
Digitising Land at Scale:

An introduction to
The Black Arrows



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What do The Black Arrows do?



Landscape-scale Mapping

Using the specialist survey drones, satellite comms, and data processing workflows. We have over 9 years experience, of consistently delivering accuracy and measurability at a very large scale.

Largest estate to date: 50km²



Who uses our Services?

Our clients range from private landowners and leading conservation organisations, Councils and Funds, to Architects and Planners

All clients have in common large project areas and a need for accountability at some level - this is where our landscape-scale, accurate and measurable aerial surveys support them



Client Testimonials



Dan Johnson, Head of Environment, Oxygen Conservation - 10 estates between 500ac to 12,000ac: *“Daniel has been with us almost from Day 1 on our mission to scale conservation, and we couldn't have hoped for a better collaborator, expert, and friend. Daniel is one of those few people genuinely enthusiastic and passionate about what they do and is always ready to go that extra mile. From his understanding of the project brief (which are always complex) right through to submission of high-end deliverables, Daniel just 'gets it' and is an absolute pleasure to work with. A consummate professional that I can't recommend highly enough. I look forward to our next adventure!”*

- Oxygen Conservation's Blackburn & Hartsgarth, Scotland - <https://www.linkedin.com/feed/update/urn:li:activity:7110155654769594370/>



Ivan de Klee, Nattergal - 850ac site in Norfolk: *“The Black Arrows did a fantastic job, Daniel was highly professional and self-sufficient and has delivered some excellent outputs. The data layers are critical both to model our rewetting interventions, and to monitor and track change as we restore this site to wilderness over the next 100 years”*

- Nattergal's High Fen, Norfolk - https://www.linkedin.com/posts/danieljgreen_rewilding-reforesting-bng-ugcPost-7109273267613376512-bBNn?utm_source=share&utm_medium=member_desktop



Merlin Hanbury-Tenison & Ennia Bosshard, Thousand Year Trust, Cabilla, Cornwall: *“Working together with The Black Arrows has been both a pleasure and an immensely valuable experience. With Daniel's expertise, cutting-edge technology, and genuine passion for our mission to restore the UK's temperate rainforests, we couldn't have hoped for a better collaborator. Daniel's commitment to excellence is evident in every aspect of his work, and he went above and beyond to ensure we not only receive top-tier drone mapping but also fully understand its potential. The high-resolution 2D and 3D drone mapping of Cabilla Manor Farm's temperate rainforest landscape is highly valuable for our ecological surveys and outreach materials. I can't recommend Daniel and the exceptional drone mapping services provided by The Black Arrows highly enough! The future holds exciting opportunities to measure the impact of our restoration efforts, and we can't wait to explore them with The Black Arrows by our side.”*

- Thousand Year Trust, Cornwall - <https://www.pix4d.com/blog/PIX4Dfields-multispectral-conservation-mapping/>

When are we used?

As we capture both visual and measurable aerial intelligence, which supports decision-making, we tend to be instructed early in a project's lifecycle.

- **Pre-Purchase/Sale** - supporting Due Diligence, or aiding sales negotiations and valuations with quantifiable evidence
- **Pre-Interventions** - supporting estate/project assessments and audits before work commences
- **Planning & Design** - whether for conservation, engineering or architectural design and planning
- **Estate management** - HiRes maps are used in day-to-day general estate management
- **Inspections** - HiRes 3D building condition inspections save time and budget
- **Agricultural land** - supporting Agronomist assessments with multi-spectral surveys
- **Renewables Filming** - documenting renewables installations & operations in remote locations

When are we used?

Acquisition



Pre-Acquisition Due Diligence/Sale

Quick & Cost Effective 3D Survey with photos and video

Informed Purchase Decision or supply buyers with evidence of land value and potential

Ecology, Planning & Design

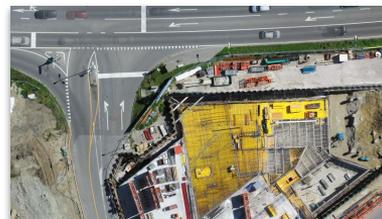


Accurate design based on real site & its hinterland

Day Zero Baseline to aid habitat classification, estate audit, assessment and planning

Reduce timescales and costs due to reduced need for site revisits

Construction



Pre/Mid/Post Construction

Aid QS/reporting to investors/Lenders

Keep tighter control of build schedule with more real-time updates on site

Management



Monitor & Manage Condition

Access tough areas safely & quickly

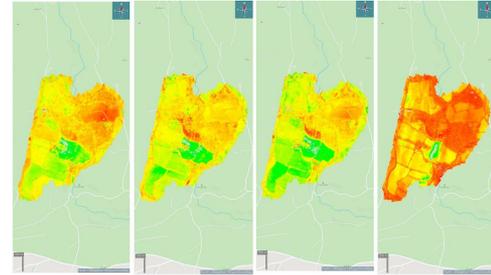
Up-to-date mapping of estates rather than depending on tacit knowledge & >20yo maps

What can you use our data for?

Most of our conservation and Natural Capital clients use our aerial surveys as their 'Day Zero' baseline, which goes on to be the single high quality source of data for their ecologists and agronomists to work from in their habitat mapping, BNG calculations, hydrology studies, environmental impact planning and evidencing, accountability and stakeholder communications.

Other landowning and renewables clients use our surveys as above, but also find that the accurate topographical data can be used for initial engineering surveys, planning and design and stakeholder engagement. - for example Oxygen Conservation used our data when working with Low Carbon to assess the best placement for wind turbines on their sites. This not only saved time and budget by reducing visits and saving on additional surveys, but also meant the teams could quickly focus in on the ideal location.

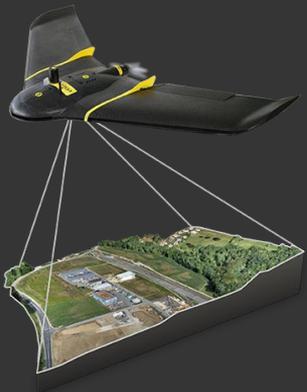
All data has an Absolute Accuracy of 2cm, and survey outputs are GIS and CAD software compatible



Multi-spectral Survey at Thousand Year Trust @ Cabilla, Cornwall
(Click to read more)



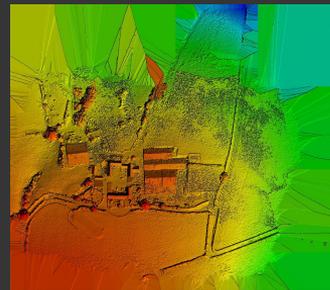
High Resolution imagery at 4cm GSD at Blackburn and Hartgarth Estate, Scottish Borders
(Click to read more)



Capture



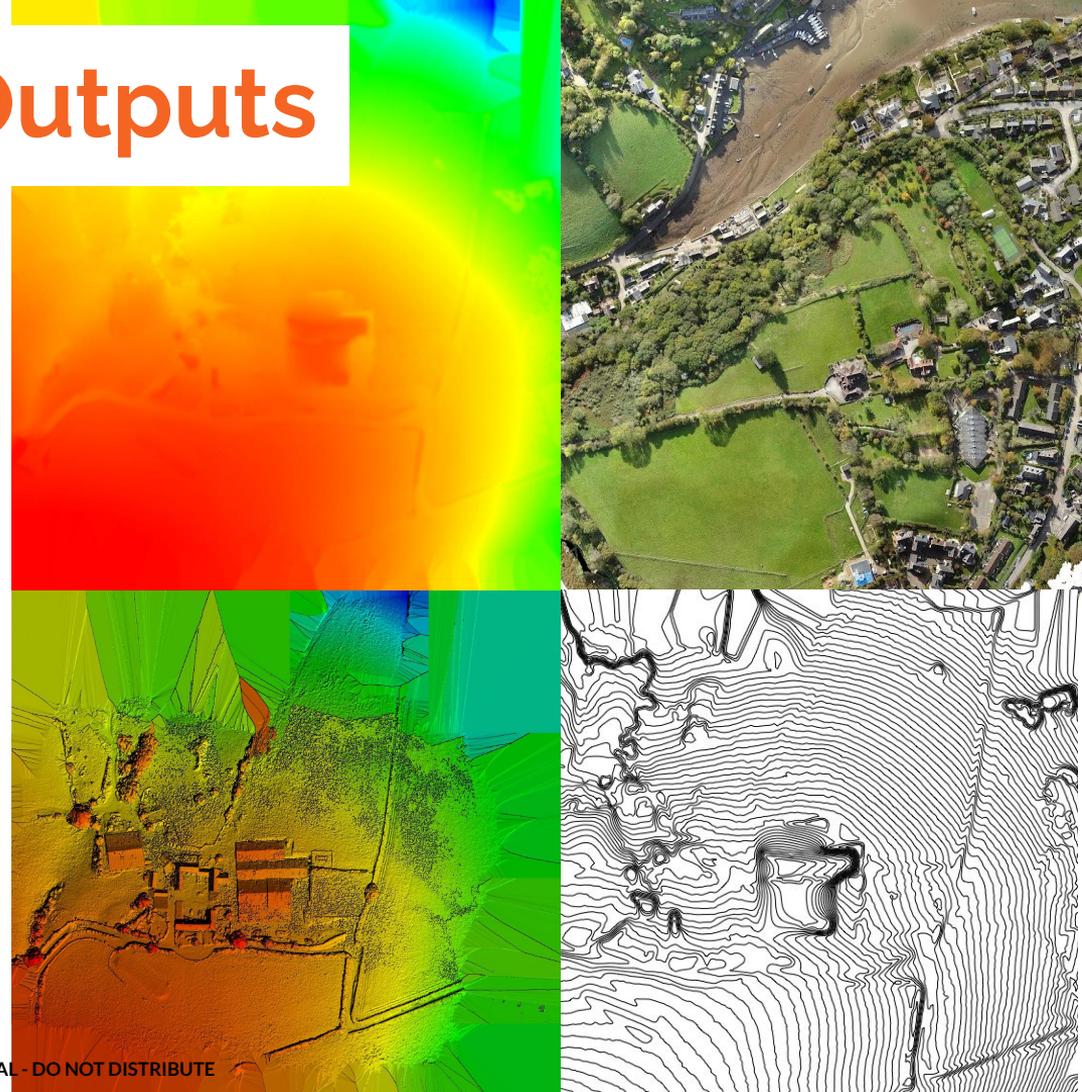
Process



Output

Survey Specs & Outputs

- **Survey Photos** - JPG, RAW/DNG images
- **Orthomosaic Raster** - GeoTIFF
- **3D Pointcloud** - LAS, LAZ, PLY, XYZ
- **3D Mesh Model** - PLY, FBX, AutoCAD DXF, OBJ
- **DSM & DTM** - GeoTIFF & LandXML
- **Contour Lines** - SHP, AJF, AutoCAD DXF



Hardcopy has also proven a great help to some clients

- Bespoke formats available per project
 - Medium and large format paper
 - Medium and large format laminated
 - Medium and large format wall-mountable
 - Acrylic
 - Aluminium
 - Glass
 - 3D printed models of landscape or structures
 - CNC-Machined landform contours

Example Projects

The Invergeldie Estate, Perthshire, Scotland

12,000ac/5,000ha/50km² - Oxygen Conservation:

Full Estate 2D & 3D Aerial RGB Survey to support baselining, BNG calculations, ecology and agronomy surveys and deer management



<https://www.youtube.com/watch?v=LkOb3Tiw4Q>



https://www.linkedin.com/posts/danielgreen_reforesting-bng-dronesforfood-ugcPost-7101289908652101632-qfiv?

High Fen, Norfolk, England

800ac/320ha - Nattergal Ltd:

Full Estate 2D & 3D Aerial RGB & Multispectral Survey to support baselining, BNG calculations, ecology and agronomy surveys and stakeholder comms



https://www.linkedin.com/posts/danielgreen_rewiding-reforesting-bng-ugcPost-7108414529859936256-t-Rz?

Multiple Forestry & Renewables Sites, Scotland

Multiple Sites - Time Investments Ltd:

Created a number of short-form aerial videos of various renewable installations across Scotland, including hydro, turbine and commercial forestry, produced for internal and external stakeholder comms



<https://www.youtube.com/watch?v=fSmKDBlyzQ>



https://www.youtube.com/watch?v=UBYXnDOR_C4





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