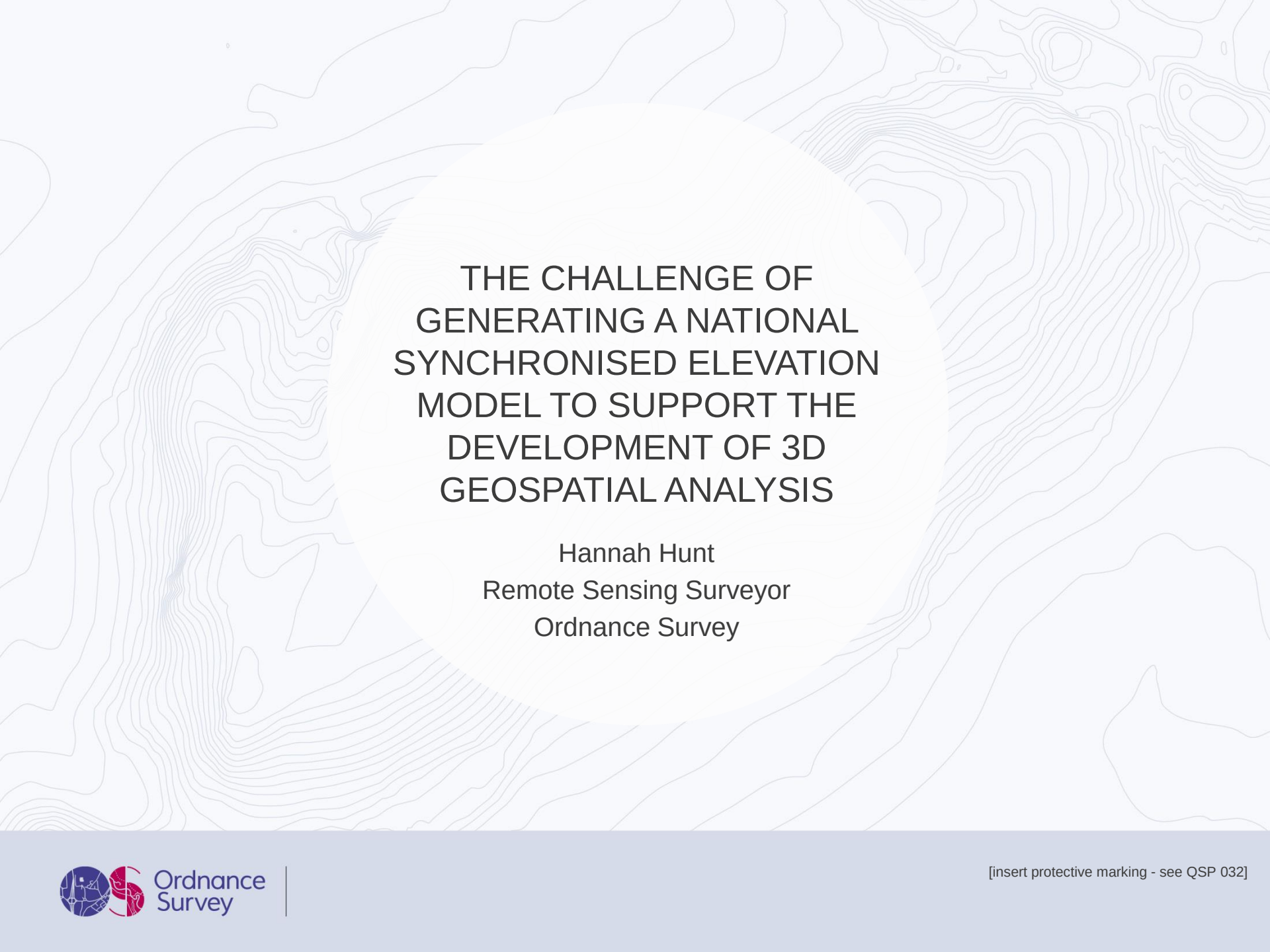




THE CHALLENGE OF GENERATING A NATIONAL SYNCHRONISED ELEVATION MODEL TO SUPPORT THE DEVELOPMENT OF 3D GEOSPATIAL ANALYSIS

Hannah Hunt
Remote Sensing Surveyor
Ordnance Survey

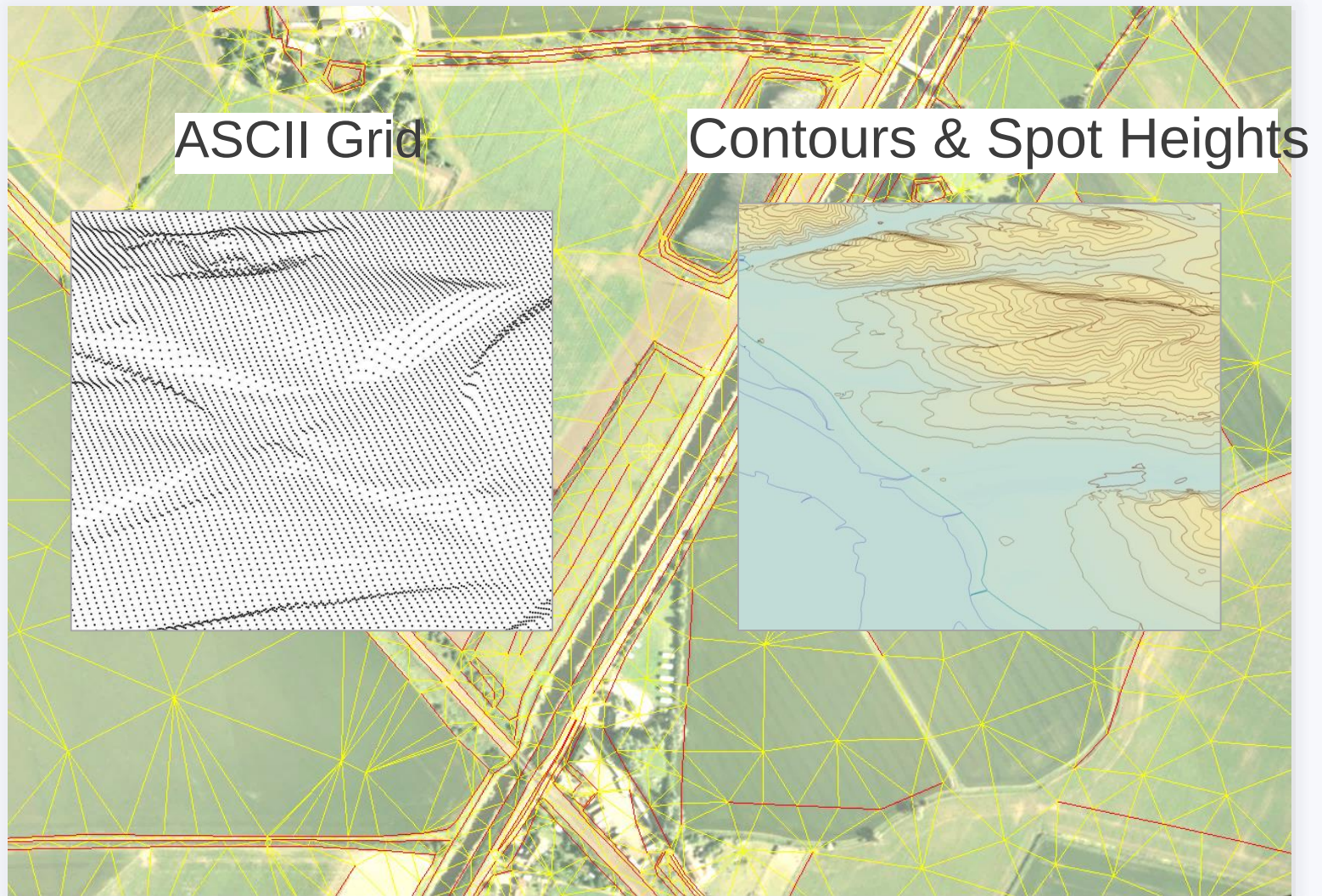
BACKGROUND TO ELEVATION MODELS – PAPER MAPS



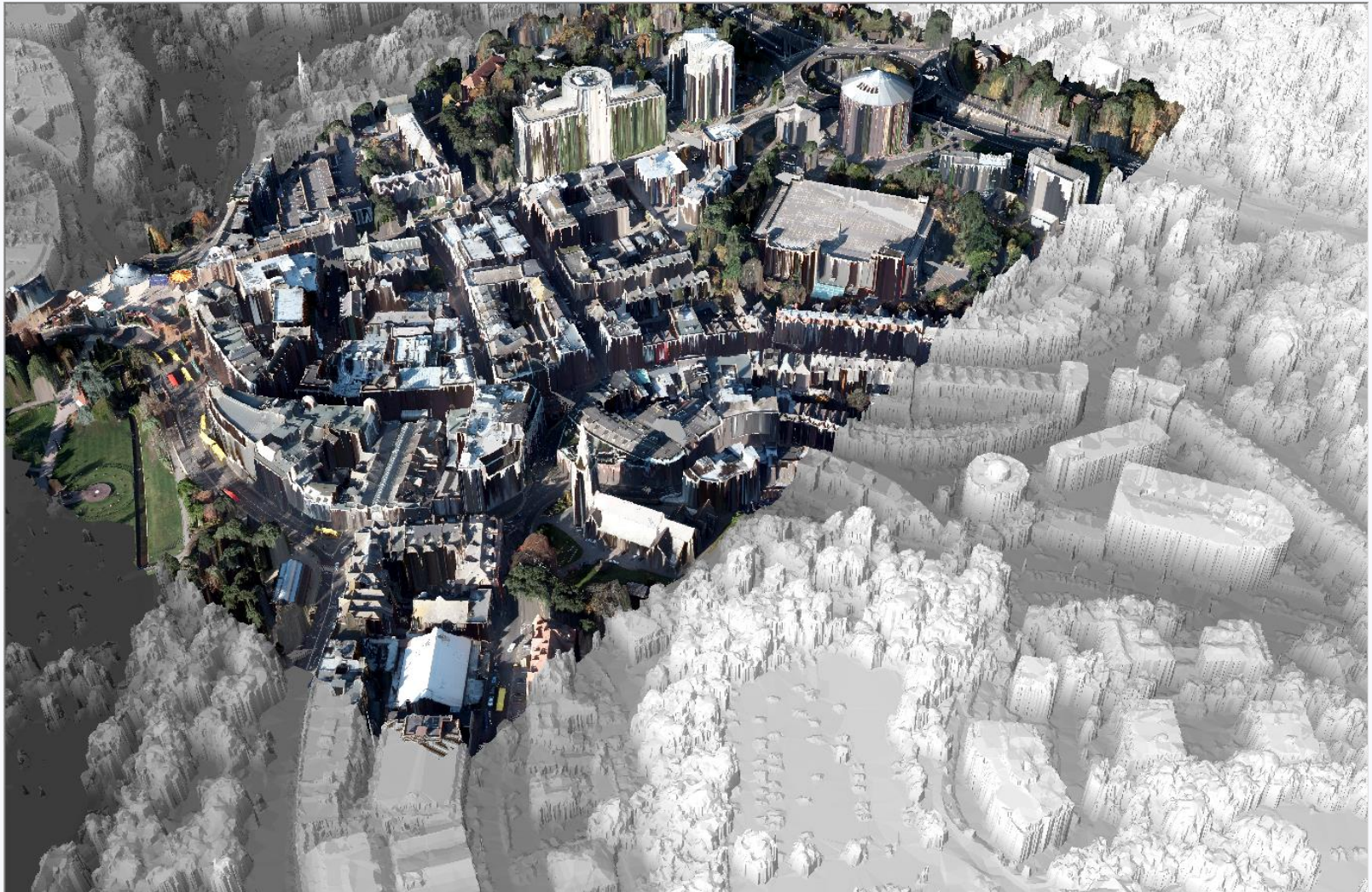
MANUAL GENERATION OF CONTOURS



OS WENT DIGITAL TERRAIN 5 AND 50



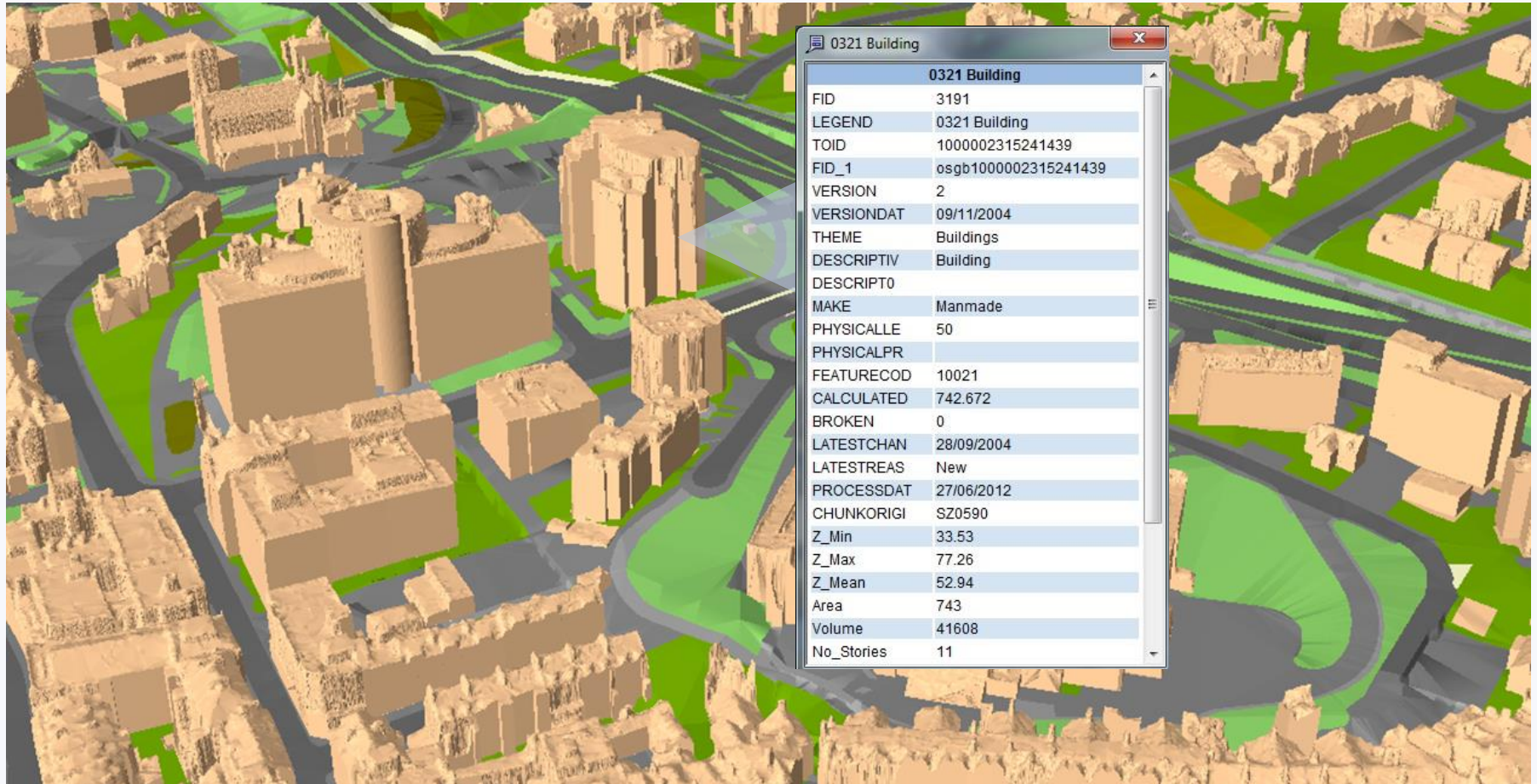
IMAGERY IS DATA



A MOVE TOWARDS 3D DATA



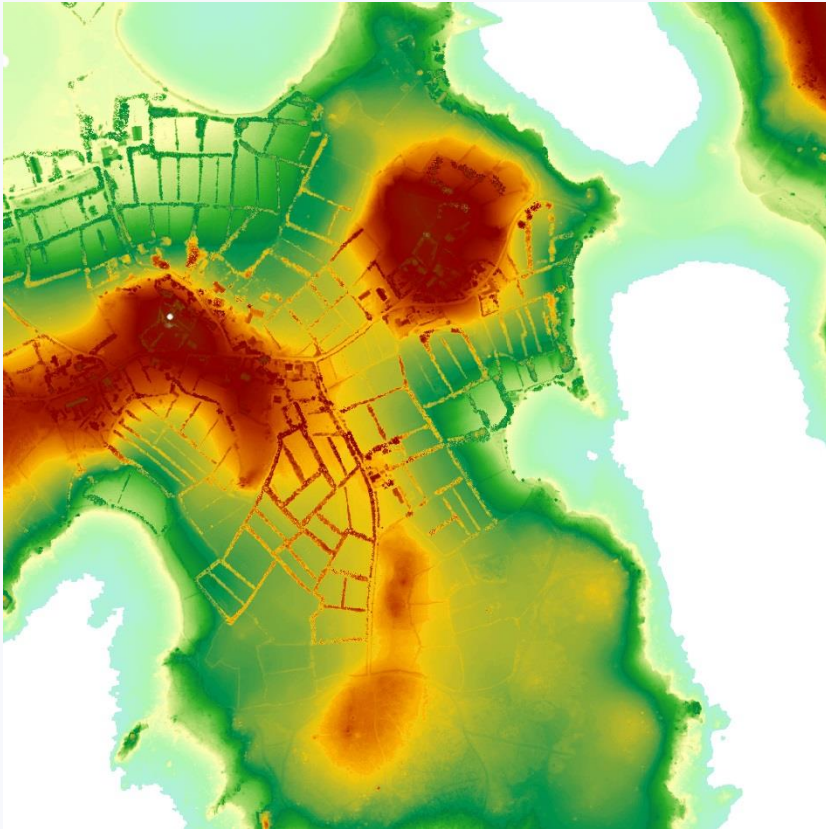
GEOMORPHIC BUILDING OBJECT – ATTRIBUTION



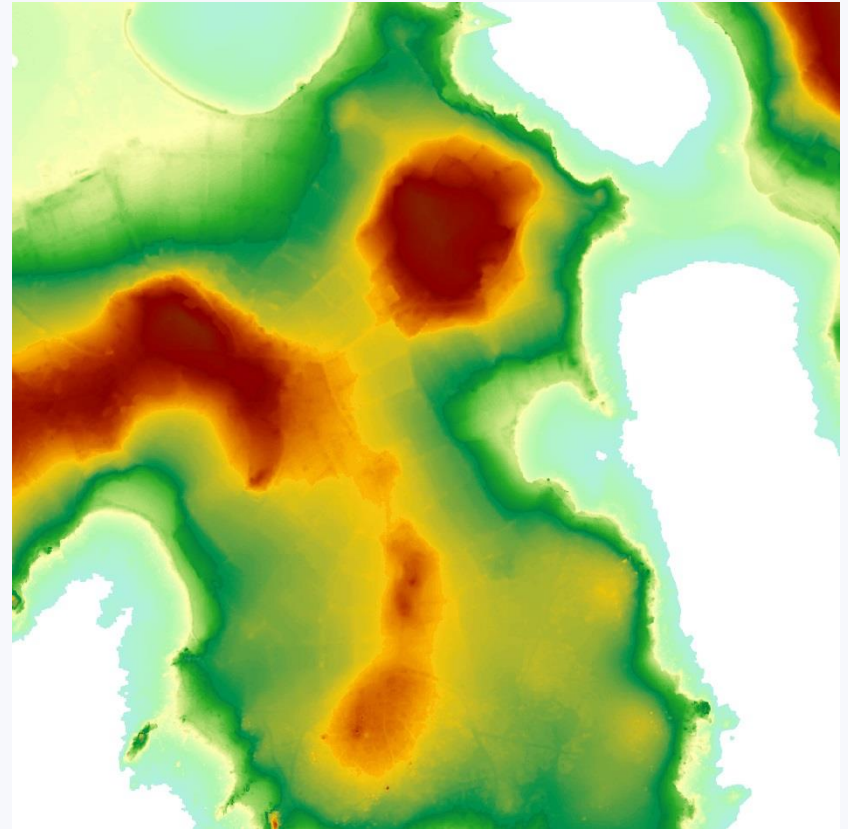
THE CHALLENGE

SYNCHRONISING HEIGHT DATA: DIGITAL SURFACE MODEL (DSM) AND
DIGITAL TERRAIN MODEL (DTM)

DSM



DTM



RESEARCH AIM

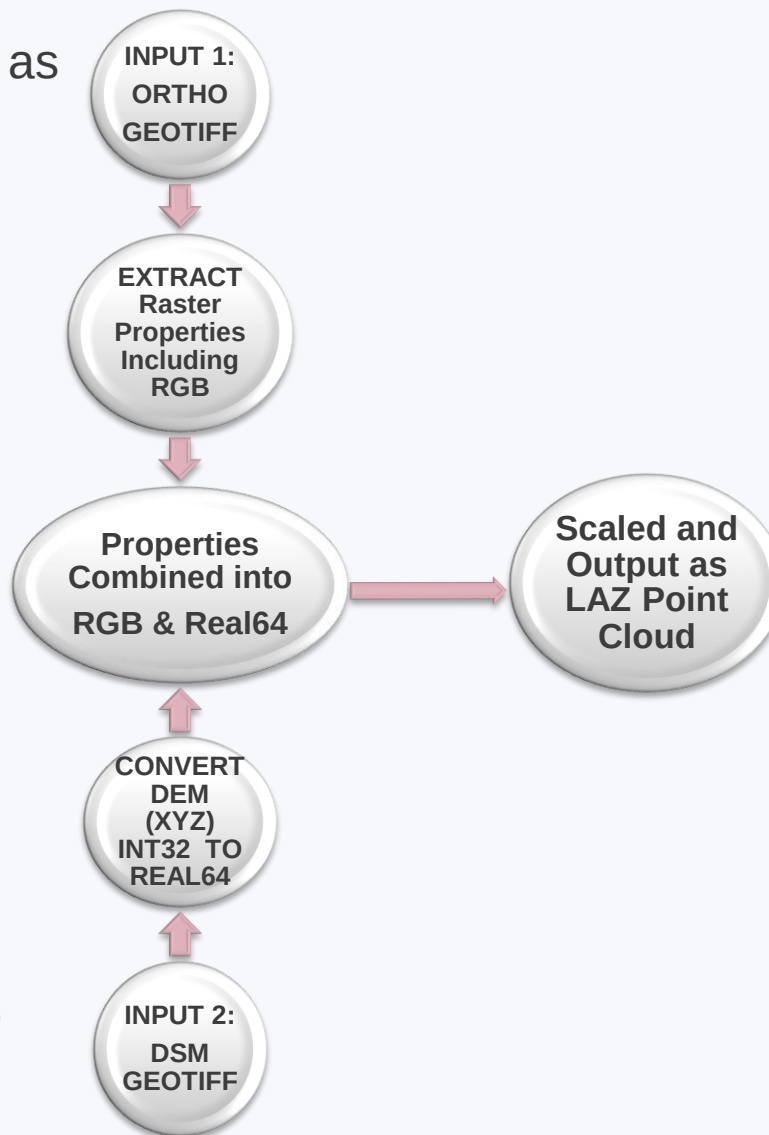
To investigate alternative approaches to the challenge of synchronising elevation data;

1. Point Cloud Classification

2. DTM extraction

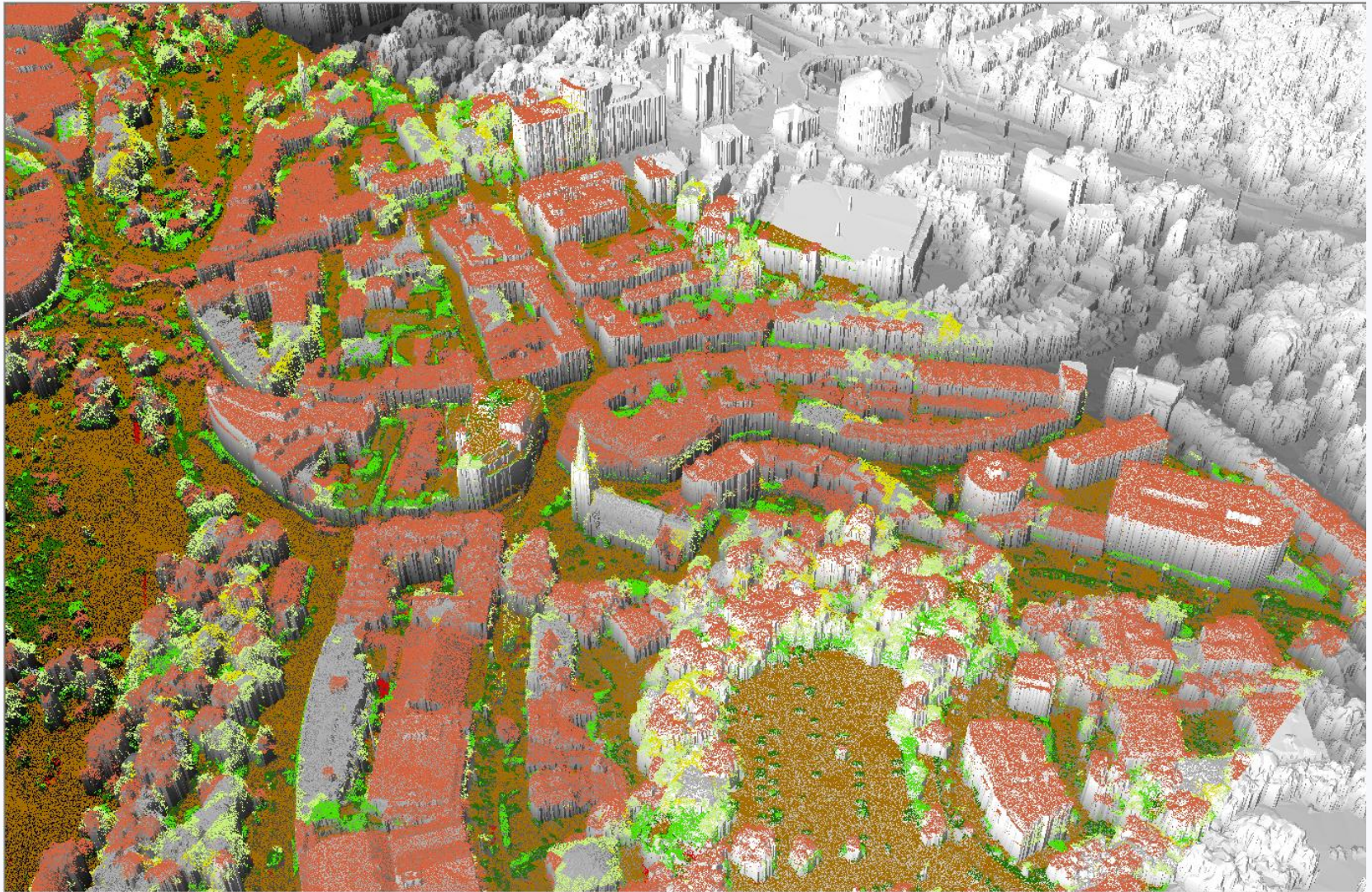
APPROACH 1 – POINT CLOUD GENERATION

Input = 1km Ortho Tile as
Geotiff



Input = 1km DSM of same
Tile as Geotiff

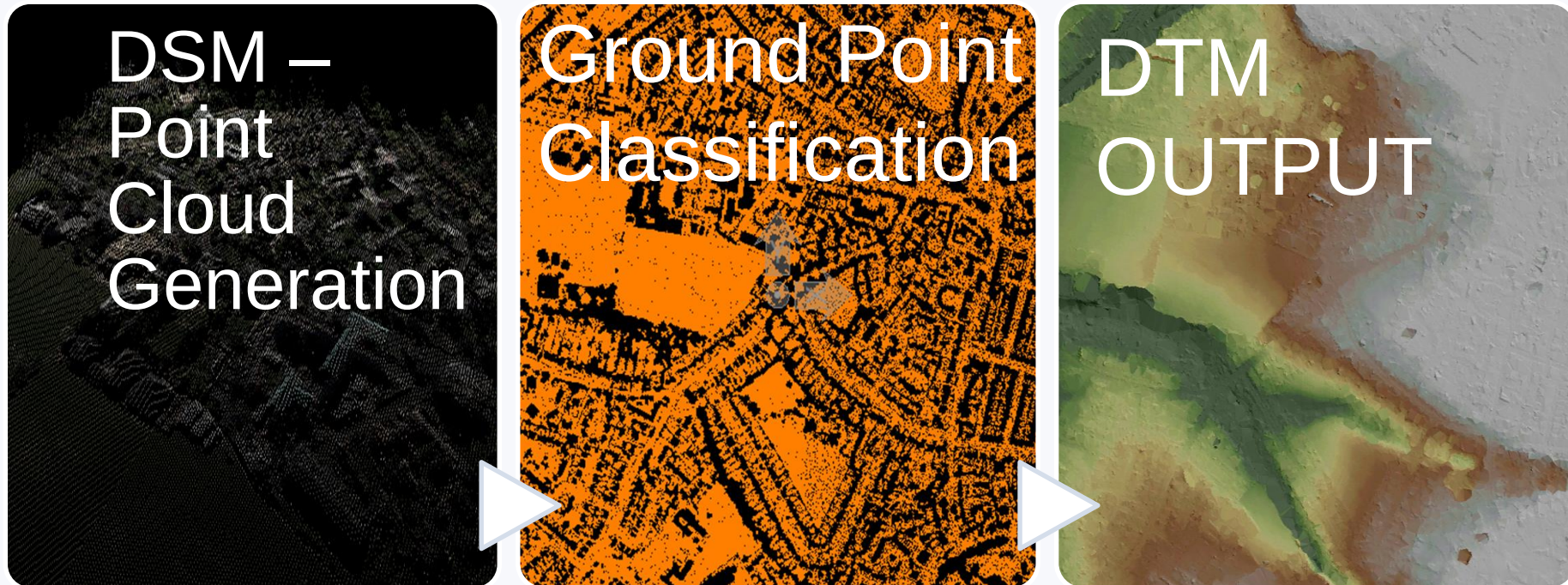
APPROACH 1 – POINT CLOUD CLASSIFICATION



GROUND POINTS PROVIDE THE BASIS FOR DTM



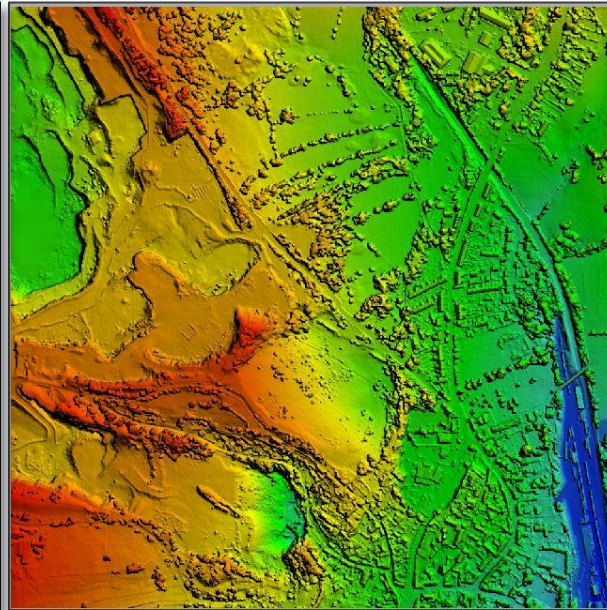
POINT CLOUD WORKFLOW



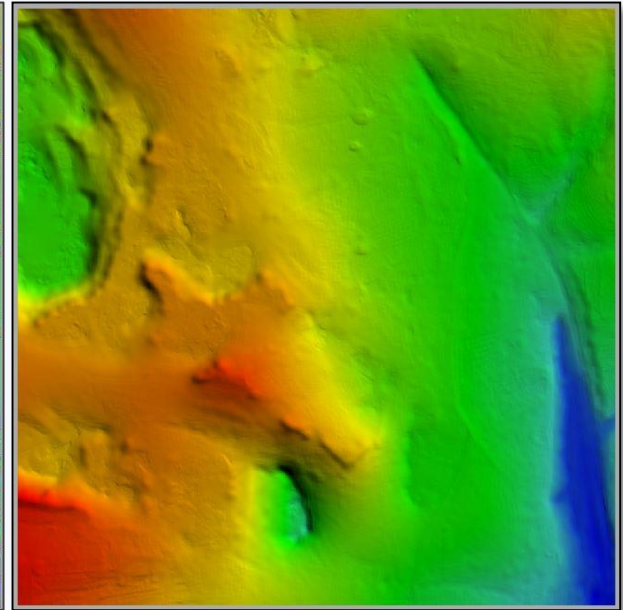
APPROACH 2 – HEIGHT DATA FILTERING



Derby Ortho Imagery

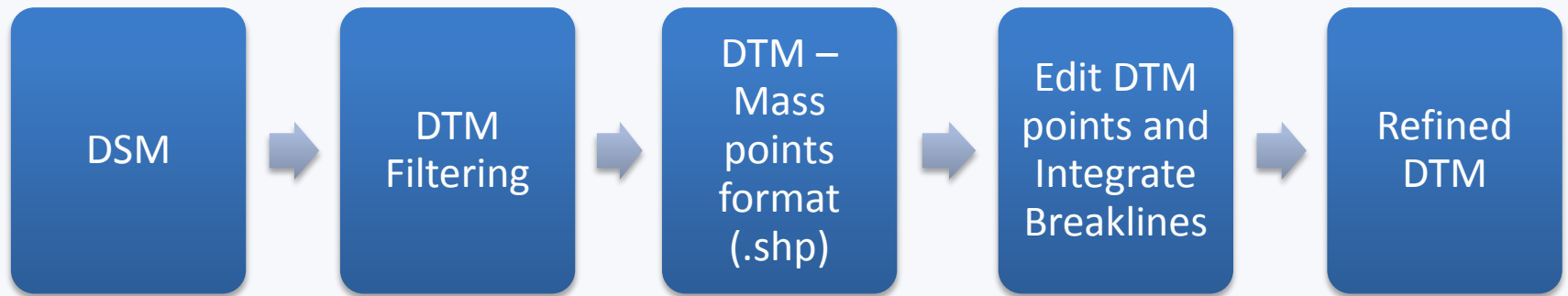


Derby DSM 25cm



Derby DTM 25cm

DTM EXTRACTION WORKFLOW



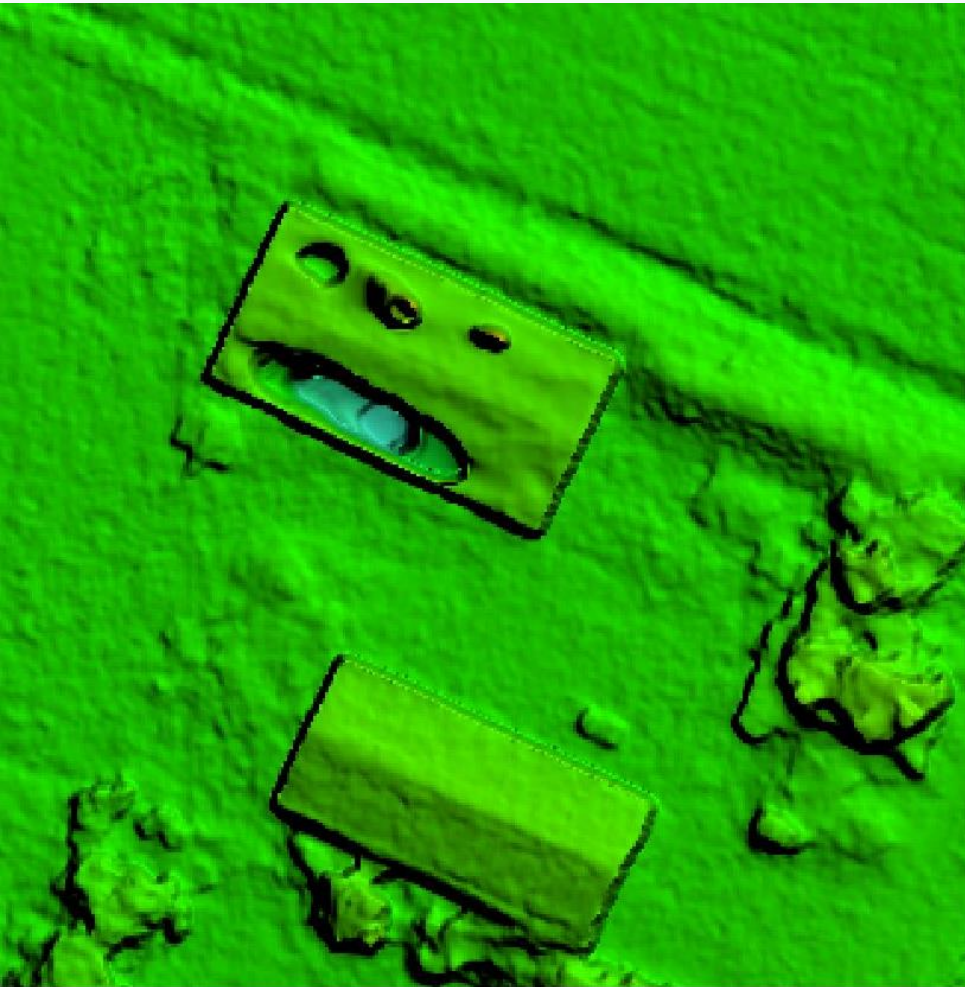
RESULTS

CRITERIA	SOFTWARE PACKAGE 1			SOFTWARE PACKAGE 2			SOFTWARE PACKAGE 3		
	Met/not met	Score	Comment	Met/not met	Score	Comment	Met/not met	Score	Comment
DTM extraction/filtering type	Automatic	10	Automatic DTM extraction from the DSM input.	Automatic	7	Automatic DTM extraction from the DSM input.	Automatic	7	It uses a predefined point classification routine to filter points out and classify as Ground, Buildings, Vegetation etc
How effectively does this filtering work?	Very Good	9	It does an excellent job in removing the above ground features (buildings, vegetation etc.). The number of editing signatures in the DTM is considerably small.	Good	7	The DTM extraction is good, however it still leaves a lot of software editing signatures - from buildings, street furniture, bridges and so on.	Good	6	many buildings and other above ground features still visible
Does this system have manual DTM editing tools?	Yes	8		Yes	9		Yes	8	
How effective are these DTM editing tools?	Very Good	8	A small but efficient number of editing tools, including the importing of vector files for editing	Good	8	A big variety of tools for editing the signatures left in the extracted DTM - thinning, interpolation or specific for buildings, vegetation, water, roads etc.	Very Good	9	Currently used inhouse to refine the existitng IDTM
DTM output format	Grid	8		Grid and TIN	9		LAZ, LAS, XYZ, GRID, TIN	9	
Stability of the software	Very Stable	9		Unstable	5	Whenever you run an operation, all the other menu options start to flicker and the software can be hard to manipulate.	Stable	7	Developed and cotinuously improved over the last 30 years
Batching capability	Yes	9	Very good batching capabilities given by the script and command mode	Yes	7		Yes	5	Unable to test fully due to tight testing timescale
Time to process DSM(merging tiles - 5x5km tiles)	1 minute	10		12 minutes	8			0	Unable to test fully due to tight testing timescale
Time to process DTM extraction(per 1km tile)	1 minute	10		10 minutes	7		7 minutes	5	
Does this system use CPU or GPU memory for processing?	GPU	10	The use of GPU memory allows the software to have small processing times	CPU	6	For large files it can cause very slow processing. Usually you leave it to run overnight.	CPU	5	
Are the interface and user's manual of the software easy to follow?	Yes	10	The manual is brief and concise. It has a simple structure and it is very easy to follow - only 78 pages	Partial	8	The explanation for each tool is quite clear, however the manual is very lengthy and not easy to follow - over 2000 pages	No	5	Initially unable to find any manuals or relevant tutorials on the website-after requesting directly I was sent some that were lengthy and difficult to follow
File size of DSM - 1km tile (input)	391 MB - 10cm 62 MB - 25cm	9	The input is a geotif file.	391 MB - 10cm 62 MB - 25cm	9	The input is a geotif file.	0.5GB- 10cm	9	LAZ input accepted
File size of DTM - 1km tile (output)	812 MB - 10cm 100 MB - 25cm	10	Output formats: software Model(.smf), Geotif(.tif), ASCII(.asc)	900 MB - 10cm 160 MB - 25cm	9	Output formats: Grid or TIN (.dth), ASCII(.asc,txt)			Depends on the format: XYZ, Txt, Geotiff, TIN, ASCII, LAZ, LAS
Cost per licence (£)	14000	6		3500	10		10000	7	
Total		126			109			82	

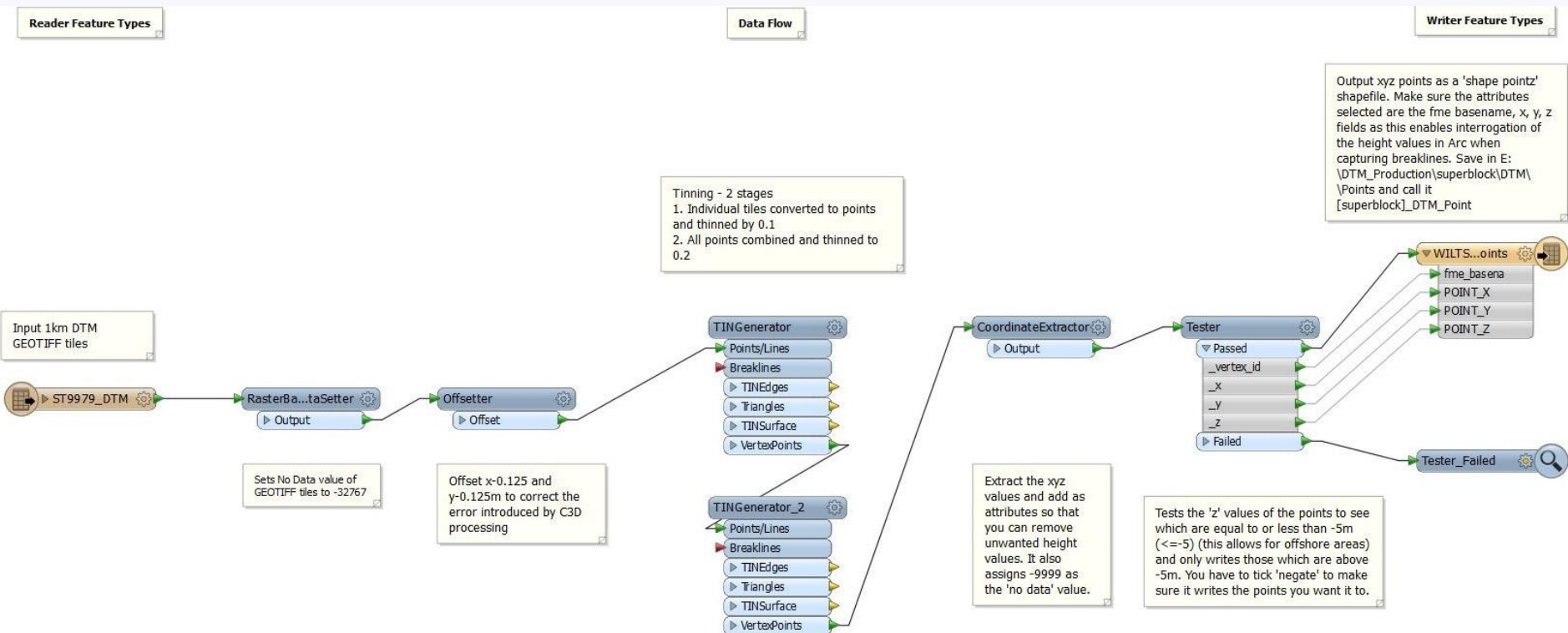
IMPLEMENTING DISCOVERIES INTO A PRODUCTION FLOWLINE

- OS working towards a 2 year update for the entire country
- Varying terrain types
- Specification considerations
- Hardware

DSM EDITING



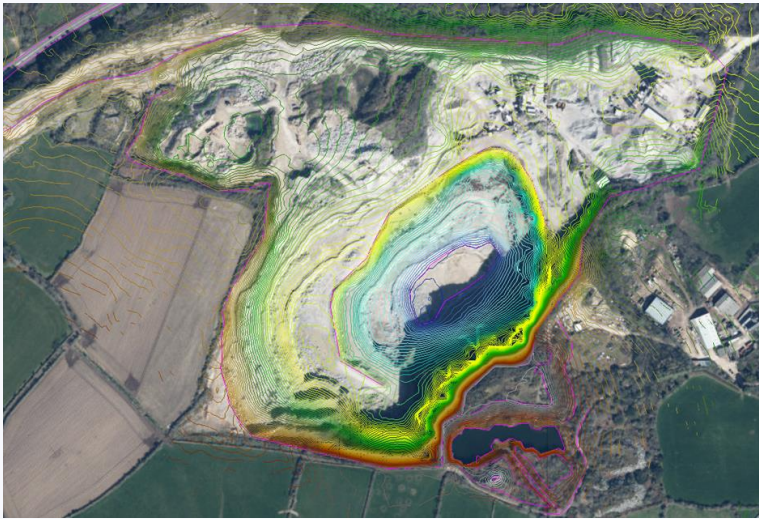
FROM RASTER TO POINT



BREAKLINE CAPTURE



Bridges



Quarry

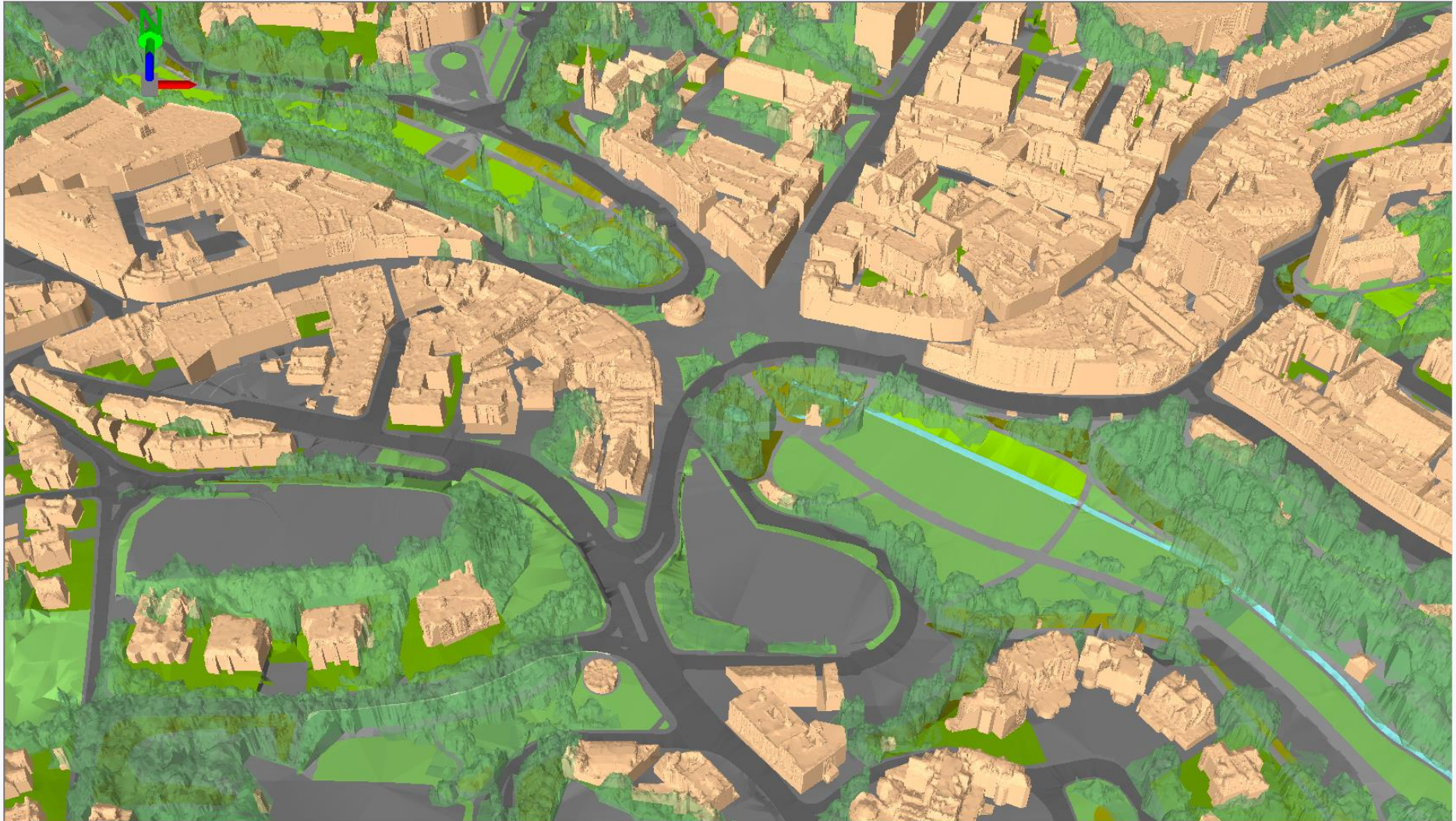


Cutting on Major Communication Route

We captured 5 types of breakline:

- Water body
- Top feature
- Bottom feature
- Road Edge
- Miscellaneous

POTENTIAL OUTCOME: 3D MAPPING





Thank You for your patience

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OS is Britain's mapping agency. To find out more about us, go to os.uk. If you'd like to talk to us, call +44 (0)3456 050505. For the hard of hearing, use Textphone +44 (0)2380 056146.
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