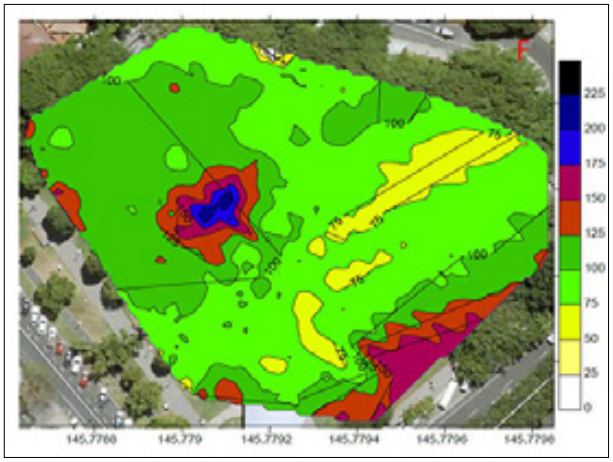
Smart Parks Irrigation Project

Traditional irrigation systems typically operate on a timer and do not respond to weather conditions or actual plant water requirements. Smart irrigation systems which are responsive to plant water requirements can optimise water usage, improve plant growth, and reduce nutrient leaching into adjacent water bodies.

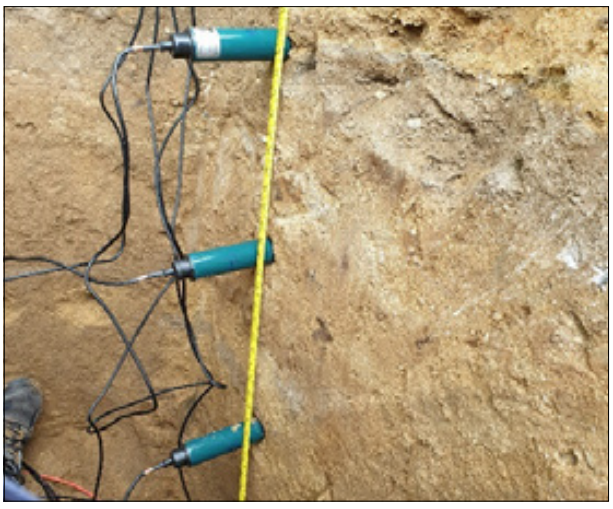
Project Background

For sustainable management of parks and lawned surfaces, it is important that the factors that influence changes in soil moisture content are understood and measured so that the irrigation conditions can be optimised to suit each location and the plant type. In 2019 the Cairns Regional Council, in conjunction with Central Queensland University, commenced the Smart Urban Irrigation Project with the aim of optimising irrigation via the integration of best available irrigation equipment, real time monitoring data and the latest irrigation software.

The project investigated various aspects that influence soil water content in Cairns parks, including soil properties, plant characteristics, weather conditions, and management practices, with the aim of developing a computer model that would help control irrigation in Cairns parks. Two parks, the Eastern Lagoon and Fogarty Park, were selected for intensive investigation. The grasses in these parks have shallow root systems (<20cm depth) due to compaction and low soil infiltration rate, and currently require frequent irrigation.



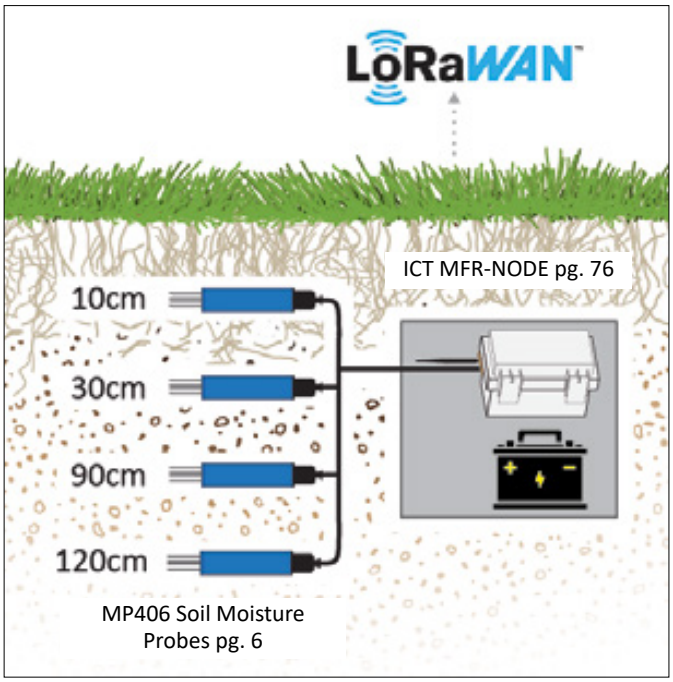
The researchers, Associate Professor Nanjappa Ashwath and Dr Biplob Ray, say that the data collected from this project will help minimise deep drainage so excess water and nutrients leaching into Great Barrier Reef can be reduced.



Monitoring and Network solution

Following Dual EM and infiltration surveys, soil moisture content at each of the two parks was monitored at three locations, each broadly representing low, medium and high moisture zones. At each location 4x MP406 moisture sensors were installed at 10, 30, 90 and 120cm depths. The MP406 sensor was selected because of its capacity to measure VSW% accurately in the saline coastal soils.

The MP406 probes were supported by an MFR-NODE, which transmitted the data from each site over LoRaWAN to a solar powered gateway located on the rooftop of the CQUniversity in Cairns. Given the public nature of the site all monitoring equipment was housed in a subterranean junction box and battery powered. The 4G connection, gateway and nodes were administered using The Things Network (TTN) LoRaWAN server via 4G connection.



Dashboard View of Past & Realtime Irrigation Drainage Data

The interface has been set up to receive and translate LoRaWAN gateway signals in National eResearch Collaboration Tools and Resources (Nectar) Cloud which also hosts the Chronograf dashboard with the InfluxDB database to store, analyse, and manage the data. The Chronograf dashboard helps visualise the data and sends alerts based on events extremely low or high moisture content. The AI (Artificial Intelligence) powered brain of the system was also developed for automating the entire irrigation process.

Data from dashboard showing how the MP406 sensors are responding to daily irrigation or rain on the 18th, 19th, 20th December 2019. The Data assisted the park manager with an ability to discern moisture content of selected soil layers (for example 10cm depth) so a decision can be made to judge if the park is under or over-irrigated.

This project was supported by Cairns Regional Council, the Australian federal Smart Cities Program and CQU's Centre for Intelligent Systems.