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September 8, 1989

Richard J. Hughto, Ph.D., P.E.
Vice President
Rizzo Associates, Inc.
235 West Central Street
Natick, MA 01760

Re: Hot Spot Feasibility Study
New Bedford Harbor (891-01)
REVISED Review of Pilot
Dredging Study Report

Dear Dr. Hughto:

Transmitted herewith is a camera ready version of our REVISED review of the dredging and capping aspects of the referenced report.

This revised report reflects all of the comments made in your notes of September 5 with the following exceptions:

1. orig report p 5, last par - your comment on the "government treats these issues very lightly." We believe this type of comment is more appropriately made by you.

2. orig report p 9, item 12 comment - you asked for more detail on the dredge operating data which is lacking. There is no dredge operating data in the Report. We have not made a comment on what data should be supplied. If you wish we could prepare such a list but this involves a review of the whole scope of a pilot study.

3. orig report p 11, first comment - you asked for what would comprise an appropriate test, references and what have similar programs done. We have prepared a review of the Corps Report. As noted in item 2 above, your request would entail a special effort.

4. orig report p 16, first par - we believe your comment on the failure of the pilot study is best made by you.

GAHAGAN & BRYANT ASSOCIATES

5. orig report p 16, comment on 35 b - we believe your comment on the Government failure to thoroughly evaluate alternatives is best made by you.

We have made two deletions from the original report:

1. orig report p 12, item 21 - deleted subparagraph a. regarding operation of spuds. We felt this was getting too "picky."

2. orig report p 13, item 24 comment - deleted sentence referring to standard winch length since obviously one would not need to keep 2,000 feet of wire on the winch.

Please advise if you have additional comments.

Very truly yours,

GAHAGAN & BRYANT ASSOCIATES

RF Thomas

Richard F. Thomas

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NEW BEDFORD HARBOR
HOT SPOT FEASIBILITY STUDY
REVIEW OF REPORTS

DREDGING PILOT STUDY REPORT

August 1989

SUMMARY

Gahagan & Bryant Associates has reviewed the Interim Report on the Evaluation of Dredging and Dredged Material Disposal of the New Bedford Harbor Superfund Pilot Study prepared by the U S Army Corps of Engineers, New England Division (referred to as "Report"). Our review has been limited to those aspects of the Report related to dredging and the placement of dredged material in the Confined Disposal Facility (CDF) and the Confined Aquatic Disposal Facility (CAD).

Our comments are generally focused upon the dredge equipment, the "near-field effects" of the equipment such as "sediment resuspension" and the disposal operations. We also restrict our review to the cutterhead dredge as the most suitable type of equipment. We do not comment on environmental effects of the dredging operations including PCB losses in the water column and plume characteristics.

The Report reaches four principal conclusions regarding effectiveness and operation of the dredging equipment in the areas of:

a. Recovery of PCB-contaminated materials,

b. Quantity of material removed,

c. Effects of dredge operational procedures.

d. Costs of Dredging.

We find that the Report does not contain adequate information or data to substantiate the claims made for the above aspects of the proposed work. Such data from the

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basis in order to control the dredging operations. Five months after the placement of the CAD cap the Report does not contain cross sections showing the cap condition.

The Report (pages 45 and 47) refers to preliminary sediment sampling and sampling for removal efficiency. It states that these data will then be used in determining the removal efficiency of each dredge. If this data is not in the Report and it will be used to determine removal efficiency, how can the Report state that the dredges are efficient in removal?

QUANTITY - Survey procedures used in the Pilot Study are not described, nor are cross section data presented to confirm the estimated quantities. The few cross sections which are presented are not conclusive. It is significant to note that the Interim Report was prepared in June 1989, five months after the CAD was filled. After this time the Report still does not contain cross sections of the work accomplished. This is an indication of the lack of real time control of the work. It also casts doubt upon the claims made for precise control of dredging depths and quantities of materials removed when no data substantiating that control is published in the Report.

Adequate cross sections and mass balances for solids and PCB are a difficult but a critical measurement and control requirement for this project.

EFFECTS - The Report discusses testing for the effects of dredge operational procedures, ladder swing speed, cutterhead rpm, rate of advance and depth of cut. Qualitative terms are used (page 30) such as "reducing as much as possible", "reducing the rpm of the cutter" and "minimizing the depth of cut." Actual data given do not indicate any good correlation between ladder swing rate and "sediment resuspension." No data are presented on cutter rpm or depth of the cutter while dredging.

COSTS - The only cost data presented in the Report is the daily rental rate for the dredge, operator and attendant plant. No estimate is provided for scaling up the pilot study rental rate to a cost for the hot spot or full-scale dredging programs.

An appropriate cost estimate would be based upon an analysis of the job conditions, special equipment costs, project management requirements, equipment productivity, special environmental requirements, special worker health

Pilot Study may exist but it is not contained in the Report. Our general comments on the four principal conclusions of the Report are given below.

RECOVERY - The Report (page 23) states that in Area 1 the cutterhead dredge left the bottom with an average of 84 ppm PCB after one pass with an average cut of 1.5ft. In Area 2 the same dredge left the bottom with an average 10 ppm PCB after an average cut of 1.1 ft using a second or sweep pass. No data is presented which substantiate this statement. Indeed, no mass balances for materials and PCB transport from cut to the disposal areas are presented to demonstrate that material and PCB were actually removed from the dredging areas.

It is an obvious possibility that the before dredging PCB levels in the two different areas could contribute to a difference in after dredging conditions. Also, the actual dredging procedures could, without careful control and measurement of effects, cause relocation, burial or otherwise lose track of contaminated materials.

Three aspects of the dredging process are of principal concern:

a. Dredge position,

b. Cutterhead location,

c. Before and after dredging surveys.

Dredge Position - The position of the dredge must be carefully and continuously measured in order to assure that the dredge is over the desired dredging area. The Report contains no indication that a high precision survey system was used in the study.

Cutterhead Location - The depth of the cutterhead with respect to the face (depth of material) being dredged is a critical factor in production and in the disturbance of the bottom. Also, the depth of the cutterhead must be frequently adjusted to maintain a relatively constant digging face while accommodating tide changes (up to 1.4 ft/hr change was reported) as well as variations in bottom elevation. The Report contains no data on cutterhead depth.

Before and After Dredging Surveys - Depth surveys as well as cores of the bottom to an adequate depth are required to determine the volumes of material removed as well the recovery of PCB-contaminated materials. The hydrographic surveys must be available on a near real-time and safety requirements and the requirements of the CDF and effluent treatment operations and their effects upon dredging productivity.

In general, we conclude from our review that adequate data are not presented in the Report to support the claims made as to the effectiveness of dredging as a means of recovering PCB-contaminated materials from the Upper Estuary.

The short time period available to carry out the Pilot Program is a condition which may have limited the collection of adequate and conclusive field data.

In our view the proposed project is too difficult, too important and too costly to be based upon the limited data presented in the Report.

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NEW BEDFORD HARBOR
HOT SPOT FEASIBILITY STUDY
REVIEW OF REPORTS

DREDGING PILOT STUDY REPORT

August 1989

1. SCOPE OF REVIEW

Gahagan & Bryant Associates has reviewed the Interim Report on the Evaluation of Dredging and Dredged Material Disposal of the New Bedford Harbor Superfund Pilot Study prepared by the U S Army Corps of Engineers, New England Division (referred to as "Report"). Our review has been limited to those aspects of the Report related to dredging and the placement of dredged material in the Confined Disposal Facility (CDF) and the Confined Aquatic Disposal Facility (CAD).

Our comments are generally focused upon the dredge equipment, the "near-field effects" of the equipment such as "sediment resuspension" and the disposal operations. We also restrict our review to the cutterhead dredge as the most suitable type of equipment. We do not comment on environmental effects of the dredging operations including PCB losses in the water column and plume characteristics.

Our comments on the Report are of two types. General Comments are made regarding the Conclusions and Recommendations of the Report and Specific Comments are made on a page by page basis for those portions of the Report reviewed by us.

GBA comments as well as selected observations are consecutively numbered and reference relevant pages and paragraphs from the Dredging Pilot Study Report.

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2. GENERAL COMMENTS

Our general comments on the Conclusions and Recommendations of the Dredging Pilot Study Report with respect to dredging (Report pages 29 through 31) are summarized in this Section. General comments on the CDF and CAD facilities follow those on dredging.

2.1 DREDGING, GENERAL COMMENTS

Conclusions and Recommendations of the Dredging Pilot Study Report with respect to dredging (Report pages 29 through 31) are summarized below. Our general comments are made after each item of the Conclusions and Recommendations.

Report Conclusions:

1. p 29, par 3 - The three dredges used were able to effectively remove the contaminated sediment...

COMMENT - The Report (p 23, par 5) states that in Area 1 the cutterhead dredge left the bottom with an average of 84 ppm PCB after one pass with an average cut of 1.5ft. In Area 2 the same dredge left the bottom at less than 10 ppm PCB after an average cut of 1.1 ft using a second or sweep pass. No data is presented which substantiate this statement.

It is an obvious possibility that the before-dredging PCB levels in the two different areas could contribute to a difference in after-dredging conditions. The actual dredging operation could, without careful control, also contribute to the redistribution of contaminated materials.

The Report (pages 45 and 47) refers to preliminary sediment sampling and sampling for removal efficiency. It states that these data will then be used in determining the removal efficiency of each dredge. If this data is not in the Report and it will be used to determine removal efficiency, how can the Report state that the dredges are efficient in removal?

2. p 29, par 3 - ...while minimizing the amount of material that was removed.

COMMENT - The Report contains no information on how the estimated quantities of material removed, placed in the CDF or CAD or placed in the caps for these facilities were determined. The limited cross sections presented in the Report are not conclusive. As an example, the cross section presented in Figures 3-2 and 3-3 (page 3-3 and 3-4) show the CAD facility. These sections are not fully annotated.

There are three aspects of these sections of interest:

a. variations from what was apparently meant to be a level bottom. The after dredging bottom varied in elevation from -5.5 to - 8.5 ft, a difference of 3 ft. The after filling bottom varied from -4.8 to -7.1 ft, a difference of 2.5 ft (Report Figure 3-3, page 3-4). A 50 by 50 ft section at -8 ft was described but is not evident.

b. At one point the after filling elevation is one foot below the before filling elevation.

c. It is significant to note that the Interim Report was prepared in June 1989, five months after the CAD was filled. After this time the Report still does not contain cross sections of the work accomplished. This is an indication of the lack of real time control of the work. It also casts doubt upon the claims made for precise control of dredging depths and quantities of materials removed when no data substantiating that control is published in the Report.

Adequate cross sections and mass balances for solids and PCB are a difficult but a critical measurement and control requirement for this project.

3. p 29, 3rd Table - The average resuspension rate for the cutterhead dredge is 17.3 g/s.

COMMENT - Measured data from which the resuspension rates (R) for the cutterhead dredge are calculated are presented in Table 1, page 1-25 of the Report. Values from this table are presented in Table A-1 in the Appendix to this review. These values represent 51 observations made over five days during a total of 13 hours of dredging out of a total of 170 hours of dredging of contaminated and clean materials with the cutterhead dredge.

The average of the values for R in this table is 21.6 not 17.3. A plot of R vs ladder swing speed (S) values in Table A-1 is shown in Figure A-1 in the Appendix. This plot indicates no strong correlation between S and R. In fact one might conclude from these data that the lowest value for resuspension occurs with the highest ladder swing speed.

R values from Table A-1 are plotted vs date of observation in Figure A-2. This seems to indicate that the date of the observation is more significant than the ladder swing speed.

The quality of these data may be affected by the inherent variability of conditions at the test site as well as the short testing time available.

4. p 30, par 2 - Different operating procedures were experimented with during the first few days of each dredge's work period. Results for the cutterhead are:

Production rate	20 cy/h, two passes
Area covered	444 sf/h, two passes
Effective time	84 percent w/o setup

COMMENT - The Report does not contain data describing the dredge production characteristics, e.g., pipeline length, pump impeller size and characteristics of the material being dredged. We have confirmed the general production rates shown after making some assumptions concerning dredging conditions.

5. p 30, par 3 - Modifications to Standard Dredging Procedure minimized resuspension and reduced the quantity of sediment removed...

Swing speed	reduce as much as possible
Rate of advance	reduce as much as possible
Cutterhead RPM	reduce
Dredge pump	run at full speed
Depth of cut	minimize

COMMENT - The Report does not discuss what rates for the factors in the above list comprise Standard Dredging Procedure. A term such as "reduce as much as possible" is wholly inappropriate since the lowest possible value is zero. It is quite likely that these values cannot be fixed at this time but will have to be adjusted for conditions encountered during an actual project. We do not believe that the Report presents sufficient data to justify the setting of any values for the factors listed.

Report Recommendations:

6. p 31, par 1 - Use a comparably sized cutterhead dredge for the Upper Estuary...

COMMENT - A "comparably sized dredge" is not a specific requirement. Does this mean a 10-inch dredge with an 8-inch pipeline as was used in the study? A 10-inch dredge and pipeline? Would a 12-inch dredge be allowed? As we develop more fully in our Specific Comments, dredge size is a critical factor in job production and cost and in the sizing of a CDF and effluent treatment facilities.

7. p 31, par 1 - Selected advantages of this type of dredge taken from those listed in Dredging Pilot Study Report:

a. equipment impacted least by debris encountered,

b. most common dredge in the U. S.

COMMENT - We believe that this statement is irrelevant. The proposed work is so unique and the cost projected by the Report so high that a common dredge is the least important factor in a successful job. We do not agree with the emphasis placed upon readily available, conventional equipment. The typical dredging contractor equipment capabilities are a compromise to cover a wide range of job conditions expected to be encountered.

General dredging practice also does not provide the appropriate approach to the work or the degree of precision required. Ordinary dredging specifications provide for a two foot overdepth allowance to provide for "the normal inaccuracies of the dredging process". The contractor is not required to remove the overdepth allowance but he is paid for material removed to the overdepth limit.

The correct approach cannot be made without specially fitted equipment and adequate procedures to assure cleanup without excess dredging quantities. The optimum production, effectiveness and cost will likely require specially designed or modified equipment.

c. there are numerous contractors with the equipment.

COMMENT - The same type of comment made in item 7b applies here. Further we have substantial concern that a conventional unit price, lump sum or performance oriented contract is appropriate for the proposed work. We believe that the uncertainties, risk and the potential environmental impacts that could result from this work remove from consideration "numerous contractors with the equipment."

8. p 31, par 3 - The following operating parameters should be used when developing plans for the Upper Estuary:

Operating time per day	3 - 4 hours
(may be extended where water depth exceeds 3 feet)	
Number of passes	2
Width of cut	60 ft
Rate of advance, first pass	11 ft/hr
second pass	25 ft/hr
Production rate, first pass	35 cy/hr
second pass	nil
Flowrate	2,100 gpm
Slurry solids concentration	40 g/L
Cost, operator and attendant plant	$1,120/day

COMMENT - As we have outlined above, the Report contains no data or analysis which support the requirement to use the procedures and rates listed above. The Report cannot be fully reviewed without such detailed backup data.

The daily rental rate quoted is not particularly relevant as a measure of the dredging cost of the proposed hot spot or full scale dredging programs. An appropriate cost estimate would be based upon an analysis of the job conditions, special equipment costs, project management requirements, equipment productivity, special environmental requirements, special worker health and safety requirements and the requirements of the CDF and effluent treatment operations and their effects upon productivity.

It is interesting to observe that no value is given for the depth of cut "when developing plans for the Upper Estuary" Depth of cut is, of course, a primary factor in determining the volume of material to be dredged. It is important to minimize dredged material volume because of the significant costs associated with processing the materials after they have been placed in a CDF.

2.2 GENERAL COMMENTS, CDF

A primary factor describing sedimentation basin performance is the overflow rate expressed in gallons per day per square foot (O/F, gpd sf . The typical rates for the CDF are 20 gpd/sf for the primary basin and 110 gpd/sf for the secondary basin. These values are on the order of parameters for other dredged material disposal areas and should give good performance subject to any unique site conditions.

2.2.1 Primary Cell - The CDF effluent TSS data are presented in Table 1, page 2-7 of the Report. These data and a plot of values for the period 2 through 30 December

1988 are given in the Appendix, Table A-2 and Figure A-3. The plot shows a significant increase in TSS for 28 - 30 December when the CDF cap was being placed. Polymer addition was made during this period. Slurry solids concentrations were reported as about 150 g/L vs the 35 g/L typically carried during placement of contaminated materials. One would expect good performance (low TSS) even at this higher solids loading.

Possibly the fact that the CDF never attained the desired ponding depth of 2 ft due to the excessive leakage through the sheet pile dividing wall would explain this poorer performance. For this reason the operational performance of the primary cell, and the polymer addition performance discussed below, are not conclusive.

2.2.2 Secondary Cell - Polymer was added only during the placement of clean cap materials by spraying at the primary cell weir. The Report states that polymer addition had no effect at low slurry solids concentrations (see Figure A-3). At the high solids levels experienced there was a measurable effect. We make three general observations:

a. High polymer performance can only be expected with a carefully designed system that provides for rapid mixing and flocculation followed by settling of the coagulated solids.

b. The better performance experienced at high solids loadings may not be relevant since it is planned to carryout the dredging at the lower solids loading where poor performance was experienced.

c. This issue must be clarified since we understand that the EPA plan provides for polymer addition followed by GAC adsorption for the effluent flows. The Report contains no analysis of effluent treatment performance and discharge quality limitations.

2.2.3 General - The Report does not contain sufficient data or analyses to demonstrate that the CDF, as now constituted, can provide adequate effluent quality for future dredging projects.

2.3 GENERAL COMMENTS, CAD

The performance of the CAD cell is not substantiated by the data presented in the Report. The cross section presented in Figure 3-3, page 3-4 of the Report does not indicate that a 2 to 3 ft cap was placed. This cross section is reproduced and discussed in Figure A-4 of the Appendix.

3. SPECIFIC COMMENTS

This Section of our review presents comments and observations on specific portions of the Report.

9. p i, par 1 - Pilot Study was conducted...between May 1988 and February 1989.

COMMENT - The Pilot Study is described as taking place over a ten-month period. Actual dredging operations using the recommended hydraulic cutterhead dredge handling PCB-contaminated materials took place for a total of 53 hours while moving 1,600 cy of material. We believe that the lack of conclusive data regarding dredge performance is due in part to this limited test period.

10. p vii, par 1 - Log of Operations, to be included in the final version of Report.

COMMENT - The log of operations should contain useful information on dredging conditions and factors affecting the performance of the dredge and disposal facilities. A final appraisal of the Report cannot be prepared until the information contained in this and other appendices is available.

11. p 4, par 3 - The Pilot Study achieved and/or evaluated the following specific technical objectives:

a - Evaluated effectiveness of the dredging equipment.

COMMENT - The Report neither describes data collection procedures nor contains data substantiating recovery of PCB-contaminated materials. Mass balances of material quantities and PCB are required to demonstrate that dredged material and PCB have actually been removed and placed in the disposal facilities. This requires a set of measurements of both volume and mass of PCB in the cut and in the disposal area.

b - Evaluated sediment resuspension at the dredge head.

COMMENT - This issue is discussed in detail elsewhere in this review. In general, the data presented in the Report do not substantiate the conclusions reached in the Report.

c - Refined and scaled-up laboratory data for design of disposal and treatment processes for contaminated material.

COMMENT - We have not reviewed the aspects of the Report related to the structural design of CDF or CAD facilities. We have reviewed the operational aspects of these facilities and find that the data presented are not conclusive in supporting the conclusions and recommendations presented. Specific details are discussed subsequently.

d - Developed and field tested procedures for construction of a CAD under specific site conditions.

COMMENT - The one set of cross sections relating to the CAD development are presented in Figure 3-3, page 3-4 of the Report. These sections are not fully annotated. These sections do not confirm that a 2 to 3 ft cap has been placed in the CAD. They do not given detail on the before and after placement depths for the contaminated material. Additional comments on this section are given in item 2.

e - Established actual cost data for dredging and disposal of New Bedford Harbor sediment.

COMMENT - The daily rental rate presented in the Report for dredge, operator and attendant plant bears little relationship to the dredging cost of a hot spot or full scale dredging program. No estimate is provided for scaling up the pilot study rental rate to a cost for the hot spot or full-scale dredging programs.

An appropriate cost estimate would be based upon an analysis of the job conditions, special equipment costs, project management requirements, equipment productivity, special environmental requirements, special worker health and safety requirements and the requirements of the CDF and effluent treatment operations and their effects upon productivity.

12. p 4, par 4 - The information gained from this study will allow for a smoother transition as the project advances from the selection of alternatives into final design.

COMMENT - The information presented in the Report is not sufficient to prepare the final design of the proposed hot spot project. As an example, the Report data do not conclusively demonstrate how dredge production and operating procedures will affect PCB loss rates or what the parameters for the design of the CDF effluent treatment facilities should be.

13. p 8, par last - ...data generated during the pilot project will aid in developing the response to the three major questions that could not be adequately addressed by the EFS (12 reports prepared by WES, WES TR EL-88-15):

a - what are contaminant release rates from dredging,

COMMENT - contaminant release rates are related strongly to suspended solids generation. Suspended solids generation at the cutterhead dredge has been discussed in item 3, page 3.

Measured data from which the resuspension rates (R) for the cutterhead dredge are calculated are presented in Table 1, page 1-25 of the Report. Values contained in that table are presented in Table A-1 in the Appendix to this review. These values represent 51 observations made over five days during a total of 13 hours of dredging out of a total of 170 hours of dredging of contaminated and clean materials with the cutterhead dredge.

The average of the values for R in this table is 21.6 not 17.3 as indicated in the Report. A plot of R vs ladder swing speed (S) values in Table A-1 is shown in Figure A-1 in the Appendix. This plot indicates no strong correlation between S and R. In fact one might conclude from these data that the lowest value for resuspension occurs with the highest ladder swing speed.

R values from Table A-1 are plotted vs date of observation in Figure A-2. This seems to indicate that the date of the observation is more significant than the ladder swing speed.

The quality of these data may be affected by the inherent variability of conditions at the test site as well as the short testing time available. The Report contains no description of the sampling device or of the sampling procedures used.

The importance of this issue is related to the fact that emphasis is placed in the conclusions and recommendations of the Report upon slow swing speeds and slow cutterhead speeds. This results in lower dredge production, and higher dredging costs. The data contained in the Report do not, however, substantiate that slow speeds result in lower suspended solids generation.

b - efficiency of dredging for contaminant removal.

COMMENT - This issue has been noted in item 1, page 2. The Report (p 23, par 5) states that in Area 1 the cutterhead dredge left the bottom with an average of 84 ppm PCB after one pass with an average cut of 1.5ft. In Area 2 the same dredge left the bottom at less than 10 ppm PCB after an average cut of 1.1 ft when using a second or sweep pass. No data are presented which substantiate this statement.

It is an obvious possibility that the before-dredging PCB levels in the two different areas could contribute to a difference in after-dredging conditions. The actual dredging operation could, without careful control, also contribute to the redistribution of contaminated materials.

14. p 9, par 1 - Starting in November 1988...All major aspects of the study were conducted under close supervision and incorporating an extensive monitoring program. By the completion of the test in February 1989 over 140 hours of dredging had been accomplished with more than 9,500 cy of material disposed of either in a CDF or CAD cell. This report provides a detailed description of the project's goals and objectives with the methods employed and the results obtained.

COMMENT - The time period described covers four months. Of the 147 hours of dredging described in the Report during that four month period, the cutterhead dredge was operated during three separate operating periods for a total of 53 hours while removing 1,646 cy of contaminated bed materials. The three separate operating periods for the cutterhead took place during November, December and January under difficult weather conditions (page 23). We believe the relatively short time period available for the test has resulted in a limited amount of data to provide conclusive findings under the difficult and complex site conditions encountered.

While the Report may provide a detailed description of goals and objectives, it does not contain a detailed description of methods used and results obtained in the attempt to satisfy the goals and objectives. If the data contained in the Report is the sum total of the data produced we believe that insufficient information is available to provide conclusive findings on performance, cost and operational controls for the proposed hot spot or full scale programs.

15. p 9, par 3 - The Report has seven technical appendices.

COMMENT - Only four appendices are contained in the Interim Report received by us. Appendix 5 describes the dredging sites and Appendix 7 contains a log of operations. These two appendices may well have the detailed data and interpretations which we do not find in the Interim Report.

16. p 12, par 5 - Tests performed for the EFS indicated that as much as 82 percent additional suspended solids reduction could be obtained by polymer addition.

COMMENT - Test data contained in the Report do not show reductions of this magnitude, possibly due to the polymer feed arrangement used.

17. p 12, par 5 - It was estimated that a suspended solids concentration of 70 mg/l could be obtained.

COMMENT - It is not clear whether this concentration is with or without polymer addition. The Report states that, with the procedures used, the primary cell effluent TSS are not affected by polymer addition at this level of concentration.

18. p 15, par last - The prime interest in this phase of the pilot study was to evaluate the practicability of placing contaminated sediment in a CAD cell and capping it with clean sediment.

COMMENT - As indicated in Figure A-4, the cross section presented in the Report, Figure 3-3, does not demonstrate that that a cap of 2 to 3 ft thickness was placed over contaminated material.

19. p 19 - Submerged Diffuser

COMMENT - The Report discusses use of a submerged diffuser for use in placing materials in the CAD. Data in the Report do not indicate the thickness of contaminated and cap materials placed or the degree of separation and containment achieved for the two types of materials.

20. p 21, par 3 - Operating procedure - Discusses the use of spuds and anchors and digging operations for a cutterhead and matchbox dredge.

COMMENT - principal aspects of dredge movement swing and digging are:

a. Swing anchors - The Report describes the difficulties encountered with positioning anchors, their holding capabilities in the bed materials and the turbidity generated from anchor handling. The use of anchor booms for handling anchors is not discussed. A swinging or rotating ladder dredge would eliminate the use of anchors. This issue is an example of the problems resulting from the use of "conventional, readily available equipment."

b. Cleanup pass - Clean up can be achieved by a variety of methods. The Report implies the dredge covered an area then moved back to the beginning of the work area for a second pass. Hydraulic dredges often use the "back swing" as a cleanup procedure. Cutterheads rotate in one direction and therefore also cut differently in the two swing directions. Use of a cleanup swing before moving ahead or stepping would avoid repositioning the dredge to make a cleanup pass and thereby improve dredge production. Comparative testing would indicate if comparable results are achieved.

c. Cutter depth - The Report makes no mention of cutter depth while dredging or whether cutter depth was adjusted for tide changes. A maximum tide change of 1.4 ft per hour was reported (see Table A-1). The depth of cutter is a significant factor in dredge production. Presumably cutter depth, along with cutter and swing speeds, would also affect suspended solids generation at the dredgehead.

21. p 21, par 4 - At the start of operations different depths of cut, swing speed and advances were experimented with. A depth of cut of 2 ft with a 2 ft advance proved to be the most effective.

COMMENT - These factors have significant impact upon dredge production and dredging cost. There are no data in the Report which support this statement. Although a depth of cut of 2 ft is given as the most effective in this paragraph, later statements (page 23, paragraph 5) states that a depth of cut of 1.1 ft was used.

22. p 21, par last - The dredge was also required to make a second pass over the area...

COMMENT - Use of a second pass over the area is less productive than a cleanup swing as noted above. The depth of the cutter in the cleanup pass as well as the digging pass is important. Data on the actual volume of material to be dredged is essential to the determination of the feasibility of the project.

23. p 22, par 1 - Anchor operations and problems.

COMMENT - Swing anchors were discussed under item 21c. Placing anchors on the shore as recommended in the Report would involve the rehandling of relatively long anchor wires as the dredge progresses and relocates itself. This long wire would be a source of turbidity generation. The maximum wire length under these conditions would be on the order of 2,000 ft. Wire lengths of 1,000 ft would be common. We believe that an analysis is required to demonstrate the feasibility of this proposal.

24. p 23, par 3 - Production

COMMENT - The Report does not indicate how dredge slurry flow rates or slurry solids concentrations were measured. The Report does not provide before dredging and after dredging cross sections and cross sections of the disposal areas to confirm the quantities moved.

25. p 23, par 4 - It is not clear from the discussion when the diffuser was used during the test. The EPA report mentions use of a diffuser in the CDF (EPA Draft, May 1989).

26. p 23, par 5 - In area 1 with one pass with an average cut of 1.5 ft the PCB level after removal was 84 ppm. In area 2 with a second, sweep pass, and a average cut of 1.1 ft the PCB level after removal was 10 ppm.

COMMENT - No data is presented which substantiate this statement or which indicates how representative this data is.

It is an obvious possibility that the before-dredging PCB levels in the two different areas could contribute to a difference in after-dredging conditions. The actual dredging operation could, without careful control, also contribute to the redistribution of contaminated materials.

Items 48 and 50 refer to the sampling program mentioned in the Report.

27. p 23, par last - The suspended solids level was used with dredge swing speed to develop the resuspension rate.

COMMENT - Measured data from which the resuspension rates (R) for the cutterhead dredge were calculated are presented in Table 1, page 1-25 of the Report. Values from this table are presented in Table A-1 in the Appendix to this review. These values represent 51 observations made over five days during a total of 13 hours of dredging out of a total of 170 hours of dredging of contaminated and clean materials with the cutterhead dredge.

The average of the values for R in this table is 21.6, not 17.3. A plot of R vs ladder swing speed (S) values in Table A-1 is shown in Figure A-1 in the Appendix. This plot indicates no strong correlation between S and R. In fact one might conclude from these data that the lowest value for resuspension occurs with the highest ladder swing speed.

R values from Table A-1 are plotted vs date of observation in Figure A-2. This seems to indicate that the date of the observation is more significant than the ladder swing speed.

The quality of these data may be affected by the inherent variability of conditions at the test site as well as the short testing time available. The Report contains no description of the sampling device or the test procedures used.

28. p 29, par 5 - The three dredges used were able to effectively remove the contaminated sediment.

COMMENT - The Report gives no data which supports this statement. As noted above, the use of two different work areas with possibly greatly different levels of contaminant requires careful and extensive sampling before and after removal to confirm that the contaminated material has, in fact, been removed and not simply redistributed or buried by the dredging operation.

29. p 29, par 5 - ...while minimizing the amount of material removed.

COMMENT - The Report presents no data which substantiate this statement. Confirmation of this statement would require an extensive set of accurate surveys before and after dredging to compute the actual cut volume removed. Sampling is also required to document the contaminant concentrations in the material removed as well as remaining in the cut area. Such data may exist but it is not presented in the Report.

30. p 29, par 5 - Average resuspension rate for the cutterhead dredge was 17.3 g/s.

COMMENT - see item 27 for Comment.

31. p 30, par 2 - Different operating procedures were experimented with during the first days of each dredge's work period. Procedures selected reduced expected production rates.

COMMENT - The cutterhead dredge only operated 53 hours over 17 work days when removing contaminated material. Resuspension data (Table 1, page 1-25 of the Report and Table A-1 of the Appendix) are presented for 5 working days totaling 13 hours of dredging over the total cutterhead operating time of 170 hours. It is clear more data might have been collected which would reduce the uncertainties indicated in the present information.

When discussing production rates the Report omits descriptions of pipeline length and pump characteristics such as impeller diameter. These are important factors affecting the production rate for a hydraulic dredge.

32. p 30, par last - Modifications to Standard Dredging Procedure minimized resuspension and reduced the quantity of sediment removed...

Swing speed	reduce as much as possible
Rate of advance	reduce as much as possible
Cutterhead RPM	reduce
Dredge pump	run at full speed
Depth of cut	minimize

COMMENT - The Report does not discuss what rates for the factors in the above list comprise Standard Dredging Procedure. A term such as "reduce as much as possible" is wholly inappropriate since the lowest possible value is zero. The Report does not present sufficient data to justify the setting of any values for the factors listed.

33. p 31, par 1 - Use a comparably sized cutterhead dredge for the Upper Estuary...

COMMENT - A "comparably sized dredge" is not a specific requirement. Does this mean a 10-inch dredge with an 8-inch pipeline as was used in the study? A 10-inch dredge and pipeline? Would a 12-inch dredge be allowed? Dredge size is a critical factor in job production and cost and in the the sizing of a CDF and effluent treatment facilities.

34. p 31, par 1 - Selected advantages of this type of dredge taken from those listed in Dredging Pilot Study Report:

a. equipment impacted least by debris encountered,

b. most common dredge in the U. S.

COMMENT - We believe that this statement is irrelevant. The proposed work is so unique and the cost projected by the Report so high that a common dredge is the least important factor in a successful job. We do not agree with the emphasis placed upon readily available, conventional equipment. The typical dredging contractor equipment capabilities are a compromise to cover a wide range of job conditions expected to be encountered.

General dredging practice also does not provide the appropriate approach to the work or the degree of precision required. Ordinary dredging specifications provide for a two foot overdepth allowance to provide for "the normal inaccuracies of the dredging process".

The correct approach cannot be made without specially fitted equipment and adequate procedures to assure cleanup without excess dredging quantities.

We believe that the optimum production, effectiveness and cost for the proposed program would likely require specially designed or modified equipment which would be fully justified by the proposed work.

c. there are numerous contractors with the equipment.

COMMENT - The same type of comment made in item 7b applies here. Further we have substantial concern that a conventional unit price, lump sum or performance oriented contract is appropriate for the proposed work. We believe that the uncertainties, risk and the potential environmental impacts that could result from this work remove from consideration "numerous contractors with the equipment."

35. p 31, par 3 - The following operating parameters should be used when developing plans for the Upper Estuary:

Operating time per day	3 - 4 hours
(may be extended where water depth exceeds 3 feet)	
Number of passes	2
Width of cut	60 ft
Rate of advance, first pass	11 ft/hr
second pass	25 ft/hr
Production rate, first pass	35 cy/hr
second pass	nil
Flowrate	2,100 gpm
Slurry solids concentration	40 g/L
Cost, operator and attendant plant	$1,120/day

COMMENT - As we have outlined above, the Report contains no data or analysis which support the requirement to use the procedures and rates listed above. Such data may exist but it is not contained in the Report. The daily rental rate quoted is not particularly relevant as a measure of the dredging cost of the proposed hot spot or full scale dredging programs.

36. p 33, Part IV, Confined Disposal Facility (CDF)

COMMENT - Some aspects of the CDF of interest in dredged material placement operations are noted in Table 1.

TABLE 1

SELECTED ASPECTS OF CDF

Cell	Area, sf (1)	O/F, gpd/sf (2)	Average depth of fill Contaminated cy (3)	ft (4)	Cap cy (5)	ft (6)
Primary	142,400	20	2,200	0.6	3,920	1.0
Secondary	26,750	110	--	--	--	--

(1) Report page 2-1
(2) Computed using area (1) and typical flow of 2,000 gpm
(3) Report page 2-1
(4) Computed average depth of material over area (1) using cy (3) bulked 1.4 times
(5) Report page 2-1
(6) Computed average depth of material over area (1) using cy (5) bulked 1.4 times

A primary factor describing sedimentation basin performance is the overflow rate expressed in gallons per day per square foot (O/F, gpd/sf). The typical rates for the CDF are 20 gpd/sf for the primary basin and 110 gpd/sf for the secondary basin. These values are within the parameters for other dredged material disposal areas and should give good performance subject to any unique site conditions.

A typical "bulking factor" of 1.4 is used in Table 1 in the absence of any field data. In our experience, this value is generally encountered in upland disposal areas containing recently placed fine-grained materials. The measurement of this factor during the Pilot Test would have been appropriate since this value affects the volume required in the CDF.

Thickness of contaminated material - As indicated in Table 1, the average thickness of contaminated material in the CDF is 0.6 ft. This is a relatively thin layer which is difficult to control during placement. It is also difficult to measure a layer of this thickness in order to make necessary material and PCB mass balances in order to confirm effectiveness of the removal operations.

Thickness of cap - The average thickness of the CDF cap is computed to be 1 ft after placement. One can reasonably expect this thickness to reduce to less than half that value after desiccation if the cap is made up of fine-grained materials. Does a cap of this thickness comply with the environmental objectives of the overall Project?

37. p 36, par 6, Effluent Quality, Primary Cell

COMMENT - The CDF effluent TSS data are presented in Table 1, page 2-7 of the Report. These data and a plot of values for the period 2 December through 30 December 1988 are given in the Appendix, Table A-2 and Figure A-3. The plot shows a significant increase in TSS for 28 - 30 December. The CDF cap was being placed during this period. Slurry solids concentrations were reported as about 150 g/L vs the 35 g/L typically carried during placement of contaminated materials. One would expect good performance even at this higher solids loading. Possibly the fact that the CDF never attained the desired ponding depth of 2 ft due to the excessive leakage through the sheet pile dividing wall would explain this poor performance. For this reason the operational performance of the primary cell, and the polymer addition performance discussed below, are not conclusive.

38. p 36, par 3, Effluent Quality, Secondary Cell

COMMENT - Polymer was added only during the placement of clean cap materials by spraying at the primary cell weir. The data indicate polymer addition had no effect at low slurry solids concentrations (see Figure A-3). At the high solids levels experienced there was a measurable effect. We make three general observations:

a. High polymer performance can only be expected with a carefully designed system that provides for rapid mixing and flocculation followed by settling of the coagulated solids.

b. The better performance experienced at high solids loadings may not be relevant since it is planned to carryout the dredging at the lower solids loading where poor performance was experienced.

c. This issue must be clarified since we understand that the EPA plan provides for polymer addition followed by GAC adsorption for the effluent flows. The Report contains no analysis of effluent treatment performance and discharge quality limitations.

2.2.3 General - The Report does not contain sufficient data or analyses to demonstrate that the CDF, as now constituted, can provide adequate effluent quality for future dredging projects.

39. p 37, par 1 - ...should achieve a (?) percent reduction in the suspended solid(s)...

COMMENT - The value expected is not given.

40. p 37, par 6, Bulking Factor - The actual bulking factor appears to be much less than 2.0.

COMMENT - As mentioned the Pilot Study provided an opportunity to measure the actual bulking factor. Apparently this was not done. In our experience a factor of 1.4 for fine-grained materials is appropriate under usual conditions.

41. p 38, par 1 - Several concrete foundations located within the primary cell also had a positive effect by increasing detention time and minimizing resuspension within the cell.

COMMENT - This comment is not explained. One would not expect these structures to have any positive effect upon settling characteristics particularly detention time or overflow rate.

42. p 38, par last - The size of the secondary cell can likely be reduced in future CDF's.

COMMENT - No data is given to support this statement. The purpose of a secondary cell in this case is to settle flocculated sediments from the polymer addition system. The fact that few solids were captured in the secondary cell results from the poor design and operation of the system. A well designed system will require an adequate final settling basin.

43. p 38, par last - ...it was impossible to maintain the water level within the CDF.

COMMENT - If this is the case how have conclusive data been obtained?

44. p 39, par 3 - the CAD cell was dredged to an average depth of -6 mlw, the 50 ft square section was dredged to an average depth of -8.0 mlw.

COMMENT - The emphasis in the Pilot Study has been upon precision dredging but depths are given as average values. Examination of Figure 3-3, page 3-4 of the Report, shows that there is no 50 ft by 50 ft with an average depth of -8 ft mlw. The remaining portions of the cell bottom varied from about 0.5 ft above to 0.5 ft below the design grade of -6 ft. This is equivalent to a plus or minus 50 percent variation over the dredging cut of 1.1 ft expressed in the

Report (page 23). The data contained in the Report does not demonstrate the capability to dredge to the precision implied in the Report.

45. p 39, par 6 - Surveys of the site will continue and this section of the Report will be updated when additional information is obtained.

COMMENT - Accurate, precise surveys are critical to a project of this type. Five months after the work (CAD material was placed in January 1989, Report is dated June 1989) the Report still does not contain cross sections demonstrating the effectiveness of the work. The Report does not contain all of the data that has or will be collected regarding the feasibility of the Hot Spot Project.

46. p 45, par 1 - Preliminary Sediment Sampling

COMMENT - The Report states that sediment PCB levels at 0.5 ft intervals for a 3 ft depth are contained in Appendix 5. Appendix 5 is not in the Report. These data, along with after dredging cores of similar depth, are critical to the measurement of the effectiveness of dredging in removing PCB-contaminated materials. The spacing of the cores is not indicated. Core spacing is, of course, a critical aspect of a sampling program.

47. p 47, par 3 - The second phase will involve sampling of the CAD cell to determine if a cap has been effectively placed.

COMMENT - Page 40, paragraph 4 of the Report states that "contaminated sediment was successfully placed in a CAD cell and capped during the Pilot Study." This statement is inconsistent with the fact that sampling work is to be done during the second phase to determine if a cap has been successfully placed.

48. p 47, par 5 - Removal Efficiency - A grid of sediment sampling stations was located in each dredging area. A sample of the top 3 inches [illegible] added to the appropriate composite sample. These samples will then be used to determine effectiveness.

COMMENT - This description is not detailed but several comments can be made:

a. Grid size is not given.

b. Sampling of the top 3 inches is not adequate since this would not show any redistribution of contaminated material into deeper portions of the bottom.

c. If these data are to be used "in determining the effectiveness of each dredge to remove contaminated sediment", how can the statement (Report page i, paragraph 4) that the dredges have been effective in removing contaminated sediment be made in the Report?

APPENDIX

1. Figure A-1, Ladder Swing Speed vs Resuspension Rate, Cutterhead Dredge
2. Figure A-2, Resuspension Rate vs Date of Observation
3. Table A-1, Resuspension Rate, Cutterhead Dredge
4. Figure A-3, CDF, Weir and Effluent TSS, 2 - 30 December 1988
5. Table A-2, CDF Weir and Effluent TSS
6. Figure A-4, CAD Cross Sections

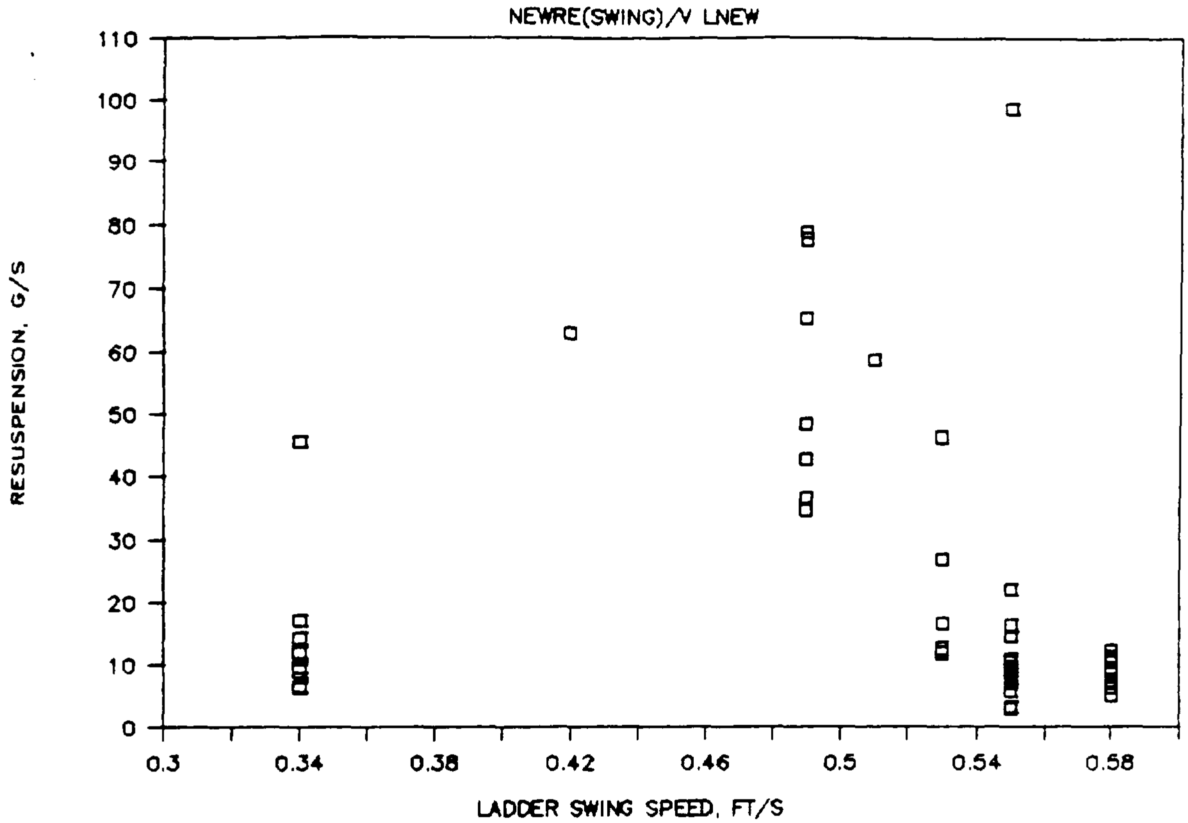

Figure A-1, Ladder Swing Speed vs Resuspension Rate, Cutterhead Dredge

reference: Table 1, page 1-25 of Report

This is a plot of all the 51 reported values of computed resuspension rate vs ladder swing speed for the cutterhead dredge. The basis for this plot is repeated from the Report in Table A-1. The average value of the resuspension rate is 21.6 g/s rather than the value of 17.3 g/s presented in Table 1, page 1-25 of the Report.

This plot shows no strong relationship between ladder swing speed and resuspension. The values for the maximum rate are equivalent to those for the minimum rate. Although one might presume that a low ladder swing speed would produce low resuspension, the data presented do not confirm such a presumption. It may be that the inherent variability of the process being studied, difficulty of measurement and the short test time available have contributed to the inconclusive results.

The Report does not describe the sampling device or procedures used during this test. The sampling techniques are an important factor in the validity of this testing.

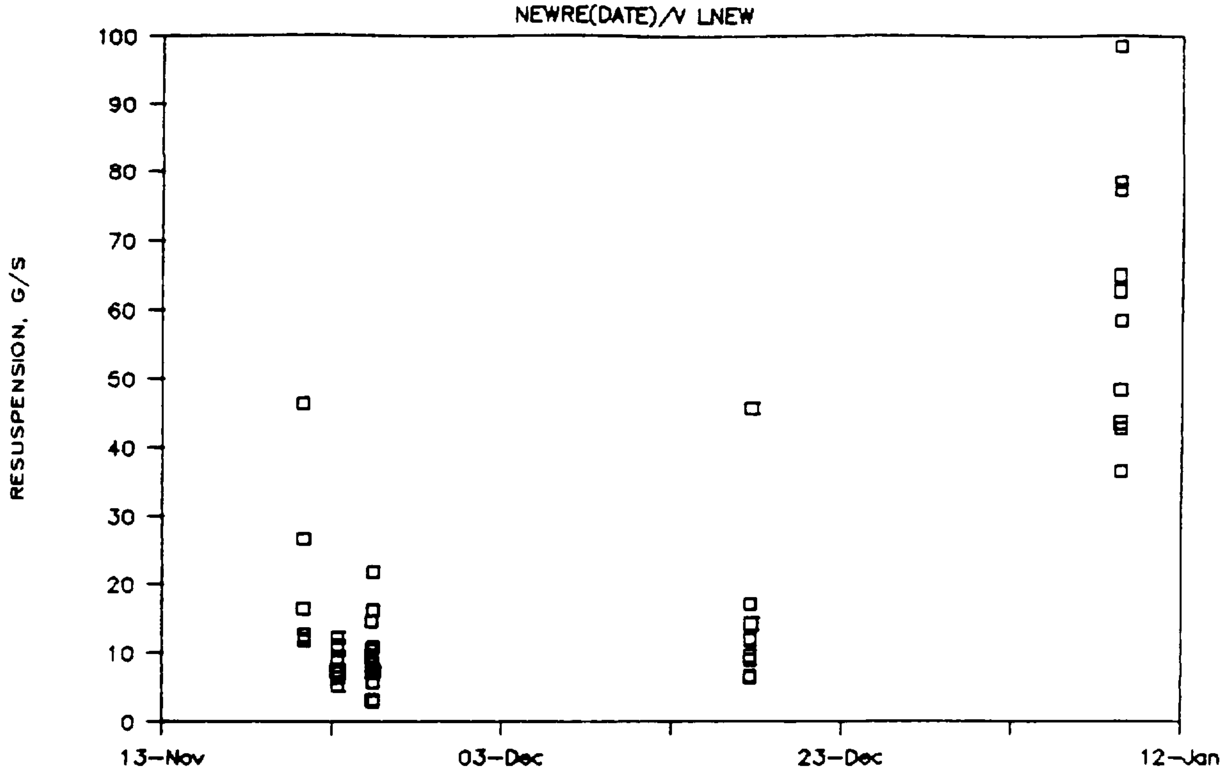

Figure A-2, Resuspension Rate vs Date of Observation

reference: Table 1, page 1-25 of Report

This is a plot of computed resuspension vs the date of observation for the cutterhead dredge. The basis for this plot is repeated from the Report in Table A-1.

This plot indicates much higher resuspension for the last of the three test periods. Ladder swing speeds are reported to have varied from 0.42 to 0.55 ft/s during these observations with 7 of 10 observations at a swing speed of 0.49 ft/s. Comparison with Figure A-1 will show this value to be about at the midpoint of swing speeds tested.

It may be that ambient conditions on the date of this last test as well as during the other test periods, could be an important factor in test results.

TABLE A-1

RESUSPENSION RATE, CUTTERHEAD DREDGE

reference: Table 1, page 1-25 of Report

	Date	Time	Tide Ht,ft	Area(1 (ft2)	Swing Speed (ft/s)	Volume (l)	Avg TSS (mg/l)	Resuspen Rate(g/sec)
32468.28	21-Nov-88	06:54	3.9	10.1	0.53	151.6	305.1	46.3
32468.29	21-Nov-88	07:09	3.9	10.1	0.53	151.6	175.8	26.7
32468.30	21-Nov-88	07:26	3.7	9.6	0.53	144.1	114.4	16.5
32468.32	21-Nov-88	07:48	3.5	9.1	0.53	136.6	87.6	12.0
32468.32	21-Nov-88	07:55	3.3	8.6	0.53	129.1	97.3	12.6
32468.34	21-Nov-88	08:13	3.1	8.1	0.53	121.6	97.2	11.8
32470.29	23-Nov-88	07:10	4.7	12.2	0.58	200.5	37.3	7.5
32470.30	23-Nov-88	07:19	4.7	12.2	0.58	200.5	55.6	11.1
32470.31	23-Nov-88	07:32	4.7	12.2	0.58	200.5	54.7	11.0
32470.32	23-Nov-88	07:48	4.6	12.0	0.58	197.2	45.8	9.0
32470.33	23-Nov-88	08:04	4.5	11.7	0.58	192.2	45.5	8.7
32470.34	23-Nov-88	08:19	4.1	10.7	0.58	175.8	40.9	7.2
32470.36	23-Nov-88	08:42	3.9	10.1	0.58	165.9	31.4	5.2
32470.36	23-Nov-88	08:48	3.9	10.1	0.58	165.9	38.7	6.4
32470.37	23-Nov-88	09:03	3.4	8.8	0.58	144.6	61.1	8.8
32470.39	23-Nov-88	09:28	2.8	7.3	0.58	119.9	102.2	12.3
32470.39	23-Nov-88	09:33	2.8	7.3	0.58	119.9	59.2	7.1
32470.40	23-Nov-88	09:48	2.5	6.5	0.58	106.8	68.7	7.3
32472.31	25-Nov-88	07:30	3.9	10.1	0.55	157.4	65.7	10.3
32472.32	25-Nov-88	07:41	4.1	10.7	0.55	166.7	46.5	7.8
32472.32	25-Nov-88	07:52	4.1	10.7	0.55	166.7	87.5	14.6
32472.34	25-Nov-88	08:17	4.3	11.2	0.55	174.5	59.9	10.5
32472.37	25-Nov-88	08:56	4.4	11.4	0.55	177.6	54.1	9.6
32472.39	25-Nov-88	09:25	4.3	11.2	0.55	174.5	40.7	7.1
32472.40	25-Nov-88	09:41	4.2	10.9	0.55	169.8	18.7	3.2
32472.41	25-Nov-88	09:53	4.1	10.7	0.55	166.7	17.8	3.0
32472.42	25-Nov-88	10:08	4.1	10.7	0.55	166.7	65.3	10.9
32472.43	25-Nov-88	10:23	4.0	10.4	0.55	162.0	134.5	21.8
32472.44	25-Nov-88	10:39	3.8	9.9	0.55	154.2	104.2	16.1
32472.45	25-Nov-88	10:56	3.5	9.1	0.55	141.8	60.0	8.5
32472.46	25-Nov-88	11:08	3.5	9.1	0.55	141.8	40.7	5.8
32472.47	25-Nov-88	11:23	3.1	8.1	0.55	126.2	58.3	7.4
32494.60	17-Dec-88	14:30	3.73	9.7	0.34	93.4	127.7	11.9
32494.61	17-Dec-88	14:45	3.88	10.1	0.34	97.3	176.0	17.1
32494.62	17-Dec-88	15:00	4.13	10.8	0.34	104.0	64.1	6.7
32494.63	17-Dec-88	15:15	4.14	10.8	0.34	104.0	86.1	9.0
32494.64	17-Dec-88	15:30	3.95	10.3	0.34	99.2	64.6	6.4
32494.65	17-Dec-88	15:45	3.8	9.9	0.34	95.4	100.4	9.6
32494.66	17-Dec-88	16:00	3.66	9.5	0.34	91.5	131.7	12.1
32494.67	17-Dec-88	16:15	3.45	9.0	0.34	86.7	163.7	14.2
32494.68	17-Dec-88	16:30	3.26	8.5	0.34	81.9	556.3	45.6
32516.36	08-Jan-89	08:48	4.81	12.5	0.42	148.7	422.9	62.9
32516.37	08-Jan-89	09:00	4.62	12.0	0.55	187.0	527.2	98.6
32516.38	08-Jan-89	09:15	4.51	11.7	0.49	162.4	401.8	65.3

TABLE A-1

RESUSPENSION RATE, CUTTERHEAD DREDGE

reference: Table 1, page 1-25 of Report

	Date	Time	Tide Ht,ft	Area(l (ft2)	Swing Speed (ft/s)	Volume (l)	Avg TSS (mg/l)	Resuspen Rate(g/sec)
32516.39	08-Jan-89	09:30	4.81	12.5	0.49	173.5	454.2	78.8
32516.40	08-Jan-89	09:45	5.04	13.1	0.49	181.8	427.6	77.7
32516.42	08-Jan-89	10:05	4.92	12.8	0.49	177.7	272.5	48.4
32516.43	08-Jan-89	10:25	4.46	11.6	0.49	161.0	215.8	34.7
32516.44	08-Jan-89	10:34	4.46	11.6	0.51	167.6	350.5	58.7
32516.45	08-Jan-89	10:55	4.09	10.6	0.49	147.1	249.3	36.7
32516.49	08-Jan-89	11:50	2.85	7.4	0.49	102.7	418.2	42.9

newre/v lnew 51 Average value 21.6

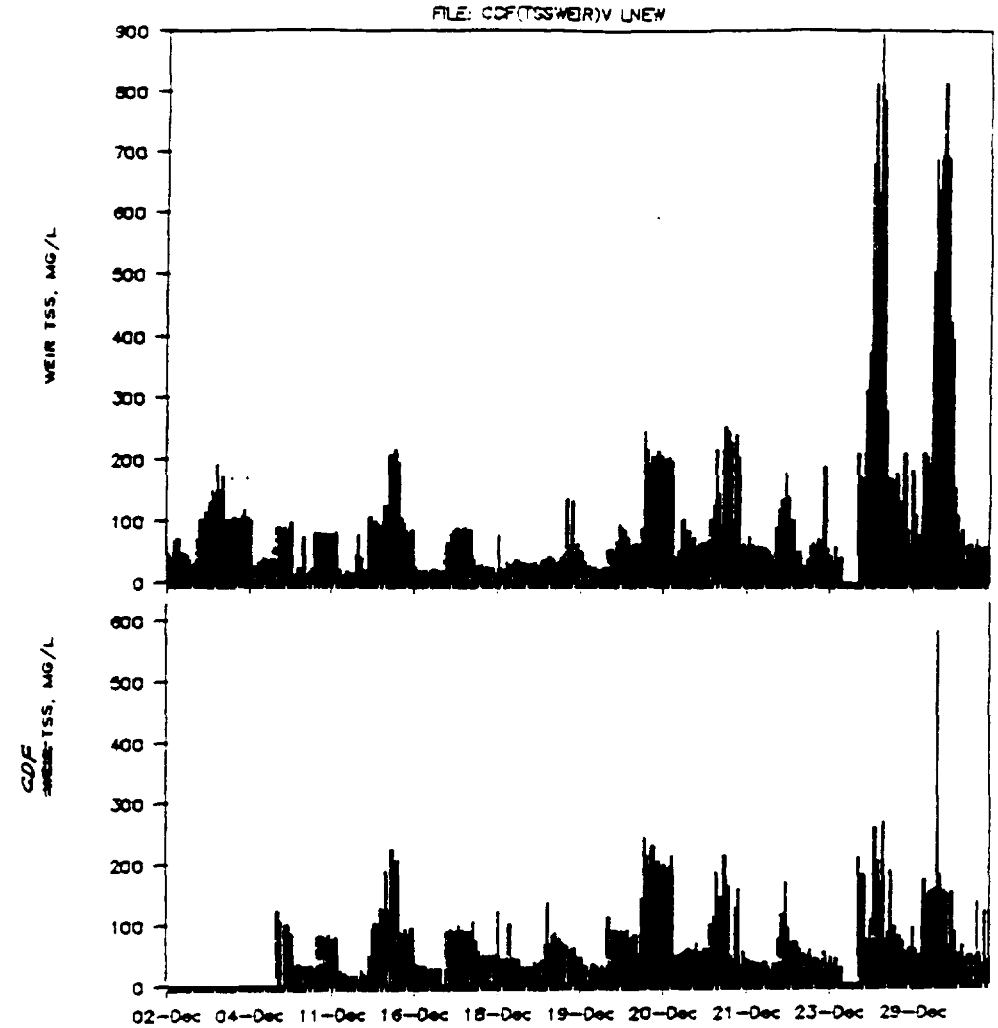

Figure A-3, CDF, Weir and Effluent TSS,
2 - 30 December 1988

reference: Table 1, page 2-7 of the Report

Upper plot is the Primary Cell effluent TSS, lower the Secondary Cell effluent TSS. Polymer was added only during the placement of clean cap materials (20 - 30 Dec) by spraying at the primary cell weir.

The Report states that polymer addition had no effect at low slurry solids concentrations. At the high solids levels experienced there was a measurable effect. See Section 2.2, General Comments, and items 37 and 38 of this Review for a discussion of this issue. A much more through evaluation of the effects of, and the design parameters for, polymer addition than that contained in the Report is required.

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
02-Dec-88	14:30	32479.60	60		1
02-Dec-88	15:30	32479.65	46		1
02-Dec-88	16:30	32479.69	39		1
02-Dec-88	17:30	32479.73	68		1
02-Dec-88	18:30	32479.77	72		1
02-Dec-88	19:30	32479.81	49		1
02-Dec-88	20:30	32479.85	46		1
02-Dec-88	21:30	32479.90	44		1
02-Dec-88	22:30	32479.94	37		1
02-Dec-88	23:30	32479.98	25		1
03-Dec-88	00:30	32480.02	33		1
03-Dec-88	13:30	32480.56	71		1
03-Dec-88	14:30	32480.60	103		1
03-Dec-88	15:30	32480.65	91		1
03-Dec-88	16:30	32480.69	115		1
03-Dec-88	17:30	32480.73	133		1
03-Dec-88	18:30	32480.77	150		1
03-Dec-88	19:30	32480.81	144		1
03-Dec-88	20:30	32480.85	193		1
03-Dec-88	21:30	32480.90	150		1
03-Dec-88	22:30	32480.94	174		1
04-Dec-88	16:30	32481.69	101		1
04-Dec-88	17:00	32481.71	102		1
04-Dec-88	17:30	32481.73	96		1
04-Dec-88	18:00	32481.75	108		1
04-Dec-88	18:30	32481.77	102		1
04-Dec-88	19:00	32481.79	103		1
04-Dec-88	19:30	32481.81	112		1
04-Dec-88	20:00	32481.83	120		1
04-Dec-88	20:30	32481.85	104		1
04-Dec-88	21:00	32481.88	101		1
05-Dec-88	16:00	32482.67	20		1
05-Dec-88	17:00	32482.71	28		1
05-Dec-88	18:00	32482.75	34		1
05-Dec-88	20:00	32482.83	38		1
05-Dec-88	21:00	32482.88	42		1
05-Dec-88	22:00	32482.92	39		1
05-Dec-88	23:00	32482.96	36		1
06-Dec-88	00:00	32483.00	38		1
06-Dec-88	01:00	32483.04	57		1
10-Dec-88	08:00	32487.33	90	125	1
10-Dec-88	09:00	32487.38	92	106	1
10-Dec-88	10:00	32487.42	79		1
10-Dec-88	11:00	32487.46	91	102	1
10-Dec-88	12:00	32487.50	84	102	1

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
10-Dec-88	13:00	32487.54	98	86	1
10-Dec-88	14:00	32487.58	15	33	1
10-Dec-88	15:00	32487.63	13	33	1
10-Dec-88	16:00	32487.67	27	36	1
10-Dec-88	17:00	32487.71	21	26	1
10-Dec-88	18:00	32487.75	77	32	1
10-Dec-88	19:00	32487.79	14	33	1
10-Dec-88	20:00	32487.83	20	34	1
10-Dec-88	21:00	32487.88	26	33	1
10-Dec-88	22:00	32487.92	82	27	1
10-Dec-88	23:00	32487.96	79	82	1
11-Dec-88	00:00	32488.00	80	83	1
11-Dec-88	01:00	32488.04	77	80	1
11-Dec-88	02:00	32488.08	80	77	1
11-Dec-88	03:00	32488.13	78	84	1
11-Dec-88	04:00	32488.17	77	75	1
11-Dec-88	05:00	32488.21	80	76	1
11-Dec-88	06:00	32488.25	85	80	1
11-Dec-88	07:00	32488.29	21	23	1
11-Dec-88	08:00	32488.33	10	10	1
11-Dec-88	09:00	32488.38	13	20	1
11-Dec-88	10:00	32488.42	20	16	1
11-Dec-88	11:00	32488.46	10	12	1
11-Dec-88	12:00	32488.50	15	16	1
11-Dec-88	13:00	32488.54	44	18	1
11-Dec-88	14:00	32488.58	79	9	1
12-Dec-88	07:00	32489.29	41	26	1
12-Dec-88	08:00	32489.33	21	19	1
12-Dec-88	09:00	32489.38	19	15	1
12-Dec-88	10:00	32489.42	108	49	1
13-Dec-88	08:00	32490.33	97	94	1
13-Dec-88	09:00	32490.38	99	102	1
13-Dec-88	10:00	32490.42	95	100	1
13-Dec-88	11:00	32490.46	64	128	1
13-Dec-88	12:00	32490.50	126	123	1
13-Dec-88	13:00	32490.54	126	190	1
13-Dec-88	14:00	32490.58	209		1
13-Dec-88	15:00	32490.63		225	1
13-Dec-88	16:00	32490.67	216	199	1
13-Dec-88	17:00	32490.71	196	205	1
16-Dec-88	14:00	32493.58	105	87	1
16-Dec-88	15:00	32493.63	98	85	1
16-Dec-88	16:00	32493.67	84	94	1
16-Dec-88	17:00	32493.71	80	72	1
16-Dec-88	18:00	32493.75	86	95	1

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
16-Dec-88	19:00	32493.79	25	35	1
16-Dec-88	20:00	32493.83	17	32	1
16-Dec-88	21:00	32493.88	20	30	1
16-Dec-88	22:00	32493.92	15	32	1
16-Dec-88	23:00	32493.96	22	31	1
17-Dec-88	00:00	32494.00	16	24	1
17-Dec-88	01:00	32494.04	22	29	1
17-Dec-88	02:00	32494.08	24	27	1
17-Dec-88	03:00	32494.13	22	29	1
17-Dec-88	04:00	32494.17	20	29	1
17-Dec-88	05:00	32494.21			1
17-Dec-88	06:00	32494.25	39		1
17-Dec-88	07:00	32494.29	65	88	1
17-Dec-88	08:00	32494.33	80	92	1
17-Dec-88	09:00	32494.38	85	88	1
17-Dec-88	10:00	32494.42	92	89	1
17-Dec-88	11:00	32494.46	88	99	1
17-Dec-88	12:00	32494.50	85	90	1
17-Dec-88	13:00	32494.54	91	84	1
17-Dec-88	14:00	32494.58	82	87	1
17-Dec-88	15:00	32494.63	87	88	1
17-Dec-88	16:00	32494.67	39	105	1
17-Dec-88	17:00	32494.71	26	73	1
17-Dec-88	18:00	32494.75	28	55	1
17-Dec-88	19:00	32494.79	30	46	1
17-Dec-88	20:00	32494.83	24	49	1
17-Dec-88	21:00	32494.88	27	46	1
17-Dec-88	22:00	32494.92	22	48	1
17-Dec-88	23:00	32494.96	23	48	1
18-Dec-88	00:00	32495.00	16	50	1
18-Dec-88	01:00	32495.04	78	122	1
18-Dec-88	02:00	32495.08	24	43	1
18-Dec-88	03:00	32495.13	22	43	1
18-Dec-88	04:00	32495.17	34	45	1
18-Dec-88	05:00	32495.21	30	101	1
18-Dec-88	06:00	32495.25	29	45	1
18-Dec-88	07:00	32495.29	39	44	1
18-Dec-88	08:00	32495.33	36	43	1
18-Dec-88	09:00	32495.38	32	31	1
18-Dec-88	10:00	32495.42	31	31	1
18-Dec-88	11:00	32495.46	31	29	1
18-Dec-88	12:00	32495.50	29	29	1
18-Dec-88	13:00	32495.54	33	31	1
18-Dec-88	14:00	32495.58	33	38	1
18-Dec-88	15:00	32495.63	27	31	1

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
18-Dec-88	16:00	32495.67	28	36	1
18-Dec-88	17:00	32495.71	38	43	1
18-Dec-88	18:00	32495.75	41	69	1
18-Dec-88	19:00	32495.79	45	136	1
18-Dec-88	20:00	32495.83	44	67	1
18-Dec-88	21:00	32495.88	38	82	1
18-Dec-88	22:00	32495.92	31	86	1
18-Dec-88	23:00	32495.96	34	75	1
19-Dec-88	00:00	32496.00	42	70	1
19-Dec-88	01:00	32496.04	46	65	1
19-Dec-88	02:00	32496.08	136	63	1
19-Dec-88	03:00	32496.13	60	55	1
19-Dec-88	04:00	32496.17	132	60	1
19-Dec-88	05:00	32496.21	47	61	1
19-Dec-88	06:00	32496.25	64	45	1
19-Dec-88	07:00	32496.29	51	44	1
19-Dec-88	08:00	32496.33	34	33	1
19-Dec-88	09:00	32496.38	23	29	1
19-Dec-88	10:00	32496.42	27	22	1
19-Dec-88	11:00	32496.46	23	37	1
19-Dec-88	12:00	32496.50	25	34	1
19-Dec-88	13:00	32496.54	22	30	1
19-Dec-88	14:00	32496.58	21	25	1
19-Dec-88	15:00	32496.63	26	33	1
19-Dec-88	16:00	32496.67	27	26	1
19-Dec-88	17:00	32496.71	53	112	1
19-Dec-88	18:00	32496.75	54	84	1
19-Dec-88	19:00	32496.79	48	87	1
19-Dec-88	20:00	32496.83	68	88	1
19-Dec-88	21:00	32496.88	95	83	1
19-Dec-88	22:00	32496.92	88	87	1
19-Dec-88	23:00	32496.96	85	83	1
20-Dec-88	00:00	32497.00	73	92	1
20-Dec-88	01:00	32497.04	51	74	1
20-Dec-88	02:00	32497.08	62	78	1
20-Dec-88	03:00	32497.13	63	82	1
20-Dec-88	04:00	32497.17	62	49	1
20-Dec-88	05:00	32497.21	88	142	1
20-Dec-88	06:00	32497.25	246	240	1
20-Dec-88	07:00	32497.29	215	212	1
20-Dec-88	08:00	32497.33	193	194	1
20-Dec-88	09:00	32497.38	207	229	1
20-Dec-88	10:00	32497.42	189	183	1
20-Dec-88	11:00	32497.46	213	200	1
20-Dec-88	12:00	32497.50	204	192	1

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
20-Dec-88	13:00	32497.54	199	197	1
20-Dec-88	14:00	32497.58	202	184	1
20-Dec-88	15:00	32497.63	202	194	1
20-Dec-88	16:00	32497.67	198	211	1
20-Dec-88	17:00	32497.71	44	47	1
20-Dec-88	18:00	32497.75	42	46	1
20-Dec-88	19:00	32497.79	53	49	1
20-Dec-88	20:00	32497.83	102	53	1
20-Dec-88	21:00	32497.88	84	56	1
20-Dec-88	22:00	32497.92	84	60	1
20-Dec-88	23:00	32497.96	60	55	1
21-Dec-88	00:00	32498.00	75	55	1
21-Dec-88	01:00	32498.04	54	68	1
21-Dec-88	02:00	32498.08	64	52	1
21-Dec-88	03:00	32498.13	65	54	1
21-Dec-88	04:00	32498.17	61	60	1
21-Dec-88	05:00	32498.21	70	54	1
21-Dec-88	06:00	32498.25	102	99	1
21-Dec-88	07:00	32498.29	127	111	1
21-Dec-88	08:00	32498.33	215	184	1
21-Dec-88	09:00	32498.38	144	143	P
21-Dec-88	10:00	32498.42	92	144	P
21-Dec-88	11:00	32498.46	252	212	P
21-Dec-88	12:00	32498.50	245	161	P
21-Dec-88	13:00	32498.54	228	46	P
21-Dec-88	14:00	32498.58	101	41	P
21-Dec-88	15:00	32498.63	241	125	P
21-Dec-88	16:00	32498.67	202	158	P
21-Dec-88	17:00	32498.71	59	30	P
21-Dec-88	18:00	32498.75	63	54	P
21-Dec-88	19:00	32498.79	57	39	P
21-Dec-88	20:00	32498.83	76	37	P
21-Dec-88	21:00	32498.88	62	36	P
21-Dec-88	22:00	32498.92	55	33	P
21-Dec-88	23:00	32498.96	60	33	P
22-Dec-88	00:00	32499.00	57	33	P
22-Dec-88	01:00	32499.04	57	38	P
22-Dec-88	02:00	32499.08	55	36	P
22-Dec-88	03:00	32499.13	51	28	P
22-Dec-88	04:00	32499.17	45	19	P
22-Dec-88	05:00	32499.21	35	35	P
22-Dec-88	06:00	32499.25	91	31	P
22-Dec-88	07:00	32499.29	120	75	P
22-Dec-88	08:00	32499.33	137	116	P
22-Dec-88	09:00	32499.38	178	168	P

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
22-Dec-88	10:00	32499.42	141	93	P
22-Dec-88	11:00	32499.46	103	67	P
22-Dec-88	12:00	32499.50	100	69	P
22-Dec-88	13:00	32499.54	49	69	P
22-Dec-88	14:00	32499.58	52	57	P
22-Dec-88	15:00	32499.63	25	45	P
22-Dec-88	16:00	32499.67	28	48	P
22-Dec-88	17:00	32499.71	41	42	P
22-Dec-88	18:00	32499.75	61	57	P
22-Dec-88	19:00	32499.79	65	41	P
22-Dec-88	20:00	32499.83	57	42	P
22-Dec-88	21:00	32499.88	72	41	P
22-Dec-88	22:00	32499.92	49	32	P
22-Dec-88	23:00	32499.96	187	52	P
23-Dec-88	00:00	32500.00	54	33	P
23-Dec-88	01:00	32500.04	45	44	P
23-Dec-88	02:00	32500.08	33	29	P
23-Dec-88	03:00	32500.13	60	43	P
23-Dec-88	04:00	32500.17	38	25	P
23-Dec-88	05:00	32500.21	43	27	P
27-Dec-88	09:00	32504.38			1
27-Dec-88	10:00	32504.42			1
27-Dec-88	11:00	32504.46			1
27-Dec-88	12:00	32504.50			1
27-Dec-88	13:00	32504.54			1
28-Dec-88	06:00	32505.25	212	209	1
28-Dec-88	07:00	32505.29	171	181	1
28-Dec-88	08:00	32505.33	172	180	1
28-Dec-88	09:00	32505.38	315	74	P
28-Dec-88	10:00	32505.42	377	72	P
28-Dec-88	11:00	32505.46	681	108	P
28-Dec-88	12:00	32505.50	812	258	P
28-Dec-88	13:00	32505.54	631	204	1
28-Dec-88	14:00	32505.58	895	165	P
28-Dec-88	15:00	32505.63	786	265	P
28-Dec-88	16:00	32505.67	280	71	P
28-Dec-88	17:00	32505.71	171	84	P
28-Dec-88	18:00	32505.75	170	186	P
28-Dec-88	19:00	32505.79	134	95	P
28-Dec-88	20:00	32505.83	179	77	P
28-Dec-88	21:00	32505.88	124	78	1
28-Dec-88	22:00	32505.92	131	69	1
28-Dec-88	23:00	32505.96	213	53	P
29-Dec-88	00:00	32506.00	86	50	P
29-Dec-88	01:00	32506.04	62	60	P

TABLE A-2

CDF WEIR AND EFFLUENT TSS

reference: Table 1, page 2-7 of Report

Date	Time	Plot Value	Weir	CDF	Polymer (1 = no polymer)
29-Dec-88	02:00	32506.08	183	93	P
29-Dec-88	03:00	32506.13	111	57	P
29-Dec-88	04:00	32506.17	78	48	P
29-Dec-88	05:00	32506.21	67	48	P
29-Dec-88	06:00	32506.25	212	173	P
29-Dec-88	07:00	32506.29	207	148	P
29-Dec-88	08:00	32506.33	192	152	P
29-Dec-88	09:00	32506.38	507	155	P
29-Dec-88	10:00	32506.42	688	159	P
29-Dec-88	11:00	32506.46	638	577	P
29-Dec-88	12:00	32506.50	695	181	P
29-Dec-88	13:00	32506.54	812	153	P
29-Dec-88	14:00	32506.58	689	149	P
29-Dec-88	15:00	32506.63	425	59	P
29-Dec-88	16:00	32506.67	395	154	P
29-Dec-88	17:00	32506.71	153	86	P
29-Dec-88	18:00	32506.75	109	50	P
29-Dec-88	19:00	32506.79	79	49	P
29-Dec-88	20:00	32506.83	87	64	P
29-Dec-88	21:00	32506.88	36	40	P
29-Dec-88	22:00	32506.92	62	48	P
29-Dec-88	23:00	32506.96	63	49	P
30-Dec-88	00:00	32507.00	55	43	P
30-Dec-88	01:00	32507.04	71	135	P
30-Dec-88	02:00	32507.08	58	51	P
30-Dec-88	03:00	32507.13	57	33	P
30-Dec-88	04:00	32507.17	59	119	P
30-Dec-88	05:00	32507.21	60	39	P

Figure 3-3 Contained Aquatic Disposal Cell
(after filling with contaminated sediment)

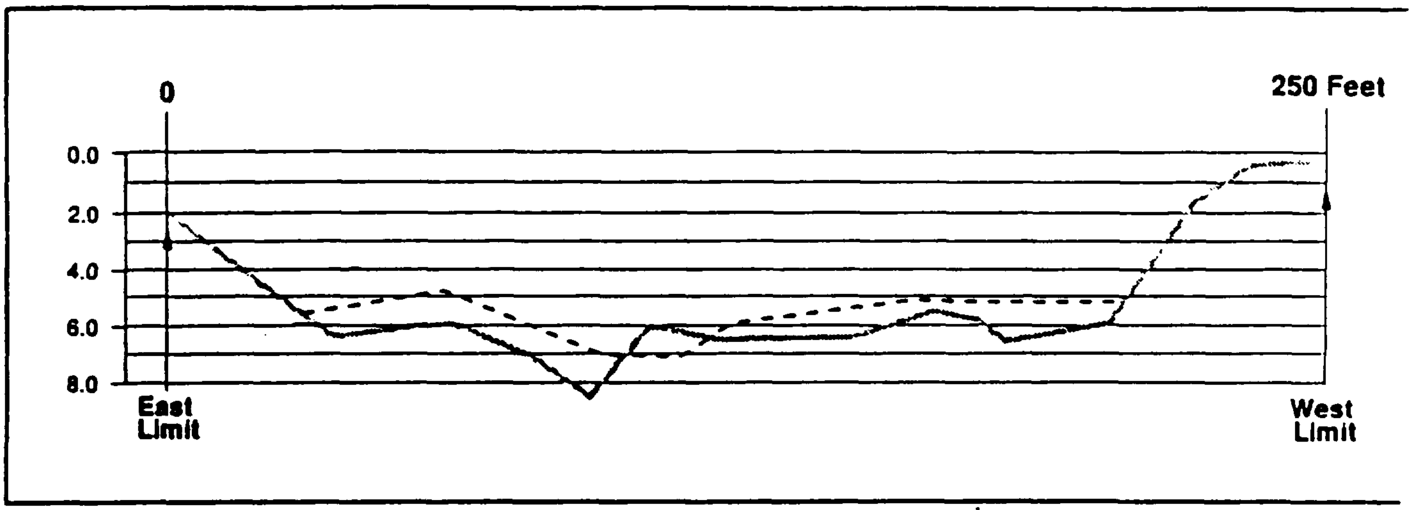

Figure A-4, CAD Cross Sections

reference: Figure 3-3, page 3-4 of the Report

This section is taken from Figure 3-3 of the Report. Although the section is not annotated, this is apparently a section in an East - West direction, transverse to the sections presented in Figure 3-2 of the Report. The Report refers to average depth of cut at the dredging areas but makes no indication of what tolerance should be expected in a hot spot or full scale project.

The section above indicates a variation of about 0.5 ft plus or minus from typical desired grade of -6 ft. There is, however, a 50 x 50 ft portion of the CAD cell which is to be at - 8 ft. Only one point is shown near that grade. This one section does not give strong evidence of the ability to control or measure the effects of the dredging process on bottom elevations.

This section does not show the cap in place. The cap was placed five months before the date of the Report. This indicates an excessive lag between actual dredging or cap placement and the preparation of sections necessary for control of the project.