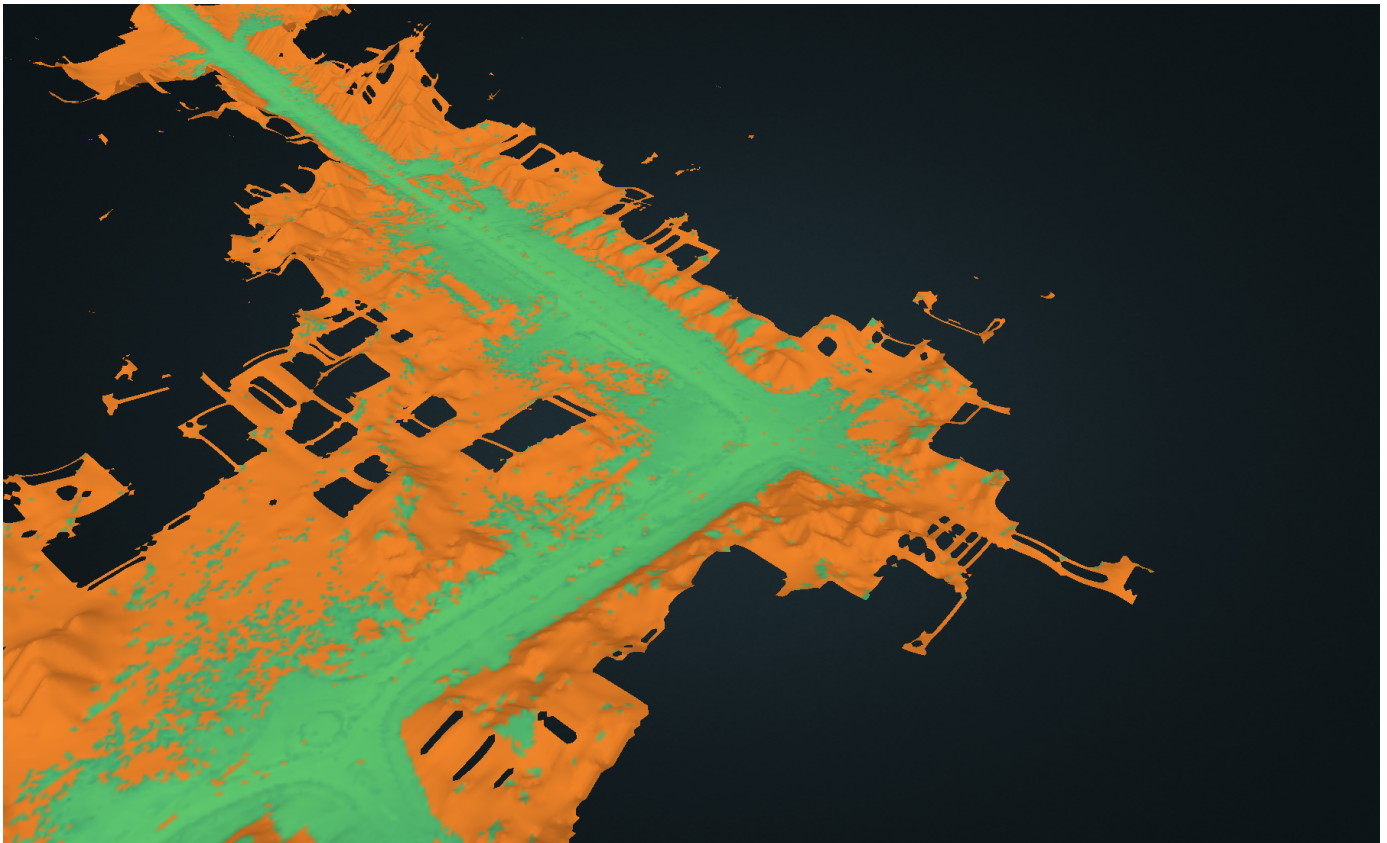


FROM CAPTURED POINTS TO A REVIEWABLE TERRAIN SURFACE

Orbis

Terrain DEM.

Understand the ground. Keep the evidence. Carry the surface into your next workflow.



15th Avenue & 2nd · completed 1 m terrain DEM. Native green/orange display distinguishes local ground fits from inferred terrain.

■ Local ground fits ■ Reconstructed estimates ■ Source cloud, where shown

Create from the full cloud

Choose the source and spacing. No measurement fence is required.

Review in context

Overlay terrain on the scan and inspect the support behind the surface.

Deliver useful geometry

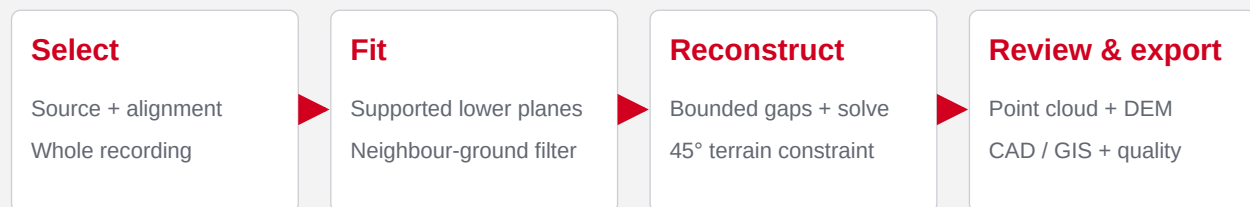
Export terrain nodes, a CAD mesh, elevation rasters and quality evidence.

01 / WHAT THE DEM PROVIDES

A ground-oriented elevation model of the recording.

Orbis Terrain DEM turns a full point cloud into a regular elevation field and a connected terrain mesh.

From point measurements to a reusable terrain surface



One final elevation field supplies the viewer mesh and elevation exports.

Conceptual workflow. Reconstruction adds modelled estimates, not new survey observations.

Conceptual workflow. The screenshots in this brochure show completed products from the two requested recordings.

One elevation at each XY node

DEM means digital elevation model. Here it represents a ground-oriented height surface: each supported grid position has one elevation. Adjacent nodes form triangles for a continuous 3D view.

A surface that can be reused

The same final elevations feed the viewer, terrain-node exports and raster products. That makes the geometry useful for terrain review and downstream CAD or GIS work.

Separate the ground from the scene

The source cloud can contain trees, buildings, vehicles, poles and wires. Orbis seeks supported lower surfaces, filters high returns against neighbouring ground, and labels reconstructed estimates.

Keep the model's scope clear

This is a 2.5D terrain representation. It does not represent every vertical wall, bridge deck, overhang or enclosed cavity, and it is not a complete semantic ground classifier.

A continuous-looking surface is still a model. Grid spacing, local fit quality, interpolation and independent survey accuracy describe different things.

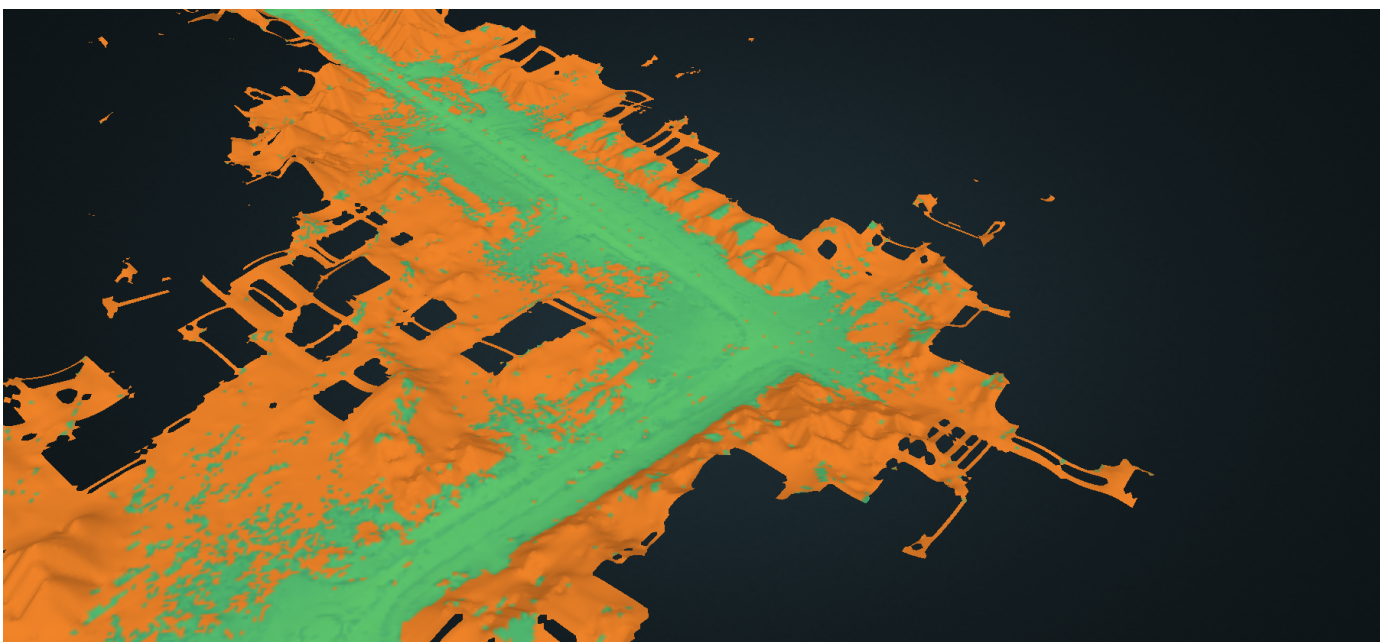
02 / FROM SCENE TO TERRAIN

Read the scan. Then read the model.

The same Avenue viewpoint shows why it helps to keep the original observations beside the DEM.



Source point cloud only, rendered in neutral grey. Objects above ground remain part of the original scan.

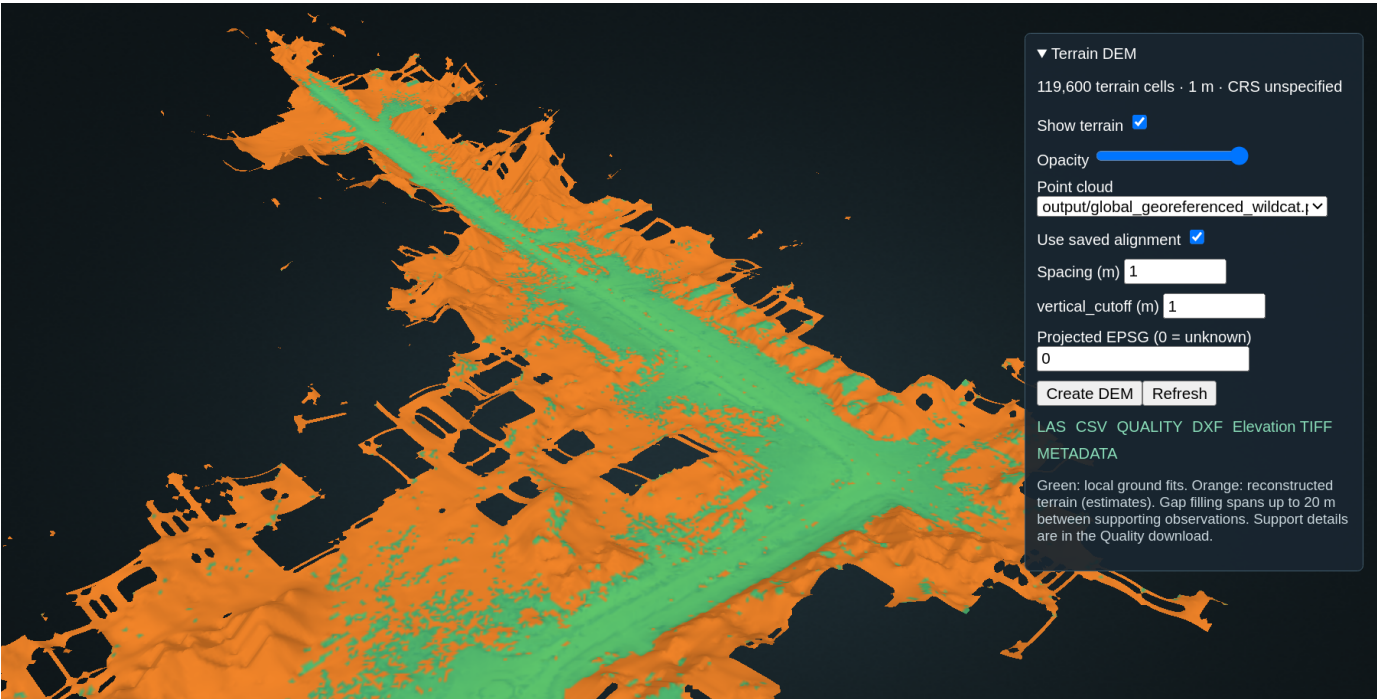


Same camera, DEM only. Green marks local ground fits; orange marks reconstructed or materially adjusted terrain. Dark openings contain no rendered surface.

03 / START IN ORBIS

Choose the source. Create the whole-cloud DEM.

Open the recording map and expand Terrain DEM in the viewer.



Native Orbis Terrain DEM controls for the Avenue recording. The completed surface is shown; no new processing run was submitted for this brochure.

Step	Action
1 · Select	Choose the PLY in Point cloud . This is the analysis source; simply changing a visible layer does not replace it.
2 · Align	Use Use saved alignment when the source needs its saved alignment to match the map coordinates.
3 · Set	Choose spacing, the neighbouring-ground height cutoff and the projected EPSG when known.
4 · Create	Click Create DEM . The job processes the whole selected cloud without a drawn fence.
5 · Review	Inspect the completed surface, its quality evidence and coordinate context before using the exports.

The recording process list also exposes **CreateDEM**. This brochure uses the recording-map workflow; the separate Atlas workspace is not wired to the same DEM panel.

04 / CONTROLS AND CHOICES

Set resolution and ground assumptions deliberately.

The controls define the derived product; display opacity and visibility only change how you inspect it.

Control	Meaning	Practical effect
Point cloud	Available analysis PLY	Choose the intended recording derivative; retain its identity with the result.
Use saved alignment	Apply the saved XY heading and offsets	Keep the DEM and source viewer in the same frame.
Spacing (m)	Grid-node interval; default 1 m	Finer spacing can resolve smaller features when the observations support them. It increases the number of nodes.
vertical_cutoff (m)	Allowed height above neighbouring ground; default 1 m	Returns above this threshold are omitted from final terrain fitting where a trustworthy reference exists.
Projected EPSG	CRS identifier; 0 means unknown	Labels the coordinate reference. It does not transform the source into a new CRS.
Show terrain / Opacity	Independent surface display controls	Compare the mesh with the point cloud without recalculating.
Refresh / Cancel	Reload product state / stop an active run	A failed or cancelled replacement keeps the previous completed DEM.

Resolution follows evidence

For the same covered area, halving spacing can require roughly four times as many grid nodes. It cannot recover details that the scan did not observe.

Use the cutoff with context

A smaller cutoff is more restrictive above a supported reference. A larger value admits more elevated returns. Neither setting guarantees removal of every object.

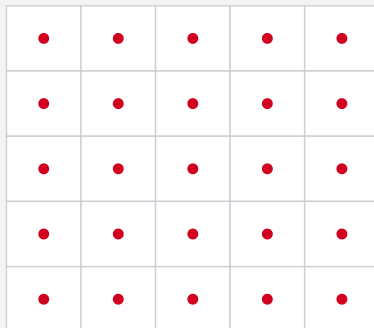
The UI accepts spacing from 0.05–100 m and a cutoff from 0–100 m. These are permitted settings, not recommended accuracy levels.

05 / LOCAL GROUND FITTING

Fit supported lower surfaces. Retain the measured context.

The engine streams the full PLY into spatial partitions and uses bounded samples within each grid cell.

The grid stores a fitted height at each node



Regular XY spacing

Preserve the local observations

Balance sample coverage across each cell.

Fit supported lower planes; reject poor fits.

Evaluate elevation at the exact grid node.

Store confidence and fit evidence.

A fitted node is not simply the lowest raw return.

Schematic grid fitting. Real node elevations come from local plane fits, rather than a simple minimum or average of all returns.

Balance the sample spatially

Each cell is divided into sixteen XY regions. The sample keeps low and high observations plus a deterministic selection of additional points, limiting the influence of uneven point density.

Test local planes

Candidate planes need enough inliers, spatial spread and acceptable residuals. The DEM rejects candidates steeper than 45° and favours a supported lower layer.

Look beyond an isolated cell

Where a fine cell cannot support its own fit, a five-cell-wide neighbourhood can provide a weaker plane estimate. Local returns must still support that plane in the target cell.

Record fit evidence

The engine retains source counts, RMS residuals, confidence and model provenance. A high confidence value indicates support under these rules; it is not an absolute accuracy probability.

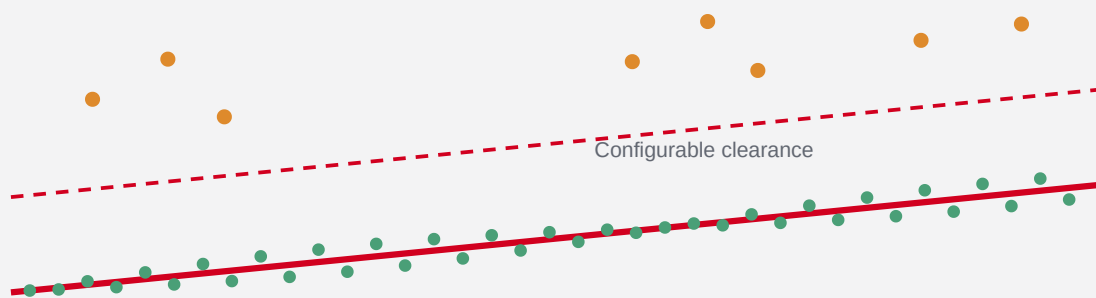
Reviewed defaults include 0.08 m fit tolerance, a 0.15 confidence threshold and at least six sampled points for a fit. These are engine settings, not ordinary controls in the Terrain DEM panel.

06 / FILTERING ELEVATED RETURNS

Use neighbouring ground before the final fit.

The height cutoff acts on raw observations before they enter the final plane extractor.

Filter above the neighbouring-ground reference



Slope-aware ground reference

Dashed line: ground height + vertical_cutoff. High returns are excluded before final fitting.

The reference needs coherent support spread in two dimensions; a line of wires is insufficient.

Conceptual cross-section. The cutoff follows the reference slope, so it is not one fixed horizontal elevation across the recording.

Find coherent lower support

The reference searches up to four cells in each direction. Neighbouring planes are projected to the target position and grouped by height; the lowest coherent group is considered first.

At least four confident supports must agree and have two-dimensional spatial spread. A narrow line of wire returns or one isolated low return cannot establish the reference.

Filter, then refit

Where the reference is valid, observations above ground height plus vertical_cutoff are excluded from the final samples. Fine and wider planes are then fitted again.

If no local fit survives but a trustworthy reference exists, Orbis can substitute a neighbouring-ground estimate. That estimate is labelled inferred.

The filter changes the derived terrain, not the stored source cloud. Unsupported areas without a reliable neighbouring reference still require cautious review.

07 / BOUNDED RECONSTRUCTION

Bridge supported gaps. Keep unsupported areas visible.

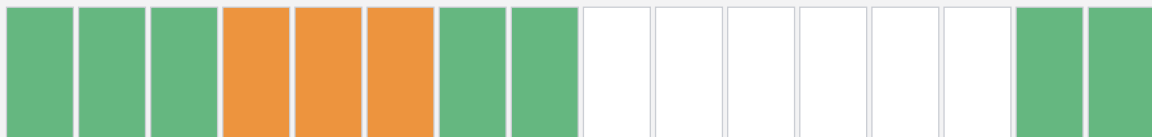
The DEM reconstructs a sparse footprint around observations rather than filling the entire bounding rectangle.

Fill supported gaps without extending the survey indefinitely

Supporting fits

Bounded gap

Unsupported larger gap



Green: local fits

Orange: estimates

White: no surface

Bridge bracketed row/column intervals up to 20 m, capped at 256 grid spacings.

At very fine spacing the cell cap reduces the allowed physical span.

Schematic. New gap nodes do not recursively extend the footprint.

Explanatory footprint diagram. White cells here mean no surface; dark openings serve that role in the native viewer screenshots.

Use bracketing observations

Missing nodes between supported observations can be filled along grid rows or columns. The maximum supported interval is 20 m, also capped at 256 grid spacings.

The interval is measured between supports. It is not an unlimited 20 m expansion beyond every survey edge.

Avoid uncontrolled growth

New gap nodes do not become new seeds that recursively enlarge the footprint. The engine also closes isolated single-node voids surrounded by the reconstructed surface.

Larger unsupported gaps and outer boundaries remain open. An opening can be an honest expression of missing support, rather than a rendering fault.

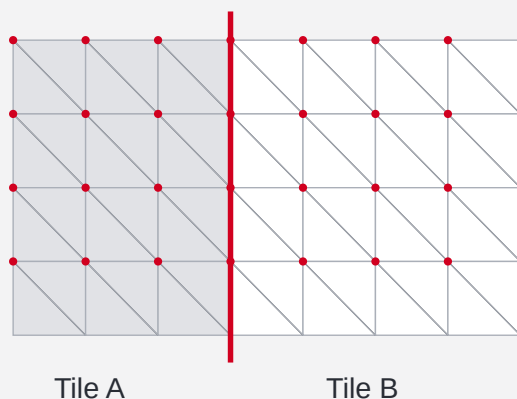
Orange terrain includes wider-neighbourhood estimates, filled gaps and materially corrected heights. It should not be read as independently surveyed ground.

08 / ONE CONTINUOUS SURFACE

Join the local fits without independent tile seams.

Orbis solves one shared height field before dividing the surface into viewing and delivery tiles.

A shared surface crosses tile boundaries consistently



Solve shared heights

Strong local fits anchor the surface.

Use weaker support for inferred nodes.

Neighbour gradients guide continuity.

Shared heights and normals avoid seams.

Schematic tile boundary; no duplicate independent solves.

Conceptual shared-vertex mesh. Local tile origins preserve rendering precision while the surface retains common world coordinates.

Anchor the surface to strong fits

Confident local observations receive stronger weights. Wider fits and explicit neighbouring-ground estimates receive weaker support. Gap-only nodes rely on their relationships to neighbouring terrain.

Use slope information between nodes

A weighted solve balances the fitted heights with local ground gradients. Observed height transitions receive different treatment from smooth neighbourhoods.

Carry the same boundary values

Adjacent mesh tiles share elevations and normals. A border halo makes their triangles meet consistently; tile edges do not come from separate terrain solutions.

Stream what is visible

The browser requests visible mesh tiles as you navigate. Local floating-point mesh coordinates sit on precise tile origins, helping retain detail in large projected coordinates.

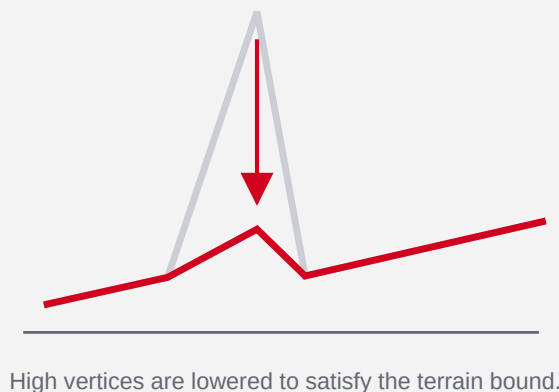
Numerical solver convergence checks the model's internal consistency. It does not establish survey accuracy or prove that the chosen lower surface is bare earth.

09 / TERRAIN CONSTRAINTS

Constrain steep artefacts. Understand the assumption.

The current DEM implementation limits the full slope of its terrain triangles to 45°.

The current terrain assumption: a maximum slope of 45°



Constrain the full triangle gradient

Check both diagonals, not just one edge.

Avoid lifting lower ground toward high objects.

Flag material corrections as inferred terrain.

Actual steeper ground can be altered by this rule.

A slope limit is a modelling assumption, not accuracy.

Schematic correction. The rule considers the two-dimensional triangle gradient and both possible grid diagonals.

Constrain the connecting surface

A nearly horizontal elevated fit can still create a very steep triangle when joined to lower ground. Checking only the fitted plane would miss that connection.

The final constraint stage lowers high vertices until the neighbouring triangle gradients satisfy the terrain bound. It does not raise lower ground toward elevated objects.

Mark material adjustments

Vertices moved by more than the fitting tolerance are marked inferred and receive reduced confidence. The Quality export records corrections and prior elevations where applicable.

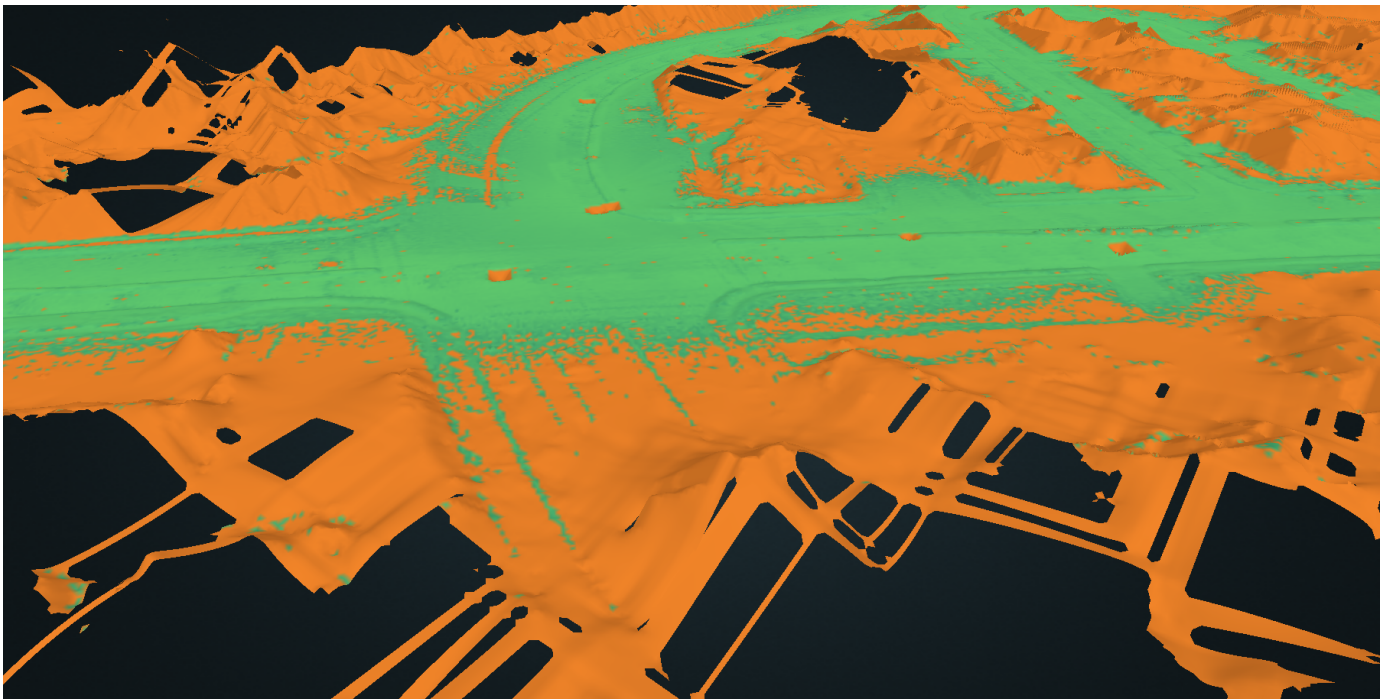
A separate check can replace isolated high tiles when surrounding, roughly flat ground supports that decision.

Actual cliffs, retaining walls and terrain steeper than 45° can be excluded or represented by constrained estimates. This assumption must suit the intended assessment.

10 / READ THE DISPLAY

Colour explains support. It is not an elevation scale.

The native terrain colours help you separate local fits from reconstructed parts of the model.



Edens Landing, terrain only. Green local fits follow the road; orange estimates and open areas show where the surface needs interpretation.

■ Local ground fits ■ Reconstructed estimates ■ Source cloud, where shown

Green • local ground fits

Green shading varies with fit confidence and the local normal. These nodes are supported by local plane fitting, with any small accepted model adjustment.

Orange • reconstructed estimates

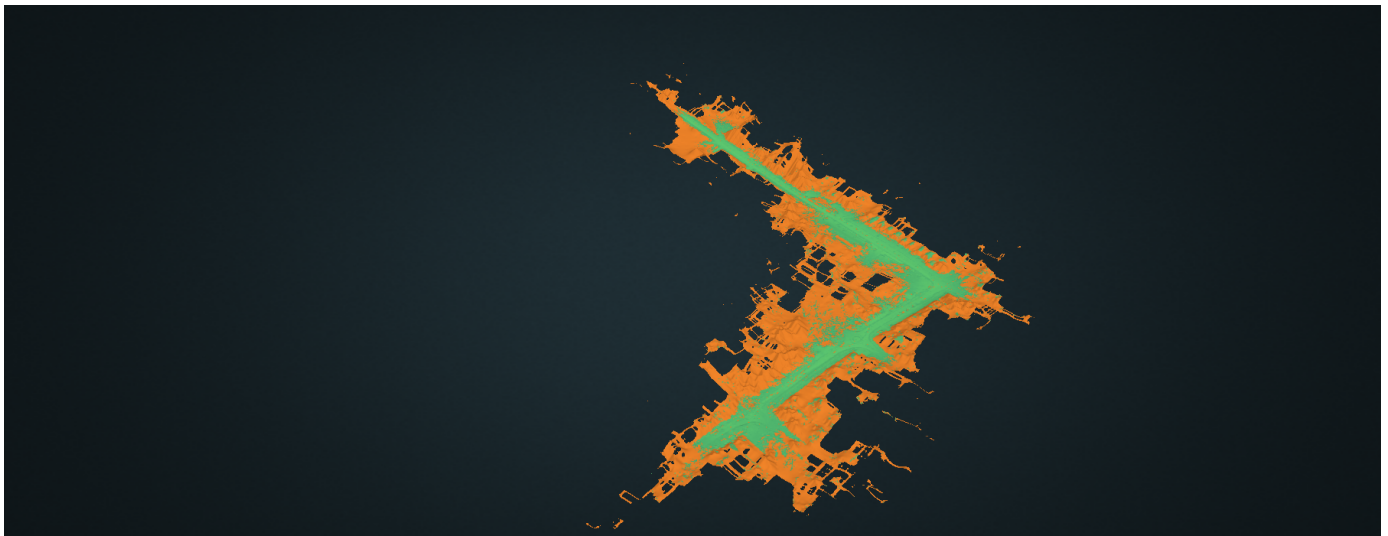
Orange includes neighbourhood reconstruction, gap filling and material constraint adjustments. The display interpolates vertex colours across triangles.

A green patch is not an accuracy certificate. An orange patch is not a clash, a cut/fill result or an automatic failure. Use the Quality CSV to investigate the underlying evidence.

11 / CASE STUDY · AVENUE

A street corridor at 1 m spacing.

2026_09_15_05_11_42Z_15th_Ave_and_2nd



Avenue terrain overview. The completed product follows the observed corridor and neighbouring supported areas.

Published product	Value
Input point count	63,514,849
Grid spacing / height cutoff	1 m / 1 m
Terrain cells / mesh triangles	119,600 / 225,135
Mesh tiles	79
High returns excluded from final fitting	34,163,872
Saved alignment / projected EPSG	Applied / 0 (unspecified)
Elevation delivery	Combined TIFF and raster tiles, plus CSV / LAS / DXF

What the example demonstrates

A compact corridor becomes a connected terrain product that can be inspected at site scale and around the junction.

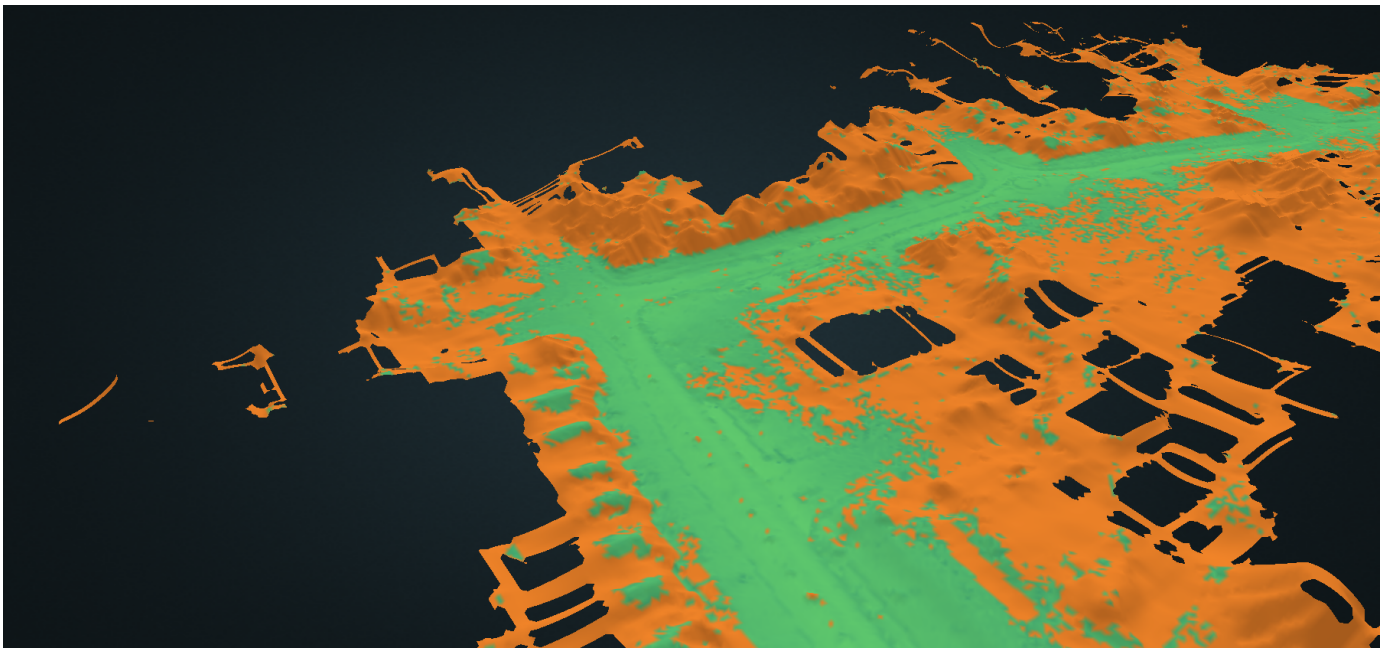
What the counts mean

The excluded-return count records observations omitted from final fitting. It is not a count of deleted source points or correctly classified objects.

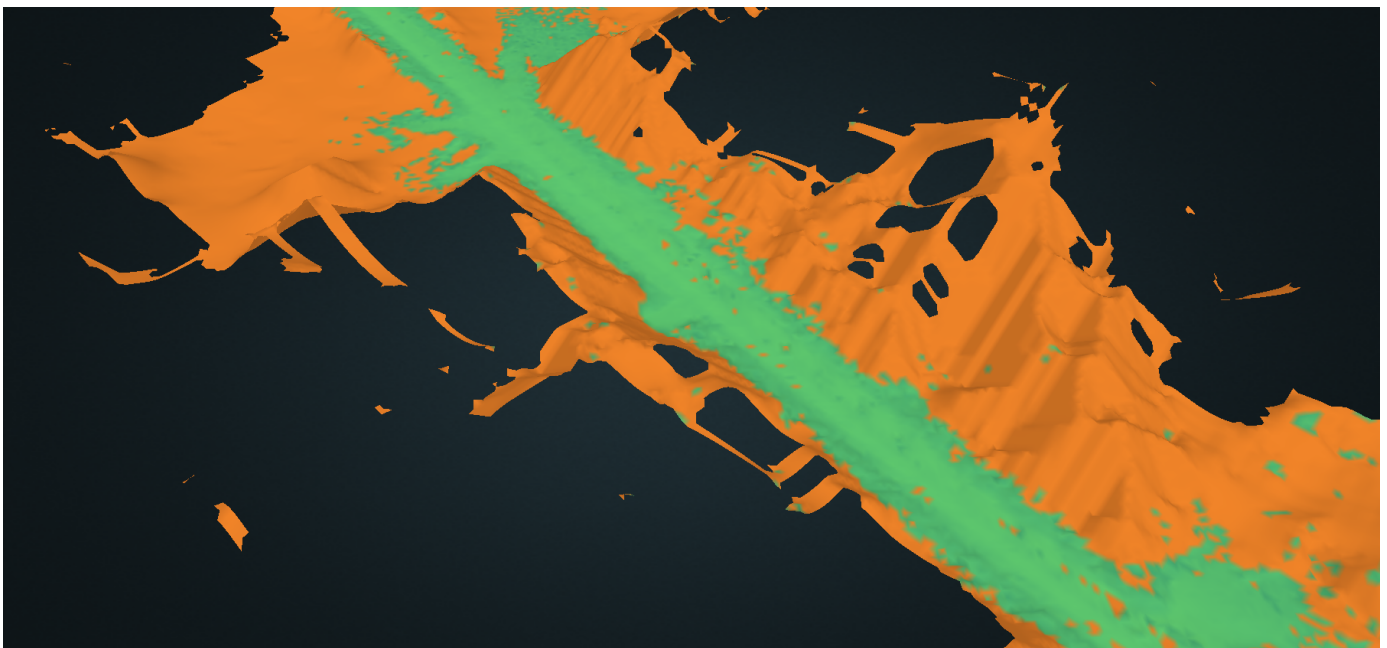
12 / CASE STUDY · AVENUE DETAIL

Change direction. Check edges and transitions.

Oblique views reveal slopes and unsupported areas that are less obvious from above.



Reverse view of the Avenue junction, with terrain shown independently of the point cloud.

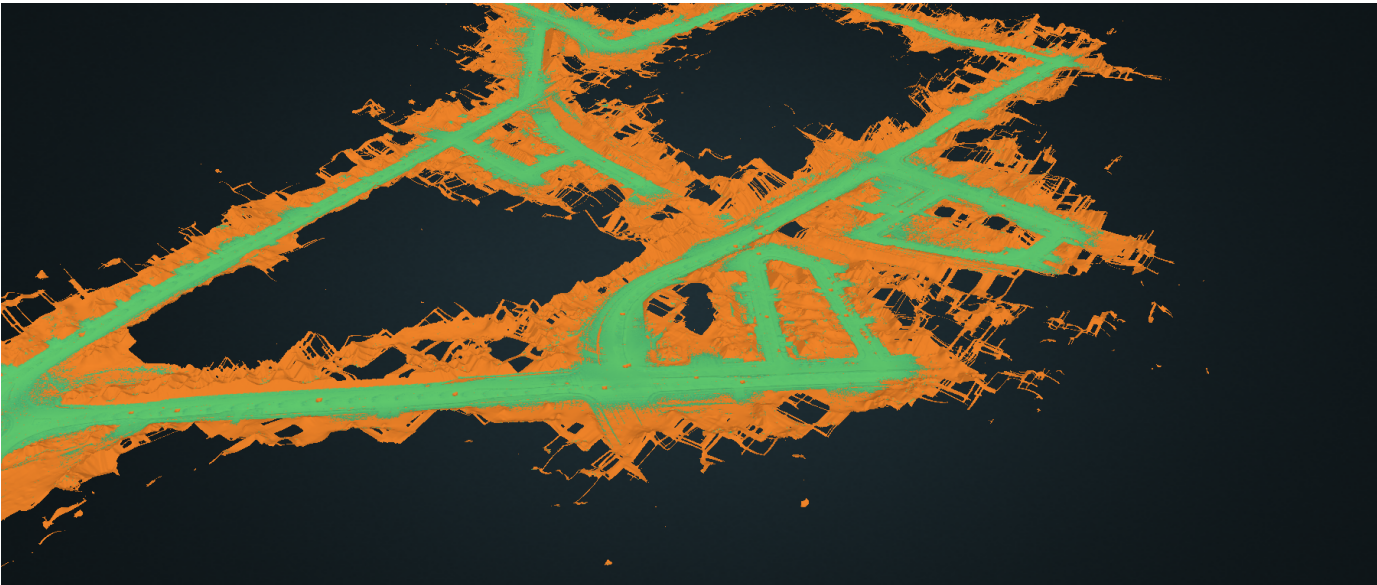


Closer corridor detail. Review the transition from supported road fits into inferred terrain and open boundaries.

13 / CASE STUDY · EDENS LANDING

A larger terrain model at 0.5 m spacing.

2026_EdensLanding



Edens Landing neighbourhood view of the completed DEM. The product can be explored as terrain alone or together with the source scan.

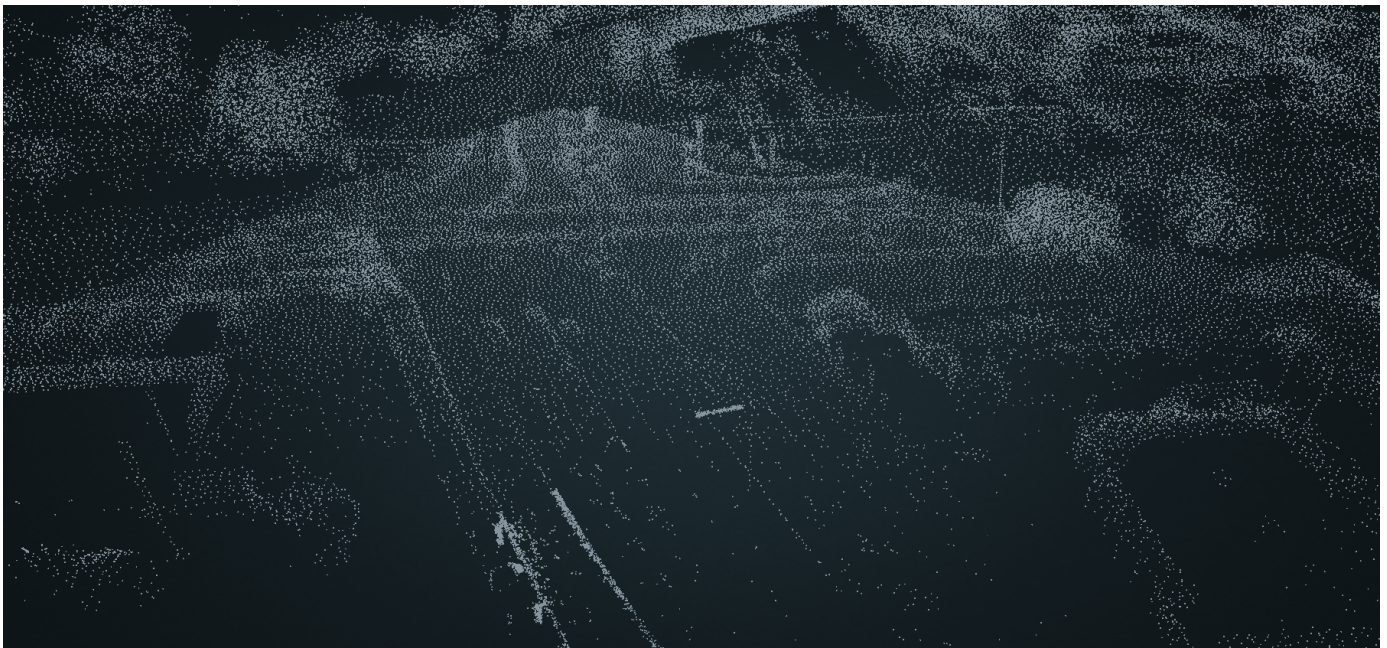
Published product	Value
Input point count	490,691,900
Grid spacing / height cutoff	0.5 m / 1 m
Terrain cells / mesh triangles	5,219,693 / 10,014,470
Mesh tiles	2,522
High returns excluded from final fitting	205,944,048
Saved alignment / projected EPSG	Applied / 0 (unspecified)
Elevation delivery	Raster tiles; combined TIFF exceeds the 25-million-pixel limit

The two examples cover different recordings and footprints. Their counts are not a controlled comparison of 1 m versus 0.5 m spacing.

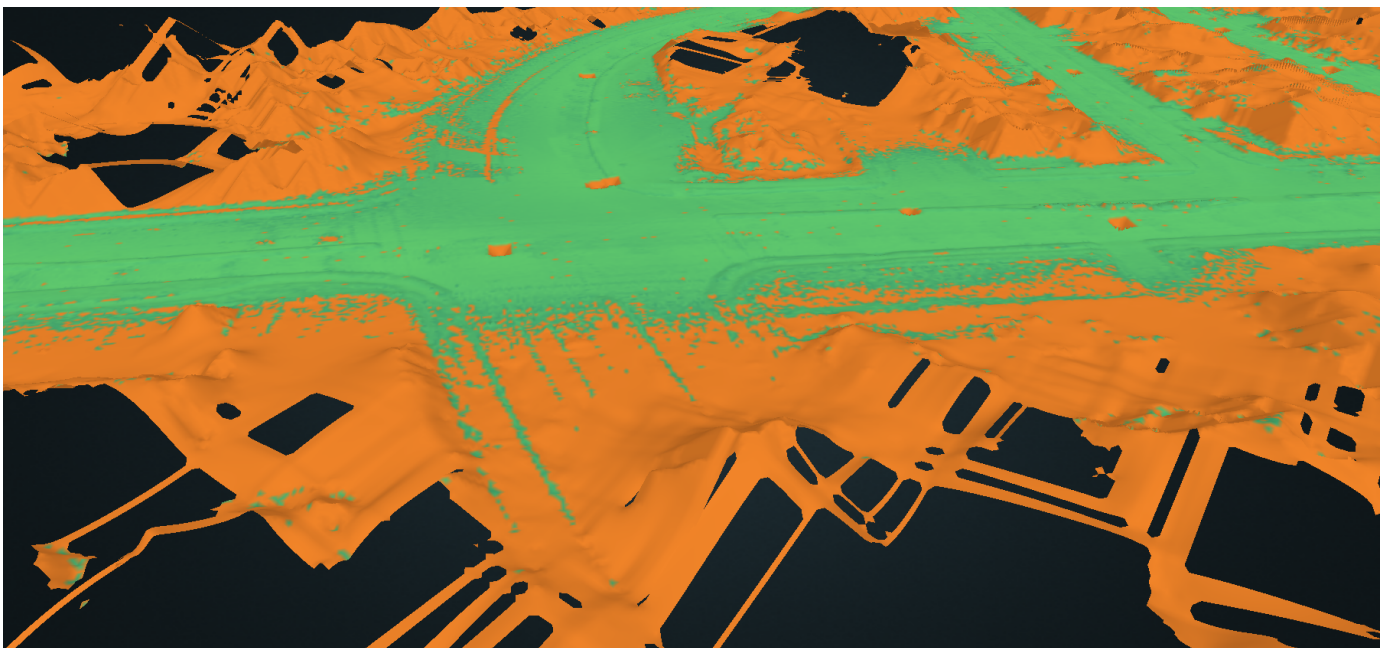
14 / CASE STUDY · MATCHED VIEWS

Keep above-ground objects separate from terrain.

The same Edens Landing camera shows the source observations and the derived surface.



Source point cloud only, rendered in grey. Above-ground returns remain visible in the original dataset.

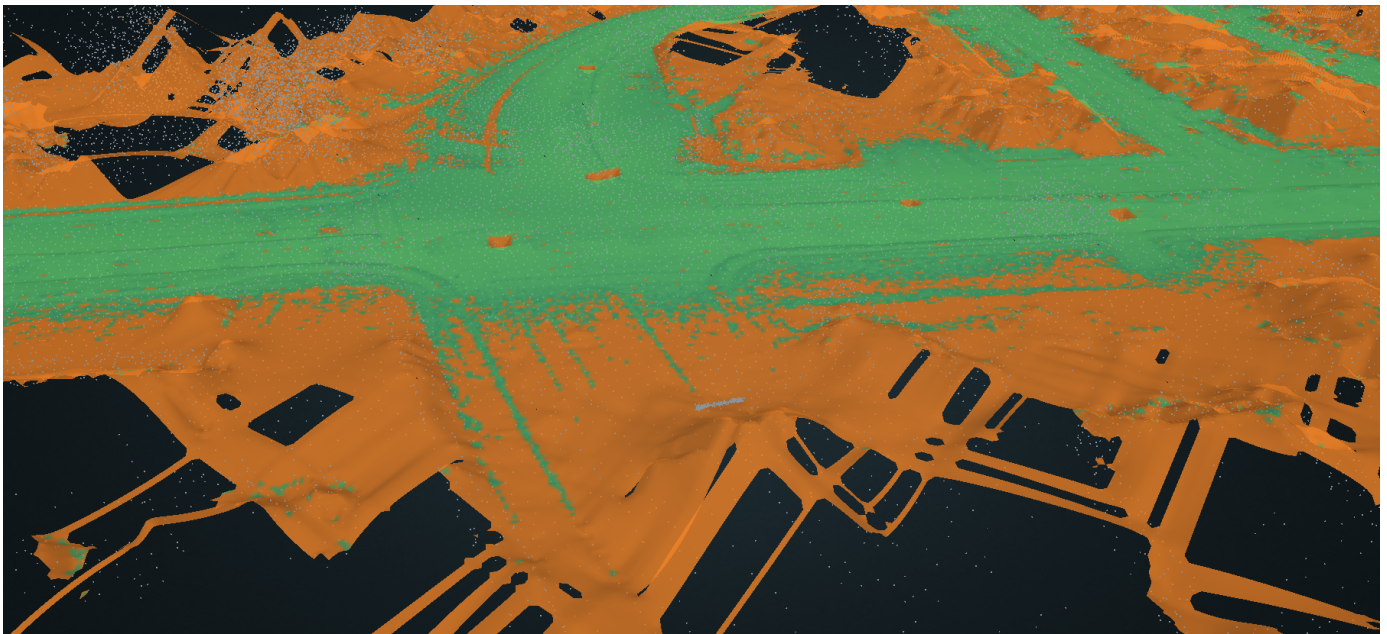


Same camera, DEM only. The model uses supported lower observations and neighbouring ground; broad objects and poorly supported areas still need review.

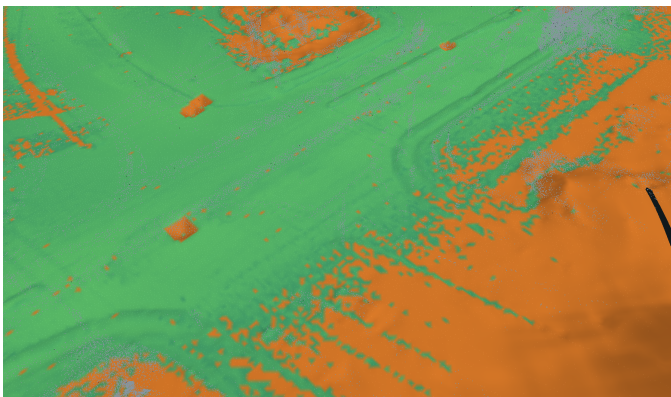
15 / REVIEW THE OVERLAY

Place the model back in the captured scene.

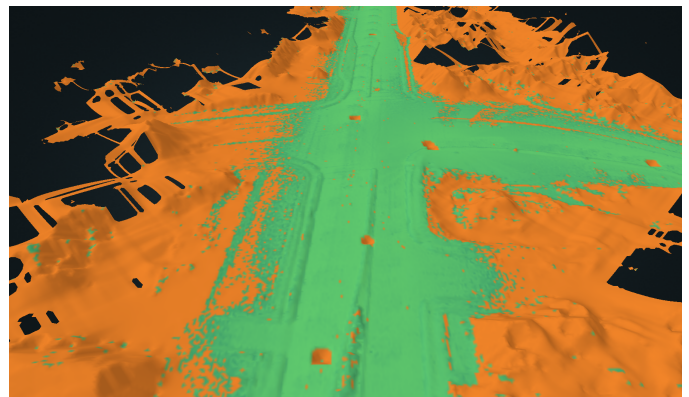
Use the point cloud to assess whether the derived terrain follows the intended ground.



Edens Landing overlay: grey source points and the native green/orange DEM, with terrain opacity reduced for comparison.



Closer oblique overlay of the same area.

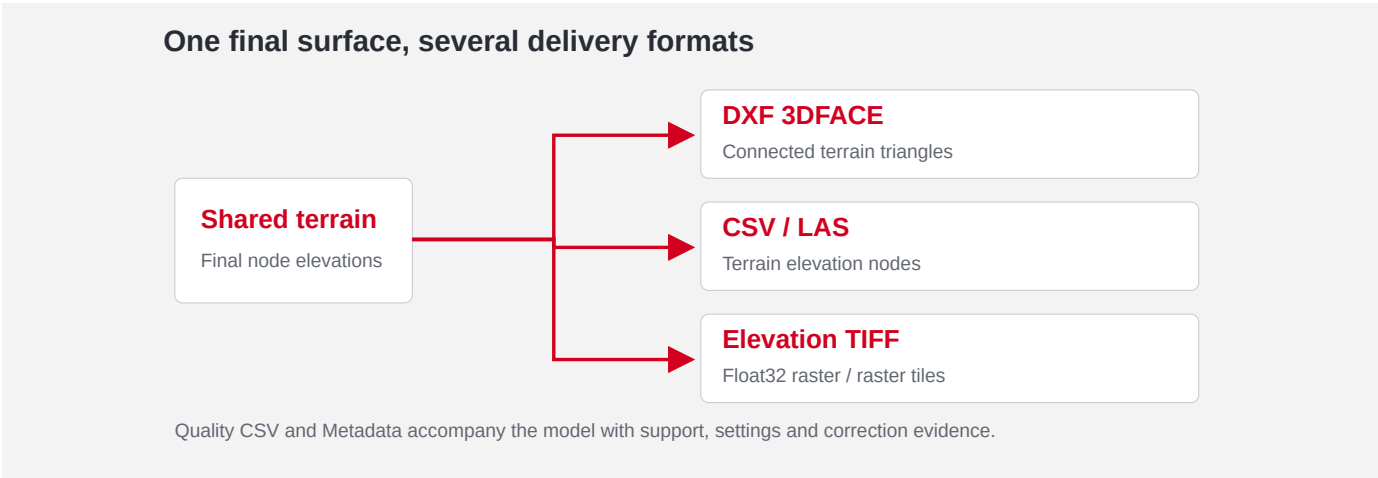


Reverse terrain view reveals a different set of edges and gaps.

Inspect several directions and scales. A plausible appearance from one viewpoint does not establish the correctness of every terrain node.

Carry one surface into CAD and GIS.

The viewer and exports use the same final node elevations, with format precision and topology appropriate to each product.



Product relationships. Downstream analysis is performed in the receiving application; it is not implied to be a separate Orbis DEM control.

Download	What it contains	Use
DXF	Connected triangles as 3DFACE entities	Bring the surface mesh into compatible CAD or civil workflows.
CSV	XYZ terrain-node coordinates	Tabular inspection, exchange or controlled import.
LAS	Derived terrain nodes	Use in point-based spatial tools; these are model nodes, not the original raw scan.
Elevation TIFF	Float32 raster with NoData	Use the combined raster when available, or tiled elevation products.
QUALITY	Node support and correction fields	Inspect confidence, residuals, inferred status and provenance.
METADATA	Bounds, settings, counts and tile/export links	Keep the product identity and locate all raster tiles.

Confirm units, horizontal reference and vertical datum in the receiving application. A file opening successfully does not prove coordinate compatibility.

17 / QUALITY EVIDENCE

Trace a height back to its support.

The Quality CSV and metadata make the reconstructed terrain reviewable beyond its display colours.

Quality field	How to interpret it
x, y, z	Final terrain-node coordinates in the output frame.
confidence / rms	Fit support score and local fitting residual. They are not independent survey accuracy measures.
source_count	Count associated with the fitted sample context; it does not describe the number of new measurements in an inferred gap.
interpolated	Identifies inferred nodes, including reconstruction and material adjustments.
support_distance_bound_m	Upper bound to supporting fit evidence along the surveyed grid relationships.
fit_adjustment_m	Change from the prior fitted height where reported. Some inferred entries leave this field blank.
fit_slope_x / fit_slope_y	Retained local fit gradients, rather than a promise that every final triangle has those slopes.
terrain_correction / prior_elevation	Correction category and previous height where applicable.

Code	Recorded correction
0	No material correction category recorded
1	Replacement measured layer
2	Neighbour reconstruction
3	Slope-constrained estimate

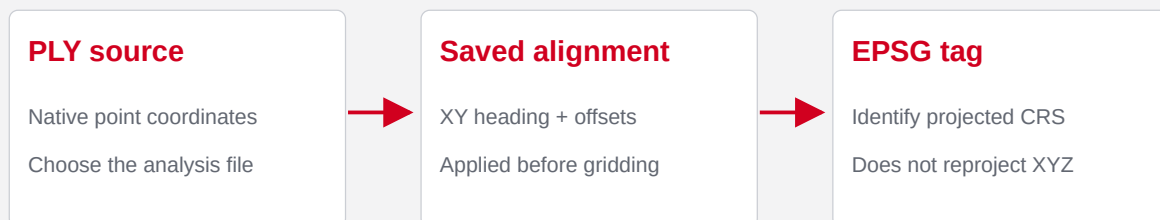
Read correction codes together with the interpolated flag. Code 0 does not imply a directly measured or unadjusted ground point. Metadata statistics describe processing stages; they are not necessarily the final green/orange display counts.

18 / COORDINATE CONTEXT

Keep alignment, projection and elevation reference together.

A coherent overlay depends on using the same spatial frame for the source and the derived model.

Coordinates need an explicit interpretation



The elevation frame must be confirmed separately. No vertical datum is inferred.

Both case products record EPSG 0: their coordinate reference remains unspecified in the manifest.

The saved alignment in the reviewed implementation applies an XY rotation and offsets. Elevations remain in the source Z frame.

Choose the matching alignment

Use the saved alignment when it is required to place the selected PLY in the recording viewer's frame. The job snapshots the source size, modification time and alignment-file hash.

Treat EPSG as identification

The EPSG setting records the intended projected coordinate reference in supported products. It does not independently georeference the scan or reproject its coordinates.

Confirm the vertical frame

The height datum and any required vertical transformation must be established separately. A horizontal CRS identifier alone does not define the elevation reference.

Read these case files correctly

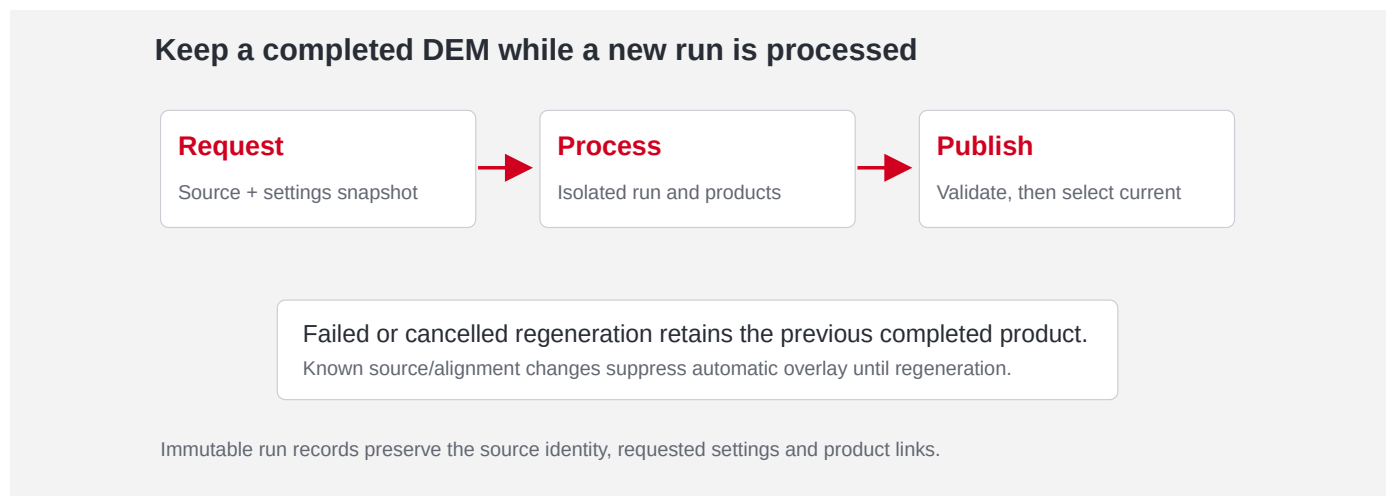
Both completed case products have EPSG 0. Their numeric coordinates and saved alignment are preserved, but the manifest does not supply a named CRS.

Do not infer survey accuracy from the number of decimal places in coordinates, exported raster precision or the numerical solver residual.

19 / SAVED PRODUCTS AND REVISIONS

Reopen the map. Retain the completed terrain.

Completed DEMs load automatically on later recording-map openings, alongside the point cloud.



Lifecycle schematic. A validated replacement becomes current only after its required products are complete.

Restore the inspection context

The panel restores the saved source, alignment, spacing and cutoff for the current product. Show terrain and Opacity remain independent of point-cloud visibility.

Follow a new run

Create DEM queues processing and shows its state and progress. Cancel stops an active request; Refresh reloads the current product state.

Preserve the previous result

Failed, cancelled or interrupted regeneration leaves the previous completed DEM selected. The status message explains the failed replacement while the older product remains available.

Detect known source changes

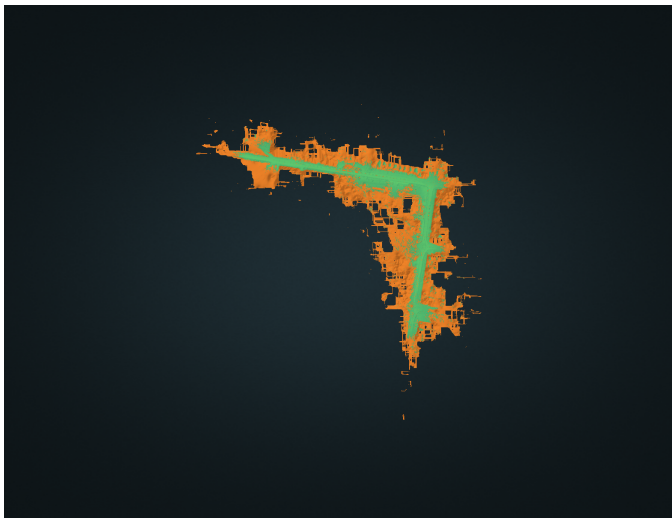
Changes to source size or modification time, or to the saved alignment hash, mark the product stale. Automatic overlay is suppressed until regeneration. This is not a full content-hash check of every source byte.

Each run retains its request and product paths. Keep those identities with an exported assessment so another reviewer knows which terrain version was used.

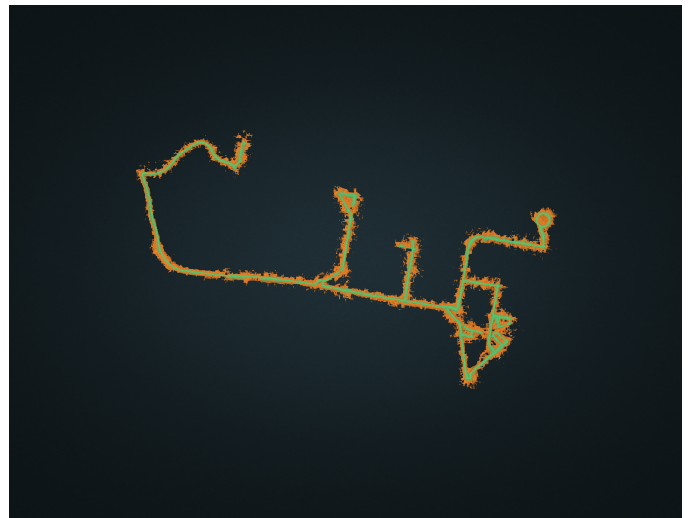
20 / LARGE SITES AND DELIVERY

Choose the right resolution. Keep the full footprint manageable.

Orbis processes the full selected recording while viewing the terrain through spatial tiles.



Avenue footprint · 1 m nodes.



Edens Landing footprint · 0.5 m nodes.

Use sparse support

The engine partitions observations on disk and stores occupied or reconstructed nodes. It does not allocate one terrain node for every empty part of the site's bounding rectangle.

The current native implementation limits the reconstructed surface to six million vertices. A very fine or large request may need coarser spacing.

Choose the appropriate raster delivery

A combined elevation TIFF is written only when its bounding rectangle is at most 25 million pixels. Larger products still provide elevation raster tiles through Metadata.

Avenue includes a combined TIFF. Edens Landing exceeds that raster limit at 0.5 m spacing, while its tiled elevations and full terrain mesh remain available.

Loading detail depends on the camera and available tiles. Wait for the visible surface to finish loading before treating a dark patch as a gap in the model.

21 / ASSESSMENT AND LIMITS

Review the terrain against the job's purpose.

The model is most useful when the observations and assumptions suit the surface you intend to assess.

Review question	Why it matters
Was the ground observed?	Vegetation, parked vehicles, water, occlusion and sparse scanning can reduce direct ground support.
Does the 45° assumption fit?	Cliffs, walls and steeper terrain may be altered or represented as estimates.
Could a broad roof remain?	A broad flat elevated surface can pass when lower neighbouring ground cannot establish a reliable reference.
Are orange regions acceptable?	Reconstruction can help continuity, but it adds modelled heights. Inspect support and correction evidence.
Are the frames compatible?	Confirm source alignment, horizontal reference, vertical datum and units before comparison or handoff.
Is the spacing appropriate?	Small features can be lost at coarse spacing. Fine spacing does not create missing survey detail.
What independent evidence exists?	Check representative locations against appropriate survey control when acceptance or accuracy must be established.

Use terrain as a reviewable input

Exports can support CAD context, GIS terrain review and further analysis in suitable downstream software.

Keep related tools distinct

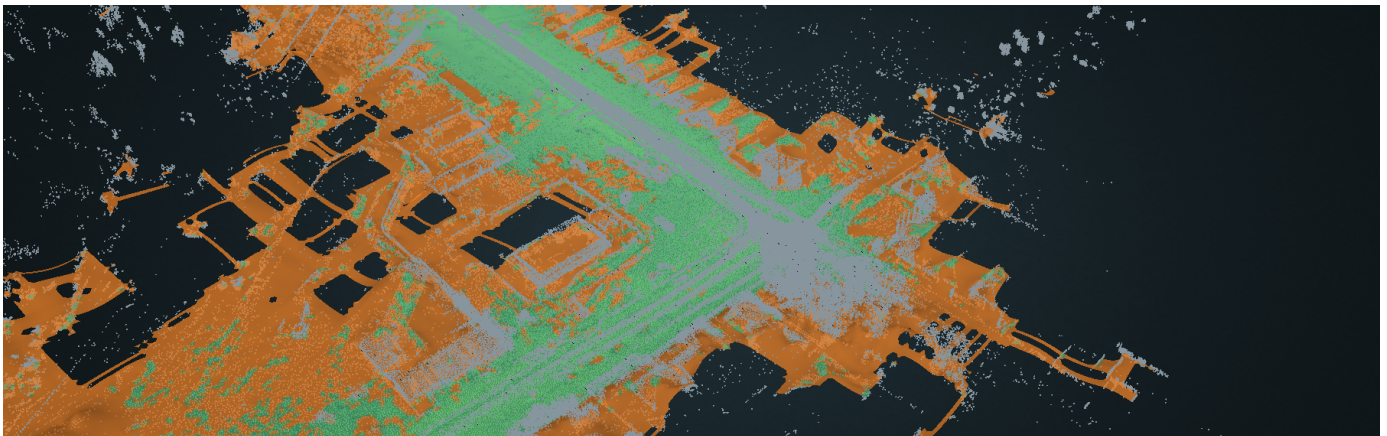
Terrain DEM does not itself calculate stockpile volume, compare two epochs or guarantee a hydrologically conditioned drainage surface. Orbis's volumetrics and grid-comparison workflows have their own settings and assumptions.

The examples illustrate completed processing and visible model behaviour. They do not provide independent absolute-accuracy certification for either recording.

22 / PUT THE DEM TO WORK

Bring the ground model and its evidence together.

A practical path from a captured site to terrain that another person can inspect and reuse.



Avenue source cloud and DEM together. Preserve views like this with the chosen source, settings and exported product identity.

Prepare

Identify the intended ground surface, source PLY, alignment and coordinate reference. Choose a spacing that fits the observations and assessment scale.

Create and inspect

Generate the full-cloud DEM. Compare terrain-only and overlay views, inspect inferred areas, and review Quality and Metadata.

Deliver with context

Export the required mesh, nodes or elevation raster tiles. Include coordinate notes, settings, run identity, supporting views and any independent checks.

Keep it repeatable

When the scan or alignment changes, generate a new terrain version and retain the evidence behind each accepted result.

Explore Orbis Terrain DEM

Discuss your terrain, capture coverage and delivery requirements with AutoMap.

sales@automap.io · 0438 753 678

automap.io/contact

Implementation review and native viewer captures: 16 September 2026. Examples use the requested Avenue and Edens Landing recordings. Green/orange are native DEM colours; source clouds are rendered grey for clarity. Diagrams are explanatory. Detailed source notes and capture records accompany this brochure.