

# TAC meeting Mar 2014

## Activity 3 presentation

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## Overview

- Aim - develop corrosion loss models for buried pipes as a function of time and environment
- Approach – empirical model based on corrosion theory and field observations.  
Requires data for calibration
- Recent work – collection of corrosion and soil data from 20 HW CA sites and calibration of a preliminary model

## Current work tasks (this quarter)

1. Corrosion and soil data collection
2. Development of a soil moisture/climate model

# 1. Corrosion and soil data collection

- Previously collected samples:
  - SW main breaks
  - SW Test bed
  - SW other
  - HW main break
- Plan for future collections
  - SW test bed + SW main breaks
  - Melbourne utilities

## Previously collected samples: SW breaks

- 11 cast iron pipe samples collected early 2013
- Soil samples collected and analysed by SW mid-year 2013



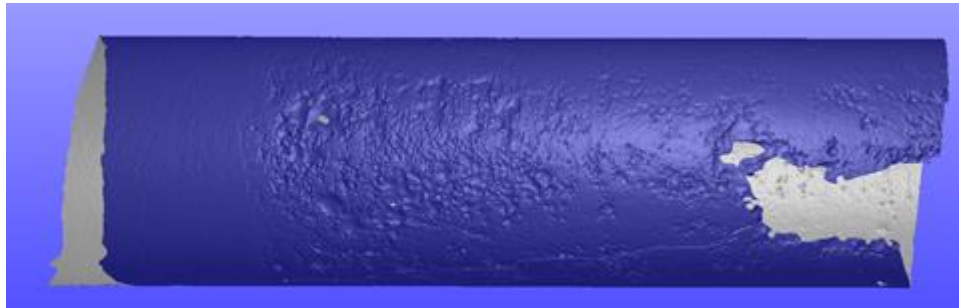
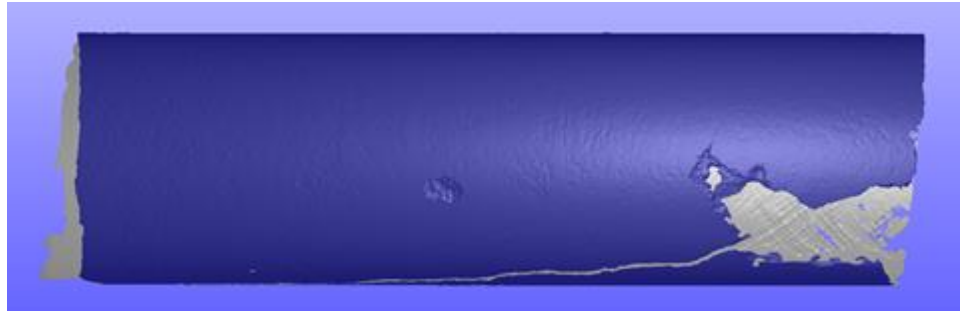
## Previously collected samples: SW breaks

- Data covers a wide range of conditions
  - Pipe age: 36-86 years
  - Pipe condition: Little corrosion – Through-wall
  - Environment: clays, sands, loams, some high chloride environments, nature strips and roads
- Pipes under roads and pipes in high chloride environments were not represented in previous HW field work

## Previously collected samples: SW breaks

- Pipe inspections/scans Jan 2014
- Identification sheets lost. Managed to Identify 8 out of 11 pipes.
- Scanned all pipe sections (external surface).
- Approach:
  - Light blast to remove soils, external rusts + remaining coating (difficult). 1<sup>st</sup> scan
  - Full blast to remove graphitised layer. 2<sup>nd</sup> scan
  - Ultimately, will compare surfaces to determine corrosion depth

# Pipe inspections



## Previously collected samples: SW breaks

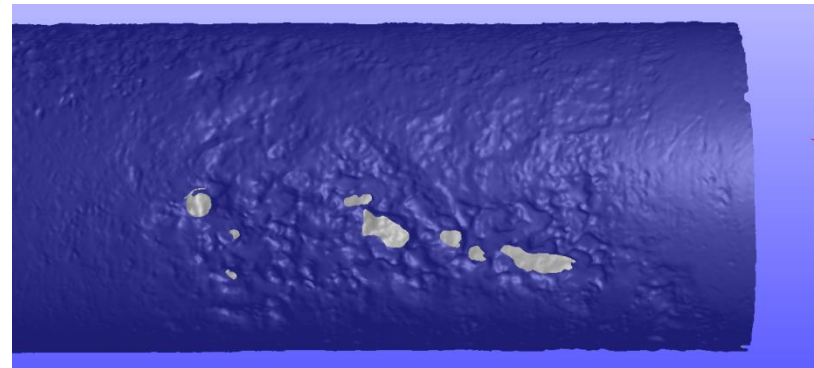
- Scans complete (all 11 pipes) and soil data collected.
- Future work
  - process scan data to determine max pit depth and average loss
  - Use corrosion and soil data to calibrate models

## Previously collected samples: Other

- Ten pipes currently stored at Newcastle incl.
  - SW Test bed samples (4), SW other (4), SW main break, & HW main break
  - In process of scanning pipes. 4 remain.
  - Plan to gather soil information for these sites.



HW main break



## Plans for future collections

- **SW test bed + SW main breaks**
  - Test bed - 10 sites. Corrosion loss already known (UTS). Only soil analysis required.
  - Possible 30 sites from main breaks over the next 2 years.
- **Melbourne Utilities**
  - CWW – Plan to supply CI pipe samples from past CA work to UTS for scanning
  - SEW – Plan to involve project in upcoming CA work on CI pipes. Will provide pipe samples and soil analyses.
  - SEW – Possible pipe and soil samples from replacement work 225 CI main St Kilda.

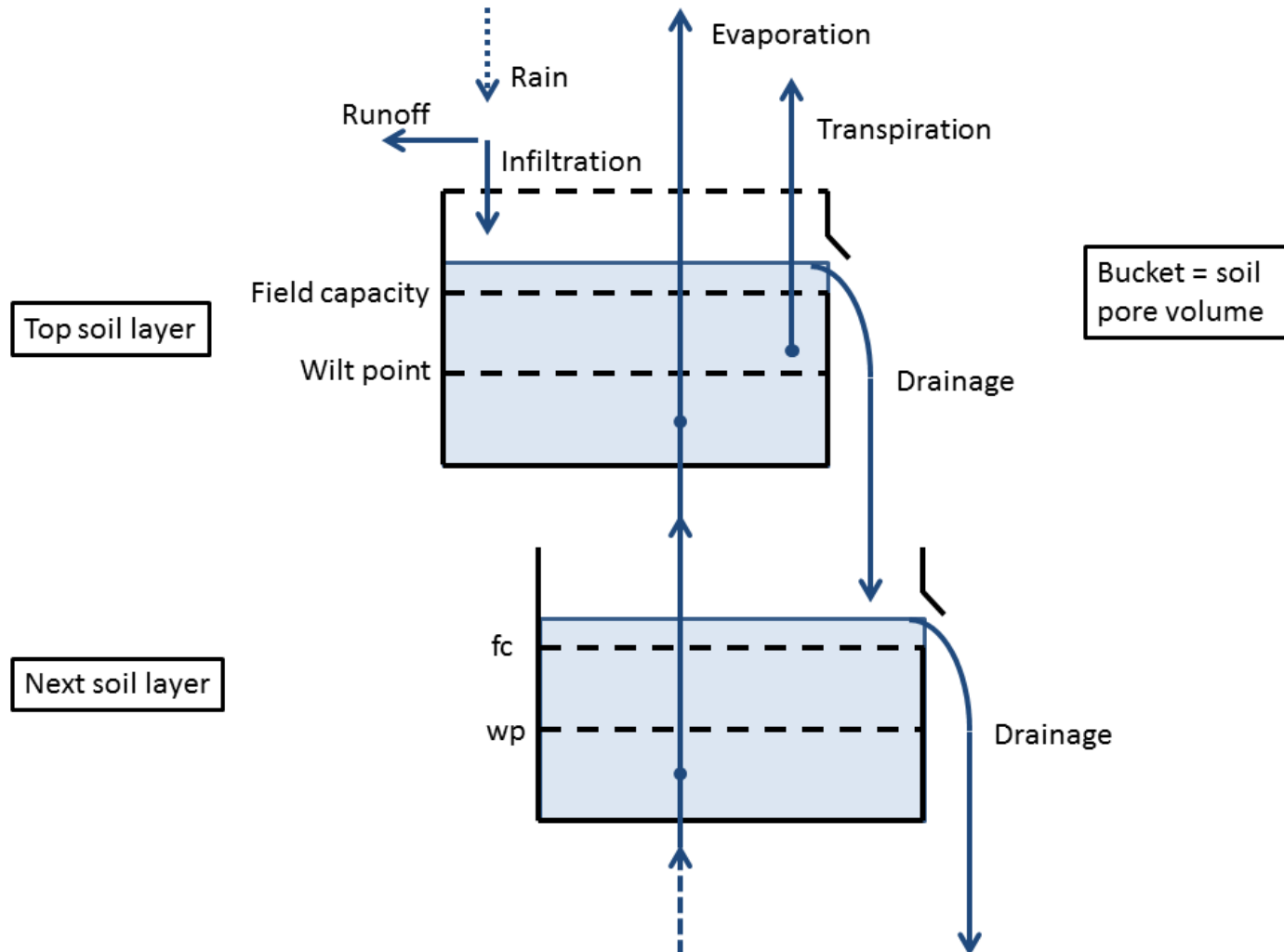
## 2. Soil moisture/climate model

- Background – Soil moisture important model parameter. Reasonable approximation of long-term value required for model calibration
- Aim – To develop a simple model to estimate the long-term average moisture content in soil next to pipe as a function of soil type & climate

## 2. Soil moisture/climate model

- Purpose of model is to provide an estimate of long-term moisture content at sites where:
  - m.c. measured at only one point in time
  - m.c. not measured at all
- Apply to collected (+ future) data sets, incl.
  - Recent HW CA
  - SW main breaks
  - Historical CA data (HW to begin)
  - Literature data (Romanoff)

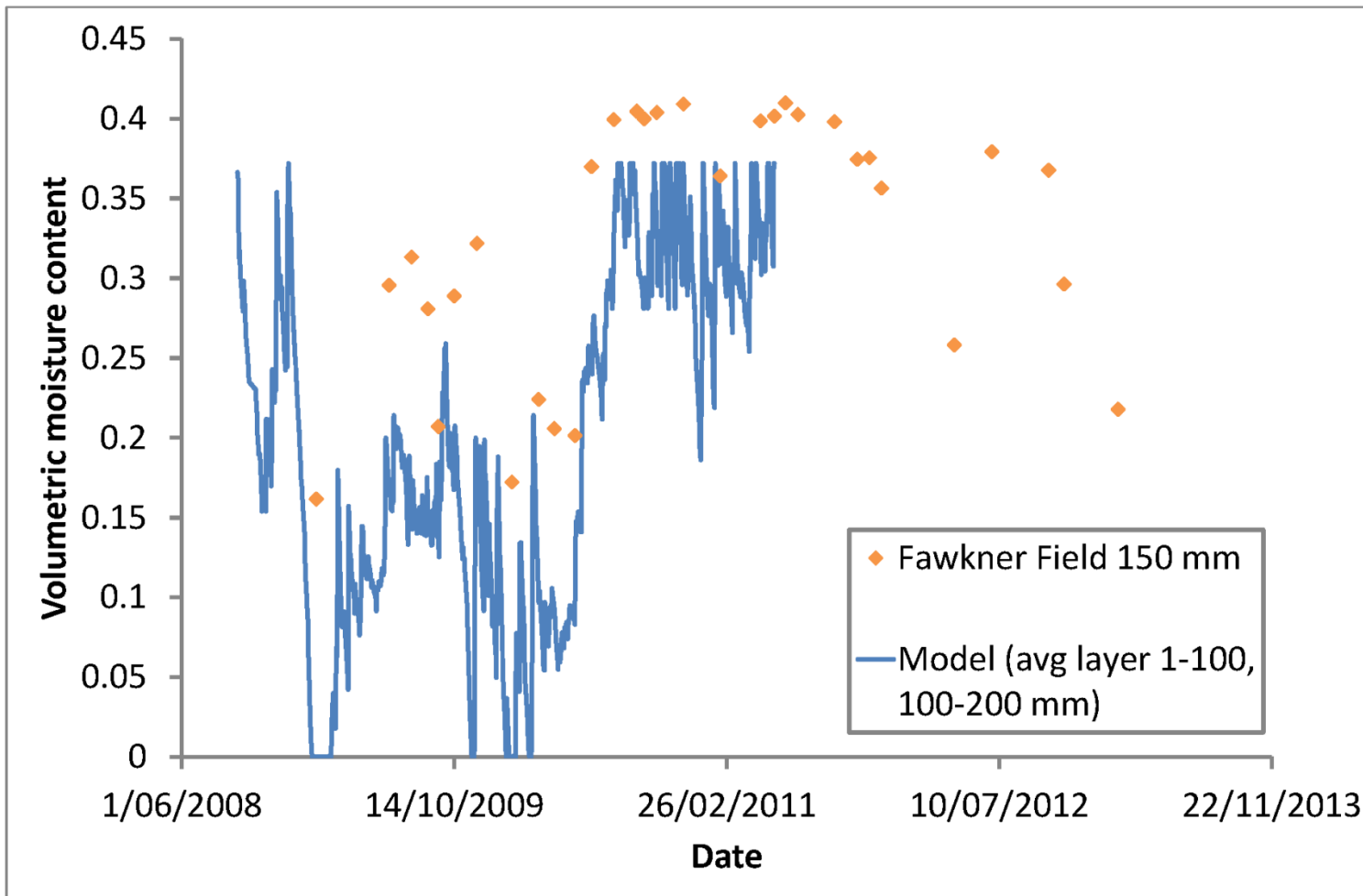
## Model schematic



## Model verification (in progress)

- Model built in excel spreadsheet
- Currently testing model against field data collected by Monash Uni
- Field data includes:
  - Model inputs: soil porosity, field capacity, permanent wilt point, infiltration rate, drainage rate, rainfall, climate data.
  - Model outputs: Soil moisture content vs time at different soil depths (over a few years)

# Model verification (in progress)



## Plan for next quarter

- Complete surface scans
- Analyse corrosion loss/soil condition data from SW failures + other pipes and begin to further develop models with this new data for max pit depth and average losses
- Finalise climate-moisture model and use to estimate site soil conditions at historical CA sites, for use in corrosion model development