CSTF AQUATIC SUBCOMMITTEE MEETING

CEMENT STABILIZATION OF CONTAMINATED DREDGED MATERIAL

BENCH SCALE STUDY

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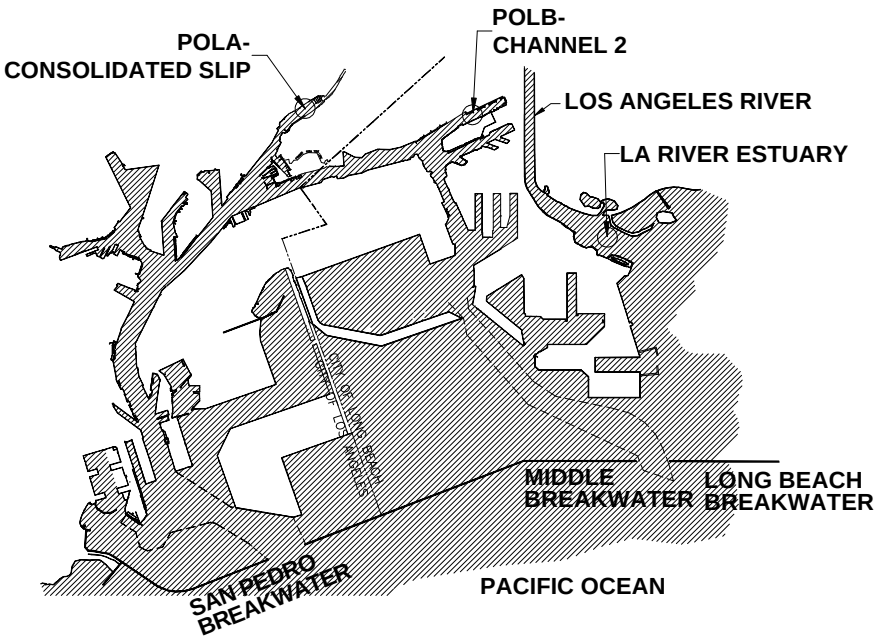
NOVEMBER 12, 2002

BENCH STUDY OVERVIEW

- Assess Application of Cement Based Stabilization (CBS) Technology to Regional Dredged Material
- Consider Range of Sediment Types and Levels of Contamination
- Analyze Ability to (1) Bind Contaminants and (2) Improve Physical Properties through Extensive Chemical and Physical Testing Program
- Determine Effectiveness of More Economical Reagents than Cement Alone

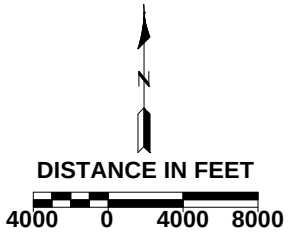
WHAT IS CEMENT BASED STABILIZATION TECHNOLOGY?

- Treatment of radioactive wastes from weapons and fuel programs
- Treatment of industrial wastes including oil and chemical wastes
- Addition of reagents causes *solidification* (physical) and *stabilization* (chemical)
- *Solidification* increases strength and decreases permeability
- *Stabilization* changes chemical structure rendering the hazardous components less soluble and less toxic
- Successful treatment of over 4 million cubic yards of contaminated dredged material



LEGEND:

○ DREDGE MATERIAL SOURCE



Prepared by: Moffatt & Nichol Engineers
April 2002
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CEMENT-BASED STABILIZATION OF DREDGED MATERIAL

LOCATION MAP

Figure E-1

REGIONAL DREDGED SEDIMENT CHARACTERISTICS

- Marina del Rey - coarse sandy material with shells & debris - strong sulfide odor
- LA River Estuary - sand (less coarse than MdR) - strong odor
- POLB Channel Two - clay with shells - strong odor
- POLA - Consolidated Slip - oily clay material - strong sulfide & organic odor

SELECTED REAGENTS

REAGENT	$/Ton Range for So.CA
Type II Portland Cement	$67 to $82
Type F Fly Ash	$32 to $36
Fluidized Bed Ash	$17 to $20

REAGENT TEST COMBINATIONS

SITE	REAGENT	REAGENT MIXTURE (Percent by Weight)									
ALL (Base Case)	Type II Cement	8	6	4	6	4	2	6	4	2	Raw
	Type F Ash							4	6	8	
	FB Ash				6	8	10	2	4	6	

- Additional tests included 2% cement w/ and w/o 2% Type F Fly Ash

BENCH SCALE TEST PROGRAM

- Upper limit to prevent loss of contaminants and improve strength
- Lower limit to show some improvement in binding and strength
- Median to be approximate mid-point
- 3 reagents at 3 percentages results in 9 combinations per site
- Full suite of testing for LARE; median for other sites
- Reduced suite for all other combinations


THE LAB


PRIVATE DOCK


MDR
MDR
MDR
MDR
MDR
MDR


POLA
Raw
Mixed
No Seawater


LARE
4% Cement
8/12/01


MDR - 029
TRASH REMOVED
148g.
8/14/01


FB-A5H


LARE
8%
1HR
016
014

PHYSICAL TESTING PROGRAM

- Grain Size
- Atterberg Limits
- Compaction
- Consolidation
- Permeability
- Unconfined Compressive Strength
- Direct and Vane Shear

CHEMICAL TESTING PROGRAM

- Bulk Chemistry
- Conventionals
- Waste Extraction Test (WET)
- Synthetic Precipitation Leaching Procedure (SPLP)
- Pore Water Salinity

KEY PHYSICAL TEST RESULTS - MDR & LARE

- Already possess good engineering qualities (93% & 89% sand, respectively)
- Produced “set times” of 5-10 hours
- Improved unconfined compression & shear strength
- Minimum impact on compaction, compressibility and permeability

KEY PHYSICAL TEST RESULTS - POLB

- 16% sand
- Set time reduced to less than 1 day
- Improved shear strength
- Increase permeability - improved drainage
- No improvement to compressibility
- Mixes with best combination of engineering properties:
  - 4% cement / 8% FB
  - 4% cement / 6% TF / 4% FB

KEY PHYSICAL TEST RESULTS - POLA

- 10% sand
- Set time reduced to less than 12 hours for higher cement contents
- Improved shear strength
- Increase permeability - improved drainage
- Reduced compressibility
- Mix with best combination of engineering properties:
  - 4% cement / 8% FB

KEY RESULTS - CHEMICAL ANALYSIS

- All raw sediments exceeded ER-M values in at least 1 category; POLA had 23
- No raw sediments exceeded TTLC values
- No raw or stabilized extracts exceeded STLC values
- Results indicate none of the samples (raw or treated) would be considered hazardous waste under California Title 22 criteria
- Blends with 4% or more cement bound contaminants better

CONCLUSIONS & RECOMMENDATIONS

- CBS improved ability to manage material in timely manner
- High fines and low density may limit applicability of POLB, POLA sediments
- Cost projected at $45/cy dredging through treatment; $7 for reagent purchase
- Recommendations:
  - more aggressive pH?
  - test material with more contaminants of concern (eg DDT)
  - market study for potential end users