Technical Memorandum

Date: 14 November 2022

To: James McMahon, COO Australian Capital Equity

From: Dr. Glenn Harrington & Dr. Tariq Laattoe

Subject: Model simulation of alternative pumping scenarios for Napier Downs Project

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Background

Innovative Groundwater Solutions Pty Ltd. (IGS) was requested by Australian Capital Equity (ACE) to undertake additional groundwater modelling scenarios to support the application for a groundwater extraction licence for Napier Downs Station. This comes after IGS has already undertaken extensive investigations and modelling for the H3 Hydrogeological Assessment report, which the Department for Water and Environmental Regulation (DWER) praised for its rigour and content but were not willing to accept the predicted levels of drawdown impact at key environmental receptors under a 6.0 GL/a. extraction scenario (i.e., 8 centre pivots).

In June 2022, IGS ran an alternative pumping scenario of 3.0 GL/a. (4 pivots) using the same ensemble of 218 groundwater model realisations that were adopted for the H3 report. Preliminary results were provided to ACE including hydrographs and summary tables of predicted (P10, P50 and P90) drawdown after 1, 10 and 30 years at three receptors: Ngooderoodyne Spring, Hawkstone Creek[1] and the closest groundwater-fed pool in the Lennard River.

IGS has now run an additional four alternative pumping scenarios with the ensemble of 218 numerical groundwater models: 4.5 GL/a. (6 pivots), 1.5 GL/a. (2 pivots), 0.75 GL/a. (1 pivot) and 0.60 GL/a. (1 pivot with low water use).

Results

Results from all scenarios are included herein for ease of comparison, firstly as summary tables for each scenario and then as simulated hydrographs.

Recommendation

Based upon these results, we recommend that ACE pursues a groundwater extraction licence for an amended volume of no less than 1.5 GL/a. This would result in a median (P50) predicted drawdown after 10 years of only 0.25 m at Ngooderoodyne Spring, 0.78 m beneath Hawkstone Creek, and 0.11 m at the Lennard River pool. Routine monitoring of groundwater levels prior to the commencement of any groundwater extraction will demonstrate that these magnitudes of predicted drawdown will be dwarfed by the seasonal and inter-annual variations in the water table that are caused by climate variability.

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[1] The Hawkstone Creek site was not previously used for the H3 report but was selected following requests from DWER to understand potential impacts to deep-rooted terrestrial vegetation. Coordinates for this site are 650940 mE 8093770 mN.

6.0 GL/a. (8 pivot bores)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek
Predicted Drawdown After 1 Year (m)			
P10	0.07	0.24	0.93
P50	0.12	0.00	1.07
P90	0.08	0.01	1.27
Predicted Drawdown After 10 Years (m)			
P10	0.79	0.41	3.03
P50	1.01	0.46	3.60
P90	1.27	0.68	4.74
Predicted Drawdown After 30 Years (m)			
P10	0.96	0.45	3.27
P50	1.16	0.67	4.00
P90	1.55	0.91	5.65

4.5 GL/a. (6 pivot bores)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek*
Predicted Drawdown After 1 Year (m)			
P10	0.05	0.01	0.74
P50	0.09	0.00	0.82
P90	0.11	0.01	0.99
Predicted Drawdown After 10 Years (m)			
P10	0.60	0.30	2.31
P50	0.79	0.35	2.77
P90	0.99	0.56	3.67
Predicted Drawdown After 30 Years (m)			
P10	0.72	0.35	2.53
P50	0.87	0.52	3.12
P90	1.19	0.73	4.45

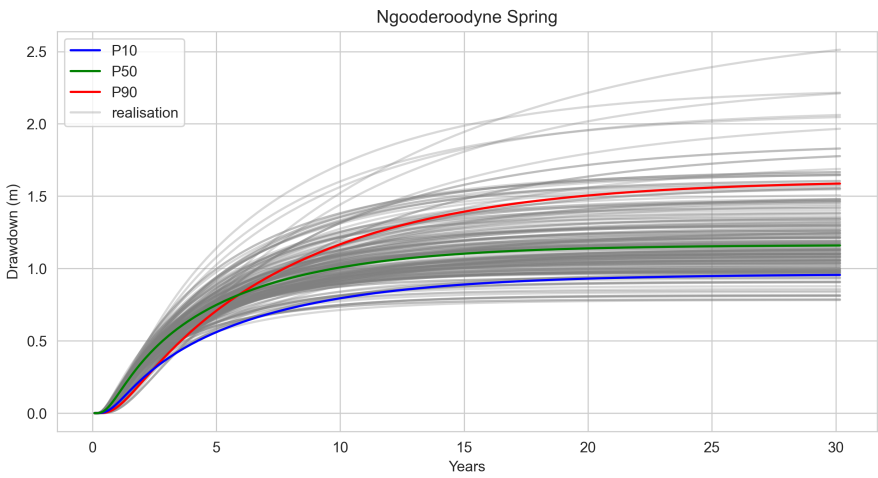
3.0 GL/a. (4 pivot bores)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek
Predicted Drawdown After 1 Year (m)			
P10	0.04	0.00	0.42
P50	0.05	0.00	0.44
P90	0.08	0.00	0.52
Predicted Drawdown After 10 Years (m)			
P10	0.41	0.17	1.44
P50	0.52	0.22	1.67
P90	0.67	0.19	2.25
Predicted Drawdown After 30 Years (m)			
P10	0.48	0.22	1.58
P50	0.59	0.32	1.93
P90	0.80	0.46	2.74

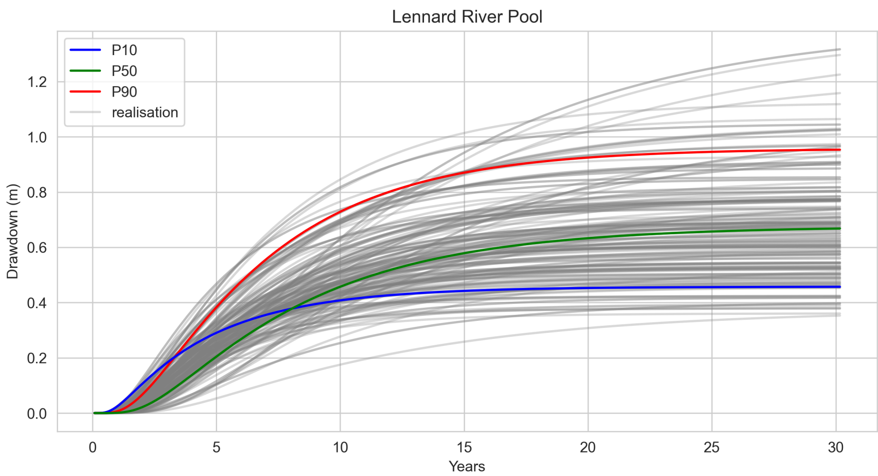
1.5 GL/a. (2 pivot bores)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek*
Predicted Drawdown After 1 Year (m)			
P10	0.02	0.00	0.18
P50	0.03	0.00	0.16
P90	0.03	0.00	0.23
Predicted Drawdown After 10 Years (m)			
P10	0.20	0.08	0.68
P50	0.25	0.11	0.78
P90	0.34	0.15	1.02
Predicted Drawdown After 30 Years (m)			
P10	0.24	0.1	0.75
P50	0.29	0.14	0.90
P90	0.40	0.21	1.29

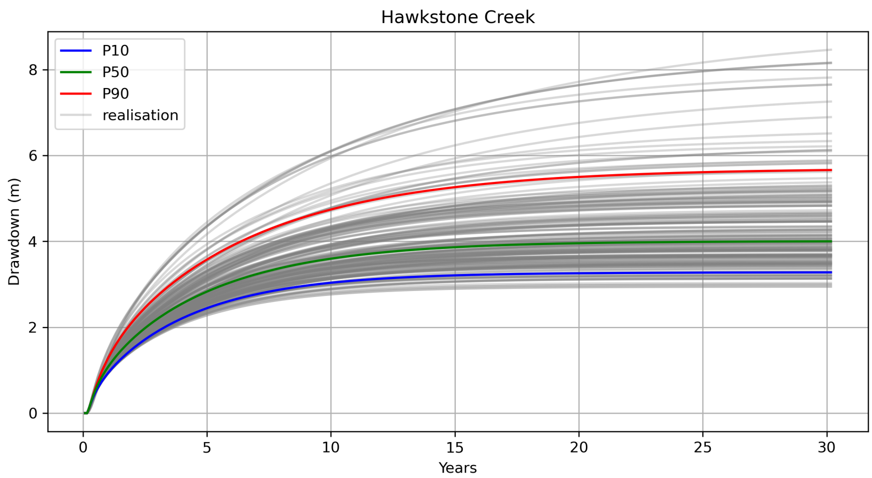
0.75 GL/a. (1 pivot bore)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek*
Predicted Drawdown After 1 Year (m)			
P10	0.02	0.00	0.08
P50	0.02	0.00	0.10
P90	0.02	0.00	0.06
Predicted Drawdown After 10 Years (m)			
P10	0.11	0.04	0.31
P50	0.13	0.05	0.38
P90	0.17	0.07	0.45
Predicted Drawdown After 30 Years (m)			
P10	0.12	0.05	0.34
P50	0.15	0.07	0.42
P90	0.20	0.10	0.6

0.6 GL/a. (1 pivot bore)	Ngooderoodyne Spring	Lennard River Pool	Hawkstone Creek*
Predicted Drawdown After 1 Year (m)			
P10	0.02	0.00	0.06
P50	0.02	0.00	0.08
P90	0.02	0.00	0.08
Predicted Drawdown After 10 Years (m)			
P10	0.09	0.03	0.25
P50	0.11	0.04	0.30
P90	0.14	0.03	0.39
Predicted Drawdown After 30 Years (m)			
P10	0.10	0.04	0.27
P50	0.12	0.05	0.33
P90	0.16	0.07	0.47

6.0 GL/a. (8 pivot bores)







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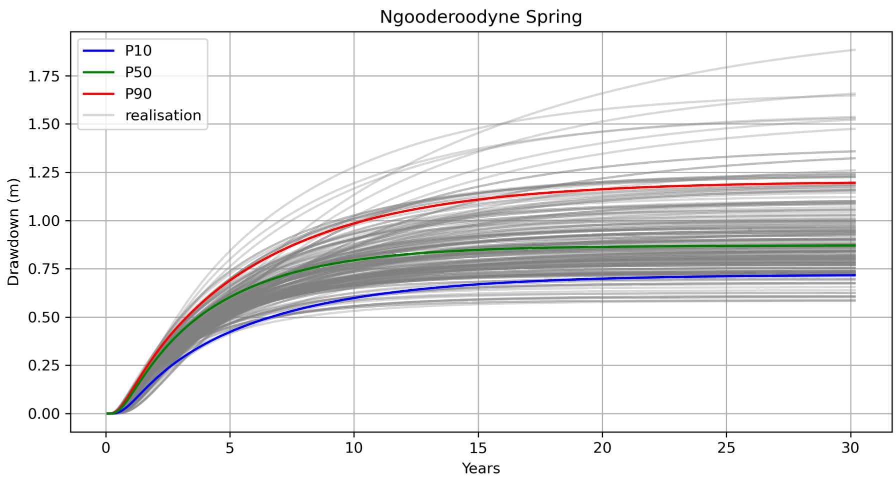

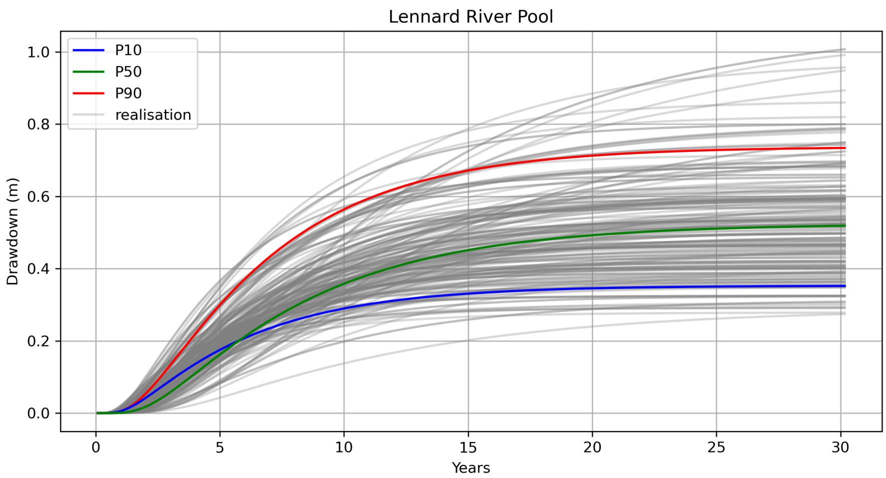

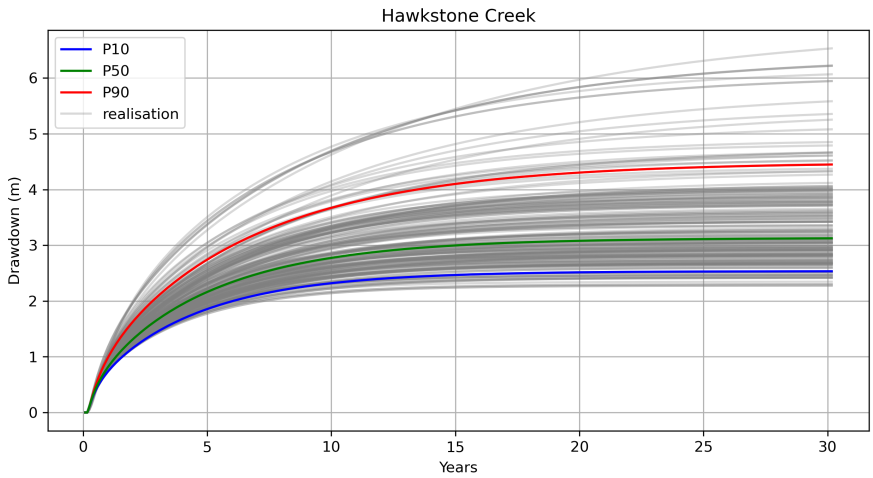

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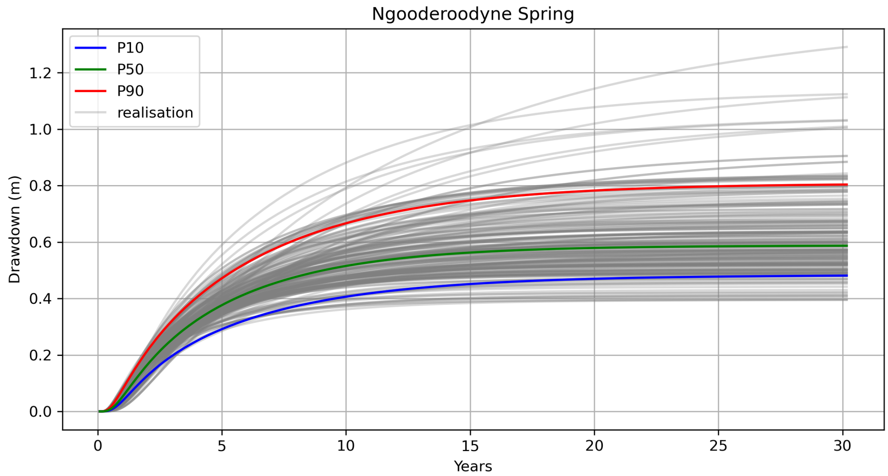

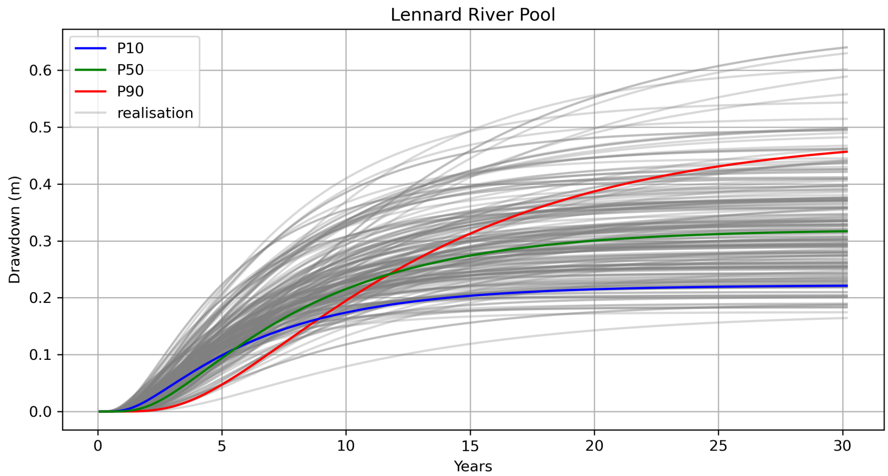

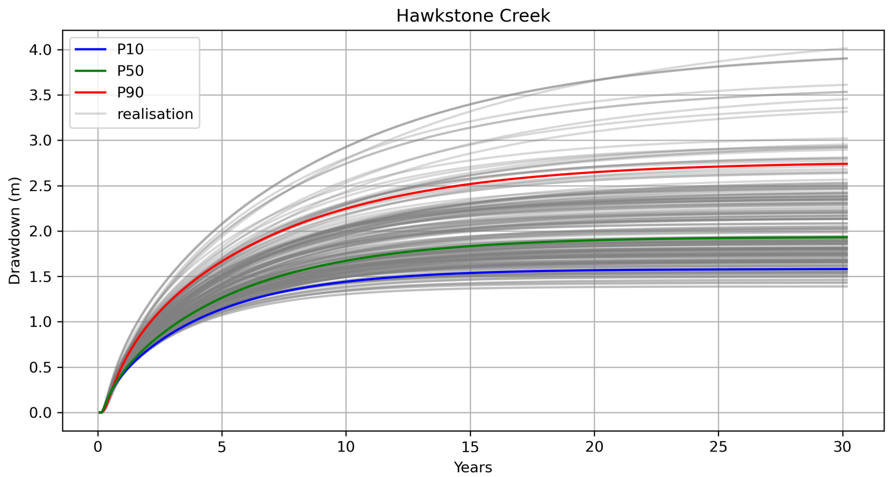

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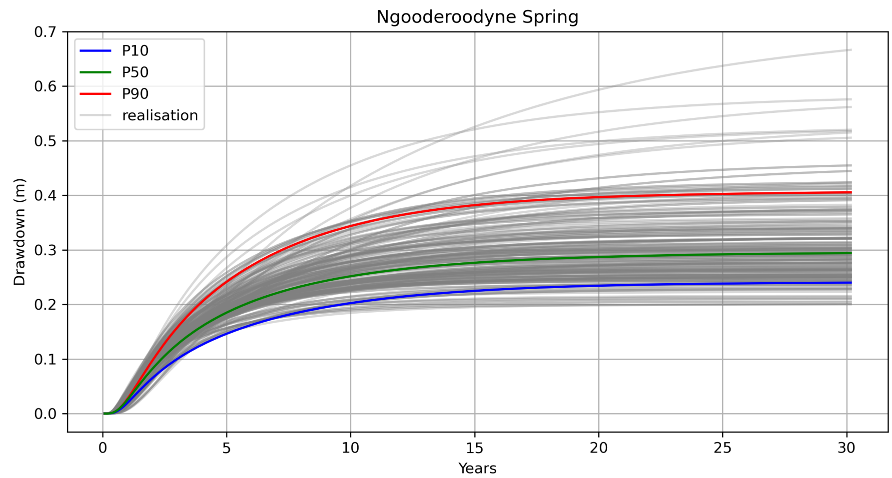

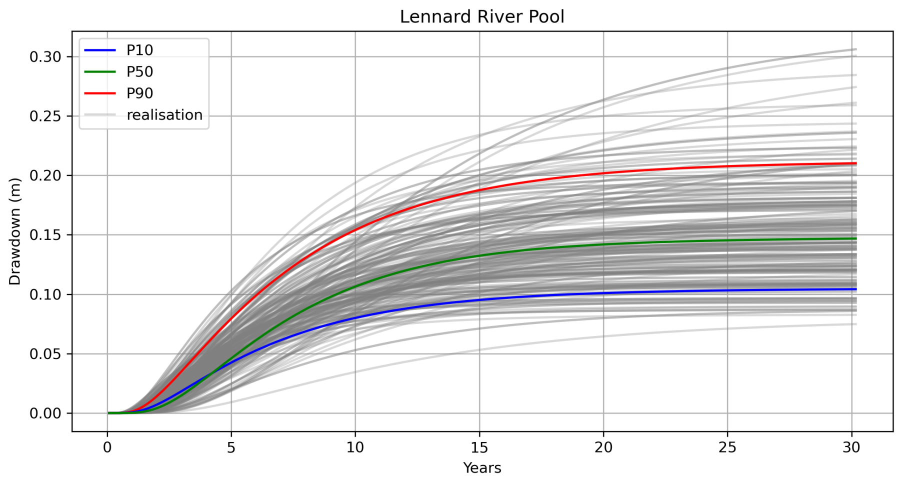

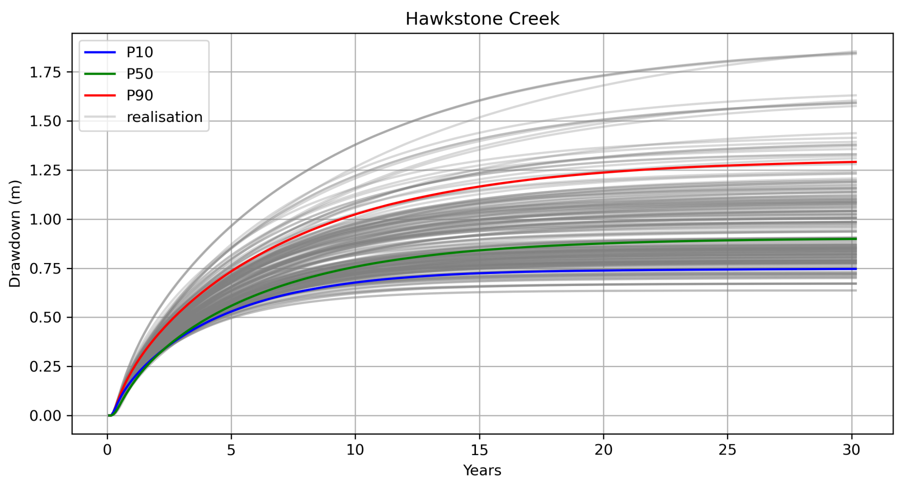

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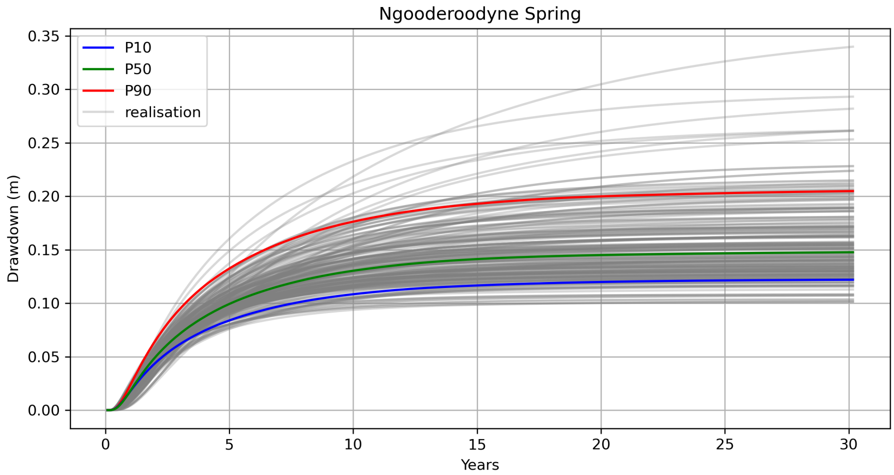

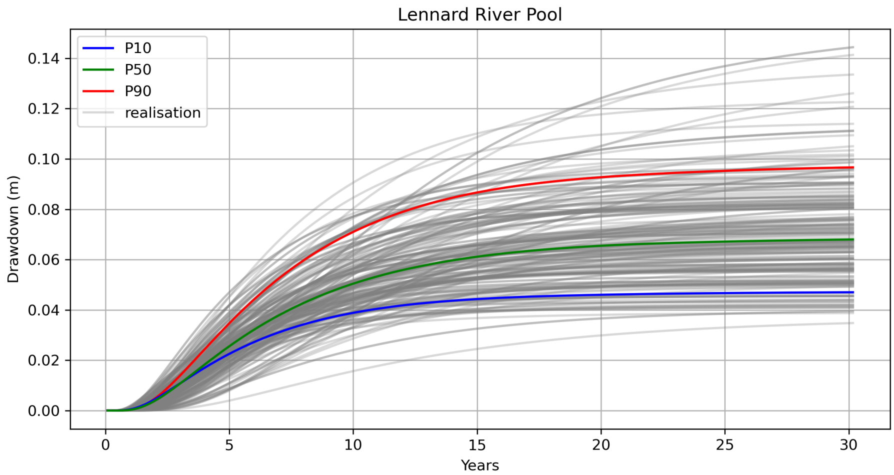

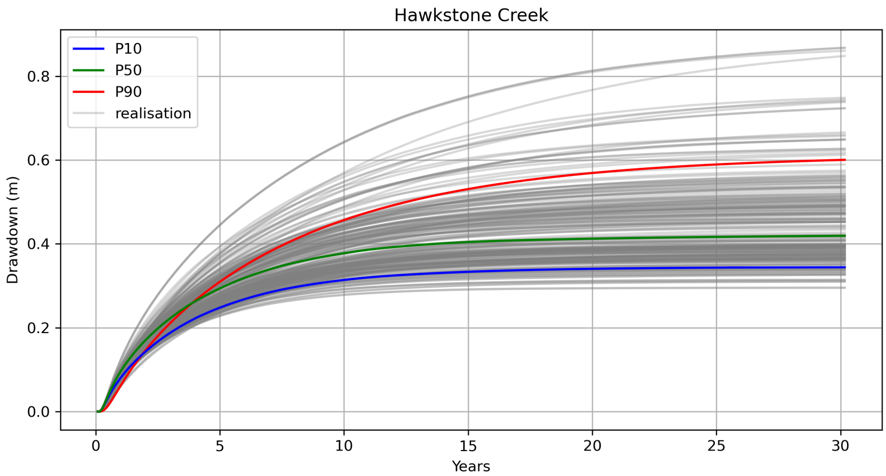

0.6 GL/a. (1 pivot bores)