Environmental Appraisal

Tralorg Wind Farm 33 kV Overhead Line and Underground Cable Connection to Mark Hill Substation

October 2018

Figures

FIGURES - TABLE OF CONTENTS

SP ENERGY NETWORKS

Key

- Mark Hill Substation
- Tralorg Substation
- Study Area

Title	Figure 1.1: Location of Proposed Development
Project No.	UK12-23166
Site	Tralorg Wind Farm Grid Connection
Client	SP Energy Networks
Date	July 2018
Scale	1:100,000 @ A3
Issue	2
Drawn by	CM/RC

RAMBOLL

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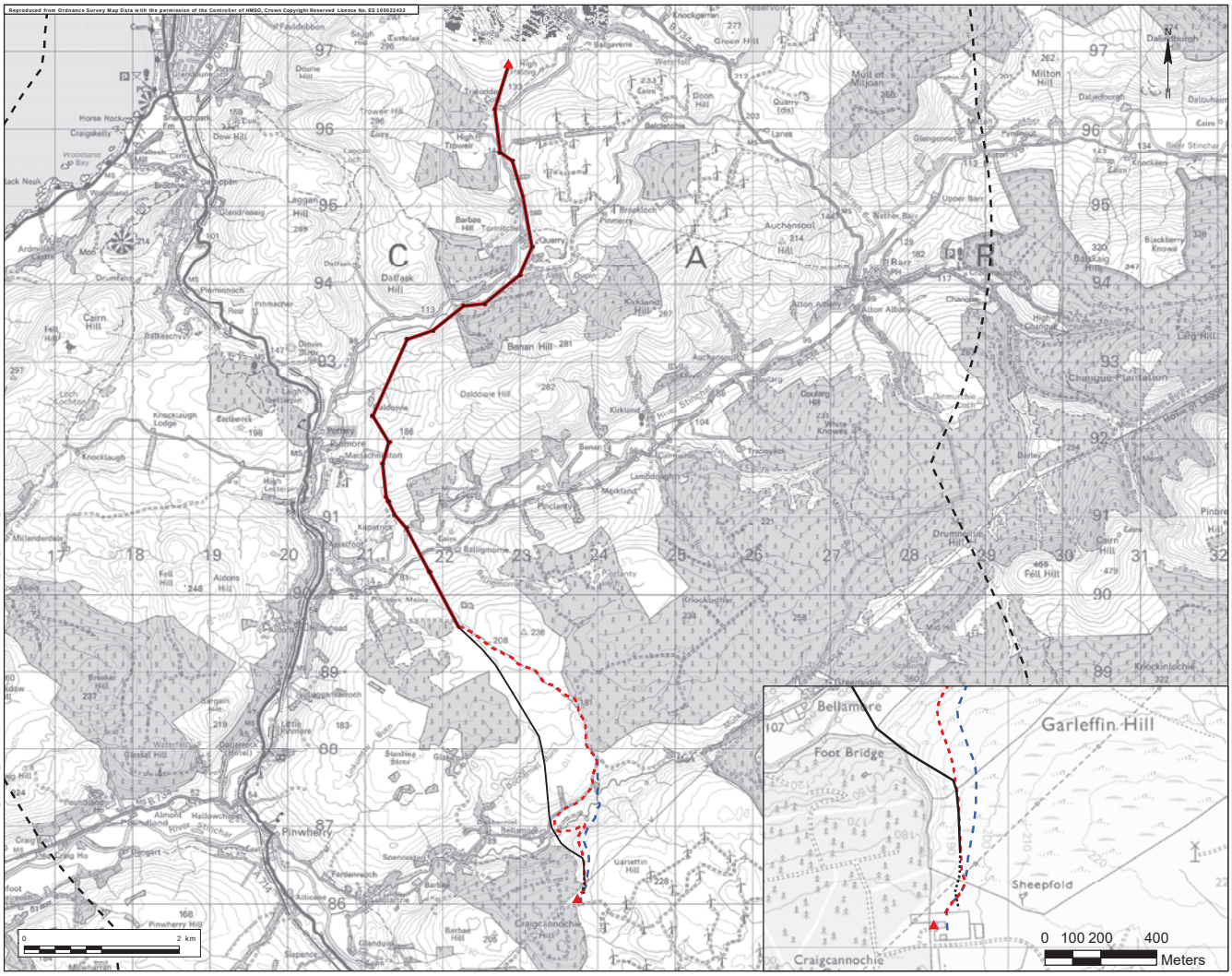

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Key

- Study Area
- Connection Point
- Proposed 33kV OHL alignment
- Proposed Cable Section
- Iteration 1 Cable Section
- Initial Proposed OHL alignment
- Initial Proposed Cable Section

Figure 2.1:
Initial Route Options

Project No. UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: September 2018

Scale: 1:45,000 @ A3

Issue: 4 Drawn by: AC

Key

- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section

Title: Figure 2.2: Route Alignment of Proposed Development

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: September 2018

Scale: 1:45,000 @ A3

Issue: 3 Drawn by: AC

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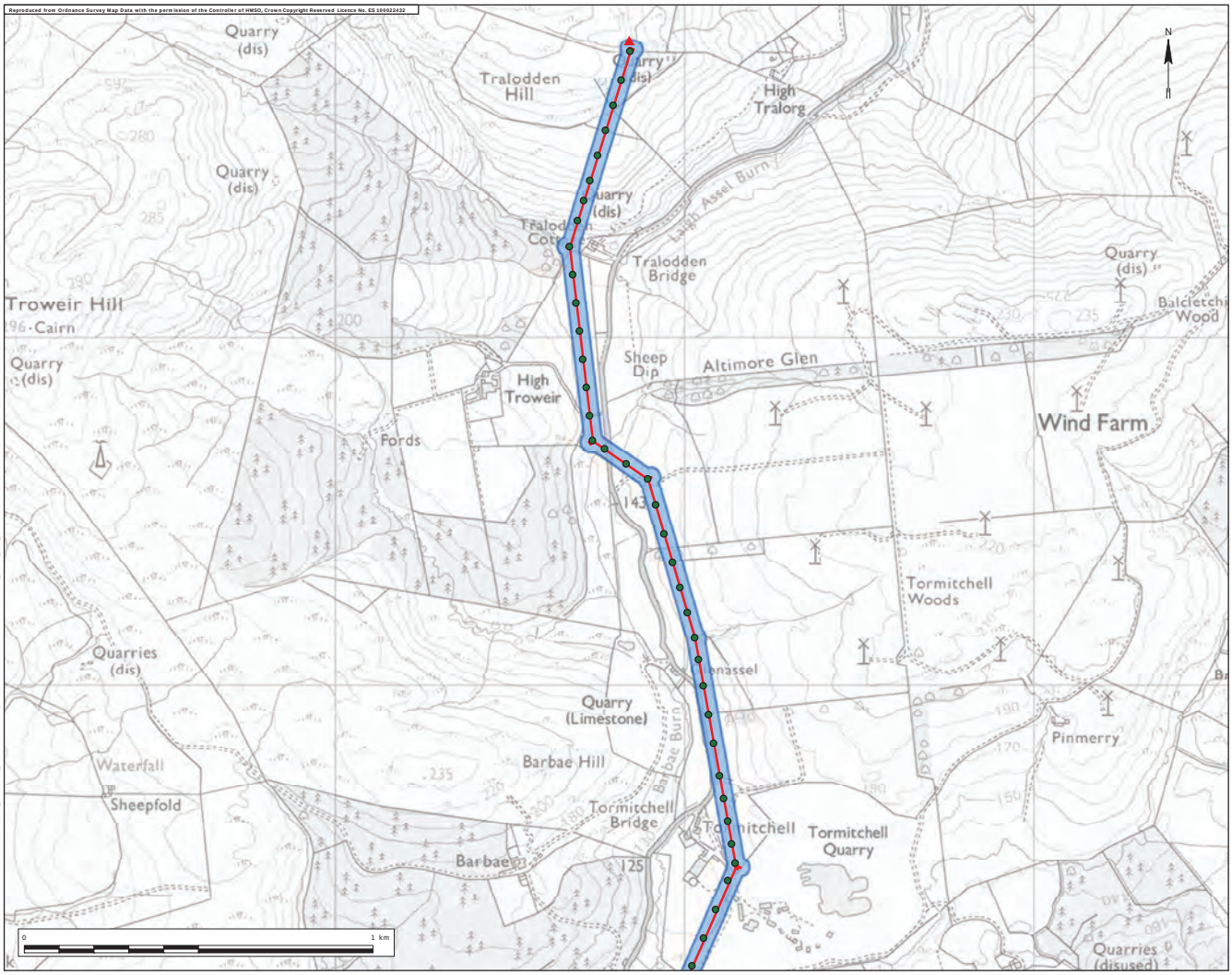

Key

- Proposed Wood Pole Location
- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed 3m Wide Temporary Access Track
- LoD (50m)

Title: Figure 3.1a: Indicative Wood Pole Positions and Limits of Deviation (LoD)

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:10,000 @ A3

Issue: 5 Drawn by: AC/CO

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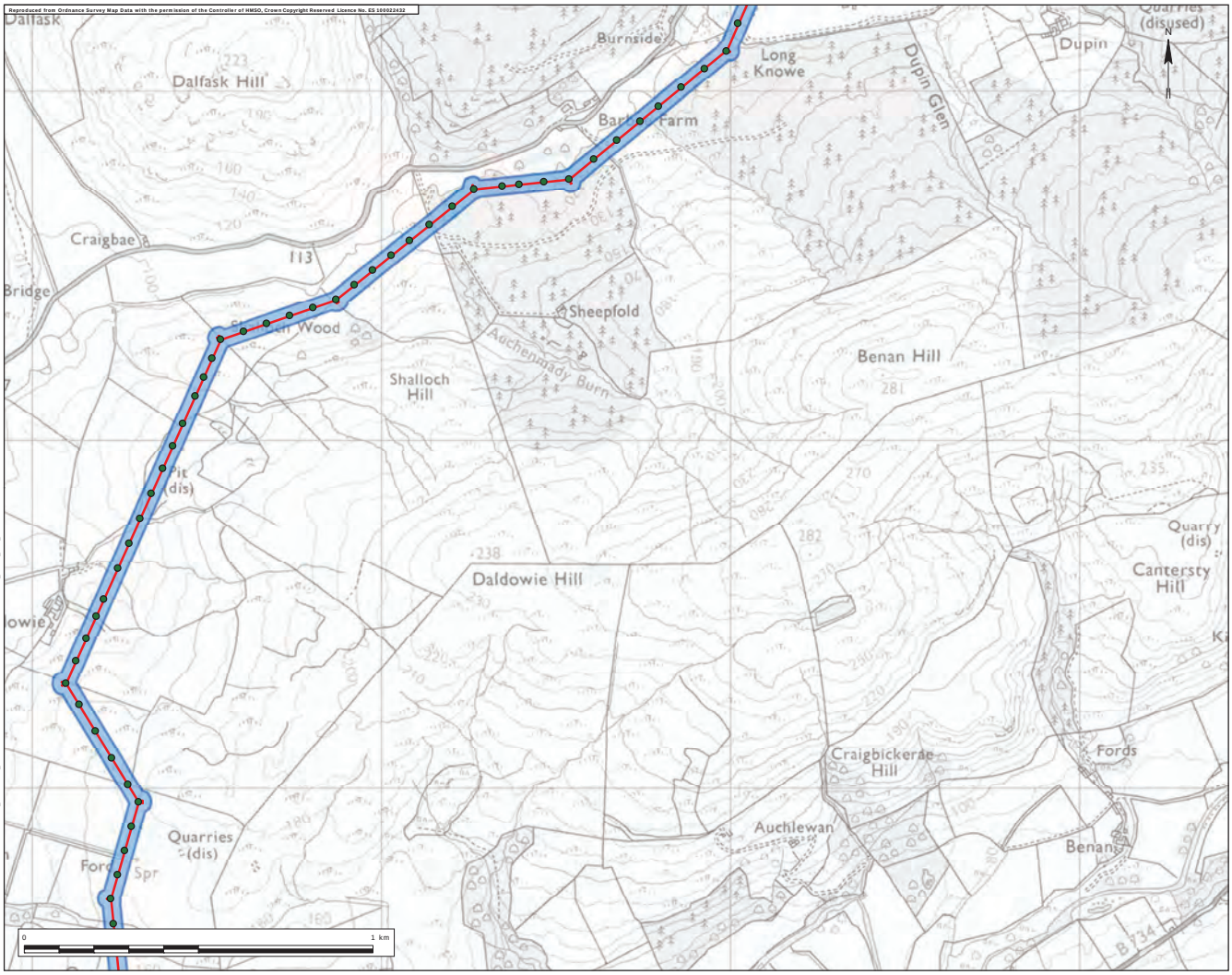

Key

- Proposed Wood Pole Location
- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed 3m Wide Temporary Access Track
- LoD (50m)

Title: Figure 3.1b: Indicative Wood Pole Positions and Limits of Deviation (LoD)

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:10,000 @ A3

Issue: 5 Drawn by: AC/CO

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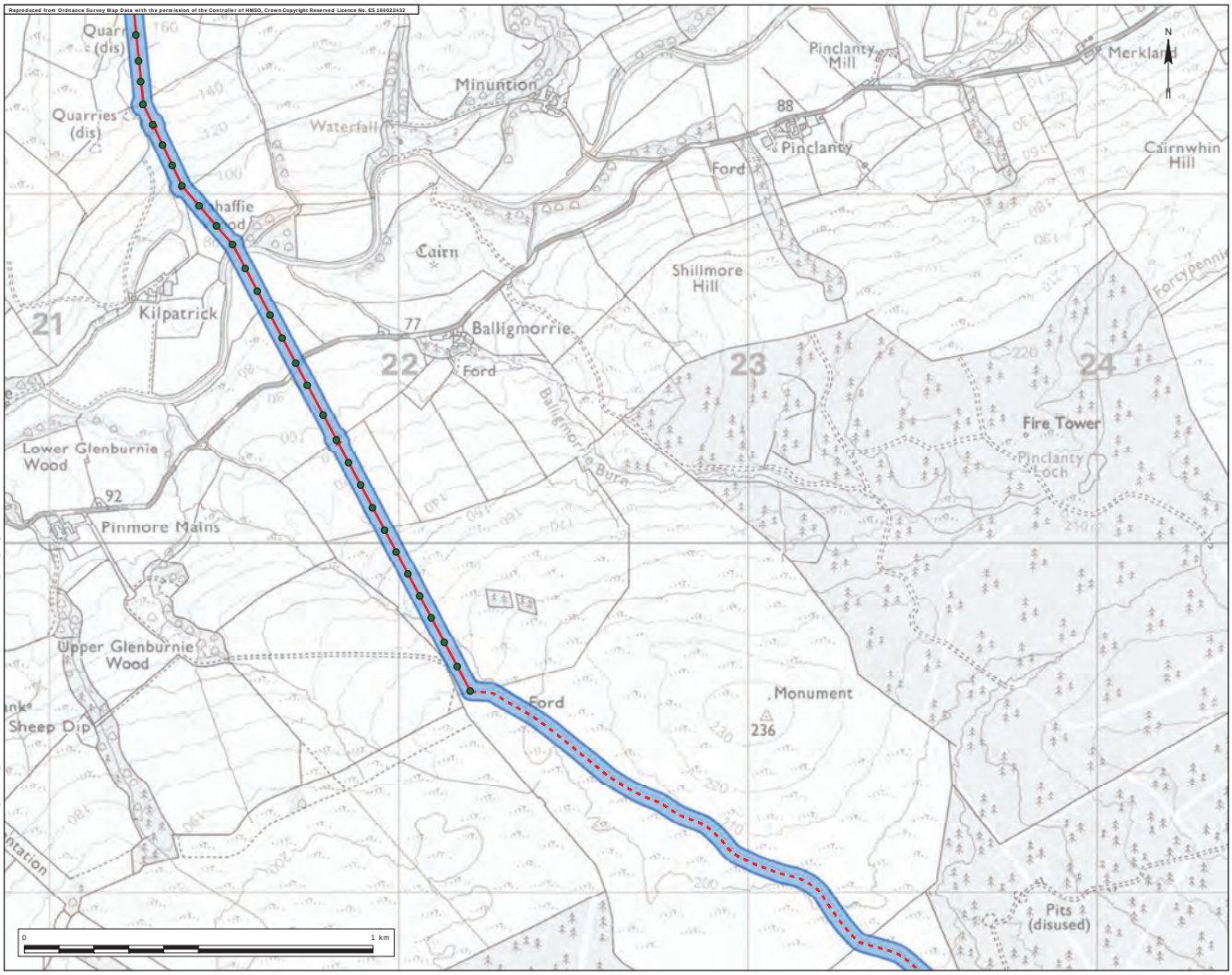

Key

- Proposed Wood Pole Location
- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed 3m Wide Temporary Access Track
- LoD (50m)

Figure 3.1c: Indicative Wood Pole Positions and Limits of Deviation (LoD)

Project No. UK12-23166

Site Tralorg Wind Farm Grid Connection

Client SP Energy Networks

Date October 2018

Scale 1:10,000 @ A3

Issue 5 Drawn by AC/CO

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Key

- Proposed Wood Pole Location
- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed 3m Wide Temporary Access Track
- LoD (50m)

Title: Figure 3.1d: Indicative Wood Pole Positions and Limits of Deviation (LoD)

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:10,000 @ A3

Issue: 5 Drawn by: AC/CO

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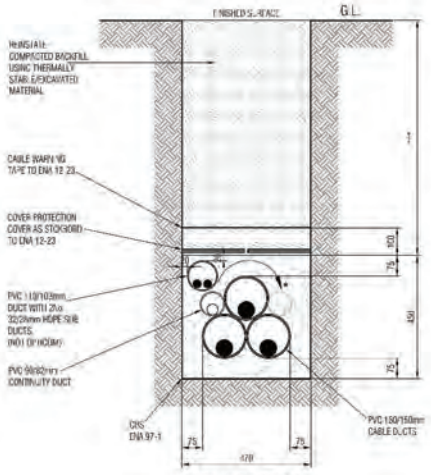
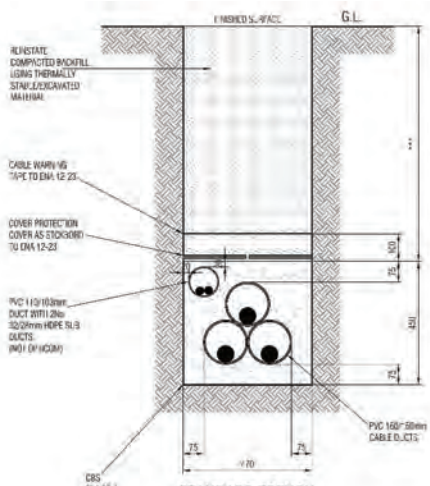


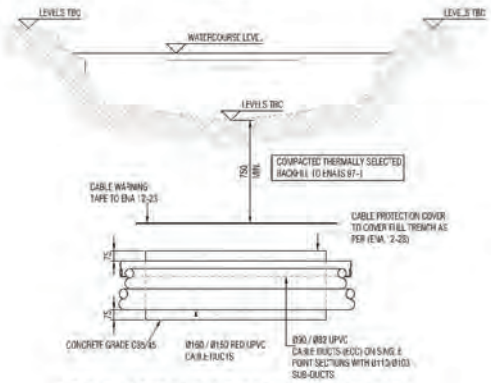
STANDARD TRENCH
SECTION A-A
(SINGLE POINT)
SCALE 1:10



STANDARD TRENCH
SECTION B-B
(CROSS BONDED)
SCALE 1:10

NOTES:

1. FOR INSTALLATION REQUIREMENTS REFER TO CAB 15-003.
2. CABLES SHALL BE TESTED IN ACCORDANCE WITH SUB-02-813 PRIOR TO ENERGISATION.
3. POLYETHYLENE SHEATHED CABLES SHALL BE MAINTAINED ABOVE -5° FOR A MIN. OF 24 HRS BEFORE INSTALLATION.
4. PROTECTION TILES SHALL BE SUPPLIED & INSTALLED WITH A PIN INTERLOCKING SYSTEM & SHALL MEET THE IMPACT REQUIREMENTS OF B.S. 2484
5. DEPTHS TO TOP OF TRENCHES WILL VARY AS REQUIRED WHEN CROSSING UNDER EXISTING CABLES OR OTHER UNDERGROUND SERVICES. A MINIMUM SEPARATION OF 500mm SHOULD BE ALLOWED BETWEEN EXISTING CABLES AND PROPOSED TRENCHES.
6. CONCRETE GRADE TO BE C35/C45 TO BS 8500.
7. WHERE THE FINAL DEPTH TO TOP OF BACKFILL MATERIAL FOR TRENCHES CROSSING EXISTING CABLES/SERVICES IS HIGHER THAN THE MAXIMUM SPECIFIED ON THIS DRAWING, THE CONTRACTOR SHALL LIAISE WITH SPEN-ENGINEERING FOR RESOLUTION PRIOR TO INSTALLATION ON SITE
8. WHERE THE PROPOSED TRENCHES CROSS EXISTING CABLES, THE AREA OF CROSSING SHOULD BE SURROUNDED TO A DEPTH OF 75mm (ABOVE AND BELOW), AND TO A WIDTH OF 500mm (ON EITHER SIDE), USING COMPACTED CBS FILL MATERIAL IN ACCORDANCE WITH ENA 97-1.
9. EXTREME CAUTION SHOULD BE EXERCISED WHEN WORKING ON DEEP EXCAVATIONS, OR WHEN EXCAVATING GROUND ADJACENT TO LIVE UNDERGROUND CABLES OR EXISTING TRANSFORMER OR O.H.L. TOWER FOUNDATIONS.



TYPICAL SECTION C-C THROUGH WATERCOURSE
SCALE 1:20

SURFACE TYPE	MIN. DEPTH OF COVER TO TILE *** (mm)
UNMADE GROUND, FOOTWAYS & FOOTPATHS	775
ROADS	775
CULTIVATED GROUND INC. GARDENS	775
AGRICULTURAL LAND	900

***WHERE EARTH BONDING IS SINGLE POINT, THE DUCT MUST BE TRANSPOSED AT THE MID POINT OF THE SINGLE POINT SECTION. FOR EARTHING REQUIREMENTS REFER TO ENA CS5-5. CONTINUITY D.C.I. ONLY REQUIRED IN SINGLE POINT EARTHING SECTIONS.

SP ENERGY NETWORKS

Key

Title: Figure 3.2: Typical Cable Trench Cross Sections

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: September 2018

Scale: Scale as indicated

Issue: 1 | Drawn by: AC

RAMBOLL

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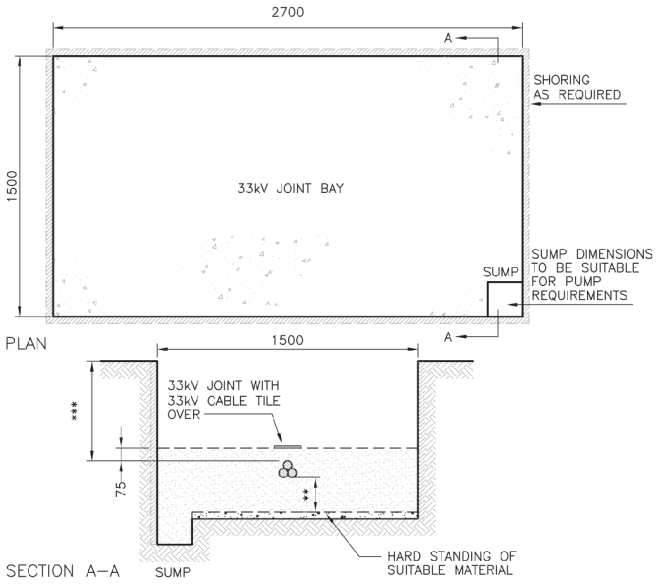

NOTES:–

JT BAY TO BE CLOSE SHORED IF REQUIRED IN ACCORDANCE WITH THE APPROPRIATE STATUTORY REGULATIONS.

FLOOR OF THE JT BAY TO BE DRY, LEVEL AND HAVE A HARD STANDING OF SUITABLE MATERIAL.

ALL JOINTS TO HAVE 75mm MINIMUM COVER WITH SELECTED BACKFILL AND CABLE TILE. MINIMUM DEPTH TO CABLE COVERS TO BE MAINTAINED.

SUMP DIMENSIONS TO BE SUITABLE FOR PUMP REQUIREMENTS.

ALL CABLES SHOULD BE BEDDED IN BACKFILL MATERIAL IN ACCORDANCE WITH POWER SYSTEMS DOCUMENT CAB–15–003 "HANDLING AND INSTALLATION OF CABLES UP TO AND INCLUDING 33kV".

ALL DIMENSIONS SHOWN ARE IN MILLIMETRES AND ARE MINIMUM SIZES.

FOR WORK ON OR NEAR RAILWAY PROPERTY INCLUDING LEVEL CROSSINGS THE CONTRACTOR SHOULD REFER TO THE POWER SYSTEMS ENGINEER AND THE RECOGNISED RAILWAY AUTHORITY.

*** REFER TO CAB–15–003

** MINIMUM CLEARANCE OF 200mm IS REQUIRED BELOW JOINTS.

SP ENERGY NETWORKS

Key

Title: Figure 3.3: Typical Joint Bay

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: September 2018

Scale: Not to Scale

Issue: 1 | Drawn by: AC

RAMBOLL

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Key

- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed Access Routes
- Proposed 3m Wide Temporary Access Track

Figure 3.4:
Access Routes

Project No. UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:15,000 @ A3

Issue: 2 Drawn by: AC/CO

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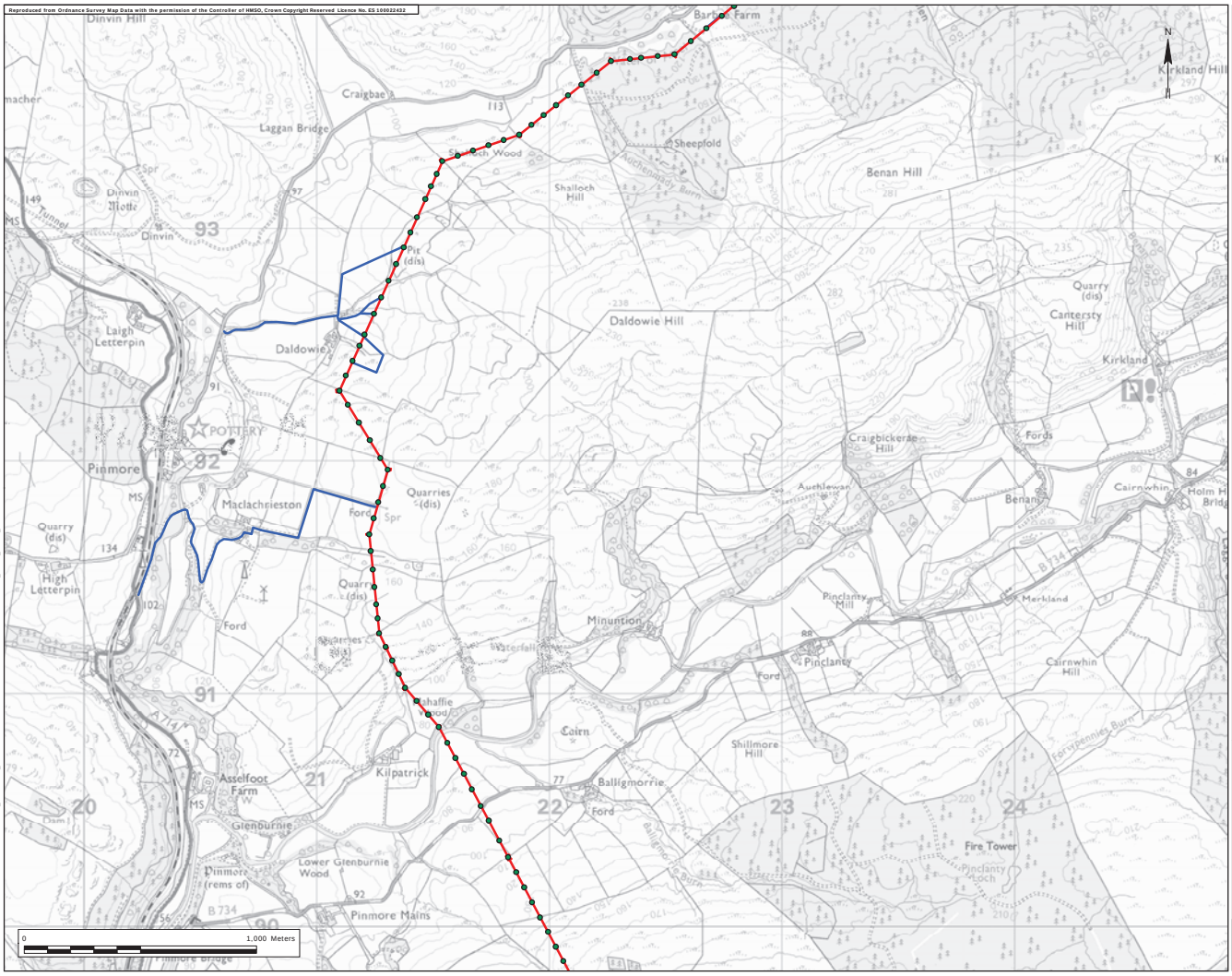

Key

- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed Access Routes
- Proposed 3m Wide Temporary Access Track

Title: Figure 3.4: Access Routes

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:15,000 @ A3

Issue: 2 Drawn by: AC/CO

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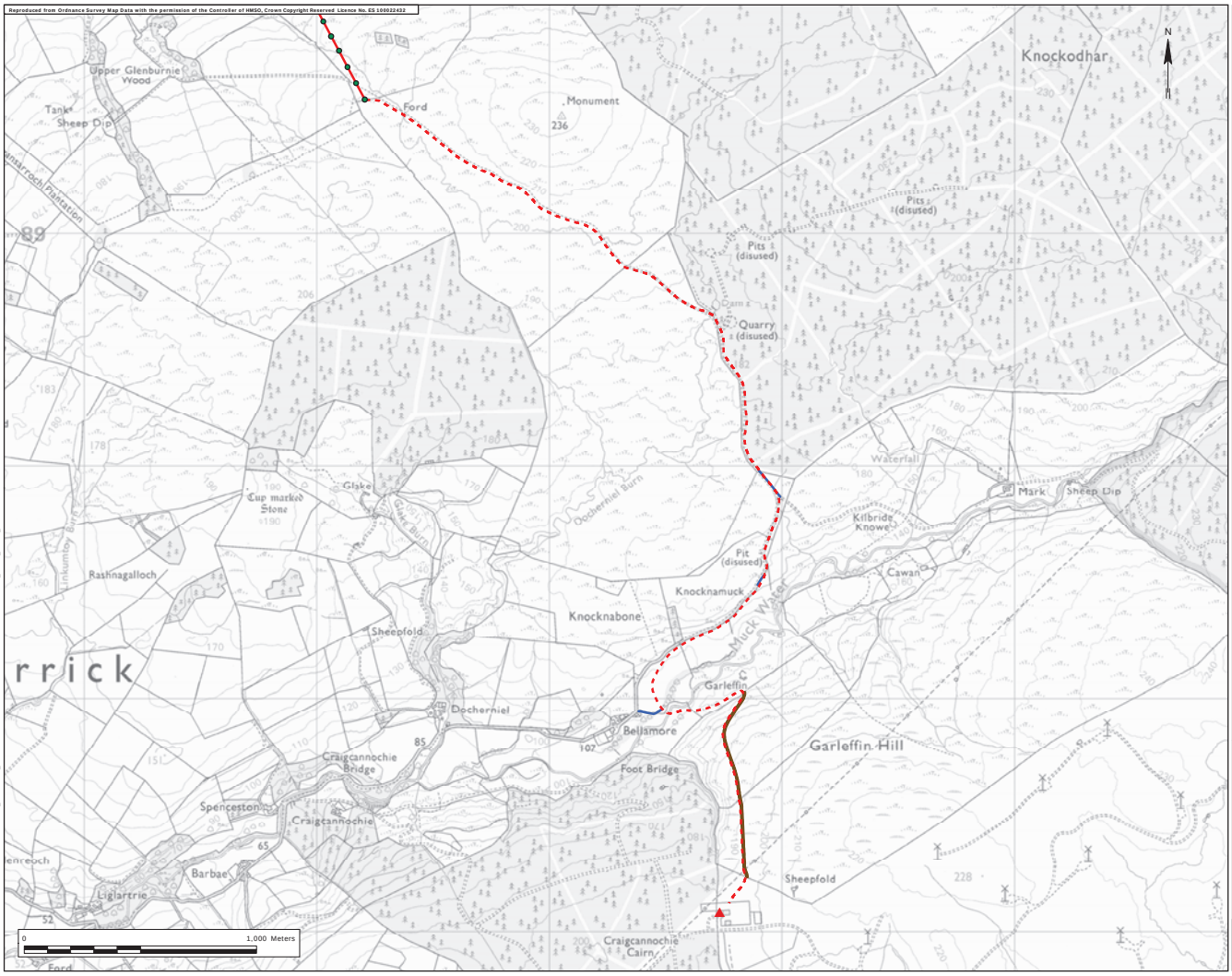

SP ENERGY NETWORKS

Key

- Connection Point
- Proposed 33kV OHL Alignment
- Proposed Cable Section
- Proposed Access Routes
- Proposed 3m Wide Temporary Access Track

Title: Figure 3.4: Access Routes

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: October 2018

Scale: 1:15,000 @ A3

Issue: 2 Drawn by: AC/CO

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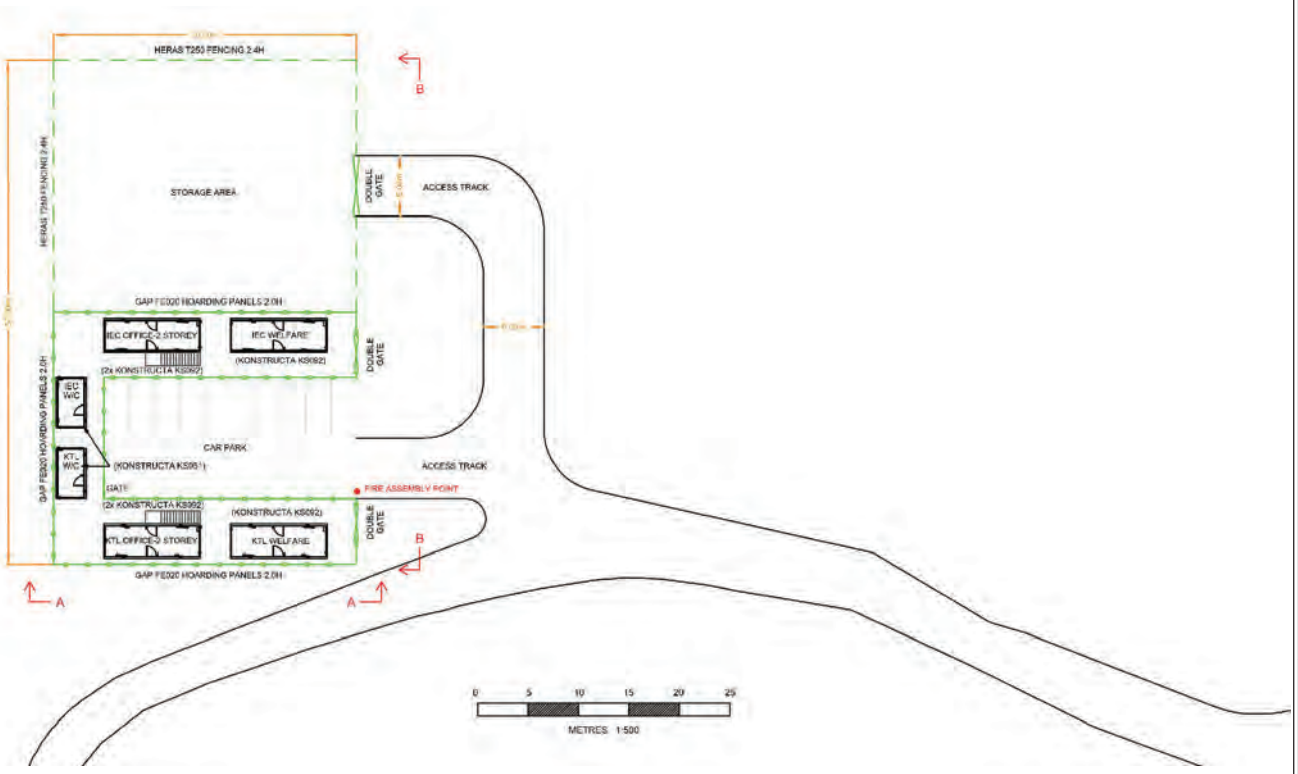


SP ENERGY NETWORKS

Key

Figure 3.5:
Typical Compound Layout

Project No. UK12-23166

Site Tralorg Wind Farm
Grid Connection

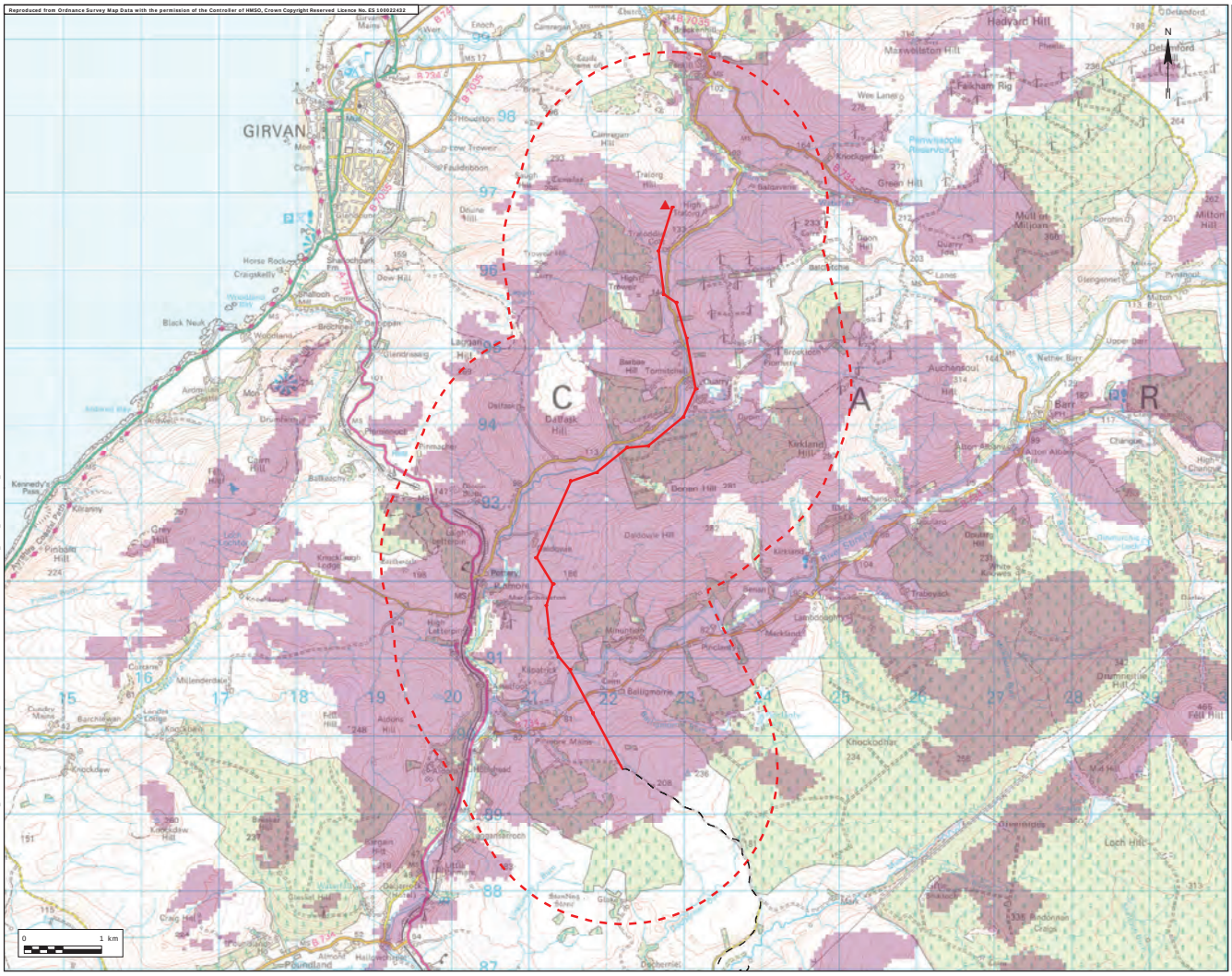
Client SP Energy Networks

Date September 2018

Scale Scale as Indicated

Issue 1 Drawn by AC

RAMBOLL



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SP ENERGY NETWORKS

Key

- LVIA Study Area (2km)
- Connection Point
- Proposed Overhead Line
- Proposed Cable Section

Zone of Theoretical Visibility

- Overhead Line Theoretically Visible

ZTV Data
Calculation: Viewshed Analysis
Eye height: 2 m
Visible Point: Top of Pole

Overhead Line Information
Number of Poles:
Height to Tip: Varies
(Minimum 9m, Maximum 16m)
Model: N/A

Notes
1. The ZTV has been created using ESRI ArcMap 10.3
2. Created using Digital Terrain Dataset (50m)
3. The analysis does not take into account intervening screening vegetation or buildings

Title: Figure 5.1 LVIA Study Area *(showing Zone of Theoretical Visibility)*

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

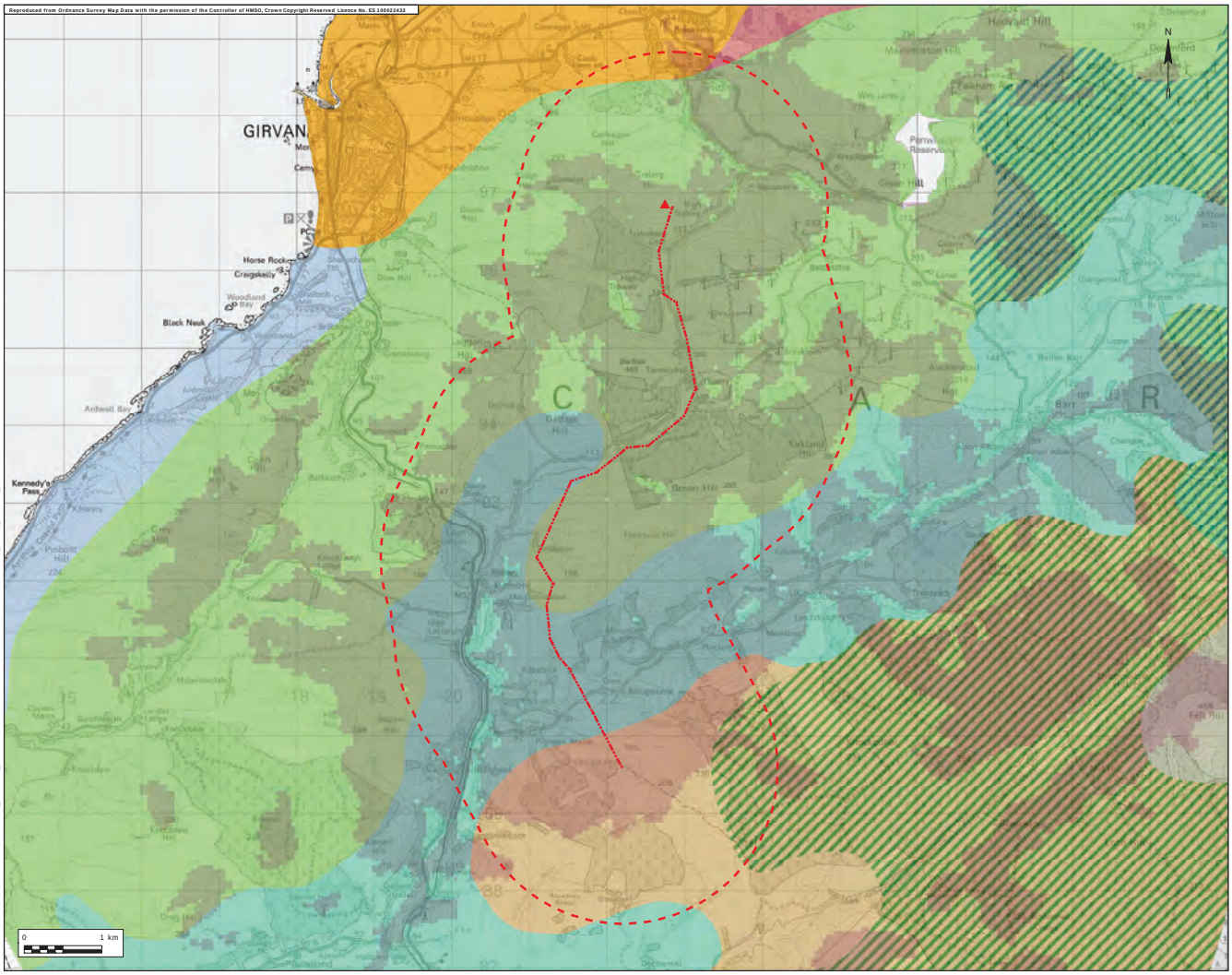
Client: SP Energy Networks

Date: September 2018

Scale: 1:45,000 @ A3

Issue: 2 Drawn by: AG/AC

RAMBOLL



SP ENERGY NETWORKS

Key

- LVIA Study Area (2km)
- Proposed Overhead Line
- Connection Point

Zone of Theoretical Visibility

- Overhead Line Theoretically Visible

Landscape Character Types (SNH)

- Foothills
- Foothills With Forest
- Intimate Pastoral Valleys
- Lower Dale
- Middle Dale
- Plateau Moorland
- Plateau Moorland with Forest
- Raised Beach Coast
- Southern Uplands

ZTV Data
Calculation: Viewshed Analysis
Eye height: 2 m
Visible Point: Top of Pole

Overhead Line Information
Number of Poles:
Height to Tip: Varies
(Minimum 9m, Maximum 16m)
Model: N/A

Notes
1. The ZTV has been created using ESRI ArcMap 10.3
2. Created using Digital Terrain Dataset (50m)
3. The analysis does not take into account intervening screening vegetation or buildings

Title: Figure 5.2a SNH Landscape Character Types *(showing Zone of Theoretical Visibility)*

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: May 2018

Scale: 1:45,000 @ A3

Issue: 1 Drawn by: AG

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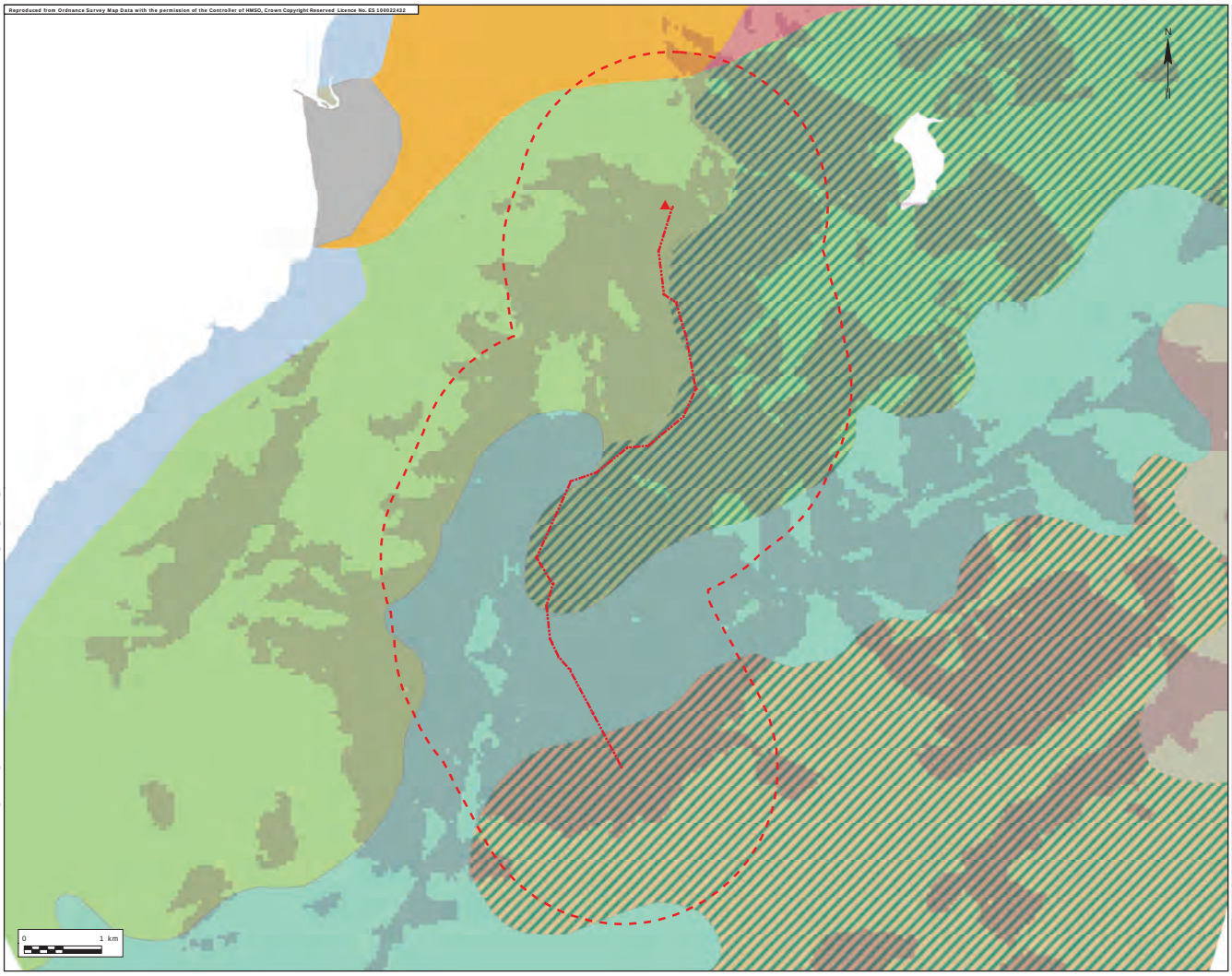

SP ENERGY NETWORKS

Key

- LVIA Study Area (2km)
- Proposed Overhead Line
- Connection Point

Zone of Theoretical Visibility

- Overhead Line Theoretically Visible

Landscape Character Types (SAC)

- Coastal Foothills
- Foothills with Forest and Wind Farms
- Intimate Pastoral Valleys
- Lower Dale
- Middle Dale
- Plateau Moorlands with Forestry and Wind Farms
- Raised Beach Coast with Flat Fields and Headlands
- Rugged Uplands with Lochs and Forest
- Urban

ZTV Data
Calculation: Viewshed Analysis
Eye height: 2 m
Visible Point: Top of Pole

Overhead Line Information
Number of Poles:
Height to Tip: Varies
(Minimum 9m, Maximum 16m)
Model: N/A

Notes
1. The ZTV has been created using ESRI ArcMap 10.3
2. Created using Digital Terrain Dataset (50m)
3. The analysis does not take into account intervening screening vegetation or buildings

Title: Figure 5.2b South Ayrshire Council Landscape Character Types *(showing Zone of Theoretical Visibility)*

Project No. UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: May 2018

Scale: 1:45,000 @ A3

Issue: 1 Drawn by: AG

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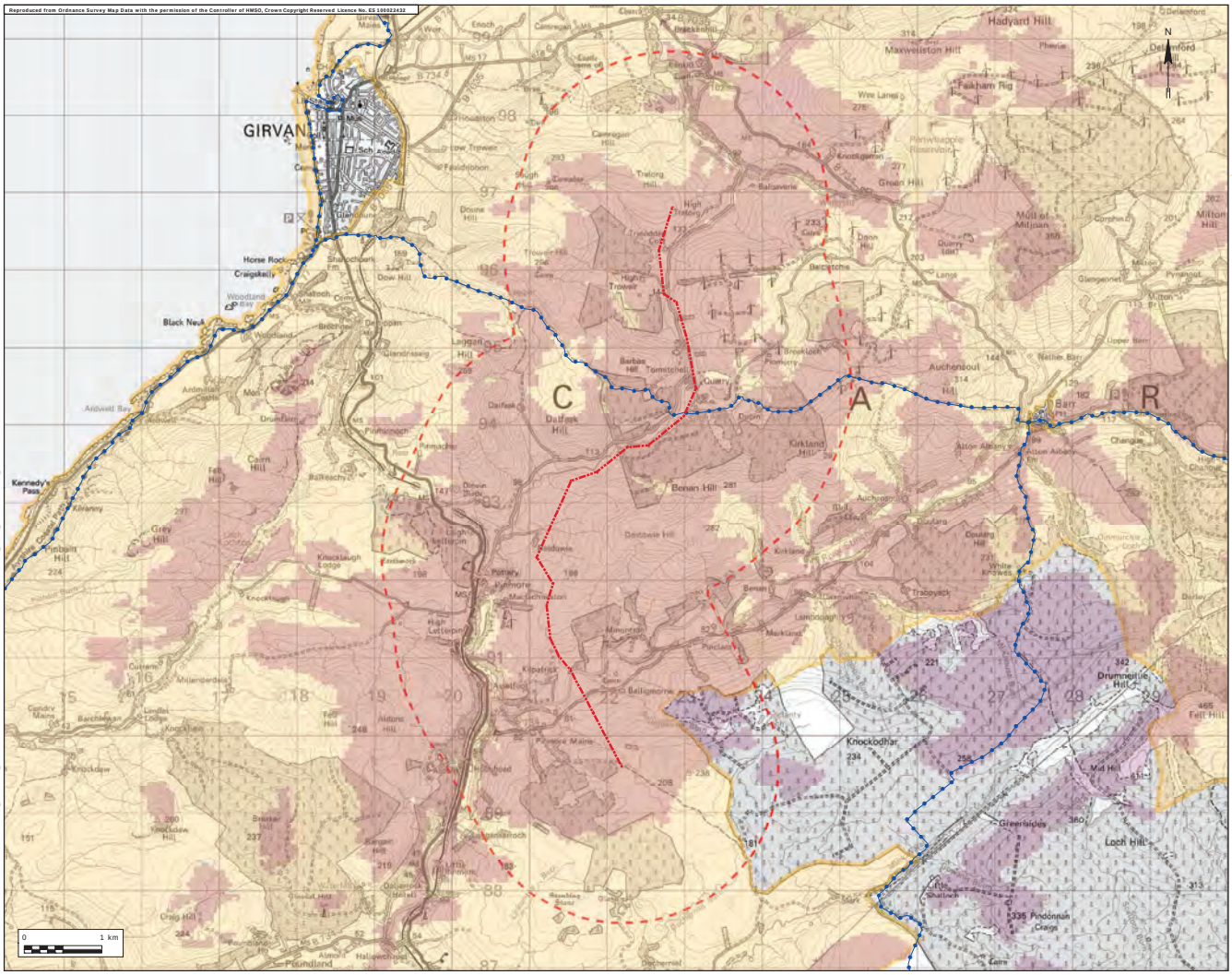

Key

- LVIA Study Area (2km)
- Proposed Overhead Line
- South Ayrshire Scenic Area
- Girvan to Barr Pathway
- Overhead Line Theoretically Visible

ZTV Data
Calculation: Viewshed Analysis
Eye height: 2 m
Visible Point: Top of Pole

Overhead Line Information
Number of Poles:
Height to Tip: Varies
(Minimum 9m, Maximum 16m)
Model: N/A

Notes
1. The ZTV has been created using ESRI ArcMap 10.3
2. Created using Digital Terrain Dataset (50m)
3. The analysis does not take into account intervening screening vegetation or buildings

Title: Figure 5.3 Landscape Designations *(showing Zone of Theoretical Visibility)*

Project No.: UK12-23166

Site: Tralorg Wind Farm Grid Connection

Client: SP Energy Networks

Date: May 2018

Scale: 1:45,000 @ A3

Issue: 1 Drawn by: AG

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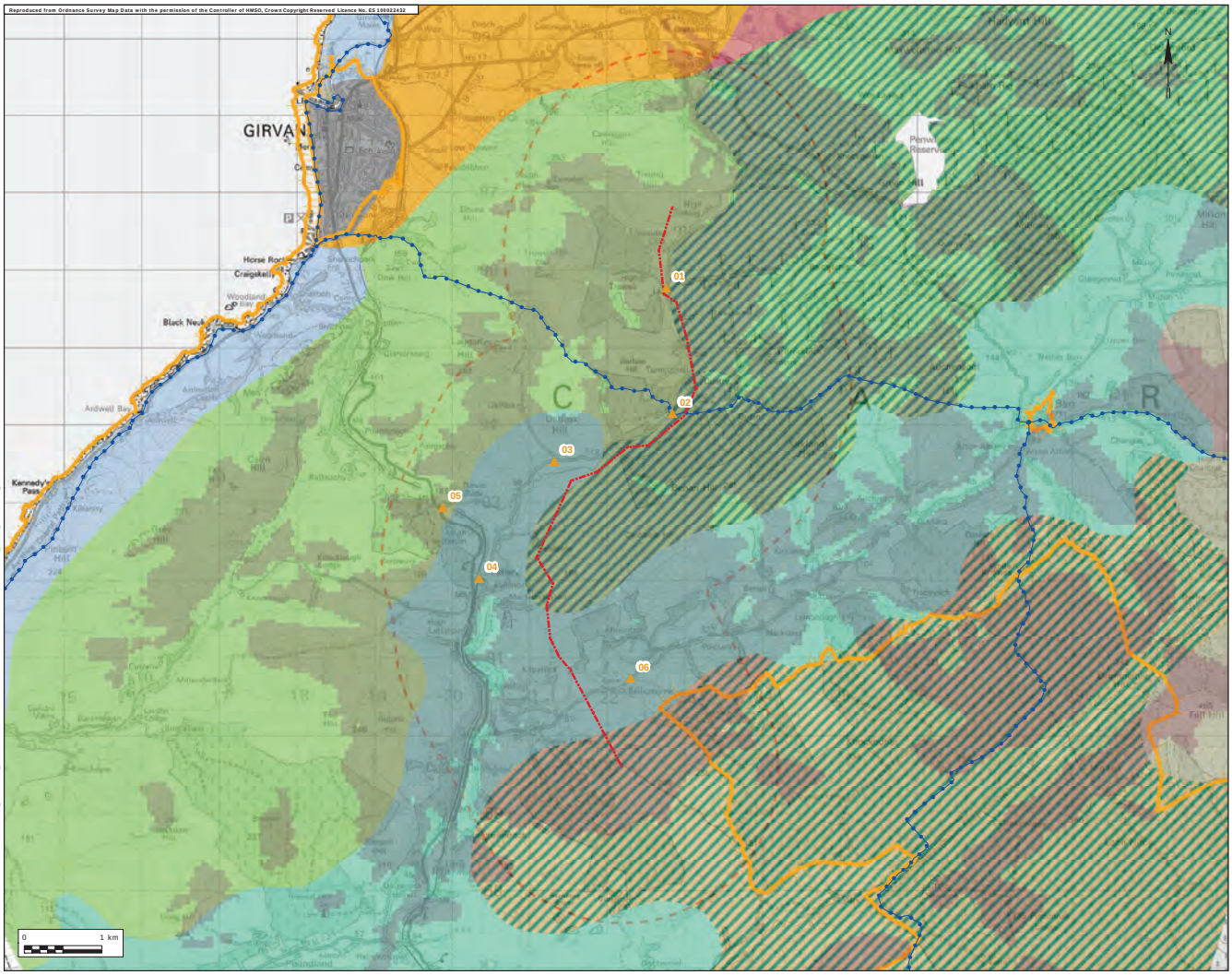

SP ENERGY NETWORKS

Key

- LVIA Study Area (2km)
- Proposed Overhead Line
- Overhead Line Theoretically Visible
- South Ayrshire Scenic Area
- Girvan to Barr Pathway
- Viewpoint Location
  - 01 Dinvin Road at High Troweir Farm
  - 02 Girvan to Barr Path
  - 03 Dinvin Road/ Assel Valley Wind Farm access
  - 04 Pinmore
  - 05 A714 layby
  - 06 Balligmorrie

Landscape Character Types (SAC)

- Coastal Foothills
- Foothills with Forest and Wind Farms
- Intimate Pastoral Valleys
- Lower Dale
- Middle Dale
- Plateau Moorlands with Forestry and Wind Farms
- Raised Beach Coast with Flat Fields and Headlands
- Rugged Uplands with Lochs and Forest
- Urban

Title	Figure 5.4 Viewpoint Locations
Project No.	UK12-23166
Site	Tralorg Wind Farm Grid Connection
Client	SP Energy Networks
Date	May 2018
Scale	1:45,000 @ A3
Issue	1
Drawn by	AG

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Figure 5.5: Viewpoint 01 - Dinvin Road at High Troweir Farm

Viewpoint Coordinate (x,y):	222767 595787		
Eye level:	148.2 m AOD	Camera:	Canon EOS 6D
Direction of View:	352°	Lens:	50mm fixed focal
Horizontal Field of View:	90°	Camera height:	1.5m AGL
Nearest Proposed Pole:	40 m	Date and Time:	19/04/2018

Figure 5.6: Viewpoint 02 - Girvan to Barr Path at Dinvin Road

Viewpoint Coordinate (x,y):	222846, 594161		
Eye level:	122 m AOD	Camera:	Canon EOS 6D
Direction of View:	35°	Lens:	50mm fixed focal
Horizontal Field of View:	90°	Camera height:	1.5m AGL
Nearest Proposed Pole:	124 m	Date and Time:	19/04/2018

Figure 5.7: Viewpoint 03 - Junction of Dinvin Road with the Assel Valley Wind Farm access

Viewpoint Coordinate (x,y):	221323, 593550		
Eye level:	104.1 m AOD	Camera:	Canon EOS 6D
Direction of View:	171°	Lens:	50mm fixed focal
Horizontal Field of View:	90°	Camera height:	1.5m AGL
Nearest Proposed Pole:	339 m	Date and Time:	19/04/2018

Figure 5.8: Viewpoint 04 - Pinmore

Viewpoint Coordinate (x,y):	220353, 592035		
Eye level:	108 m AOD	Camera:	Canon EOS 6D
Direction of View:	112°	Lens:	50mm fixed focal
Horizontal Field of View:	90°	Camera height:	1.5m AGL
Nearest Proposed Pole:	790 m	Date and Time:	19/04/2018

Figure 5.9: Viewpoint 05 - A715 Layby (representative of views from the road and railway)

Viewpoint Coordinate (x,y):	219882, 592952		
Eye level:	147.5 m AOD	Camera:	Canon EOS 6D
Direction of View:	74°	Lens:	50mm fixed focal
Horizontal Field of View:	90°	Camera height:	1.5m AGL
Nearest Proposed Pole:	1.35 km	Date and Time:	19/04/2018