

Drillox[®] Technology

Patent Pending

SOLVAY
Chemicals



IXPER[®] 75C Calcium Peroxide

Appearance	Yellowish white particles
Composition	CaO ₂ , Ca(OH) ₂ , other Ca prod.
Calcium peroxide (%)	75% min (typical 78 ± 2)
Available oxygen (%)	16.65% min (typical 17.3 ± 0.44)
Impurities	Meets Food Chemicals Codex
Bulk density (g/mL)	0.5 ± 0.075
Particle size distribution	
	50% <20μ
	100% <75μ

Effect of Water

- ◆ Very low solubility in H₂O (<0.01% @ 20°C)
- ◆ pH of suspensions depends upon conc.
 - 0.05% 8
 - 0.2% 11
 - 1% 11.7
 - 10% 12.7
 - 25% 12.8

Effect of Water

- ◆ At pH 11 – very slow decomposition generating oxygen and heat



- ◆ Rate of oxygen generation depends upon conditions and can last a year
- ◆ Oxygen enhances bioremediation

Effect of Acid

- ◆ In buffered systems at lower pH – progressively increasing generation of H₂O₂

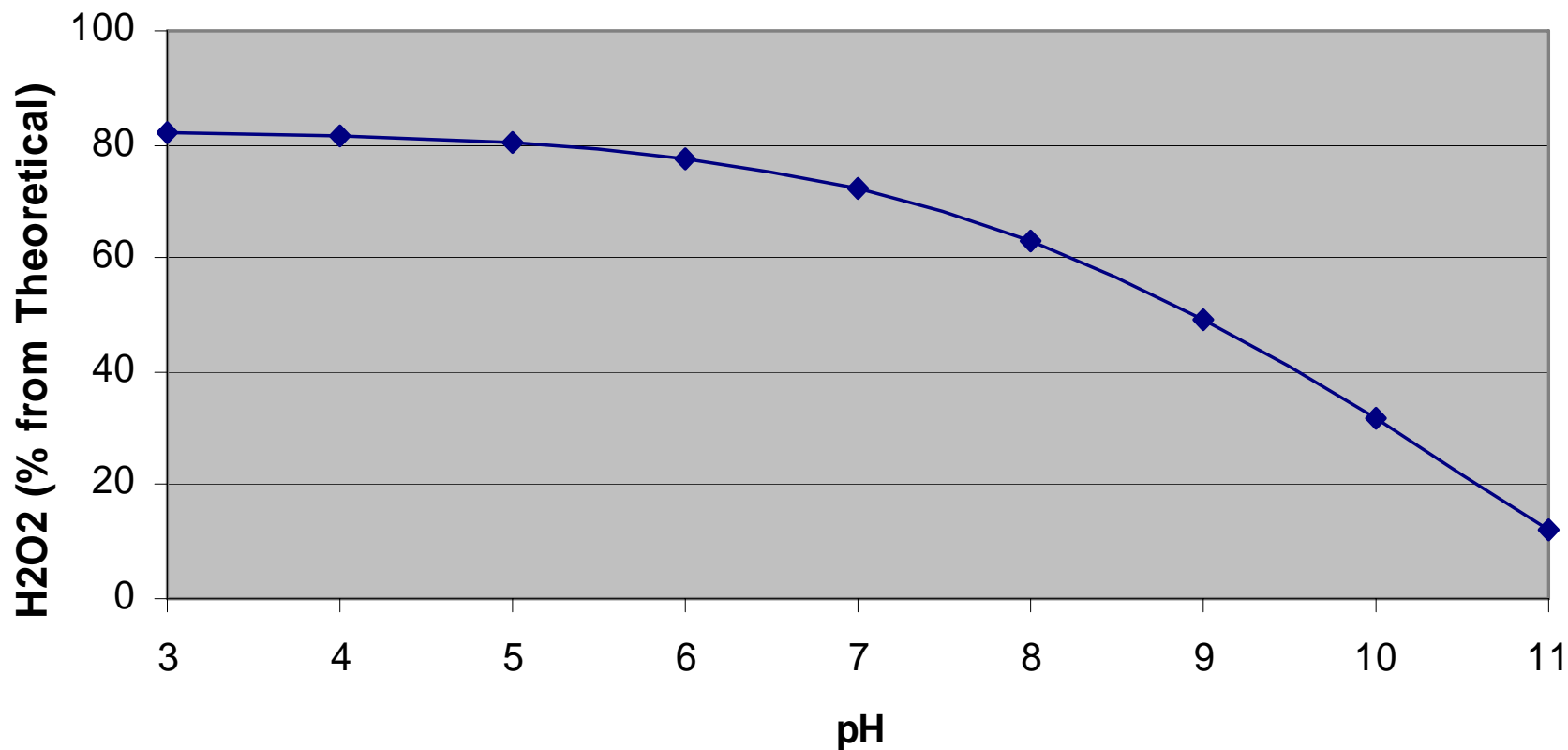


Effect of Acid

- ◆ The peroxide generated could lead to competing reactions



pH Effect on H₂O₂ Produced



Add H₂SO₄ to CaO₂ slurry to reach desired pH
Draw & filter sample of slurry as pH stabilizes.
Add more acid & repeat to obtain lower pH reading.

Drillox[®] Technology

- ◆ Principle can be applied for generating Modified Fenton Chemistry with IXPER 75C CaO_2
- ◆ Technology can be applied for In-situ Chemical Oxidation of contaminants in soil and groundwater
- ◆ **Solvay patent application**
 - IXPER 75C Calcium Peroxide for slow H_2O_2 release + bioremediation
 - Fe chelate to produce Modified Fenton Chemistry

Lab Test

- ◆ One port equipped with activated carbon traps to capture VOCs
- ◆ Mechanical stirring at 400rpm
- ◆ Duration: 3 weeks
- ◆ Protocol
 - Control
 - Drilox Technology (low and high dose)

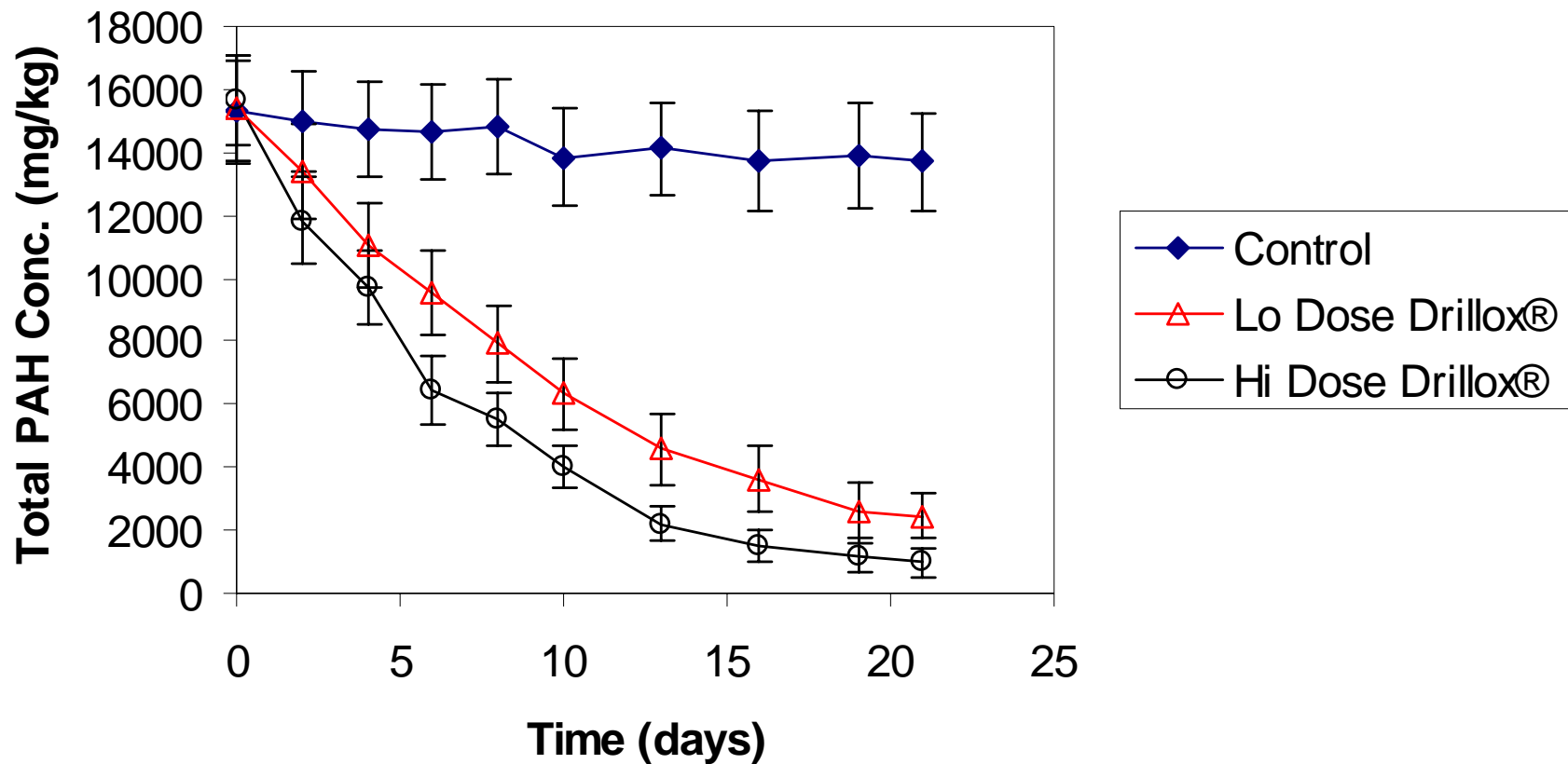


Wood Treating Site

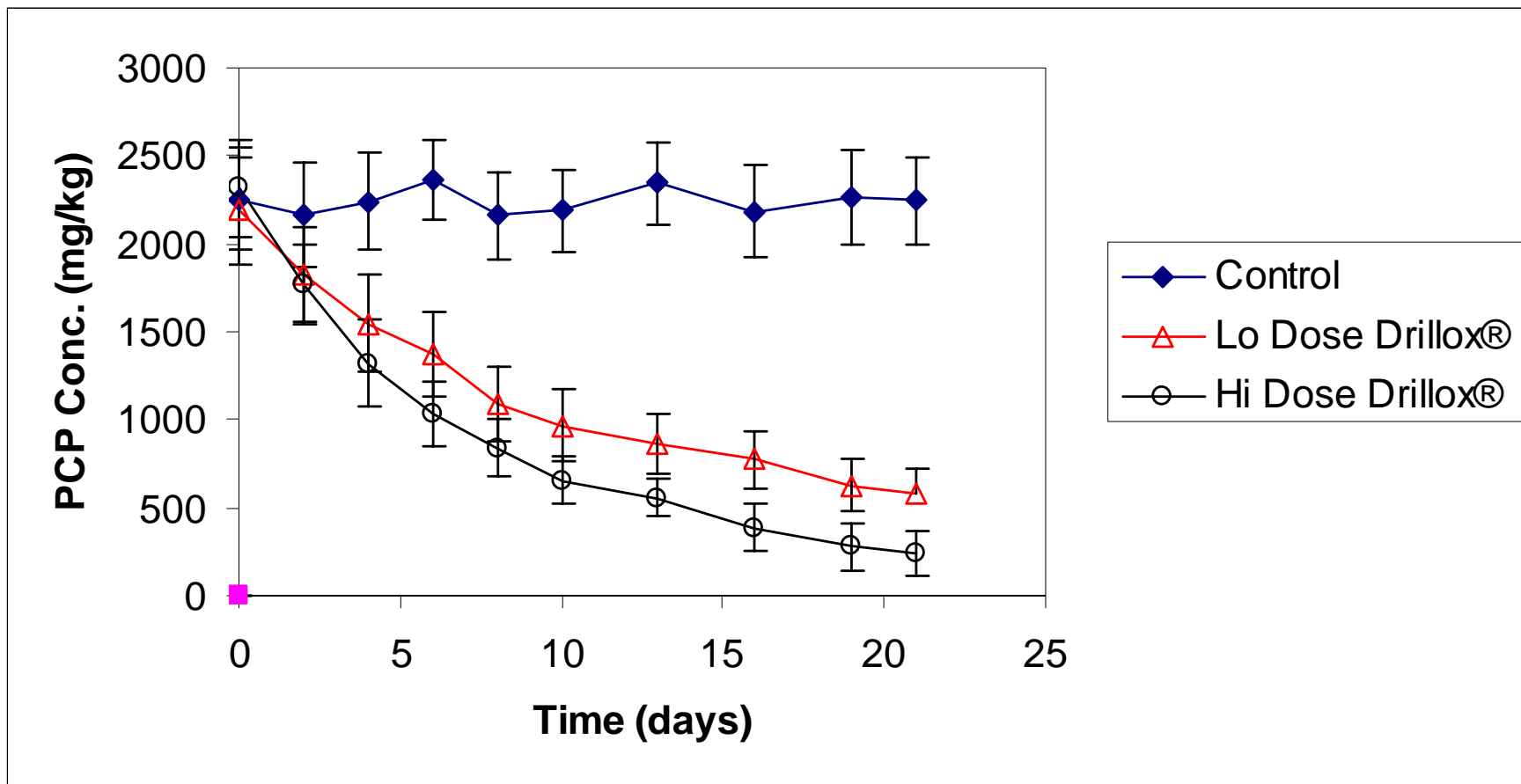
pH	6.8
Sand (62.5 μm -2 mm) (%)	64
Fines (<62.5 μm) (%)	36
Native Organic Matter	Not measured
Total PAH (mg/kg)	15,486 \pm 1,231 ^a
PCP (mg/kg)	2,405 \pm 317 ^a
BTEX (mg/kg)	1,321 \pm 103 ^a
Benzene (mg/kg)	371 \pm 29 ^a

a = arithmetic mean \pm standard deviation for 6 replicates

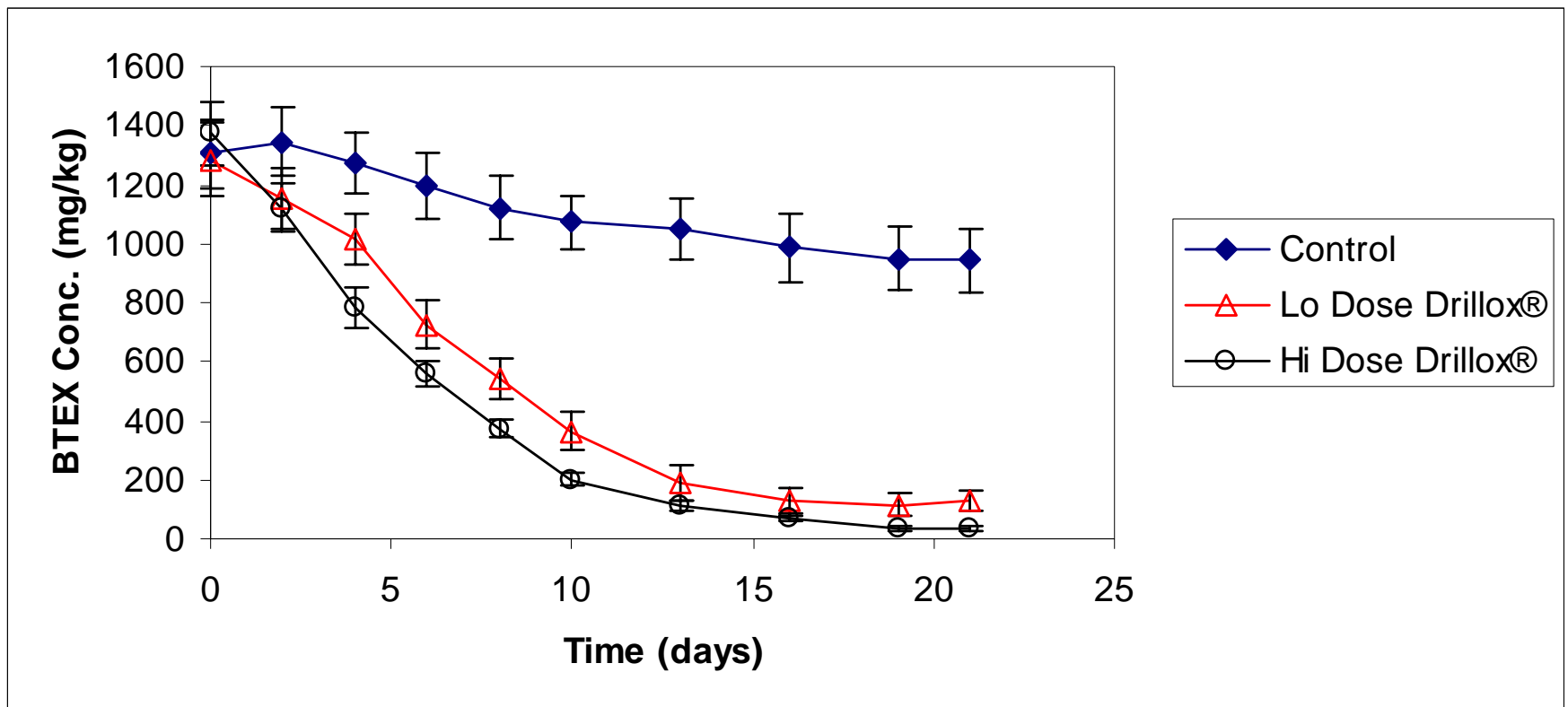
PAH Removal



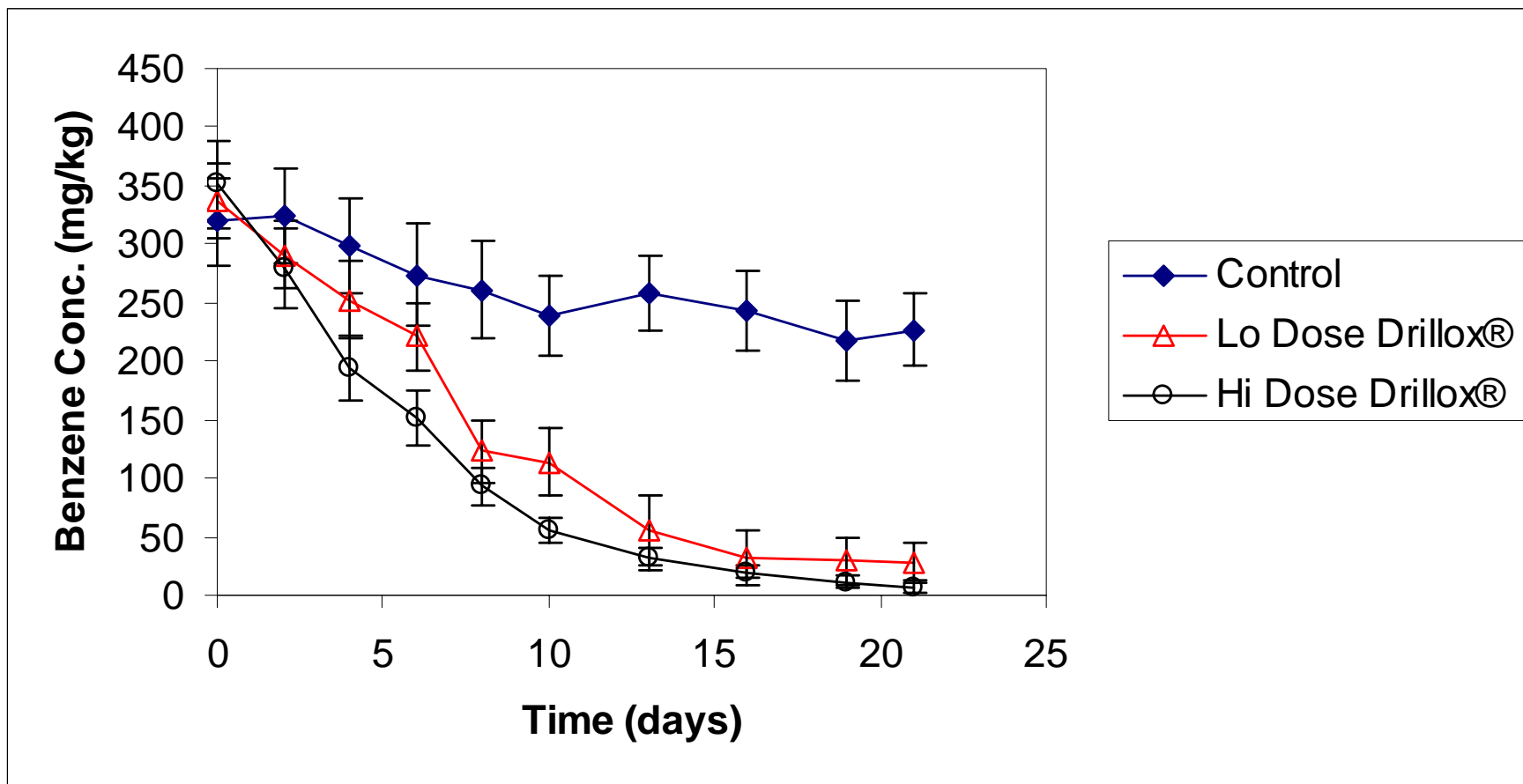
PCP Removal



BTEX Removal



Benzene Removal

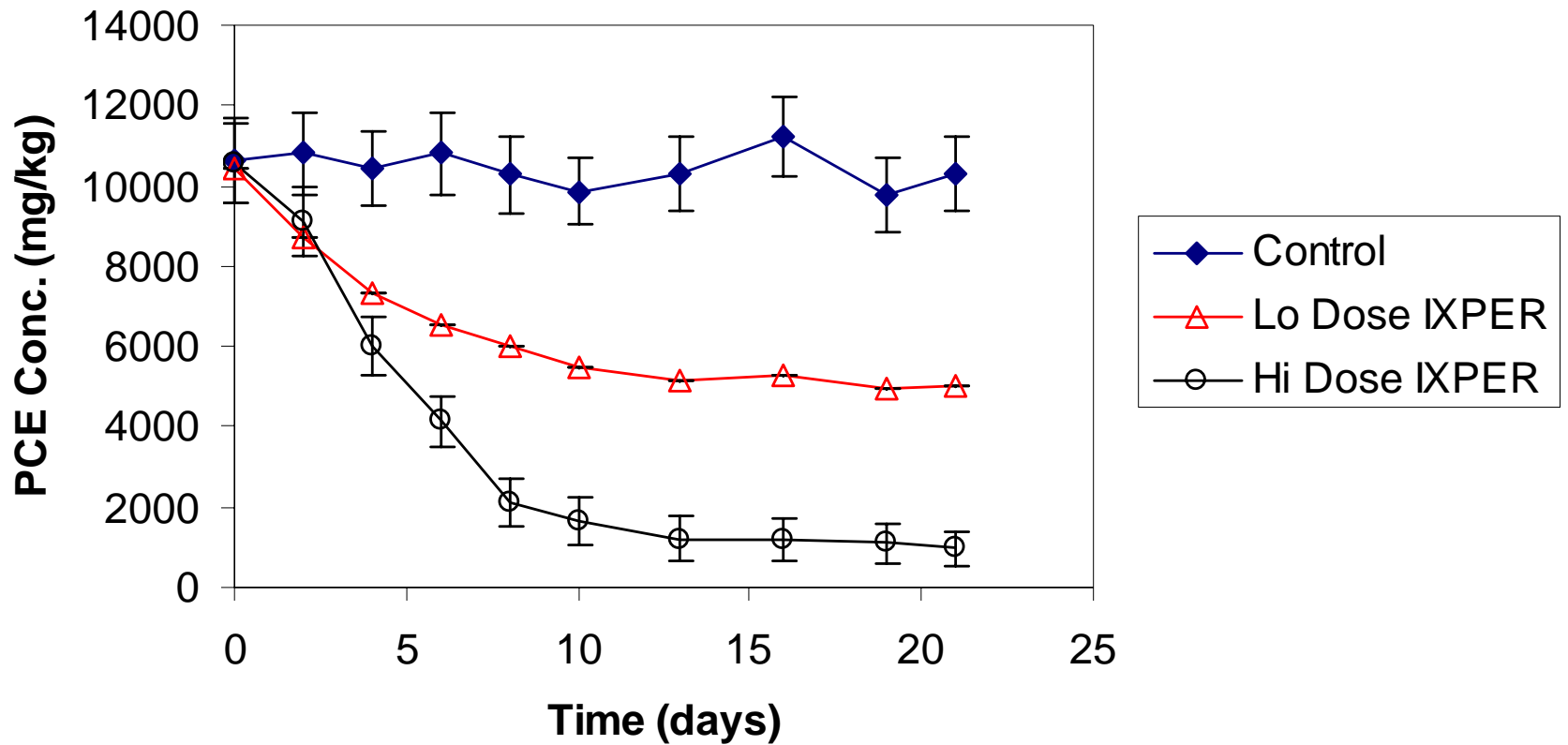


Dry Cleaners Site

pH	7.1
Sand (62.5 μm -2 mm) (%)	92
Fines (<62.5 μm) (%)	8
Native Organic Matter	Negligible (no products of reductive chlorination)
PCE (mg/kg)	10,672 \pm 799 ^a

a = arithmetic mean \pm standard deviation for 6 replicates

PCE Removal



Drillox[®] Technology Summary

- ◆ Suitable for treating high concentrations of PAHs, BTEX, PCP, and PCE
- ◆ All chemicals are biodegradable and “green”
- ◆ Simple application with Geoprobe
- ◆ More sustainable than technologies requiring heavy machinery
- ◆ In field trials, possible additional benefits of bioremediation from residual IXPBR 75C CaO_2

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