Plattsburgh AFB Case Study: Influence of Modeling Fe(II) Transport on Redox Zonation

Prepared by
Grant R. Carey
Porewater Solutions, Ottawa, Ontario

Prepared for
Dr. Brian Looney
Savannah River National Laboratory (SRNL)

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Figure 1 – Site Map

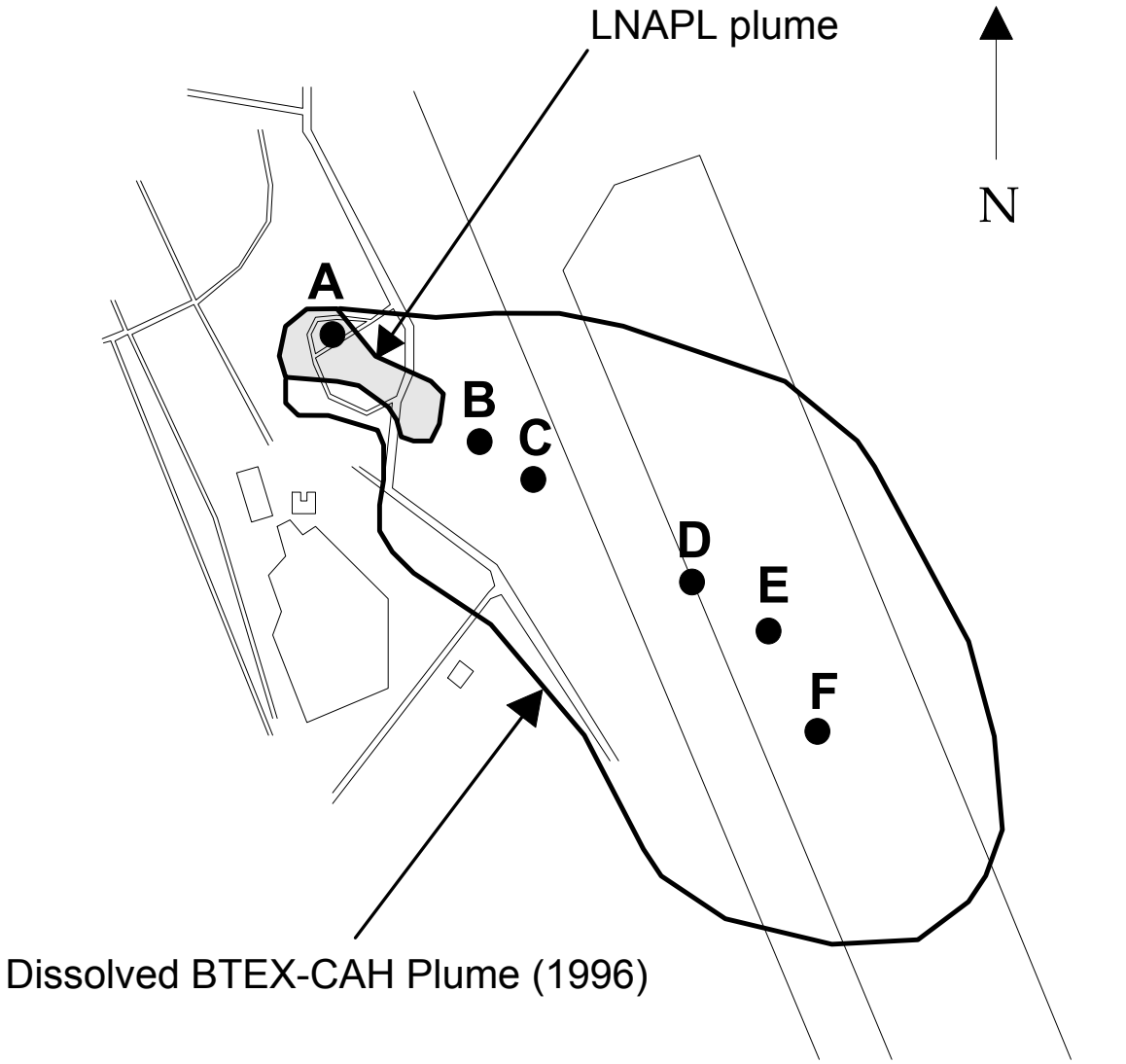


Figure 2 – Radial Diagram Map: VOCs (1995)

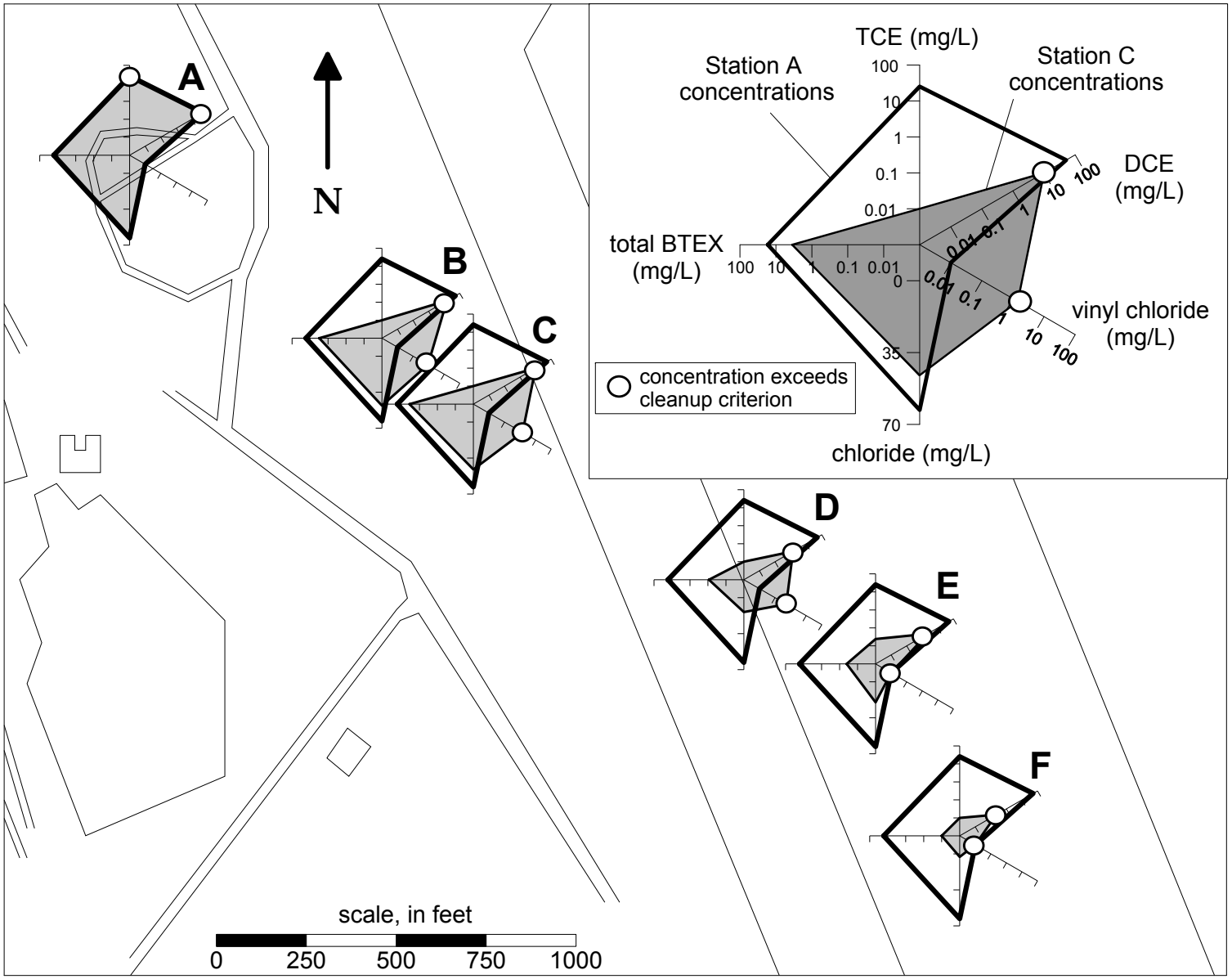


Figure 3 – Radial Diagram Map: Redox Indicators (1995)

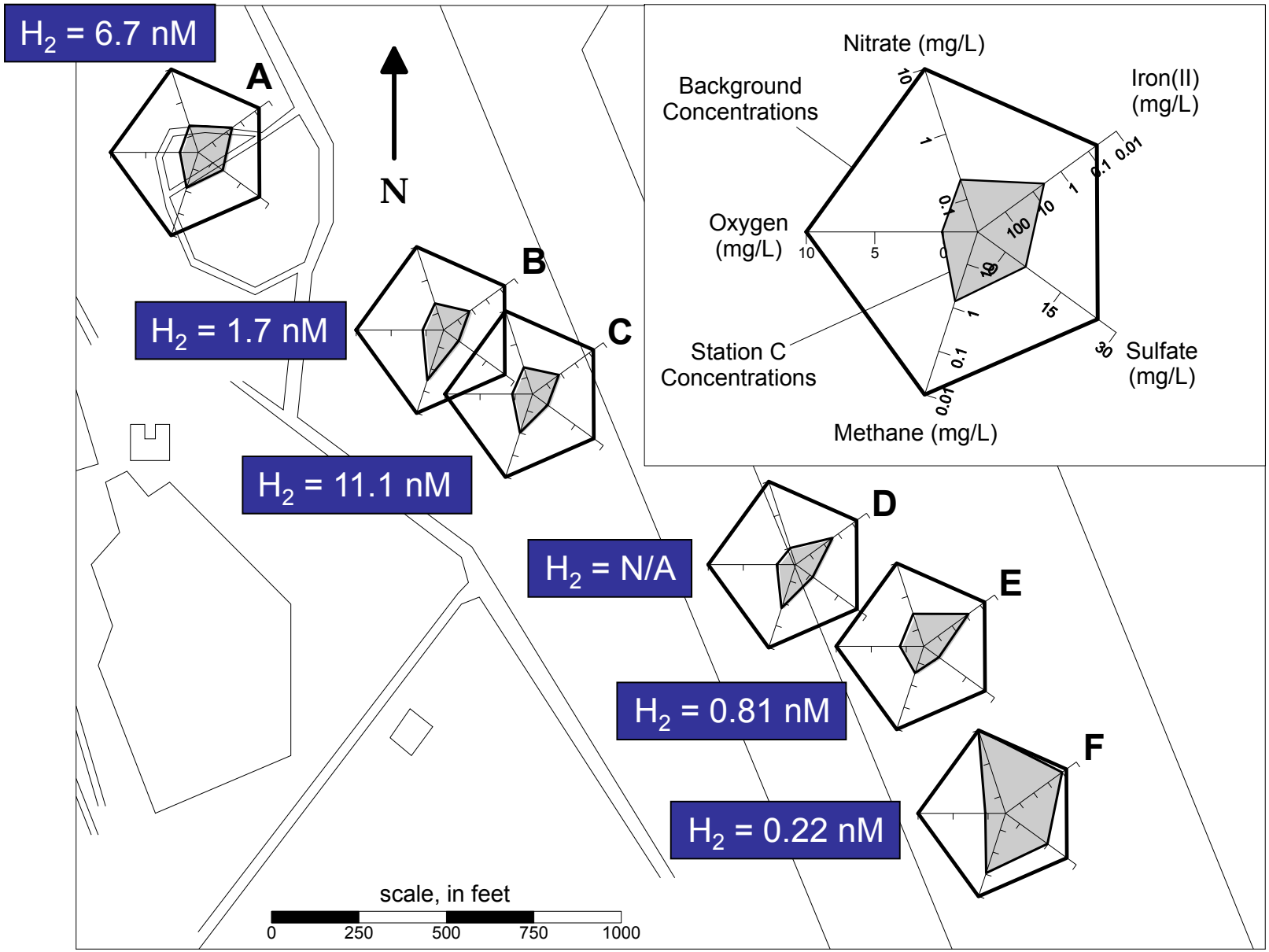


Figure 4 – Transport Model Domain and Boundary Conditions

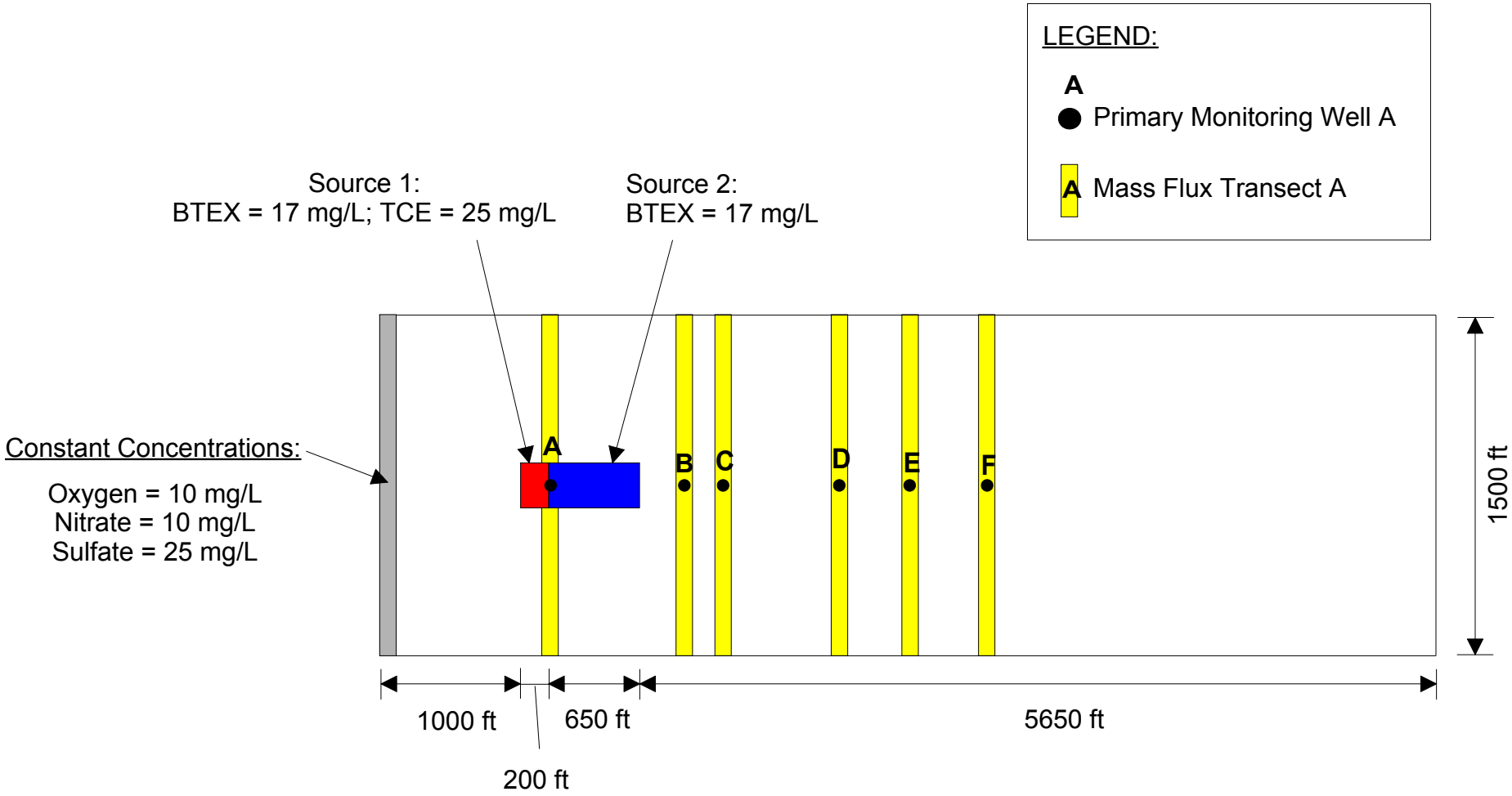


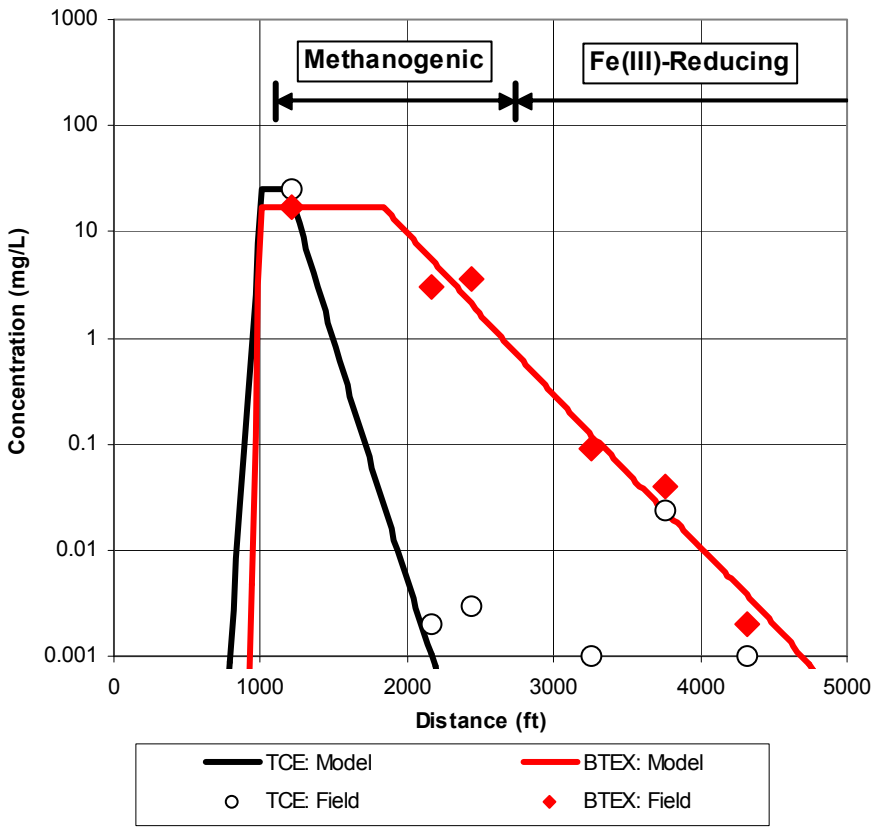
Figure 5 – Calibrated Half-Lives (years)

	CH_4	SO_4	Fe^{3+}	NO_3	O_2
BTEX	0.6	0.6	0.6	0.6	INST.
TCE	0.2	0.3	1		0.25
DCE	2	2	2		0.25 / 0.2
VC	0.2		0.02/0.2*		0.25 / 0.2
Fe^{2+}					INST.
CH_4	2	2	2	2	0.2

LEGEND:

	Mechanism	*Kinetics*
	Oxidation	Instantaneous
	Oxidation	First-Order
	CH_4 Co-metabolism	First-Order
	Dehalogenation	First-Order
	No Degradation	n/a

Figure 6a – Model vs. Field Concentrations: VOCs



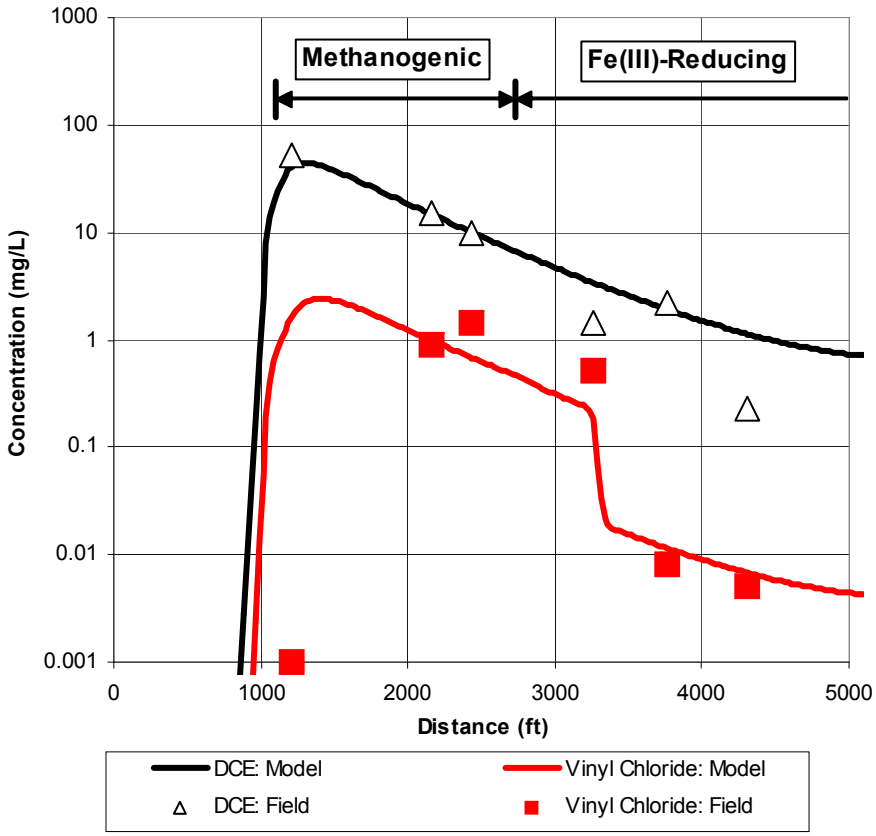


Figure 6b – Model vs. Field Concentrations: Redox Indicators

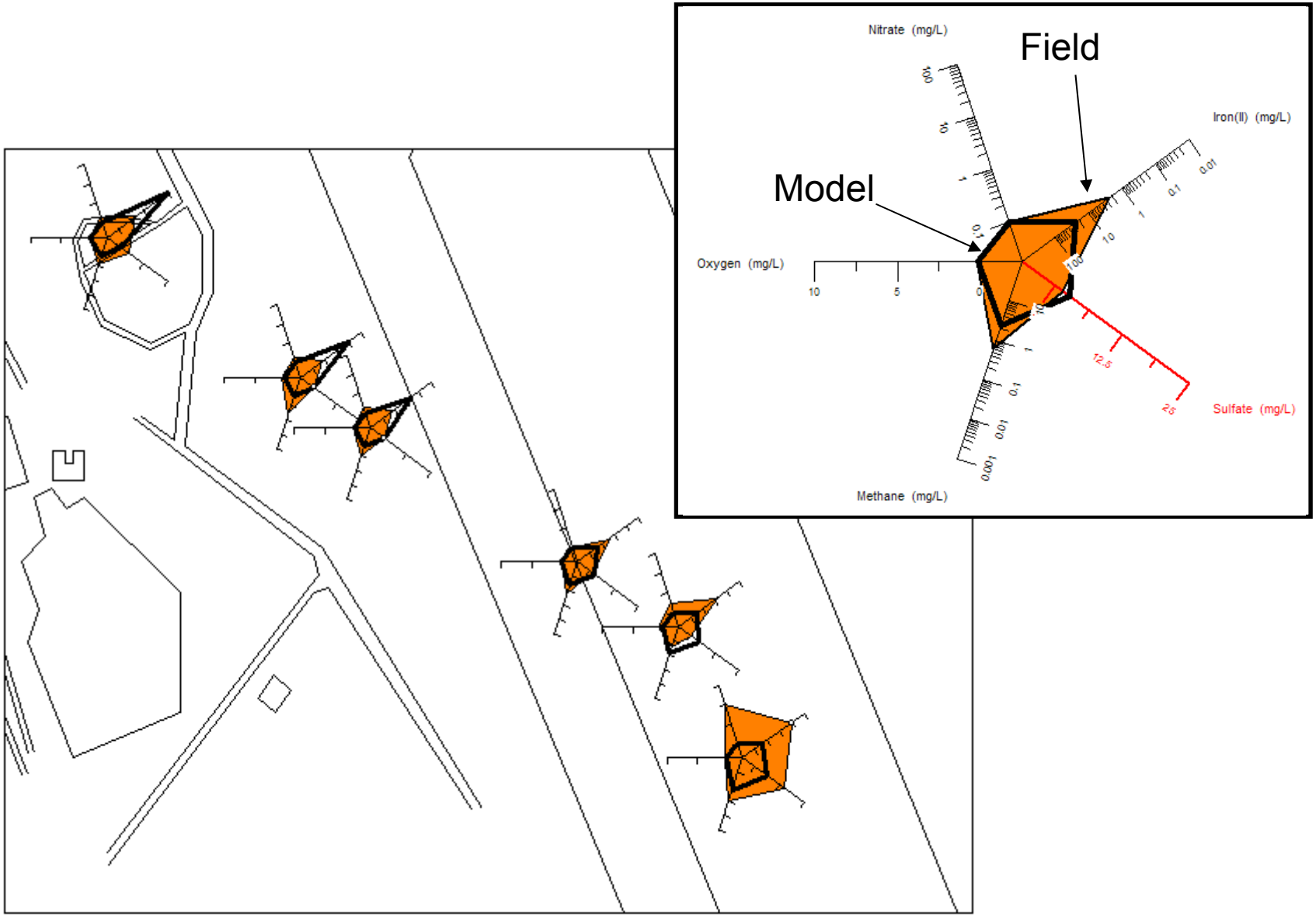
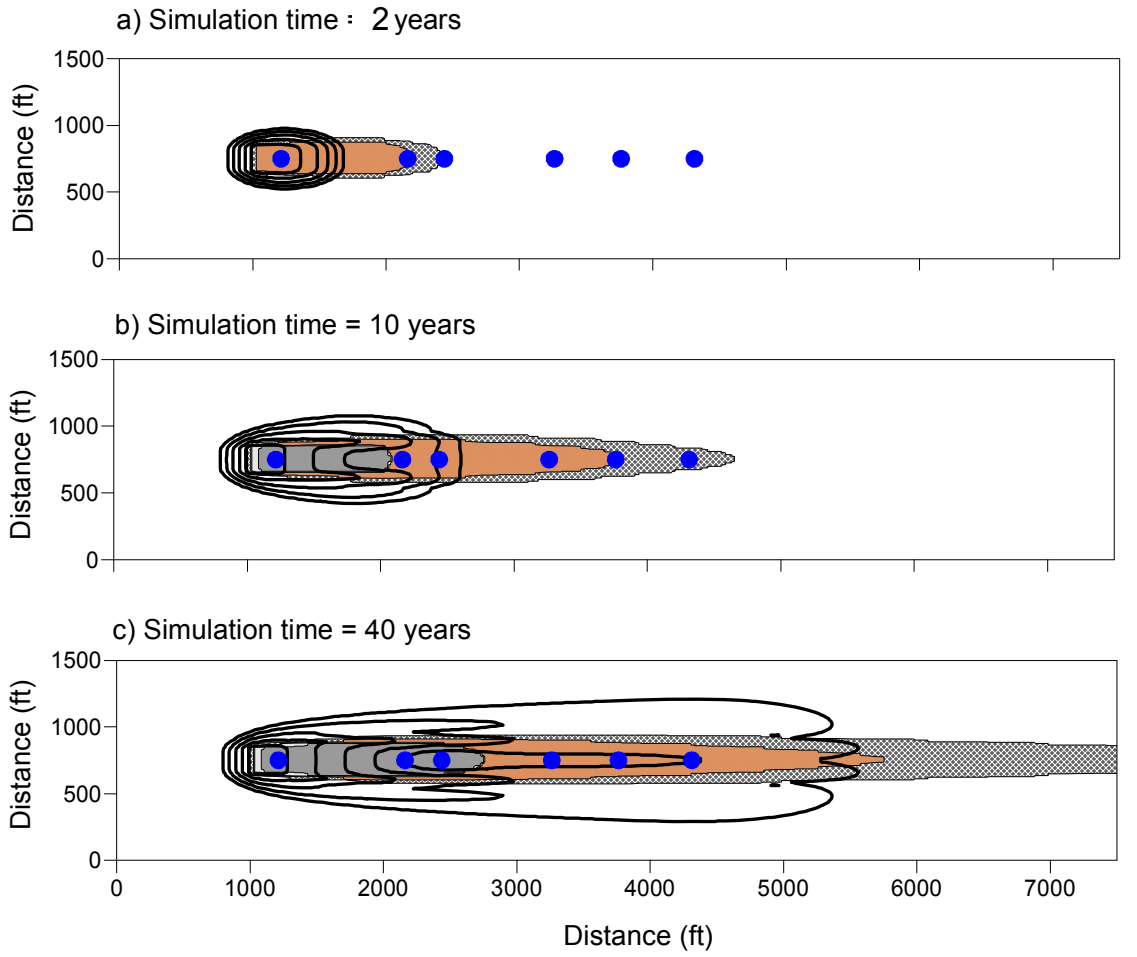


Figure 7 – Simulated TCE and Redox Zones Distributions over Time



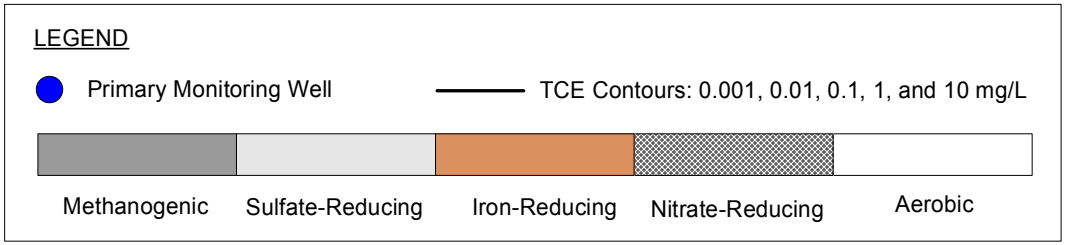
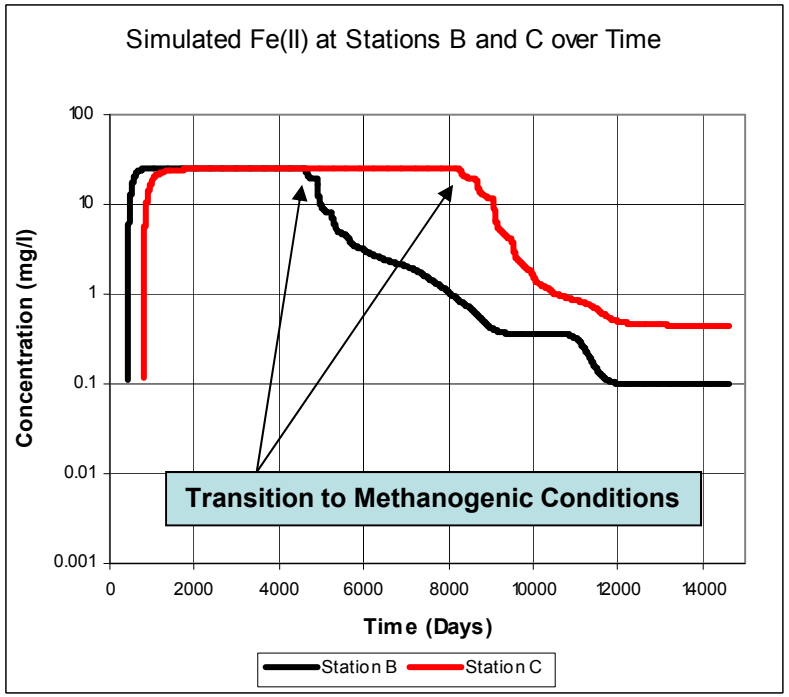


Figure 8 – Simulated Iron Concentrations

8.a) Simulated Fe(II) vs. time at Stations B and C



8.b) Simulated Fe(III) vs. time at Stations A, C, and D

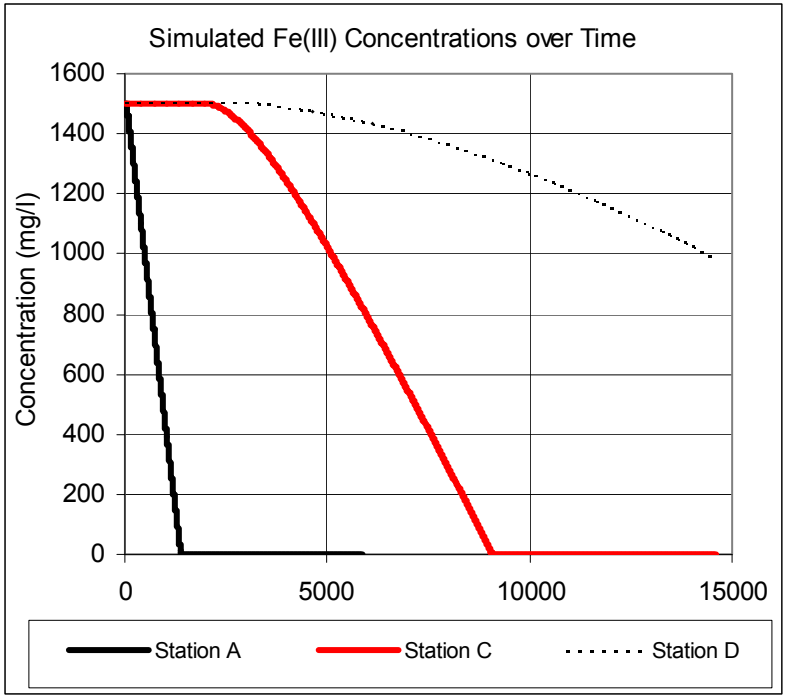
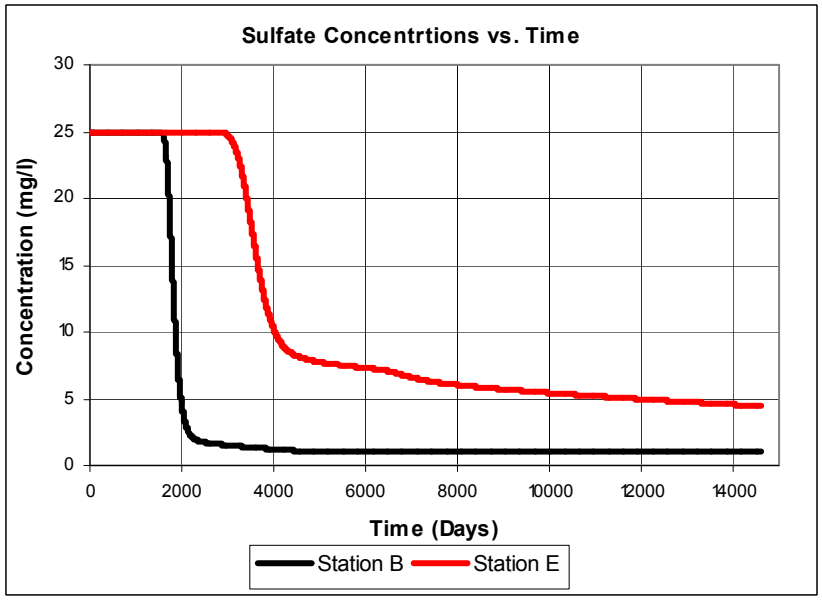


Figure 9 – Simulated Sulfate and Methane Concentrations

8.a) Simulated Sulfate vs. time at Stations B and E



8.a) Simulated Methane vs. time at Stations A, C, and E

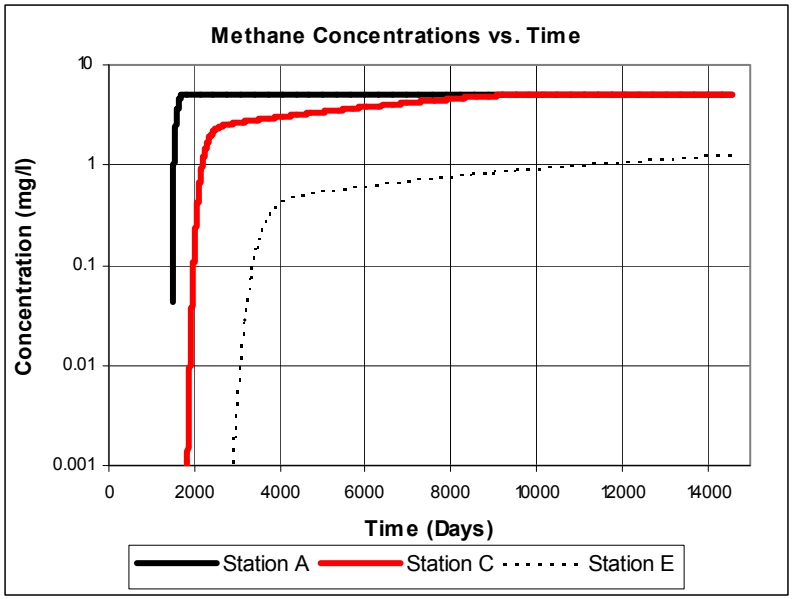


Figure 10 – Simulated Vinyl Chloride Concentrations

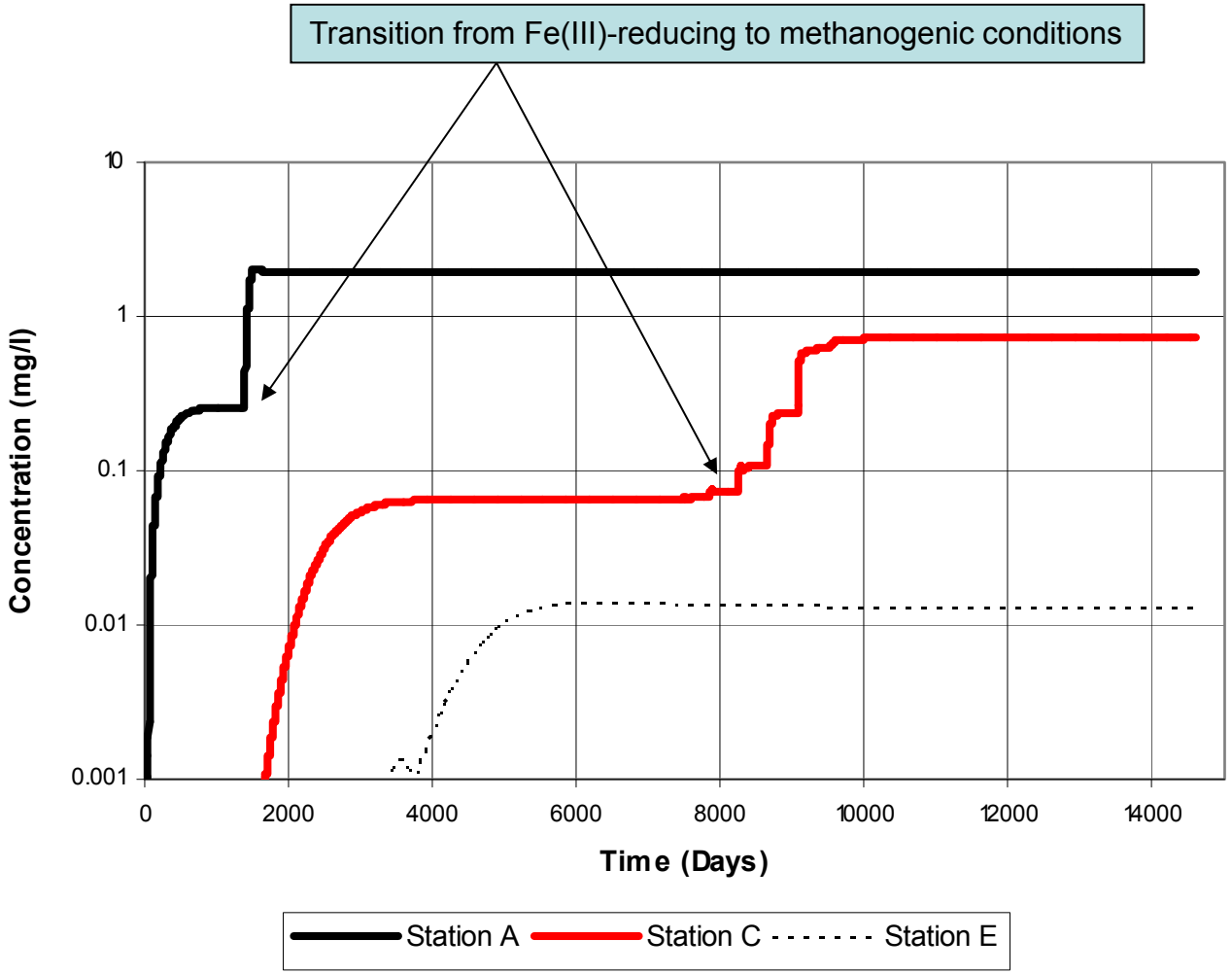
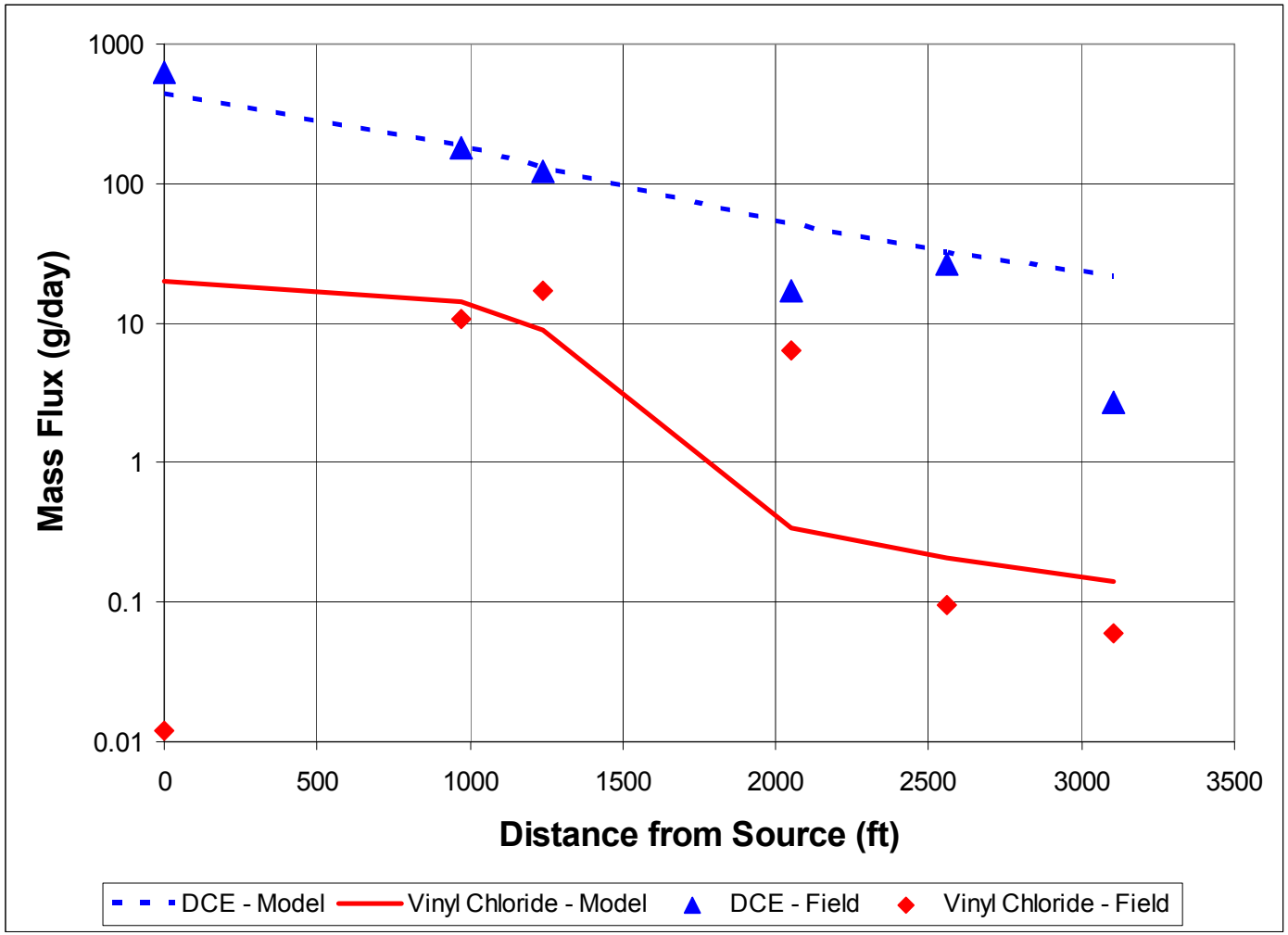


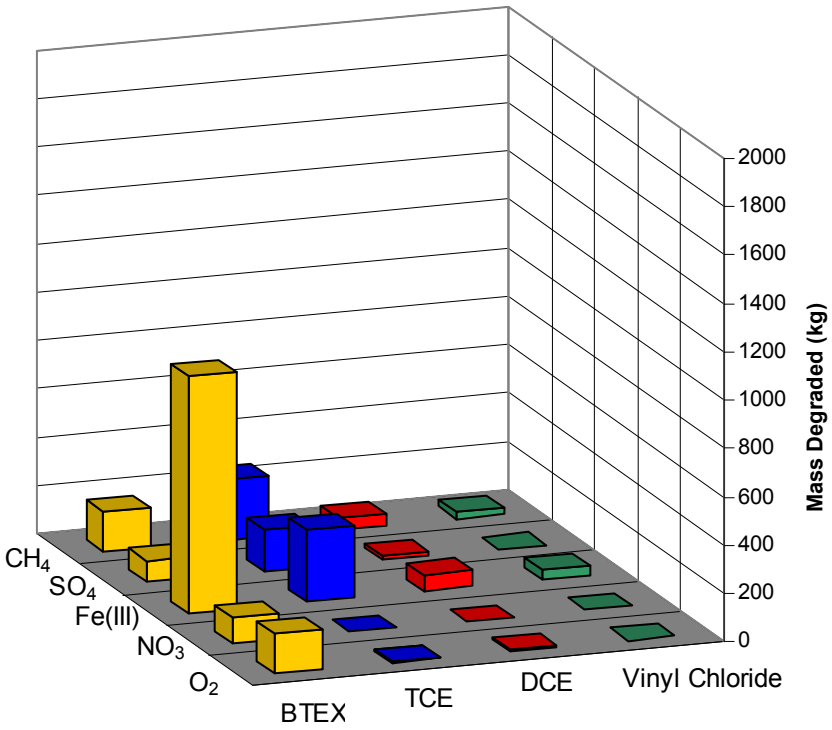
Figure 11 – Mass Flux Comparison: Model vs. Field (t = 40 years)



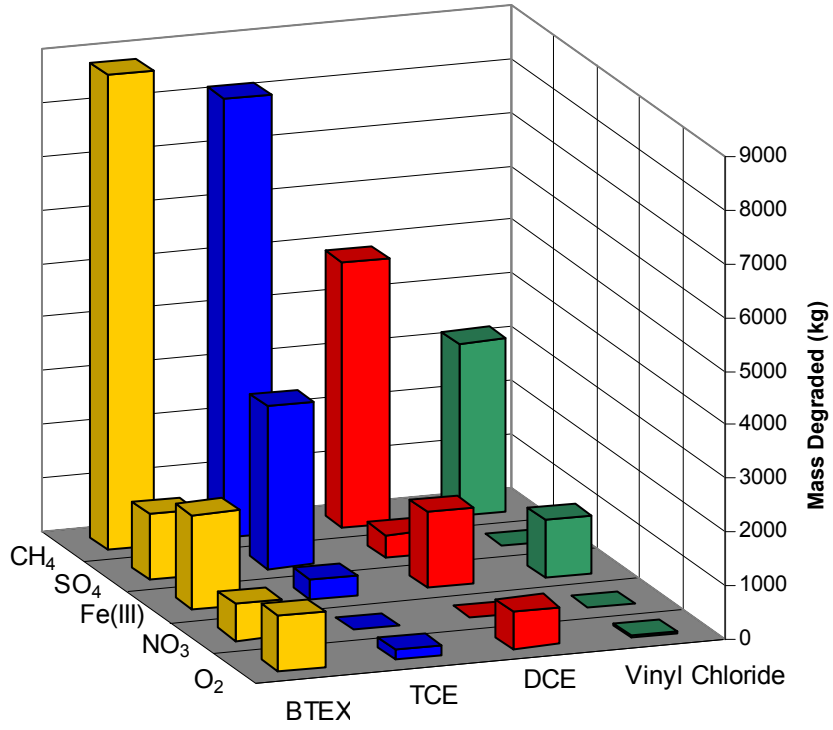
Note – field-estimated mass flux is based on concentrations at key monitoring wells along plume centerline, and assumption that main plume width is equal to source width of 200 feet.

Figure 12 – Simulated Biodegradation Mass Balance (t=30 years)

12.a) Simulated Mass Degraded by Redox Zone
(t = 5 years)

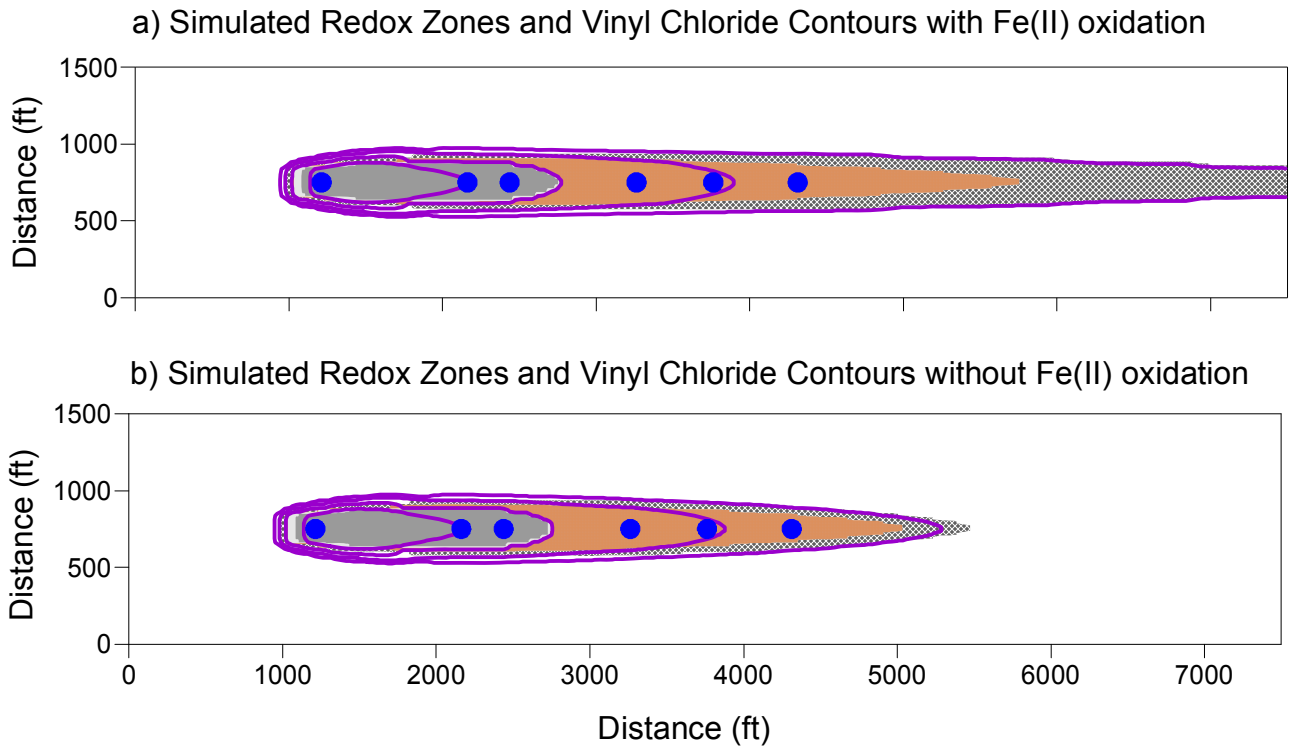


12.a) Simulated Mass Degraded by Redox Zone
(t = 40 years)



Redox Zone Legend: O2 = aerobic; NO3 = nitrate-reducing;
Fe(III) = iron-reducing; SO4 = sulfate-reducing;
CH4 = methanogenic.

Figure 13 – Simulated Influence of Coupled Fe(II)-O2 Reaction



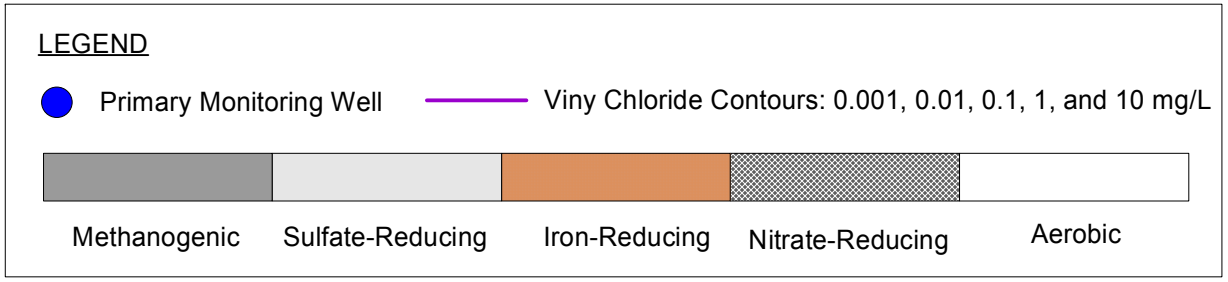


Figure 14 – Influence of Fe(II) Oxidation on Vinyl Chloride Plume Extent