Figure S1. Flow diagram of the Null-Space Monte Carlo methodology.

Table S1. Summary of the modelled parameters (initial and after calibration) of the numerical model implemented for Site 2.

	Regional model (m/s)				Local model (m/s)			
	Initial min	Initial max	Calibrated min	Calibrated max	Initial min	Initial max	Calibrated min	Calibrated Max
Horizontal hydraulic conductivity	7.00×10^{-5}	8.80×10^{-4}	4.20×10^{-6}	2.50×10^{-4}	3.00×10^{-4}	3.00×10^{-4}	1.00×10^{-7}	1.20×10^{-4}
Vertical hydraulic conductivity	7.00×10^{-6}	8.80×10^{-5}	4.20×10^{-7}	2.50×10^{-5}	3.00×10^{-5}	3.00×10^{-5}	1.00×10^{-8}	1.20×10^{-5}
Recharge	1.00×10^{-9}	8.00×10^{-9}	2.50×10^{-9}	9.00×10^{-9}	6.00×10^{-9}	6.00×10^{-9}	2.00×10^{-9}	2.50×10^{-9}
Vertical conductivity of bottom river sediments	6.00×10^{-5}	6.00×10^{-3}	4.00×10^{-6}	6.50×10^{-4}	5.00×10^{-7}	4.50×10^{-4}	5.00×10^{-6}	6.50×10^{-5}

Table S2. Mass balance of the Site 2 models [m³/s].

	Regional		Local	
	Inflows	Outflows	Inflows	Outflows
Well		0.31 (12%)		0.015 (15%)
GHB	0.69 (26%)	0.09 (3%)	0.045 (46%)	0.009 (9%)
River	0.22 (8%)	1.74 (66%)	0.021(22%)	0.052 (54%)
Drain		0.51 (19%)		0.021 (22%)
Recharge	1.74 (66%)		0.031(32%)	
TOTAL	2.65 (100%)	2.65(100%)	0.097(100%)	0.097(100%)
Percent error	-0.0000028		-0.00023	

Table S3. Summary of the main characteristics of the Site 1 numerical model.

Pilot Area (395 km²)	
Grid	210 R – 88 C (100 m x 100 m)
Active cell	355.320
Layer	9 (1 to 2 representing the Aquifer A, from 3 to 9 representing the semi-confined Aquifer B)

CH	Water Table m a.s.l. (Colombo et al., 2019)
River	Villoresi, Olona and Seveso with RIV Package (Colombo et al., 2019)
Hydraulic conductivity	Aquifer A: $1*10^{-5}$ and $4*10^{-3}$ m/s Aquifer B: $1*10^{-5}$ and $1.4*10^{-3}$ m/s.
Target	63