

Aerial drone-based thermal imaging to detect leakage from sewage lagoons

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TasWater is an asset-intensive organisation with a need to undertake condition assessment to support our infrastructure asset management.

A challenge is to identify appropriate condition assessment technologies and methodologies that, while providing data and information on relevant asset distress indicators, also give sufficient spatial coverage and are cost-effective.

A recent challenge has been to detect leakage from lagoons that comprise part of our sewage treatment plants. A scan of water industry practices conducted through the Water Services Association of Australia (WSAA) indicated that flow balancing (i.e. inflows plus rainfall less outflow less evaporation) was the most frequently used method. While this indicates leakage may be occurring, it does not allow the leakage locations to be identified.

TasWater has engaged with a local robotics company to trial an industrial aerial drone to detect leakage locations. An aerial drone equipped with a high resolution optical and specially tuned thermal imaging camera conducts a lagoon survey from a fixed level. Optical images can identify cracks and other defects that are visible, but can also establish areas that have not been affected by shadow over the course of the drone survey. For these shadow-free areas, analysis of the thermal images can reveal localised regions that differ in their response to uniform radiant heat over the duration of the survey. Regions that do not heat up as rapidly as their surroundings are considered to be potential leakage pathways from the lagoon.

This paper presents a case study of aerial drone-based surveys for sewage lagoon leakage detection. Results from the surveys are compared to bore-hole testing, indicating that thermal anomalies correlate with relatively high nutrient levels from bore monitoring. The aerial drone-based survey is considered a useful new technique for cost-effectively locating lagoon leakage and informing subsequent monitoring and identifying capital lagoon refurbishment projects.