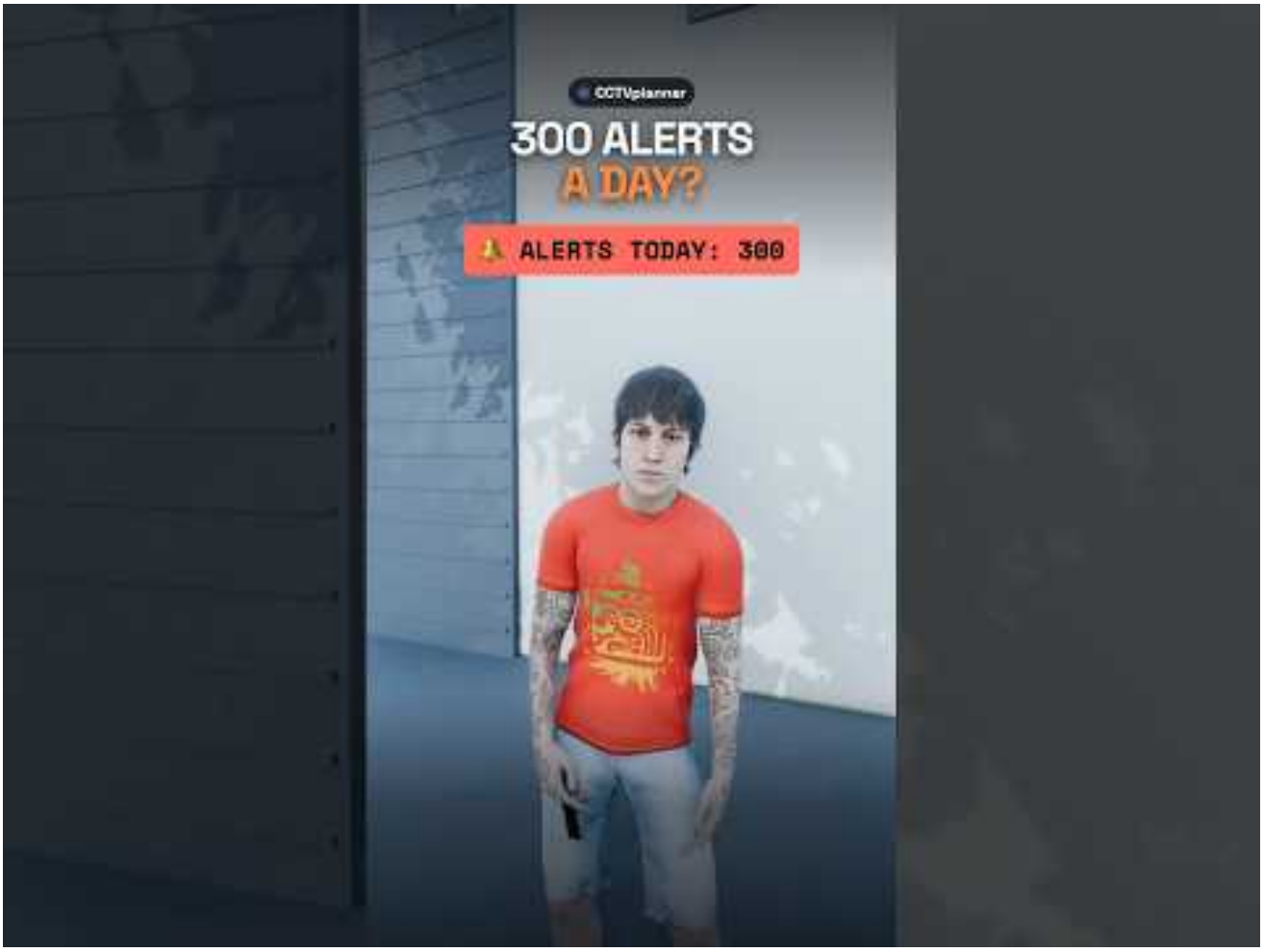
Why satellite map camera placement matters for CCTV design

When I first started designing CCTV systems, I spent most of my time on site, pacing out distances and guessing where shadows would fall. That method works for a single camera on a single wall. But once you scale up to a warehouse, a school campus, or a retail park, you need a different kind of view. You need a satellite map camera placement strategy that lets you plan coverage before you climb a ladder.

Satellite imagery provides a literal bird's-eye perspective that ground surveys cannot match. By dropping virtual cameras onto a high-resolution map, you can see overlaps, gaps, and blind spots long before any cable is run. The challenge is knowing which tools to use, what the limitations are, and how to translate pixel coordinates into real-world positions. Let me walk through the practical side of this approach.



The role of satellite imagery providers

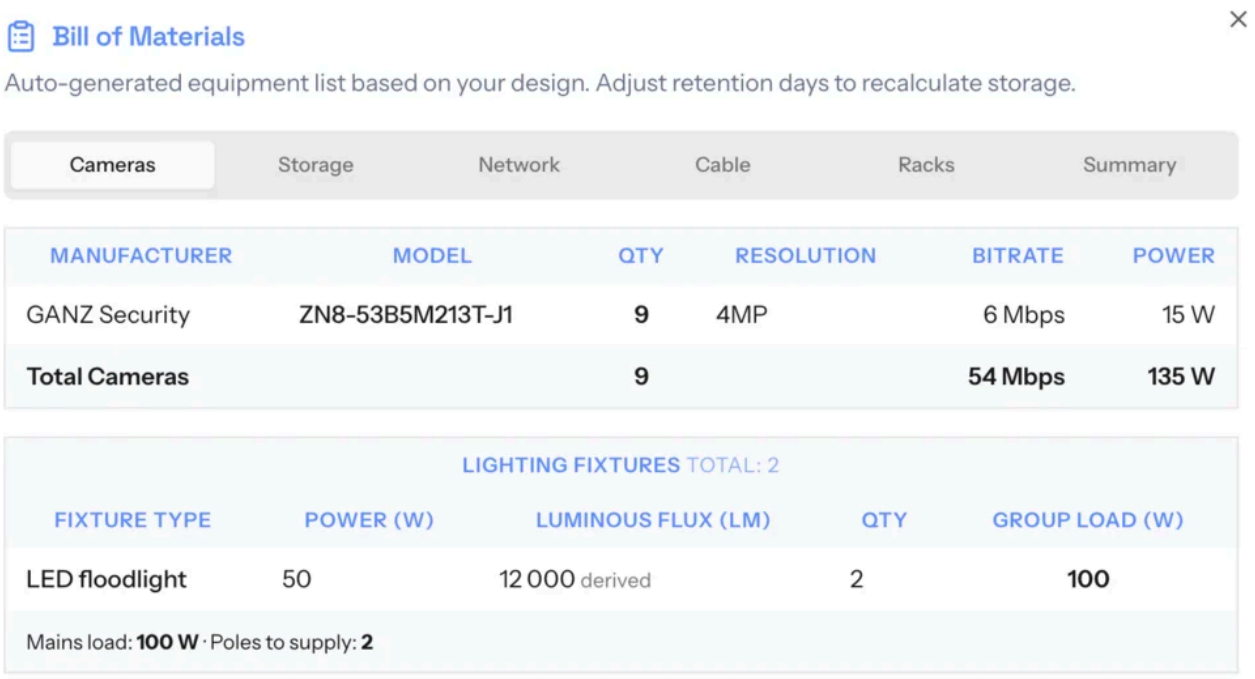
Not all satellite maps are equal. The most common source for general planning is Google Maps, which offers a seamless global mosaic of aerial and satellite views. Its imagery is generally recent enough for most commercial projects, though it varies by region. OpenStreetMap provides the underlying road and building data for many planning tools, while Bing Maps and its satellite layer remain a solid alternative when Google data is outdated or restricted.

For higher accuracy, you might look at imagery from Maxar, one of the leading satellite imagery providers. Their Earth observation satellites capture sub-meter resolution that you can use to identify parking lot markings, roof vents, and even the direction of door swings. That level of detail matters when you are trying to place a camera to read a license plate at the far end of a lot. The trade-off is cost and freshness: Maxar data is not free, and its refresh cycles can be longer than Google's.

On the open-source side, QGIS paired with the QuickMapServices plugin gives you access to multiple tile sources in one interface. ArcGIS offers similar capabilities with its own basemaps and analytical tools. The choice of satellite imagery provider often depends on your budget and the geographic region you are covering.

Map scale and camera FOV

One of the first mistakes I made was assuming the map scale matched the real world perfectly. It does not. Every digital map introduces some distortion, especially when you zoom in. A satellite map camera placement that looks correct at zoom level 18 might be off by several meters at zoom level 20. That is where GIS coordinates become your friend.



By using latitude and longitude pairs from a map overlay, you can place virtual cameras with reasonable accuracy. Most planning tools, including CCTVplanner, let you drop markers on the map and assign a camera FOV to each one. The FOV is represented as a wedge that shows the camera's horizontal angle and suggested range. You can rotate the wedge, adjust the tilt, and see how it interacts with buildings and terrain.

The catch is that satellite imagery is taken from directly overhead, while your camera will be mounted at eye level or higher. This difference creates what surveyors call parallax error. A tree canopy or a roof overhang that looks small from above can block half your view from the ground. That is why a good satellite map camera placement must be combined with a site walk or at least a careful review of street-level photos.

Ground control points and geotagging

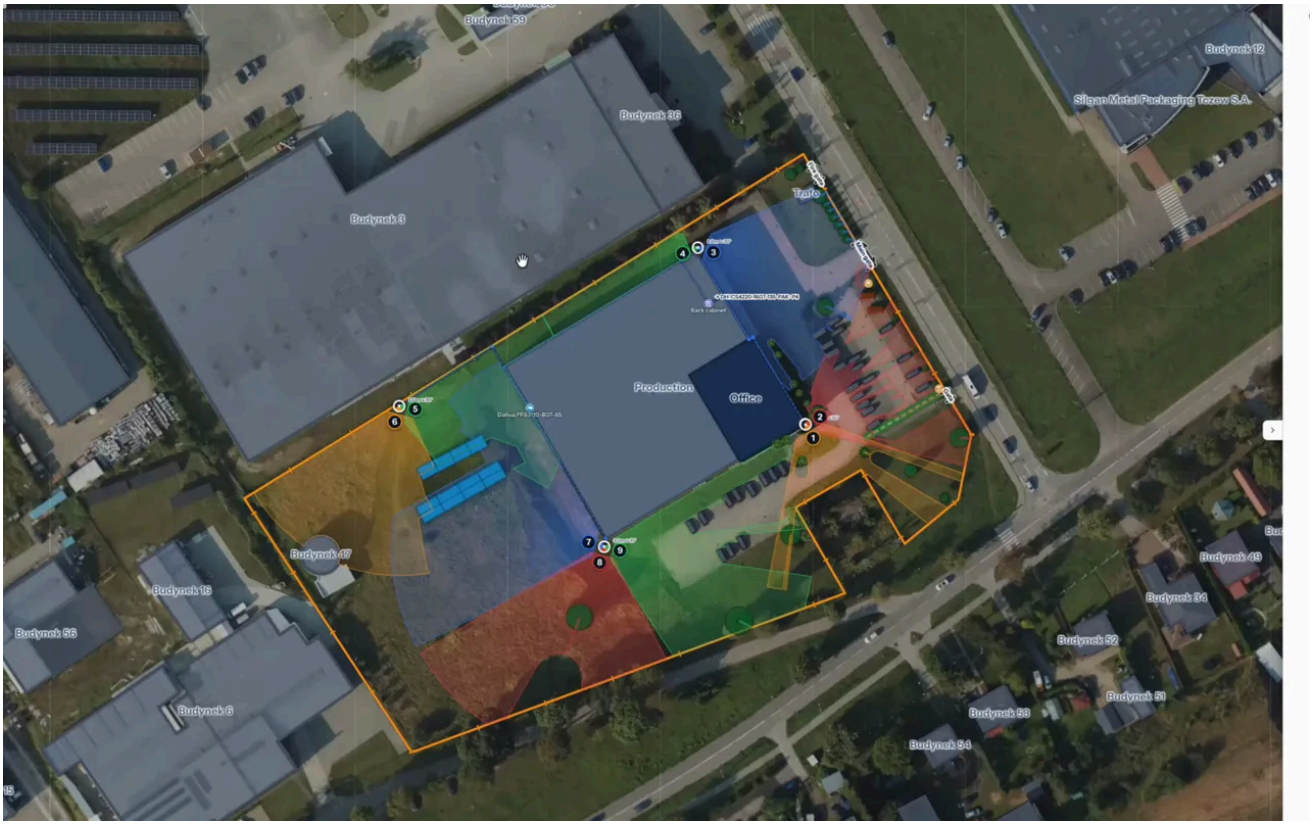
To improve accuracy, you can use ground control points. These are physical features with known coordinates that you measure on site with a GPS device. You then align the satellite image to those points in software like QGIS or ArcGIS. This process, called georeferencing, corrects for the shift between the image and the real world. It is more work, but it pays off when you are covering a large area with many cameras.

Geotagging your camera positions also helps during installation. If you export the GIS coordinates from your planning tool, the installer can use a handheld GPS or a smartphone map app to find each mounting point. That saves time and reduces the chance of a camera ending up behind a structural column that was not visible on the satellite view.

Resolution bandwidth and what you can actually see

Satellite images are static, but camera feeds are live. One common disconnect is that planners assume the resolution of the satellite image matches the resolution of the camera feed. It does not. Satellite imagery has its own resolution bandwidth limits. A typical free tile from Google Maps might have a ground sample distance of 15 to 30 centimeters per pixel in urban areas. That is enough to see a car, but not to read a license plate.

When you are planning a system that needs to identify individuals or vehicles, you need to account for the camera's own resolution and lens selection. The satellite map is only a reference for placement, not a substitute for a proper lens calculator. A camera with a 2.8mm lens might cover a wide area on the map, but its ability to resolve a face at 20 meters is very different from a 12mm lens. The FOV wedge on your map overlay should be paired with a distance-to-resolution table for each camera model you plan to use.



Photogrammetry and measuring from images

If you want to get more technical, photogrammetry lets you take measurements directly from overlapping satellite or aerial images. By knowing the altitude of the satellite and the geometry of the sensor, you can calculate the height of a building or the width of a driveway. This data feeds directly into your camera placement decisions. For example, if you know a loading dock is exactly 12 meters wide, you can choose a camera with a FOV that covers it without overshooting into the street.

Most planning tools do not offer built-in photogrammetry. But you can use QGIS or ArcGIS to measure distances and areas on the satellite image, then export those measurements to your CCTV design software. The key is to remember that the map scale changes with zoom level, so always check the scale bar before you take a measurement.

Practical workflow for satellite map camera placement

Here is a simple workflow I have used on several projects:

- Choose a satellite imagery provider that offers recent, high-resolution tiles for your site. Maxar or Google Maps are good starting points.
- Import the imagery into a planning tool that supports map overlays and GIS coordinates. CCTVplanner works directly in the browser with Google Maps and

OpenStreetMap layers.

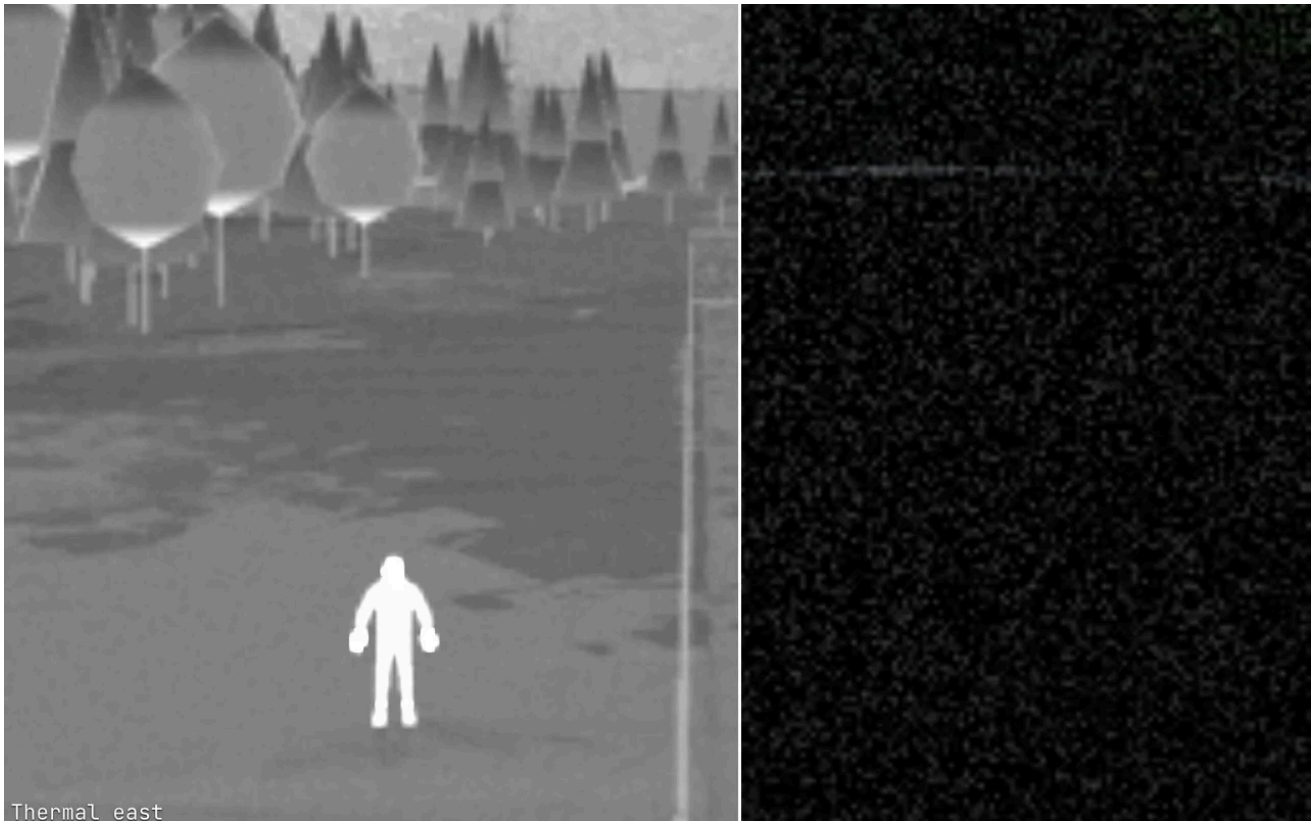
- Place virtual cameras on the map, adjusting each camera FOV to match the lens and mounting height you plan to use.
- Check for overlaps and gaps. A coverage map that shows 100 percent coverage on the satellite view may still have blind spots caused by walls or signs that are not visible from above.
- Export the coordinates and a visual report for the installation team. Include notes on any parallax error you identified.

This process is not perfect, but it is far better than guessing. I have seen teams save days of on-site survey time by doing the initial layout on satellite imagery first.

The limits of GPS accuracy

Even with a perfect satellite image, your physical camera position will never be exactly where you clicked on the screen. Consumer GPS accuracy is typically within 3 to 5 meters under open sky. Near tall buildings or under trees, that error can grow to 10 meters or more. If you are placing cameras to cover a specific door or a narrow alley, that margin matters.

To mitigate this, use a combination of GPS and tape measurements. Mark the proposed mounting point on the satellite map, then verify it on site with a measuring wheel or laser distance meter. Update the GIS coordinates after the physical check. This feedback loop improves your satellite map camera placement over time, especially if you work on the same types of sites repeatedly.



Bringing it all together

A satellite map camera placement is not a substitute for a site survey. But it is a powerful starting point that saves time, reduces travel costs, and helps you communicate your plan to clients and installers. The key is to understand the strengths and weaknesses of each element: the satellite imagery provider, the map scale, the camera FOV, and the real-world GPS accuracy. When you treat the map as a planning tool rather than a perfect replica, you get better results.

For anyone designing CCTV systems today, learning to use satellite maps effectively is no longer optional. It is a core skill that separates amateur layouts from professional coverage plans.