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BACKGROUND

There are increasing concerns regarding the potential environmental impact of PAH-, PCBs- or metals-contaminated sediments on water quality. An in-situ technology that uses PPB amendments has been developed by Dr. Dahmani and SESI to render sand-based isolation capping of sediment more stable, minimize dredging-related resuspended sediment and to efficiently transport Organoclay and Powdered Activated Carbon (PAC) amendments through the water column for in-situ placement with a sand matrix.

OBJECTIVES

Testing was conducted at the University of Connecticut (UCONN) to assess the following:

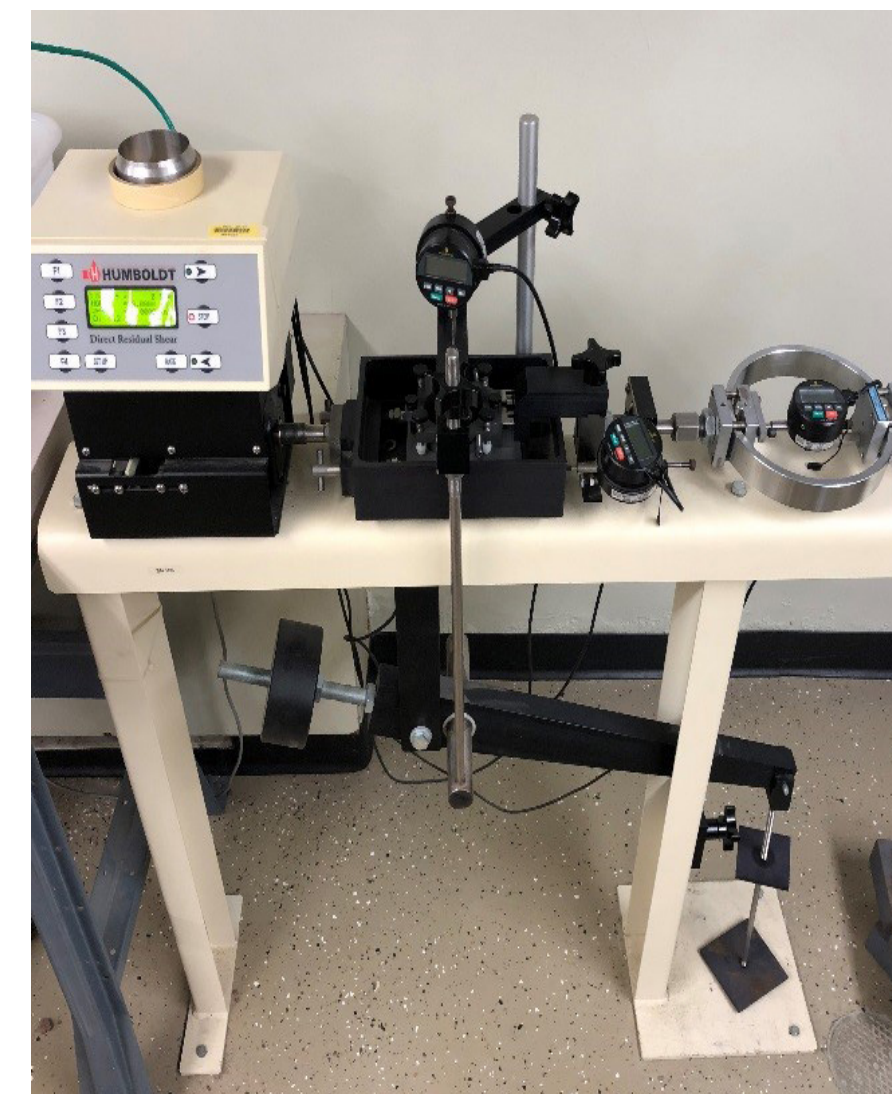
- Sand cohesion-enhancing properties of PPB amendments.
- Organoclay-amended sand cohesion-enhancing properties of PPB amendments.
- PPB treatment effectiveness in increasing shear strength and reducing the turbidity of sediment/water mixtures on sediment from a tidally influenced mudflat in Barnegat Bay, New Jersey.
- Transport through the water column of PPB-treated PAC/sand mixtures to assess PAC dispersion.

Aquatic toxicity testing was conducted at New England Bioassay (NEB) in Manchester, CT to assess toxicity of the SED-1 PPB amendment.

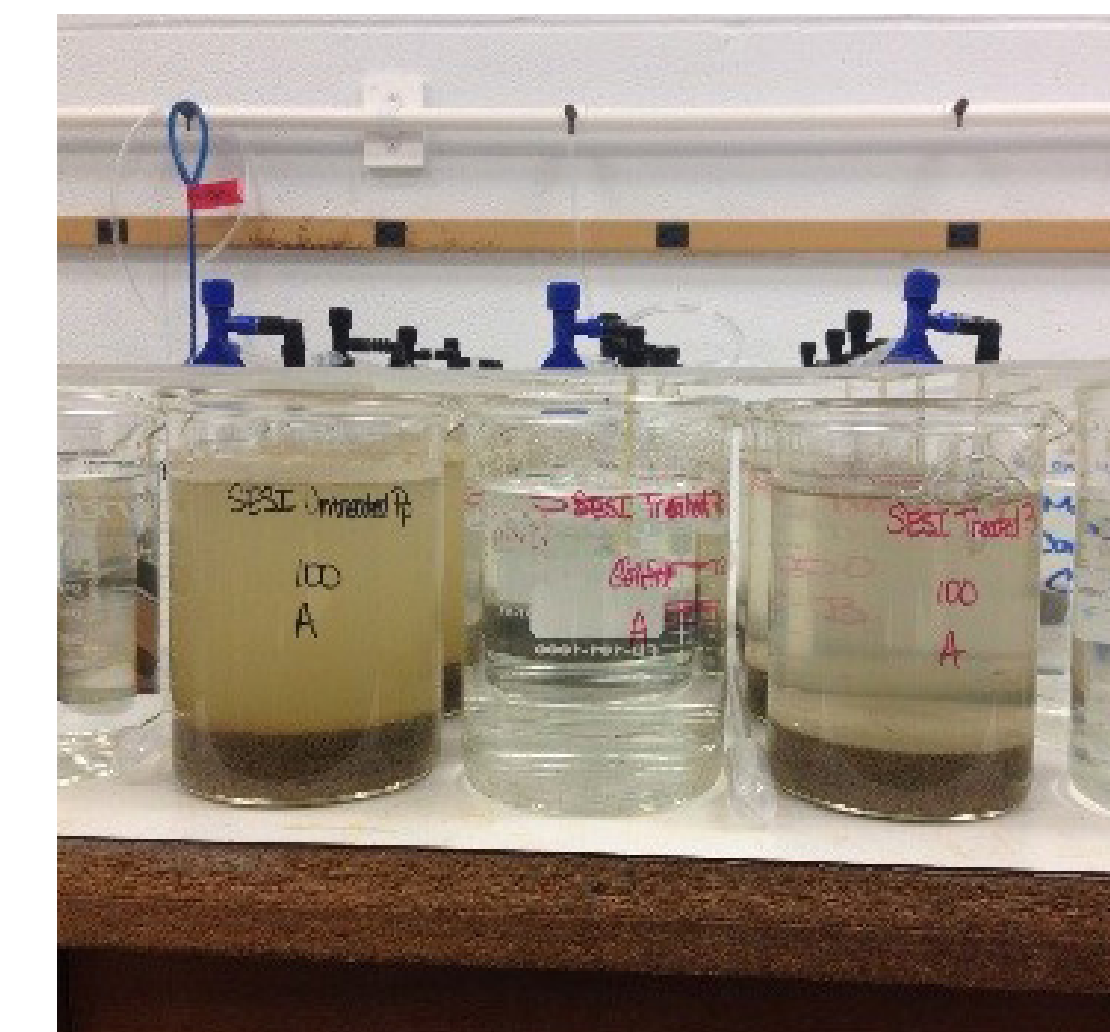
METHODS

- Direct shear strength (ASTM D3080) of PPB-treated sand.
- Water turbidity of PPB-treated sediment.
- Aquatic Toxicity tests (EPA-821-R-02-012) of SED-1 PPB were performed using Ceriodaphnia dubia and Pimephales promelas as freshwater species, and Mysidopsis bahia and Menidia beryllina as saltwater species.

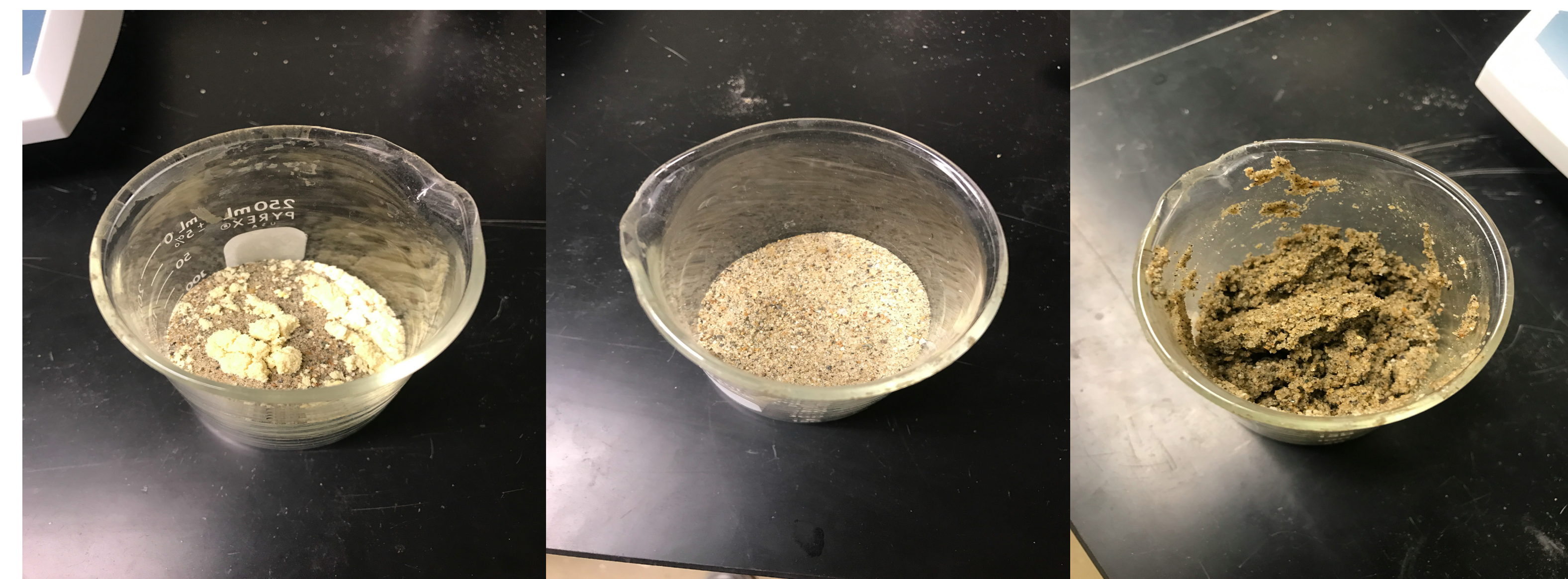
METHODS



Direct Shear Instrument



Aquatic Toxicity Testing

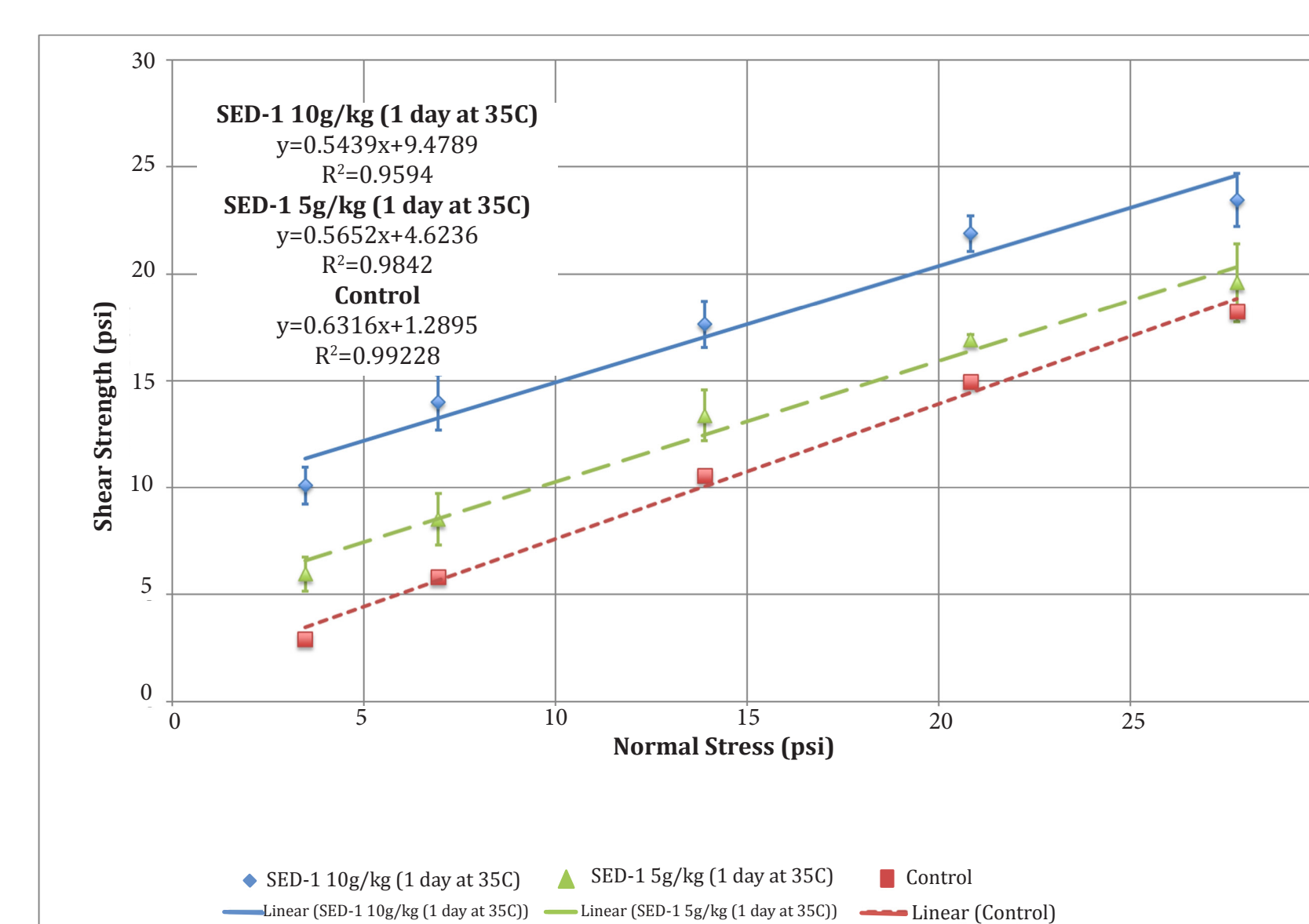


SED-1 PPB-treated Sand Sample Preparation

From left to right: unmixed biopolymer powder and sand; biopolymer/sand mixture; biopolymer/sand/water mixture

RESULTS

PPB Dosage Impact on Shear Strength



Aquatic Toxicity Tests of SED-1 PPB

	Ceriodaphnia Dubia	Pimephales Promelas
SED-1 Treated	94%	100%
Untreated	82%	100%

Sand Cohesion Testing Results

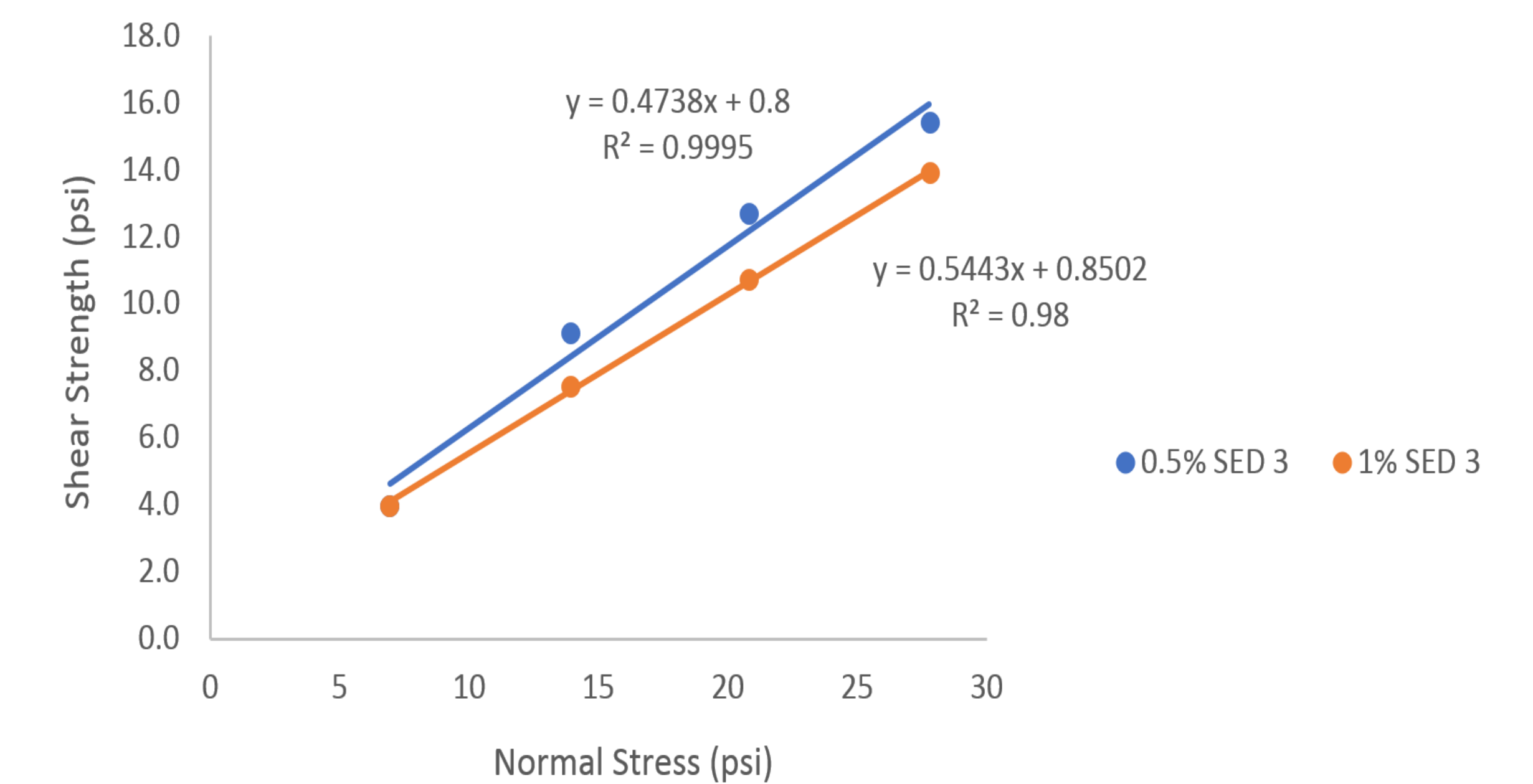
	Cohesion (psi)
Control	0.93
SED-1 (5g/kg)	4.60
SED-1 (10g/kg)	8.90

SED-1 PPB Product Specifications:

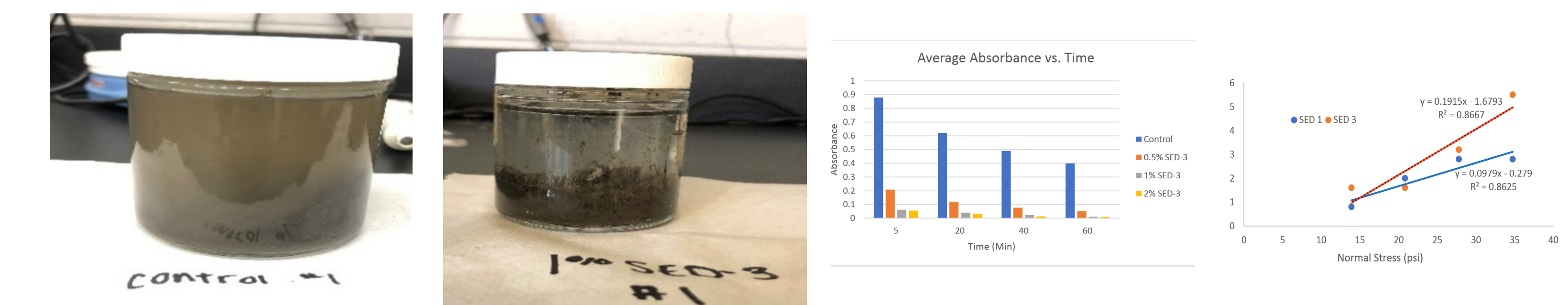
- Vegetable Protein Extracts: < 20%
- Polysaccharides: < 95%
- Off-White Powder; Odorless

RESULTS

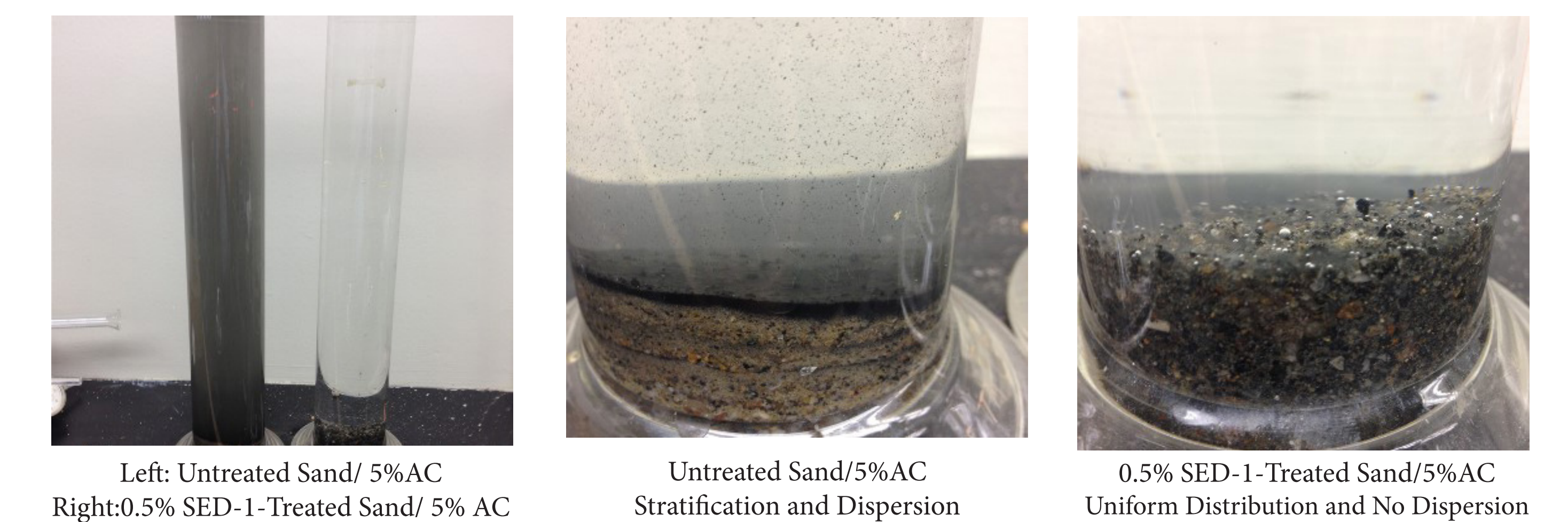
Impact of PPB Treatment on CETCO Organoclay-Amended Water Saturated Sand Shear Strength



Sediment Shear Strength Enhancement and Resuspension Mitigation Tests (Sediment from a tidally influenced mudflat in Barnegat Bay, New Jersey)



Activated Carbon (AC) Amendment Transport Optimization



CONCLUSIONS

- PPB treatments increase shear strength and cohesion of sand and Organoclay-amended sand. The treatments may be used to stabilize sand caps.
- PPB treatments are effective in increasing shear strength and reducing the turbidity of sediment/water mixtures. The treatments may be used to stabilize mudflats to reduce dredging and minimize sediment resuspension operations.
- The SED-1 PPB treatment minimizes dispersion of activated carbon and fine sand/silt in water. The SED-1 PPB can be mixed with activated carbon for direct sediment application or as part of an amended sand cap before placement in-situ.
- The SED-1 PPB treatment passed the aquatic acute toxicity tests (> 90% survival).