Background

- Sediments at the mouth of Chollas and Paleta Creeks had some sediment contamination
  - Mixtures of constituents
- Sediment toxicity and benthic community impacts at some sites
- What constituent(s) is causing the impact?
  - Toxicity identification evaluation (TIE)

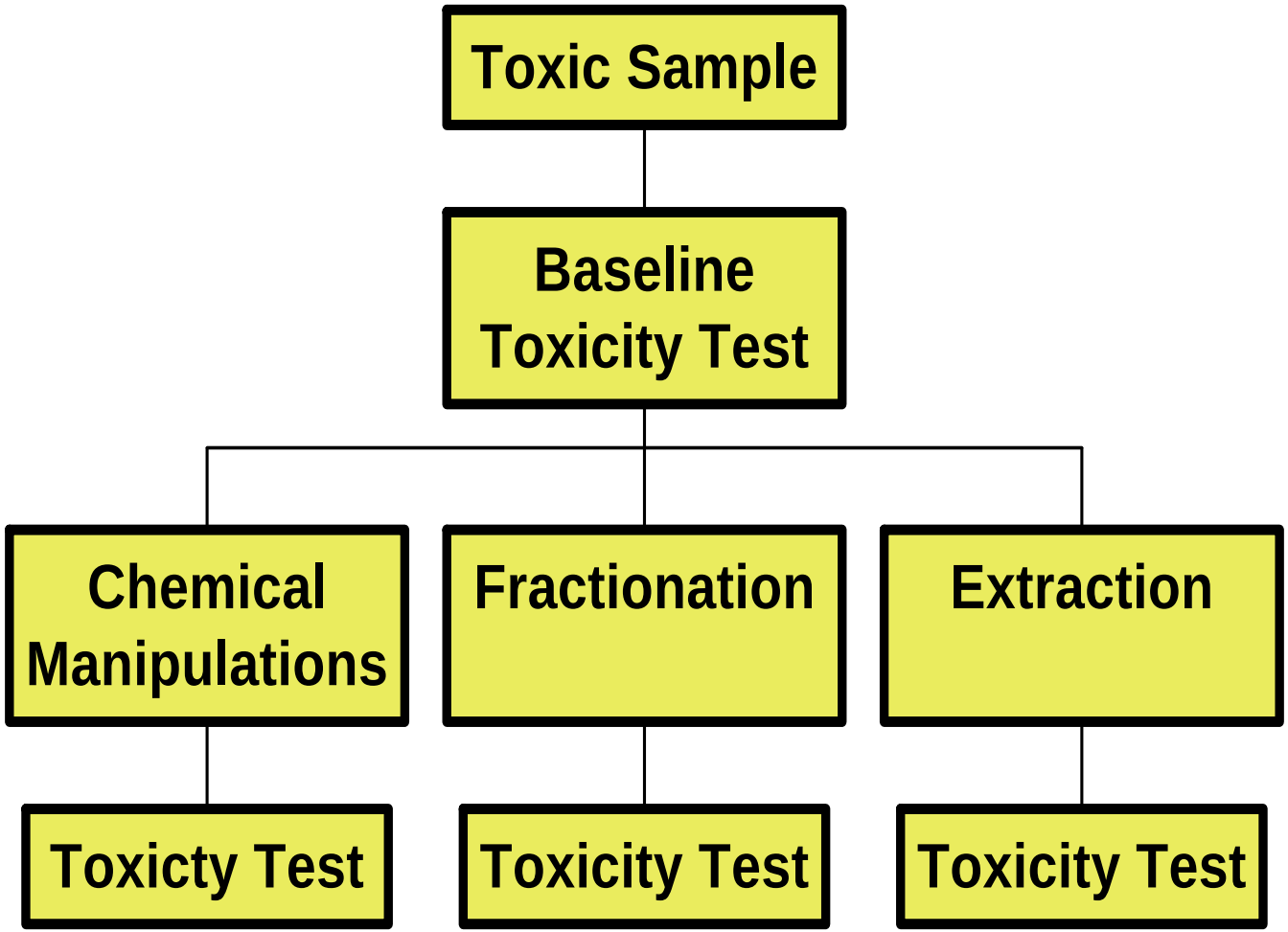
Objectives

- TIE methods standardized in water samples
  - Sediment methods are less routine
- Characterize likely contaminant classes
  - Metals or organics?
- Initial constituent confirmation
  - Can we tell which specific constituent?

TIE Methods

- Two approaches
  - Whole sediment/amphipod survival
  - Pore water/amphipod survival
- Multiple stations
  - Toxic stations from Chollas and Paleta sites
- Three sampling events
  - July 2001, October 2002, April 2004

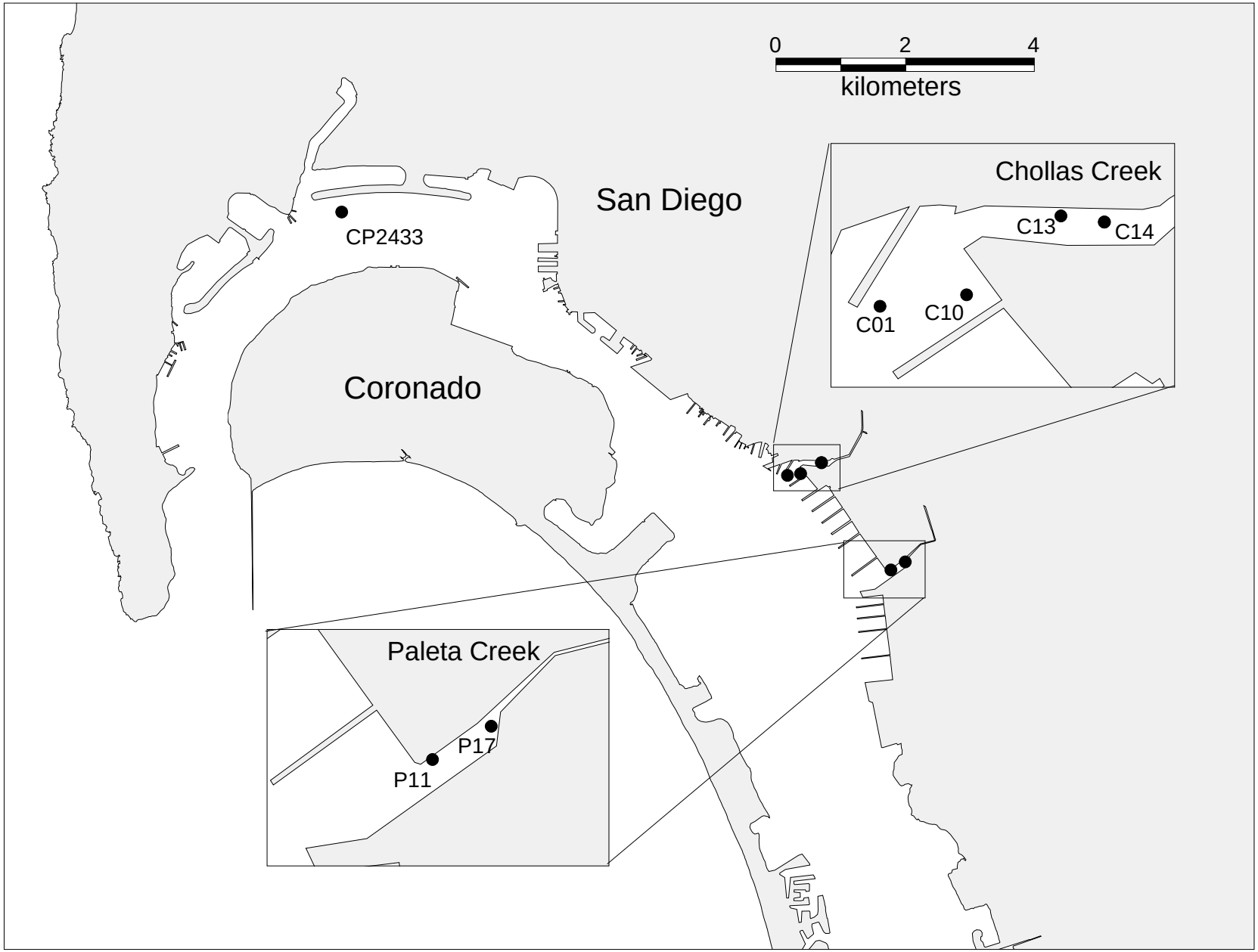
Toxicant Characterization



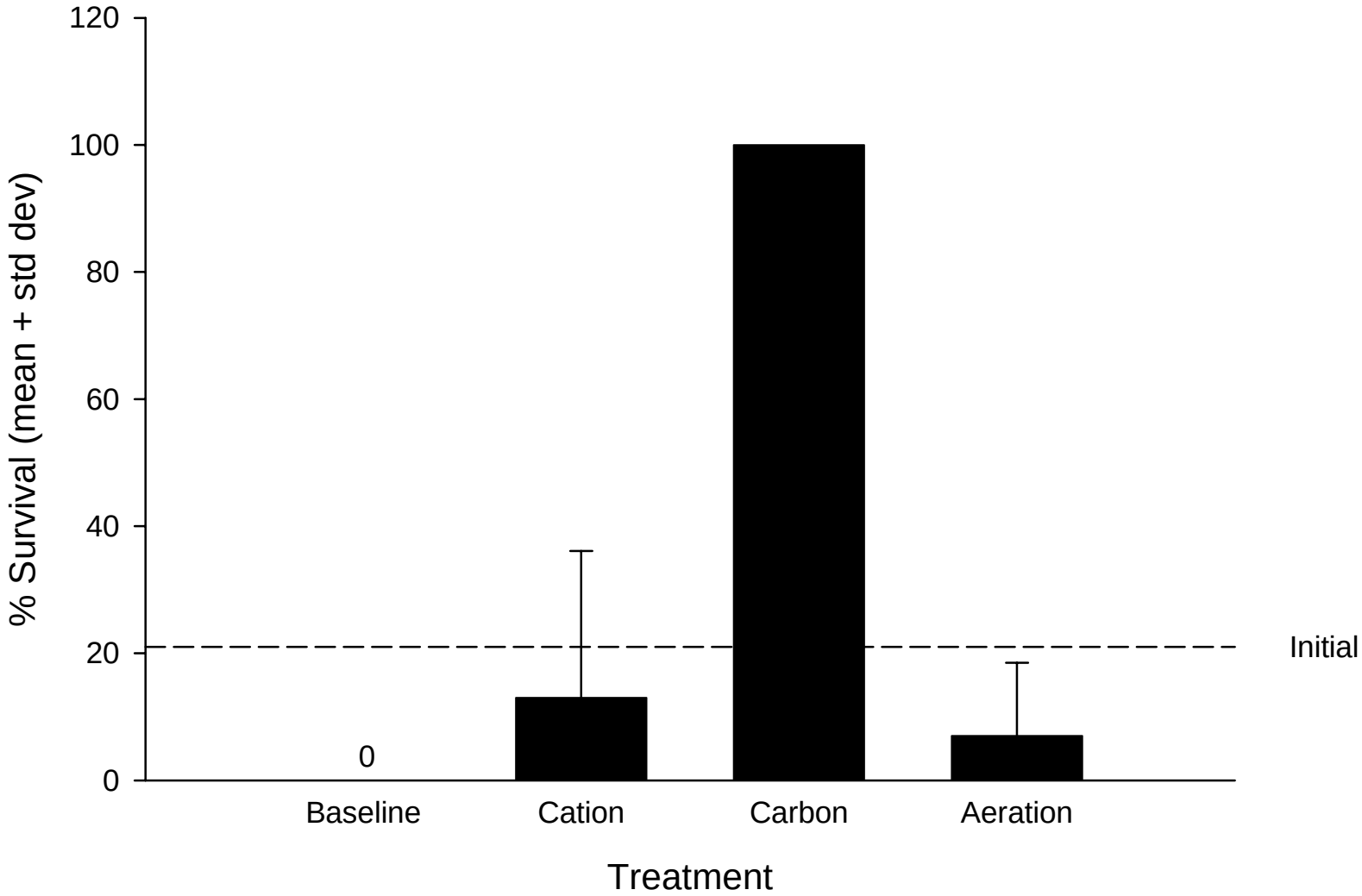
Toxicant Characterization Treatments

Sediment Treatment	Pore Water Treatment	Purpose
Baseline Toxicity	**Baseline Toxicity**	**Evaluate treatment effectiveness**
Cation exchange resin	**EDTA**	**Complexes metals**
Activated carbon Extraction (SFE)	**Extraction (C18)**	**Removes nonpolar organics**
Piperonyl Butoxide (PBO)	**Piperonyl Butoxide (PBO)**	**Metabolic inhibitor Blocks op pesticide toxicity**
	Sodium Thiosulfate (STS)	**Neutralizes oxidants Complexes some metals**
Reference Sediment		**Control for dilution and mixing effects**

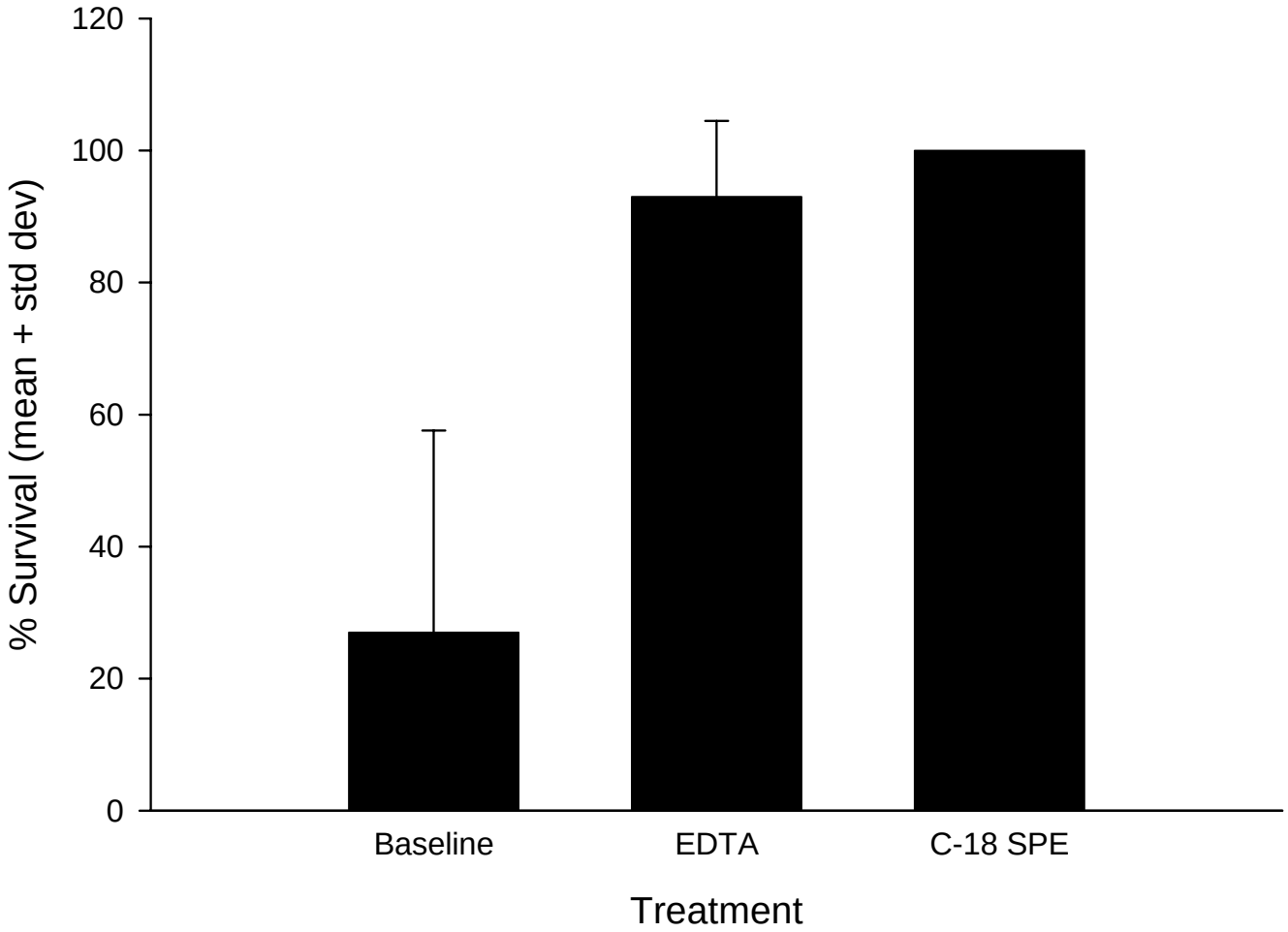
TIE Sites


0
2
4
kilometers
San Diego
Coronado
CP2433
Chollas Creek
C13
C14
C01
C10
Paleta Creek
P17
P11

June 2001: C14 Whole Sediment

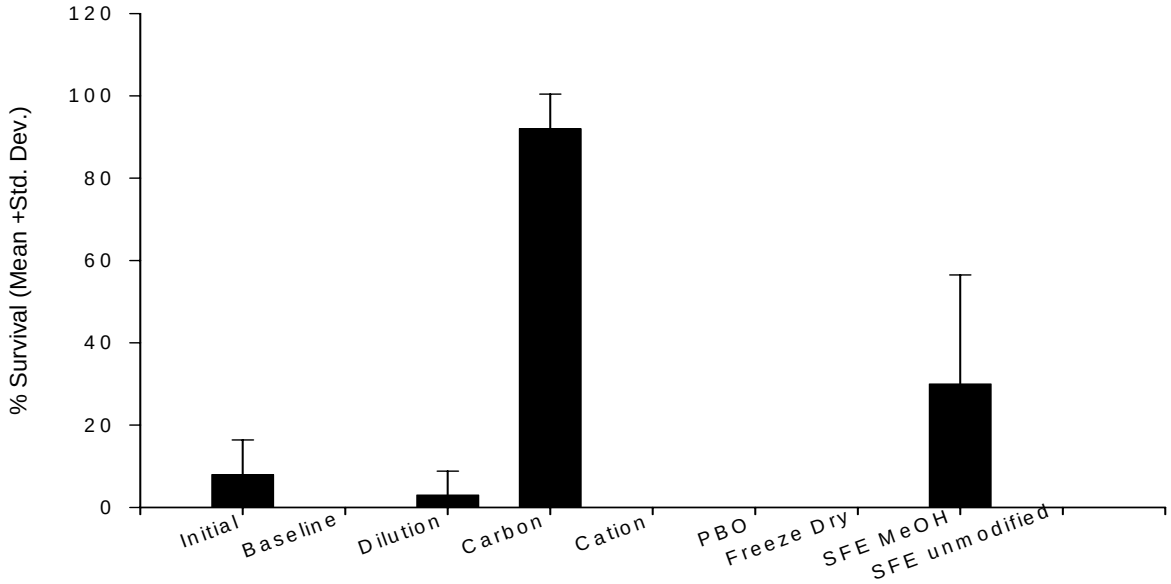


June 2001: C14 Pore Water

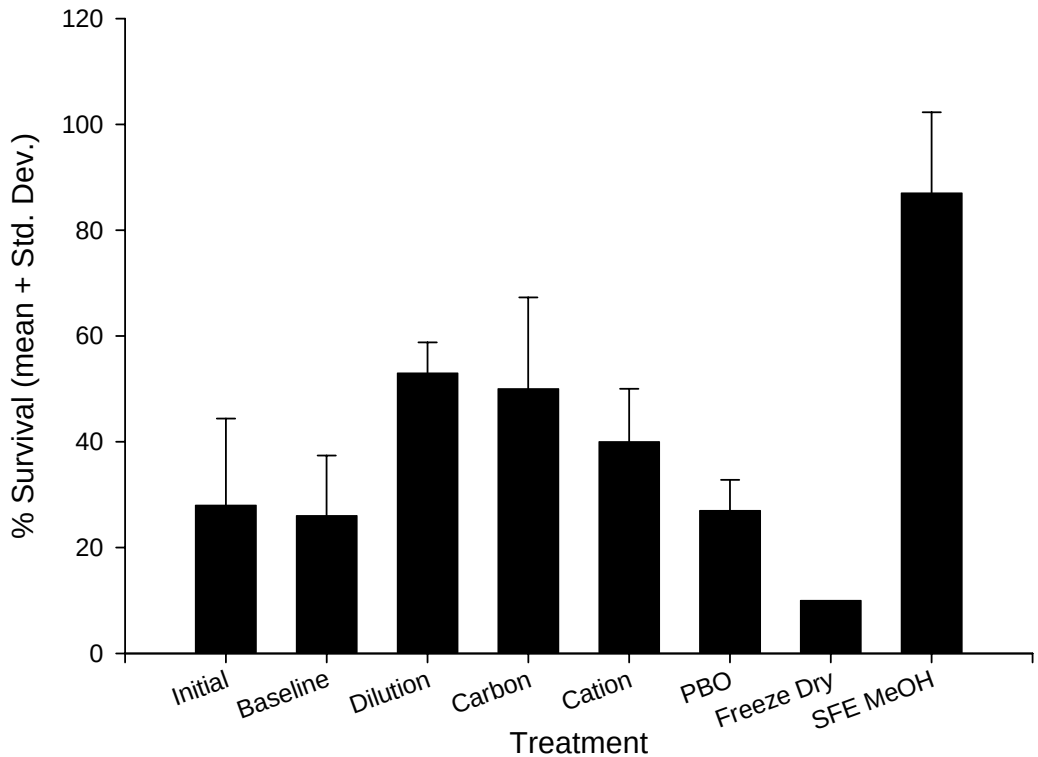


April 2004 Whole Sediment

C13



P11



TIE Results: Whole Sediment

Station	Date	Site	Carbon	Cation	SFE	PBO
C14	July 2001	Chollas	+	+0	NA	NA
C14	Oct. 2002	Chollas	+	0	NA	NA
P11	Oct. 2002	Paleta	+	0	NA	NA
P17	Oct. 2002	Paleta	+	0	NA	NA
C13	April 2004	Chollas	+	0	+0	0
P11	April 2004	Paleta	0	0	+	0

0 = Not effective **+0 = Slightly effective** **+ = Highly effective**

NA=Not analyzed

TIE Results: Pore Water

Station	Date	Site	EDTA	STS	C-18
C01	July 2001	Chollas	?	NA	?
C14	July 2001	Chollas	+	NA	+
C13	April 2004	Chollas	0	0	+0
P11	April 2004	Paleta	?	?	?

0 = Not effective **+0 = Slightly effective** **+ = Highly effective**

? = Inconclusive (no toxicity present) **NA=Not analyzed**

TIE Confirmation Steps

- Are concentrations high relative to other So. Cal. Estuaries?
  - Bight comparisons
- Are concentrations above a toxic benchmark?
  - Spiked sediments, equilibrium partitioning, etc.
- Are concentrations correlated with toxic responses?
  - Spearman rank correlations

Chollas Ck TIE Confirmation

Constituent	Concentration high for So Cal estuaries?	Concentration above toxic benchmark?	Correlated with toxicity?
Total DDT	+0	0	+
Total PCB	+0	0	+
Total Chlordane	+	?	+
Total PAH	+	+0	+0
Trace Metals	+0	0	0

0 = No +0 = Maybe + = Yes ? = no data

Paleta Ck TIE Confirmation

Constituent	Concentration high for So Cal estuaries?	Concentration above toxic benchmark?	Correlated with toxicity?
Total DDT	+0	0	0
Total PCB	+0	0	0
Total Chlordane	0	?	0
Total PAH	+	+	0
Trace Metals	+0	0	+0

0 = No +0 = Maybe + = Yes ? = no data

Toxicity Confirmation

	Chollas	Paleta
Fines	-0.621	0.045
TOC	-0.762	-0.072
Ag (fn)	0.402	-0.075
As (fn)	0.354	-0.053
Cd (fn)	0.280	-0.510
Cr (fn)	0.548	-0.040
Cu (fn)	0.190	0.143
Hg (fn)	0.338	-0.090
Ni (fn)	0.442	0.012
Pb (fn)	0.230	-0.275
Zn (fn)	0.244	-0.152
LMWPAH	-0.431	0.073
HMWPAH	-0.443	-0.146
TPCB	-0.563	-0.031
TCHLOR	-0.535	-0.131
TDDT	-0.590	-0.142

TIE Study Summary

- Organic contaminants are the most likely cause of toxicity
  - Carbon effective, but sequesters a wide mixture of constituents
  - Other potential toxicants unmeasured (i.e. TBT, pesticides, etc.)

- Chlordane is one probable cause of toxicity at Chollas
  - Significant correlation with toxicity
  - Similar concentrations almost always toxic at other So. Cal. sites
  - Correlations between chemistry and toxicity

- PAHs are one probable cause of toxicity at Paleta and may contribute to effects at Chollas
  - Equilibrium partitioning model predicts PAH toxicity at Paleta
  - Similar concentrations are frequently associated with toxicity at other So. Cal. sites

TIE Study Recommendations

- Spiked sediment testing would help confirm existing TIE results
  - chlordane
- Sediment fractionation would help to confirm and verify TIE by isolating toxicants
  - Greater specificity
  - Unmeasured toxicants
- Analysis of body burdens would help confirm and verify TIE through exposure quantification
  - Residue effects comparisons