

II. DEWATERING STUDIES FOR HOWLAND HOOK MATERIAL -- 1995

FINAL

# **FEASIBILITY STUDY REPORT**

Dredged Material Disposal  
Howland Hook Marine Terminal

Staten Island, New York

Agreement No. 415-95-024

Prepared by:  
**Malcolm Pirnie, Inc.**  
102 Corporate Park Drive  
White Plains, New York 10602

Port Authority of  
New York and New Jersey

November 1995  
2252-022



**OHM Remediation  
Services Corp.**

A Subsidiary of OHM Corporation

**TREATABILITY TESTING REPORT  
FOR THE RIVER HARBOR SEDIMENTS  
RECEIVED FROM MALCOLM PIRNIE**

Prepared By:

OHM Remediation Services Corp.  
Findlay, OH

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Paul R. Lear, Ph.D.  
Manager, Treatability

June 9, 1995  
OHM Project 17xxx

**TESTING OBJECTIVE**

The objective of the treatability testing on the river harbor sediments submitted by Malcolm Pirnie was to evaluate the efficacy of recessed chamber filter press dewatering to achieve optimal liquid/solid separation in the sediments. The physical characteristics of the harbor river sediment sample, such as solids content, particle size distribution, and bulk density were examined. The proposed treatment process for the river harbor sediments was indicated by Malcolm Pirnie to consist of clam shell dredging, filter press dewatering of the dredged sediments, and disposal of the dewatered filter press cake.

**CHARACTERIZATION**

One 5 gallon and four 1 gallon samples of the river harbor sediment material, labelled Loc #14, were received by OHM's Treatability Laboratory on June 5, 1995. The four 1 gallon samples were homogenized and characterized for solids content, pH, particle size distribution, and bulk density. The results are summarized in Tables 1 and 2.

Table 1. Solids Content, pH and Bulk Density Results

Sediment Sample	Solids Content (%)			Average Solids Content	pH	Bulk Density (lb/ft <sup>3</sup> )
	Replicate 1	Replicate 2	Replicate 3			
Composite	40.5	40.6	40.7	40.6	7.36	82.4

Table 2. Particle Size Distribution Results

Particle Size	% of Total Dry Solids
>4.75 mm	1.4
4.75 mm - 2 mm	<0.65
2 mm - 600 µm	2.1
300 µm - 600 µm	2.6
150 µm - 300 µm	1.9
75 µm - 150 µm	3.1
38 µm - 75 µm	8.5
<38 µm	80.4



Based on the solids content and bulk density of the composite sediment sample, the average particle density of the solids in the sediment samples can be calculated to be 2.48 g/mL which is within the range typically seen for most common soil minerals (~2.4 - 2.8 g/mL). The particle size distribution results for the composite sediment samples indicate that the sediment material consists mainly of silt (50  $\mu\text{m}$  - 2  $\mu\text{m}$ ) and clay (< 2  $\mu\text{m}$ ) sized particles.

### Dewatering Treatability Testing

In order to evaluate the dewatering process parameters, portions of the homogenized sediment sample were diluted with water to produce pumpable slurries. The dilution is necessary since material can only be fed into a recessed chamber filter press in the form of a pumpable slurry. It was determined that diluting the composite sediment material with between 1:1 sediment/water and 1:4 sediment/water would produce a pumpable slurry material.

Slurries containing 1:1 sediment/water and 1:4 sediment/water were amended with a dewatering conditioning agent and dewatered in a bench-scale recessed chamber filter press. Preliminary dewatering testing indicated that hydrated lime was an effective conditioning agent. Hydrated lime was added to the slurries at rate of 0.05 and 0.1 lbs/gallon of slurry. The applied press pressure was 225 psi and the filter cloth used was 3-5 cfm mesh. The required press time was determined by monitoring the rate of effluent production. Table 3 summarizes the dewatering treatability testing results.

### CONCLUSIONS

The physical characterization data for the composite harbor sediment sample indicated that the bulk and particles densities of the sediment material is within the range typically encountered for river sediments. The solids content were within the ranges typically expected for sediments of a clayey nature. The particle size distribution data for the harbor sediment samples indicated that a majority of the solid material present are silt- and clay-sized (< 50  $\mu\text{m}$ ) particles.

The dewatering treatability results are predicated on having the clam-shell-dredged harbor sediments are diluted with water to create a pumpable slurry. Testing indicated that mixing the sediment material 1:1 with water would create a pumpable slurry. The slurry, when amended with 0.1 lbs per gallon of hydrated lime, can be dewatered to a suitable filter cake material. The dewatering testing conducted suggest that volume and weight reductions, as compared to the undiluted sediment, in the range of 30% and 24% can be achieved by dewatering.



Table 3. Summary of Dewatering Treatability Testing Results

Filter Press Run	2	3	4	5
Sediment/Water Slurry	1:4	1:4	1:1	1:1
Hydrated Lime (lb/gal)	0.05	0.10	0.10	0.05
Run Time (min)	50	50	30	45
Cake Quality	Good	Very Good	Good	Poor
Cake Solids (%)	55.4	61.16	54.64	48.26
Cake pH	11.66	11.75	11.59	10.15
Cake Density (tons/yd <sup>3</sup> )	1.19	1.32	1.25	1.17
Effluent Quality	Good	Good	Good	Good
Effluent pH	11.52	12.07	12.09	8.93
Effluent TSS (mg/L)	37	22	86	46
Weight Reduction <sup>1</sup> (%)	22.6	26.2	22.4	14.0
Volume Reduction <sup>1</sup> (%)	28.0	37.7	30.9	18.0

<sup>1</sup> Weight and volume reductions were based on the undiluted composite sediment material

As with most treatability and laboratory studies, the results of this study were obtained under laboratory conditions using a single composite sample. Full scale processing under field conditions and/or variability in the materials to be treated may result in treated material which varies from the treated material produced under laboratory conditions or the use of additional reagents, equipment and/or processing time to produce a similar treated material to that produced under laboratory conditions.



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June 9, 1995

Malcolm-Pirnie, Inc.  
102 Corporate Park Drive  
White Plains, NY 10602

ATTN: David Foster

RE: Job No. 2252-021-130  
Results of Arthur Kill  
Bench Scale Dewatering Tests

Dear Mr. Foster,

Please find the enclosed bench scale test results for the Port Authority/Arthur Kill mud. Three dewatering methods were tested.

1. Plate and Frame Filter Press
2. Belt Filter Press
3. Centrifuge

The results of the test indicate that the mud dewateres well using a belt filter press or a plate and frame filter press. The centrifuge did not yield good results. The plate and frame filter press will generate a slightly higher filter cake percentage than a belt filter press; 55.8% (not including ferric) vs. 52.4% solids by dry weight. (See enclosed lab results). A plate and frame filter press will require 30,000 ppm of ferric chloride as a conditioning agent for dewatering. This is a relatively high chemical dose, and it might effect the characterization of the filter cake for disposal purposes. The belt filter press would utilize approximately 4.5# of polymer per dry ton of solids. Based on the lab results Mobile recommends using belt filter presses to perform the dewatering of this mud.

Please find the following summary of the test results.

As received solids:	40.58%
As received pH :	7.7
As received density:	10.38#/gal.

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Bench Test Summary (cont.)

	B.F.P	P.F.P	CENTRIFUGE
Dilution Factor:	3:1	3:1	3:1
Infeed Solids :	10.70%	10.70%	10.70%
Infeed Density :	8.9#/gal.	8.9#/gal.	8.9#/gal.
Conditioning :	Polymer	Ferric Chloride	Polymer
Cake Solids :	52.4%	60.3%	31.5%

NOTE: All percent solids figures are on a dry weight basis.  
B.F.P = Belt Filter Press  
P.F.P = Plate and Frame Filter Press

Based on an estimated volume of 150,000 cubic yards of material in place. The following calculations have been made:

Total Dry Tons of Material in Place: 63,815 Dry Tons

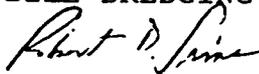
Total Tons of filter  
cake to be disposed (using B.F.P) : 121,785 Tons of Cake

Estimated Number of Trucks : 5,536 @ 22 tons/load

We trust you will find these bench test results helpful. Samples of the filter cake that was generated from each test will be sent to the Malcolm-Pirnie Environmental Lab as requested. Please, do not hesitate to contact me with any questions.

Very truly yours,

MOBILE DREDGING & PUMPING CO.

  
Robert D. Sims  
Division Manager

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