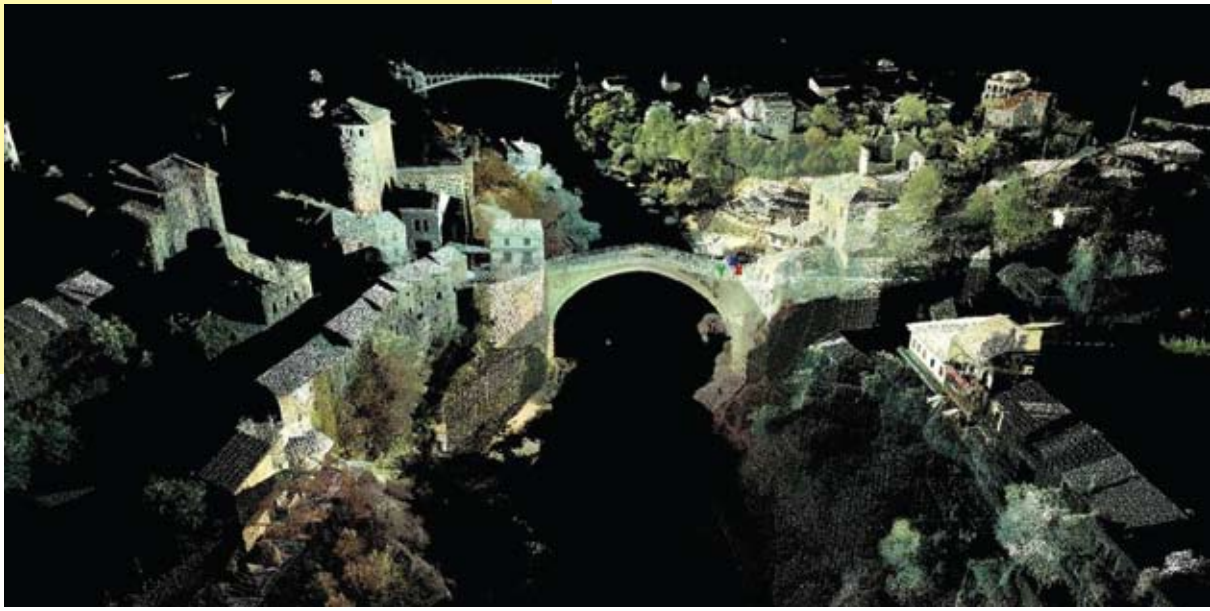
# The Context Benefit

We've all heard someone talk about using words out of context; words spoken out of context can be interpreted very differently than in their original context. I think the same case can be made for visual and geospatial information. A person's interpretation of images and geospatial information considered out of context may be different than if that same person saw those same images in their full context.

I didn't fully appreciate this fact (and the corollary "context" benefits of laser scanning) until I had the good fortune to visit the thousands-of-years-old Stonehenge site in England a few years ago.



Laser scanning can add valuable context for surveys, such as this one of a historic city center area with a river flowing through it—*courtesy of BIMTAS.*

Pictures of Stonehenge feature its unusual stone pillars and massive, straight arch stones arranged in concentric circles within an area roughly the size of a baseball diamond. Like many visitors, I was struck by the stones and their placement and wondered how the heck people ever erected them there so long ago. But what took my appreciation of the site to the next level was the site's location within its surrounding, open terrain.

Looking outward from the Stonehenge site, one can see a vast panorama, as the site sits atop one of the highest elevations in the very gently rolling terrain. There are no trees at Stonehenge or nearby. Only a few small, distant clusters of relatively short trees are visible in the surrounding terrain. Within this panorama, one can also see several gently rounded and grassy mounds (approximately 20' high and 75' in diameter), sprinkled circumferentially within a ½ mile or so of the Stonehenge site.

I didn't know these barely noticeable mounds were actually ancient burial mounds until a guide told me so; originally I thought they were part of the natural terrain. Seeing them and understanding what they were gave me a whole new appreciation of the heritage site. That's when I fully understood the concept and importance of visual context. That's also when it dawned on me why I'd heard some laser scanning users excitedly refer to "added context" when they talked about various laser scanning projects.

Fast forward from Stonehenge to the year 2010. I think the growing popularity of applications such as Google Earth is evidence of today's increasing appreciation of visual, geospatial context. The ability to zoom in to a specific area of interest starting from far away, or conversely zoom out, often provides valuable context for one's understanding of an area.

By capturing 3D building details, all overhead lines, and tree details, a high-definition survey can provide helpful context to supplement traditional 2D drawings for planning proposals—*courtesy of MJ Engineering and Land Surveying.*

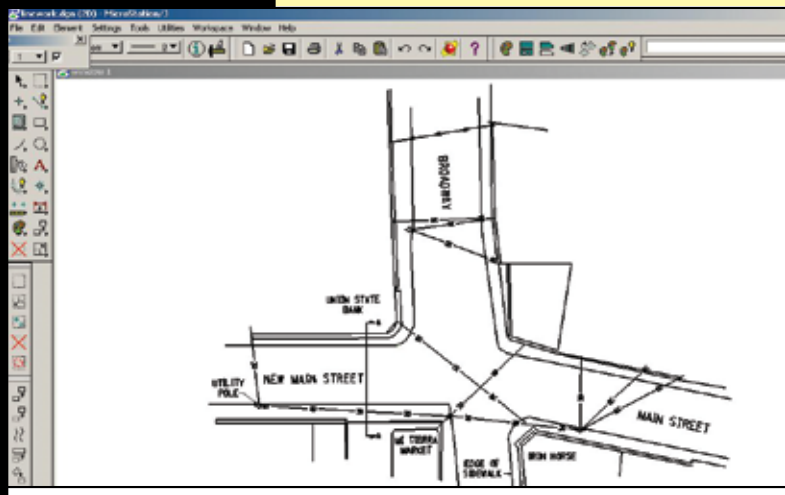
## Laser Scanning Provides Added Context

Traditional surveying focuses on collecting coordinates and features of very specific points. In contrast, a laser scanner quickly sprays the scene/site around it with a dense array of what are basically reflectorless total station laser shots.

Unless the scanner operator has activated a maximum distance filter for a scan, the scanner will automatically collect and record *all* reflectorless shots that have enough laser return energy to be picked up by the scanner. For many scanners used for surveying, this can easily be out to 900 ft (~300m) or even farther from each scanner setup position. Often, returns for this type of maximum laser return distances are from vertical surfaces, such as buildings, fences, vegetation, or vertical rock faces.

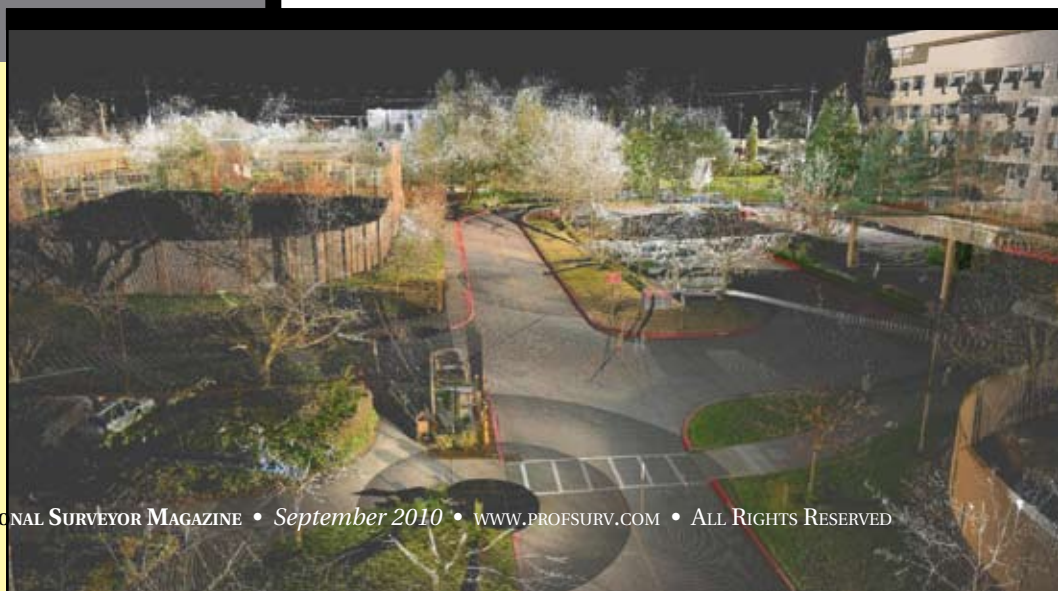
A scanner operator can restrict the horizontal and vertical field-of-view of a particular scan, but even for a restricted field-of-view scan, many extra shots are often collected farther away from the area of specific interest and between areas of specific survey interest.

Points captured past the specific area of interest and in between all form part of a full, high-definition survey data set. Although these extra points are often ignored or temporarily removed when creating specific survey deliverables requested by a client, it turns out that these extra points can also provide valuable added context, for the client and for the service provider. These added context points come "free" with a high-definition survey.




## Advantages Over Photos

Of course, you can also simply take photos of a site and its surroundings to help provide added visual context for a survey. This is a routine practice. However, single photos have a limited field of view (typically 40°x30°), don't contain geometry, and are inherently flat, 2D images. A photo's representation of a scene is restricted to the camera's specific viewpoint from a single perspective. This constraint on a single perspective per photo is one of the main reasons why field staff often take many photos at a project site, i.e. to provide additional perspectives and visual detail of the site.



**Right**
True-color laser scans such as this are used by construction site planners and subcontractors to aid in site coordination activities—*courtesy of Hoffman Construction.*

In contrast to single photos, laser scans can be viewed in full 360° panoramic mode as seen from the scanner setup location. They can also be viewed in full 3D mode. In 3D mode, you can literally select *any point of view* that you like of the rich set of 3D scan points. You can, for example, select points of view of a scanned site where you could not physically place a camera, such as viewing a site/structure from below the ground surface or from aerial/oblique perspectives.

You can even drape photos directly over point clouds, so users gain the advantages of a photographic image plus panoramic and 3D viewing all in one.

## Benefits

The added context that high-definition surveys offer can be especially beneficial in certain situations, such as visual impact assessments and planning proposals, including presentations at public review meetings.

In these situations, high-definition survey details of trees, bushes, overhead wires, etc. can provide valuable added context for understanding proposed site development plans. 3D viewing tools in software also let people answer the all-important question, "What can I see from this point?" With a high-definition survey, people can see the exact shape of trees and other subtle elements not typically shown in standard survey maps. A high-definition survey, with all of its added context, can give people a better feel for a site planning proposal.

Added context is also valuable for better understanding heritage sites and structures, as the visual and geospatial aspects of many elements of such sites often add significantly to an appreciation of the site.

Laser scanning can provide users with an added benefit of context for a specific survey project. This context benefit can help users who are processing scan data into the requested deliverables. It can also help clients better understand the context of the surrounding environment of the surveyed site or structure. This context benefit comes free with scanning because the collection of extra scene information is inherent in the way a scanner works.

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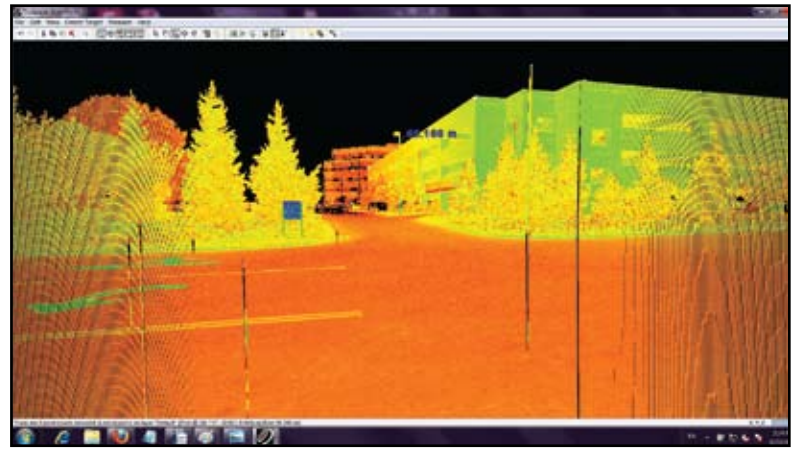

**Above**
The panoramic image on the top is a false-colored point cloud, showing only actual scan data. The true color scan image on the bottom includes the same scan data, but with true colors applied to the scan points plus digital imagery of the sky and objects past the range of the scanner. Notice the distance measurement made from the scan points.