

Takaka Nutrient Modelling

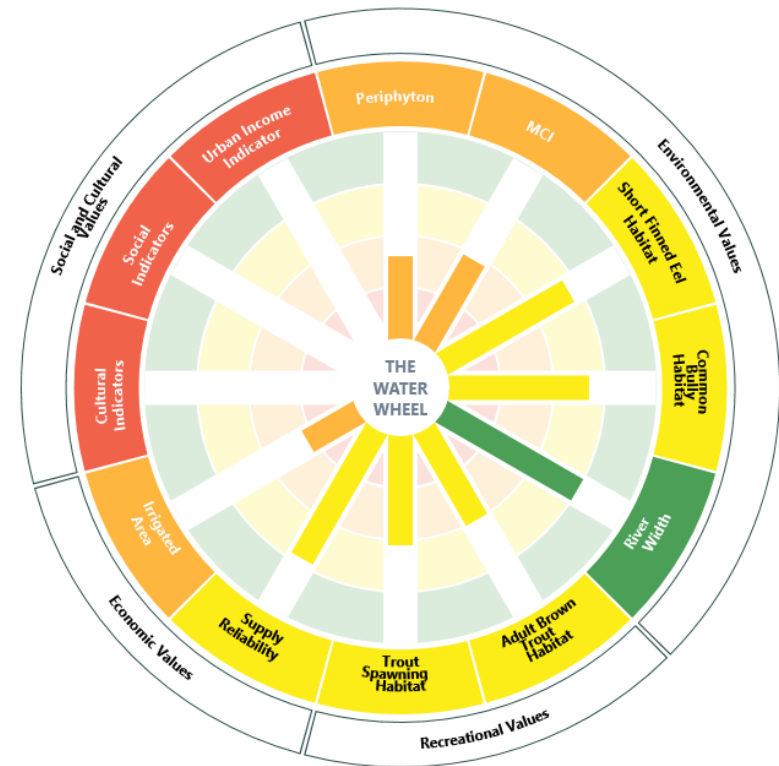


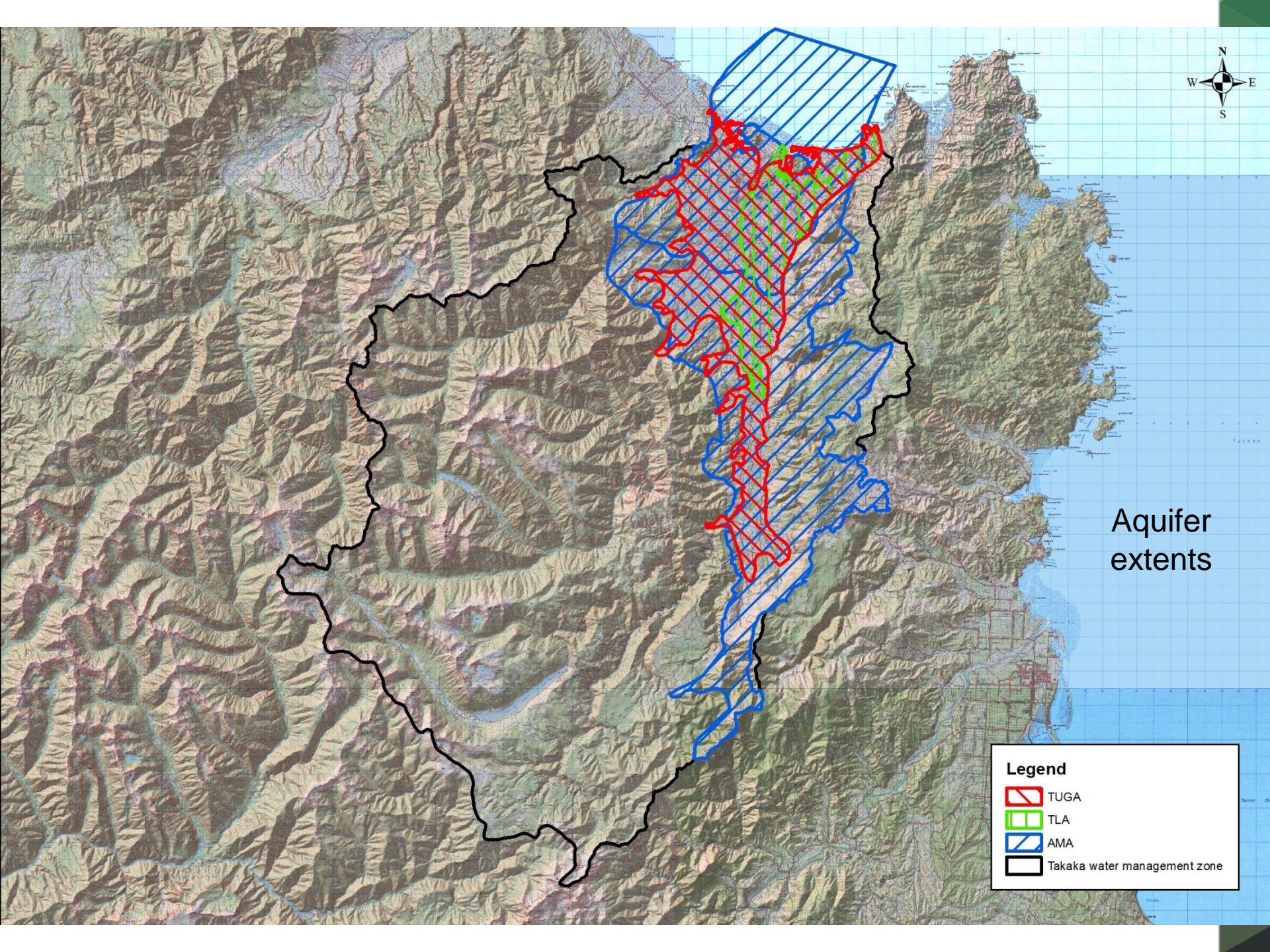
Landcare Research
Manaaki Whenua

Examples of Water Wheel diagrams



Site O: Environmentally Conservative
Data-SCCS-SiteO-Sc2



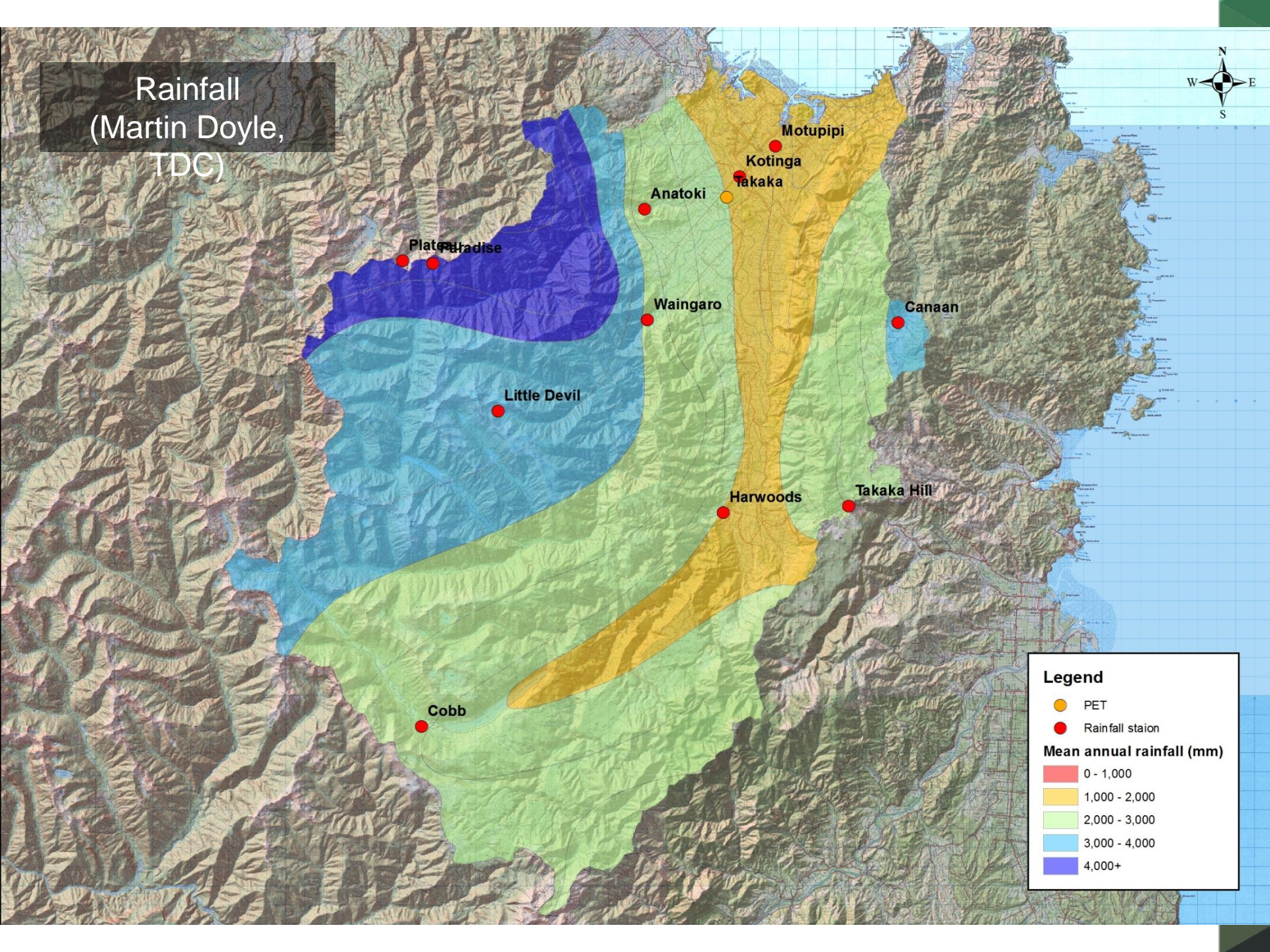
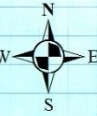


Aquifer extents

Legend

-  TUGA
-  TLA
-  AMA
-  Takaka water management zone

Rainfall
(Martin Doyle,
TDC)



Legend

- PET
- Rainfall station

Mean annual rainfall (mm)

- 0 - 1,000
- 1,000 - 2,000
- 2,000 - 3,000
- 3,000 - 4,000
- 4,000+

Soil water holding capacity

Unmapped = hill country
(low WHC; 40 mm assumed)

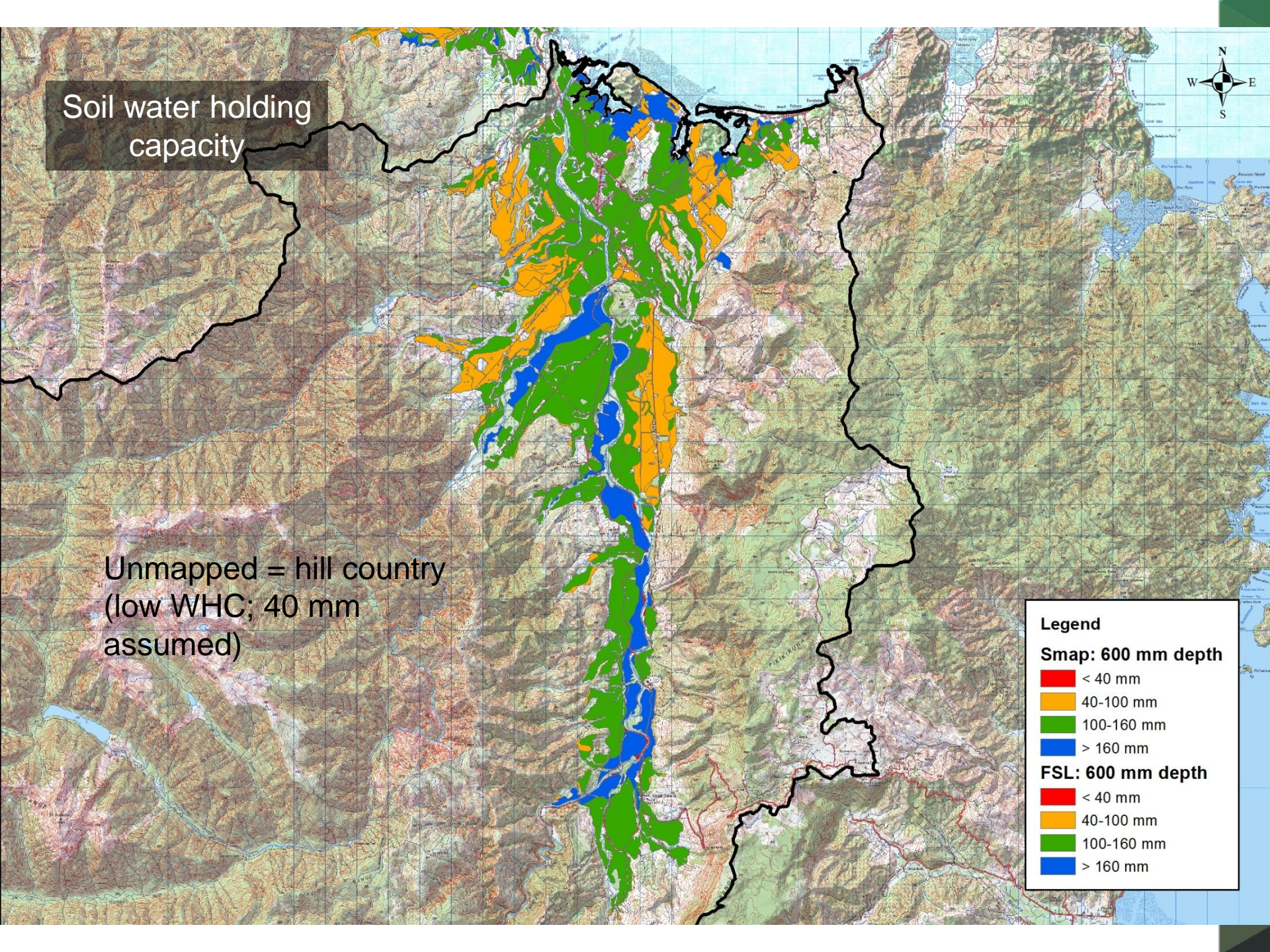
Legend

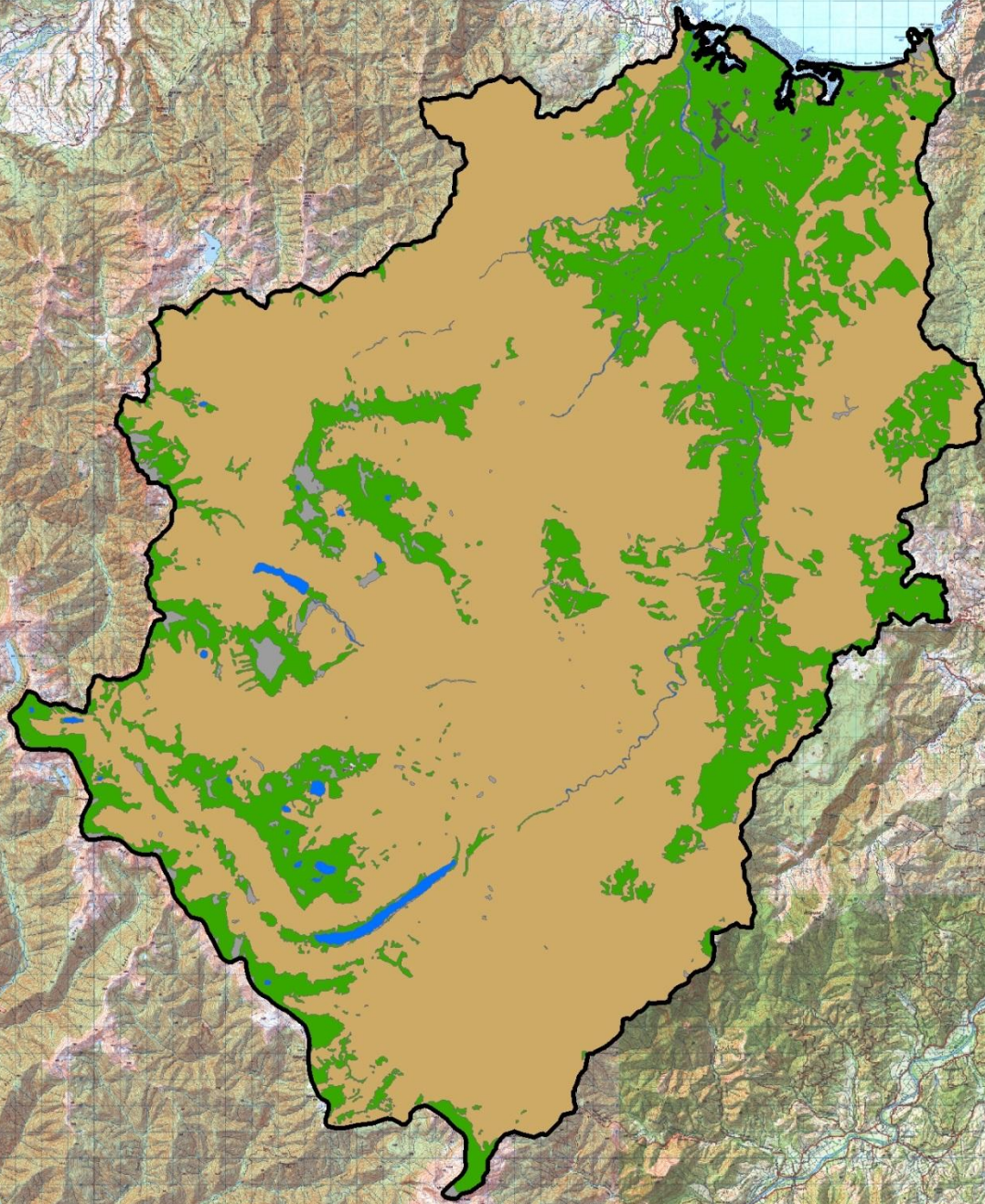
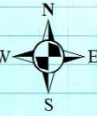
Smap: 600 mm depth

- < 40 mm
- 40-100 mm
- 100-160 mm
- > 160 mm

FSL: 600 mm depth

- < 40 mm
- 40-100 mm
- 100-160 mm
- > 160 mm





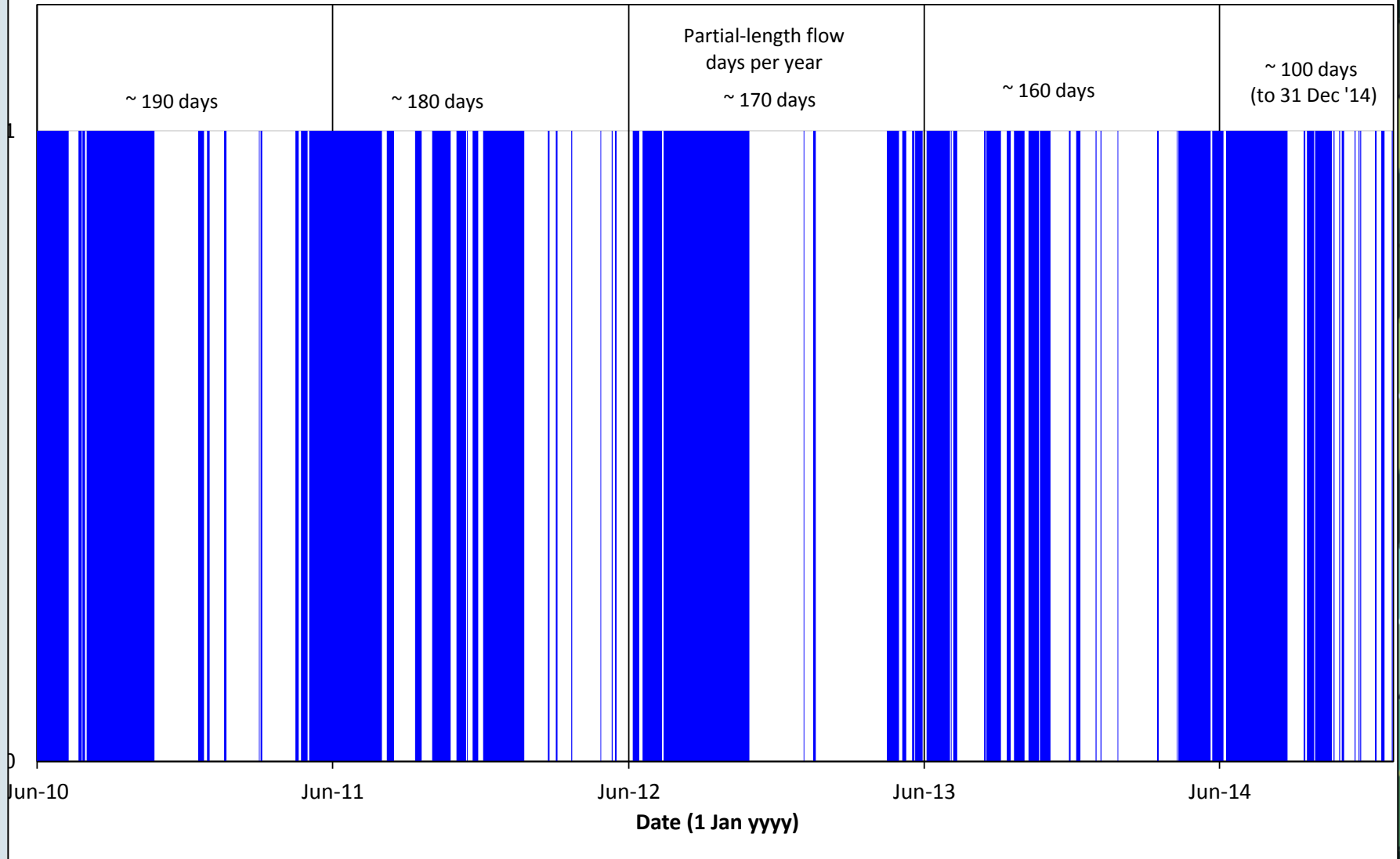
Land use
(LCDB4)

Legend

Simplified land use

- Forest
- Grass
- Gravel or Rock
- Town
- Water

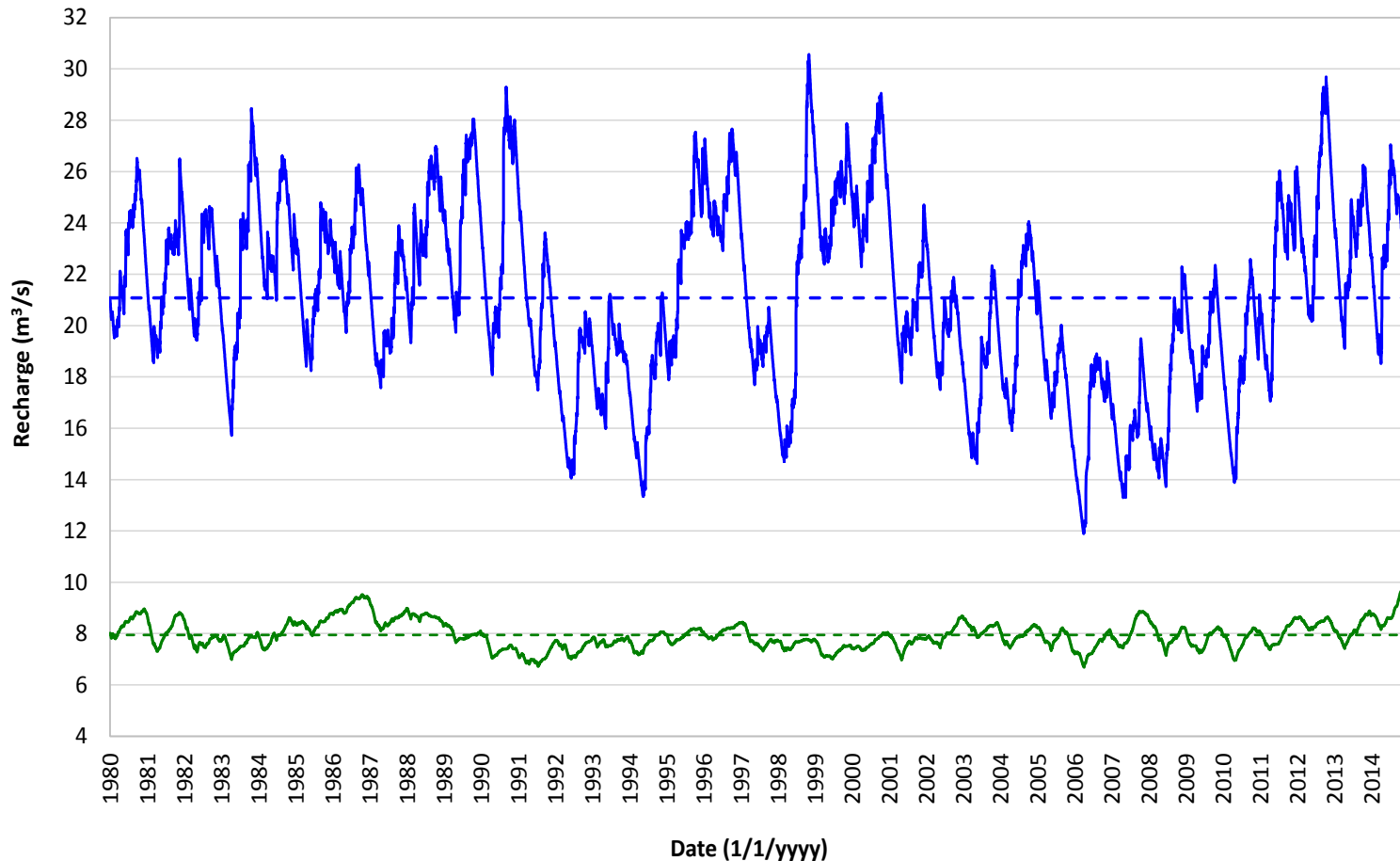
Prediction of Full-Length Flow in the Takaka River



Catchment Flows

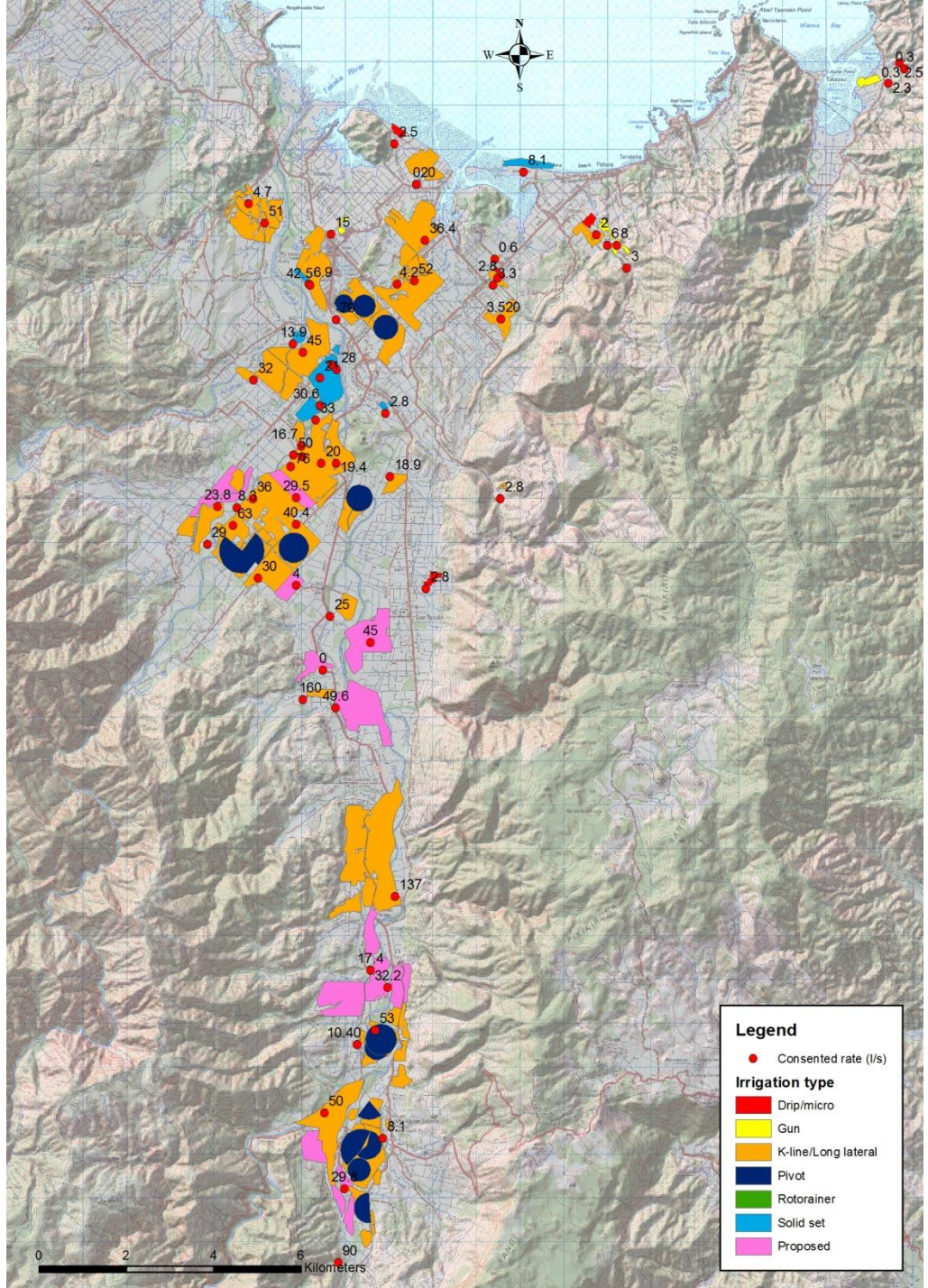
| Flow component | Flow (m ³ /s) |
|------------------------------|--------------------------|
| Inflows | |
| Land surface recharge | 21.3 |
| River recharge | 7.3 |
| River run off down catchment | 36.7 |
| Total in | 65.3 |
| Outflows | |
| Surface water | 57.3 |
| Groundwater (off shore) | 8.0 |
| Total out | 65.3 |

Average Groundwater Recharge
(Exponentially Weighted Moving Average)

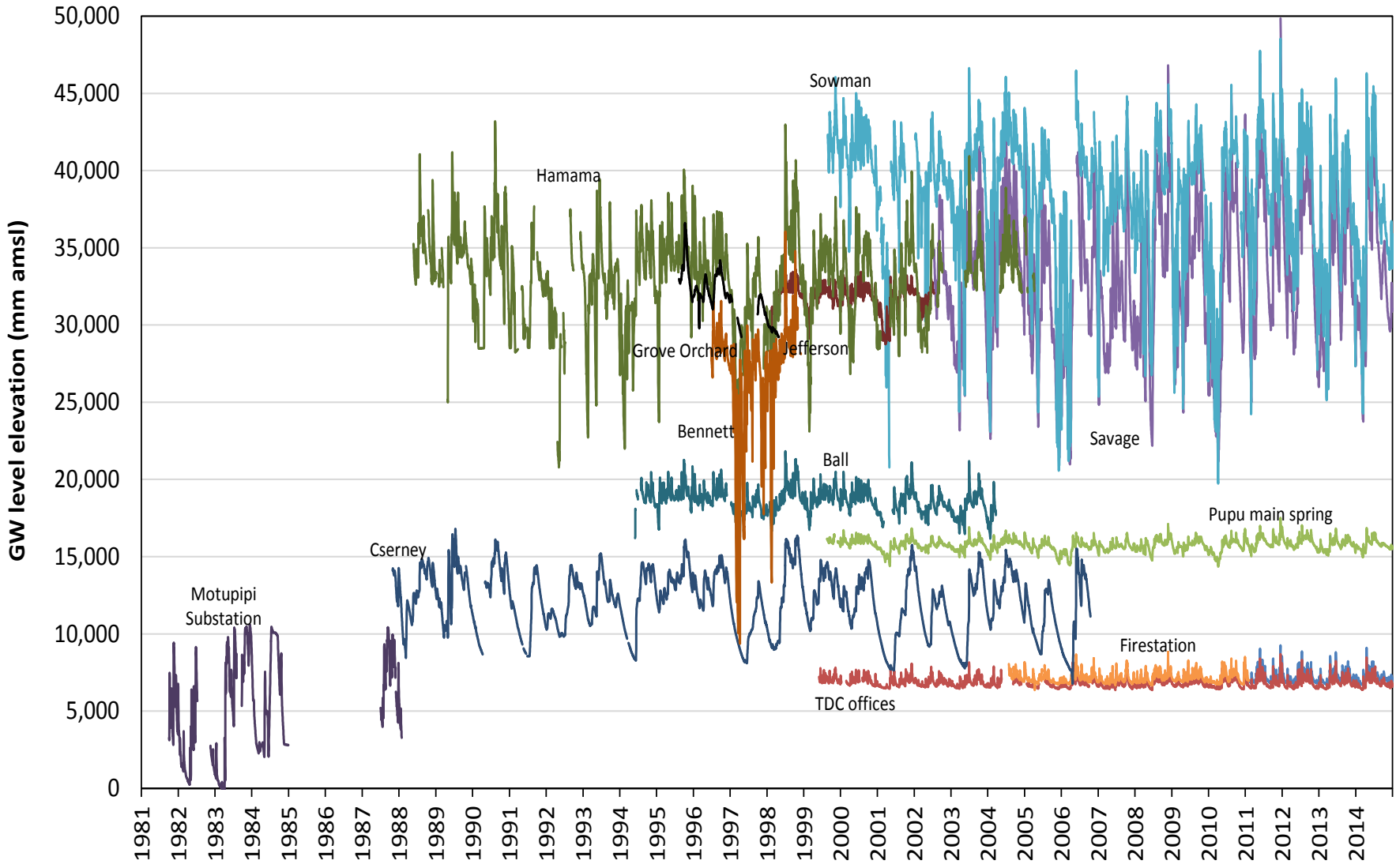


— Land surface recharge
 - - - Average land surface recharge
 — River recharge
 - - - Average river recharge

Existing and Proposed Irrigation



Takaka Groundwater Levels



Date (1 Jan yyyy)

- | | | | | |
|-----------------------------|---------------------|---------------------------|-----------------|--------------------------|
| — Takaka Fire 2 (23648) | — TDC Office (6339) | — Pupu Main Spring (6013) | — Savage (6713) | — Sowman (6912) |
| — Takaka Firestation (6535) | — Cserney (6418) | — Jefferson (6829) | — Hamama (6710) | — Motupipi SubStn (6413) |
| — Ball (6011) | — Bennett (6815) | — Grove Orchard (6224) | | |

Caution

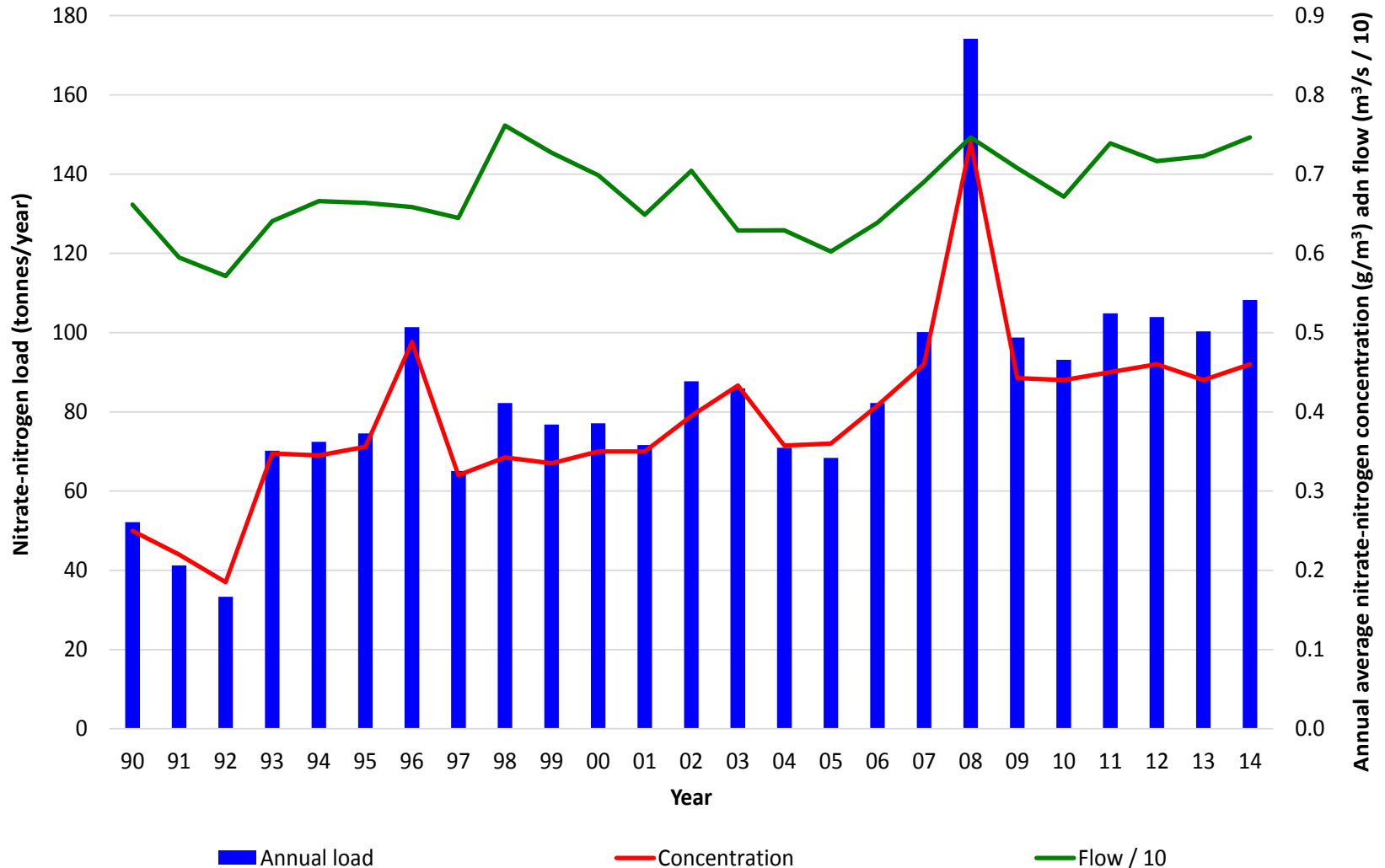
Following figures and data are **INDICATIVE** only and in development.

The presentation is to share methodology, not results, at this stage.



Pupu flows, nitrate loads, concentrations

Pupu Main Spring
Nitrate-Nitrogen



Nitrate trends Puppu (Stark)

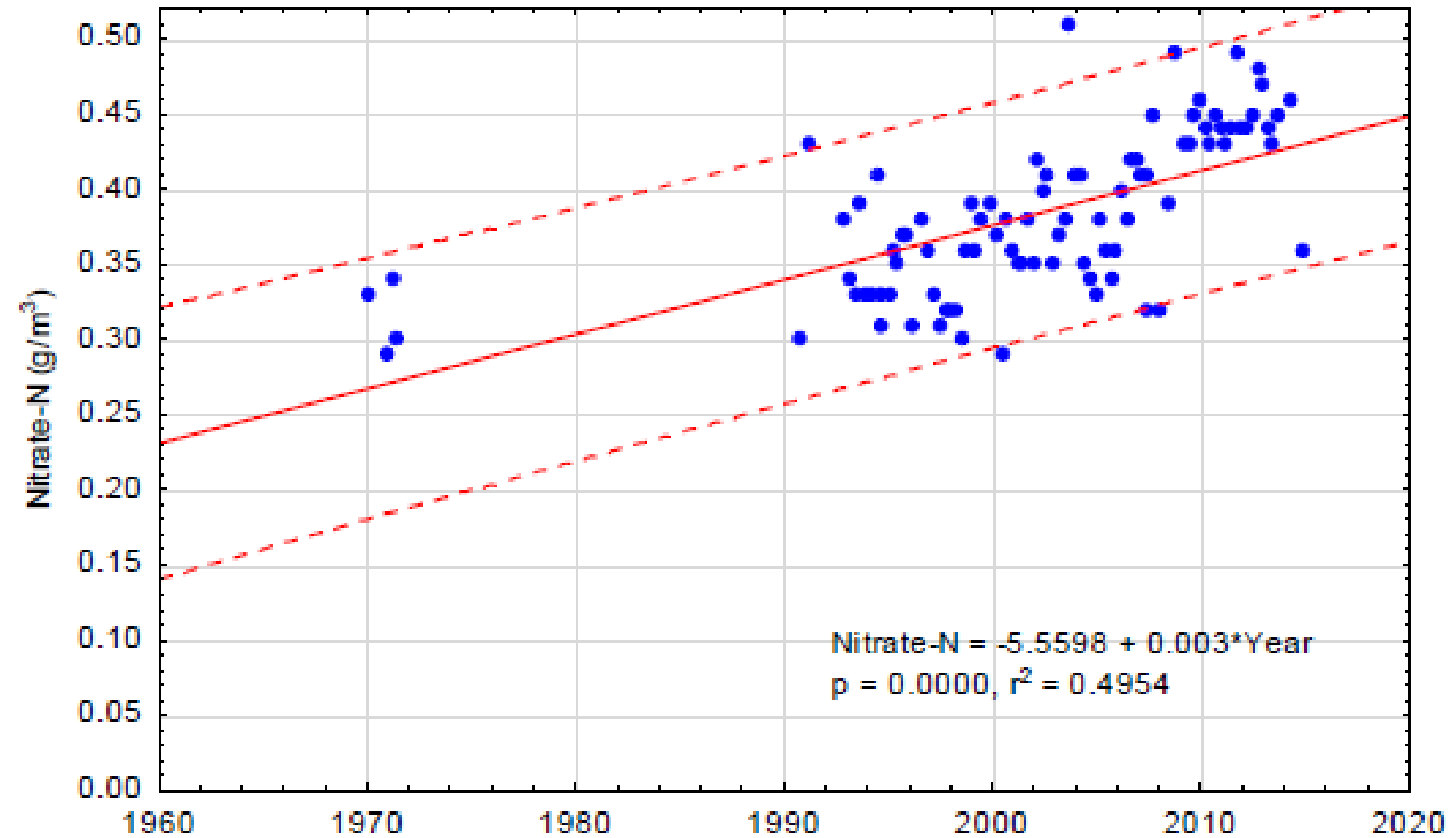


Figure 1 Trend in nitrate-N concentrations in Waikoropupu Springs from Michaelis (1974) for 1970-71 and TDC/GNS data from 1990 to 2014. The dashed lines are 95% prediction limits about the regression line.

Sub-catchment modelled flows

| Flow component | Flow (m ³ /s) | | | |
|-------------------------|--------------------------|------------|-------------|-----------------|
| <i>Aquifer</i> | <i>AMA</i> | <i>TLA</i> | <i>TUGA</i> | <i>Combined</i> |
| <i>Inflows</i> | | | | |
| Land surface recharge | 8.6 | 2.0 | 10.7 | 21.3 |
| River recharge | 1.9 | 0.7 | 4.7 | 7.3 |
| Total in | 10.5 | 2.7 | 15.4 | 28.6 |
| <i>Outflows</i> | | | | |
| Surface water | 7.4 | 0.4 | 12.8 | 20.6 |
| Groundwater (off shore) | 3.1 | 2.3 | 2.6 | 8.0 |
| Total out | 10.5 | 2.7 | 15.4 | 28.6 |

Calculated surface water nitrate loads

| River | Site | Average flow (m ³ /s) (see Error! Reference source not found.) | Average NO ₃ -N (g/m ³) | Mass of NO ₃ -N (tonnes/year) |
|--|----------------------------|---|--|---|
| Takaka River | Kotinga | 33.4 | 0.167 | 176 |
| Anatoki River | One Spec Bridge | 12.0 | 0.027 | 10 |
| One Spec Creek | Takaka River confluence | 0.3 | 0.027 ⁽¹⁾ | 0 |
| Motupipi River | Reillys Bridge | 0.5 | 1.35 | 20 |
| Waikoropupu River | Springs River | 10.6 | 0.36 ⁽²⁾ | 120 |
| Misc. eastern streams (Motupipi through Pohara) | Various | 0.5 | 0.2 ⁽³⁾ | 3 |
| | | | Total | 329 |

Calculated land surface nitrate loads

| Land cover | Area (ha) | Average NO ₃ -N (kg/ha/year) | Mass of NO ₃ -N (tonnes/year) |
|-----------------------------------|----------------------|---|--|
| Forestry | 67,400 | 3 | 202 |
| Intensive pasture/dairying | 2,226 ⁽¹⁾ | 50 | 111 |
| Dryland/low intensity pasture | 5,514 ⁽²⁾ | 14 | 77 |
| Native grassland / hill scrubland | 16,860 | 2.5 | 42 |
| | | Total | 433 |

Calculated subcatchment nitrate loads

| Flow component | Nitrate-nitrogen (tonnes/year) | | | |
|--|--------------------------------|------------|------------|-------------|
| | <i>Aquifer</i> | <i>AMA</i> | <i>TLA</i> | <i>TUGA</i> |
| <i>Input</i> | | | | |
| Land surface | 91 | 35 | 115 | 241 |
| <i>Output</i> | | | | |
| Surface water (groundwater component) | 84 | 31 | 46 | 161 |
| Groundwater (off shore) | 35 | 36 | 38 | 109 |
| Total out | 119 | 67 | 84 | 270 |

Development Scenarios

Scenario 1: No water takes (quasi-natural state)

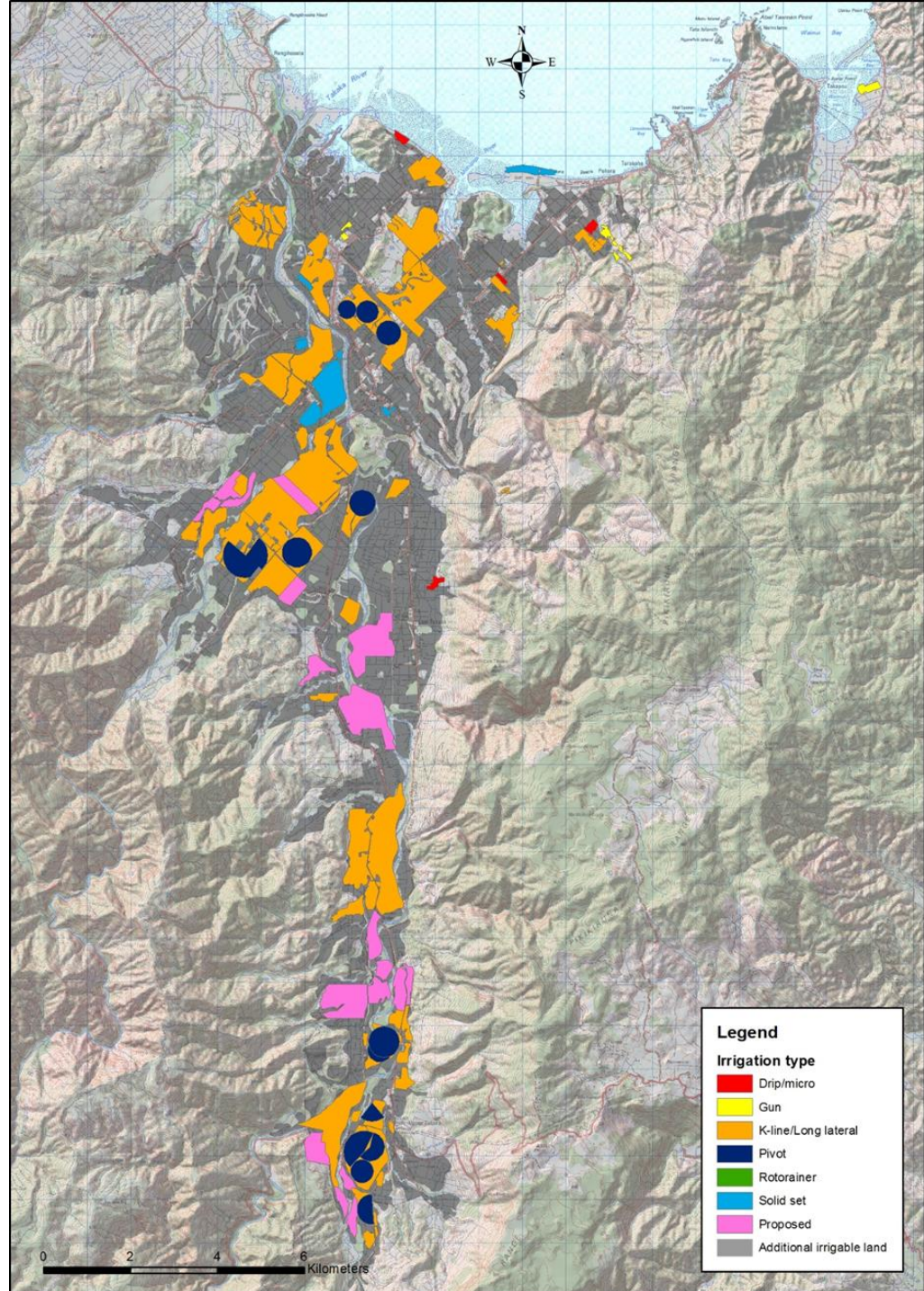
Scenario 2: Double development

Scenario 3: All existing irrigation taken from groundwater

Scenario 4: No Cobb Dam

Scenario 5: No Waingaro River recharge of Pupu

Scenario 2 – double irrigation



Questions

- Any other scenarios to suggest?
- Irrigable land scenario
- Pinch points for contaminant limits – do we have them covered?
- Effects of past vs future land use

