StageCurve

Stage–area and stage–volume curves – in-browser app • Hydrogeological Repository

What it does

StageCurve derives the stage–area and stage–storage relationships of a pit, void or basin: how much surface area is inundated, and how much water is held, at every elevation. It works from the volume between two surfaces – a **floor** and a **roof** – rather than from a single terrain model, which is what lets it handle enclosed voids as well as open basins.

Typical uses are pit water rebound and dewatering targets, underground void capacity and mine flooding, dam and reservoir capacity, and tailings or pollution-control dam freeboard.

Everything runs in your browser

No installation, no account, and no upload of your data to a server. Your elevation grids are read and processed locally by the page itself and never leave your machine – which also means the size of grid you can work with is set by your own computer, not by an upload limit.

The two surfaces

Surface	What it represents	Examples
Floor	The lower bounding surface – where water collects	Pit floor, mine floor, dam basin, a liner
Roof	The upper bounding surface – where the void stops	Original topography, mine roof or hangingwall, a cap or design surface

For an open pit or a dam the roof is simply the pre-mining or natural ground surface. For an underground working it is the hangingwall, and the volume between the two is the mineable void.

What you need

Requirement	Detail
File format	One ZIP per surface, each containing an ESRI ASCII grid (.asc) and its projection file (.prj). The .asc header states the cell size, the NODATA value and the grid geometry, so none of it has to be inferred.
Coordinate system	A projected system in metres – UTM, Transverse Mercator, or a Lo. system. Grids in degrees (geographic coordinates) or in feet are rejected, because every area and volume is computed in metres. Elevations must be in metres too.
Both surfaces	Floor and roof must share the same coordinate system. The .prj of each is read and the two are checked against one another before anything is computed.

Cell size drives everything. The horizontal area each cell represents is the single most important control on the resulting volumes. A coarse grid will systematically misrepresent a steep-sided pit; check the cell size reported in step 2 before trusting the numbers.

How the volume is calculated

At each stage – a candidate water surface elevation – the app sums the volume between the two surfaces below it. Every cell fills from its floor elevation up to the stage, and stops contributing once the stage passes its roof surface. Repeating this over a range of stages produces the curve.

Pond method	When to use it
All cells below stage	The simple bathtub calculation, applied across the whole usable area. Appropriate when the surfaces cover a single basin.
Connected pool from seed	Flood-fills outward from a seed cell, so only volume hydraulically connected to the pond is counted. The right choice when the surfaces span more than one pit, void or depression – otherwise unconnected hollows are silently added to the storage. This mode also reports the spill elevation, where the pool first reaches the edge of the usable area.

How a run works

Step	What happens
1. Load Surfaces	Upload the floor and roof ZIPs. Each is drawn as soon as it loads so the data can be checked before anything is computed.
2. Grid	Cell size, extent and NODATA handling are reported, along with how the two surfaces overlap.
3. Stage Range & Pond Method	Set the elevation range and interval, and choose bathtub or connected-pool.
4. Curves	Stage–area and stage–volume plotted with elevation up the vertical axis, inundated area on the lower axis and cumulative storage on the upper – the conventional rating-curve presentation.
5. Water Level & Inundation	The floor surface rendered as terrain with flooded cells shaded, and a slider to raise and lower the pool.
6. Results Table	One row per stage, including the incremental volume gained since the previous stage and the number of cells filled.
7. Report	A standalone report: grid properties, method settings, the curve chart, the inundation map and the full stage table.
8. Export	CSV of the stage curve, and of the gridded floor and roof elevations with the void thickness between them.

Limitations worth knowing

- Volumes are only as good as the elevation data. Grid resolution, survey vintage and interpolation artefacts in the source surfaces all propagate straight into the storage figures.
- The stage interval matters most near the bottom of the pond, where the curve changes shape fastest. Check the incremental volumes in step 6 and refine the interval if they jump.
- Bathtub mode counts every depression below the stage, connected or not. Where the surfaces cover several workings, use connected-pool mode or the storage will be overstated.
- The calculation is purely geometric. It takes no account of porosity, backfill, rock storage, inflow or evaporation – it reports the void, not the water balance.

Beta. StageCurve is published for evaluation and feedback. Check any figure you rely on against an independent calculation before using it in a design.