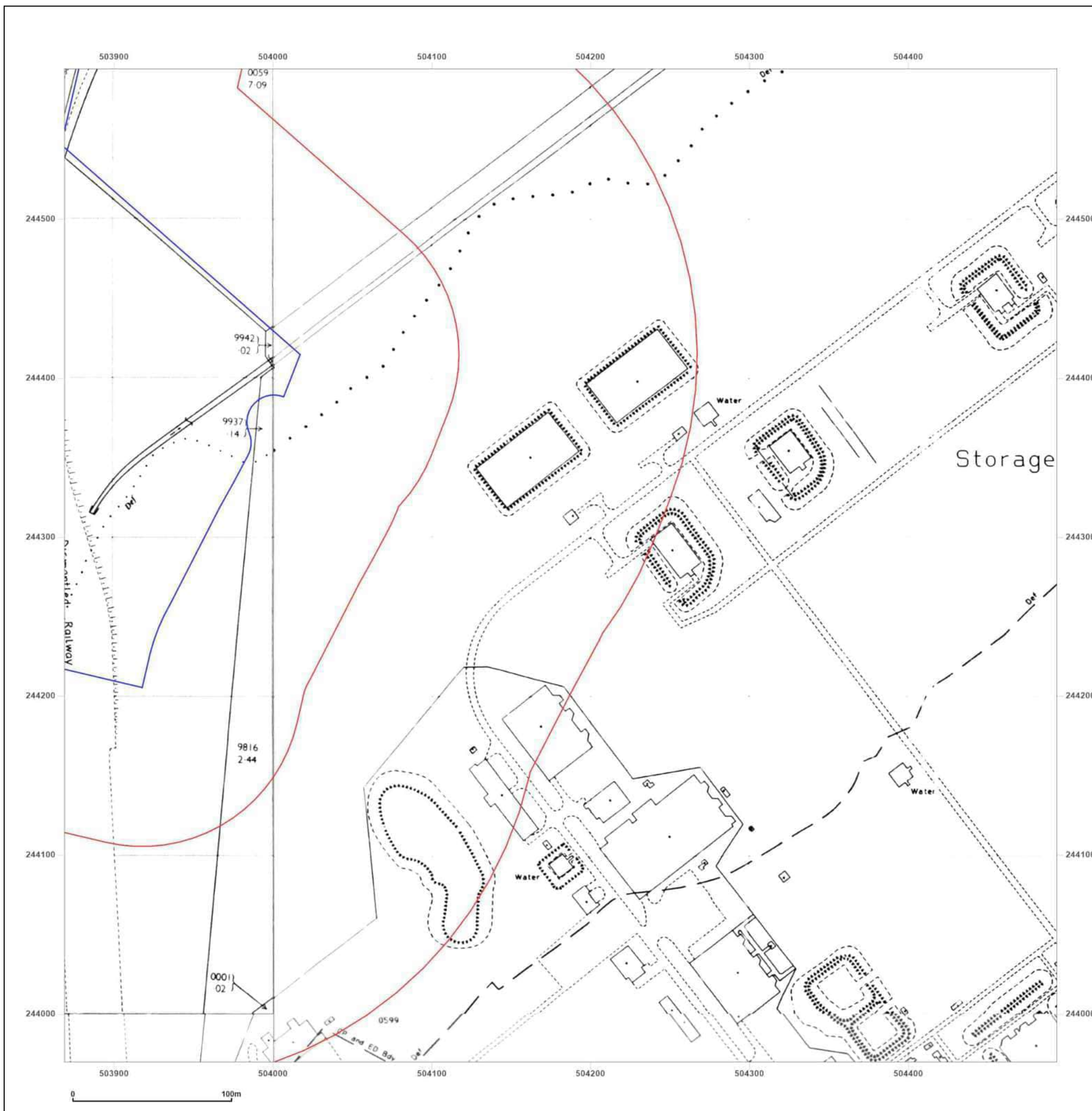


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_4  
**Grid Ref:** 504181, 244907

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

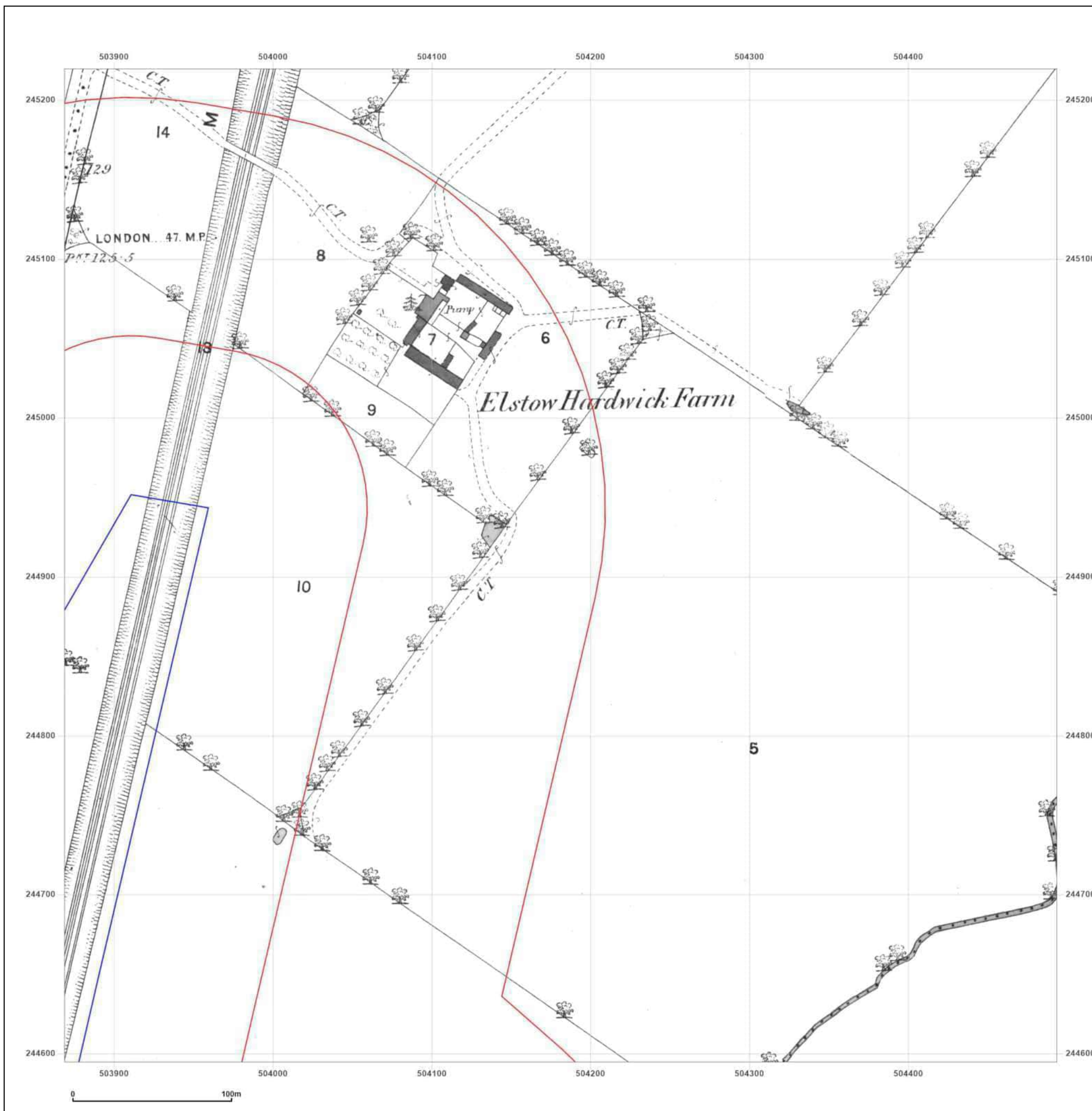


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_4  
**Grid Ref:** 504181, 244907

**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

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

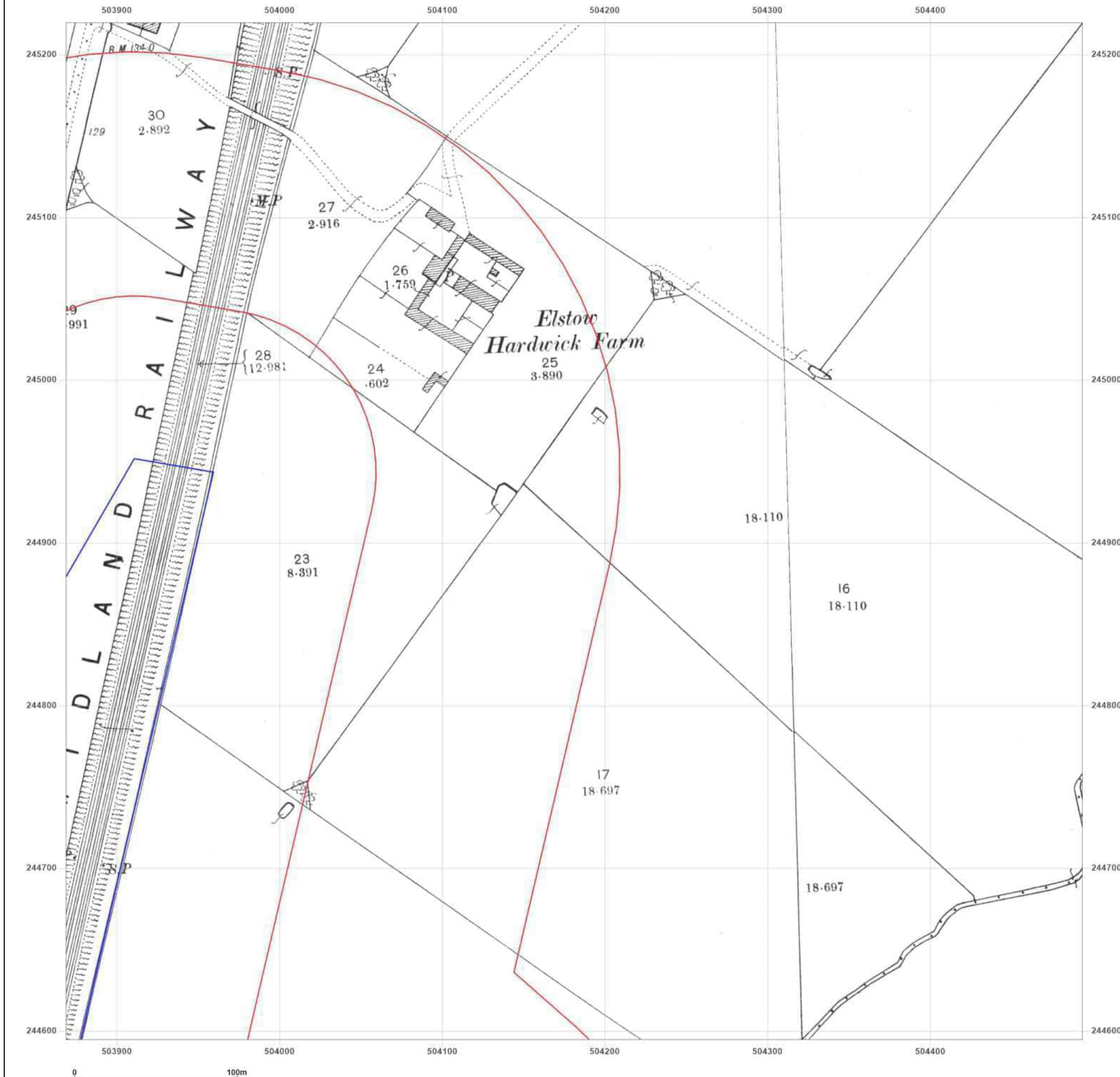


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_4  
**Grid Ref:** 504181, 244907

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

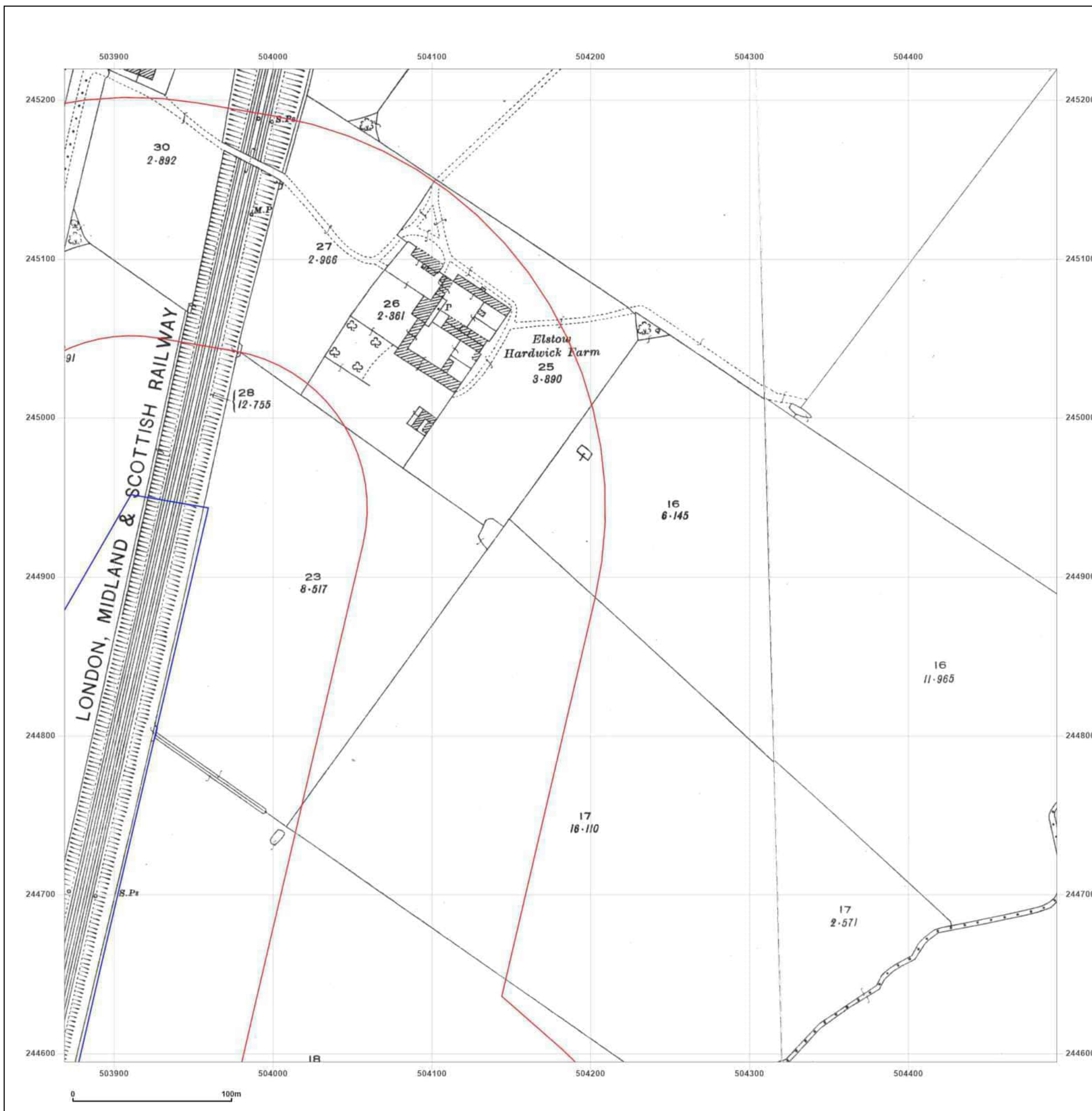


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_4  
**Grid Ref:** 504181, 244907

**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

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

Surveyed 1968  
Revised 1968  
Edition N/A  
Copyright 1970  
Levelled 1959

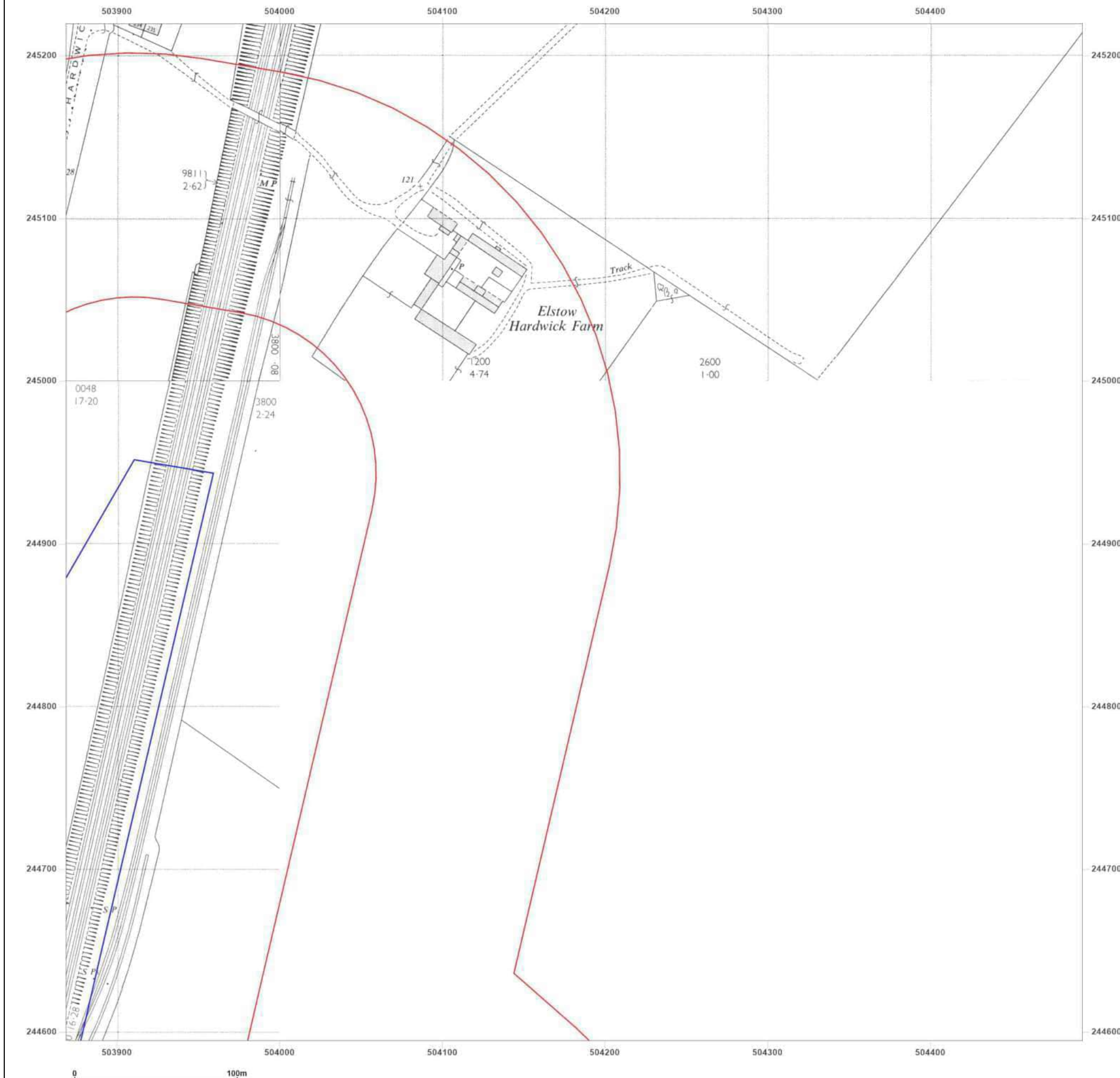


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Site Details:

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Report Ref: GSIP-2024-14754-18112\_LS\_7\_4  
Grid Ref: 504181, 244907

Map Name: National Grid

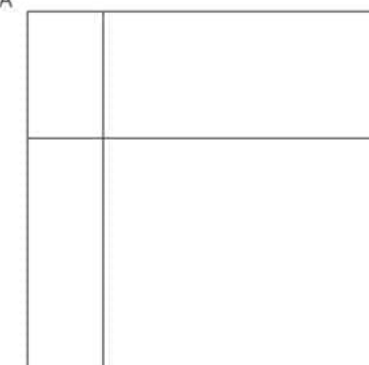
Map date: 1969-1974

Scale: 1:2,500

Printed at: 1:2,500



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



Surveyed 1974  
Revised 1974  
Edition N/A  
Copyright 1975  
Levelled 1972

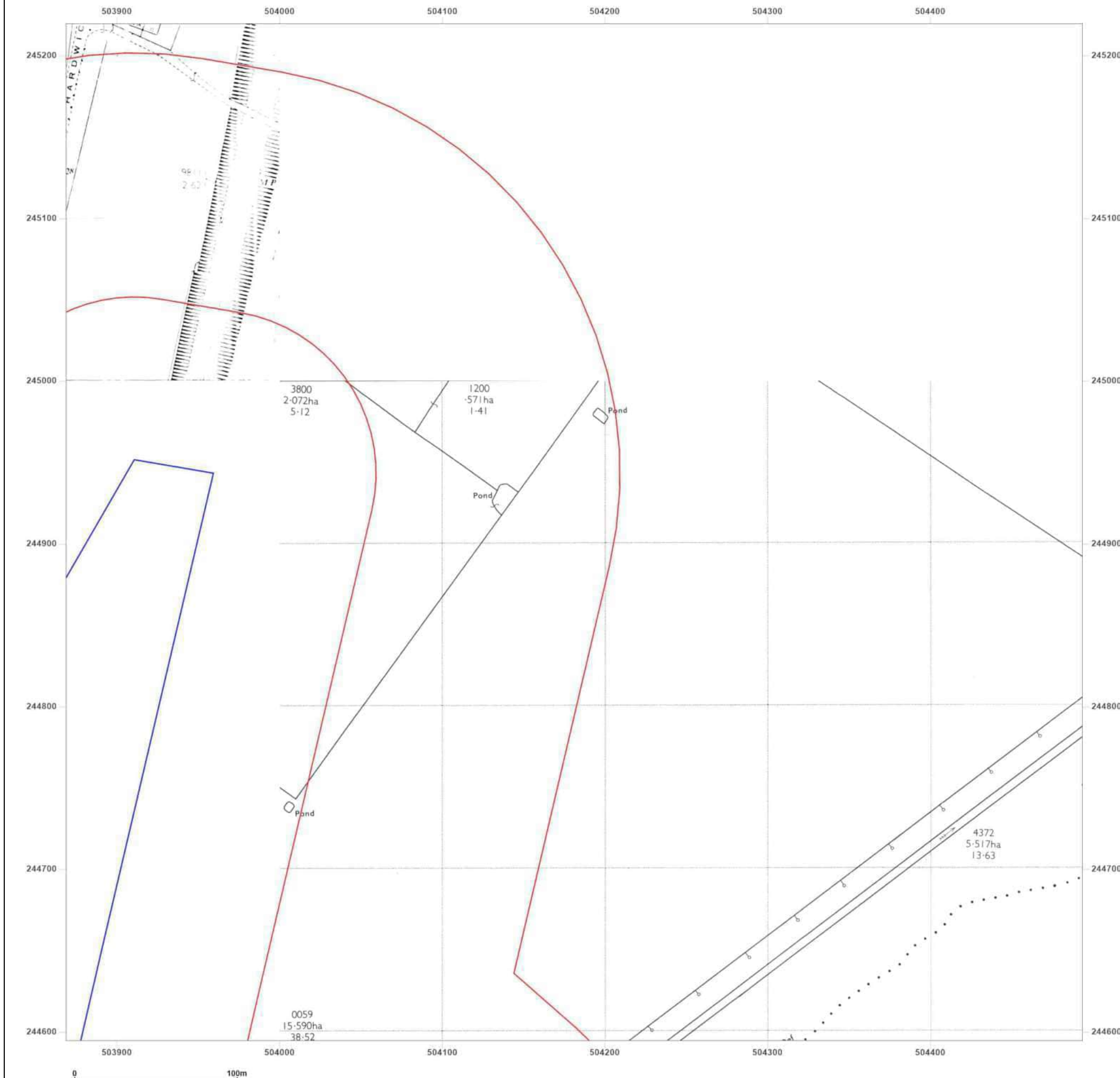


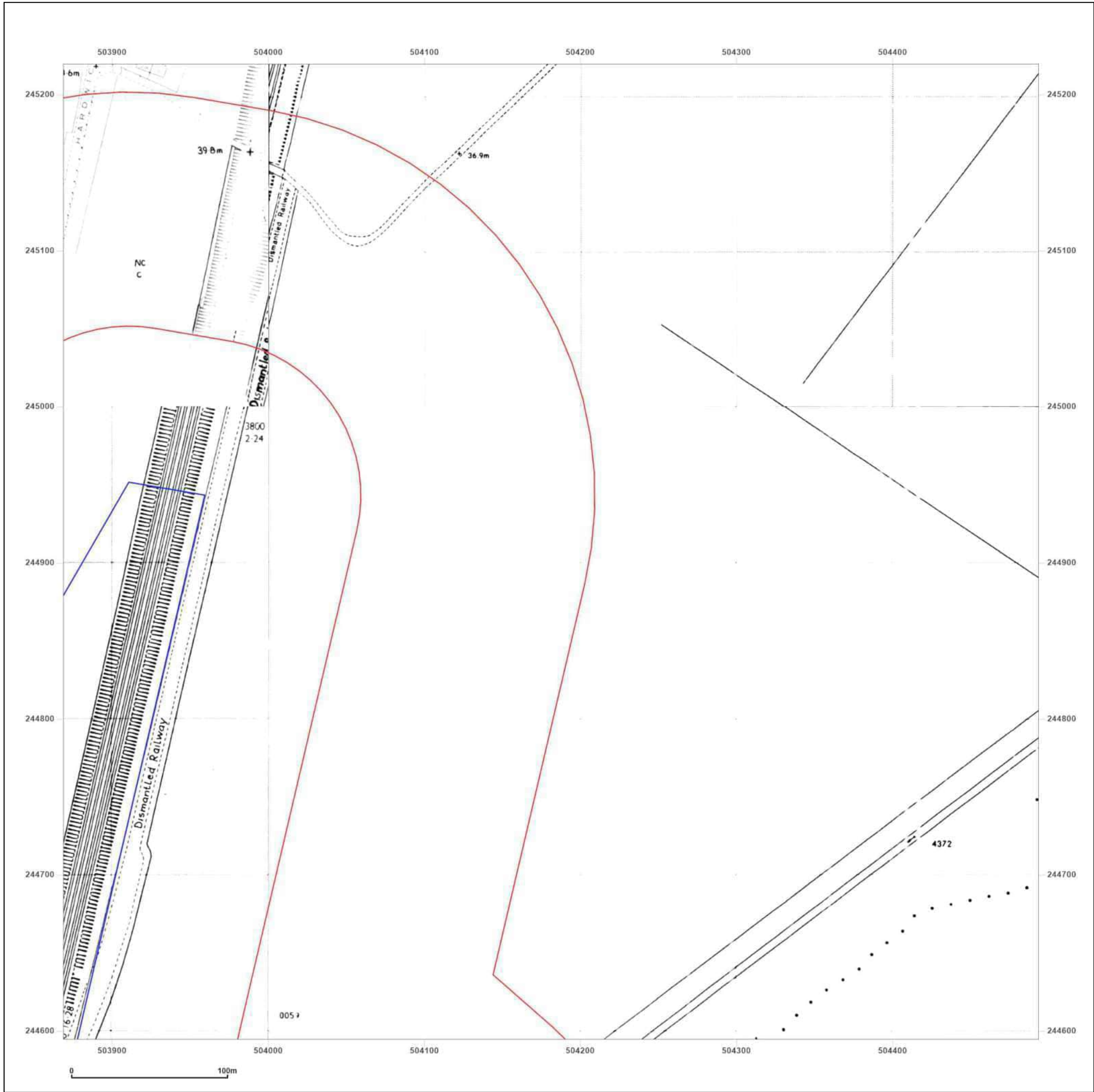
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**Site Details:**

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_4  
**Grid Ref:** 504181, 244907

**Map Name:** National Grid

**Map date:** 1988-1993

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1991  
Levelled 1971

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A

Surveyed 1971  
Revised 1988  
Edition N/A  
Copyright 1988  
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Surveyed N/A  
Revised N/A  
Edition N/A  
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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_5  
**Grid Ref:** 504181, 245532

**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

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

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

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

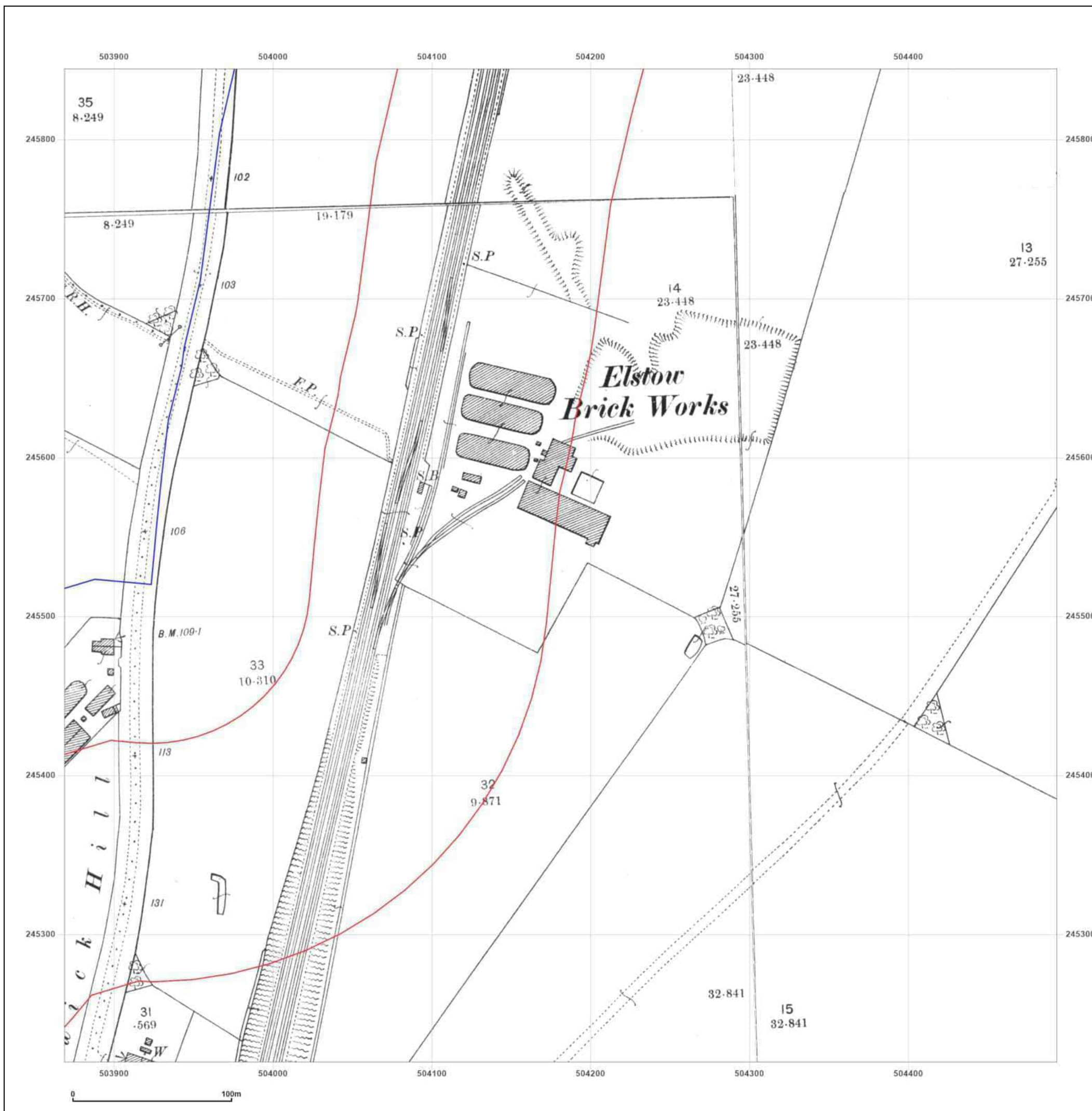


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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_5  
**Grid Ref:** 504181, 245532

**Map Name:** County Series

**Map date:** 1926

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1926  
 Revised 1926  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

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 Revised 1926  
 Edition N/A  
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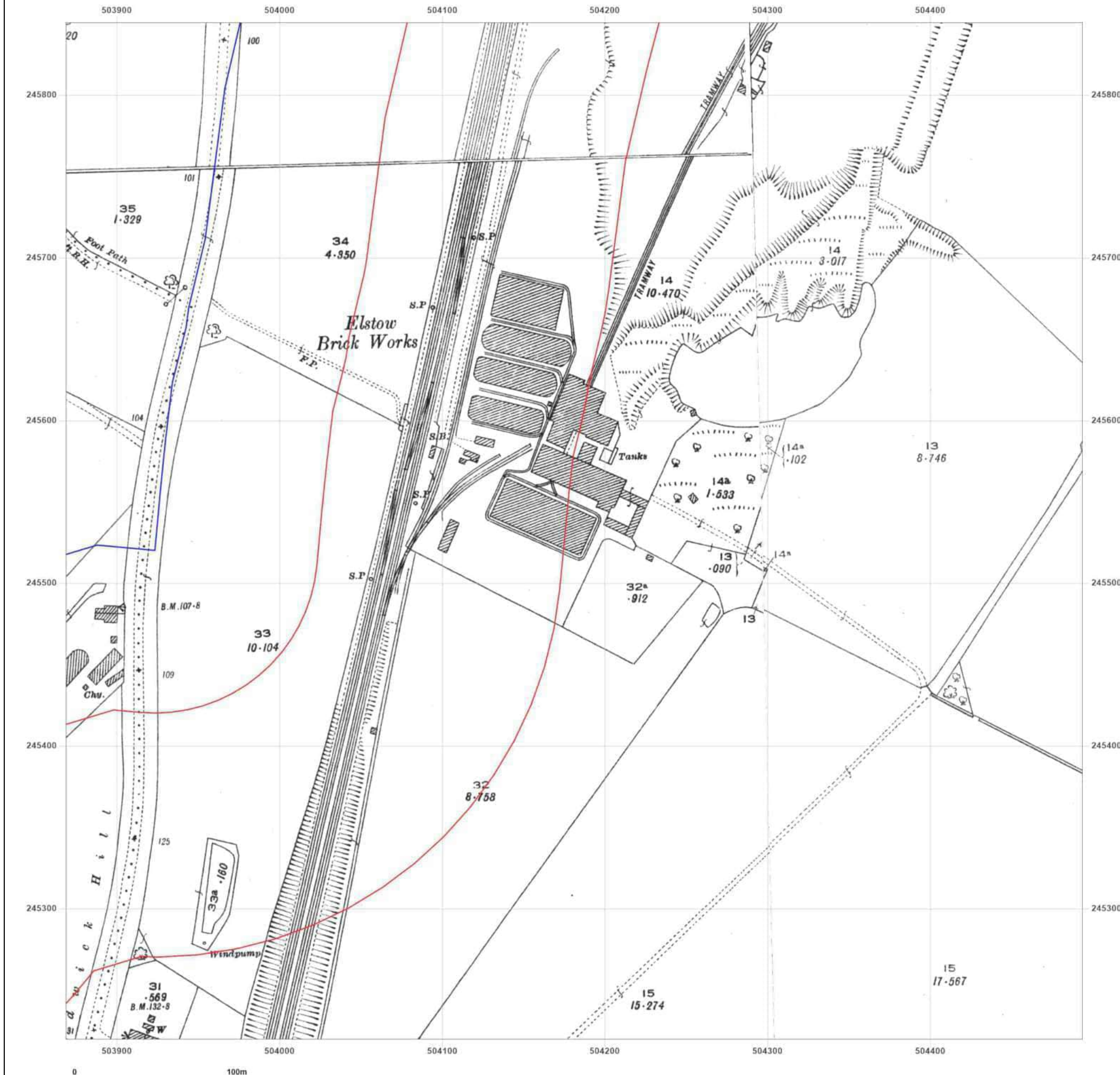


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Site Details:

70116516 Rev B

Client Ref: 70116516 Rev B  
Report Ref: GSIP-2024-14754-18112\_LS\_7\_5  
Grid Ref: 504181, 245532

Map Name: National Grid

Map date: 1991-1993

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1971  
Revised 1991  
Edition N/A  
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Levelled 1971

Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1993  
Levelled N/A



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#### Site Details:

70116516 Rev B

**Client Ref:** 70116516 Rev B  
**Report Ref:** GSIP-2024-14754-18112\_LS\_7\_6  
**Grid Ref:** 504181, 246157

**Map Name:** County Series

**Map date:** 1884

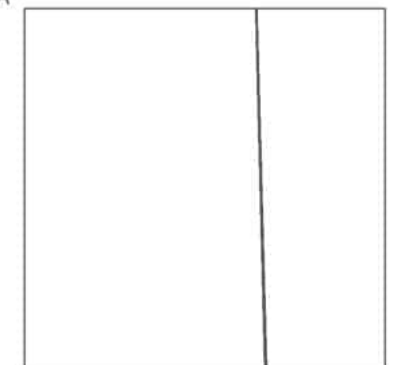
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**Printed at:** 1:2,500



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 Edition N/A  
 Copyright N/A  
 Levelled N/A

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 Revised 1884  
 Edition N/A  
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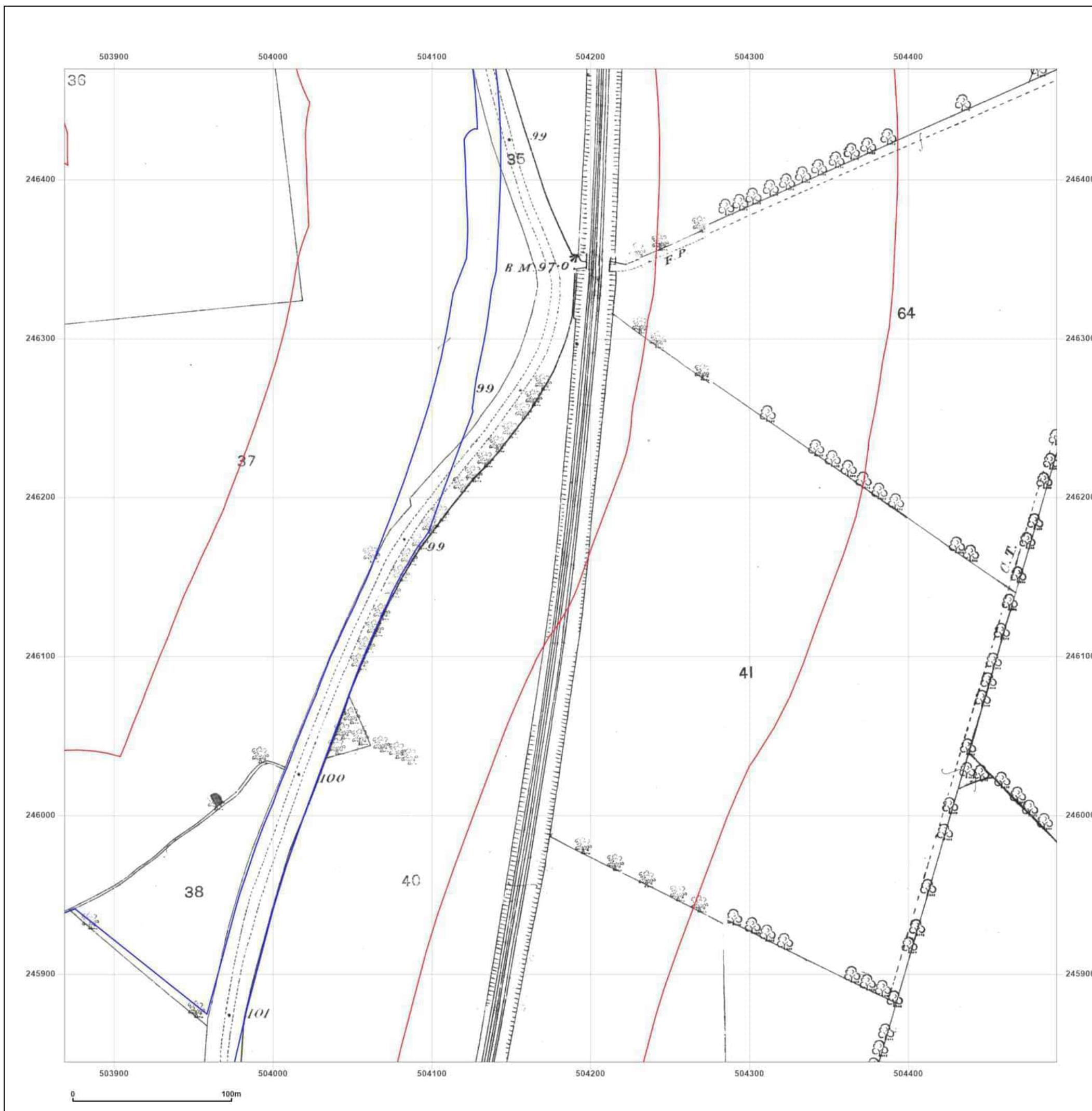


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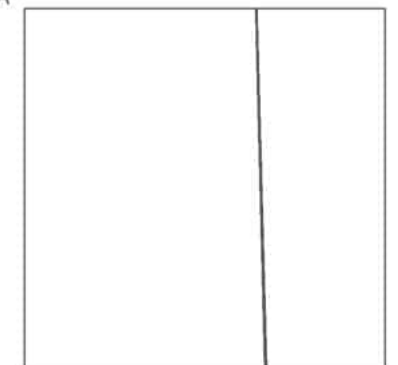
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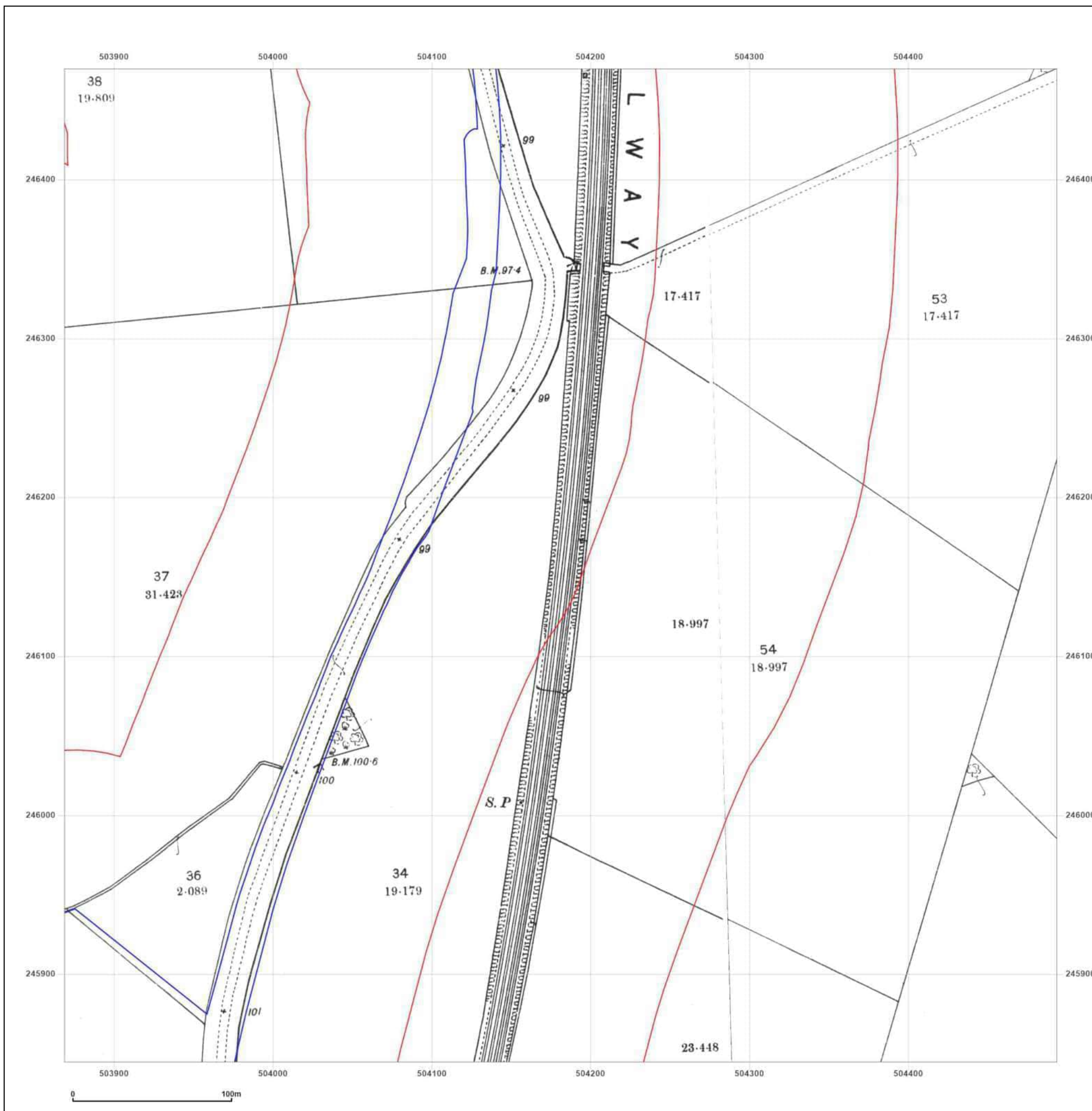


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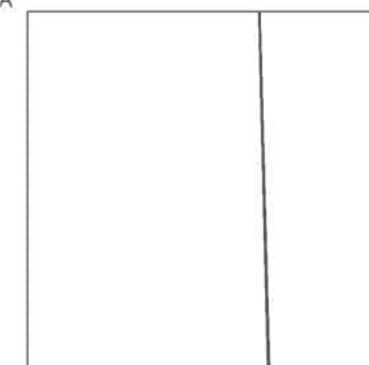
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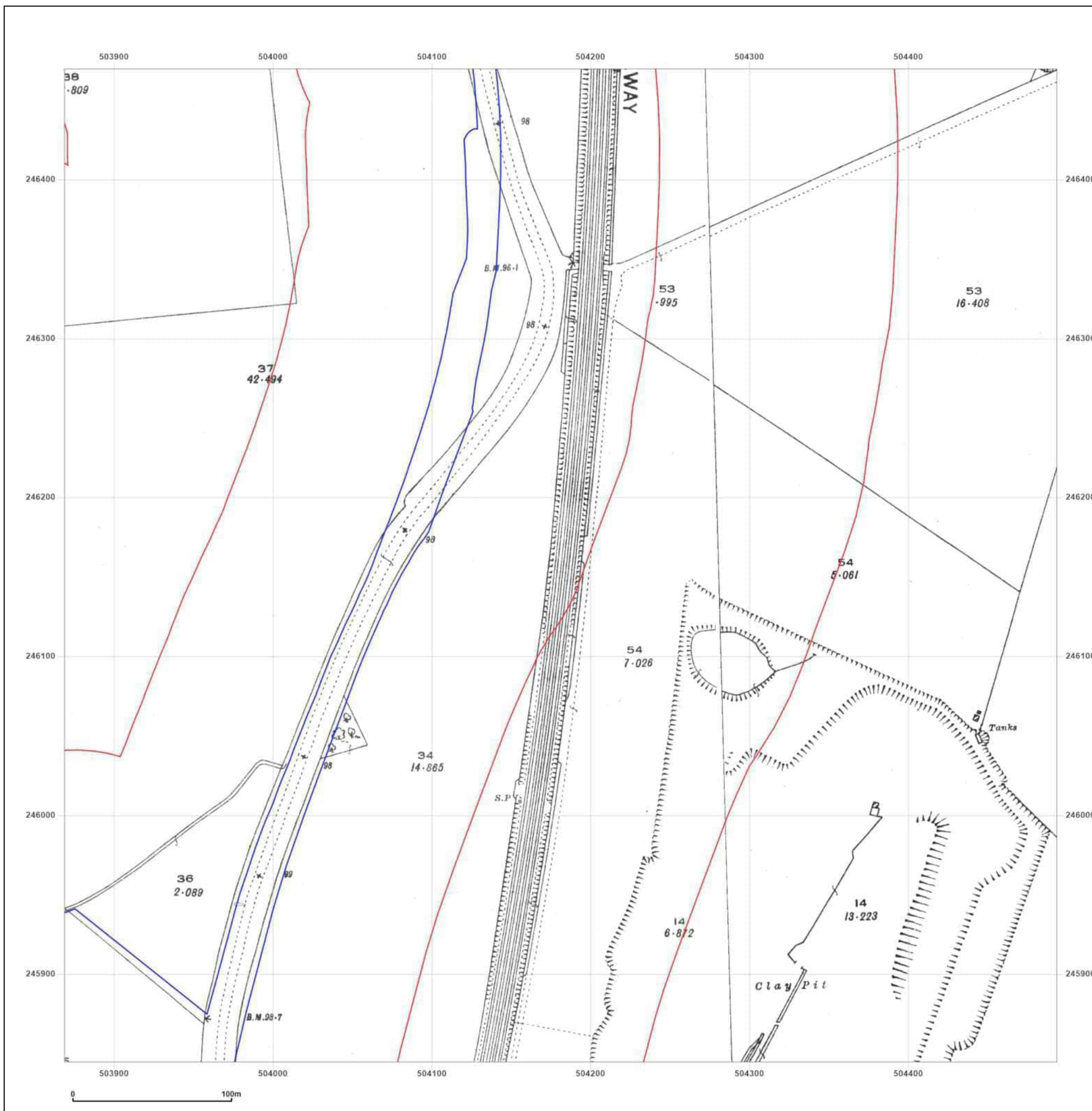


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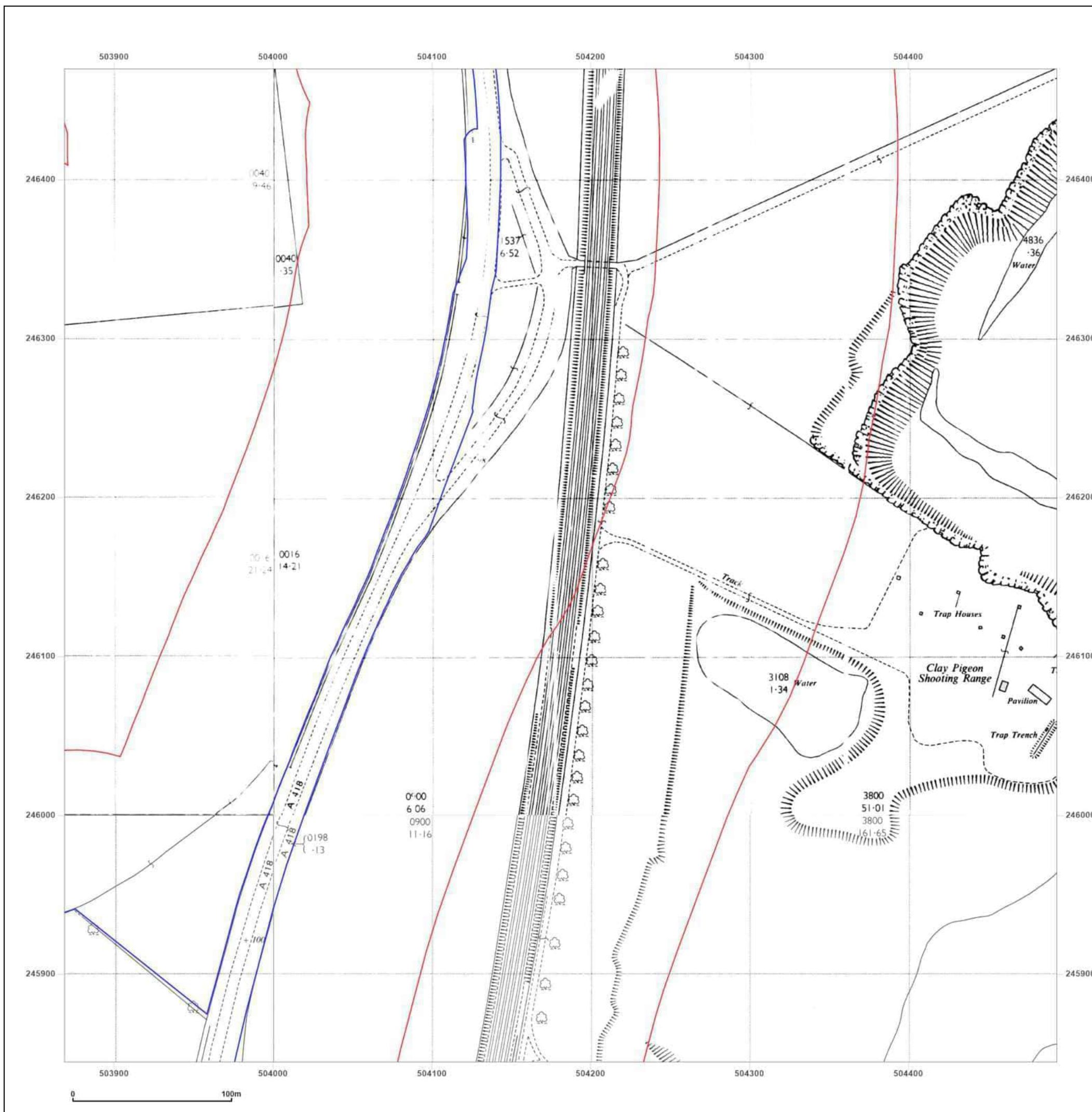


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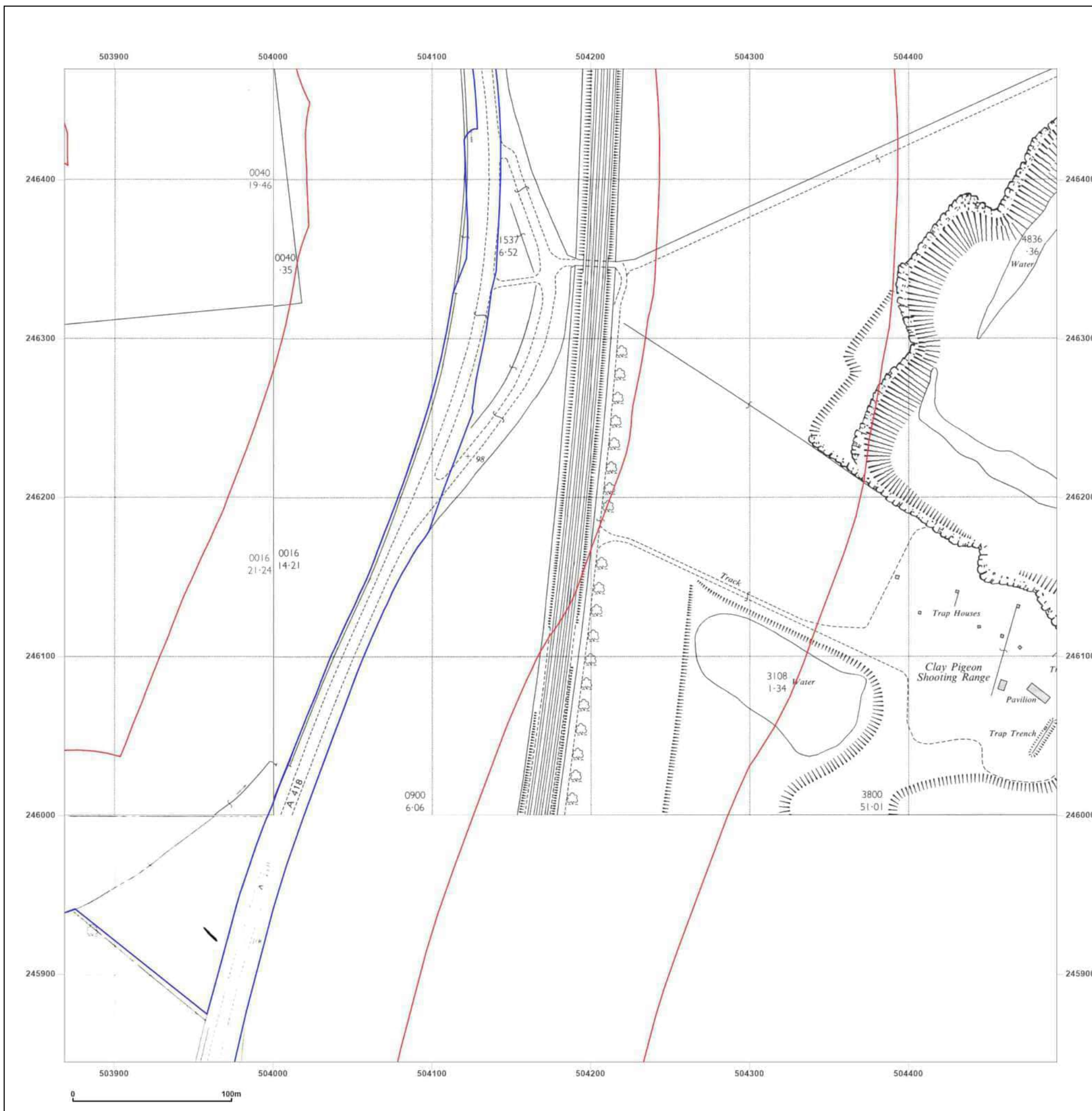


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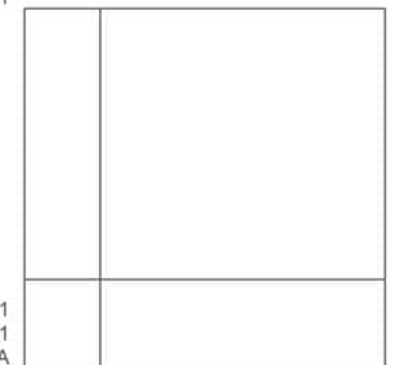
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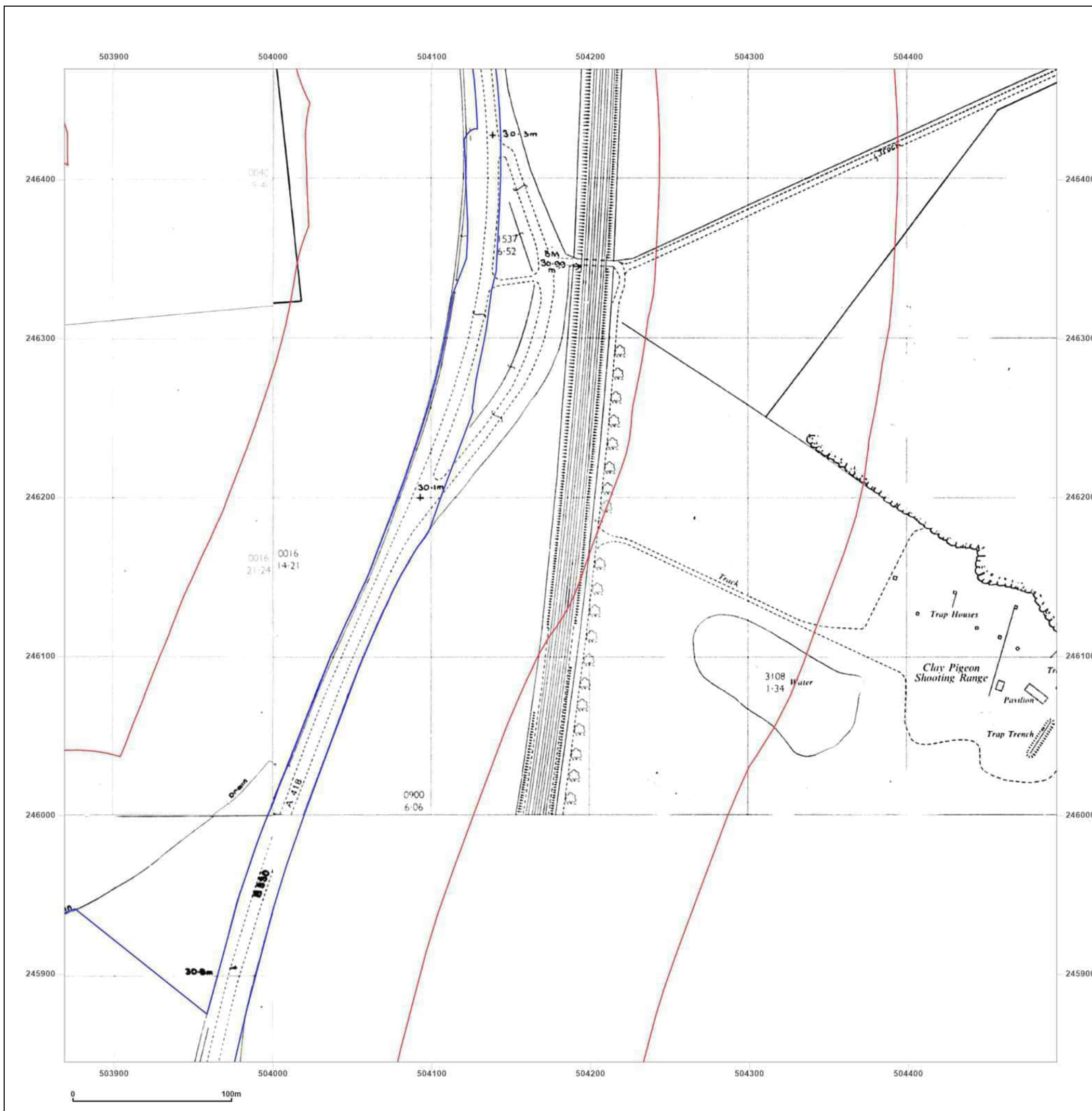


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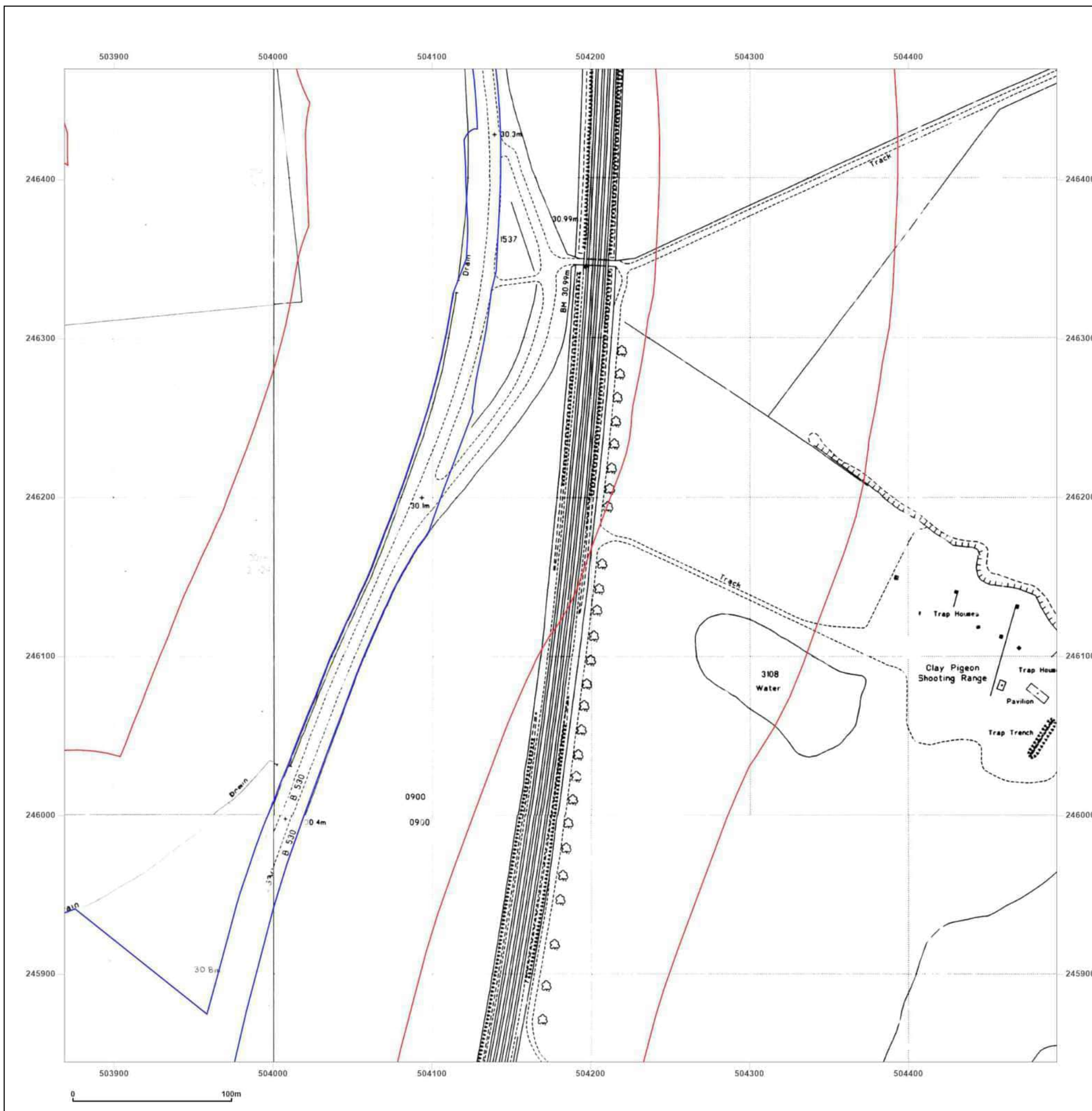


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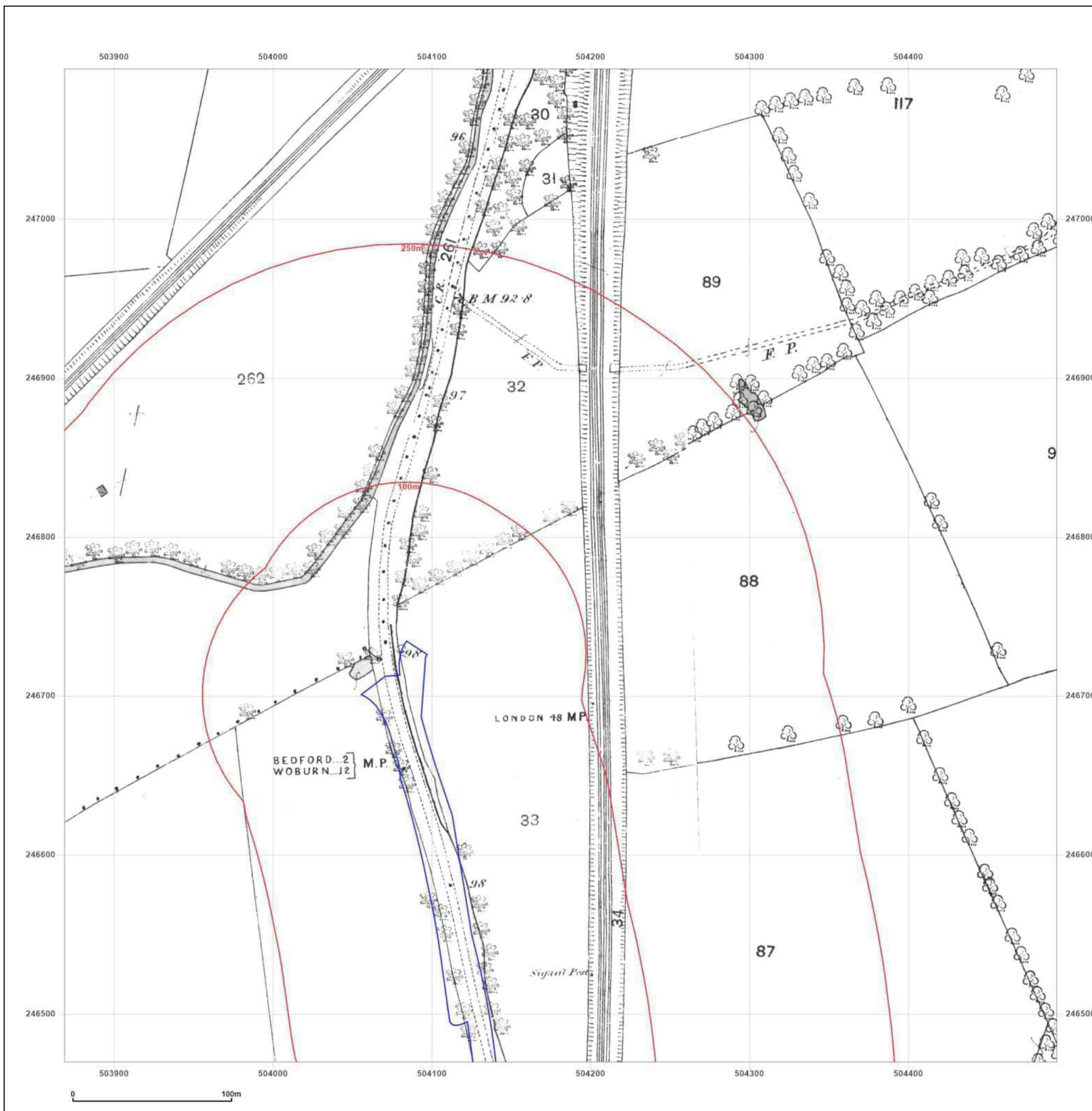


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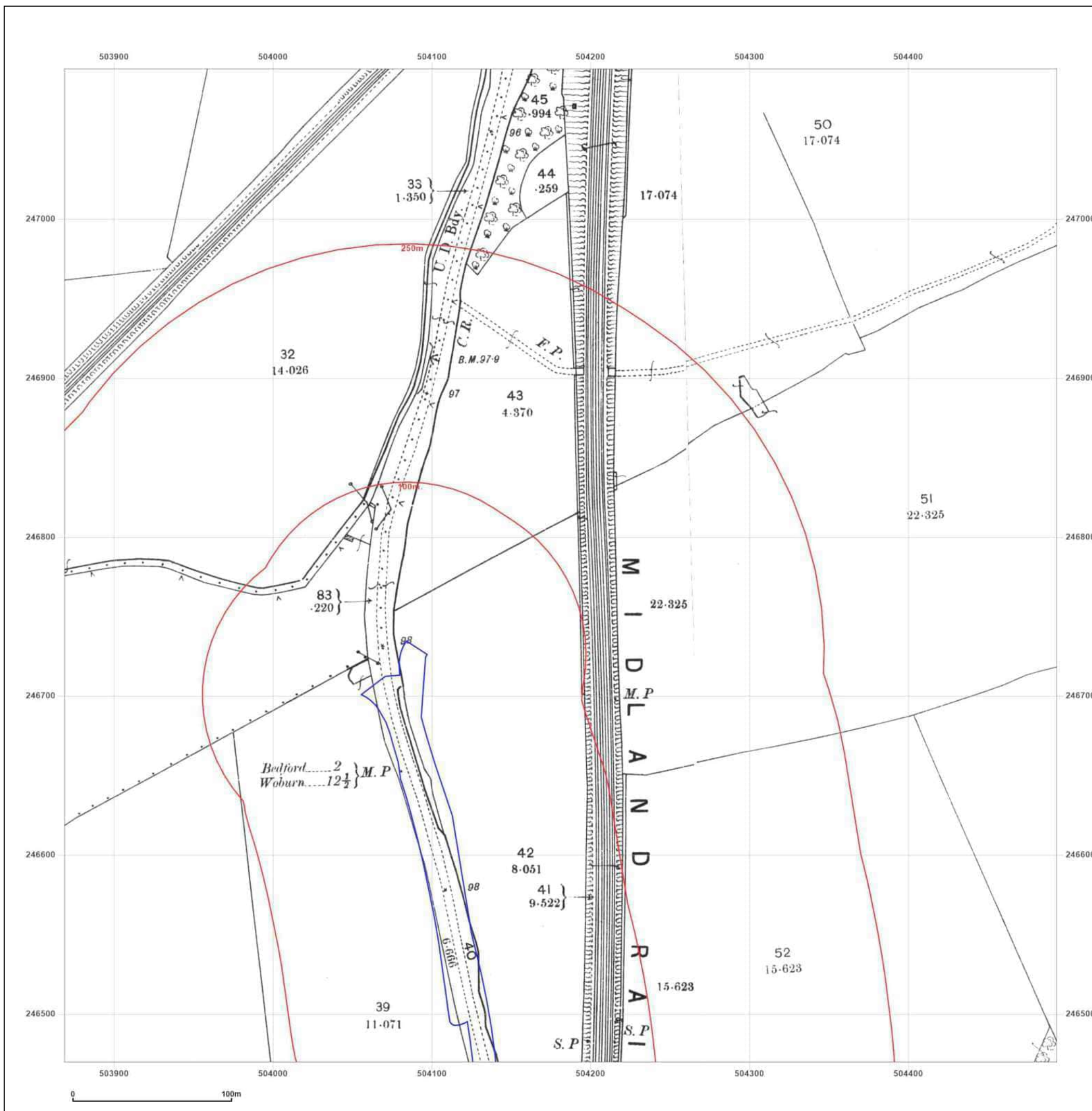


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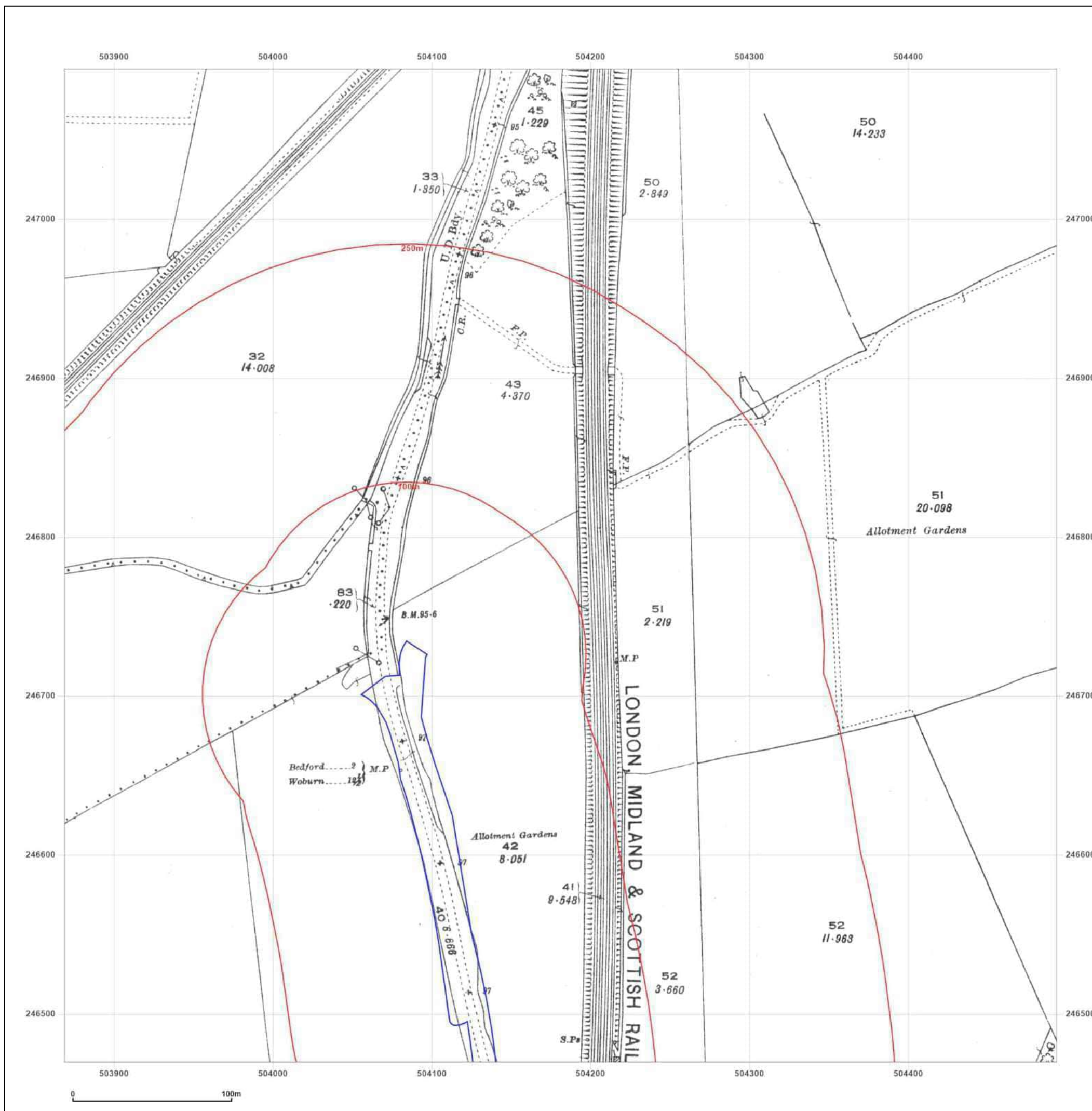


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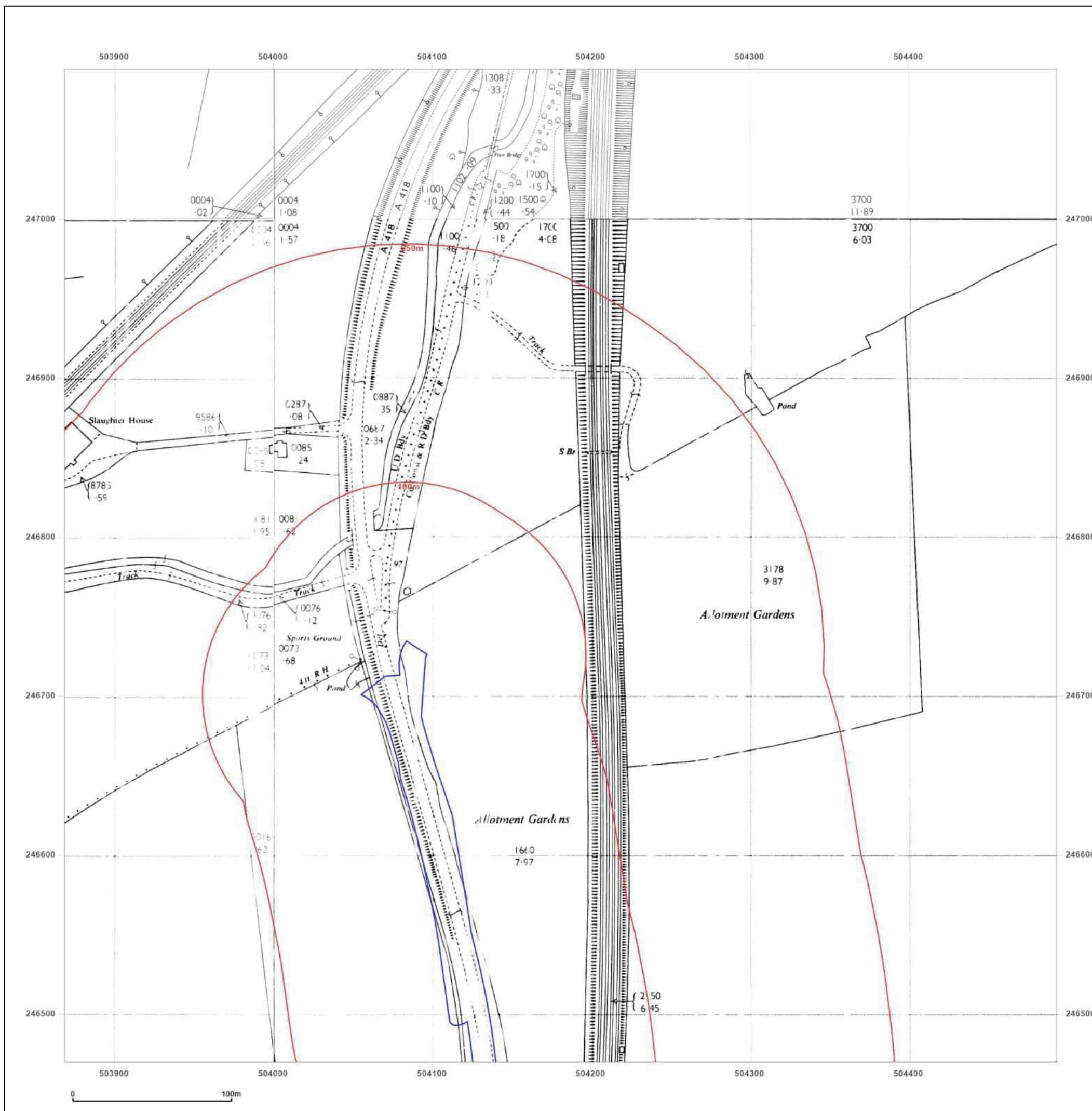


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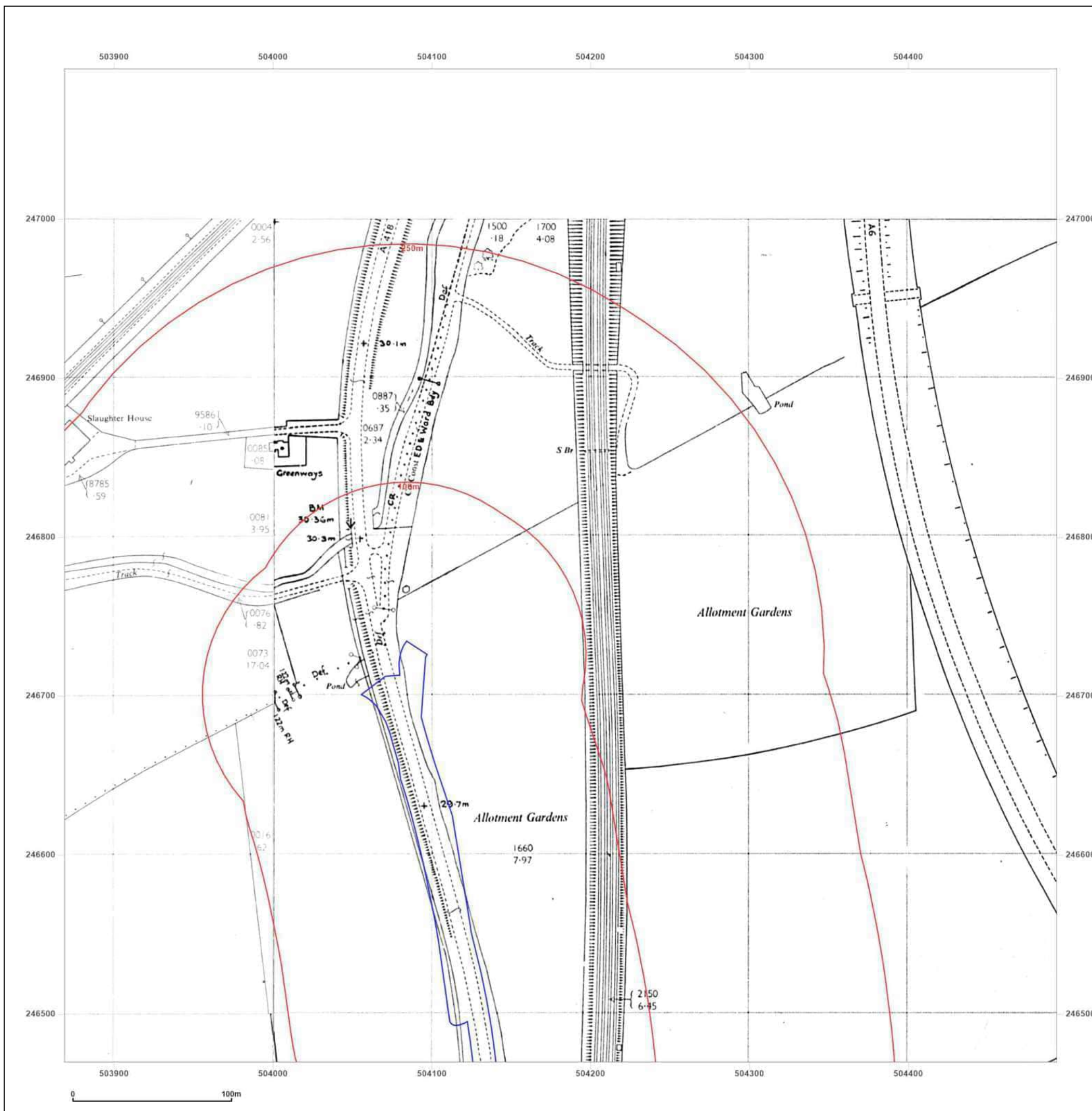


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# Annex 5

UNEXPLODED ORDNANCE

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# Universal Destinations & Experiences – UXO Site Surveys

<b>DATE:</b>	18 March 2024	<b>CONFIDENTIALITY:</b>	Confidential
<b>PROJECT:</b>	Universal Destination & Experiences	<b>AUTHOR:</b>	Rob Hares
<b>SUBJECT:</b>	UXO Non-Intrusive Surveys	<b>APPROVED:</b>	Rob Hares

## INTRODUCTION

WSP has been appointed to develop a scheme of site surveys to further assess Unexploded Ordnance (UXO) for Universal Destinations & Experiences UK Project .

WSP has previously instructed Pre-Desk-Study-Assessments (PDSA) for the Site. We have also instructed a detailed UXO Desk Study and Risk Assessment to further assess risks (refer to Appendix A).

The purpose of this technical note is to evaluate the benefits of conducting non-intrusive surveys across the entire Site to assess on going UXO risks.

## SOURCES OF INFORMATION

The following relevant sources of information were used in the production of this technical note.

- Project 320 Preliminary Risk Assessment, produced by WSP UK Ltd and dated March 2024; and,
- UXO Desk Study and Risk Assessment; Kempston Hardwick, Ref: P14166-R1, produced by Zetica Ltd and dated March 2024.

## BACKGROUND AND SITE INFORMATION

The majority of the site is occupied by agricultural land, woodland, ponds, roads and scrubland with the Cedarland Site being the only currently developed area which currently comprises a storage yard with several buildings and parking for approximately 50 vehicles including trucks. The Site is approximately 365 Ha in area.

Arcadis undertook a Due Diligence Site Investigation Report on land Parcels A and Parcel B (eastern half of the Site). This report covers the meteorological conditions of the land, land ownership, meteorological conditions, utilities including power, water and telecoms, an ecological survey, an archaeological survey, a flood risk assessment and an environmental site assessment.

The environmental site assessment constituted a summary of a previous Geo-environmental Desk Study as well as the results of a ground investigation between 20th March to 21st April 2023.

The ground conditions found comprised topsoil of soft dark brown sandy clay with rootlets or Made Ground comprised of either: bricks and concrete or cohesive soft light grey to light brown slightly sandy clay.

The underlying superficial deposits were found to comprise either head deposits or alluvium which were underlain by bedrock of the Peterborough Member Mudstone of the Oxford Clay Formation, this formation was found in all boreholes and in the majority of the trial pits. The stratigraphy below the Peterborough



# Universal Destinations & Experiences – UXO Site Surveys

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<b>SUBJECT:</b>	UXO Non-Intrusive Surveys	<b>APPROVED:</b>	Rob Hares

Member Mudstone was found to comprise: the Kellaways Formation (Sand and Clay members), the Cornbrash Formations, the forest marble formation, the Blisworth Formation and the Ruthland Formation.

## UXO DESK STUDY AND RISK ASSESSMENT

Zetica Ltd was commissioned to carry out a detailed Unexploded Ordnance (UXO) Desk Study and Risk Assessment for the 'Site in March 2024.

### Methodology

The aim of this report was to assess of the potential UXO hazard on or affecting the Site in accordance with the Construction Industry Research and Information Association (CIRIA) C681 'Unexploded Ordnance (UXO), a Guide for the Construction Industry'.

The hazard assessment included the likelihood of ordnance being present based on historical mapping & records; the type and quantity of ordnance (size, filling, fuze mechanisms); potential for live ordnance; and probable location and condition of ordnance.

Based on available information obtained by the National Archives, the US National Archives & Records Administration (NARA), the Imperial War Museum (IWM), Historic England, National Collection of Aerial Photography (NCAP), the Defence of Britain Project, and relevant archaeological bodies, the confidence in the data was assessed as High.

### Military Activity

Between 1940 and 1946, ROF Elstow was located adjacent to the east of the Site. No records have been found to indicate that ROF Elstow encroached on the Site and no sources of UXO hazard associated with ROF Elstow have been identified on the Site.

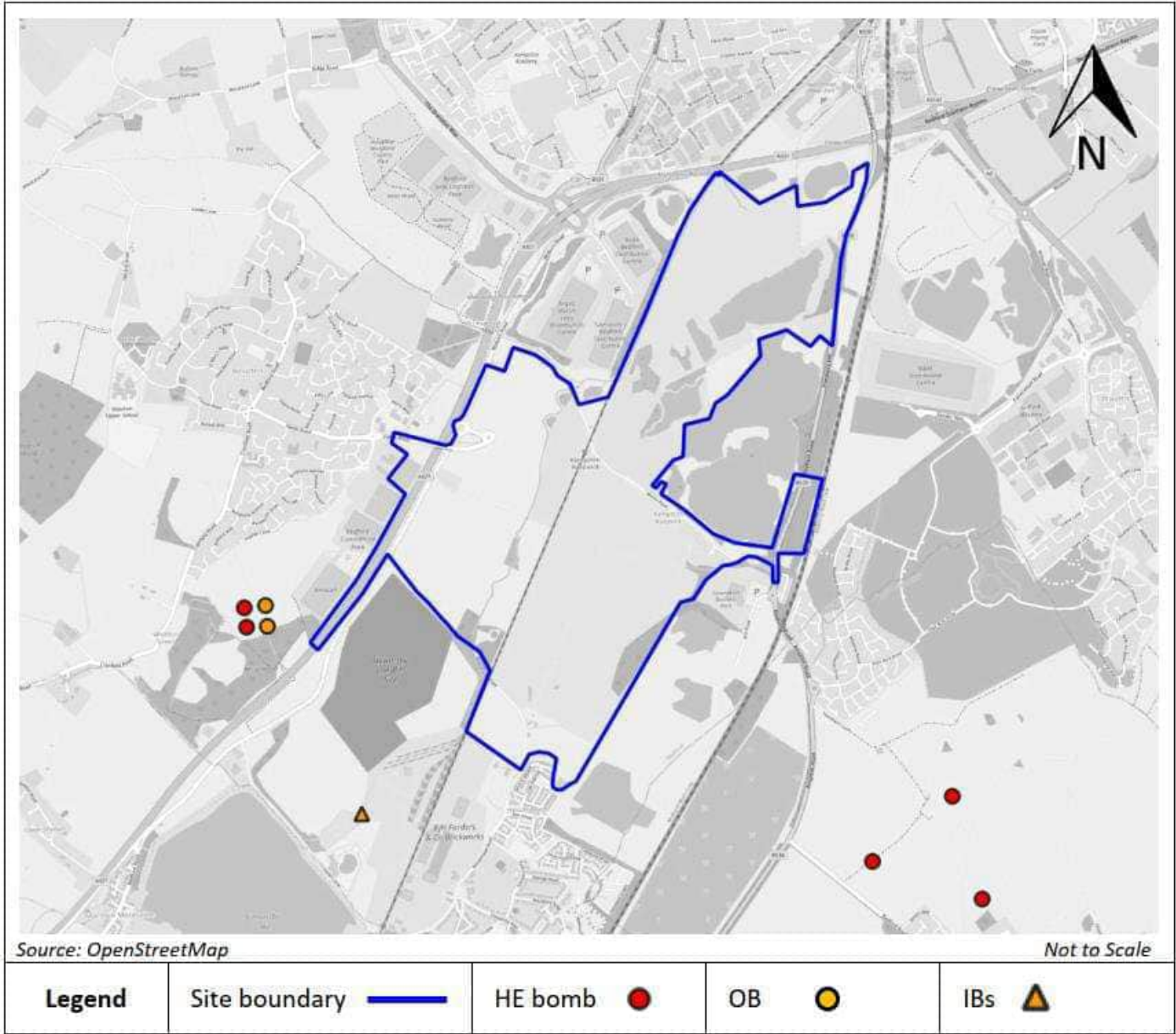
No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

However, a few recorded bomb impacts were recorded within the vicinity of the Site as illustrated in Figure 1.



# Universal Destinations & Experiences – UXO Site Surveys

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<b>SUBJECT:</b>	UXO Non-Intrusive Surveys	<b>APPROVED:</b>	Rob Hares



**Figure 1 Compiled Bomb Map for the Site Surrounds**

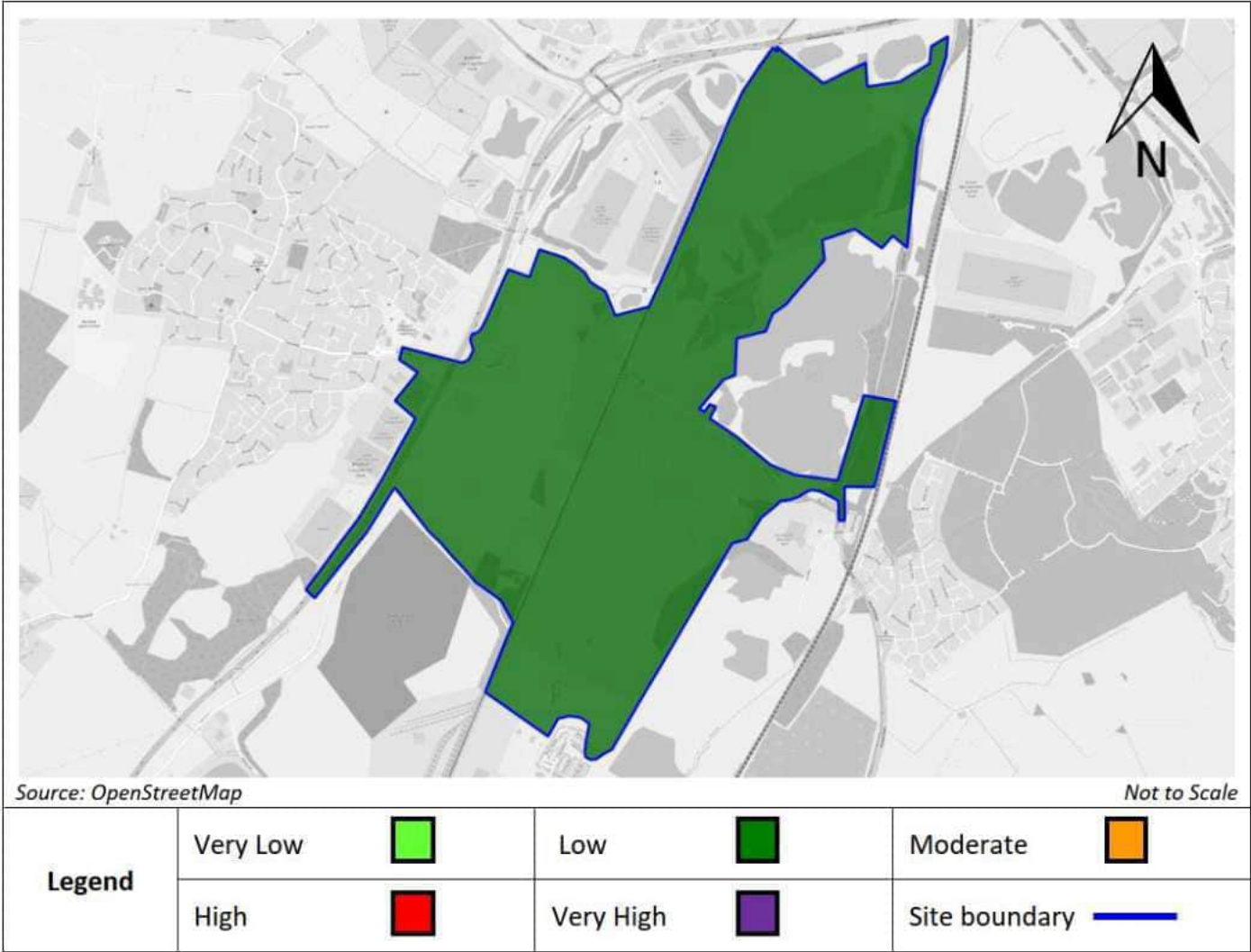
Based on the encountered geology at the Site (refer to above) the average maximum bomb penetration depths calculated by Zetica is as follows:

- 50 kg Bomb – Max. Penetration Depth: 5.5 m bgl;
- 250 kg Bomb – Max. Penetration Depth: 8.5 m bgl; and,
- 500 kg Bomb – Max. Penetration Depth: 16.0 m bgl;

# Universal Destinations & Experiences – UXO Site Surveys

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<b>SUBJECT:</b>	UXO Non-Intrusive Surveys	<b>APPROVED:</b>	Rob Hares

Based on a review of all available information, Zetica concluded that the Site has a low UXO hazard level, as shown in Figure 2.



**Figure 2 UXO Hazard Zone for the Site**

## Risk Assessment

The Zetica risk assessment was undertaken by assessing the Probability of Encountering an UXO coupled with the Probability of Detonation to provide the likelihood of encountering and denotating UXO during construction.

To assess overall risk, the likelihood of encountering and denotating UXO during construction was assessed against the severity of risk construction workers.





# Universal Destinations & Experiences – UXO Site Surveys

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Based on the above the risk of UXO was assessed as **Low**, defined as ‘*no positive evidence that UXO is present, but its occurrence cannot be totally discounted*’.

Zetica did recommend that an UXO awareness briefing was prudent for all construction staff involved with below ground excavations.

## NON-INTRUSIVE SURVEYS

The Detailed Desk Study and Risk Assessment undertaken by Zetica, has concluded a Low Risk of encountering, and accidentally detonating buried UXO.

To further assess risk there are a number of types of non-intrusive surveys that can be employed to identify in ground anomalies including metallic/ferrous objects.

The most frequently used method involves magnetometer surveys and multi-frequency electromagnetic surveys. These surveys have the added benefit in being able to identify ground disturbance associated with potential archaeological remains; buried waste/pits; buried obstructions.

### Magnetometer Survey

To map ferrous anomalies that may be indicative of potential UXO, a magnetometer survey is recommended using a caesium vapour magnetometer. These instruments can detect small ordnance such as mortars up to approximately 1.0 m depth and large calibre ordnance bombs up to 5.0-6.0 m below ground level depending on in-ground interferences.

The typical detection depth for a given weight of UXO using caesium vapour magnetometer is provided below but will vary depending on target size, characteristics, and ground conditions:

- 50 kg Bomb – Max. Detection Depth: 3.0 m bgl;
- 250 kg Bomb – Max. Detection Depth: 5.0 m bgl; and,
- 500 kg Bomb – Max. Detection Depth: 6.0 m bgl.

### Multi-frequency Electromagnetic Survey

A multi-frequency electromagnetic (MFEM) technique can be deployed simultaneously to identify changes in apparent ground conductivity which may relate to buried, metallic and non-metallic features. The MFEM is used to assist with characterisation of any anomalies detected by the magnetometer survey. Detection depths will again vary depending on target size, characteristics, and ground conditions.



# Universal Destinations & Experiences – UXO Site Surveys

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<b>SUBJECT:</b>	UXO Non-Intrusive Surveys	<b>APPROVED:</b>	Rob Hares

## In-Field Survey Techniques

There are two main techniques to undertake the magnetometer surveys and multi-frequency electromagnetic surveys; namely: Towed Platform and Drone Surveys.

### Towed Platform Survey

Where access allows a towed geophysical survey platforms behind a vehicle is a good method to undertake the magnetometer and multi-frequency electromagnetic surveys simultaneously and can typically survey 8-10 Ha per day, dependent on access. In restricted areas, a walked survey using handheld equipment can be used.

### Drone Survey

Drone surveys may be helpful in difficult to access areas however, the efficiency is likely to be lower than a towed survey across the accessible areas.

Based on the open nature of the site it is recommended that a towed vehicle survey is used to undertake the surveys the above with handheld surveys in more inaccessible areas.

## Data Analysis

Analysis of the geophysical survey data will be undertaken to will determine limits of detection and allow for target selection. Geophysical modelling of specific targets is undertaken to assess the likelihood of an identified an object being UXO, or other buried structures.

## FURTHER WORKS

If significant anomalies are identified during the non-intrusive surveys, intrusive investigations can be carried out to confirm whether the probability of UXO encounter is likely to be low. This would typically focus on proposed developable areas and involved a Mag Cone. A Mag Cone is a Cone Penetration Test system which pushes magnetometer probe into the ground to clear deeper anomalies. The type of cone employed and the penetration depth will depend on the anomaly encountered. Further details can be developed following receipt of the non-intrusive survey information.

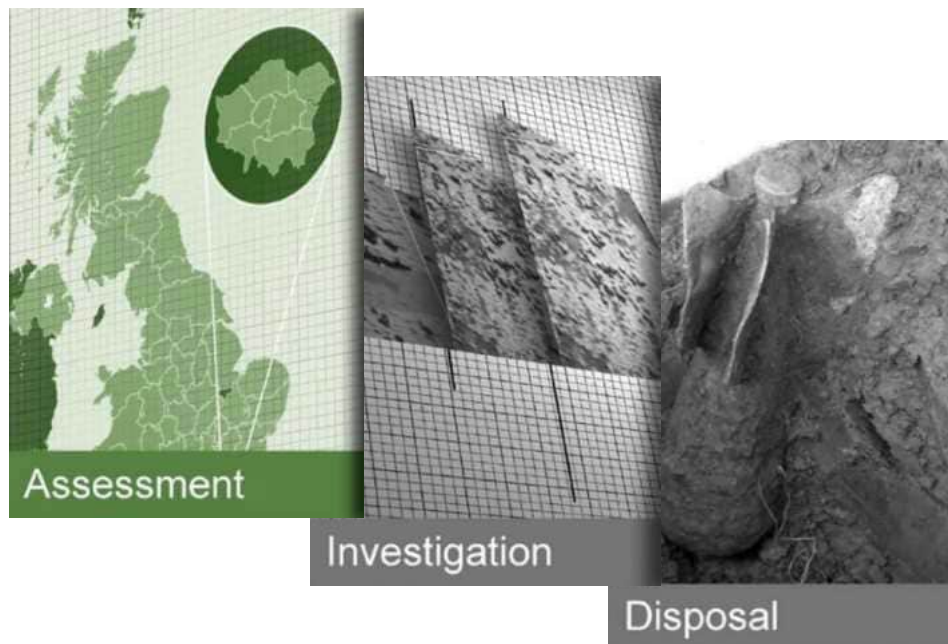




# Universal Destinations & Experiences – UXO Site Surveys

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PROJECT:	Universal Destination & Experiences	AUTHOR:	Rob Hares
SUBJECT:	UXO Non-Intrusive Surveys	APPROVED:	Rob Hares

## APPENDIX A - UXO DESK STUDY AND RISK ASSESSMENT



## UXO Desk Study & Risk Assessment

**Document Ref.** P14166-24-R1

**Revision** A

**Project Title** Kempston Hardwick

**Client** WSP

**Date** 11<sup>th</sup> March 2024

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**Checked by** James Major  
**Authorised by** Stefan Lang



## UXO DESK STUDY & RISK ASSESSMENT

### EXECUTIVE SUMMARY

**Key findings:** No significant sources of Unexploded Ordnance (UXO) hazard have been identified.

**Key actions:** Proceed with works. An UXO awareness briefing is prudent for staff involved in excavations.

#### UXO hazard assessment

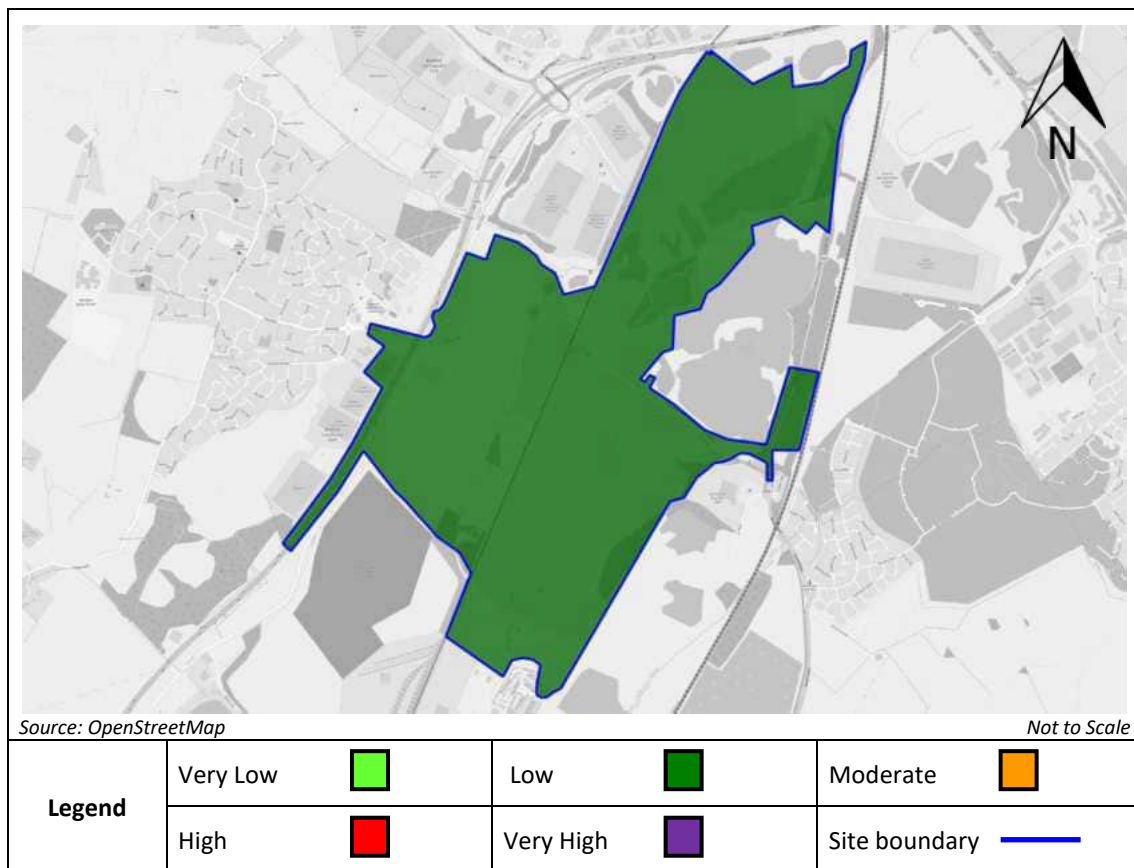
Between 1940 and 1946, Royal Ordnance Factory (ROF) Elstow was located adjacent to the east of the Site. No records have been found to indicate that ROF Elstow encroached on the Site and no sources of UXO hazard associated with ROF Elstow have been identified on the Site.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in the following Figure, reproduced as Figure 5 in the main report.

The UXO hazard zone plan of the Site is also given in the accompanying P14166-24-R1-MAP01-A.

#### UXO hazard zone plan of the Site



The main findings of the report are summarised below.

- In 1940, ROF Elstow was established on land adjacent to the east of the Site. During World War Two (WWII) ROF Elstow filled bombs, shells, and cartridges with explosives and propellants.
- After WWII, ROF Elstow closed and was converted into a Ministry of Defence (MoD) storage depot. It closed in 1963 and has since been redeveloped for housing and industrial use.

- During WWII, the main strategic targets in the vicinity of the Site included ROF Elstow, London Midland and Scottish Railway (LMS) lines, and Royal Air Force (RAF) Cardington.
- No records have been found indicating that the Site was bombed during WWII. Records indicate that the nearest High Explosive (HE) bombs fell approximately 0.3km west of the Site, on the 11<sup>th</sup> October 1940.
- There were 2No. Heavy Anti-Aircraft (HAA) batteries within 10km of the Site during WWII. The potential for an Unexploded AA (UXAA) shell to have fallen on the Site cannot be discounted.

### Proposed works

It is understood that works on the Site are associated with a commercial redevelopment scheme. Works will include laying traditional foundations and piled foundations to a depth of approximately 15m below ground level (bgl).

It is assumed that works on the Site may also include intrusive ground investigations.

### Risk assessment

The Table below, reproduced as Table 3 in the main report, provides a UXO risk assessment for the proposed works on the Site.

Further details on the risk assessment methodology are given in Section 7.2 of the main report.

#### UXO risk assessment for the Site



Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low

PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood

### Risk mitigation plan

The Table below, reproduced as Table 4 in the main report, summarises the UXO risk for proposed works on the Site and recommended actions.

#### Summary of UXO risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		<b>Proceed with works</b> – an UXO awareness briefing is prudent for staff involved in excavations.
Boreholes/Piling		<b>Proceed with works</b>

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP). An UXO awareness briefing for staff involved in excavations is always prudent.



### What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	<b>01993 886682</b>		<b><u><a href="mailto:uxo@zetica.com">uxo@zetica.com</a></u></b>		<b><u><a href="http://zeticauxo.com">zeticauxo.com</a></u></b>
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If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

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## Accompanying GIS data

P14166-24-R1-MAP01-A (UXO Desk Study)

## ABBREVIATIONS

<b>AA</b>	Anti-Aircraft
<b>ALARP</b>	As Low As Reasonably Practicable
<b>AP</b>	Anti-Personnel
<b>ARP</b>	Air Raid Precaution
<b>AXO</b>	Abandoned Explosive Ordnance
<b>BGS</b>	British Geological Survey
<b>CEGB</b>	Central Electricity Generating Board
<b>CIRIA</b>	Construction Industry Research and Information Association
<b>DCLG</b>	Department of Communities and Local Government
<b>ELG</b>	Emergency Landing Ground
<b>EO</b>	Explosive Ordnance
<b>EOC</b>	Explosive Ordnance Clearance
<b>EOR</b>	Explosive Ordnance Reconnaissance
<b>ERW</b>	Explosive Remnants of War
<b>ESA</b>	Explosive Substances and Articles
<b>HAA</b>	Heavy Anti-Aircraft
<b>HE</b>	High Explosive
<b>HER</b>	Historic Environment Record
<b>IB</b>	Incendiary Bomb
<b>IRBM</b>	Intermediate Range Ballistic Missiles
<b>IWM</b>	Imperial War Museum
<b>LAA</b>	Light Anti-Aircraft
<b>LMS</b>	London Midland and Scottish Railway
<b>LSA</b>	Land Service Ammunition
<b>MoD</b>	Ministry of Defence
<b>MoS</b>	Ministry of Supply
<b>NARA</b>	National Archives & Records Administration
<b>NCAP</b>	National Collection of Aerial Photography
<b>NLG</b>	Night Landing Ground
<b>OB</b>	Oil Bomb
<b>OSNGR</b>	Ordnance Survey National Grid Reference
<b>PM</b>	Parachute Mine
<b>RAF</b>	Royal Air Force
<b>RE</b>	Royal Engineers
<b>RFC</b>	Royal Flying Corps
<b>ROF</b>	Royal Ordnance Factory
<b>UXAA</b>	Unexploded Anti-Aircraft
<b>UXB</b>	Unexploded Bomb
<b>UXO</b>	Unexploded Ordnance
<b>WO</b>	War Office
<b>WWI</b>	World War One
<b>WWII</b>	World War Two
<b>ZAA</b>	Rocket Anti-Aircraft



## UXO DESK STUDY & RISK ASSESSMENT

**Please read:** Zetica has colour coded each paragraph. Paragraphs with black text on a white background provide site-specific information or information specifically researched as part of this project.

Boxed paragraphs in a dark green text with a green background provide general information and, where appropriate, links to online resources giving further detail. These are all available at [www.zeticauxo.com](http://www.zeticauxo.com). If you cannot gain access to these resources, Zetica can forward them on request.

### 1 INTRODUCTION

#### 1.1 Project outline

Zetica Ltd was commissioned by WSP to carry out a detailed Unexploded Ordnance (UXO) Desk Study and Risk Assessment for an area of approximately 365 hectares (ha) at Kempston Hardwick, in Bedfordshire (the 'Site').

The aim of this report is to gain a fair and representative view of the potential UXO hazard on or affecting the Site in accordance with the Construction Industry Research and Information Association (CIRIA) C681 'Unexploded Ordnance (UXO), a Guide for the Construction Industry'.

Where appropriate, this hazard assessment includes:

- Likelihood of ordnance being present.
- Type of ordnance (size, filling, fuze mechanisms).
- Quantity of ordnance.
- Potential for live ordnance.
- Probable location.
- Ordnance condition.

It should be noted that some military activity providing a source of UXO hazard may not be recorded and therefore there cannot be any guarantee that all UXO hazards affecting the Site have been identified in this report.

#### 1.2 Sources of information

Zetica Ltd researched the World War One (WWI)/World War Two (WWII) bombing and military history of the Site and its surrounding area using a range of information sources. The main sources of information are detailed in the following sections and referenced at the end of this report.

##### 1.2.1 Zetica Ltd records

Zetica Ltd's in-house records were consulted, including the Zetica Ltd bomb risk maps (<https://zeticauxo.com/guidance/risk-maps/>), previous requests for information from government bodies, reference books, and archive materials from past work in the region.

Relevant documents have been cited in the bibliography of this report.

##### 1.2.2 Historical records, maps, and drawings

Numerous reference documents including historical maps, aerial photographs and drawings have been consulted from sources such as the National Archives, the US National Archives & Records Administration (NARA), the Imperial War Museum (IWM), Historic England, National Collection of Aerial Photography (NCAP), the Defence of Britain Project, and relevant archaeological bodies.

The British Geological Survey (BGS) was consulted for borehole information.

### 1.2.3 Local records

Bedford Borough Council, Bedfordshire Archives, local historical groups, and the Bedfordshire Historic Environment Record (HER) were consulted for records.

### 1.3 Data confidence level

In general, there is a high level of confidence in the researched information sources used for this report. Further detail is given in the text of the report where appropriate.

Definitions of data confidence level		
Data Confidence Level		Definition
	Low	There are very few sources of information, and/or those available are lacking in detail.
	Moderate	There is a limited range of available sources of information, a key source of information is missing, and/or some sources may be contradictory or lacking in detail.
✓	High	There is a wide range of available sources of information, which are detailed and corroborate each other.



## 2 THE SITE

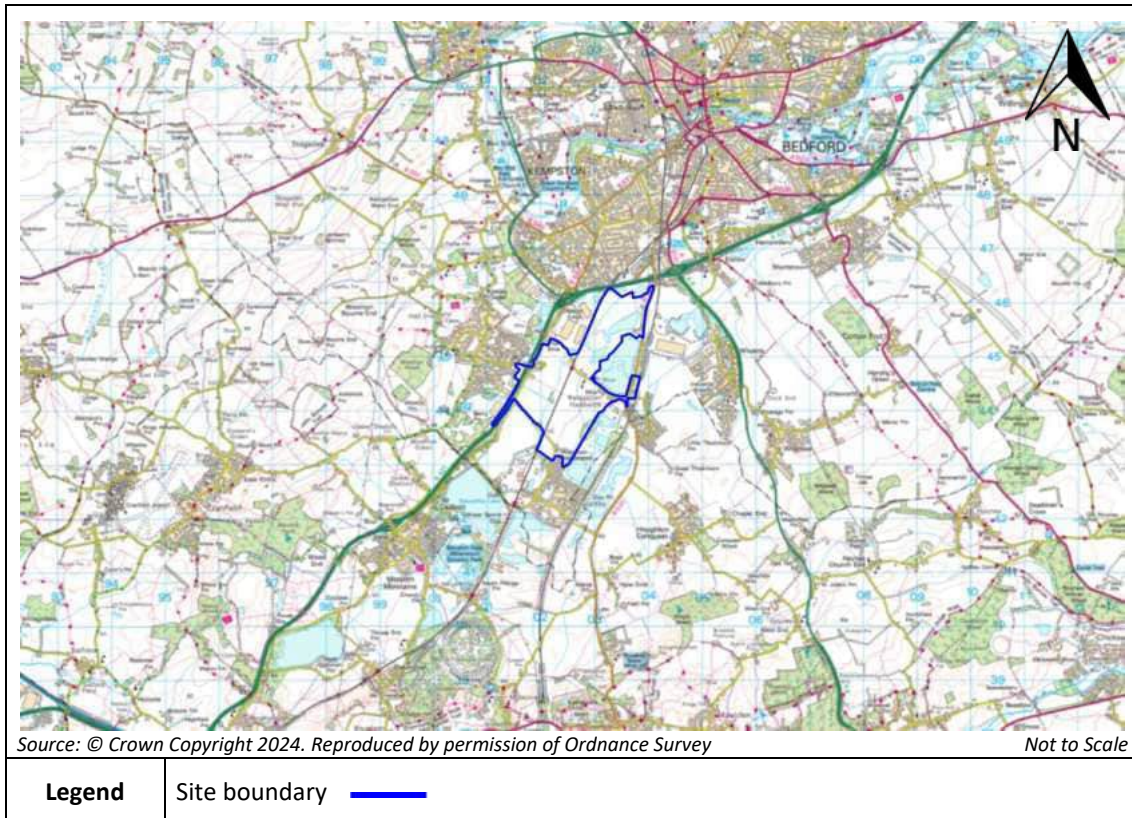
### 2.1 Site location

The Site is centred on Ordnance Survey National Grid Reference (OSNGR) TL 026447. It is located approximately 3.6km south-southeast of central Bedford.

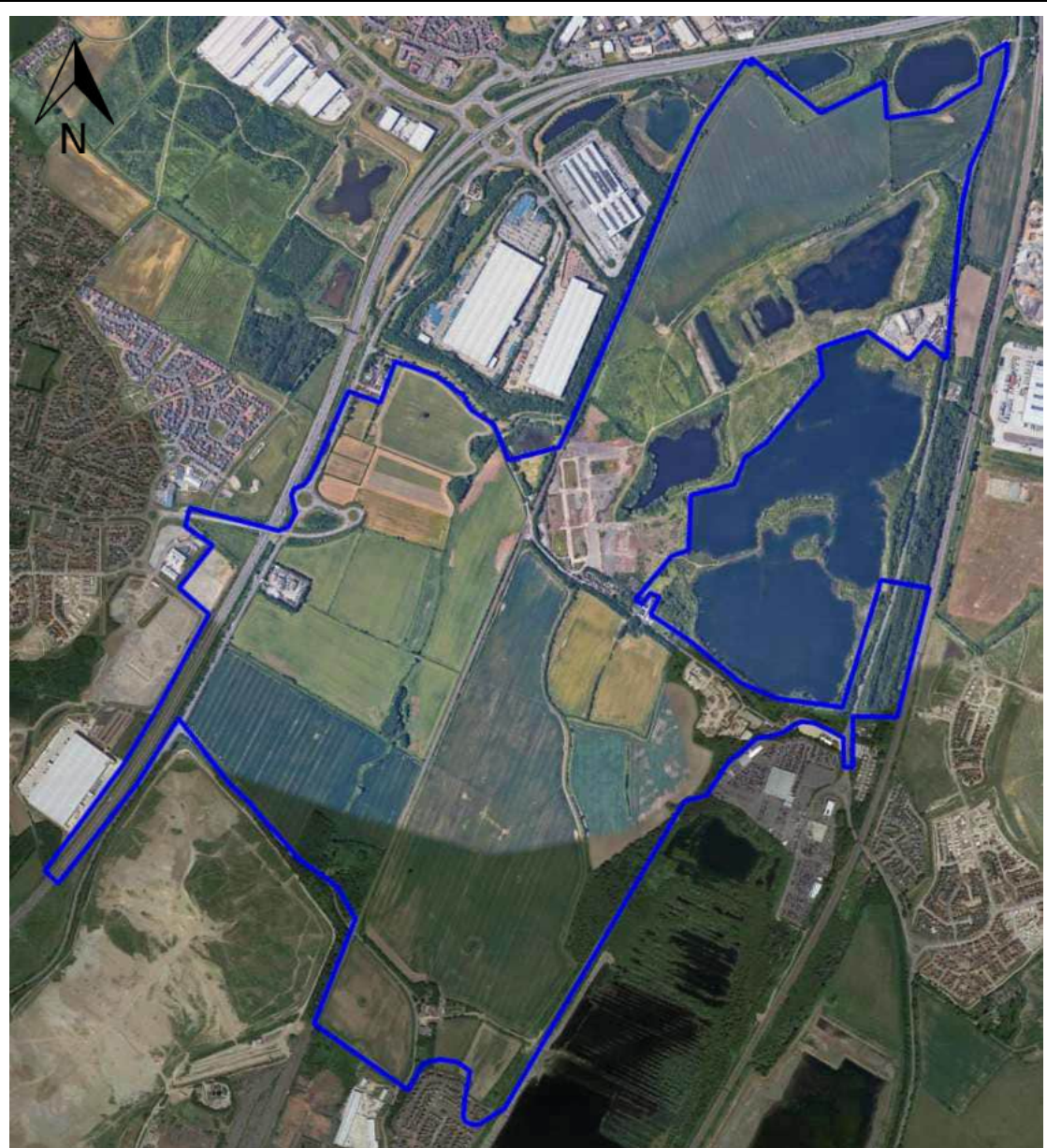
The Site comprises open ground, hardstanding, and roadway. It is bounded to the north by the A421, to the east by Ampthill Road, the Midland Mainline Railway, and open ground, to the south by open ground and residential and industrial buildings, and to the west by the A421 and open ground.

Figure 1 is a Site location map and Plate 1 is a recent aerial photograph of the Site.

**Figure 1 Site location map**



**Plate 1 Recent aerial photograph of the Site**



Source: Google Earth

Not to Scale

**Legend**

Site boundary





### 3 MILITARY ACTIVITY

The following sections outline the recorded military activity on and in the vicinity of the Site. The potential UXO hazard from WWI and WWII bombing is detailed in Section 4.

#### 3.1 Royal Ordnance Factory (ROF) Elstow

During WWII, ROF Elstow, an ordnance filling factory, was established on land adjacent to the east of the Site. A brief operational history is provided below.

##### 3.1.1 ROF Elstow

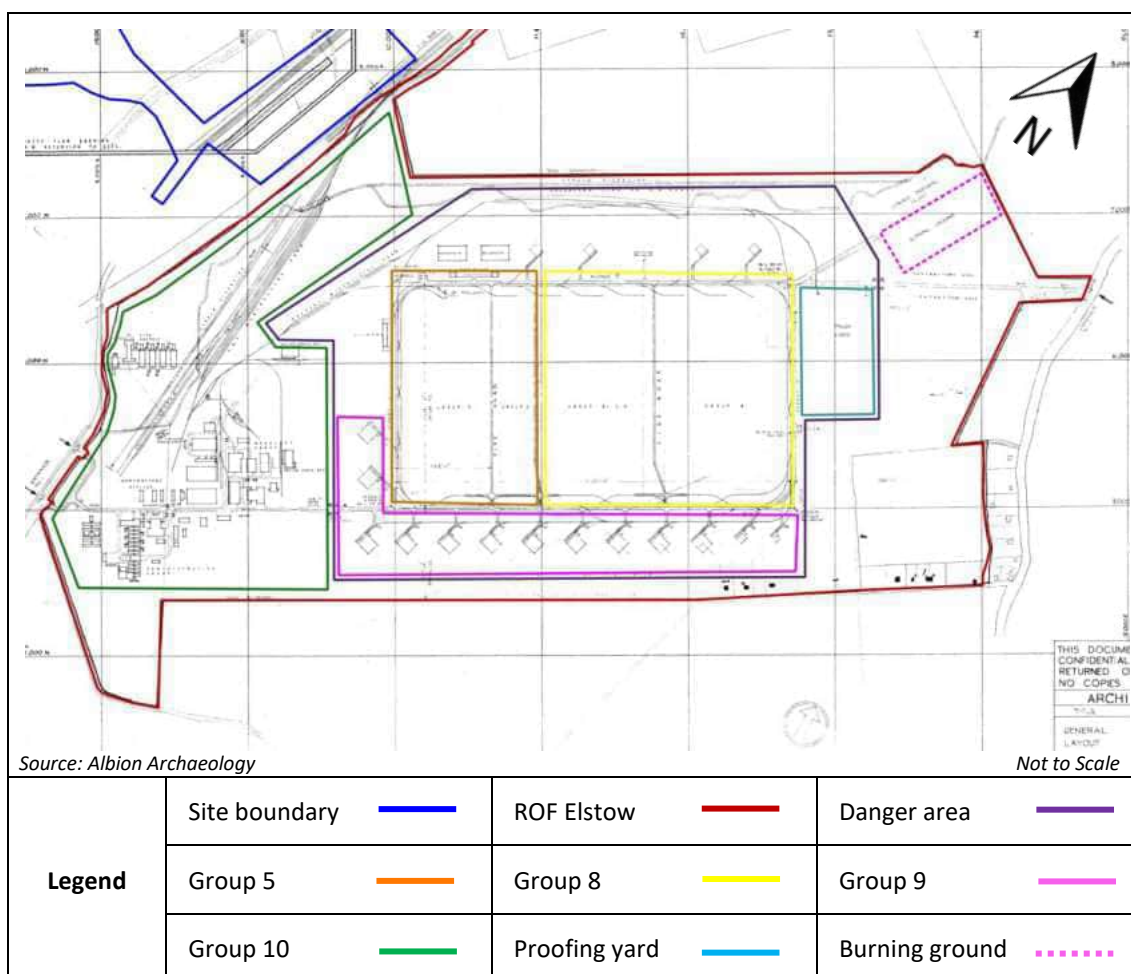
In 1939, the Ministry of Supply (MoS) purchased approximately 167ha of land at Elstow, adjacent to the east of the Site, for development of ROF Elstow, No. 16 Filling Factory.

In 1940, plans for construction of ROF Elstow were officially authorised, and construction of the factory began.

The factory was divided into 4No. areas, or 'Groups'. 'Group 5', produced cordite for cartridges. 'Group 8' filled larger shells and bombs with the High Explosive (HE) main charge. 'Group 9' comprised storage magazines for components and completed ordnance. 'Group 10' was an administrative area containing offices, workshops, accommodation, and supporting infrastructure.

Figure 2 is a plan of ROF Elstow, dating from November 1940. The 4No. groups, the danger area, proofing yard, and burning ground used for munitions disposal have all been identified.

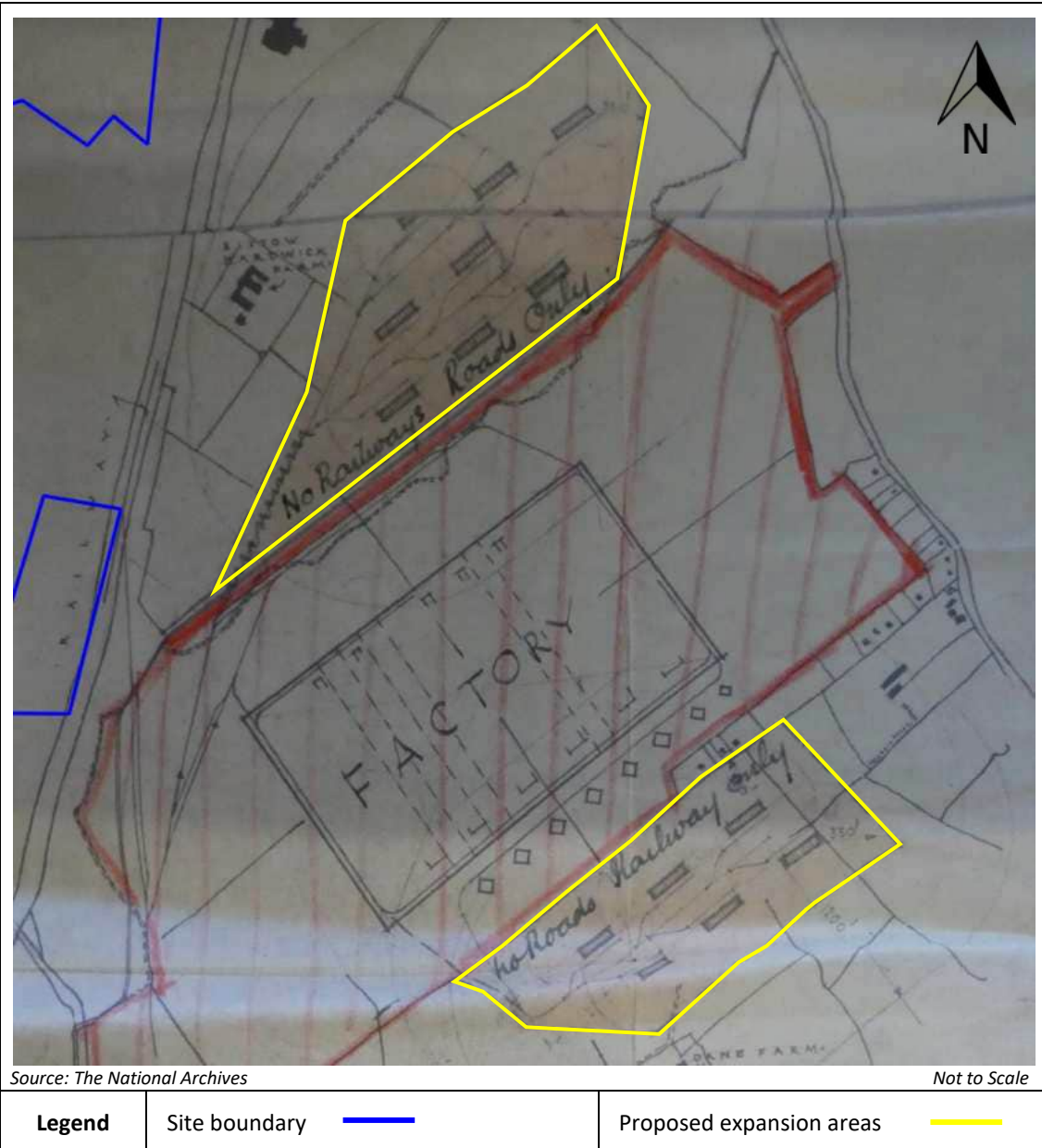
**Figure 2 Plan of ROF Elstow, November 1940**



In 1941, plans were drafted to expand Group 9 at ROF Elstow to provide additional munitions storage areas.

Figure 3 is a plan of ROF Elstow, dated the 23<sup>rd</sup> September 1941. This shows two proposed options for the location of the Group 9 expansion.

**Figure 3 Plan of ROF Elstow, 23<sup>rd</sup> September 1941**



The southern expansion option was eventually selected, and the additional storage area was constructed prior to the official opening of ROF Elstow.

In February 1942, ROF Elstow began production. Initially the factory manufactured Land Service Ammunition (LSA), such as 2" mortar bombs. In June 1942, Groups 5 and 8 officially opened and ROF Elstow began producing cordite, cartridges, exploder pellets, artillery shells, and aerial bombs.

In May 1943, ROF Elstow stopped producing cordite and exploder pellets. The cordite and pellet facilities in Groups 5 and 8 were redeveloped as shell reconditioning workshops and additional storage for components and supplies.



In June 1945, ROF Elstow stopped producing ordnance and in 1946 it officially closed.

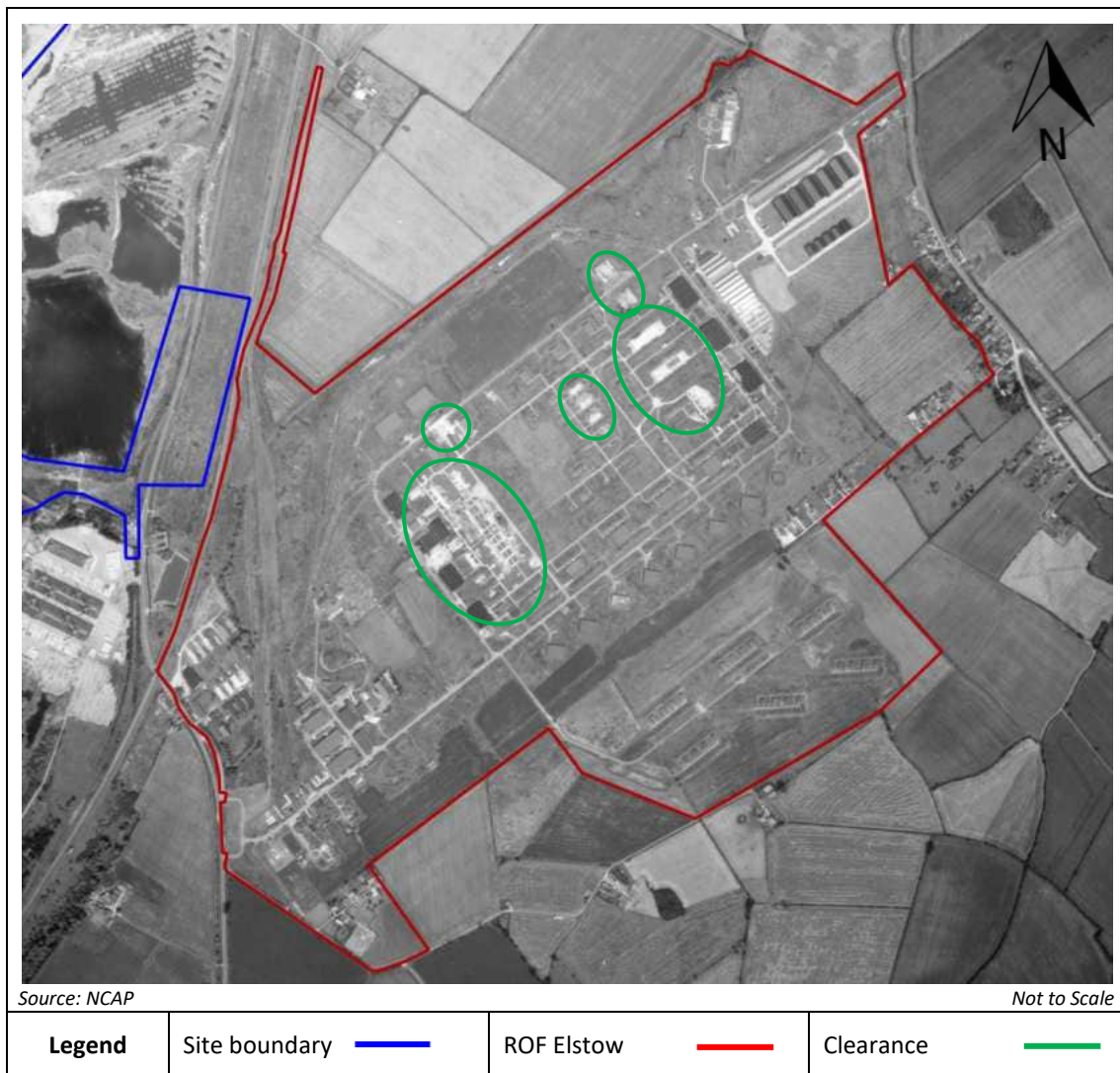
After 1946, the Ministry of Defence (MoD) acquired former ROF Elstow and converted it for use as storage depot. Records indicate that it was mainly used to store inert material, such as clothing, vehicles, and furniture. From the mid-1950s until 1961, the MoD stored 'Blue Streak' Intermediate Range Ballistic Missiles (IRBMs) at former ROF Elstow.

The MoD depot closed in 1963 and in 1969 the land was sold to the Central Electricity Generating Board (CEGB).

During the 1970s, several of the facilities at former ROF Elstow were dismantled and removed.

Plate 2 is an aerial photograph of ROF Elstow dated the 21<sup>st</sup> July 1974. Several areas of demolition and building clearance have been identified.

**Plate 2 Aerial photograph of former ROF Elstow, 21<sup>st</sup> July 1974**



Former ROF Elstow has since been partially redeveloped for housing and as an industrial estate.

### Potential UXO hazard

No records have been found to indicate that ROF Elstow encroached on the Site. The nearest parts of ROF Elstow to the Site comprised administrative areas and railway connections.

ROF Elstow is not considered to provide a source of UXO hazard to the Site.

### 3.2 Defences

For further information on military defences, and the potential UXO hazards associated with them, follow the links below:

- [Anti-Aircraft Guns](#)
- [Anti-Invasion Defences](#)
- [Barrage Balloons](#)
- [Bombing Decoys](#)
- [Home Guard](#)
- [Mined Locations](#)
- [Mortar & Gun Emplacements](#)
- [Pillboxes](#)

No military defences have been identified on the Site. The nearest are described below.

#### 3.1.1 Anti-Aircraft (AA) guns

During WWI, there was 1No. AA battery recorded within 10km of the Site. It was located at Fenlake (TL 062481), approximately 2.8km northeast of the Site. It was armed with 1No. 18-pounder gun.

During WWII, there were 2No. Heavy AA (HAA) batteries recorded within 10km of the Site. The nearest was located at Queen's Park (TL 029492), approximately 3km north of the Site. Its armaments are unknown.

#### Potential UXO hazard

Given the presence of AA gun batteries in the surrounding area, the potential for an Unexploded AA (UXAA) shell to have fallen on the Site unnoticed, whilst unlikely, cannot be totally discounted.

### 3.3 Military airfields

For further information on military airfields, and the potential UXO hazards associated with them, follow the link below:

- [Military Airfields](#)

No records of any military airfields on the Site have been found. The nearest are described below.

During WWI, the nearest operational airfield was Royal Flying Corps (RFC) Goldington, approximately 6km northeast of the Site. It opened in October 1916 as a Night Landing Ground (NLG) operated by No. 75 Home Defence Squadron.

After WWI, RFC Goldington closed, and the land has since been redeveloped for housing.

During WWII, the nearest operational airfield was Royal Air Force (RAF) Kempston, approximately 0.2km west of the Site (see Plate 3). It was a civilian landing strip which the RAF requisitioned at the start of WWI as an Emergency Landing Ground (ELG). No records have been found to indicate that the landing ground was ever used.

After WWII, RAF Kempston was derequisitioned and turned over to agricultural use.



Military airfields are not considered to provide a source of UXO hazard to the Site.

### 3.4 Aircraft crashes

For further information on military aircraft crashes, and the potential UXO hazards associated with them, follow the link below:

- [Aircraft Crashes](#)

No records of any aircraft crashes on or in close proximity to the Site have been found.

### 3.5 Firing ranges and military training areas

For further information on firing ranges and military training areas, and the potential UXO hazards associated with them, follow the links below:

- [Artillery Ranges](#)
- [Bombing Ranges](#)
- [Military Training Areas](#)
- [Small Arms Ranges](#)

No records of any firing ranges or military training areas on or in close proximity to the Site have been found.

## 4 BOMBING

### 4.1 WWI bombing

For further information on WWI bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.1 or use the following link.

- [WWI Bombing](#)

No records have been found indicating that the Site was bombed during WWI.

### 4.2 WWII bombing

For further information on WWII bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.2 or use the following link.

- [WWII Bombing](#)

No records have been found indicating that the Site was bombed during WWII. Details of WWII bombing in the vicinity of the Site are provided in the following sections.

#### 4.2.1 Bombing in Bedfordshire

Given its predominantly rural nature, Bedfordshire was subjected to relatively few significant bombing raids and bombing densities were typically low.

Raids over Bedfordshire were usually low intensity, involving single or small numbers of aircraft, either jettisoning unused bombs on return from strategic targets further afield or undertaking 'tip and run' raids against opportunistic targets.

Bombing in the county was concentrated towards the industrial works in Luton, over 20km south-southeast of the Site, and military establishments.

#### 4.2.2 Strategic targets

From prior to the declaration of war in 1939, Britain was subjected to reconnaissance flights by the Luftwaffe which was building up a photographic record of potential targets.

The Site was located in a predominantly rural area which contained few strategic targets. The nearest were ROF Elstow, London Midland and Scottish Railway (LMS) lines, and RAF Cardington.

It should be noted that ROF Elstow, adjacent to the east of the Site, was constructed after the major air raids in Bedfordshire had ended (see Section 3.1).

The nearest identified Luftwaffe target was RAF Henlow, approximately 13.5km east of the Site.



### 4.2.3 Bombing densities and incidents

Table 1 gives details of the overall bombing statistics recorded for the Local Authority Districts of the Site (highlighted by bold text) and surrounding districts. These were categorised as Rural Districts (RD), Urban Districts (UD), Municipal Boroughs (MB), Metropolitan Boroughs (MetB), and County Boroughs (CB). WWII bomb density levels are defined below:

<5 bombs per 405ha is a Very Low regional bombing density.

5-15 bombs per 405ha is Low.

15-50 bombs per 405ha is Moderate.

50-250 bombs per 405ha is High.

>250 bombs per 405ha is Very High.

Official UK bombing statistics have been compiled from both British and German sources. There were differences in the way the figures were originally reported and collated which has led to discrepancies in the summary data.

Note that Table 1 excludes the figures for Incendiary Bombs (IBs). Discrepancies between the below list and other records, such as bomb clearance records, demonstrate that this data is likely to under-represent actual bombing.

**Table 1 Bombing statistics**

Area	Bombs Recorded				Bombs per 405ha (1000 acres)
	High Explosive	Parachute Mines	Other	Total	
<b>Bedford RD</b>	<b>283</b>	<b>1</b>	<b>10</b>	<b>294</b>	<b>2.6</b>
Amphill RD	281	4	14	299	4.8
Biggleswade RD	165	0	8	173	3.5
Bedford MB	13	1	0	14	2.8
Newport Pagnell RD	161	1	1	163	2.6
Kempston UD	1	1	0	2	1.5
Amphill UD	0	0	0	0	0.0

It should be noted that during WWII, many Unexploded Bombs (UXBs) were mapped and subsequently removed as and when conditions and demands on Bomb Disposal teams allowed. Their removal was not always accurately recorded and sometimes records were later destroyed. In practice, most UXBs were probably removed and only a much smaller number were actually registered as officially abandoned bombs.

Details of the nearest recorded bombing incidents to the Site are given in the following section.

#### **11<sup>th</sup> October 1940**

2No. HE bombs and 2No. Oil Bombs (OBs) fell on Hoo Fields, Wootton Green, approximately 0.3km west of the Site.

Several IBs fell on open ground near Stewartby Brick Works, approximately 0.7km south of the Site.

#### **9<sup>th</sup> November 1940**

2No. HE bomb fell on Great Thickthorn Farm, approximately 1.5km southeast of the Site.

### 11<sup>th</sup> March 1941

1No. HE bomb fell on a field in Houghton Conquest, approximately 1.6km south-southeast of the Site.

Figure 4 is a map showing the approximate location of recorded bomb impacts in the immediate vicinity of the Site. IBs shown are indicative of larger numbers of similar devices that fell within the given area.

The map has been compiled from different sources, including air raid incident reports, historical aerial photographs, and bomb census maps.

The bomb map is also given in the accompanying P14166-24-R1-MAP01-A.

**Figure 4 Compiled bomb impact map for the vicinity of the Site**

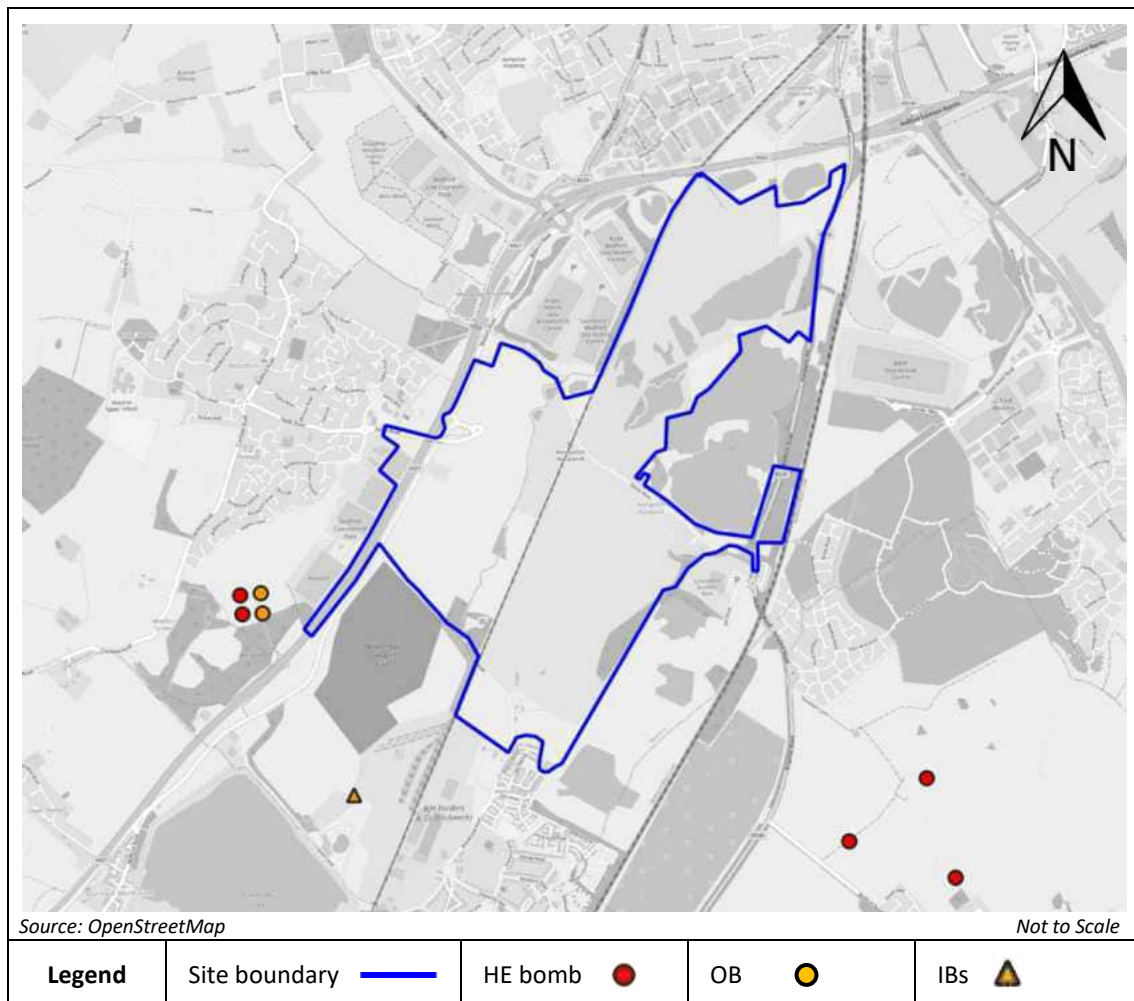


Plate 3 is an aerial photograph of the northern part of the Site, dated the 7<sup>th</sup> June 1946. No bomb damage or cratering has been identified on or in the vicinity of the Site.

RAF Kempston has been identified (see Section 3.3).



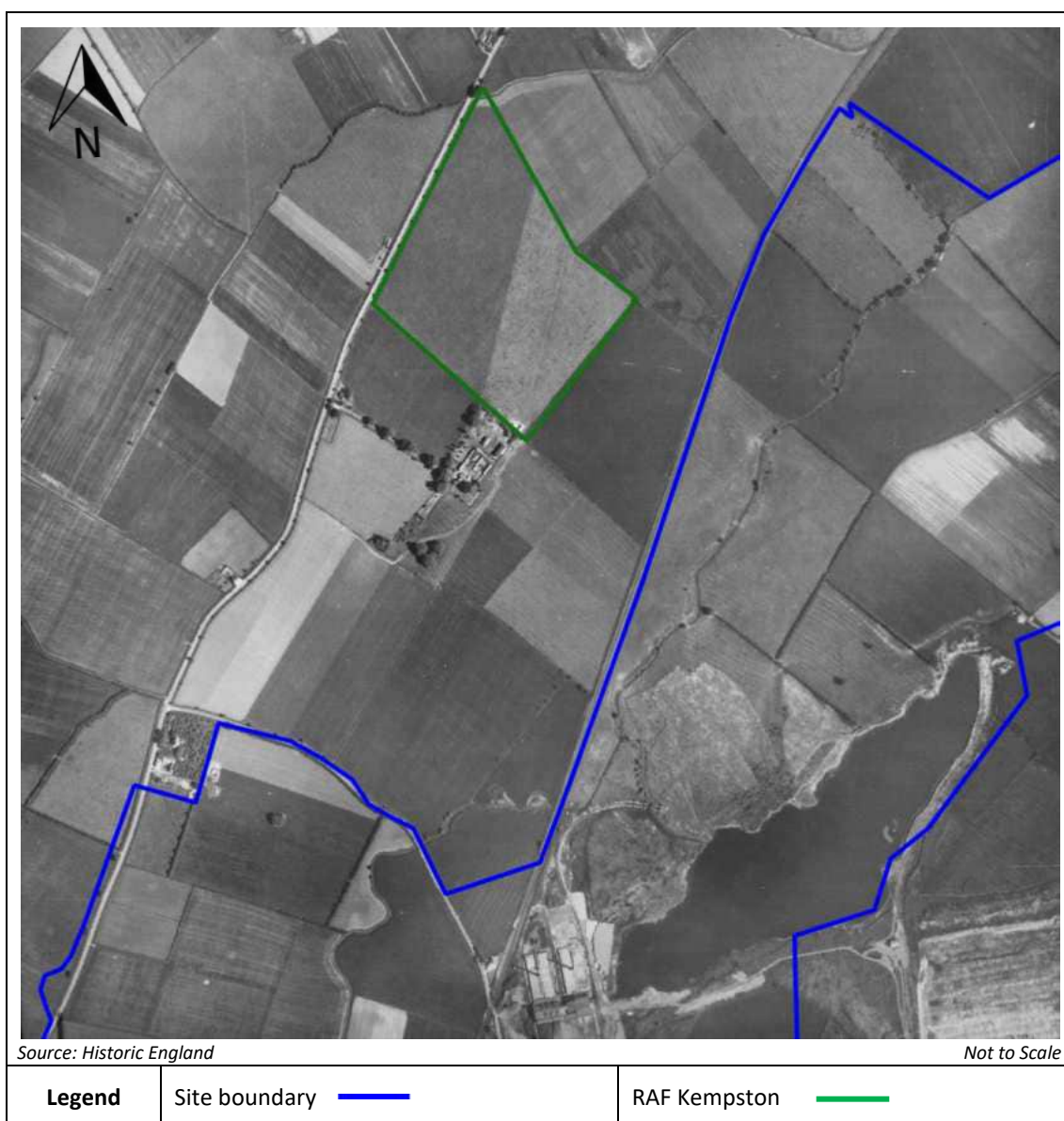
**Plate 3 Aerial photograph of the northern part of the Site, 7<sup>th</sup> June 1946**

Plate 4 is an aerial photograph of the western part of the Site, dated the 11<sup>th</sup> October 1946. No bomb damage or cratering has been identified on or in the vicinity of the Site.

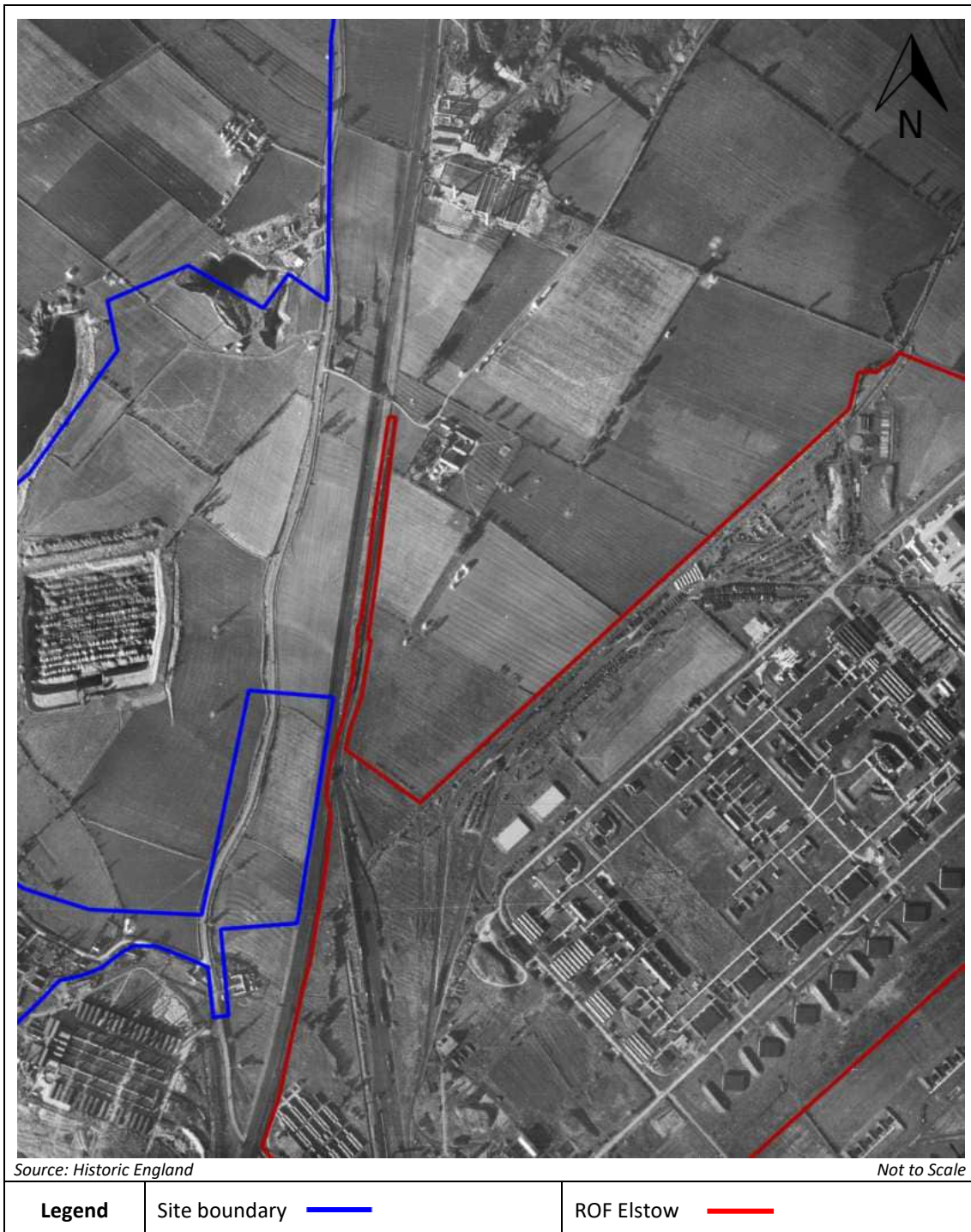
**Plate 4 Aerial photograph of the western part of the Site, 11<sup>th</sup> October 1946***Source: Historic England**Not to Scale***Legend**

Site boundary —

Plate 5 is an aerial photograph of the eastern part of the Site, dated the 11<sup>th</sup> October 1946. No bomb damage or cratering has been identified on or in the vicinity of the Site.

ROF Elstow has been identified adjacent to the east of the Site (see Section 3.1).



**Plate 5 Aerial photograph of the eastern part of the Site, 11<sup>th</sup> October 1946**

### Potential UXO hazard

No records have been found indicating that the Site was bombed and no bomb damage or cratering has been identified on the Site on historical aerial photography.

WWII bombing is not considered to provide a significant source of UXO hazard to the Site.

#### 4.2.4 Abandoned bombs

No records have been found indicating that any officially abandoned bombs are located on the Site.

#### 4.2.5 Bomb penetration depths

BGS 1:50,000 Sheet 203 Bedford (Bedrock & Superficial) and BGS borehole records from nearby investigations have been consulted to get an indicative overview of the Site geology.

The WWII geology of the Site is understood to consist of open ground, Head deposits of clays to gravels, overlying mudstone of the Peterborough Member.

Table 2 provides an estimate of average maximum bomb penetration depths for the Site assuming WWII ground conditions of 0.5m of topsoil (modelled as soft clay), over 18m of stiff to very stiff clay, overlying more than 20m of weak rock.

**Table 2 Estimated average maximum bomb penetration depths**

Estimated average bomb penetration depths for anticipated geology		
Bomb Weight	50kg	5.5m
	250kg	8.5m
	500kg	16.0m

These calculations can be refined on receipt of further Site-specific information.

The estimated bomb penetration depths given in Table 2 are from the WWII ground level and are based on the following assumptions:

- a) High-level release of the bomb resulting in an impact velocity of 260m/s (>5,000m altitude).
- b) A strike angle of 10 to 15 ° to the vertical.
- c) That the bomb is stable, both in flight and on penetration.
- d) That no retarding units are fitted to the bomb.
- e) That the soil type is homogenous.

Assuming the above, a bomb will enter the ground and travel on the same trajectory until momentum is nearly lost. The bomb will then turn abruptly to the horizontal before coming to rest. The horizontal distance between the centre of the entry hole and the centre of the bomb at rest is known as the 'offset'. A marked horizontal movement from the original line of entry is common.

Low-level attacks may have an impact angle of 45° or more, which will frequently lead to a much greater amount of offset movement during soil penetration.

The average offset is one third of the penetration depth. If hardstanding or Made Ground were present during WWII, bomb penetration depths would have been significantly reduced but offset distances may have been up to four times greater.



## 5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES

Based on data from 1939 to 1945, War Office statistics indicate that 200,195No. HE bombs exploded within Great Britain. Additionally, 25,195No. HE bombs (approximately 11%) were recorded as UXBs. However, records from the Royal Engineers (RE) who were responsible for bomb disposal at the time indicate that by 27<sup>th</sup> February 1946, more than 45,000No. UXBs were disposed of.

On average, 8.5% of UXBs later self-exploded. In some cases, the bombs had delayed action fuzes or were never intended to explode, their purpose being to cause inconvenience and fear. Given the discrepancy in records and the fact that UXBs are still being found unexpectedly, it is clear that the original figures are understated and provide only an approximation of the number of potential UXBs in the UK.

War Office (WO) statistics also show that between October 1940 and May 1941 most UXBs (93%) were either 50kg or 250kg. It should be noted that details of the recovery and size of the UXB were not always accurately reported.

The larger WWII UXBs are often difficult to recover due to both penetration depths and the presence of two or more fuzes, combined with more sensitive fillings of explosive mixtures including Amatol and Trialen.

### 5.1 EOC tasks

Zetica holds the following records of post-WWII EOC tasks having taken place in the vicinity of the Site.

#### **24<sup>th</sup> July 2008**

2No. mortar bombs were discovered on Green Lane in Stewartby, approximately 1km south of the Site. These were safely disposed of.

## 6 UXO HAZARD ASSESSMENT

### 6.1 UXO hazard level

Definitions of UXO Hazard Level for a Site	
Hazard Level	Definition
Very Low	There is positive evidence that UXO is not present, e.g. through physical constraints or removal.
Low	There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted.
Moderate	There is positive evidence that ordnance was present or that other uncharted ordnance may be present as UXO.
High	There is positive evidence that UXO is present.
Very High	As high, but requires immediate or special attention due to the potential hazard.

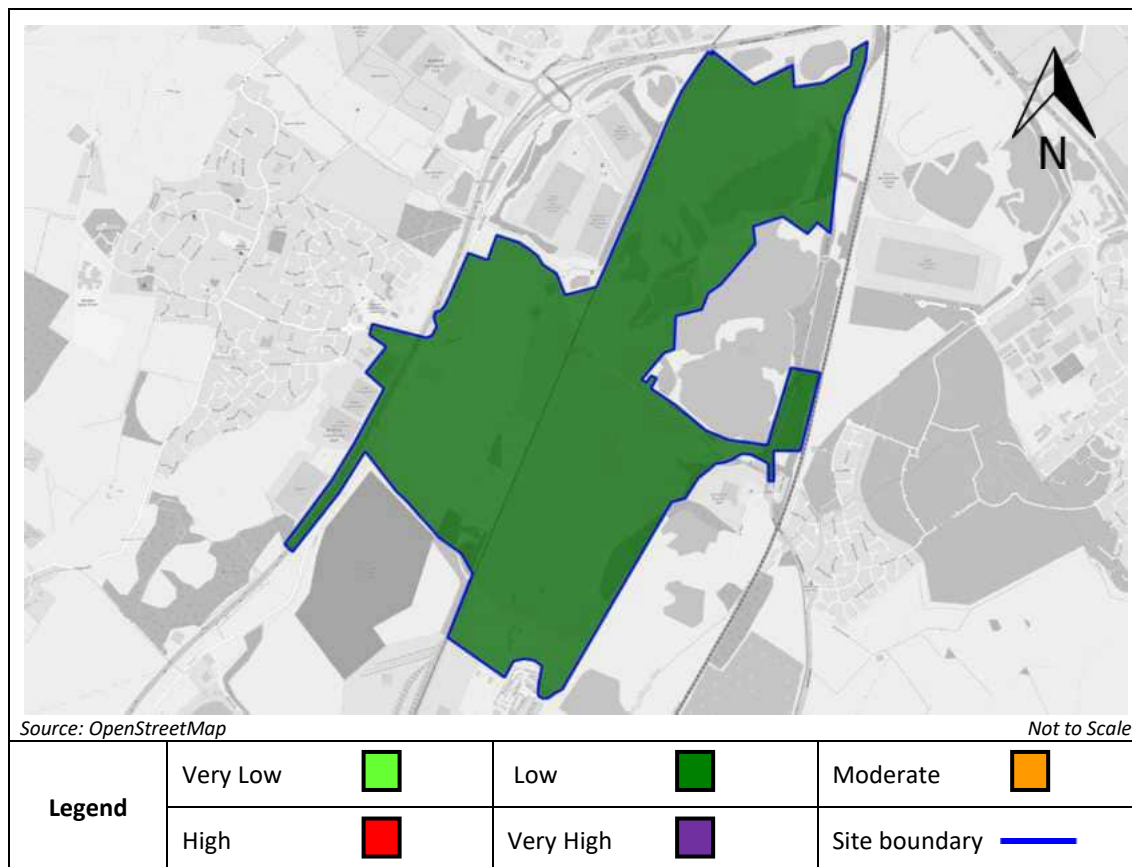
Between 1940 and 1946, ROF Elstow was located adjacent to the east of the Site. No records have been found to indicate that ROF Elstow encroached on the Site and no sources of UXO hazard associated with ROF Elstow have been identified on the Site.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in Figure 5.

The UXO hazard zone plan of the Site is also given in the accompanying P14166-24-R1-MAP01-A.

**Figure 5 UXO hazard zone plan of the Site**





## 7 UXO RISK ASSESSMENT

### 7.1 Proposed works

It is understood that works on the Site are associated with a commercial redevelopment scheme. Works will include laying of traditional foundations and piled foundations to a depth of approximately 15m below ground level (bgl)

It is assumed that works on the Site may also include intrusive ground investigations.

### 7.2 Risk assessment methodology

A UXO risk assessment has been undertaken for the proposed works, taking into consideration the identified UXO hazard(s).

Firstly, the probability of encountering UXO (PE) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Encounter (PE)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Secondly, the probability of detonating an item of UXO (PD) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Detonation (PD)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Next, the probability of encountering and detonating the UXO (PE x PD) have been used to generate an overall likelihood rating (P).

P = PE x PD	LIKELIHOOD of Encounter and Detonation	Rating
21 to 25	Frequent, highly likely, almost certain.	5
16 to 20	Probable, more likely to happen than not.	4
6 to 15	Occasional, increased chance or probability.	3
2 to 5	Remote, unlikely to happen but could.	2
1	Improbable, highly unlikely.	1
0	Impossible	0
<b>P ranges from 25, a certainty of UXO being encountered and detonated on the Site by engineering activity, to 0, a certainty that UXO does not occur on the Site and will not be detonated by engineering activity.</b>		

The likelihood of encountering and detonating UXO during site works (P) is multiplied by the severity (S) of such an event occurring (P x S), to provide a risk level using the following matrix.

Severity (S)	Rating
Multiple fatalities	5
Major injury, long term health issues, single fatality.	4
Minor injury, short term health issues, no fatalities.	3
First aid case but no lost time or ill health.	2
Minor injuries, no first aid.	1
No injuries.	0

UXO Risk Matrix							
LIKELIHOOD (P)	SEVERITY (S)						
		5	4	3	2	1	0
	5	25	20	15	10	5	0
	4	20	16	12	8	4	0
	3	15	12	9	6	3	0
	2	10	8	6	4	2	0
	1	5	4	3	2	1	0
	0	0	0	0	0	0	0

### 7.3 UXO risk level

The UXO risk assessment for proposed works on the Site is given in Table 3.

**Table 3 UXO risk assessment for the Site**

Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low

**PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood**



## 8 RISK MITIGATION PLAN



**Key findings:** No significant sources of UXO hazard have been identified.

**Key actions:** Proceed with works. An UXO awareness briefing is prudent for staff involved in excavations.

### 8.1 UXO risk summary

Table 4 summarises the UXO risk for proposed works on the Site and recommended actions.

**Table 4 Summary of UXO risk and mitigation recommendations**

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		<b>Proceed with works</b> – an UXO awareness briefing is prudent for staff involved in excavations.
Boreholes/Piling		<b>Proceed with works</b>

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP). An UXO awareness briefing for staff involved in excavations is always prudent.

### 8.2 Risk mitigation techniques

#### 8.2.1 UXO awareness briefing

It is prudent that all staff involved in intrusive works are provided with a formal UXO awareness briefing.

The briefing should offer some recognition skills for typical UXO, and suitably sensitise staff to be vigilant during site works.

An UXO awareness briefing ensures that in the unlikely event that UXO is encountered:

- All site staff take appropriate action.
- A support mechanism and points of contact are established.
- The likelihood of harm to people or property is reduced.
- Significant delays to site work are prevented.

### 8.3 What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	<b>01993 886682</b>		<b><u><a href="mailto:uxo@zetica.com">uxo@zetica.com</a></u></b>		<b><u><a href="http://zeticauxo.com">zeticauxo.com</a></u></b>
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If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

## APPENDICES

### Appendix 1 Anticipated ordnance types

For a more comprehensive set of ordnance data sheets, see <https://zeticauxo.com/guidance/ordnance-data-sheets/>.

#### Information Data Sheet

**Category** Bomb (Luftwaffe)

**Type** Sprengbombe-Cylindrisch (SC) 50kg

**Variants** 8

**Body Dimensions** 762 x 200mm (30" x 7.9")

**Weight** 55kg (122lbs)

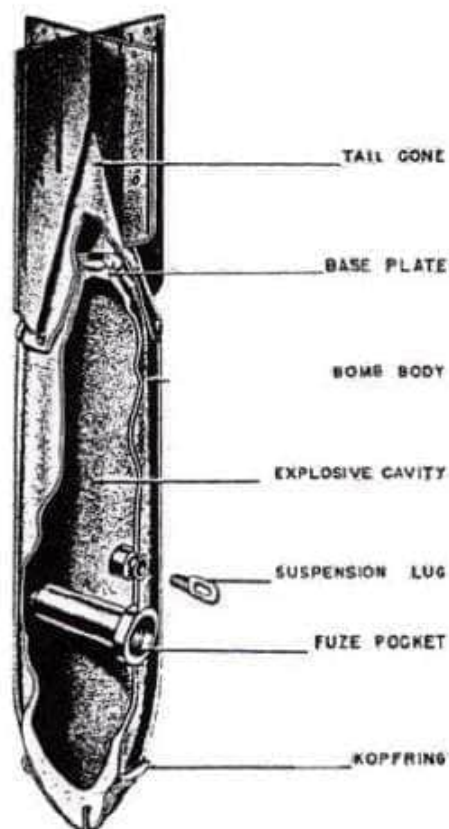
**Charge Weight** 25kg (54lbs)

**Fuze** Single electric impact fuze. Some have short time delay

**Composition** Sheet steel

**Description** Thick nose welded to a steel body. Nose may be attached to Kopfring (a triangular section steel ring) or spike. Suspension bolt in eye/body and sheet metal tail attached to body with rivets/screws. Originally painted green-grey with a yellow stripe on the tail. Cast TNT, Amatol or Trialen filling.

**Function** Designed to maximise shock waves through air, water and earth and for general demolition. Used against easily damageable targets, including roads, aircraft hangars, rolling stock and small buildings. Spike bombs/ 'Stabo' (SC 50 with spikes attached to nose) were used against rail lines and country roads, with Kopfring used against naval targets.





## Information Data Sheet

**Category** Bomb

**Type** Sprengbombe-Cylindrisch (SC) 250kg

**Variants** 8

**Body Dimensions** 1194mm x 368mm (47" x 14.5")

**Weight** 249-264 kg (548-582lbs)

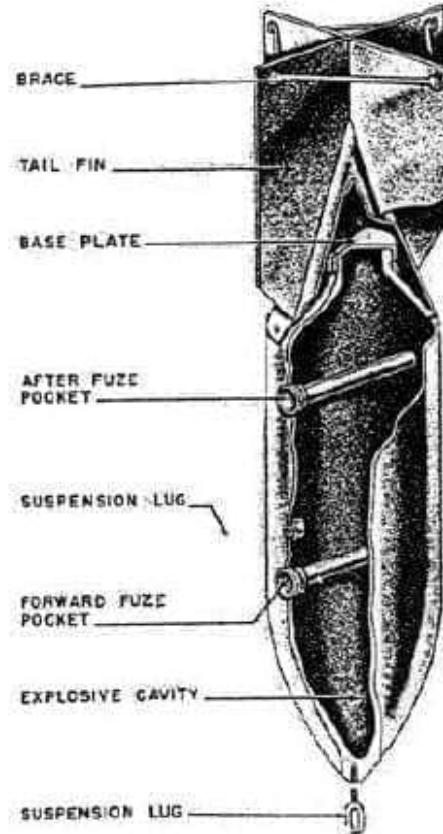
**Charge Weight** 130-145 kg (287-320lbs)

**Fuze** Electric impact fuze/electric clockwork time fuze & electric anti-disturbance fuze

**Composition** Sheet steel with stays

**Description** Thick nose welded to steel body. Nose may be attached to Kopfring (triangular section steel ring) or spike. Sheet metal tail attached to body with rivets/screws. Suspension eye bolt in the nose/body. Originally painted green-grey with a yellow stripe on the tail. TNT; amatol; TNT and aluminium powder, naphthalene, ammonium nitrate and wax/ wood meal filling.

**Function** Designed to maximise shock waves through air, water and earth and general demolition. Used against railway installations, large buildings, ammunition depots and below-ground installations (to 8m). Spike bombs/ 'Stabo' (SC 50 with spikes attached to nose) used against rail lines and country roads.



## Information Data Sheet

**Category** Bomb

**Type** Sprengbombe-Cylindrisch (SC) 500kg

**Variants** -

**Body Dimensions** 1414-1486mm x 470mm (55.7-58.5" x 18.5")

**Weight** 500kg (1,100lbs)

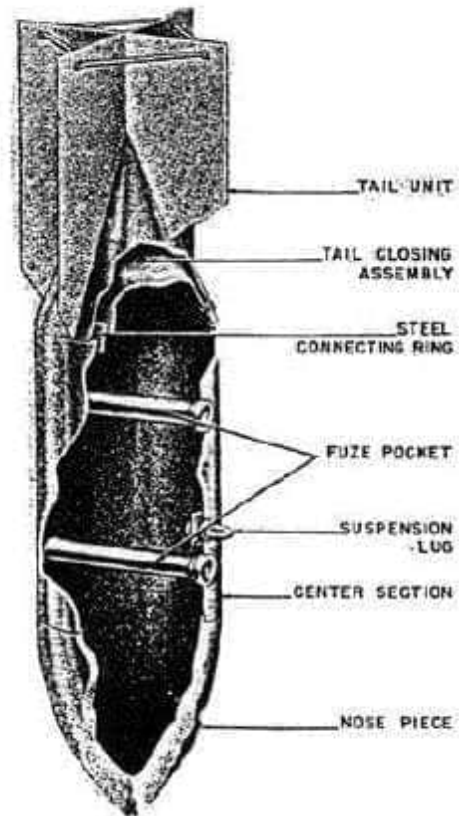
**Charge Weight** 220kg (484lbs)

**Fuze** Electric impact fuze/electric clockwork time fuze & electric anti-disturbance fuze.

**Composition** Sheet steel with stays or drum

**Description** Thick nose welded to steel body. Nose may be attached to Kopfring (triangular section steel ring). Tail either steel sheet or drum-shaped. Suspension band. Originally painted green-grey/ buff (some later versions sky blue) with yellow stripe on tail. Filled with amatol, TNT or trialen.

**Function** Designed to maximise shock waves through air, water and earth and for general demolition. Used against railway property, large buildings, shipping and below-ground installations.



## Information Data Sheet

**Category** Projectile  
**Type** 3.7" Anti-Aircraft Shell

**Variants** 6

**Body Dimensions** 94mm x 360mm (3.7 x 14.7")

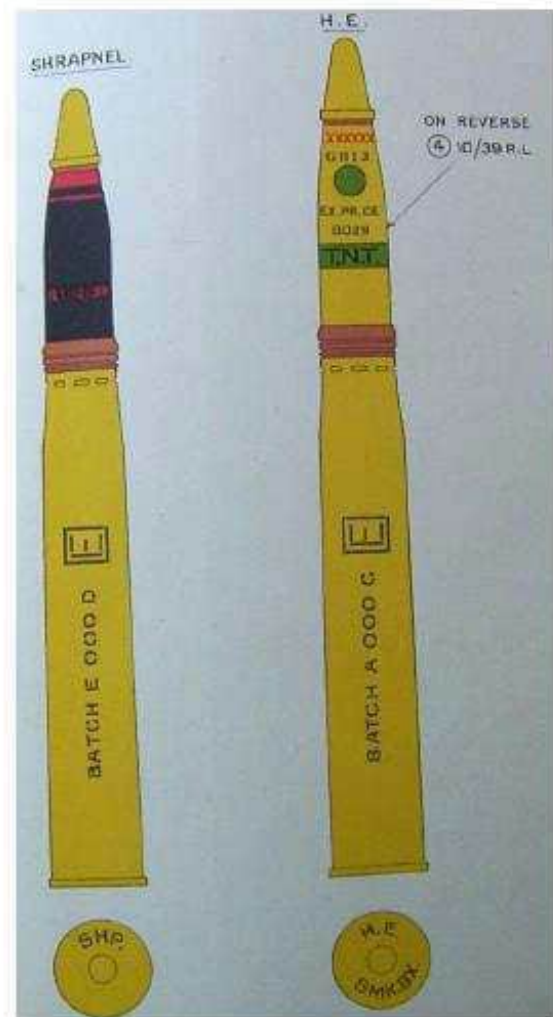
**Weight** 12.7kg (28lb)

**Fuze** Mechanical time fuze

**Composition** Cast steel

**Description** Brass cartridge case. Square-based shell with tapered nose, filled with Amatol, TNT or RDX/TNT. MK6 had forward centring bands and a wider driving band.

**Function** Used as a defence against enemy aircraft, fired from fixed batteries and mobile mountings. Could fire approximately 20 rounds per minute with a maximum ceiling of 41,000ft and horizontal range of 20,600 yards.





## Information Data Sheet

**Category** Projectile

**Type** 4.5" Shell (Mark II – Anti-Aircraft)

**Variants** -

**Body Dimensions** 114mm x 566mm (4.5" x 21.9")

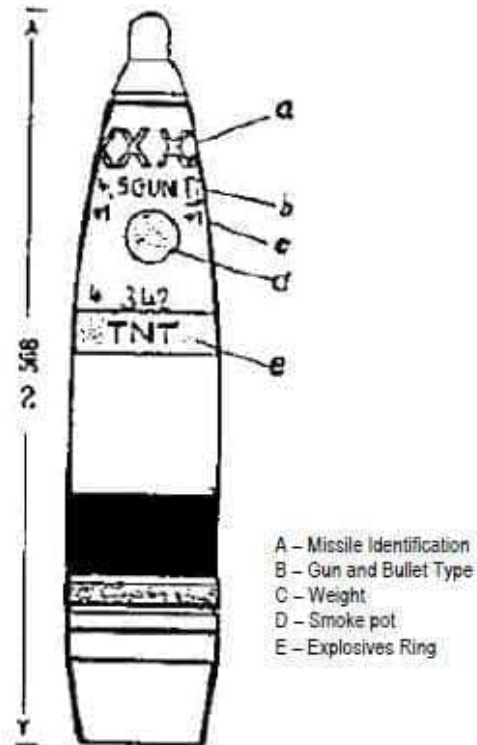
**Weight** 24.9kg (55lb)

**Fuze** Mechanical time fuze

**Composition** Cast steel

**Description** Square-based, tapered-nosed shell filled with TNT or Amatol. Steel casing, rotating band of either copper or gilding metal located 3.5" in front of the base end with single groove.

**Function** Used as field artillery and adapted for use in anti-aircraft defence from fixed batteries. Rate of fire of 8 rounds per minute, maximum ceiling of 44,000ft and horizontal range of 22,800 yards.



## Appendix 2 Sources of UXO hazard

The sections below provide background information on the potential sources of UXO hazard affecting the Site. For a more comprehensive set of UXO information sheets, see <https://zeticauxo.com/guidance/uxo-hazard-sources/>.

### Appendix 2.1 WWI bombing

## Information Data Sheet

### Category World War One (WWI) Bombing

#### Description:

During WWI, significant bombing took place across some areas of the UK. An estimated 9,000No. German bombs were dropped on Britain during the course of 51No. airship and 52No. aircraft raids. It was the first time that strategic aerial bombardment had been used.

Nearly 100No. air raids were carried out on London and Southeast England, over 40No. of which were by Zeppelin airships. Areas along the East Coast was also targeted regularly due to their proximity to the European continent. Bombing raids further inland were rare and West England and Wales were out of reach for German aircraft of the time.

Aerial bombing during WWI initially relied on visual aiming, with bombsights not developed until later in the war. The inaccuracy inherent in this method meant that bombs often fell some way from their intended targets.

The first recorded raid against England occurred on the 21<sup>st</sup> December 1914 when 2No. High Explosive (HE) bombs fell near the Admiralty Pier at Dover. Zeppelin raids intensified during 1915 and 1916, with aircraft raids becoming more frequent after 1917. The last raid of WWI took place on the 19<sup>th</sup> May 1918, when 38 Gotha and 3 Giant aircraft bombed London and surrounding districts, dropping a total of more than 2,500lbs of bombs.



A variety of WWI German bombs

#### Hazard:

The potential of coming across an Unexploded Bomb (UXB) from WWI is far less likely than an UXB from World War Two (WWII), given the lower bombing densities during raids in WWI.

Some areas which were subjected to sustained bombing raids recorded a higher number of UXBs. In these areas, where there has been no significant development for the last century, the potential of a UXB remaining from WWI cannot be totally discounted.



**Appendix 2.2 WWII bombing****Information Data Sheet****Category** World War Two (WWII) Bombing**Description:**

Bombing raids began in summer 1940 and continued until the end of WWII. Bombing densities generally increased towards major cities, such as London, Birmingham, Coventry, and Hull, or strategic targets such as docks, harbours, industrial areas, and airfields. Coastal towns, such as Eastbourne, and cathedral cities, such as Canterbury were also heavily targeted.

The German bombing campaign saw the extensive use of both High Explosive (HE) bombs and Incendiary Bombs (IBs). 50kg and 250kg HE bombs were most commonly used, although 500kg were also used to a lesser extent. More rarely 1,000kg, 1,400kg and 1,800kg bombs were dropped. HE bombs tended to contain about half of their weight in explosives and were fitted with one or two fuzes. Not all HE bombs were intended to explode on impact and some contained timing mechanisms where detonation could occur more than 70 hours after impact.

Incendiary devices ranged from small 1kg thermite filled, magnesium bodied IBs, to 250kg and 500kg Oil Bombs (OB). Occasionally IBs were fitted with a bursting charge which exploded after the bomb had been alight for a few minutes, causing burning debris to be scattered over a greater area. Large OBs were similar in appearance to HE bombs, although their design was sufficiently different to warrant a specially trained unit of the Royal Engineer (RE) to deal with their disposal.



**Variety of WWII bombs**

Anti-Personnel (AP) bombs and Parachute Mines (PMs) were also deployed. The most common AP bombs were 1kg and 2kg, which could inflict injury across an area up to 150m away from the impact. PMs could be up to 4m in length and were typically detonated either magnetically or by noise/vibration. Anti-shipping PMs were commonly dropped over navigable rivers, dockland areas, and coastlines. Whilst the Royal Navy (RN) was responsible for ensuring that anti-shipping PMs were made safe, their removal and disposal was still the responsibility of the RE.



In 1944, new offensive weapons were introduced. The Flying Bomb (V1), a pilotless guided missile, exploded on impact and could cause significant damage. The Long Range Rocket (V2), a ballistic missile rocket, travelled at such speed that no one could see or hear its approach.

WWII bomb targeting was inaccurate, especially in the first year of the war. A typical bomb load of 50kg HE bombs mixed with IBs aimed at a specific location might not just miss the intended target but could fall a considerable distance away.

Local Civil Defence authorities in urban areas typically had a comprehensive system for reporting bomb incidents and dealing with Unexploded Bombs (UXB). In more rural and coastal areas where fewer bombing raids occurred, it is known that Air Raid Precaution (ARP) records under-represent the number and frequency of bombs falling. Bombs could be released as part of 'tip and run' raids where bomber crews would drop their bombs to avoid Anti-Aircraft (AA) fire or Allied fighter aircraft, on route to and from other strategic targets. Bombs dropped as a result of poor targeting or 'tip and run' raids often went unrecorded or were recorded as 'fell in open country' or 'fell in the sea'. The Luftwaffe are thought to have dropped approximately 75,000 tons of bombs on Britain throughout WWII and an estimated 11% of all bombs dropped during the war failed to detonate.



Removal of an UXB

**Hazard:**

The potential for a UXB hazard to exist on a site depends on a variety of factors:

- Were their strategic targets in the surrounding area?
- Was the site bombed and how heavy were the raids?
- Could an UXB impact have been missed, masked by rubble or debris?

Even in rural areas, the potential for UXBs cannot be totally discounted and therefore it is essential that detailed local bombing records are obtained when assessing the UXB hazard on any site.

**Appendix 2.3 Anti-Aircraft defences****Information Data Sheet****Category** Anti-Aircraft (AA) Defences**Description:**

As aerial bombardment first began during World War One (WWI), AA gun batteries were gradually established throughout much of England to counter German bombing raids. By June 1916, there were approximately 271No. AA guns and 258No. searchlight installations defending London alone.

Common WWI AA defences included 3", 75mm, 6-pounder (pdr), and 1pdr guns. Many of these guns were mobile and would follow the course of an airship, firing from areas of open land.

During WWI, Unexploded AA (UXAA) shells, could land up to 13km from the firing point, although they more typically fell within 10km.



WWI 3-pdr mobile Vickers AA gun



WWII 3.7" static AA gun

During World War Two (WWII), AA gun batteries were used extensively to counter the threat posed by enemy aircraft. AA shells could be distributed over a wide area and could land up to 27km from the firing point, although they more typically fell within 15km.

3No. types of AA batteries existed:

- Heavy AA (HAA) – typically 3.7", 4.5", and 5.25" calibre guns designed to engage high flying bomber aircraft. These tended to be permanent gun emplacements.
- Light AA (LAA) – typically used 40mm shells and machine gun ammunition and designed to counter low flying aircraft. These were often mobile and were moved periodically.
- Rocket AA (ZAA) – fired 3" or 3.7" AA rockets with a maximum altitude of 5,800m and a ground range of 9km. These tended to be permanent gun emplacements.

**Hazard:**

AA batteries had munitions stores which stored shells for the batteries and Small Arms Ammunition (SAA) for troops manning the position. Such stores were typically removed at the end of WWII, although some disposal may have occurred in the immediate vicinity of the gun battery.

In areas heavily protected by AA batteries, it is prudent to consider the potential for UXAA shells in the area surrounding a battery, taking into consideration the likely extent within which shells would have fallen. Finding an UXAA shell immediately adjacent to a former gun battery is less likely.



## Appendix 3 Recent UXO finds

## Information Data Sheet

**Category** Recent UXO Finds

UXO finds in the UK are a regular occurrence, although they almost never result in an accidental detonation.

Explosives rarely lose effectiveness with age. In some instances, mechanisms such as fuzes and gaines can become more sensitive and more prone to detonation, regardless of whether the device has been submersed in water or embedded in silt, clay, or similar materials.

Zetica Ltd, and other commercial EOD companies, uncover and make safe thousands of items of UXO each year, though details are rarely made public knowledge.

Publicly recorded discoveries also occur regularly, as shown by the list of recent significant UXO finds in the UK below. Click [here](#) to keep up to date with the latest UXO finds.

On the 26<sup>th</sup> February 2021, a 1,000kg German "Hermann" UXB was discovered by builders at Exeter University campus (see below). It was investigated and detonated in-situ following the evacuation of nearby properties and University halls of residence.



**1,000kg German UXB discovered in Exeter, 2021**

On the 29<sup>th</sup> March 2021, 1No. 250lb UXB was discovered on the seabed near Hinkley Point C harbour, Bristol. A maritime exclusion was imposed while the item was investigated and then destroyed in a controlled explosion.

On the 1<sup>st</sup> June 2021, a cache of approximately 100No. WWII-era hand grenades were found in a Nottinghamshire forest, a possible relic from nearby WWII camps. They were destroyed.

On the 24<sup>th</sup> July 2021, 1No. 500lb British UXB was uncovered during construction works in Goole, East Yorkshire. Reports indicated that the UXB had been jettisoned by a Lancaster bomber aircraft prior to crashing nearby in WWII. The item was investigated and destroyed.

On the 18<sup>th</sup> August 2021, 1No. UXB was found by construction workers on a Site in Earl Sterndale, Derbyshire. Upon inspection the UXB was deemed to be dangerous, and a controlled detonation was undertaken.



On the 10<sup>th</sup> September 2021, EOD teams destroyed 25No. mortar bombs which had been washed up onto beaches around Nairn and Ardersier in Morayshire. These beaches had been used during WWII for training prior to the D-Day landings in Normandy.



**Mortar bombs found on beaches in Nairn and Ardersier, 2021**

On the 15<sup>th</sup> December 2021, approximately 200No. artillery shells were discovered at a construction site located within the former Royal Ordnance Factory at Swynnerton in Staffordshire. The shells were removed and destroyed.

On the 2<sup>nd</sup> January 2022, 1No. heavily deteriorated 105mm artillery shell was discovered by dogwalkers on a beach in Cumbria. This may have originated on one of the several offshore ranges which have been operational along the nearby coastline since WWII.

Between the 24<sup>th</sup> and 27<sup>th</sup> January 2022, 5No. empty artillery shells were uncovered at a construction site in Manchester. These were likely linked to a shell-production factory which had been active on the site during WWII.

On the 14<sup>th</sup> July 2022, 1No. 2" mortar bomb and several Small Arms Ammunition rounds were discovered on a beach near Ardnamurchan. An EOD team disposed of the items.

On the 28<sup>th</sup> November 2022, 45No. Self-Igniting Phosphorus grenades were discovered during construction works at a school in Swindon. They were disposed of by an EOD team.

On the 5<sup>th</sup> December 2022, 1No. UXB was discovered during construction at Biggin Hill Airport. An EOD team removed the UXB for safe disposal.

On the 7<sup>th</sup> February 2023 1No. 250kg bomb was found during dredging works in the River Yare, Great Yarmouth. It detonated unplanned whilst being disarmed by an Army EOD team.

On the 17<sup>th</sup> April 2023, 1No. unexploded mortar bomb was discovered at Cavenham Heath Nature Reserve. It was destroyed in a controlled explosion by an EOD team. This followed 2No. other similar discoveries on the 7<sup>th</sup> March and 12<sup>th</sup> March in the same stretch of canal.

On the 27<sup>th</sup> July 2023, 1No. 250kg WWII bomb was discovered off the coast of Guernsey by a recreational diver. It was detonated in situ by a Royal Navy EOD diver team.

## Appendix 4 Glossary and definitions

<b>Abandoned Explosive Ordnance (AXO)</b>	Explosive ordnance that has not been used during an armed conflict, that has been left behind or disposed of by a party to an armed conflict, and which is no longer under control of that party. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use.
<b>Demil</b>	Derived from the term 'Demilitarisation', demil refers to the break down and the recycling or disposal of ordnance components.
<b>Detonation</b>	The high-speed chemical breakdown of an energetic material producing heat, pressure, flame, and a shock wave.
<b>Device</b>	Any component, sub-assembly or completed ordnance, which may or may not have an explosive risk. It can apply to detonators, primers, gaines, fuzes, shells, or bombs.
<b>Explosive</b>	Compounds forming energetic materials that under certain conditions chemically react, rapidly producing gas, heat, and pressure. These are extremely dangerous and should only be handled by qualified professionals.
<b>Explosive Ordnance (EO)</b>	All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. This includes bombs and warheads, missiles, artillery, mortar, rocket, Small Arms Ammunition, mines, torpedoes, depth charges, pyrotechnics, cluster bombs and dispensers, cartridge and propellant devices, electro-explosive devices, clandestine and improvised explosive devices, and all related items/components which are explosive in nature.
<b>Explosive Ordnance Clearance (EOC)</b>	The operation of ordnance detection, investigation, identification, and removal, with Explosive Ordnance Disposal being a separate operation.
<b>Explosive Ordnance Disposal (EOD)</b>	The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of Unexploded Ordnance.
<b>Explosive Ordnance Reconnaissance (EOR)</b>	The detection, identification, and on-site evaluation of Unexploded Ordnance before Explosive Ordnance Disposal.
<b>Explosive Remnants of War (ERW)</b>	Unexploded Ordnance and Abandoned Explosive Ordnance, excluding landmines.
<b>Explosive Substances &amp; Articles (ESA)</b>	<p>Explosive substances are solid or liquid substances (or a mixture) which are either: capable by a chemical reaction of producing gas at a speed, temperature, and pressure to cause damage to the surroundings; or designed to produce an effect by heat, light, sound, gas, or smoke (or a combination) as a result of a non-detonative, self-sustaining, exothermic reaction.</p> <p>One or more explosive substances form an explosive article.</p>

<b>Fuze</b>	The part of an explosive device that initiates the main explosive charge to function. In common usage, the word fuze is used indiscriminately, but when being specific (and especially in a military context), fuze is used to mean a more complicated device, such as a device within military ordnance.
<b>Gaine</b>	Small explosive charge that is sometimes placed between the detonator and the main charge to ensure ignition.
<b>Geophysical survey</b>	A range of methods that can be used to detect objects or identify ground conditions without the need for intrusive methods (such as excavation or drilling). This is particularly suited to ordnance, as disturbance of ordnance is to be avoided where possible.
<b>High Explosive (HE)</b>	Secondary explosives (commonly known as HE) make up the main charge or filling of an ordnance device. They are usually less sensitive than primary explosives. Examples of secondary explosives are Nitro-glycerine (NG), Trinitrotoluene (TNT), Amatol (Ammonium nitrate and TNT), gunpowder, and Cyclotrimethylenetrinitramine (RDX).
<b>Land Service Ammunition (LSA)</b>	Items of ordnance thrown, propelled, or placed during land warfare, to include grenades, mortar bombs, projectiles, rockets, and landmines.
<b>Munition</b>	<p>The complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in military operations, including demolitions. This includes those munitions that have been modified for use in training, ceremonial, or non-operational purposes.</p> <p>These fall into three distinct categories: inert (contain no explosives), live (contain explosives and have not been fired), and blind (have fired but failed to function as intended.)</p>
<b>Primary Explosive</b>	Explosives used to initiate less sensitive explosives and usually extremely sensitive to friction, heat, and pressure. Primary explosives are commonly found in detonators. Examples of primary explosives are lead azide, lead styphnate, and mercury fulminate.
<b>Propellants</b>	Provide ordnance with the ability to travel in a controlled manner and deliver the ordnance to a predetermined target. Propellants burn rapidly producing gas, pressure, and flame. Although usually in solid form they can be produced in liquid form. Examples of propellants are ballistite, often in flake form, and cordite, often in string form.
<b>Pyrotechnic</b>	An explosive article or substance designed to produce an effect by heat, light, sound, gas, or smoke (or a combination), as a result of non-detonative, self-sustaining, exothermic chemical reactions.
<b>Small Arms Ammunition (SAA)</b>	Projectiles around 12mm or less in calibre and no longer than approximately 100mm. They are fired from a variety of weapons, including rifles, pistols, shotguns, and machine guns.



<b>Unexploded Anti-Aircraft (UXAA) Shell</b>	Ordnance containing High Explosives, although they can also contain pyrotechnic compounds that produce smoke. They ranged from 2" to 5.25" calibre, although most common were 3.7" and 4.5" HE shells.
<b>Unexploded Bomb (UXB)</b>	A common term for unexploded air-dropped munitions.
<b>Unexploded Ordnance (UXO)</b>	Explosive ordnance that has been primed, fuzed, armed, or prepared for use and subsequently fired, dropped, launched, projected, or placed in such a manner as to present a hazard to operations, persons, or objects, and remains unexploded either by malfunction or design.
<b>V1</b>	The Vergeltungswaffe-1, also designated Fieseler Fi 103/FZG-76, known colloquially in English as the Flying Bomb, Pilotless Aircraft, Buzz Bomb, or Doodlebug, was the first guided missile used in WWII and the forerunner of today's cruise missile.
<b>V2</b>	The Vergeltungswaffe 2 ('Reprisal Weapon 2') was the first ballistic missile. It was used primarily against Belgian and British targets during the later stages of WWII. It was also the first man-made object launched into space, during test flights in 1944.

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## **Appendix 6 General Notes**

1. This report has been prepared in relation to the specific requirement of the contract or commission.
2. The report should not be used by third parties without prior consultation with Zetica Ltd. The copyright for this report remains with Zetica Ltd.
3. No part of this report may be reproduced, published or amended without prior written consent from Zetica Ltd.
4. The report refers to the conditions of the Site at the time of investigation/reporting. Zetica Ltd cannot accept liability for subsequent changes of Site conditions.
5. Zetica Ltd may have relied on externally provided information. Zetica Ltd cannot be held responsible for the accuracy of such information or data supplied.
6. The report has been written utilising relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation or in site conditions may render parts of this report obsolete. If the report is utilised after such changes have occurred or at a time in excess of 1 year of the issue date, it would be prudent to contact Zetica Ltd to reassess the report under a new contract (see pg. ii).





**Established for over 32 years, Zetica's services include**

- ☑ Desk studies
- ☑ Unexploded ordnance risk assessments and risk mitigation
- ☑ Utility services detection
- ☑ Environmental and engineering geophysical surveys
- ☑ Transport infrastructure surveys
- ☑ Pipeline & cable route surveys
- ☑ Intrusive ground investigations

More details are available at

**[www.zetica.com](http://www.zetica.com)**

# Annex 6

## REGULATORY INFORMATION

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WSP

I've collated the relevant information from the council records in the table below.

Using site location maps section 1 - area of site above Manor road, Section 2 - area of site below Manor Road detailed in following table.

Reference	Location	Information on database
CL/00001563	Onsite east Section 2	Eastwood Cottages - Medium Coronation Clay pit - Waste transfer/ Treatment site
CL/00001276	Onsite north of section 1	Former clay pit
HLD Reference: EAHLD01152	Onsite south of Section 1	Former clay pit & landfill Date of First Input: 12/31/1977, 12:00 Am Date of Last Input: 12/31/1993, 12:00 Am Commercial Waste: Yes Household Waste: Yes Industrial Waste: Yes
CL/00000016	Onsite central south section 1	Hanson Brickworks - medium/ Landfill site
CL/00001562	Onsite adjacent to southern boundary of section 1	Eastwood Cottages - medium
CL/00000201	Onsite south west of Section 1	London Brick co. Ltd - Coronation works/ Eastwoods Fletton Ltd - brickworks
RC/00000044	Offsite north west boundary of section 1	Borehole at Stanley works b34
CL/00001278	Offsite north west boundary	Stanley Works ( Formerly part of brickworks - medium
CL/00001567	Offsite adjacent to south west boundary section 1	Askern House - Kempston Hardwick - medium/ Waste Transfer/Treatment site
CL/00001470	Offsite adjacent to northern border of Section 2	Works (Stewartby)



CL/00001472	Offsite adjacent to northern border of Section 2	Waste transfer / treatment site
CL/00000025	Offsite adjacent to northern border of Section 2	Waste transfer / treatment site
CL/00001471	Offsite 145 m east of section 1	Brickworks (Stewartby) - kiln and clay pit
HLD Reference: EAHLD01103	Offsite 300m east of section 1	Landfill Date of First Input: 9/1/1964, 1:00 Am Date of Last Input: 12/1/1996, 12:00 Am Commercial Waste: Yes Gas Control Waste: Yes Household Waste: Yes Industrial Waste: Yes Liquid Sudge Waste: Special Waste: Unknown Waste:
HLD Reference: EAHLD00990	Offsite 130m south of section 2	Landfill Date of First Input: 7/17/1952, 1:00 Am Date of Last Input: 11/6/1986, 12:00 Am Commercial Waste: Yes Gas Control Waste: Yes Household Waste: Yes Industrial Waste: Yes Liquid Sudge Waste: Special Waste: Yes
HLD Reference: EAHLD00975	Offsite 130m south of section 2	Landfill Date of First Input: 7/17/1952, 1:00 Am Date of Last Input: 1/1/1988, 12:00 Am Commercial Waste: Yes Gas Control Waste: Yes Household Waste: Yes Industrial Waste: Yes Liquid Sudge Waste: Yes Special Waste: Yes
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So far I've found the following site investigation reports available under the following planning application ref: 18/02940/ EIA:

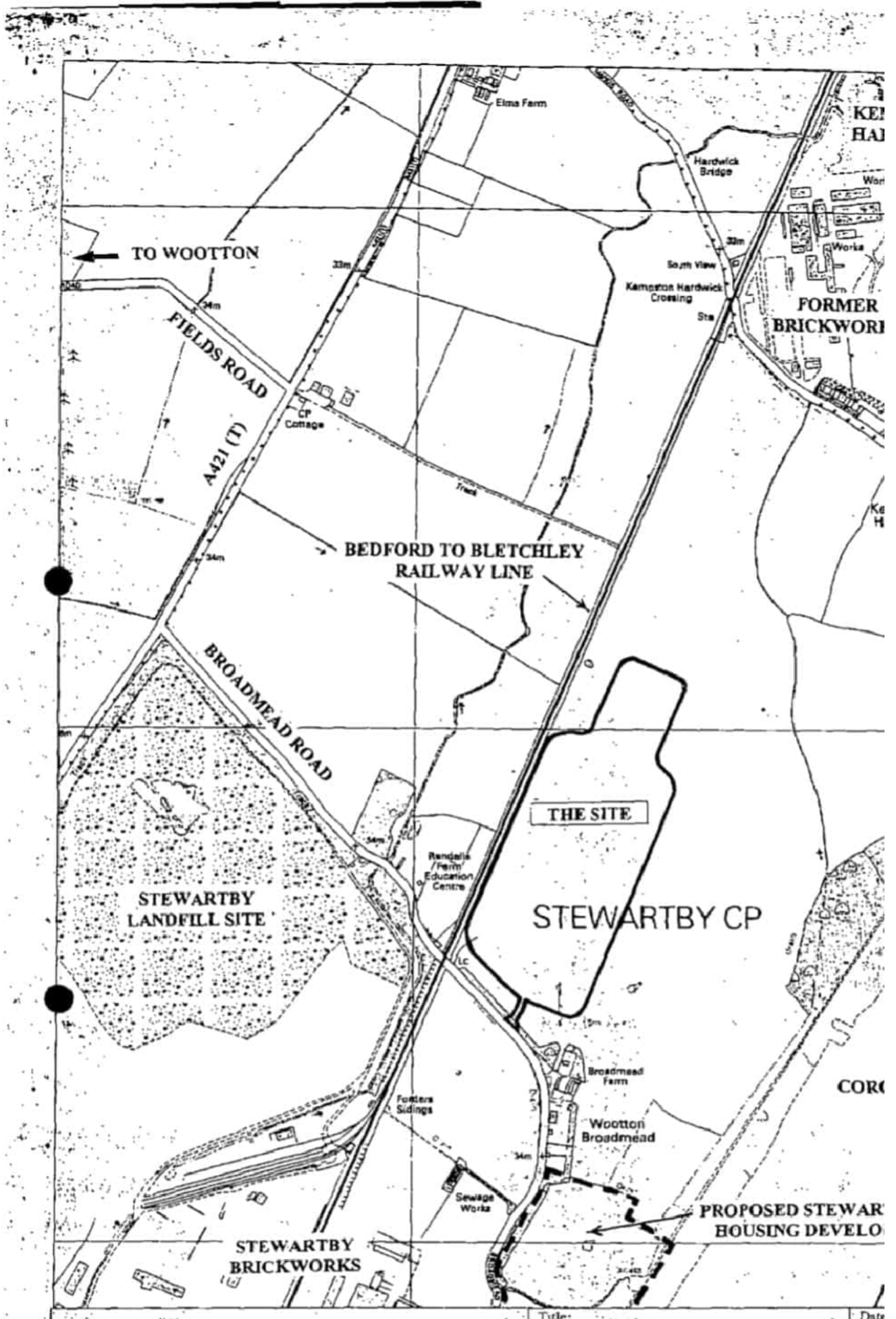
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Phase 1 and 2 Site Investigation – Phase 1 Report. Report ref: 403.00027.00436; SLR; October 2016

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Planning ref: 00/00624/COM includes the following map section of the site dated August 2003.





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Please find below the initial response to this request, you will see that work is still being undertaken in relation to the couple of matters relating to contaminated and an update will be provided to that hopefully before too long. The response to permitted process and is compelte

- Review of council records relating to potentially contaminative uses of the site and in close proximity;  
A review of records indicates that the northern section of the site was used as a clay pit and brickworks, and then the area was used as a landfill until 1993
- Review of any site investigation and any remediation reports relating to the site and in close proximity (where available);  
No record of any remediation reporting, 2 site investigations reports and a desk study report are available under following planning application ref: 18/02940/EIA –
  - Geo-environmental desk study; Report ref: MP/DSPA4/5112.v1; JPG Group; October 2018
  - SLR Phase 1 and 2 Site Investigation – Phase 1 Report. Former Kempston Brickworks, Bedfordshire.
  - SLR Factual Geotechnical Investigation Report. Former Kempston Brickworks, Bedfordshire.

The officer has advised that there is a lot of information and that they will attempting to complete their search in the next weekday or so

- Details of any authorised processes within proximity to the site;

A review of locations subject to permitting under the LAPPC regime within the vicinity of the site are provided below

PPCA 108 - Mobile Crusher	Manor Road	Kempston Hardwick	Kempston Hardwick	MK
PPCA 45 - Mobile Crushing	Manor Road	Kempston Hardwick	Kempston Hardwick	MK
PPCA 117 - Mobile Crushing	Manor Road	Kempston Hardwick	Kempston Hardwick	MK
PPCA 15 - Concrete Plant	Hardwick Hill Works	Manor Road	Kempston Hardwick	MK
PPCA 119	Manor RD	Kempston Hardwick	Bedford	MK
PPCA 37 - Di-isocyanate	15 Ronald Close	Kempston	Kempston	MK
PPCA 120	Kiln RD	Kempston Hardwick	Kempston Hardwick	MK
PPCA 113 - Cement Plant	Wilstead Road	Elstow	Elstow	MK
PPCA 16 - Roadstone Coating	Wilstead Road	Elstow	Elstow	MK
PPCA 116 - Cement plant	Wilstead Road	Elstow	Elstow	MK
PPCA 46 - Petrol Station	Wilstead Road	Elstow	Elstow	MK

- Details of any oil fuel storage records relating to the site and in close proximity.

A review of records, information and archived files has been undertaken which has identified 2 historic fuel storage sites within the defined area.

- (ref BD177) IBETT engineering , Stanley Works, Kempston Hardwicke , which was a manufacturer of trailers. One tank installed in 1967 is recorded with a capacity 4546 litres (1000 GALLON) of petroleum spirit , this was converted to diesel use in 1986. A survey conducted in 1992 showed the tank was no longer in use. There is no record of the tank either being permanently filled or subsequently removed.
- (ref BD178) Marsh Leys Ltd. Leys Farm, Kempston. A farm. One tank installed in 1958 with a capacity of 2,273 Litres (500 gallon) of petroleum spirit. The tank changed use to Deisel in 1991. There is no record of the tank either being permanently filled or subsequently removed.

Unfortunately the review of archived files did not identify ground plans showing the location of the tanks

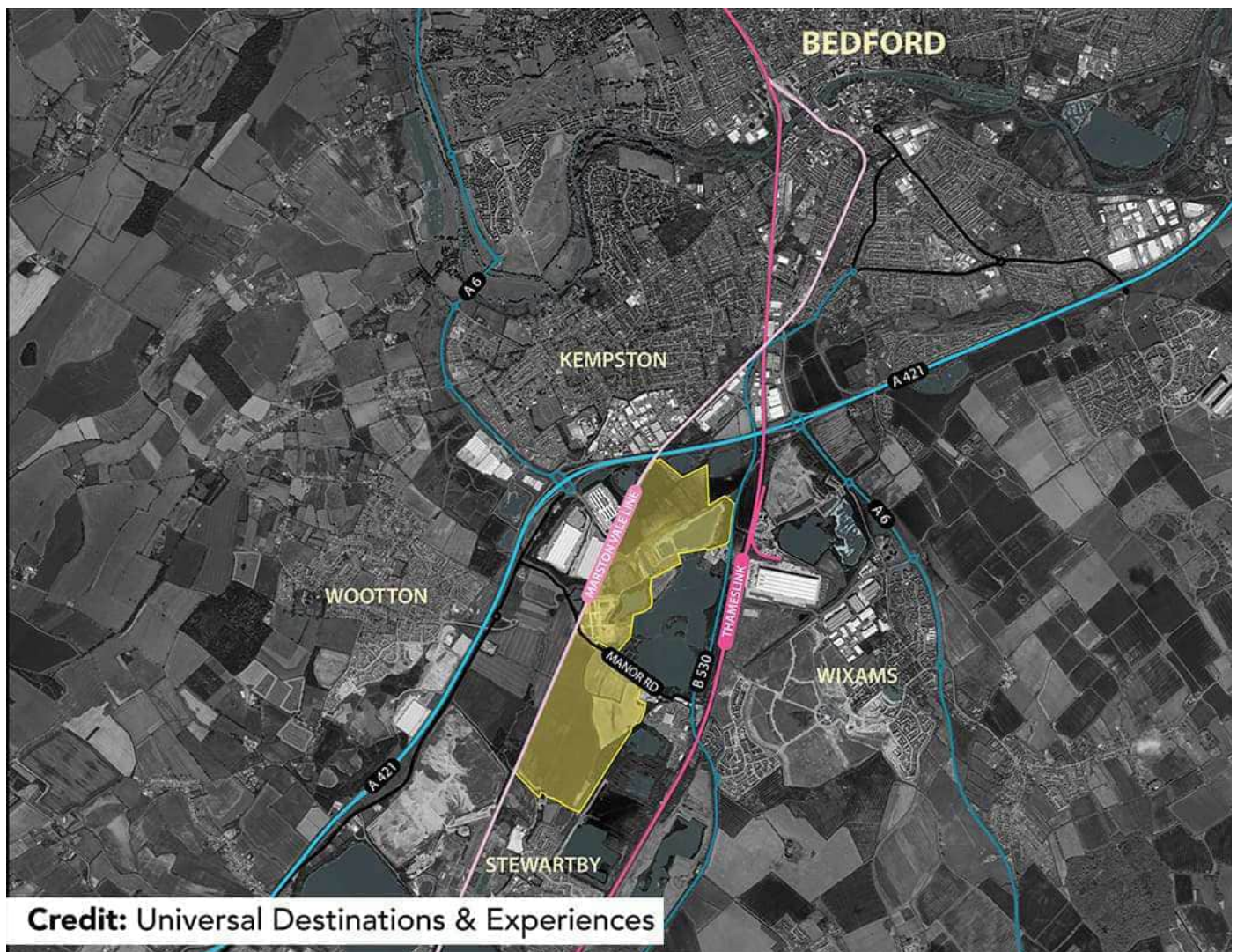
I'll provide a further update on the matters relating to contaminated land as soon as these are received but hope that the above is of use.

---

The Universal land is shown below in yellow.

Many thanks for your help with this.

Kind regards



**Credit:** Universal Destinations & Experiences



I've collated the relevant information from the council records in the table below.

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