Accelerated flushing of contaminants from MSW landfill at the field scale using a 'fill and draw' method

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Supplementary Information

Table S1. Elevation of monitoring wells and piezometers (mNAP = metres above sea level)

Well Number	Response zone	Diameter (mm)	Base level (mNAP)	Elevation of response zone above pilot base (m)
GWA	Fully screened	90	111.6	0 to surface
GWB	Fully screened	90	111.8	0 to surface
GWC	Fully screened	90	112.0	0 to surface
GWD	Fully screened	90	111.6	0 to surface
GWE	Fully screened	90	111.8	0 to surface
GWF	Fully screened	90	112.5	0 to surface
PB1	0.5 m	25	114.5	~3
PB2	0.5 m	25	114.2	~3
PB3	0.5 m	25	111.3	0 (at base)
PB5	0.5 m	25	111.0	0 (at base)
PB7	0.5 m	25	112.0	0 (at base)
PB8	0.5 m	25	114.4	~3

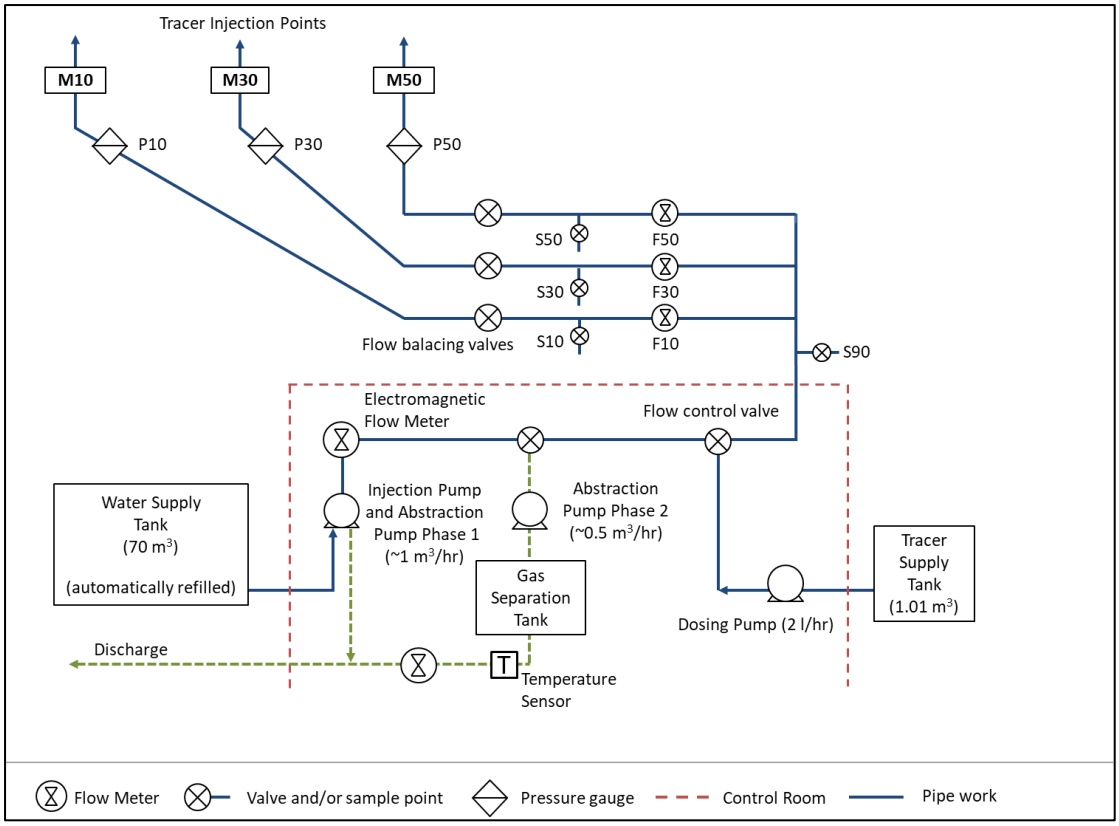

Figure SI 1. Tracer test instrumentation schematic

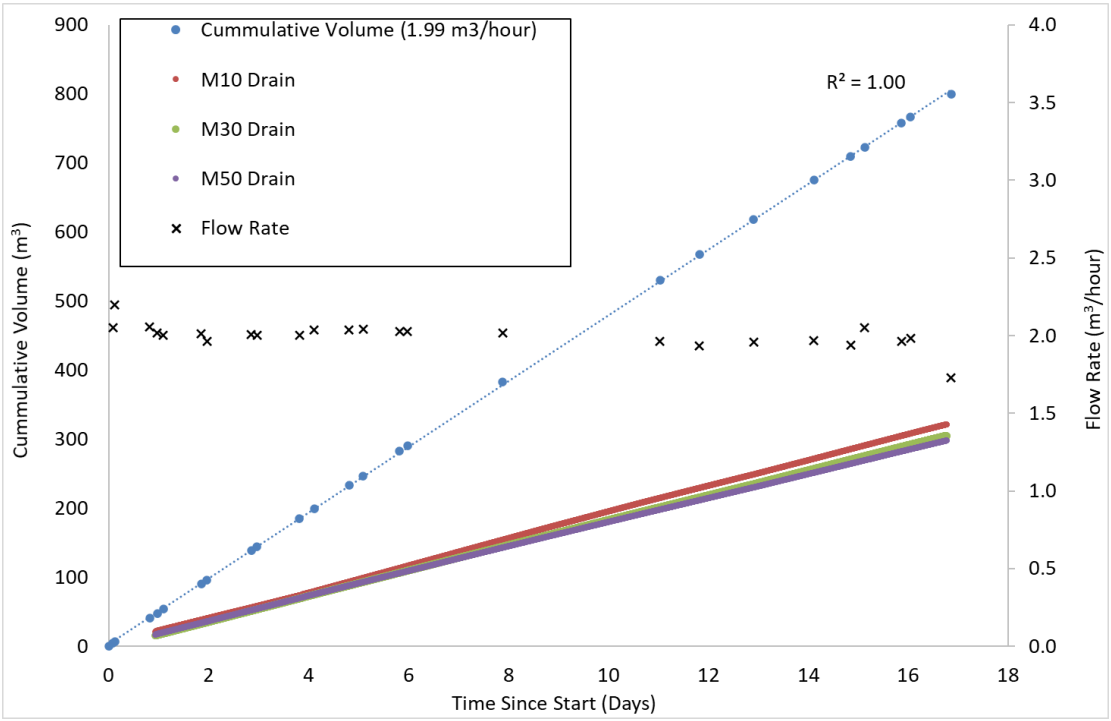

Figure SI 2. Cumulative volume pumped and flow rate measured by main flow meter and three individual drain meters (±6 %)

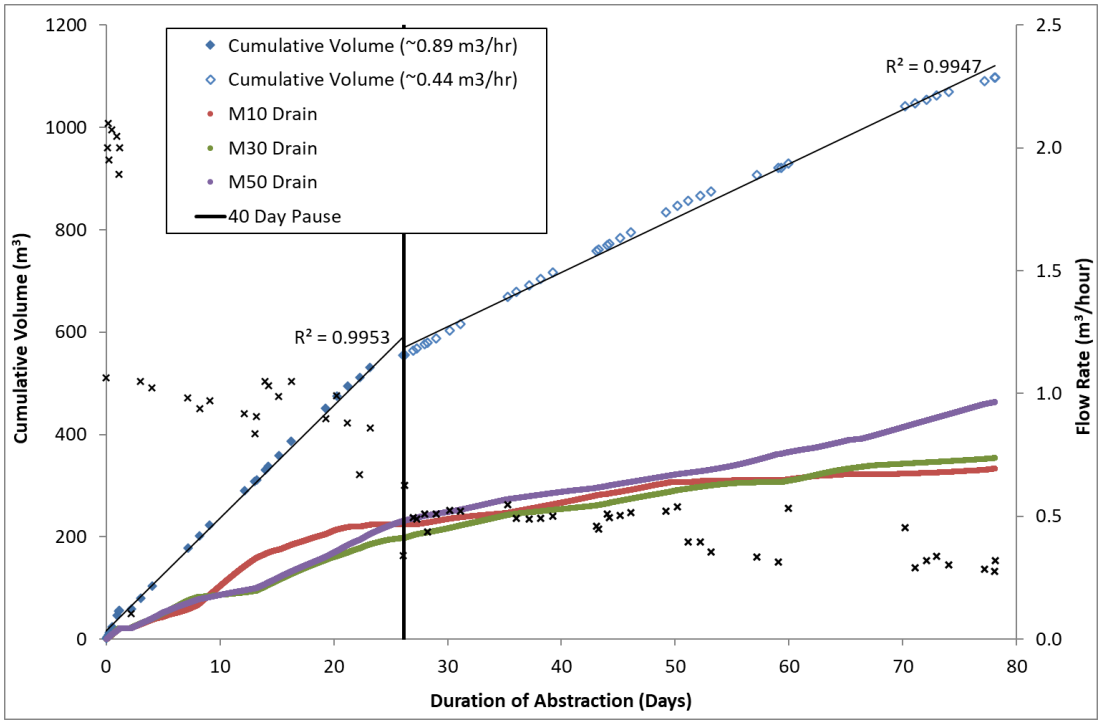

Figure SI 3. Cumulative volume pumped and flow rate measured by main flow meter during abstraction phase 1 and 2 and cumulative flow from individual drains (±6%)

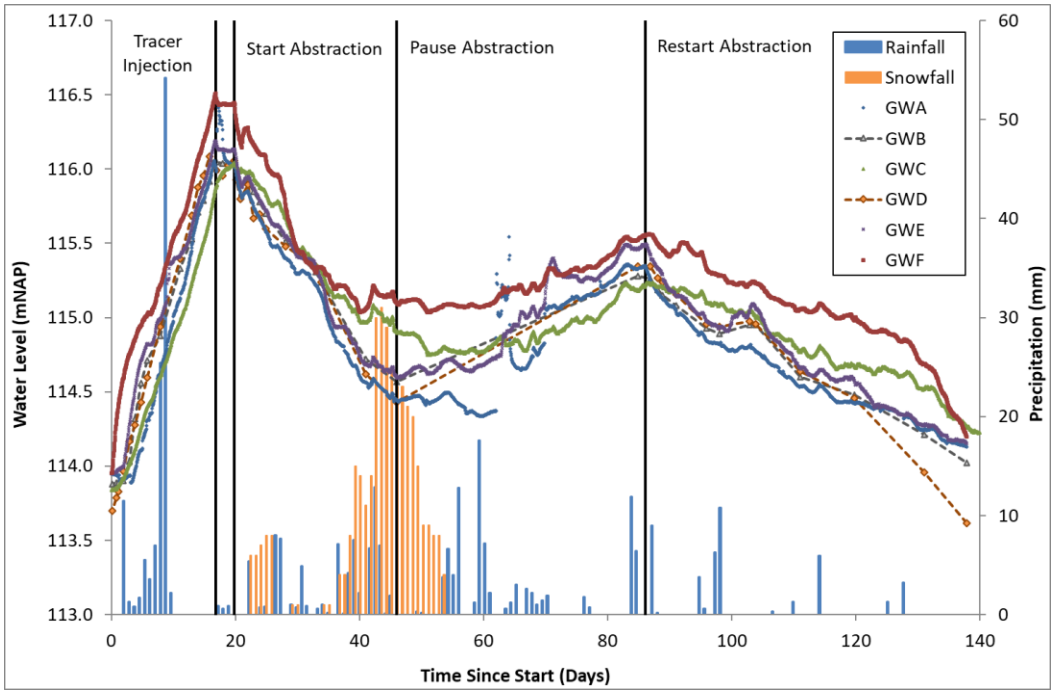

Figure SI 4. Water levels measured in wells plotted as mNAP and daily precipitation (mNAP = metres above sea level). The average base of the landfill basal drainage layer was ~111.5 mNAP.

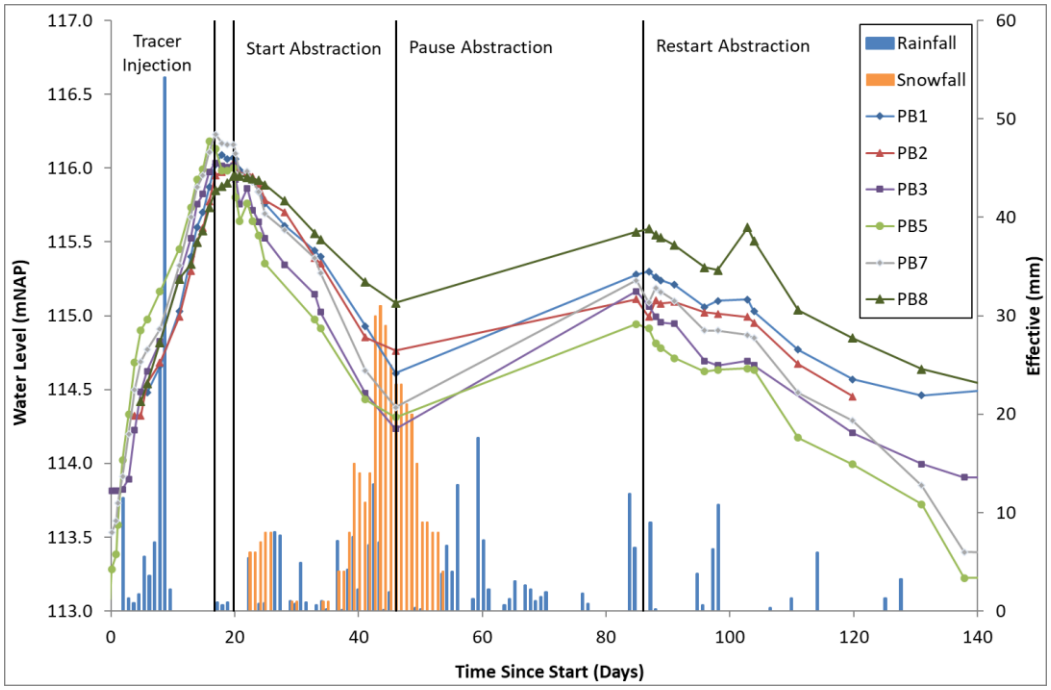

Figure SI 5. Water levels measured in piezometers plotted as mNAP and daily precipitation. The average base of the landfill basal drainage layer was ~111.5 mNAP.

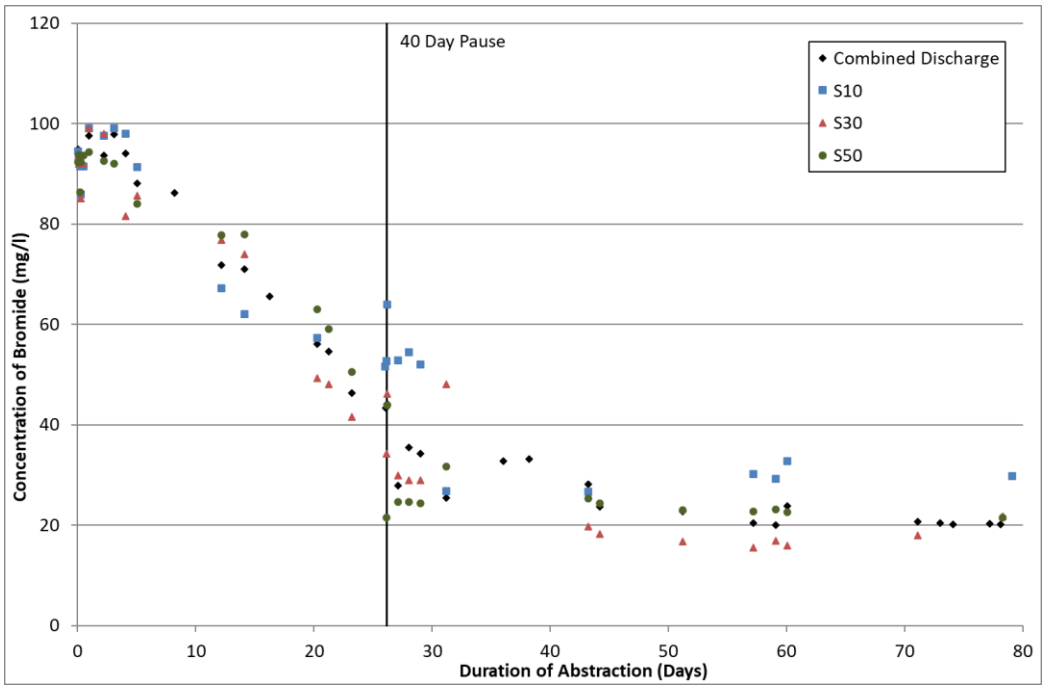

Figure SI 6. Bromide data from samples collected in individual drains (S10, S30 and S50) and the combined (S90)

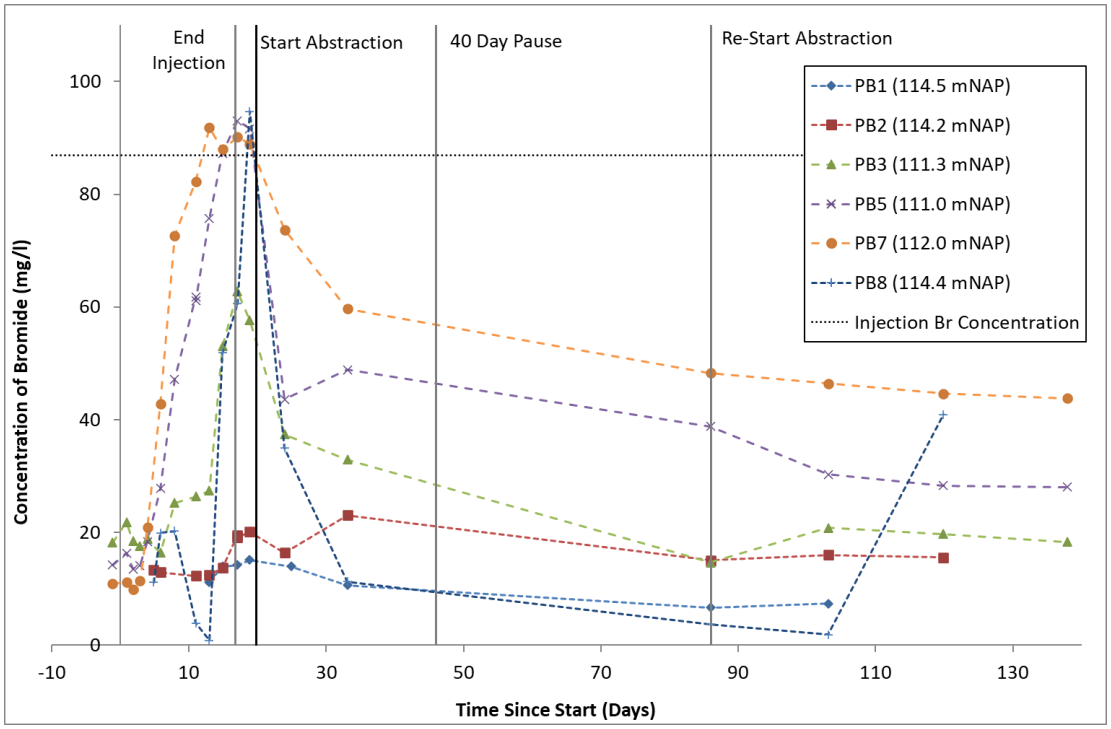

Figure SI 7.1 Bromide concentrations measured in piezometers (base level of piezometer given in mNAP)

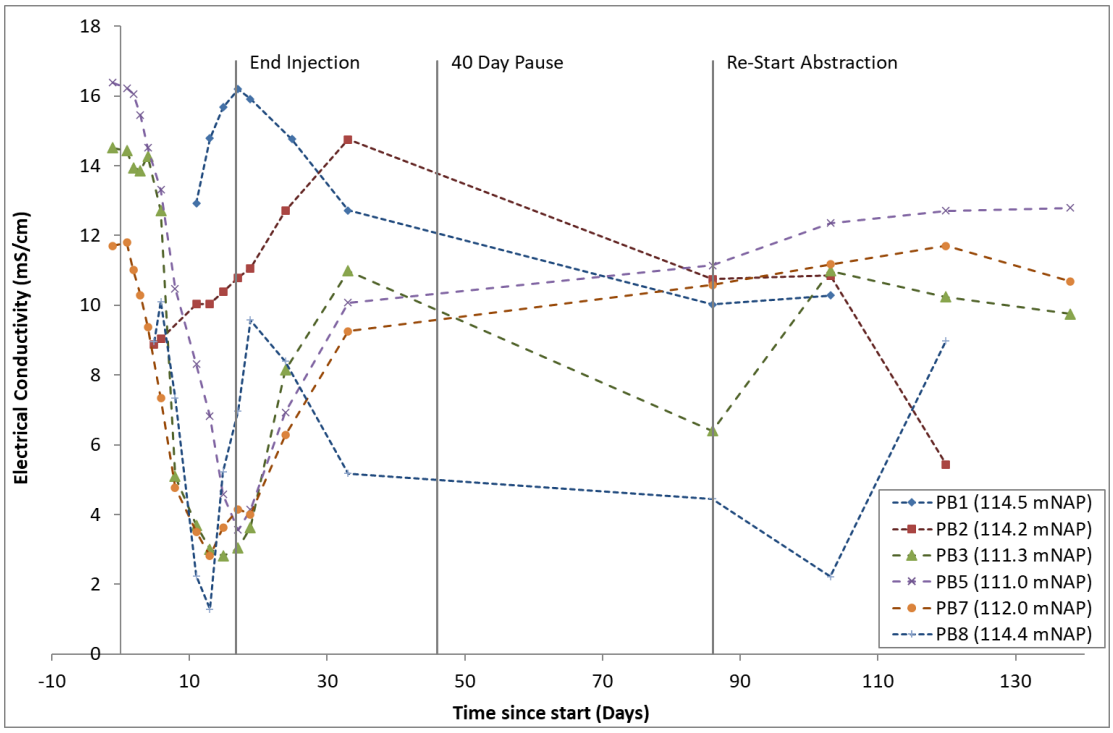

Figure SI 8. EC measured in piezometers (base level of piezometer given in mNAP)

An analytical solution explaining t_{cb}

A block with slab geometry continually flushed by uncontaminated water will release ~93% of its solute mass in time t_{cb}. This value was obtained from the solution of the 1D diffusion equation for a finite slab with an initial concentration of 100 and its ends held at zero concentration. The analytical solution for the average concentration reduction by time t can be expressed as an inverse Laplace transform:

$$c(t/t_{cb}) = 100\ L^{-1}\{\tanh(\sqrt{s})\ /s^{3/2}\}, \tag{6}$$

Equation 6 can be inverted numerically to give, for example, $c(1) \approx 93.13$ and $c(0.2) \approx 50.41$, i.e. half the mass is removed in approximately time $t_{cb}/5$ and 93% in time t_{cb}.