



# Q&A SYDNEY



**Q1: Did you know that without a surveyor, cities wouldn't be built? Can you spot all the surveyors in Sydney?**

**A:** Altogether, there are fifteen surveyors working hard in this scene. You can usually spot them by their hi-vis vests, which they wear to keep safe while they're on site, as well as the various pieces of technology they're using. See if you can spot a few of the surveyors' favourite devices: the scanners on tripods, radar tech fitted to boats, and imaging drones being piloted across the city!

Surveyors are involved in urban development in so many ways. They work on the planning and construction of everything from roads and transport tunnels to shopping centres and skyscrapers! And it's not just buildings and transport links - surveyors are relied upon to help with communication and power networks, too. In short, a city like Sydney just wouldn't work without surveyors!

**Q2: There are 3 different types of survey targets around the city. What do you think they are used for and can you find them all?**

**A:** These are tough to spot - if you managed to find all three, high-five yourself! There's one on the underground station: the black and white circle just above the end of the red pipe, being used by Cubey and his laser scanner to make a 3D model of the platform.

There's also a red and white target on the side of the river, just by the water-skiing Riegl bear.

These targets are used by hydrographers when they survey the river. There are two more red and black targets on the top of two buildings in the background: the clock tower on the left, and the office building on the far right. These are used by surveyors to monitor the buildings for any changes in their position.



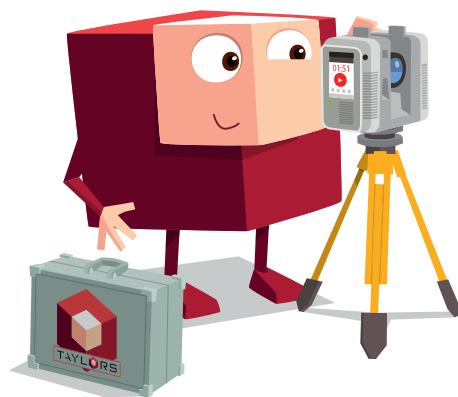
**Q3: Can you spot Henry on the zebra crossing with his Leica BLK2GO scanner? Did you know that the BLK2GO follows a user's path while scanning and it always knows where it is and where it has been in space?**

**A:** This nifty scanner uses something called SLAM technology, which stands for Simultaneous Localization and Mapping. It was born in factories, where robotics engineers needed to help autonomous vehicles find their way around without bumping into walls, people, or each other! They couldn't rely on satellite data as they were indoors, so instead they created a system that used sensors to build a picture of the surrounding environment, and work out the position of the device within that environment.

The sensors they use utilise visual data (such as camera imagery), non-visible data sources (such as Sonar, Radar, or LiDAR), and movement-sensing data to compute a 'best estimate' of where the device is within its environment. A clever algorithm (a set of digital instructions) then continually analyses the data to improve the accuracy of the positioning result.



**Q4: Surveyors use laser scanners to make 3D models of buildings, bridges, tunnels and roads you name it. Can you spot Cubey in the underground using a laser scanner?**



**A:** Cubey is using his laser scanner to scan the underground platform. Once he's collected all the data he needs, he will go back to the office, take the memory stick out of the scanner and pop it into his computer. He will be able to bring up a 3D model of the data he has collected, showing everything he scanned. At first, it will look like a join the dot picture of the underground, but what's cool about a laser scanner is that it doesn't just take millions of measurements, but it also has a camera inside that overlays photographs over

the measured points. This makes it super useful to help people see the area scanned, and take measurements from it where needed.

The collected data can also be used in designing content for the surveyors working to help position a new staircase on the platform using their mixed-reality VR glasses - which sound like something out of a sci-fi comic - perhaps like the one the two travellers on the nearby bench are reading!

**Q5: Hydrographic surveyors use GNSS, sonar and LiDAR technology in their work to locate features above and below water. Can you find the TWO teams performing hydrographic surveys?**

**A:** There are two boats travelling down the river. The one on the right has a laser scanner, which makes this boat a mobile mapper. Like Cubey in the underground, the data it collects will be used to create a 3D model of the river and its banks - the difference being that it is able to do this while it moves along. The data it collects is important

in helping to maintain the waterway and make sure that no potentially dangerous changes are occurring along the riverbanks.

The other boat has a sonar scanner attached - its sensors sit below the surface of the water, recording the bounce-back time of radio waves and

using them to work out distances. When combined, this data can be used to create a picture of what's happening below the surface of the river - including the varying depths, shapes and movements of the riverbed.



**Q6: Did you know surveyors use high-tech equipment to keep an eye on buildings in cities so that they don't collapse? This is called Monitoring. Can you spot the equipment used for it? (Clue: Look on the top of the buildings)**

**A:** To the right of the Australian flag, on top of the turquoise building, there is a total station inside a special cage (to deter any would-be thieves!). This device works all day, every day, gathering data on the surrounding buildings, roads and other structures. Surveyors will check this data

regularly to see if there are any movements, cracks or potential hazards appearing in the scanned environment. This way, we can keep a close eye on our cities, and keep their residents and buildings safe.



**Q7: Did you know surveying is one of the few professions that allow you to fly Drones in the city? Can you spot the different ones in Sydney?**

**A:** There are three drones: the LiDAR USA drone, which has a laser scanner attached to it, making a 3D model of the city below; the black and white drone on the right, and Dr Karen Joyce operating Dronie by the BBQ. These last two drones are used for photogrammetry - the process of taking measurements from photographs.

The pilots of drones stay on the ground, controlling the vehicle via remote. This comes in handy when surveyors want to explore an area which is hard to access, maybe because it is densely populated and busy - like Sydney - or maybe because it could be dangerous - like mountains and volcanoes, glaciers and deserts, or anywhere else where a normal person might not want to venture!