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Groundwater resource update and managed aquifer recharge



This talk is in two halves:

1. state of the groundwater resource quantity and quality and how these have changed since 2009.
2. critical assessment of the possibilities and issues associated with managed aquifer recharge (MAR).



Review of catchment key points





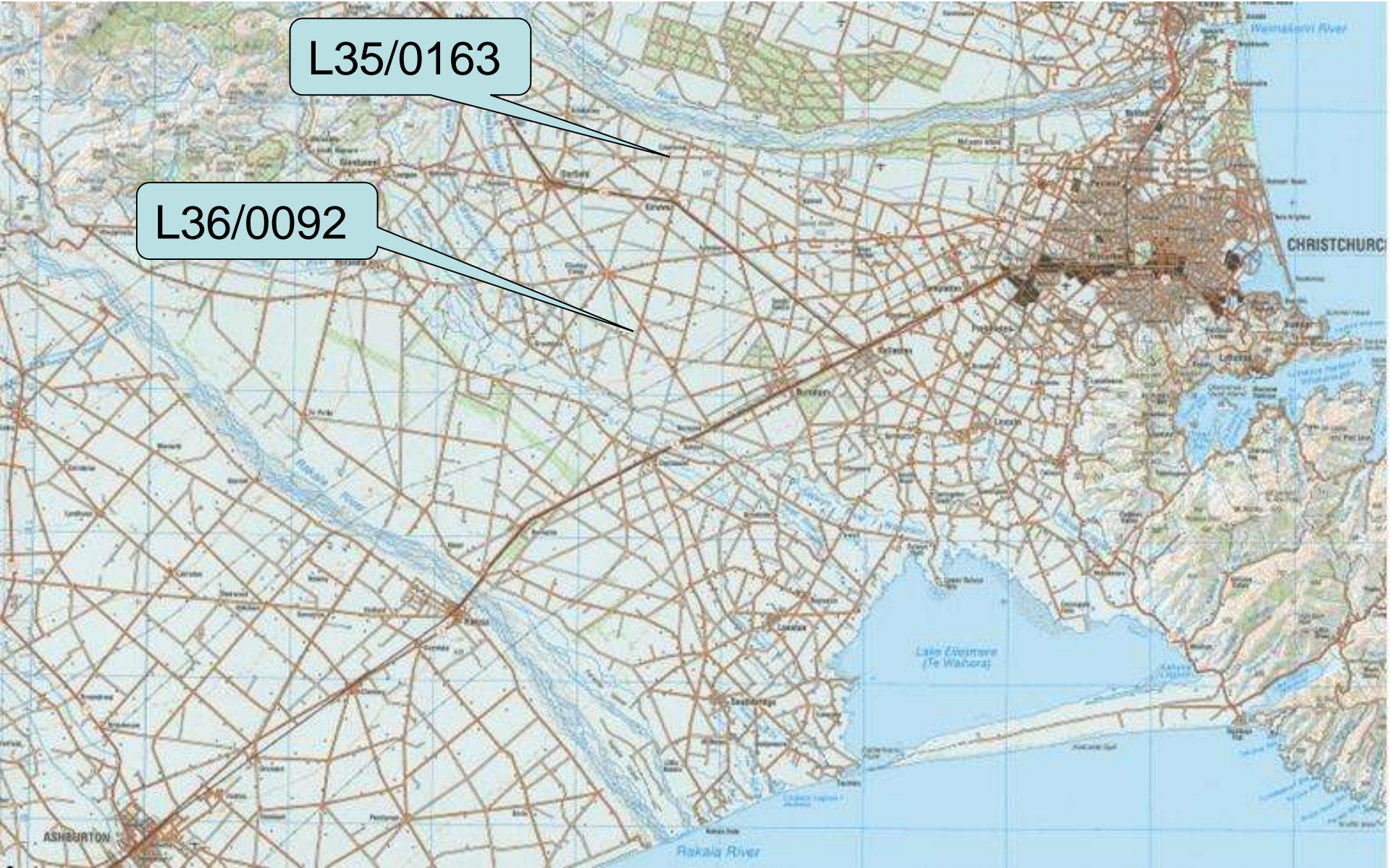
Everything is connected

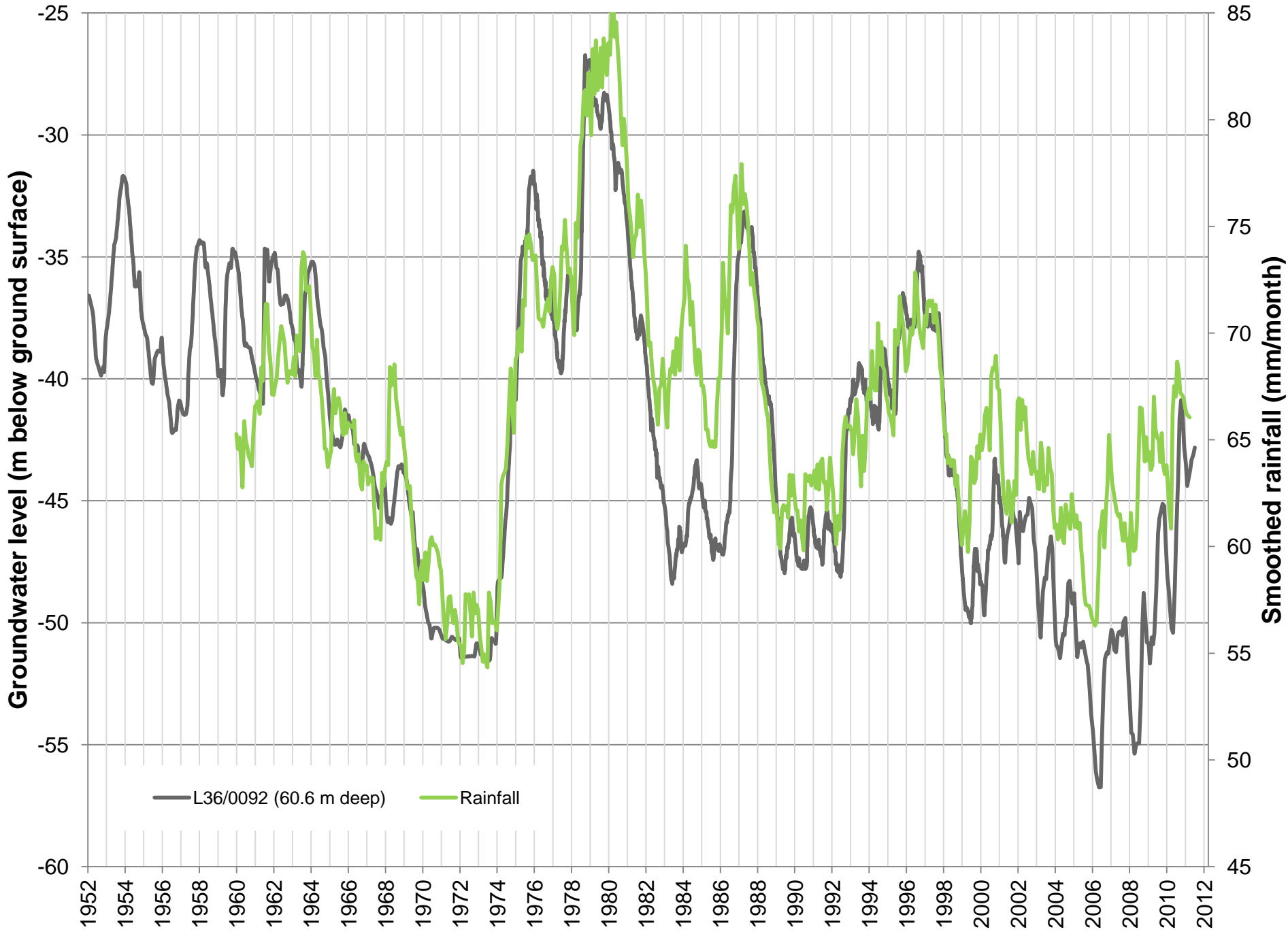


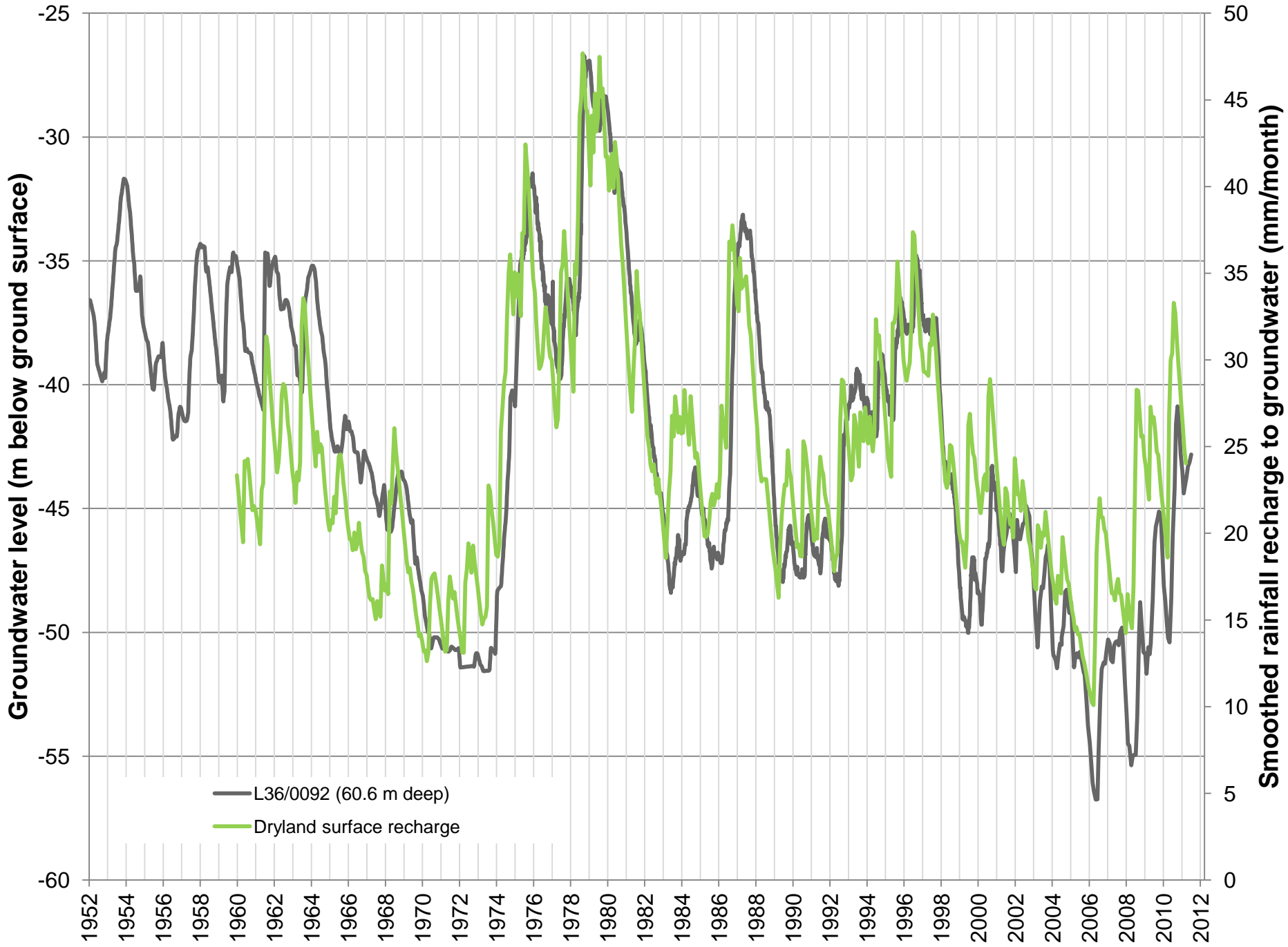
STATE OF RESOURCE:

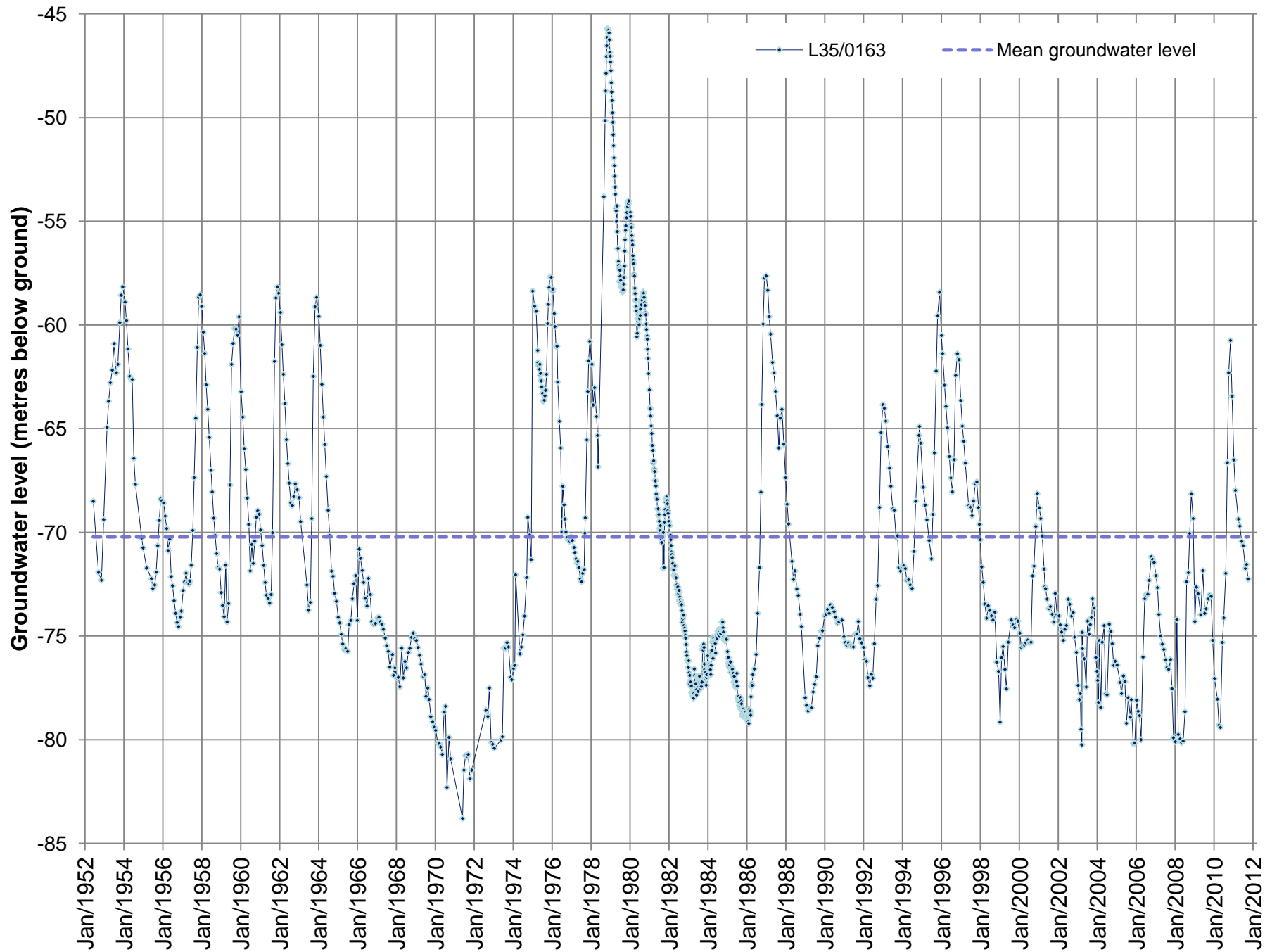
- Groundwater levels are currently about average to above average in most of the catchment.
- Groundwater levels in the northern part of the catchment, especially West Melton, are slightly lower than average.

Groundwater – Quantity:









CHANGE SINCE 2009:

- Levels are much the same as in 2009, perhaps slightly higher as a result of the relatively wet winters, though this winter has been slightly drier than average.
- The biggest change since 2009 has been the gradual rise in deep groundwater levels in the upper parts of the catchment.

Groundwater – Quantity: LESSONS LEARNED SINCE 2009:



STATE OF RESOURCE:

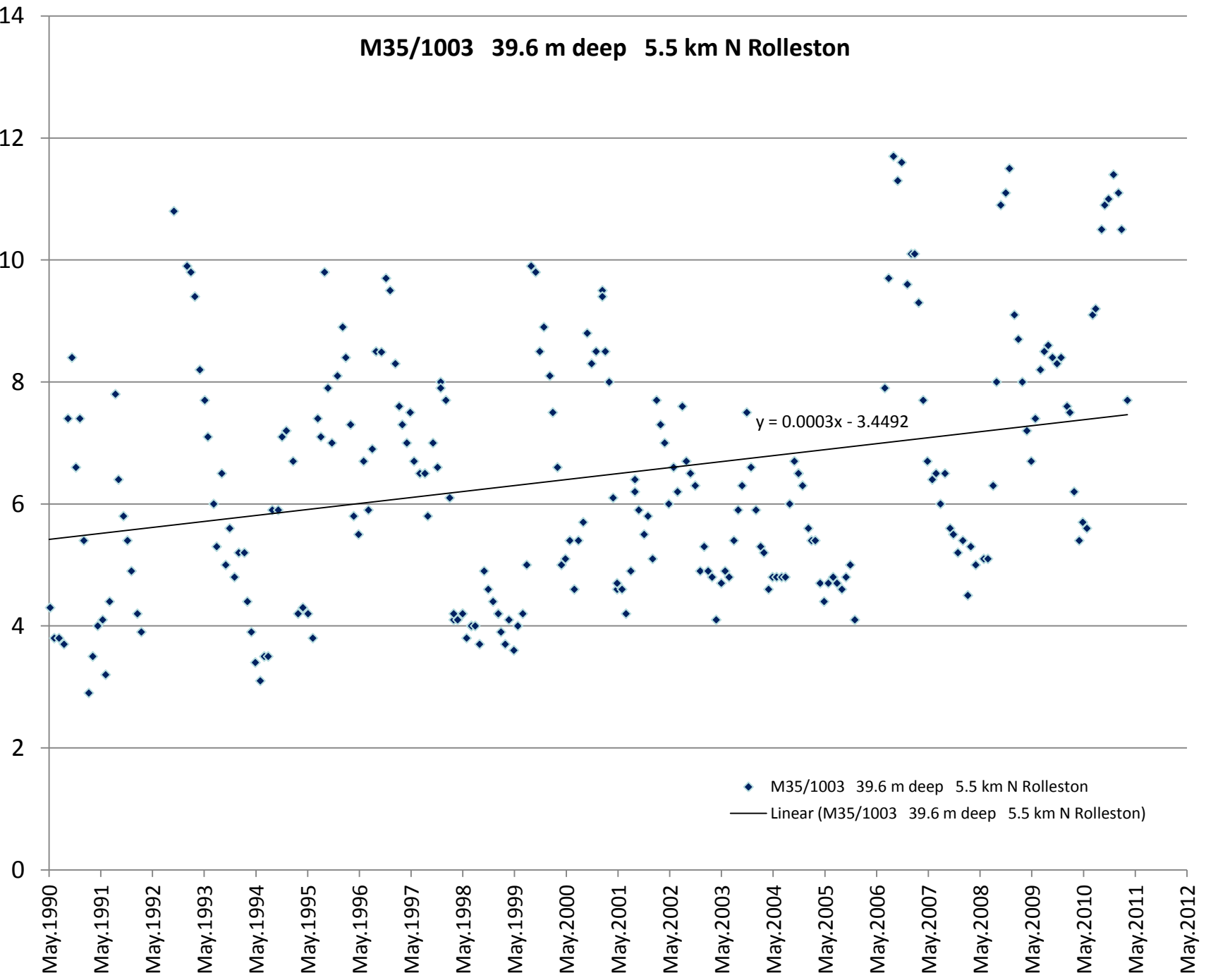
- Groundwater quality as measured by the increase in nitrogen concentration has continued to decline.
- Over the last ten years in 49 wells, 22 show upwards trends, 2 downward, the remainder no clear trend.
- The nitrogen concentration in groundwater and in groundwater-fed streams exceeds ANZECC guidelines.

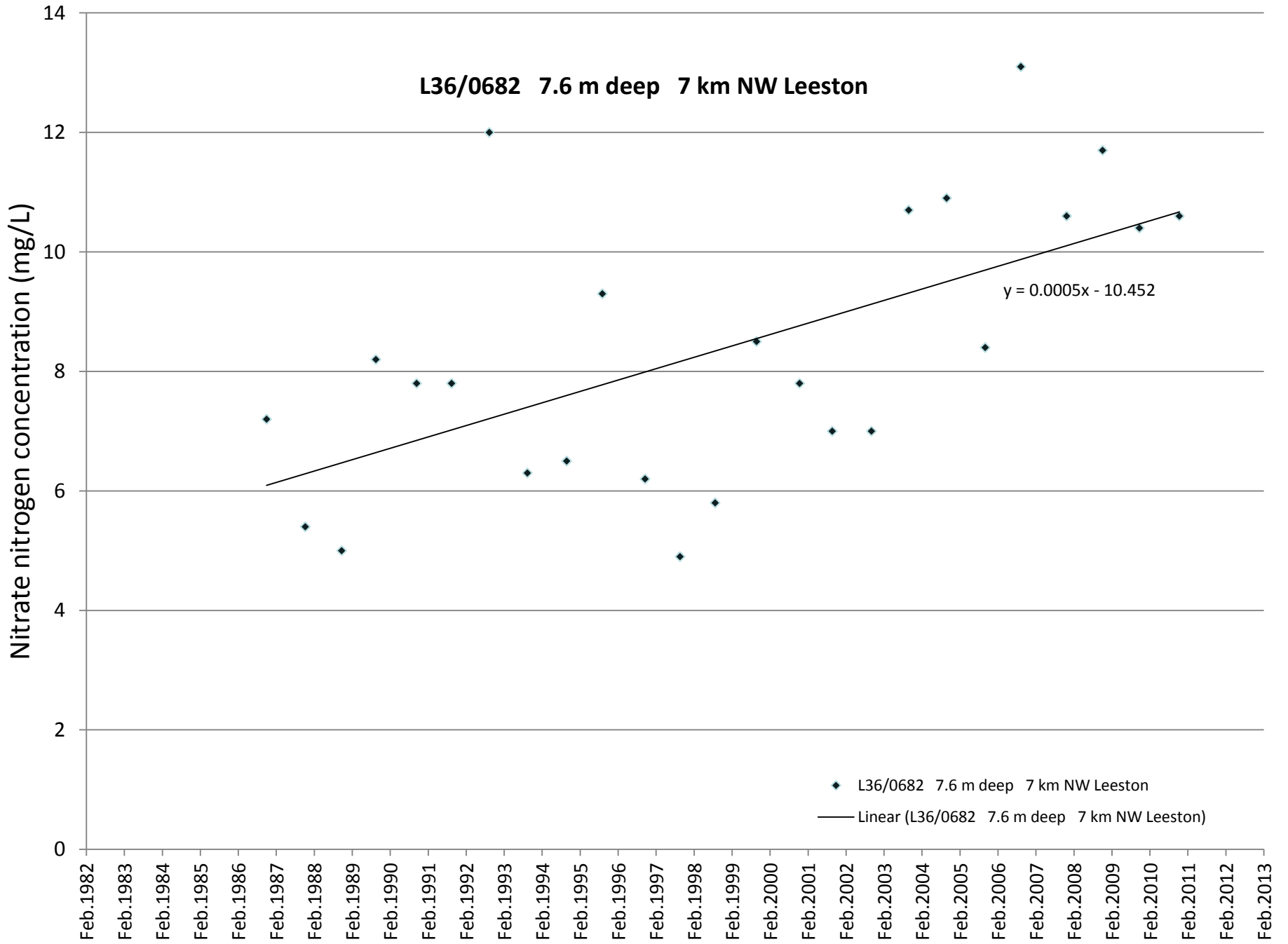
M35/1003 39.6 m deep 5.5 km N Rolleston

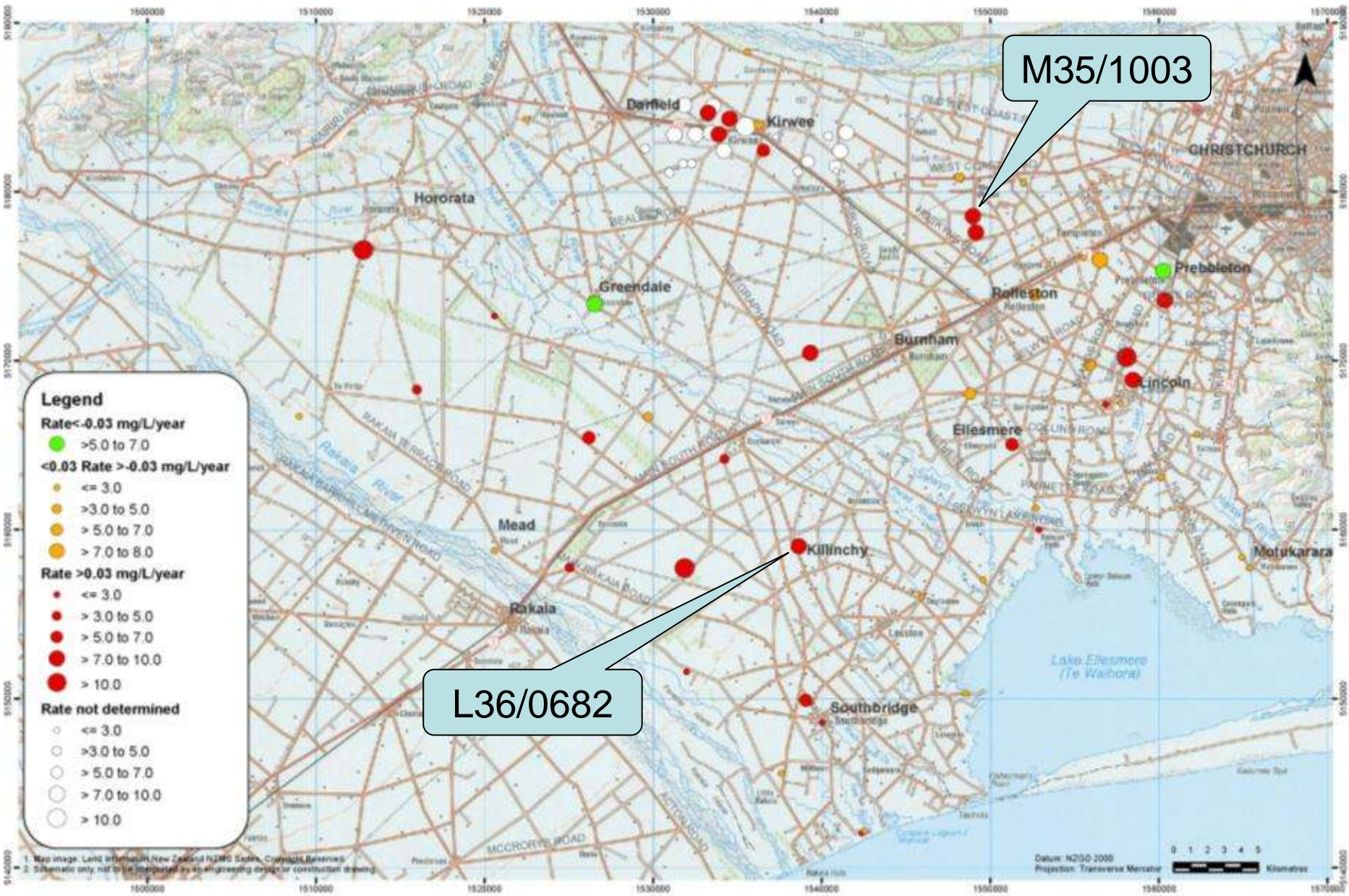
Nitrate nitrogen concentration (mg/L)

$y = 0.0003x - 3.4492$

- ◆ M35/1003 39.6 m deep 5.5 km N Rolleston
- Linear (M35/1003 39.6 m deep 5.5 km N Rolleston)









Groundwater – Quality: CHANGE SINCE 2009





LESSONS LEARNED SINCE 2009:

- Continued and more effective management required.



MAR – 1 Managed aquifer recharge





MAR – 2 Managed aquifer recharge





MAR – 3 Clogging of basins





MAR – Managed aquifer recharge



Managed Aquifer Recharge (MAR) - 4





MAR – 5: Advantages

Issue	Advantages
Recharge time	Recharge when water available
Storage for retrieval	No evaporation of water as in a reservoir
Increase in flows	Recharge timed to provide increase where and when it is needed
Cost	Much less costly than a dam
Water quality	Providing source water is good, stored water quality improved; can be used to 'clean' water



MAR – 6: Disadvantages

Issue	Disadvantages	Solution
Clogging	Unless water has very low turbidity, basins clog	Engineered basins with periodic removal of fines
Storage for retrieval	Not all water recharged can be used	Ensure that un-used water derives an environmental benefit
Unplanned increase in flows	Potential for flooding if recharge winter followed by wet summer	Maintain natural drainage systems to alleviate flooding potential



CONCLUSIONS

- That groundwater levels are healthy, despite dry winter (until mid October!!).
- That continued and more effective management of nitrogen use in the catchment is required if the observed rise in nitrogen levels towards the NZDWS MAV is to be halted.
- MAR can address both these issues.