

## Advanced scanning technologies for documentation of plant operations.

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TAFE SA inaugurated the Virtual Learning Environments Project to explore technologically driven potential methods for enhancing the practical learning outcomes for its students. While this project was initially contained to the Air-Conditioning and Refrigeration programme, the shutdowns and disruptions associated with Covid 19 provided a need for many of the systems and processes associated with the Project.

Among these was the use of a commercial grade scanner to develop Virtual Field Trips, which have since been used by, among others, TAFE SA's Water Operations team to document and acclimatise students to the various working plant rooms and other areas that would normally have been demonstrated via a class visit or other boots-on-the-ground experience.

With access to a relatively cheap scanning kit and minimal training, TAFE SA Water Operations staff are now documenting remote workspaces with minimal assistance from technology experts or other supports. While the potential for information sharing between workers and agencies are only in the infancy of being explored, this work has already been commercialised via SA Water through the documentation of work processes for the Cobdogla Humphrey Pump.

### CASE STUDY 1 – SCHOOL REDEVELOPMENT

In the early stages of the Virtual Learning Project, an offhand comment about wishing to find a construction project to document for its lifecycle led to an invitation to attend a school redevelopment to generate scans using our Matterport camera, a 360-degree rotating camera that also contains a LIDAR scanner for spatial references.

The scan points are a series of connected photographs and measurements from a particular vantage that are automatically joined to other scan points, visible in Figure 1 as a white circle on the ground on the left side, that allow for movement through the scan, as well as pivoting at each point to re-orient the view towards any objects of interest. A range of view options are available to cover the full scan and allow instant travel to or between scan points.



**Figure 1: A Screenshot from a Matterport Scan**

Over the course of just under a year, the site was scanned and a 3D explorable model created approximately weekly. The general upside of this was that it allowed the school administration and community to see what was happening behind the hoarding, which proved popular with these stakeholders who are normally denied the ability to see progress at this level.

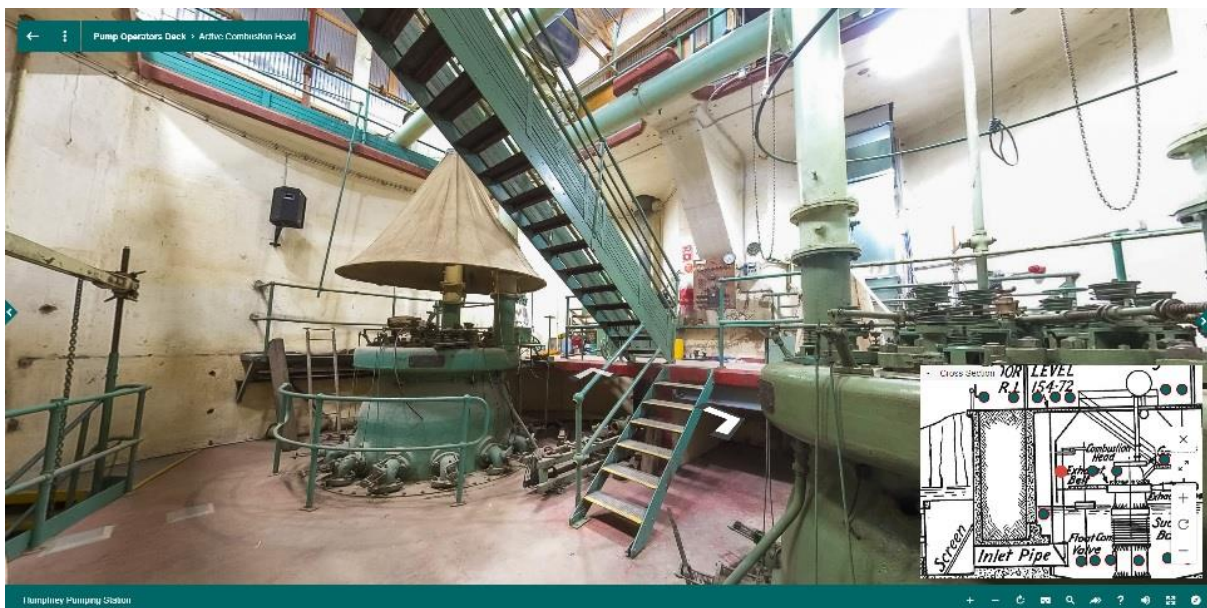
Additionally, the contractor expressed an interest in exploring this as a value-added service for other high-profile projects, although TAFE SA were not positioned to provide this service, leading to an in-house uptake of the process by the contractor independently.

For TAFE SA, the key benefit was the ability to see each stage of a construction project as each trade worked through, allowing content for each workgroup within the Building and Construction school to find relevant content for their courses, which proved especially useful when the onset of Covid 19 brought an end to in-class learning and removed the possibility for site visits for a class sized group.

### CASE STUDY 2 – COBDOGLA HUMPHREY PUMP

SA Water approached TAFE SA to develop a method of preserving the living wisdom of the volunteers at the Cobdogla Irrigation and Steam Museum as related to the Humphrey Pump, which while physically capable of operation, is currently out of use due to waste and safety concerns.

Using a different type of fixed 360-degree camera, a series of photographs were taken and manually joined to make a Virtual Tour similar to the one generated by the Matterport camera. While the interface is slightly different, as seen in Figure 2, the same functionality of allowing each scan point to be explored is present via the white arrows in the middle of the screen, as is an expanded navigation set up in the bottom right-hand corner, allowing a user to select scan points relative to an old technical diagram found in the documentation on site.



**Figure 2: A Screenshot from the Cloud Tour of the Cobdogla Humphrey Pump**

This tour is combined with an updated manual for the operation and maintenance of the pump, also generated by TAFE SA, for the purpose of allowing future volunteers to restore the pump to operation should the safety issues be resolved.

Both this scan and the Matterport scans can be viewed and explored using a Virtual Reality headset as well as a computer or phone screen.

### CASE STUDY 3 – MT BARKER WWTP

After seeing the results of the school scanning project and similar single scans, while also being heavily involved in the Cobdogla project, one of the TAFE SA Water Industry Operations lecturers, Richard Scott, identified the potential to scan Drinking Water and Waste Water Treatment facilities for use in class, and potentially by other Operators for the purpose of pre-visit orientation and to convey information about specific equipment and its potential idiosyncrasies.

To achieve this, after a scan was completed and processed, hotspots and points of interest were added to the scan, as seen in Figure 3. These hotspots can contain text, hyperlinks, or even video of usage instructions for the various bits of equipment within the plant.



**Figure 3: A Matterport scan of a Waste Water Treatment Plant with identified Points of Interest**

The Matterport camera is controlled by an iPad or phone and processing is done invisibly by its web service once uploaded. The Points of Interest are added through a web interface and allow several options, including colour coding to allow differentiation between classes of potential interest (e.g., usage instructions vs maintenance instructions).

With minimal up-front and ongoing costs, the system is allowing TAFE SA to document plant within every council district that can be visited, and while no formal arrangements exist, the potential for cooperation and collaboration within the wider WIOA network is certainly anticipated.