Manaaki Whenua
Landcare Research

MANAAKI WHENUA – LANDCARE RESEARCH

OGC Environmental Data Standards for Monitoring and Mapping

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INTRODUCTION

- What is the OGC and WSMA*?
- Earth science (and Agriculture) Working Groups
- When one bureaucracy isn't enough – the OGC and ISO and W3C
- Overview by example – OGC Soil Data Interoperability Experiment
- Coming soon – a peak over the horizon
- Why participation is valuable for New Zealand

* Why So Many Acronyms

THE OPEN GEOSPATIAL CONSORTIUM (OGC)

- 'The Open Geospatial Consortium (OGC) is an international industry consortium of over **529** companies, government agencies and universities participating in a consensus process to develop publicly available interface standards.'

  From: http://www.opengeospatial.org/ogc

- New Zealand members:
  - Hawkes Bay RC, Horizons RC, Land Information NZ, Manaaki Whenua, Ministry for the Environment, NIWA
- Consensus driven specification of standards for:
  - the behaviour and implementation of data services (interoperable communication protocols)
  - data formats (geography mark-up language; GeoPackage)
  - the structure of data describing real world things (hydrological features, observation and sampling data, aviation data …)
  - best practices for applying and using standards
  - policies and tools for testing and endorsing compliance with the standards
- Standardisation by *innovation and doing*
  - heavy emphasis on large scale Testbeds and focused Interoperability Experiments

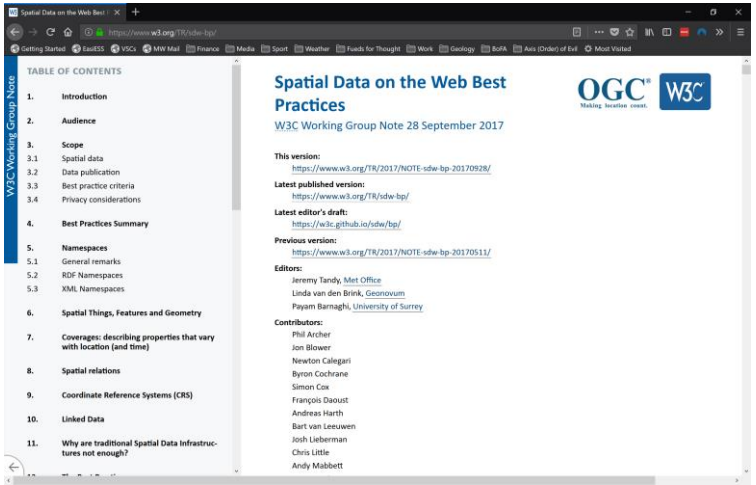
IMPORTANT WORKING GROUPS

- Hydrology Domain Working Group
  - WaterML 2.0 suite of standards for surface water, groundwater, monitoring standards
- Geoscience Domain Working Group
  - GeoSciML (geology)
- Met-ocean Domain Working Group
- Sensor Web Enablement Working Group
  - Sensor Observation Services, SensorThings API (IoT enablement)
- Observations and Measurements Standards Working Group
  - Collaboration with ISO/TC 211 – Geographic Information Standards
  - Used by all environmental working groups
- Time Series Standards Working Group
  - Builds on work by Observations and Measurements (O&M 2.0) and Hydrology (WaterML 2.0, part 1) WGs
- Agriculture Domain Working Group
  - Soil data standards. Industry focus, strong affinity with environmental WGs

IMPORTANT PARTNERSHIPS

- ISO Technical Committee 211 - Geographic information/Geomatics
  - Foundation standards of the geospatial web (ISO19100 series)
  - Developed in partnership with the OGC
  - Published as ISO Standards (user pays) and OGC Specifications (free)

- World Wide Web Consortium (W3C)
  - Spatial Data on the Web Working Group
  - Geospatial data for the masses, but with a semantic web twist
  - Best practices for the publication of spatial data on the web
  - Ontologies for observations and sampling (SOSA) and time (OWL Time)
  - New work on uncertainty, data publication/catalogues



EXAMPLE - OGC INTEROPERABILITY EXPERIMENTS

- Interoperability Experiments – standardization by doing

- '**Brief**, low-overhead, formally structured and approved initiatives led and executed by OGC members to achieve specific technical objectives'

  From: http://www.opengeospatial.org/ogc/programs/ip

- Should lead to the formation of a Standards Working Group that moves the IE results to a formal specification

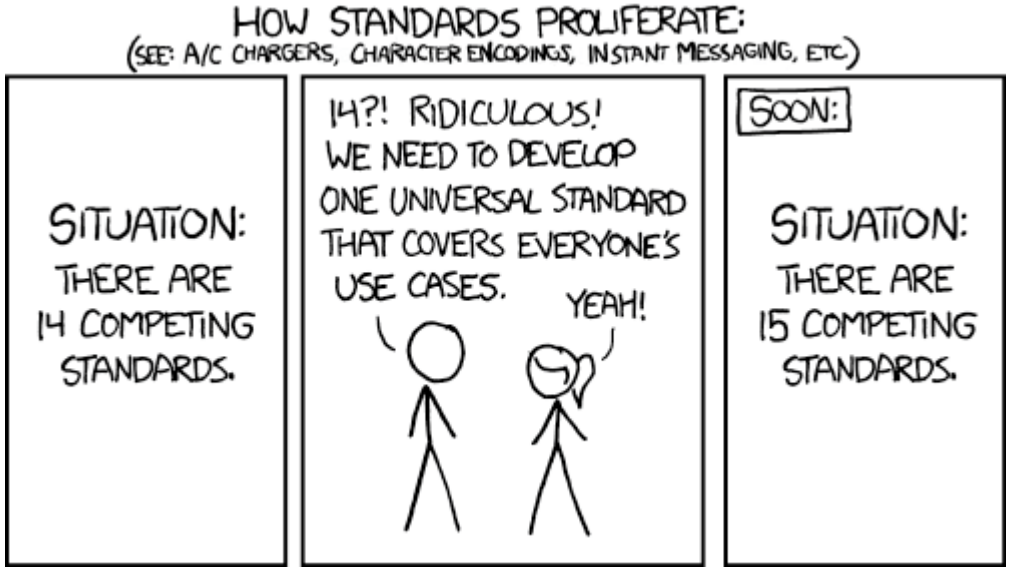
- New Zealand involvement:
  - Groundwater Interoperability Experiment
  - Soil Data Interoperability Experiment
  - Linked Environmental Features Interoperability Experiment (ELFIE)
  - Borehole Interoperability Experiment (new)

SOIL DATA INTEROPERABILITY EXPERIMENT

- Started by the IUSS Working Group on Soil Information Standards
- OGC Initiators
  - CSIRO (AU)
  - Manaaki Whenua (NZ - Initiative Manager and Technical Lead)
  - ISRIC World Soil Information (NL)
- Active Participants
  - Federation University of Australia (AU)
  - USDA Natural Resource Conservation Service (US)
  - Agribiology and Pedology Research Centre (IT)
  - USGS (US)
  - Horizons Regional Council (NZ)
  - Tumbling Walls (US)
- Reconcile five existing standards …

… into a single standard …

UH OH



- Not quite … point to prove … can use existing standards

SOIL DATA IE USE CASES

- Use Case 1: soil data integration & publication

  Publication of heterogeneous soil data from different databases at different agencies

- Use Case 2: soil sensor data

  Publication of data from sensors monitoring dynamic soil properties

- Use Case 3: soil property modelling and predictions

  Provision of high resolution estimates of functional soil properties generated using digital soil mapping techniques – e.g. GlobalSoilMap project soil property predictions

- Use Case 4: pedo-transfer functions

  Process observed and interpreted soil properties using of pedo-transfer functions - algorithms that calculate additional interpreted soil properties

SOIL IE EXCHANGE STANDARD

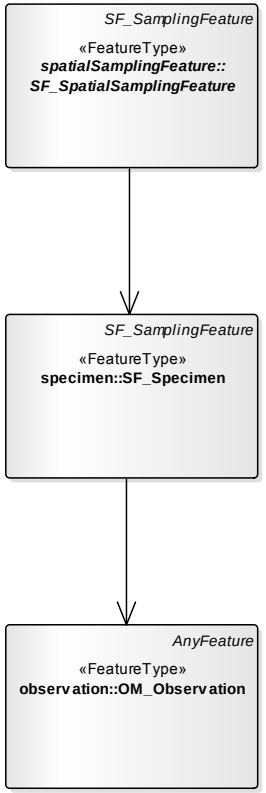
- Reviewed five existing standards
  - Australia and New Zealand Soil Mark-up Language
  - e-SOTER Soil and Terrain Mark-up Language
  - INSPIRE D2.8.III.3 Data Specification on Soil
  - ISO 28258:2013 Soil quality – Digital exchange of soil-related data
  - IUSS/ISO 'Wageningen Proposal' (effort to reconcile 1. and 4.)

- No clear candidate from this work

- Back to basics using as much existing work as possible
- Don't bind the information model too tightly to technology
  - Abstract and implementation specifications

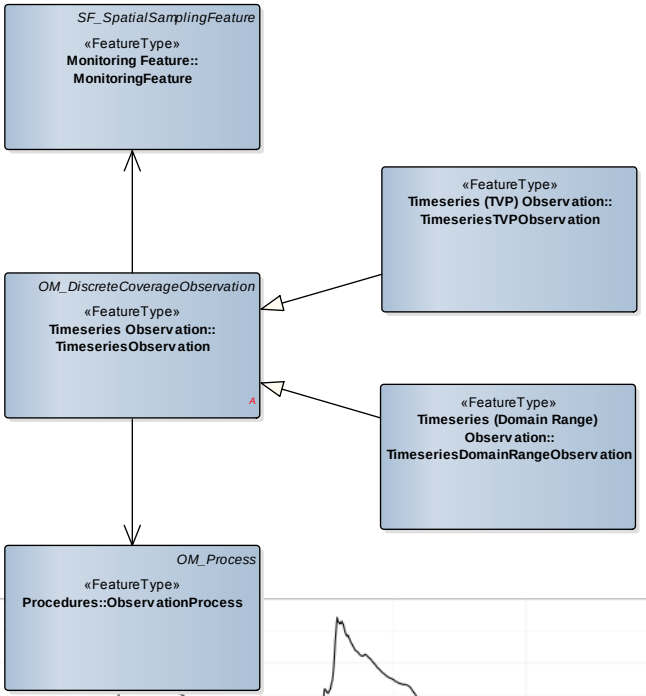
SOIL OBSERVATIONS

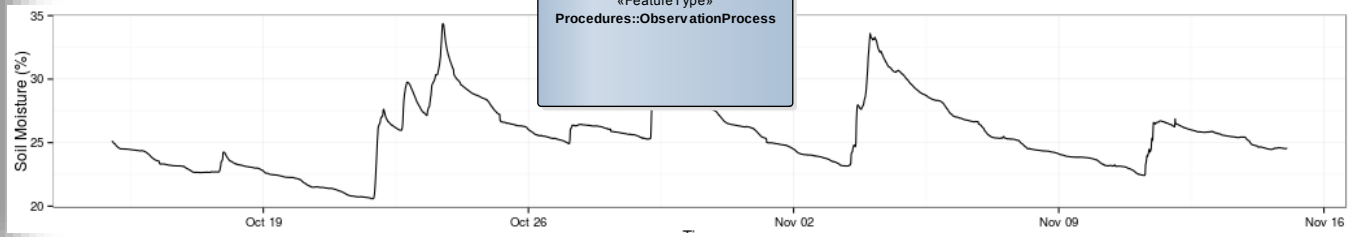
ISO19156/OGC10-004r3 - Observations and Measurements



SOIL SENSORS

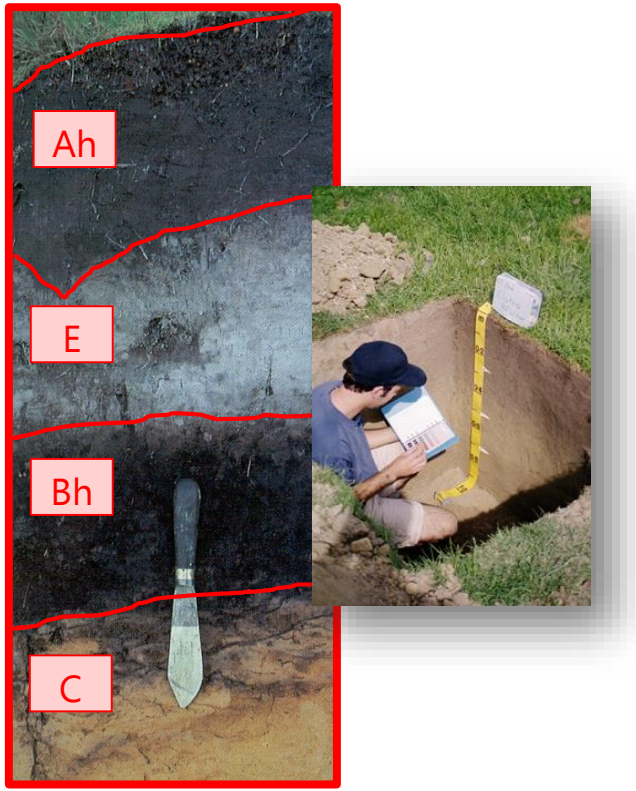
OGC15-043r3 – Timeseries Profile of Observations and Measurements

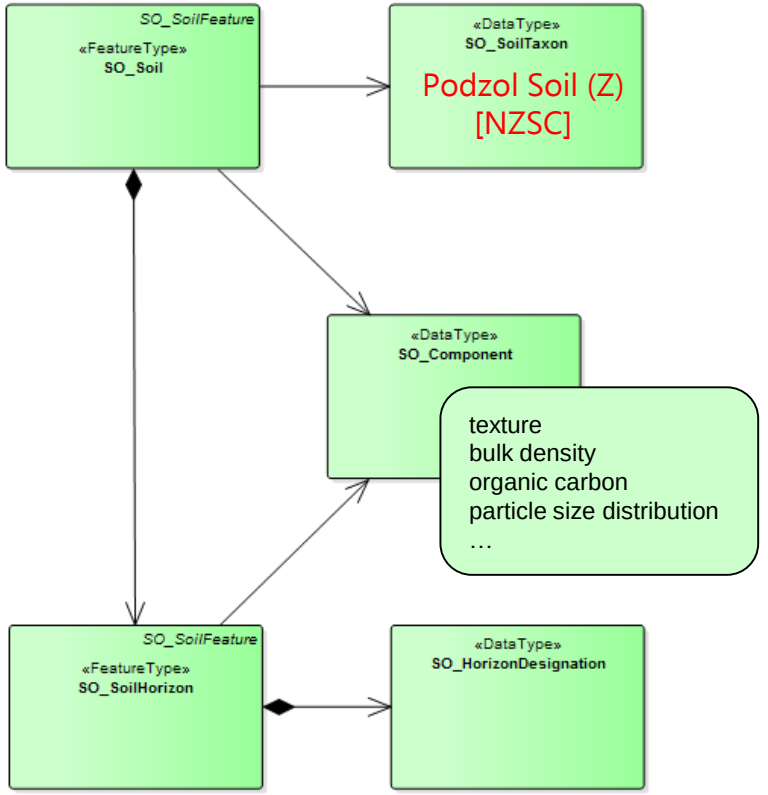




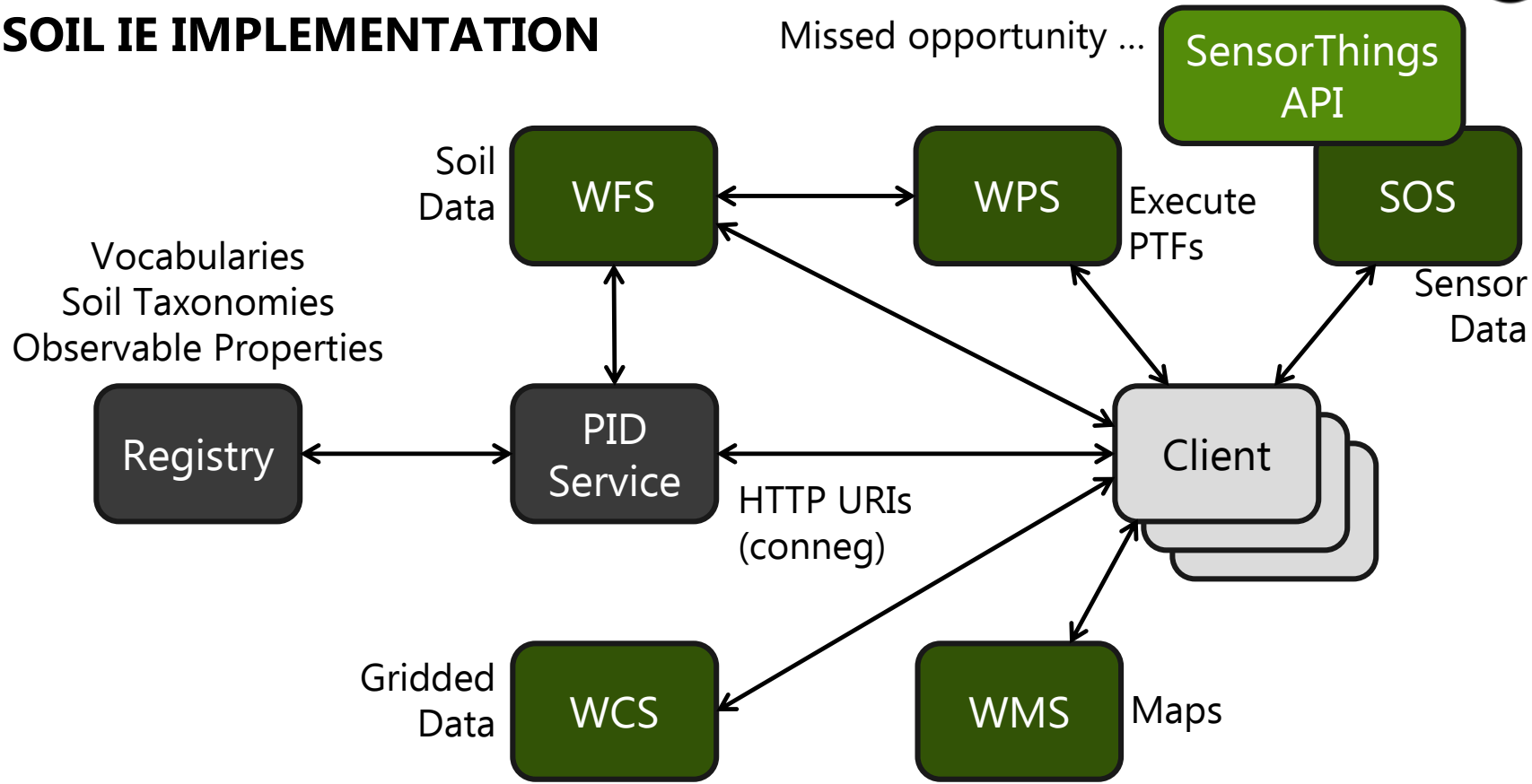
SOIL DESCRIPTIONS

OGC16-088r3 - OGC Soil Data Interoperability Experiment





SOIL IE IMPLEMENTATION



DEMONSTRATION – SOIL TIME SERIES DATA

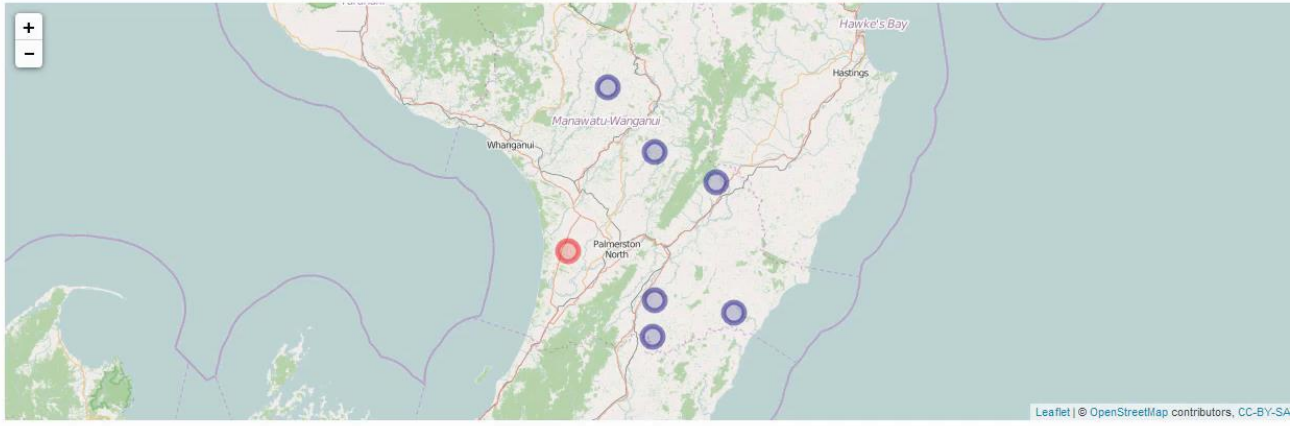
OGC Soil Interoperability Experiment

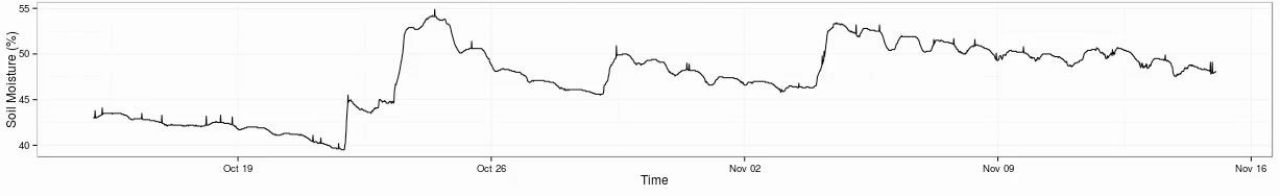
Select data provider

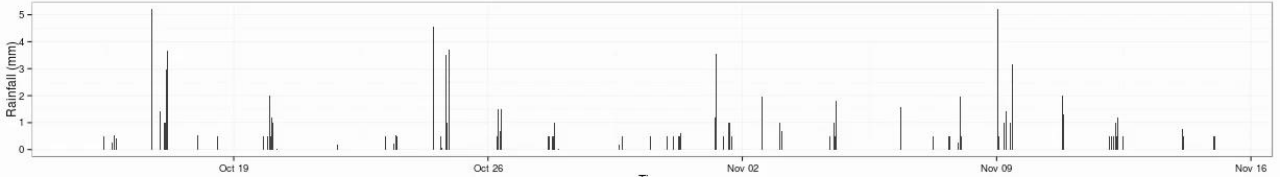
Horizons RC

Select station

Makino at Halcombe Road

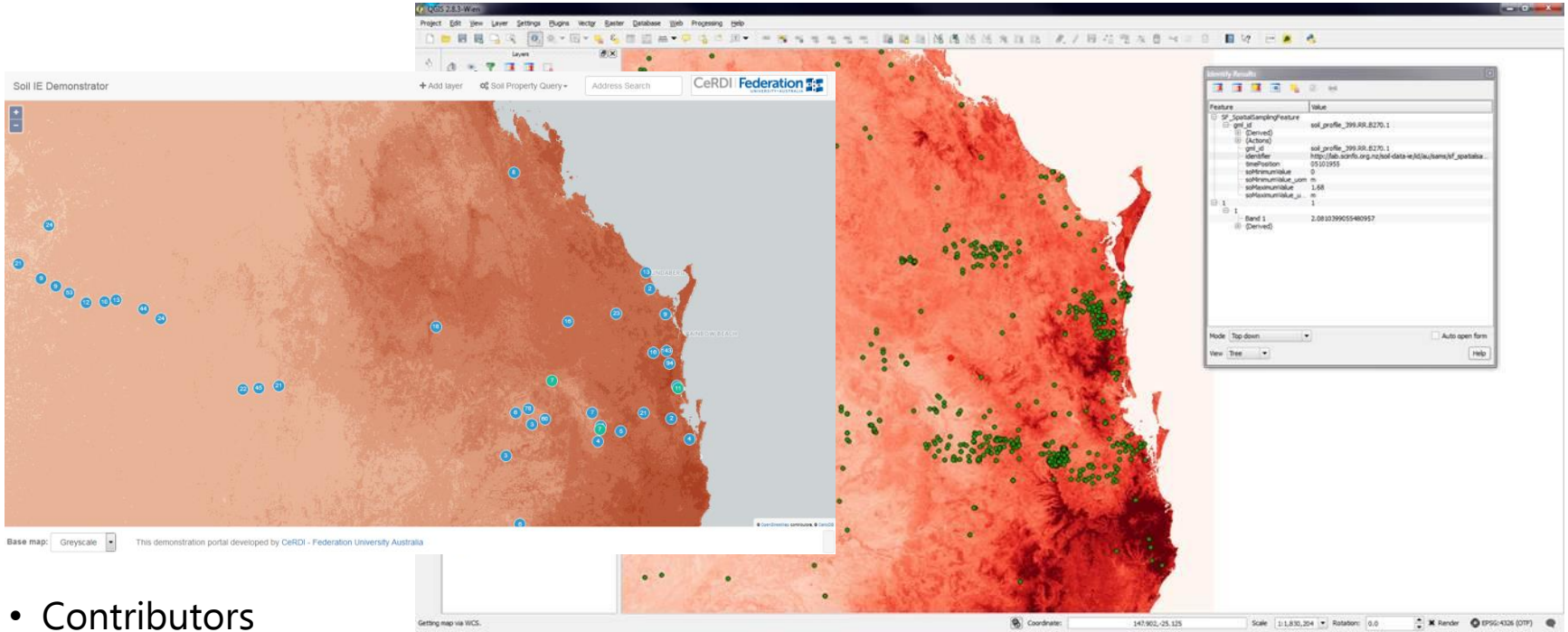






- Properties:
  - Soil Moisture
  - Soil Temperature
  - Rainfall
- Contributors:
  - Manaaki Whenua (NZ)
  - Horizons RC (NZ)
  - USGS (US)

DEMONSTRATION – SOIL PROPERTY SURFACES



- Contributors
  - CSIRO Land and Water (AU)
  - Federation University of Australia (AU)

DEMONSTRATION - SOIL DESCRIPTIONS

- Use Cases One and Four
  - Field observations
  - Sampling
  - Laboratory analyses
  - Pedo-transfer functions

- Contributors
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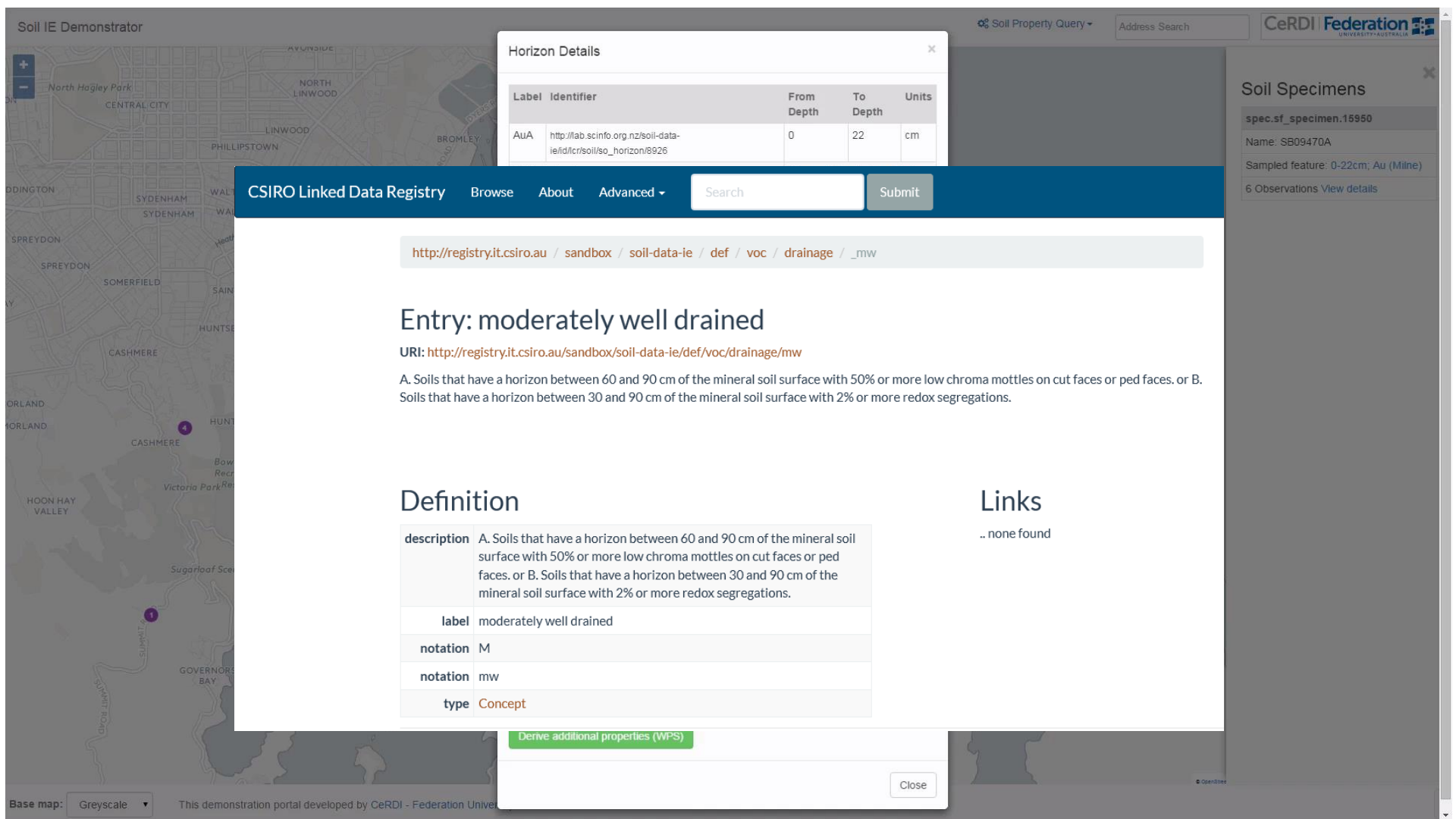
  - CSIRO Land and Water (AU)
  - Federation University of Australia (AU)
  - ISRIC World Soil Information (NL)


Soil IE Demonstrator
Soil Property Query
Address Search
CeRDI Federation
Horizon Details
Label
Identifier
From Depth
To Depth
Units
AuA
http://lab.scinfo.org.nz/soil-data-ie/id/lcr/soil/so_horizon/8926
0
22
cm
Soil Specimens
spec.sf_specimen.15950
Name: SB09470A
Sampled feature: 0-22cm; Au (Milne)
6 Observations View details
CSIRO Linked Data Registry
Browse
About
Advanced
Search
Submit
http://registry.it.csiro.au / sandbox / soil-data-ie / def / voc / drainage / _mw
Entry: moderately well drained
URI: http://registry.it.csiro.au/sandbox/soil-data-ie/def/voc/drainage/mw
A. Soils that have a horizon between 60 and 90 cm of the mineral soil surface with 50% or more low chroma mottles on cut faces or ped faces. or B. Soils that have a horizon between 30 and 90 cm of the mineral soil surface with 2% or more redox segregations.
Definition
description
A. Soils that have a horizon between 60 and 90 cm of the mineral soil surface with 50% or more low chroma mottles on cut faces or ped faces. or B. Soils that have a horizon between 30 and 90 cm of the mineral soil surface with 2% or more redox segregations.
label
moderately well drained
notation
M
notation
mw
type
Concept
Links
.. none found
Derive additional properties (WPS)
Close
Base map:
Greyscale
This demonstration portal developed by CeRDI - Federation Univer

RESULTS

- Created a simple *information model* of soils data
- *Harmonised* the structure and some content of soils data between agencies
- Brought data from different soil agencies together in applications for users (*service – driven interoperability*)
- Provided a way to describe and organise soil concepts, features, methods, etc (*semantics*)

- Started a conversation with Dave Blodgett at the USGS

How do we link together all of our environmental data?

How do we do it in a way that is 'the HTML for environmental data'?

What does that even mean – Byron Cochrane will tell you …

COMING SOON

- WFS (Web Feature Service) 3.0
  - Complete redefinition of the specific to align with the modern web
  - OpenAPI; JSON; REST
  - Open development process with strong developer focus - https://github.com/opengeospatial/WFS_FES
  - If successful will influence the entire OGC standards baseline

- Observations and Measurements 3.0
  - Part of scheduled ISO review process
  - Great opportunity to apply what we have learned from nearly a decade of implementation

- Borehole Interoperability Experiment
  - Consolidate multiple community models for the description of bore/drillhole sampling features

- Greater integration of Semantic Web technologies and practices
  - Controlled vocabularies, Linked Data, machine learning

BENEFITS TO NEW ZEALAND

- Provides standards that New Zealand can use for environmental data infrastructures
- The work has been done for us, but is not imposed on us …
- Open membership means we can (and do) influence the work
- Standards have been implemented by other, equivalent, communities
  - US National Water Model
  - Canadian Groundwater Information Network (wet GIN)
  - US Geoscience Information Network (dry GIN)
  - Australian Geoscience Information Network (hot GIN?)
  - AuScope earth science infrastructure
  - Australian Integrated Marine Observing System (IMOS)
- Communities that are keen to work with us …

THANK YOU

(EASY) QUESTIONS?