



N52 CAVESTOWN TO KILRUSH SCHEME

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Client signoff

Client	Westmeath County Council
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1. Contract

1.1 Conditions of Contract

The Works required under this contract, while procured by AtkinsRéalis on behalf of Westmeath County Council, will be directly contracted between the Contractor and Westmeath County Council.

The Contract for these works is the Standard Conditions of Engagement for Consultancy Services (Technical) Document Reference COE-1 v.2j (30 September 2024).

1.2 Completion Dates

Contractor shall complete the whole of the survey within the Performance Period as stated in the Schedule and the following:

- Completion of the Site Operations: within 4 weeks from permission to start
- Submission of a Draft Deliverables: within 5 weeks from permission to start
- Submission of the Final Deliverables: within 6 weeks from permission to start.

1.3 Project Contacts

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2. Requirements of the Contract

2.1 Purpose and Scope

2.1.1 Location

The proposed scheme is located in County Westmeath, along the N52 between Delvin and Clonmellon. The site extents are shown within the contract drawing in Appendix A. The area to be surveyed is 210 hectares.

2.1.2 Aim of the Survey

AtkinsRéalis, acting on behalf of Westmeath County Council (WMCC) require a topographical survey including a LiDAR survey to enable a detailed assessment of the existing features at the locations identified on the Contract drawings included in Appendix A. An accurate and detailed survey of the existing surface and sub-surface services is required. The purpose of this document is to provide specification requirements for the survey works.

2.1.3 Scope of Services

WMCC requires a suitably qualified survey contractor to undertake:

1. **Topographical survey** of the survey area (as shown in Appendix A).
2. **Aerial photography** capture of the full survey area (as shown in Appendix A).
3. **High-resolution orthophotography** production.
4. **LiDAR survey suitable for archaeological assessment** of the full survey area (as shown in Appendix A), including production of raw and classified point cloud data, DSM, DTM, contours and associated metadata.

The purpose of the survey is to provide accurate, controlled and quality-assured spatial data suitable for engineering design and archaeological assessment. The LiDAR data shall be processed to produce a high-quality bare-earth Digital Terrain Model capable of representing and emphasising microtopography, including low-relief archaeological earthworks and features potentially obscured by vegetation.

2.1.4 Access to Areas within the Survey Extents

Due to the nature of the surveys, impact on landowners is anticipated to be minimal.

Known landowners will have been notified in writing of the occurrence of the survey works and the identity of the Survey Contractor by Westmeath County Council. Westmeath County Council will provide the Survey Contractor with a list of known landowners/occupiers; however, it is noted that this list may not be exhaustive.

No access arrangements will have been agreed with landowners/occupiers. It will be the responsibility of the Survey Contractor to contact the landowners/occupiers to arrange access. The Survey Contractor shall notify in writing all occupiers before gaining entry and agree with them dates, times and all routes and means of access. Where access to the Survey Contractor is refused, the Survey Contractor shall immediately notify the Employers Representative.

The Survey Contractor must endeavour to foster good relations with landowners, householders and members of the public throughout the survey period. The Survey Contractor shall provide a single point of contact to liaise with both landowners/occupiers and the Employers Representative on all matters relating to landowner liaison and access.



The Employer shall provide letters of authority for the Contractors staff, as necessary. Contractor staff entering such properties shall carry this letter of authority and individual proof of identity supplied by the Survey Contractor..

2.1.5 Safety, Health, and Welfare

All activities performed during the work undertaken by the Contractor as part of this Contract shall be in accordance with the requirements of, including but not limited to, the: -

- Safety, Health, and Welfare at Work Act 2005 (Number 10 of 2005);
- Safety, Health, and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013), and any amendments thereof.
- Safety, Health, and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006); and
- Safety, Health, and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), and any amendments thereof.

All works should be conducted using safe systems of work and in accordance with method statements provided to the Employer's Representative & WMCC for approval before work commences. When surveying close to or on a public road please refer to the requirements of the Traffic Signs Manual, the Safety, Health & Welfare at Work (Construction) Regulations, Guidance for the Control and Management of Traffic at Road Works and the HSA Guidelines for Working on Roads.

The Contractor is to take account of any requirements of the HSA Code of Practice for Avoiding Danger from Underground Services while undertaking survey work.

The Contractor is to take account of any requirements of the ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines while undertaking survey work.

The Contractor must ensure that all personnel involved in the Works are made aware of the need to comply with safe working practices. The Contractor is required to submit a programme covering the duration of the contract and a specific person shall be nominated by the Contractor to consult with the Employer's Representative & WMCC in relation to health and safety matters. The Contractor shall comply with any specific safety requirements of all relevant utility providers and landowners in conducting these works.

Compliance with the above does not absolve the Contractor from his obligation to comply with the provisions of the Safety Health and Welfare (General Application) Regulations 2007, the Safety Health and Welfare at Work Act 2005 and relevant regulations made thereunder.

The contract total shall include all costs which may be incurred by the Contractor in complying with its Health and Safety obligations pursuant to the Safety Health and Welfare at Work Act, HSE guidance and HSA guidance.

2.2 Traffic Management

2.2.1 General

Temporary lane closures may be required to facilitate the Works. Full road closures will not be required, nor permitted, to facilitate the Works.

Where traffic management is required, the requirements for such traffic management measures are set out in the following:

- It is the responsibility of the Contractor to coordinate and agree their proposed Traffic Management Plan with Westmeath County Council in advance of any works commencing on site.



- Public access must be always maintained past the works along all public roads within the extent of the works for vehicles and cyclists, and along the footways for pedestrians.
- The Contactor shall employ a suitably qualified Traffic Management Company to design and implement any required traffic management measures.

2.2.2 Other Traffic Safety Management Requirements

Two weeks prior to commencement of lane closures the Contractor shall submit the dates and times and a site access plan for each in both the public and private roads to Westmeath County Council and the Employer's Representative.

Appropriate Traffic Management measures will be required to ensure safety of workers and of the public and to minimise disruption to the traffic flow in accordance with (but not limited to):

- Traffic Signs Manual – Chapter 8: Temporary Traffic Measures and Signs for Roadworks (2019)
- Guidance for the Control and Management of Traffic at Road Works (Department of Transport)
- Temporary Traffic Management Design Guidance (TTMDG), 2021
- HSA Guidelines for Working on Roads

It is the responsibility of the Contractor to submit a Traffic Management Plan with traffic management proposals for any location where required to Westmeath County Council and An Garda Síochána.

It is a traffic management requirement within this contract that a maximum of one lane may be closed on any given carriageway at a time. Therefore, full road closure is not permitted within the carrying out of the works.

The Contractor shall be responsible for obtaining written consent of all Traffic Safety and Management from the relevant authorities. The Contractor shall provide, erect, inspect, assess, and maintain such traffic signs, road markings, lamps, barriers and traffic control signals and such other measures as may be necessitated by the works in accordance with the recommendations contained in Chapter 8 of the Traffic Signs Manual and the Guidance for the Control and Management of Traffic at Road Works referred above and any local authority requirements.

The installation and maintenance of traffic management shall only be carried out by operatives who have received suitable training as per Regulation 97 S.I. 291 of 2013.

At some locations, depending on the road, visibility, work to be undertaken, "Give and Take" and/or "Priority" options detailed in the Traffic Sign Manual may be considered.

When working close to or on a public road the requirements of the Traffic Signs Manual, the Safety, Health & Welfare at Work (Construction) Regulations, Guidance for the Control and Management of Traffic at Road Works and the HSA Guidelines for Working on Roads should be referred to.

The Contractor must ensure that all personnel involved in the Works are made aware of the need to comply with safe working practices. The Contractor is required to submit a programme covering the duration of the contract and a specific person shall be nominated by the Contractor to consult with the Westmeath County Council and in relation to health and safety matters. The Contractor shall comply with any specific safety requirements of Westmeath County Council in carrying out these works.

The Contractor shall require written consent from the Client for all proposed operations including programme, time allocations, TM and reinstatements etc. All such consents shall be addressed and granted by Westmeath County Council.

Compliance with the above does not absolve the Contractor from his obligation to comply with the provisions of the Safety Health and Welfare (General Application) Regulations 2007, the Safety Health and Welfare at Work Act 2005 and relevant regulations made thereunder.



Works involving traffic management and lane closure for any duration is restricted to the following hours:

- Mon-Fri 08.00-18.00, except for works requiring lane closures which shall be strictly limited to 10:00 to 16:00
- Sat & Sun 10.00-16.30 with Employer's permission / approval
- Public Holidays 10.00-16.30 with Employer's permission / approval

Work in other areas is restricted to daylight hours Monday to Friday. Work on Saturday, Sundays and/or Bank Holidays is subject to prior approval from the Employer's Representative.

The Contractor shall give not less than 72 hours' notice to the Employer's Representative prior to the date he intends to work on a Saturday.



3. Topographical Survey Specification

3.1 General

The Specification for this part of the Works shall be in accordance with the SCSl Guidance Note: Measured Surveys of Land (2022), which sets out accuracy requirements, control standards, and deliverables for topographical surveys in Ireland. This document shall be referred to hereafter as the Survey Specification.

The Contractor shall take cognisance of the RICS guidance note 'Measured Surveys of Land, Buildings and Utilities, 3rd Edition, 2014'.

This Specification is to be read in conjunction with the Specification for Geodetic Surveying Services, DMRB MCHW Volume 5 Section 1 Part 2. Should conflicts occur between this Specification and the Specification for Geodetic Surveying Services, this Specification shall take precedence. Watercourse surveys for the purposes of hydraulic modelling may also be required. These should be undertaken to the Office of Public Works Specification for Surveying Services; Section IV – LOT 1 – Channel, Structure and Flood Defence Surveys, as included in Appendix J. Where it appears that conflicts occur between this Specification and the Office of Public Works Specification for Surveying Services the successful Contractor should raise this with the Client for advice.

The extent of the Topographical Survey required is shown in **Appendix A**.

3.2 Topographical Survey Details

The following features listed below shall be surveyed:

Control Points

Ordnance Survey trigonometrical stations
Permanent survey stations
Ordnance survey bench marks used in the survey
Permanent bench marks

Buildings/Structures

The plinth line of all permanent buildings
Levels to be shown on drawing- Ground levels & Inverts
Open sides of buildings – pecked lines
Pre-fabricated houses
Hutment camps
Huts and outbuildings irrespective of floor areas
Garden sheds
Glass houses
Covered passages and archways
Internal property divisions between abutting buildings where visible externally
Ruins or partially demolished constructed buildings or foundations
by the walls and masonry visible at the time of survey
Names and numbers of all domestic and trade premises or plots gardens of private Residencies.
Buildings under construction
Bridge and subways
Overhangs and canopies
Footbridges
Retaining walls
Headwalls – showing height and width

Boundary Features



Fence (showing type and height)

Gates

Stiles

Hedges – showing type, height and width

Walls – showing type, height and width

Boundary markers

Roads, Tracks and Footpaths

Kerblines or edge of surfacing to carriageways

Centre lines and Crown lines to carriageways

Carriageway lane markings

Carriageway edge markings

Road studs

Pavement joints

Tracks and bridle paths

Rides and drives

Footways

Pedestrian crossing

Steps

Traffic islands

Paths in public grounds

Tunnels and/or underpasses

Changes of paved surface materials

Bridge and subways

Poorly defined or overgrown bridle paths – conventionalised

Paths in the front or side gardens of private residences

Paths in factory areas

Roads in factory areas

Street Furniture

Call boxes- type identified e.g. BT, Drains or gullies

Police, RAC, AA, etc

Fire hydrants

Letter boxes

Stop valves and stop cocks

Bus stops

Manhole and inspection covers, including note of any identifying markers, cover levels, invert levels, pipe sizes, no of pipes, direction of flows (with respect to north).

Lamp posts

Telegraph poles

Weighbridges

Electricity poles

Vent pipes

Covers or lights to cellars

Road Signs

Parking meters and ticket machines

Road and street name boards

Barriers

Hoardings. Notice boards

Bollards

Traffic signals and control boxes

Marker Posts

Vehicle detector pads

Ditches	Fountains
Canals and towpaths	Sewer outfalls
Wells	Piers, jetties and landing stages
Springs	Harbour walls and breakwaters
Marshes	Groynes and sea defences
Locks	Tunnels
Aqueducts	Hydraulic Rams
Water towers	The direction of flow of all rivers, streams and watercourses
Culverts (Inverts and sizes)	Ferries
Millraces	
Siphons	
Sluice gates	
<u>Slopes and Earthworks</u>	
Contours over grassed areas	Quarries
Cuttings and embankments	Rock outcrops
Terrace slopes	Tips
Retaining walls	Adits and mineshafts
Mounds	Mulch Mounds
Open pits	Ancient camps, etc
<u>Woods, Trees and Recreation Areas</u>	
Playground and sports facilities	
Parks and open spaces	
Trees and woods – girth and canopy line only to be plotted	
Hedgelines - showing type, height and width	

3.3 Additional Notes

Buildings

Buildings shall be defined by a string of ground levels immediately adjacent to the building walls following the plan shape of the building.

In any groups of buildings, the residential properties, if any, should be identified, including house names where appropriate and single storey or two storey etc, and the names of public houses, libraries, meeting halls and the like, and labelled as text strings.

Existing Bridges

At bridges and other similar structures, both upper and lower surfaces shall be surveyed. The lower surface (comprising the ground surface without the bridge deck) shall be included in the main part of the model. The upper surface (comprising the upper section of the deck between the abutments and outer edges of the parapets) shall be separated out using the string labelling to allow them to be excluded during the surface modelling.

Retaining Walls

These shall be defined by two strings, one at the top and one at the bottom, immediately adjacent to the face of the wall. If the back of the wall can be identified this should also be defined.

Boundaries

Boundaries shall be defined by the ground level immediately adjacent to them. All boundaries shall be suitably annotated with text to describe their type and construction.



Roadways

Kerblines shall be defined by two strings, one along the edge of the carriageway immediately adjacent to the kerb face and one along the top of the top face (including any ramped and dropped kerbs). The strings must not be vertically above each other.

In addition to the kerblines or edges of surfacing for unkerbed carriageways, other strings shall be surveyed as necessary to define the carriageway surface to the accuracy specified. As a minimum, one other string shall be created along the carriageway centreline.

Traffic Islands

Traffic islands are to be defined by at least three points on each apex and sufficient points on each of the sides to define them to the specified accuracy.

Street Names

Street/Road names shall be recorded as text strings.

Water Features

The top of banks shall be surveyed for ditches, outfalls, streams, culverts and drains at 10m intervals and if specifically identified bed/invert levels shall be surveyed at 10m intervals.

Water levels (with date of survey) of rivers, streams, watercourses, canals, ponds, lakes, lochs and reservoirs and where applicable, flood water levels shall be surveyed.

The direction of flow of all watercourses shall be indicated.

Cross Sections through the existing watercourses shall be provided.

Slopes and Earthworks

Slopes with a height greater than 1.0 metre including river, stream banks and the top and bottom of slopes are to be recorded as feature strings.

Woods, Trees and Landscaping

The trunks of individual trees with a circumference exceeding 1.0m measured 1.0m above ground level shall be recorded together with the Ordnance Survey requirements and string labelling system.

Shrubs on highway verges, central reserves and roundabouts, etc. shall be recorded.

Unfenced woods or clumps of trees shall be defined by strings along the line of the overhang of trees, around the perimeter.

Clearings in woods shall be defined by strings representing the overhang of the surrounding trees.

3.4 Survey Control

Plan Control

Plan control shall be based on ETRS89 coordinate system with computed coordinates projected into Irish Transverse Mercator (ITM). The Contractor shall establish control throughout the route at a density sufficient to achieve the specified accuracy. Ellipsoidal heights shall be transformed into orthometric height to Malin Head Datum using the Ordnance Survey Geoid Model.

Secondary control points shall be connected by a closed net, which shall be tied to at least two control points positioned using GPS (Global Positioning System) referencing the Active GPS Network.



The maximum closing error for all distance between points used to determine the location of secondary control points when checked by precise measurement shall not exceed $1/100,000$ or between adjacent site survey control point $\pm (0.5\sqrt{K})$ mm where K is the distance in meters between the two points being considered.

Height Distance and Vertical Accuracies

All levels supplied by the Contractor shall be related to Ordnance Survey Datum (Malin Head).

The maximum error between adjacent secondary control points, when measured by precise spirit levelling shall not exceed:

± 3 mm.

or

$\pm (12\sqrt{K})$ mm where K is the sum of the distances levelled in kilometres.

Permanent Bench Marks

An appropriate number of permanent site benchmark(s) shall be established at suitable locations chosen by the Contractor. Coordinates for benchmarks shall be provided to ITM coordinate system.

The permanent site benchmark(s) intended for control and future setting out shall be stable for at least 5 years after installation. The benchmark(s) shall be located as to allow for ease of access and safety for the Contractor's crew. The locations shall also minimise the likelihood of damage from third parties. Alternative proposals must be approved by Meath County Council.

Schedule of Permanent Survey Control Stations

On completion of the fieldwork and adjustments, a comprehensive control report shall be prepared and submitted to the Employer's Representative and Meath County Council. The report shall contain the following;

- Station designation
- Plan co-ordinates
- Level values
- Description including location map and picture.
- Ordnance Survey triangulation stations (if used)

Units of Measurement

Metric units shall be used throughout, base units to be in metres.

Digital Surface Model by Cross Sections

The surface model spot levels shall be provided at longitudinal profiles of:-

- 5.0m chainage spacing.

The lateral separation at centres of:

- Max 1.0m real world coordinates on soft surfaces as the embankments.
- Max 0.5m on road pavement.

The surface model shall be a pure x, y, z representation of the surface at these intervals. Alternatively, a DSM with even grid spot levels at 0.5m is preferred. Break lines shall be captured on all geometric level changes on the pavement and at significant slopes and changes on soft ground.



3.5 Accuracy of Features

Tolerance Values

The tolerance values stated in the tables in this clause are Root Mean Square Error (RMSE) values and the following conditions have to be satisfied:

- At least 67% of all readings must be correct to or better than the RMSE.
- At least 90% of all readings must be correct to or better than 1.65 times the RMSE.
- All readings must be correct to or better than 3 times the RMSE.
- All readings not complying with the above 3 conditions including consequential errors shall be corrected by the Contractor at his own expense.

Recorded Points

The levels and co-ordinates of recorded points shall be correct to within the following RMSE tolerances when checked from the nearest Survey Control Points.

Accuracy of Surface Model

Within any square of 100 meters side of the survey area, all spot levels when checked by precise levelling, shall be correct to within the standard deviation given in Column A for pavement areas and Column B for soft ground as shown in Table 3-1.

Standard Deviation at confidence interval of Sigma1	Pavement Areas	Soft Ground
Vertical	±0.003m	±0.020m
Horizontal	±0.015m	±0.015m

Table 3-1 Level Data

Spot levels shall be shown at all road intersections, along road centre line, along road edge, road gullies, accesses and at all significant changes of slope, at intervals of:

- 5.0m real world (0.25m for laser grid output).

Spot levels shall be shown indicating bank levels on both sides, top water level and invert level of rivers, streams, and ditches at intervals of:

- 10.0m real world (0.25m for laser grid output).

In open areas, a grid of spot levels should be supplied and supplementary levels should be given where necessary. Spot levels shall be reported to three decimal places on pavements, otherwise two decimal places.

Break lines should be included where appropriate.

Accuracy of Detail

All plotted detail shall be Field Completed. The plan position of plotted detail shall be such that no point of well-defined detail shall contain a co-ordinate error of more than 0.5 mm at mapping scale when measured from the nearest grid line, permanent ground marker or ground control point.

The distance on the drawing between any two well defined points of detail when checked by horizontal ground measurement, shall not contain an error of more than 0.025% plus 0.5mm.



3.6 Grid Digital Terrain Model

Method

The data shall be presented by the Contractor shall be prepared as a 3-dimensional (3D) digital layout which is compatible with AutoCAD Civil 3D and MX Road. All data recorded shall x, y and z dimensions.

Grid Digital Terrain Model

The ground surface over the required area, as shown in the contract drawings in Appendix A, shall be simulated by levels located at regular 10.0m grid points or at the change in horizontal or vertical direction.

The DTM along the existing roads shall include the following;

- Levels at the centreline, wheel track and edge of tar of the existing road surface and top and bottom of kerbs
- Levels on the verge /slope line and slope/ground line of the existing road.

Grids

The co-ordinates of the GDTM shall be to ITM and Ordnance Survey Malin Head.

Area of GDTM

The area for which the GDTM is required shall be as indicated on the Contract Drawing.

Position and Accuracy of Level Points

Levels points shall be defined as three-dimensional co-ordinates. The levels and co-ordinates of recorded points shall be correct to within the RMSE tolerances stated in Table 3.1. 90% of these must be within 1.65 times the values stated, when a representative sample of points is checked by measurement from the nearest OS Benchmark height control point.

A level must be supplied for every grid point without exception. Where the position is occupied by a building the ground level may be estimated subject to the approval of the Employer's Representative. Where the ground is obscured by thick vegetation, the ground height at grid points may be interpolated from an irregular pattern of points provided major breaks of slope are surveyed. The Contractor shall provide a schedule of levels and co-ordinates of the points used for the interpolation. The Contractor shall also provide schedules of estimated grid level points. The prescribed level of accuracy to be obtained should comply with Table 3.1.

3.7 Topographical Survey Deliverables

Survey Drawing Presentation

Digital survey drawings are to be produced in 2D and 3D to a scale of 1:1 in AutoCAD format. The 3D drawing shall utilise 3D strings and polylines where possible. Break lines should be incorporated into the 3D drawing to represent vertical faces as necessary. Point cloud data is also to be supplied.

Draughtsmanship on the final drawing shall be to a neat and legible cartographic standard suitable for reproduction.

The Contractor shall also make available the output of the scanning survey in a suitably detailed form to be agreed with the Employer's Representative.

Preferred Text

Text should be ROMANS font.

Text should generally be capitalised;

Text to have width factor of 0.8.



Height	Width Factor	Colour	Usage
1.8	0.65	Red	Spot Heights
2.5	0.65	Yellow	Normal Notes, feature descriptions
3.5	0.65	Green	Boxed Text
5.0	0.65	Cyan	Titles

Table 3-2 Preferred Text

Preferred Line Types

Thickness	Type	Colour	Usage
0.18	Centre	Red	Spot Heights
0.25	Hidden	Yellow	Normal Notes, feature descriptions
0.25	Continuous	Yellow	Boxed Text

Table 3-3 Preferred Line Types

Recommended Minimum Layering

Layer Item	Colour	Line type
Building	Blue	Continuous
Sheet Border	-	Continuous
Defect\Ponding Extents	Magenta	Dashed
Ditches	Cyan	Dashed
Drop Kerb	Magenta	Continuous
Frames	Green	Dash-dot
Footpath	Yellow	Dashed
Hatching	Red	Continuous
Hedges	Green	Hidden
Kerbs	Yellow	Dashed
Major	Contours	Green Continuous
Minor	Contours	Red Continuous
Overhead Lines	Green	Continuous
Rivers	Cyan	Dashed
Road Edges	Yellow	Dashed
Scrub	Green	Continuous
Services	Yellow	Continuous
Spot-levels	Red	Continuous



Layer Item	Colour	Line type
Streams	Cyan	Dashed
Street Furniture	Yellow	Continuous
Tactile Paving	Magenta	Continuous
Text	Yellow	Continuous
Tracks	Yellow	Dashed
Trees	Green	Continuous
Vegetation	Green	Continuous
Walls	Blue	Continuous
Water features	Cyan	Dashed

Table 3-4 Minimum Layering

Schedule of Results

The Contractor shall supply two copies of the following on completion of fieldwork and adjustments:

- Statement of survey method and co-ordinate system used to include coordinates of control points positioned with GPS. Control points shall be provided to ITM coordinate systems.
- Descriptions of permanent site benchmarks giving types of points constructed, location sketches, and distances to a minimum of three points of reference of permanent detail.
- Digital photographs of control points and benchmarks (min. two number photographs per location, with a recognisable point of reference clearly shown in at least one photograph).
- Diagrams of the plan control net showing the connections between site survey control points with loop closures or residuals.
- Diagrams of the levelling net indicating the connections between site survey control points.
- Colour contoured map identifying differences in levels across each area.



4. Aerial Survey and Orthophotography Specification

4.1 Aerial Survey Deliverables

The Contractor shall acquire high-quality aerial imagery of the full survey area using UAV, fixed-wing aircraft or another suitable platform, subject to Client approval. The imagery shall be suitable for the production of orthophotography and shall support engineering and archaeological assessment.

Image acquisition shall be undertaken in appropriate weather and lighting conditions. Imagery shall be free, as far as reasonably practicable, from cloud, cloud shadow, haze, smoke, flooding, smearing, excessive soil moisture, poor exposure, significant tilt and avoidable obstruction or clipping of buildings and other features. Solar altitude shall be above 15 degrees during capture.

The following deliverables are to be provided as part of the Aerial Survey:

- High-resolution (10cm) orthophotography of the full survey area.
- Appropriate ground control and independent check points.
- Georeferenced orthomosaic imagery.
- Image capture sufficient to support topographical mapping and archaeological assessment.
- Metadata confirming capture date, equipment, flying height, ground sample distance, coordinate system and processing methodology.

The Successful Tenderer shall be responsible for obtaining all required permissions, licences, consents and flight approvals necessary to undertake aerial survey operations.

4.2 Orthophotography Deliverables

The Contractor shall process the aerial photography to produce a georeferenced orthophoto. The Orthophotography shall be digital images. Image acquisition shall occur when the solar altitude is above 15 degrees. Imagery shall be acquired to minimize the amount of tilt, obstruction, and clipping of buildings and other features. Imagery shall be acquired without smearing and under conditions free from clouds, cloud shadows, smoke, haze, light streaks, flooding, and excessive soil moisture.

The orthophotography shall:

- Be orthorectified to remove the effects of camera tilt and terrain relief as far as reasonably practicable
- Be suitable for use as a measurable mapping background
- Be supplied using Irish Transverse Mercator
- Be positionally controlled using appropriate ground control points, survey control or other agreed georeferencing methodology
- Have consistent colour balancing and seamless joins between image tiles
- Be suitable for overlay with CAD, GIS, topographical survey and other project datasets

Unless otherwise agreed, the orthophoto shall be supplied as a GeoTIFF and, where appropriate, as tiled image files suitable for use in GIS/CAD platforms.



5. LiDAR Survey for Archaeological Assessment Specification

The Contractor shall undertake a LiDAR survey (Aerial Laser Scan Survey) of the full survey area and process the data to produce LiDAR-derived products suitable for archaeological assessment. The LiDAR processing methodology shall be appropriate for generating a high-quality bare-earth DTM that accurately represents microtopography, including low-relief earthworks, banks, ditches, platforms, enclosures, field systems and other archaeological features. The LiDAR survey shall be undertaken by aerial survey methods. It is the Contractor's responsibility to obtain all necessary flight permission from air traffic control authorities.

5.1 General

The following requirements shall be met as part of the LiDAR Survey:

- The survey shall be carried out and delivered using Irish Transverse Mercator, ITM / EPSG:2157, unless otherwise agreed in writing by the Client.
- Non-vegetated Vertical and Horizontal Accuracy at 95-percent confidence level $\leq 9.8\text{cm}$
- Vegetated Vertical and Horizontal Accuracy at 95-percent confidence level $\leq 14.7\text{cm}$
- Aggregate Nominal Pulse Spacing for 'last returns' shall be $\leq 0.35\text{pls/m}^2$.
- Aggregate Nominal Pulse Density for 'last returns' shall be ≥ 8 points per metre square ($\text{ppm})(\text{pls/m}^2)^2$.
- All levels shall be in terms of the Ordnance Survey of Ireland – Malin Head Vertical Datum (OSGM15).
- Be positionally controlled using appropriate ground control points, survey control or other agreed georeferencing methodology.
- Flightline overlap and cross track flightlines:
 - Minimum 20% overlap between adjacent flightlines
 - Minimum of one cross track flightline
- Data compliance:
 - All point deliverables must be fully compliant with the American Society for Photogrammetry and Remote Sensing (ASPRS) LAS Specification, Version 1.4 (R15; 2020). The classification regime implemented for the classified point cloud shall be in accordance with Table 9 of that document.
 - Digital data must be supplied in tiles georeferenced to the Irish Transverse Mercator (ITM) coordinate system.

5.2 LiDAR Survey Deliverables

The LiDAR survey shall provide, as a minimum:

- A raw point cloud in .las format and as a series of comma delimited text files in the sequence of x,y,z,i limited to a maximum of 1million points per file. The raw point cloud shall be supplied in geo-referenced tiles that shall edge match seamlessly without gaps or overlaps.
- A classified point cloud in .las format and as a series of comma delimited text files in the sequence of x,y,z,i, limited to a maximum of 1million points per file. The classified point cloud shall be supplied in geo-referenced tiles that shall edge match seamlessly without gaps or overlaps.
- A Digital Surface Model (maximum cell size 0.5m)
- A Digital Terrain Model (bare earth DTM model) (maximum cell size 0.5m)



- A Digital Surface Model (maximum cell size 2m)
- A Digital Terrain Model (bare earth model) (maximum cell size 2m)
- Extracted building footprints in AutoCAD format
- Final Survey Reports including Metadata
- Prepare from the DTM string contours at 0.5m intervals and supply in a file in vector format suitable for use in Bentley, MX, Bentley Microstation and AutoCAD.
- LiDAR and Orthophotography Survey Control Report:
 - On completion of the data capture and processing, a soft copy of a comprehensive LiDAR and Orthophotography Survey Control Report shall be prepared detailing the survey methodology, checks/validations applied, and any issues encountered. It should be demonstrated that the results achieved follow these Service Requirements. It shall be specified in the LiDAR and Orthophotography Survey Control Report how data voids, if any, were treated. A copy of this report shall be submitted to Westmeath NRO for approval no later than 7 weeks after completion of the survey.

The Contractor is not required to undertake the archaeological interpretation. However, the LiDAR and orthophotography outputs shall be of sufficient quality to allow an archaeological consultant to identify, map and assess the morphology, extent and condition of known and potential archaeological sites.

6. Standards and Compliance

The Contractor shall comply with the following standards and guidance, where applicable:

- SCSI Guidance Note: Measured Surveys of Land, 2022.
- RICS Professional Standard: Measured Surveys of Land, Buildings and Utilities, 3rd Edition, April 2024.
- USGS LiDAR Base Specification, 2021 Revision A, as a benchmark for LiDAR quality, metadata and reporting.
- ASPRS LAS Specification Version 1.4, R15, 2020, including classification in accordance with the relevant ASPRS classification regime.
- Relevant Irish statutory health and safety legislation, including the Safety, Health and Welfare at Work Act 2005 and associated regulations.
- Traffic Signs Manual Chapter 8 and relevant Irish guidance for traffic safety and management at road works, where work is carried out on or near public roads.
- Relevant requirements of utility providers, landowners and statutory authorities

7. General Programme and Method Statement

Within two weeks of award of the Contract, the Contractor shall provide the Employers Representative with a detailed programme, risk assessment and method statement of the activities the Contractor intends to carry out, in order to meet the Contract timetable and the Specification. The risk assessment(s) and method statement(s) shall include copies of calibration certificates for the survey equipment.

Specific items to include in the LiDAR survey method statement:

- a LiDAR and Orthophotography survey flight plan.
- technical equipment to be used in the execution and completion of the survey work.



- details of the proposed methods of data processing.
- methods of data validation for survey data and processed data.
- software that will be used and the parameters, algorithms, filters and macros that will be applied in order to achieve the quality of point cloud classification necessary to facilitate the production of a high-quality Digital Terrain Model (DTM) that emphasises the representation of microtopography.
- methods, personnel, equipment and software that will be used to undertake the assessments and to prepare the LiDAR Archaeological Assessment Outputs.
- detailed workflows.
- indicative Programme demonstrating the required resources to complete the Services within the Programme of Services.
- Quality Assurance statement describing the quality management measures that will be implemented to ensure high-quality assessments, reports, digital data outputs, data management and data storage and to ensure that the Services are completed to a high standard and in accordance with the requirements set out in this Service Requirements.

The Contractor shall conform to the requirements of private or public utility service companies or Statutory Authorities involved as far as access to their facilities is concerned. The Contractor shall ensure that written permission is obtained from the Employers Representative for any works which, in the opinion of the Contractor, are likely to cause damage to property.

Advance and proof copies of Survey Drawings and data shall be provided for discussion and approval before the survey deliverable is finalised.

8. Site Visit

The Tenderer shall conduct a site visit in order to satisfy themselves of the scope of services listed above. If during the site visit omissions from the scope of services are identified, notification of such items shall be submitted to the Employers Representative. Any requirements to access private land as part of the site visit shall be notified to the Employers Representative in a timely manner detailing clearly what access is required. Please note that access to private land within the tender period cannot be guaranteed and may not be approved.

9. Survey Control and Methodology in Areas of Restricted Coverage

The Contractor shall establish suitable survey control across the survey area, including control points on the ground as required to achieve the specified survey accuracy and completeness. As a minimum, tenderers should allow for approximately **three** primary control points and **six** secondary control points.

GPS coverage may be restricted in woodland areas due to tree cover and local site conditions. Tenderers should therefore note that GPS survey methods may not be sufficient in this area to capture all required information and avoid gaps in the survey data.



Where GPS coverage is poor or unreliable, the Contractor shall use alternative survey methods, including total station survey, as necessary to achieve full survey coverage and the required accuracy. Tenderers shall make their own assessment of the survey methodology required and shall allow in their tender pricing for the possibility that total station survey will be required within woodland areas.

10. Employer Meeting

As soon as is practicable after award of the Contract, the Contractor shall arrange and meet with the Employers Representative in order to explore procedures for anticipating and reporting, avoiding or minimising, monitoring, recording, well managing generally and properly any changes or impediments to the performance of the services or their progress that may arise. Any agreements reached shall be recorded and agreed procedures shall be implemented by the Contractor, its sub-contractors and the Employer throughout the Contract so as to fulfil their purposes.

The Contractor shall liaise continuously with the Employer and Employer's Representative during performance of the Services, to report progress and to deal expeditiously with queries and problems while the survey team/s are on site. The Contractor shall provide a programme of works and notify the Employer and Employer's Representative when and where the surveys are taking place.

The Contractor shall nominate, in its tender submission, a key person who shall act as the liaison between the Contractor and the Employer and its representative. If replacement of this key person is necessary, such replacement shall be agreed with the Employer prior to the change taking place.

11. Quality Assurance

The Contractor shall implement quality management procedures to ensure that the information supplied comply with this Specification and achieve fitness for purpose in terms of quality, accuracy, completeness and standard of presentation and timely delivery.

The Contractor is required to provide evidence of the Quality/Assurance Systems it operates including Certificates.

The Contractor shall be responsible for implementing full quality control and assurance procedures at each stage of the work. This shall include documented self-checks and independent checks to ensure that mistakes, errors and omissions are identified and corrected prior to delivery of results. Data shall not be deemed delivered until received by the Client in a form that complies with the specification.

The Client shall be entitled to inspect the work in progress at any time, on site or in the Contractor's office and requires a series of sample areas to be delivered for a Client quality check prior to the processing of the complete contract dataset.

The Client, at their cost, shall be entitled to undertake an independent validation of the results to ensure that it is accurate within the required tolerances and to the required formats. Should significant errors be found, the Client reserves the right to claim the cost of the validation survey from the Contractor. The Contractor shall co-operate with



the Client's validation survey by honouring all reasonable requests for data and information. The Contractor remains responsible for his work irrespective of whether the Client has undertaken validation checks.

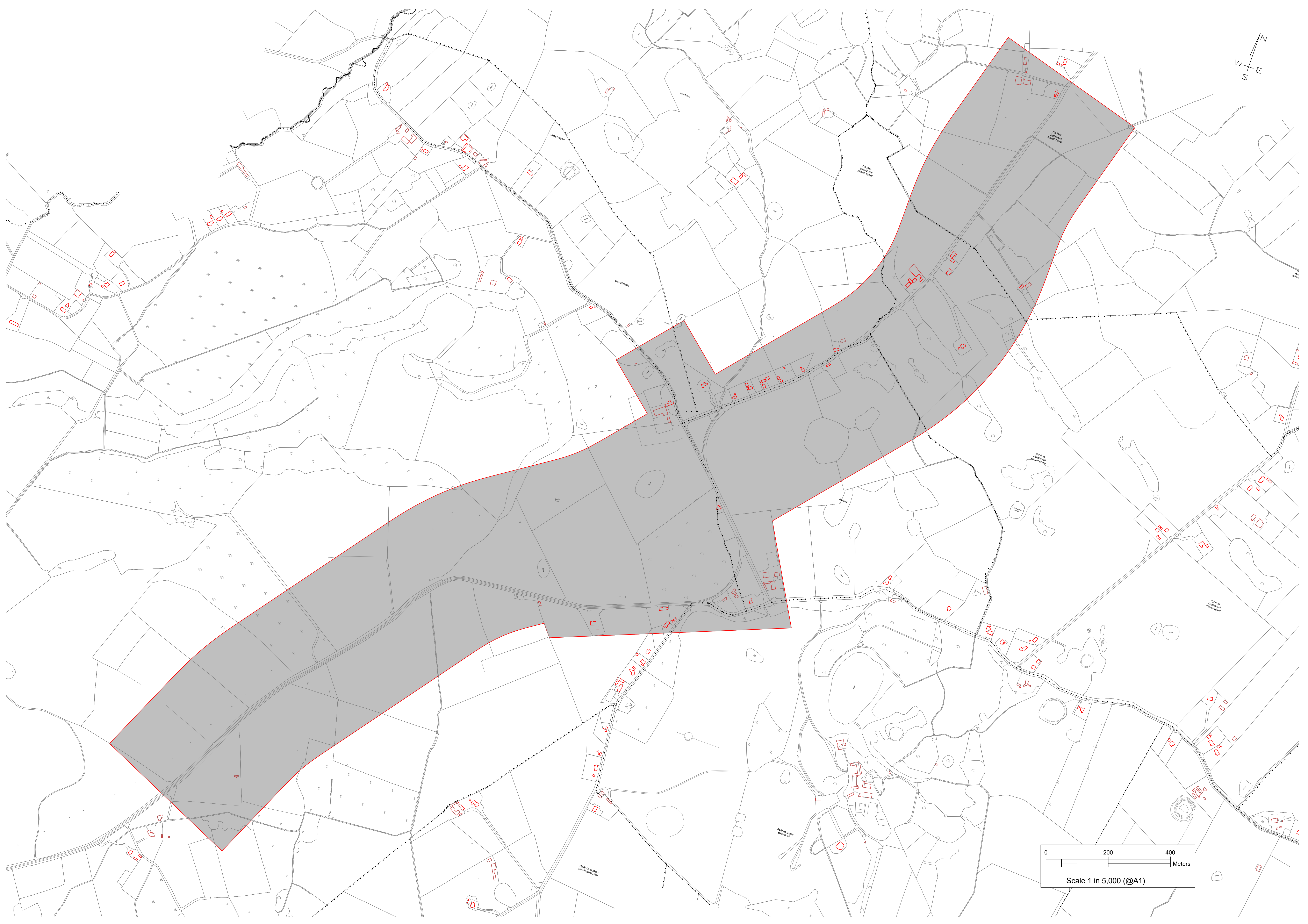
The Client will direct and manage any corrective action required for deficient data, which shall be rectified by the Contractor at no additional cost.



APPENDICES

Appendix A. Survey Extent Drawings





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