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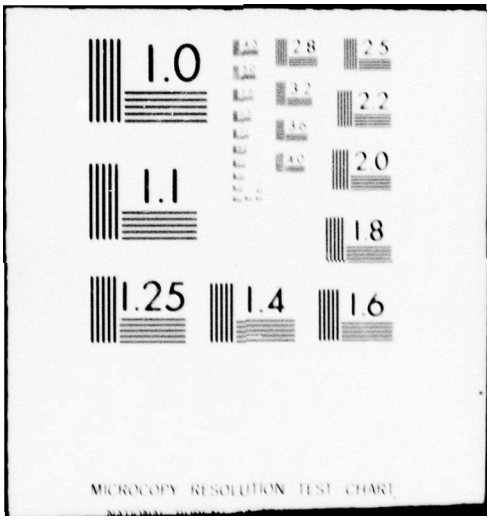
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DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-77-24

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON.

APPENDIX D. CHEMICAL AND PHYSICAL ANALYSES OF WATER AND SEDIMENT IN RELATION TO DISPOSAL OF DREDGED MATERIAL IN ELLIOTT BAY. Volume II.

[redacted] September-December 1976.

by

S. Sugai, W. R. Schell, A. Nevissi, S. Olsen, D. Huntamer

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Seattle, Washington 98195

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Final Report

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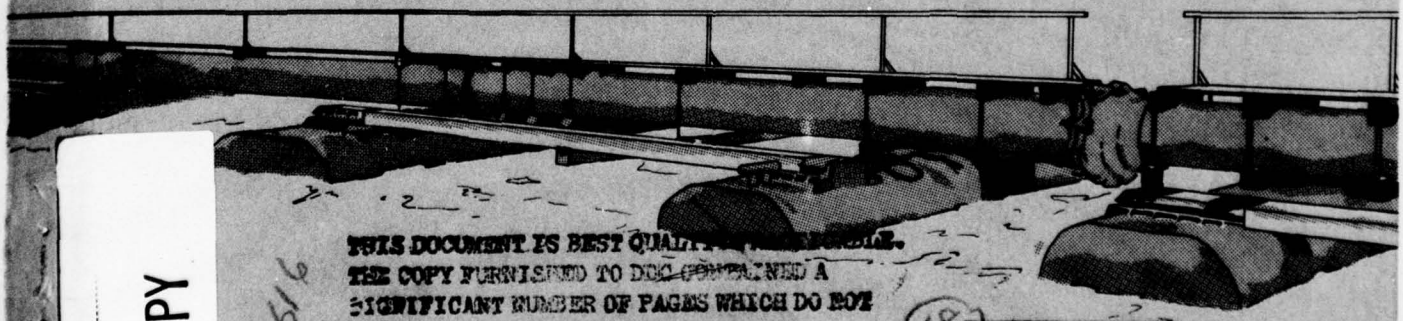

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Under Contract No. DACW39-76-C-0167
(DMRP Work Unit No. 1A10D)

Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

AQUATIC DISPOSAL FIELD INVESTIGATIONS
DUWAMISH WATERWAY DISPOSAL SITE
PUGET SOUND, WASHINGTON

Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliott Bay, Seattle, Washington

Appendix B: Role of Disposal of PCB-Contaminated Sediment in the Accumulation of PCB's by Marine Animals

Appendix C: Effects of Dredged Material Disposal on the Concentration of Mercury and Chromium in Several Species of Marine Animals

Appendix D: Chemical and Physical Analyses of Water and Sediment in Relation to Disposal of Dredged Material in Elliott Bay

Appendix E: Release and Distribution of Polychlorinated Biphenyls Induced by Open-Water Dredge Disposal Activities

Appendix F: Recolonization of Benthic Macrofauna over a Deep-Water Disposal Site

Appendix G: Benthic Community Structural Changes Resulting from Dredged Material Disposal, Elliott Bay Disposal Site

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DEPARTMENT OF THE ARMY
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IN REPLY REFER TO: WESYV

31 July 1978

SUBJECT: Transmittal of Technical Report D-77-24 (Appendix D, Volume II)

TO: All Report Recipients

1. The technical report transmitted herewith represents the results of one of several research efforts (work units) undertaken as part of Task 1A, Aquatic Disposal Field Investigations, of the Corps of Engineers' Dredged Material Research Program. Task 1A was a part of the Environmental Impacts and Criteria Development Project (EICDP) and had as a general objective determination of the magnitude and extent of effects of disposal sites on organisms and the quality of surrounding water, and the rate, diversity and extent that such sites are recolonized by benthic flora and fauna. The study reported on herein was an integral part of a series of research contracts jointly developed to achieve the general objective at the Duwamish Waterway Disposal Site, one of five study sites located in several geographical regions of the United States. Consequently, this report presents results and interpretations of but one of several closely interrelated efforts and should be used only in conjunction with and consideration of the other related reports for this site.

2. This report, Appendix D: Chemical and Physical Analyses of Water and Sediment in Relation to Disposal of Dredged Material in Elliott Bay, Volume I February-June 1976 and Volume II September-December 1976, is one of seven contractor-prepared appendices published as Waterways Experiment Station Technical Report D-77-24 entitled: Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington. The titles of all contractor-prepared appendices to this series are listed on the inside front cover of this report. The main report, the Evaluative Summary, will provide additional results, interpretations, and conclusions not found in the additional appendices and will provide a comprehensive summary and synthesis overview of the entire study.

3. The purpose of these two investigations, conducted as Work Units 1A10C (Volume I) and 1A10D (Volume II), was to monitor selected physical and chemical parameters in water-column and sediment samples obtained before, during, and after disposal of contaminated dredged material at

an Elliott Bay disposal site. Appendix D is divided into two volumes since two separate research groups were involved. Volume I discusses the results of analyses of samples collected before, during, and 1 week, 1 month, and 3 months after the disposal operation while Volume II reports on samples collected 6 and 9 months after the operation.

4. The Duwamish River sediments were found to be highly heterogeneous. However, the concentrations of several significant parameters such as ammonia, alkaline-soluble sulfide, and total mercury were in general several times higher than the Elliott Bay disposal site sediments. Standard elutriate tests conducted with the river sediments indicated that ammonia and manganese would probably be released to the water column following each disposal event. Analyses of samples collected during the disposal operation revealed elevated levels of manganese, suspended solids, and ammonia in the water column for a few minutes following each dump. Interstitial water concentrations of manganese, ammonia, and sulfides remained above ambient at the disposal site through the 3 months of postdisposal monitoring discussed in Volume I. One week after the disposal operation, there were no chemical differences found between water-column samples taken at the disposal and reference sites.

5. At 6 and 9 months after the disposal operation, the levels of manganese, ammonia, and inorganic phosphate in the interstitial waters were found to be higher than at both reference sites. There were no detectable chemical differences in water-column samples from the disposal and reference sites at 1, 3, 6, and 9 months after disposal.

6. The results of this study are important in determining placement of dredged material for open-water disposal. Referenced studies, as well as the ones summarized in this report, will aid in determining the optimum disposal conditions and site selection for either the dispersion of the material from the dump site or for its retention within the confines of the site, whichever is preferred for maximum environmental protection at a given site.

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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Tables 1-19 were reproduced on microfiche and are enclosed [redacted] inside the back cover of this report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aquatic environment	Dredged material disposal	Waste disposal sites
Bottom sediment	Duwamish Waterway	Water analysis
Chemical analysis	Elliott Bay	Water quality
Dredged material	Field investigations	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents results obtained in a study conducted to evaluate the extent and duration of changes in chemical characteristics of Elliott Bay, Washington, six and nine months after disposal of dredged materials from the Duwamish River. The seawater, sediment, and interstitial water were analyzed for the following chemical parameters: (1)

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20. ABSTRACT (Continued).

a. Seawater.--Suspended solids, arsenic, manganese, mercury, reactive silicate, inorganic phosphate, nitrate, and ammonia. (2)

b. Sediment.--Free and total (acid soluble) sulfide, manganese, chromium, arsenic, mercury, and particle size, and (3)

c. Interstitial water.--Arsenic, manganese, reactive silicate, ammonia, and inorganic phosphate.

Temporal, depth, and spatial changes in concentrations of chemical variables were evaluated at disposal and reference sites. The results of analyses showed only minimal changes in trace metal concentrations in the water column above the disposal site, but lower Eh and pH values in the sediments than at the reference site. The manganese, inorganic phosphate, and ammonia concentration values were greater in interstitial waters at the disposal site than at the reference site.

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SUMMARY

This study is part of a comprehensive program to measure the effects on the biota, sediment, and water quality that result from open-water disposal of dredged material at the Duwamish Waterway site, Elliott Bay, Puget Sound, Washington. Specifically, this work examined the extent and duration of changes in the chemical characteristics of the water and sediment at the disposal site in Elliott Bay six and nine months after disposal. Measurements before, during, and at three months after disposal were made by the Environmental Protection Agency (EPA) laboratory in Corvallis, Oregon.

Disposal of dredged materials from the Duwamish River into Elliott Bay has resulted in minimal long-term changes in the concentrations of trace metals in water above the disposal site. The only significant changes observed were decreases in the concentration of suspended solids and arsenic in the water column above the disposal area between September and December 1976 with no comparable change in concentrations at the reference sites.

Alteration in several chemical parameters of sediments at the disposal site was significant six and nine months after disposal when compared to one or both reference stations. In September and December 1976, the sediments at the disposal site had pH and Eh values significantly lower than those determined at the west reference station. At the disposal site, concentrations of manganese, inorganic phosphate, and ammonia in the interstitial waters were higher than at both reference sites, while the chromium concentration was higher in sediments at the west reference site that at the disposal site.

The significant changes between September and December 1976 in the chemical characteristics of the sediments at the disposal site were a decrease in values for pH, Eh, and inorganic phosphate and an increase in mercury and manganese concentrations. At the reference stations only Eh was significantly different in December than in September and in December the sediments became more reducing in nature.

PREFACE

The study described in this report was performed under Contract DACW39-76-C-0167, entitled "Elliott Bay Dredge Disposal Project--Trace Metals Project," between the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, and the University of Washington, Seattle, Washington. The research was sponsored by the Office, Chief of Engineers (DAEN-CWO-M), under the Civil Works Dredged Material Research Program (DMRP), Work Unit 1A10D. The work was initiated in September 1976 and the chemical analyses of all environmental samples collected during the project were completed in July 1977. This study includes data from collections made six and nine months after disposal and thus the evaluation of changes was restricted to that time period. The measurements on samples collected at the disposal site before, during, and three months after disposal have been made by the EPA laboratory in Corvallis, Oregon.

The work was conducted by the Laboratory of Radiation Ecology, College of Fisheries, University of Washington, whose personnel included Dr. W. R. Schell (Principal Investigator), Dr. A. Nevissi, S. Sugai, S. Olsen, D. Huntamer, and M. Brown. The project officer for this contract was Mr. J. H. Johnson of the WES Environmental Laboratory under the supervision of Dr. R. M. Engler, Manager of the Environmental Impacts and Criteria Development Project at WES.

Director of WES during the period of the contract and the preparation of the report was COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

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* Tables 1-19 were reproduced on microfiche and are enclosed in an envelope attached inside the back cover of this report.

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APPENDIX D: CHEMICAL AND PHYSICAL ANALYSES OF WATER AND SEDIMENT IN RELATION TO DISPOSAL OF DREDGED MATERIAL IN ELLIOTT BAY

VOLUME II: SEPTEMBER-DECEMBER 1976

PART I: INTRODUCTION

Objective

1. This study is part of a comprehensive program to measure effects on the biota, sediment, and water quality resulting from open-water disposal of dredged material at the Duwamish Waterway site, Elliott Bay, Puget Sound, Washington. Specifically, this work examined the extent and duration of changes in the chemical characteristics of the water and sediment at the disposal site in Elliott Bay six and nine months after disposal.

Description of Study Area

2. Elliott Bay is located on the east side of central Puget Sound and is bounded by Duwamish Head to the southwest and Magnolia Bluff to the northwest (Figure 1).

3. The Duwamish River drains an area of 1251 km^2, mostly industrial, and provides fresh water to Elliott Bay at an average annual rate of about 1300 cfs.[1] The river discharges into the southeast corner of Elliott Bay, around Harbor Island, through two channels--the East and West Waterways.

4. Approximately 114,250 m^3 of dredged material from a 1.88-km stretch of the upper Duwamish Estuary (Figure 1) was deposited near the center of a disposal site marked by a Coast Guard lighted buoy (47°35'42"N; 122°21'42"W) during the period 16 February 1976 to 6 March 1976. The locations of the 16 stations (1-16) at the experimental disposal

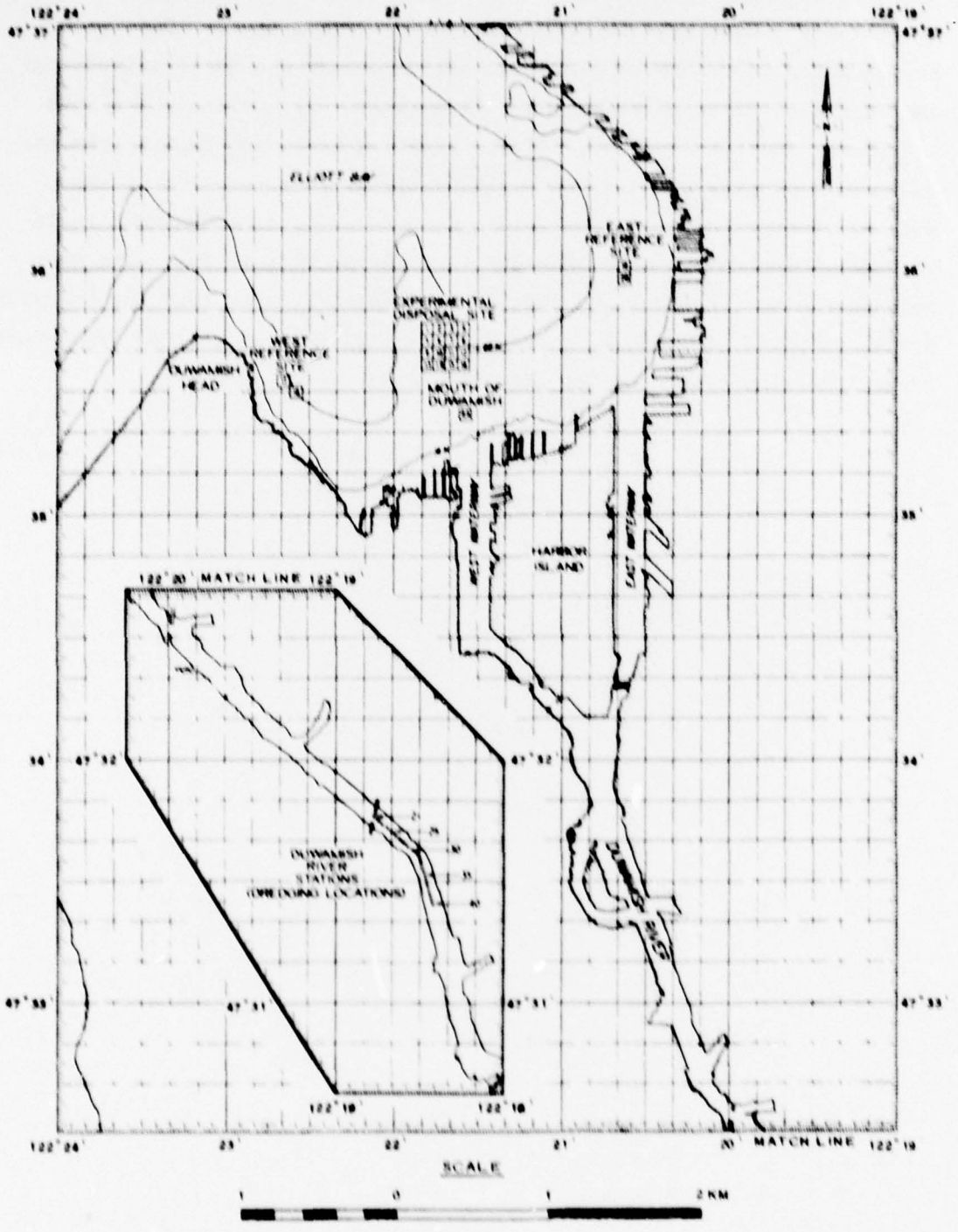

Figure 1. Locations of dredging, disposal, and reference sites

site, located due north of the mouth of the West Waterway, were selected by use of a 4 by 4 grid with the grid lines 76.2 m apart. The two reference sites were located along the east and west shores of Elliott Bay and consisted of two stations each (Figure 1). Historically the west reference site (stations 17, 18) has received the least impact from the municipal, commercial, and industrial activities of the Seattle area. Water flow over this location originates primarily from the main basin of Puget Sound rather than from the interior of Elliott Bay. The east reference site (stations 19, 20) has received effluents from the Duwamish River, shipping, and nearby shore-based activities, as well as from storm sewage overflow along the Seattle waterfront.

PART II: EXPERIMENTAL PROCEDURES

Sampling Design

5. Seawater and sediment samples for chemical analyses were collected during September and December 1976 following sampling and field procedures used during earlier portions of the disposal study.

Seawater samples

6. Water samples were collected at five stations: two stations near the center of the disposal site (station 6, north of buoy; station 10, south of buoy), two reference stations (station 17, west reference site; station 19, east reference site), and at the mouth of Duwamish River (station 44).

7. Water samples were collected at depths of 1 and 10 m above the bottom and 2 m below the surface. Two samples were taken at each station using a peristaltic pump attached to 1/2-in.-ID polyethylene tubing that had been lowered to depth on the hydrowire and then flushed thoroughly before sample collection.

Sediment samples

8. Sediment samples were taken using a double-barreled gravity cover with 67-mm-ID lucite liners at 20 sampling stations in the experimental disposal site (stations 1-20) and at two reference sites (one on the west side of the bay, stations 17 and 18; one on the east side, stations 19 and 20).

Shipboard Procedures

Seawater samples

9. Sufficient water was pumped to determine suspended solids, trace metals, and nutrients. To determine suspended solids, 2 to 10 litres of water were filtered through weighed 0.4 µm Nuclepore filters and stored in plastic petri dishes. Samples for determination of chromium (Cr), manganese (Mn), and arsenic (As) were collected in acid-cleaned 2-litre polyethylene bottles and acidified to pH 1.0 with 2 ml/l doubly distilled

6 M hydrochloric acid (HCl). Mercury (Hg) samples were collected in acid-cleaned 1-litre polyethylene bottles and acidified with 2 ml/l of doubly distilled 16 M nitric acid (HNO_3), to give a pH of less than 1.0, and stored frozen. Nutrient (nitrate, reactive silicate, inorganic phosphate, ammonia) samples were frozen at -15°C in 250-ml polyethylene bottles.

Sediment samples

10. For each of the two casts (two cores per cast) taken at a station, the top 10 cm of one core was extruded into a nitrogen-filled polyethylene bag, the next 15 cm extruded into a second bag, and the excess discarded. The second core on each cast was processed for the trace organics program of S. Pavlou. Each sample was homogenized, subsampled, and stored at 5°C.

Processing of Sediment Samples

11. In the field initial measurements of Eh, pH, and free sulfide ($S^=$) in the sediments were made using appropriate probes while working in a nitrogen-filled glove box. Upon return to the laboratory, in a nitrogen-atmosphere glove box, sediment samples were divided into two sections: one for Eh, pH, $S^=$, total sulfide, percent water, and heavy metals analyses; and the other for centrifugation to remove interstitial water for trace metal and nutrient determinations. Particle size analyses were made on the sediment remaining after centrifugation.

12. After Eh, pH, and free sulfide were determined on the first aliquot of sediment, 30 g was removed and oven-dried at 70°C to determine the percent water. The dry aliquot was retained for heavy metal analyses.

13. In the nitrogen atmosphere of the glove box, 100 g of the second sediment aliquot was sealed into a 250-ml centrifuge bottle and centrifuged at 5°C for 20 minutes at 9000 rpm. Upon return to the glove box the interstitial water was decanted into a 10-dram vial, extracted from the vial with a 25-cc clean polyethylene syringe, and filtered through a 0.4 µm Nuclepore® filter into a tared, clean 60-ml polyethylene

bottle. One aliquot was frozen at 15°C for nutrient analyses, and a second aliquot was acidified with 25 µl/ml of 6 M doubly distilled HCl for heavy metals analyses.

Analytical Procedures

14. The analytical methods used in determining chemical parameters in the seawater and sediment are given below.

Seawater and interstitial water

15. Arsenic. Twenty mg of ferric ion was added to a measured aliquot of acidified seawater or interstitial water in an acid-cleaned polyethylene bottle and mixed. Concentrated ammonium hydroxide (NH_4OH) was added to raise the pH of the sample to between 9 and 10 to coprecipitate As with ferric hydroxide ($Fe(OH)_3$), digested at 80°C for 30 min and allowed to cool. Samples were then filtered through 0.45 µm Millipore or 0.4 µm Nuclepore filters and precipitates were rinsed with deionized distilled water. Filters were removed and placed in 2/5 dram neutron activation analysis (NAA) vials to dry at room temperature. When dry, vials were sealed and irradiated for 2 hours along with As standards sorbed to silica gel and National Bureau of Standards (NBS) orchard leaves.[2]

16. Mercury. Distilled 8 M HNO_3 and reagent grade 18 M sulfuric acid (H_2SO_4) were added to the 470-500 ml seawater and 0.5 - 5 ml interstitial water samples. These samples were then loosely capped and digested in a 90°C water bath for 1 hour. Saturated potassium thiosulfate ($K_2S_2O_8$) was added and the solution allowed to cool. Analysis of the mercury concentration was then made using the flameless atomic absorption method of Melton, Hoover, and Howard.[3]

17. Manganese. Acidified seawater and interstitial water samples were diluted 1:10 with acidified, deionized distilled water and analyzed by flameless atomic absorption using the method of standard additions.

18. Nutrients. Nitrate, inorganic phosphate, ammonia, and reactive silicate were determined using a Technicon Autoanalyzer. Nitrate was analyzed by the cadmium-copper reduction of nitrate to nitrite with

corrections made for nitrite measured in samples.[4,5] Inorganic phosphate was determined by the ascorbic acid reduction method, ammonia by the phenate procedure, and reactive silicate by reduction of silicomolybdate complexes by a solution of Metol and oxalic acid.[6]

Sediment samples

19. Free sulfide. Free sulfide was measured using an Orion specific ion electrode and a Chemtrix Model 60A pH/pIon meter. The sulfide electrode was calibrated by bubbling H_2S (gas) through buffered solutions at different pH values. After the electrode reached equilibrium with the saturated solution (changes of < 1 mv/min), the millivolt reading and pH of the solution were recorded.

20. Manganese. To each 2-gram aliquot of dried sediment, 20 ml of dionized water and 20 ml of distilled HNO_3 were added. The samples were heated, 5 ml of perchloric acid was added, and then the samples were evaporated to dryness. Subsequently, 10 ml of distilled HCl and 50 ml of dionized distilled water were added and the samples were boiled 10 to 15 min. Samples were then filtered and filtrates were combined with washings of the filter. Volume of filtrate was measured and concentration of manganese was determined by flameless atomic absorption.

20. Arsenic. Weighed aliquots of dried sediment were sealed in 2/5 dram vials and irradiated for 2 hours. Arsenic concentration was determined by comparison with As standards sorbed on silica gel and NBS standardized orchard leaves.

22. Mercury. Sediment samples were leached with distilled HNO_3 and reagent grade H_2SO_4 in a water bath at 90°C. Saturated $K_2S_2O_8$ was added to each sample and samples were then treated as the seawater and interstitial water samples. Mercury in leachate was determined by flameless atomic absorption.

23. Chromium. Weighed aliquots of dried sediment were sealed in 2/5 dram vials and irradiated for 8 hours. Chromium concentration was determined by comparison with Cr standards sorbed on silica gel and NBS standardized orchard leaves.

24. Total (acid soluble) sulfide. Sulfide was separated by acidifying the sediment samples to produce hydrogen sulfide (H_2S) which was

bubbled and trapped quantitatively in a zinc (Zn) solution as zinc sulfide precipitate. Iodometric titration was then used to determine the sulfide in the precipitate and solution. The total (acid soluble) sulfide determination measured dissolved HS^-, H_2S, and soluble metal sulfides.[7]

25. Particle size analyses. Following the removal of the interstitial water from the sediment by centrifugation, the particle size distributions of samples were determined by procedures suggested by H. P. Guy.[8]

Statistical Treatment of Experimental Data

26. A listing of the experimental data broken down by position, time, and depth is tabulated in Table 1. The data reduction and analysis was done by use of SPSS (Statistical Package for the Social Sciences) programs.[9]

27. The statistical treatment of experimental data was divided into the analysis of the independent variables and the correlation of dependent variables. For water and sediment samples, the independent variables of time (sampling date), depth (in core or water column), and position (station location) were analyzed by analysis of covariance using position as the factor with time and depth as the covariates. The response parameters for these analyses of covariances were the dependent variables listed in paragraph 31. The strength of association between dependent variables in both the water and sediment was evaluated by means of the Pearson product-moment correlation.

Analytical treatment of independent variables

28. Using the analysis of covariance to test independent variables, the effect of time and depth was isolated and checked for significance at the 95 percent ($S \leq 0.05$) and 99 percent ($S \leq 0.01$) confidence levels. This approach allowed position effects to be examined after being corrected for time and depth. The corrected means are tabulated in the multiple classification section of the analysis of covariance tables.

The assumptions for analysis of variance (ANOVA) were assumed valid for all data and the covariate-by-factor interaction was assumed to be zero.

29. Analysis of covariance for water samples. In the water samples the treatment design was a 5 × 2 × 3 factorial. The factor was position with the five levels being the five stations: 6, 10, 17, 19, and 44. The first covariate was time with the two levels being September 1976 and December 1976. The second covariant was depth with the three levels being 2 m from surface, 10 m from bottom, and 1 m from bottom. The position effects were compared pairwise with the corrected means given in the multiple classification analysis of Scheffé's multiple comparison test.[10] The time and depth effects were broken down into three parts by a further analysis of covariance. Three areas were examined (disposal site, stations 6, 10; reference sites, stations 17, 19; and Duwamish River mouth, station 44) so that the disposal site could be compared with the reference sites.

30. Analysis of covariance for sediment samples. The sediment samples were analyzed in a manner similar to that used for the water samples. However, the data for the sediment were reduced into four categories to aid in interpretation. The first group was the central disposal site consisting of stations 6, 7, 10, and 11. The second and third groups were the west (stations 17, 18) and east (stations 19, 20) reference sites. The fringe area of the disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, and 16) was included in the fourth group. After the data reduction, the treatment design was a 4 × 2 × 2 factorial. The factor was position with the four levels described above. The first covariate was time with the two levels being September 1976 and December 1976; and the second covariate was depth with the two levels being 0 to 10 cm and 10 to 25 cm in the core. The significant effects of time, position, and depth were compared, as with the water samples, except that time and depth were broken down into only disposal and reference sites.

Analytical treatment
of dependent variables

31. Pairwise matrices were constructed to examine the linear

correlations between response parameters. The correlation coefficients not only summarized the strength of association between a pair of variables, but also provided an easy means for comparing the strength of relationships between one pair of variables and a different pair. In order to evaluate whether elements were behaving differently in the disposal and reference sites, two correlations were done for each dependent variable: disposal and reference. The dependent variables for the water samples are as follows: suspended solids, As, Mn, Hg, nitrate, ammonia, inorganic phosphate, and reactive silicate. The dependent variables for the sediment samples are as follows: pH, Eh, sediment manganese (Mn(Sed)), interstitial water manganese (Mn(IW)), sediment arsenic (As(Sed)), intersittial water arsenic (As(IW)), sediment mercury (Hg(Sed)), interstitial water mercury (Hg(IW)), sediment chromium (Cr(Sed)), free sulfide, inorganic phosphate, ammonia, and particle size coarse fractions (CF1-CF6), silt, and clay. The data were assumed to be normally distributed and the linearity of the correlation was determined by inspection of scattergrams.[11]

PART III: RESULTS AND DISCUSSION

32. The concentrations of four trace metals (Mn, As, Hg, Cr) and four nutrients (nitrate, ammonia, reactive silicate, inorganic phosphate), and supporting chemical and physical information determined in water, sediment, and interstitial water of Elliott Bay are listed in Tables 2-11.

Chemical Characteristics of Elliott Bay Water

33. The concentrations of suspended solids, trace metals, and nutrients at the Elliott Bay dredge disposal site (stations 6, 10), Duwamish River mouth (station 44), and two reference sites (stations 17, 19) are shown in Table 2. The significance of temporal, depth, and spatial differences in the chemical parameters as determined by analysis of covariance is tabulated in Table 12.

Temporal differences in chemical parameters

34. Suspended solids measured over the disposal site decreased between September and December 1976 sampling cruises although no significant changes occurred in the reference sites. Seawater arsenic concentrations at the disposal site were lower in December than in September although arsenic in the reference sites remained constant. Other observed temporal changes occurred at both disposal and reference sites and therefore were likely seasonal rather than disposal effects.

Position differences over depth in the water column

35. Over the disposal site, manganese concentrations were higher in bottom waters than in surface waters, while in reference sites the opposite trend was observed.

Spatial differences in chemical parameters

36. Concentration levels of the various trace metals and nutrients measured in the water above the disposal site were not statistically

different from levels measured at the reference sites except for mercury concentrations in September. In September, the mercury concentrations at the east reference site (station 19) were approximately two to three times higher than levels in other parts of Elliott Bay.

Chemical Characteristics of Elliott Bay Sediment

37. The pH, Eh, and free and total sulfide concentrations are tabulated in Table 3. Concentrations of arsenic, chromium, manganese, and mercury in sediments are shown in Tables 4-7. Particle size distribution and percent water values are given in Table 8. Tables 9 and 10 list the concentrations of arsenic and manganese in interstitial waters. Inorganic phosphate, reactive silicate, and ammonia concentrations are tabulated in Table 11. The significance of temporal, depth, and spatial differences in the chemical parameters as determined by analysis of covariance is tabulated in Table 13.

Sediment parameters

38. pH. Sediment pH was lower at the Elliott Bay disposal site than at reference sites for both sampling cruises and decreased between September and December (Table 3). No temporal effect was observed for the west reference site. In addition, pH values for the central disposal site increased from the top to bottom sections of the core.

39. Eh. Eh values were more negative in December than in September for central disposal and reference sites (Table 3). The Eh values in the west reference site were higher than values obtained in the central disposal area and in the fringe of the experimental disposal area. No Eh differences were observed with depth in the core.

40. Free sulfide. No spatial or temporal differences were observed for free sulfide concentrations in Elliott Bay (Table 3).

41. Manganese. Manganese concentrations in sediment from the disposal area were greater in December than in September (Table 6). Concentrations in the central disposal area were higher than those in the east reference site.

42. Arsenic. The arsenic concentration in sediment from the

central disposal site was higher in the top section of the core than in the lower section (Table 4). No temporal differences were observed and differences in concentration between the central disposal site and the west reference station were not significant.

43. Mercury. Mercury concentrations in sediment at the disposal site increased between the September and December sampling cruises (Table 7). The concentration at the disposal site decreased from the top to the bottom sections of the cores. Mercury concentrations were two to three times greater in sediments from the east reference site than elsewhere in Elliott Bay.

44. Chromium. Chromium concentrations in sediment were higher at the west reference station than at the central disposal, fringe disposal, or east reference sites (Table 5). The chromium concentration in sediment at the disposal site decreased with depth in the core. No temporal differences were observed.

45. Particle Size. Coarse fractions 1 (>2 mm) and 2 (1-2 mm) decreased with depth in the cores taken from the central disposal area while coarse fractions 3 (0.5-1 mm) and 4 (0.25-0.5 mm) increased with depth (Table 8). No particle size variation with depth was seen for the west reference site. CF2 was higher at the west reference site than at either the central disposal area or the east reference site. CF4 was higher at the disposal site than at the east reference site. The silt fraction was higher at the disposal site than at the west reference site.

Interstitial water parameters

46. Manganese. Manganese concentrations in interstitial waters from Elliott Bay sediments were significantly higher within the disposal site than at reference stations (stations 17-20) (see Table 10). No consistent pattern of increasing or decreasing manganese concentration was observed with depth or distance from the center of the disposal site. No temporal effect upon concentration was seen for disposal site sediments. A decrease in manganese concentration with depth was seen at the west reference site.

47. Arsenic. No statistically significant differences in

concentration of arsenic were observed between disposal and reference sites or with depth in the cores (Table 9).

48. Phosphate. Inorganic phosphate concentrations decreased from September to December for the central disposal site (Table 11). The phosphate concentration at the central disposal region was higher than that observed at either of the reference sites. No concentration gradients were observed with depth in the core.

49. Ammonia. Ammonia concentration was significantly higher at the center of the disposal site than at the reference sites and concentrations were generally higher in December than in September for both the disposal and west reference sites (Table 11). No significant concentration differences were observed with depth.

Discussion of Results

Correlations between various chemical and physical parameters

50. Seawater. Table 14 lists the Pearson product-moment correlation coefficients, R, for seawater samples taken at stations 6 and 10 of the disposal site. A similar matrix constructed for the reference stations (stations 17, 19) is shown in Table 15. The only significant correlations ($S \leq 0.01$, 99 percent confidence limit) present in the reference stations are between the various nutrients: nitrate and phosphate, nitrate and silicate, and phosphate and silicate. In the disposal site there is also a correlation between suspended solids and manganese ($S \leq 0.001$) and between arsenic and phosphate ($S \leq 0.005$).

51. Sediment. Correlation coefficient matrices for sediment parameters in disposal and reference stations are given in Tables 16 and 17, respectively. At the reference stations, arsenic in sediment correlates ($S \leq 0.001$) with arsenic and mercury in interstitial water and with mercury and chromium in sediment. Arsenic in interstitial water correlates strongly with mercury in interstitial water and with chromium in sediment. At the disposal area pH correlates with Eh ($S \leq 0.003$), with manganese (0.006), arsenic (0.001), and mercury (0.001) in sediment,

and with manganese in interstitial water (0.001). However, the strong correlations between the various heavy metals seen at the reference stations were not observed.

Choice of reference sites

52. When undertaking a study of the effect of a perturbation upon a natural system it is important to have a reference area that is similar to the study area in every way except that it is not subject to the experimental stress, in this case disposal of dredged material. However, in this study the east reference site, located offshore from the Seattle piers, had mercury concentrations in the water, sediment, and interstitial waters which were elevated with respect to both the disposal and west reference sites. In addition, Eh and Cr(Sed) values at the east reference site were significantly lower than values measured at the west reference site. Sediments at the east reference site had a much greater percentage of finer particle size material than either the west reference site or the disposal area. Thus, the choice of the reference sites for sediment and water chemistry comparisons was not ideal. Only stations 19 and 20 were used in Table 13 for determinations of temporal and depth differences between the central disposal site and the undisturbed areas of Elliott Bay.

Improper storage and pretreatment problems

53. Although estuarine samples can contain airborne and waterborne contamination from industrial and human sources which result in elevated concentrations of heavy metals relative to pristine open ocean areas, parts per billion levels necessitate that care be exercised to minimize metal contamination or loss during collection, storage, and analysis. Without adequate protection of sample integrity, spatial and temporal changes in metal concentration which occur in the natural marine system cannot be determined. Threats to the sample integrity include metal contamination or loss in the laboratory and care must be taken to quantify these problems.

54. Following centrifugation, interstitial water samples that were to be analyzed for trace metals were acidified with HCl and stored at

room temperature in polyethylene bottles. Because samples were not frozen, considerable amounts of arsenic and mercury were lost to the container walls in the 5 to 6 months the December samples were stored before the analyses were completed.

55. Arsenic. Table 18 shows the effect of storage upon the observed arsenic concentration in interstitial waters collected in September. The first arsenic concentration, As1, was measured in November within about a month of collection. As2 is a second aliquot taken from the same storage bottle and analyzed in May, approximately 6 months later. As shown in Table 18, the percent change in arsenic concentration ranged from -75 percent to +231 percent of the value determined in November. Although adsorption of metals on the walls of containers is probably the most likely mechanism for change in concentration, resulting in a decrease in observed concentration, contamination can increase the measured concentration. Samples from the December cruise were not analyzed until 5 months after collection and were considerably lower in concentration reflecting the loss of arsenic to the container walls. Thus, the only arsenic concentrations reported were from the September cruise.

56. Mercury. A similar problem was encountered in analyses for mercury in interstitial waters. Acidified aqueous solutions initially containing 0.34 mg/l have been observed to lose more than 65 percent of the original mercury when stored in polyethylene containers for 10 days.[12] Table 19 shows the change in mercury concentration measured in September samples following 7 months of storage. Because December samples were stored 6 months before analyses, the results were not reported. September samples were stored for over a month and therefore are also questionable and not reported. Lindberg and Harriss[13] indicate that interstitial dissolved mercury is much greater than that in the overlying water. Results of this study did not support this observation, and, rather than being indicative of unique conditions in the study area, measured mercury concentrations in interstitial water are believed to reflect the improper storage of the samples. Seawater samples to be analyzed for mercury were frozen immediately after the collection,

but interstitial water samples were not.

57. Nitrate. Nitrate values for interstitial waters are not reported because samples were mistakenly stored in bottles that had been soaked in nitric acid which contaminated the samples for this nutrient.

PART IV: SUMMARY AND CONCLUSIONS

58. Disposal of dredged material from the Duwamish River into Elliott Bay has resulted in minimal long-term changes in concentrations of trace metals observed in water above the disposal site. Six and nine months after the disposal of dredged material, the only significant difference between water at the disposal site and at the two reference sites was a higher mercury concentration in waters of the east reference site located near the Seattle waterfront. The concentrations of suspended solids and arsenic in the water column above the disposal area decreased between September and December although no significant change in concentration was observed at the reference sites.

59. Alteration in chemical parameters of the disposal site sediments was significant six and nine months after disposal when compared to one or both reference stations. In September and December 1976, the sediments of the disposal area had pH and Eh values significantly lower than those determined at the west reference station. At the disposal site, concentrations of manganese, inorganic phosphate, and ammonia in the interstitial waters were higher than at both reference sites, while chromium was highest in sediments at the west reference site.

60. Significant temporal changes in the sediment chemistry of the disposal site were observed between September and December 1976; pH, Eh, and inorganic phosphate decreased at the disposal site and mercury and manganese concentrations in sediment increased. At the reference stations only Eh was significantly different in December than in September and also, in December, the sediments became more reducing in nature.

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APPENDIX A'

ANOVA AND MULTIPLE CLASSIFICATION ANALYSIS TABLES FOR SEAWATER AND SEDIMENT VARIABLES WITH SIGNIFICANT POSITION EFFECTS

ANOVA Table for Seawater Mercury by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 10,) west reference site (station 17,), east reference site (station 19)

Time = Sampling date (September, December 1976)

Depth = Depth in water column (2m from surface, 10m above bottom, 1m above bottom)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	110.008	2	55.004	.193	.825
Time	30.343	1	30.343	.106	.746
Depth	79.665	1	79.665	.279	.600
Main effects	4318.674	4	1079.669	3.782	.009
Position	4318.674	4	1079.669	3.782	.009
Explained	4428.682	6	738.114	2.586	.029
Residual	14844.381	52	285.469		
Total	19273.063	58	332.294		

Covariate	Beta
Time	-1.434
Depth	-1.411

60 cases were processed

1 case (1.7 PCT) was missing

Multiple Classification Analysis for Seawater Mercury by Position with Time and Depth as Covariates

Grand Mean = 26.26

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for Independents DEV≠N	Beta	Adjusted for indepedents + Covariates DEV≠N	Beta
Position							
St. 6. central disposal site	11	-5.39				-5.35	
St. 10 central disposal site	12	-2.46				-2.47	
St. 17 west reference site	12	-2.26				-2.27	
St. 19 east reference site	12	16.58				16.57	
St. 44 Duwamish River mouth	12	-6.92				-6.93	
			.47				.47

ANOVA Table for Seawater Manganese by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 10,) west reference site (station 17), east reference site (station 19),

Time = Sampling date (September, December 1976)

Depth = Depth in water column (2m from surface, 10m above bottom, 1m above bottom)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	334.604	2	167.303	31.388	.001
Time	212.105	1	212.105	39.794	.001
Depth	122.500	1	122.500	22.983	.001
Main effects	264.417	4	66.104	12.402	.001
Position	264.417	4	66.104	12.402	.001
Explained	599.023	6	99.837	18.731	.001
Residual	277.165	52	5.330		
Total	876.187	58	15.107		

Covariate	Beta
Time	-3.793
Depth	1.750

60 cases were processed
1 case (1.7 PCT) was missing

Multiple Classification Analysis for Seawater Manganese

by Position with Time and Depth as Covariates

Grand Mean = 18.35

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for Independents DEV≠N	Beta	Adjusted for Independents + Covariates DEV≠N	Beta
Position							
St. 6 central disposal site	11	-1.52				-1.39	
St. 10 central disposal site	12	3.80				3.77	
St. 17 west reference site	12	.32				.28	
St. 19 east reference site	12	- .33				- .36	
St. 44 Duwamish River mouth	12	-2.39				-2.42	
			.56				.55

ANOVA Table for Sediment pH by Position
with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11, west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	1.044	2	.522	8.622	.001
Time	.430	1	.430	7.100	.009
Depth	.614	1	.614	10.144	.002
Main Effects	10.130	3	3.377	55.751	.001
Position	10.130	3	3.377	55.751	.001
Explained	11.174	5	2.235	36.900	.001
Residual	8.721	144	.061		
Total	19.896	149	.134		

Covariate	Beta
Time	-.107
Depth	.128

160 cases were processed
10 cases (6.3 PCT) were missing

Multiple Classification Analysis for Sediment pH
by Position with Time and Depth as Covariates

Grand Mean = 6.86

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	31	-.16				-.17	
2 West reference	16	.50				.50	
3 East reference	16	.50				.50	
4 Fringe disposal	87	-.13				-.12	
			.72				.71

ANOVA Table for Sediment Manganese by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	32881.749	2	16440.875	5.006	.008
Time	32516.971	1	32518.971	9.901	.002
Depth	277.986	1	277.986	.085	.772
Main Effects	39583.925	3	13194.642	4.017	.009
Position	39583.925	3	13194.642	4.017	.009
Explained	72465.674	5	14493.135	4.413	.001
Residual	492668.236	150	3284.455		
Total	565133.910	155	3646.025		

Covariate	Beta
Time	28.881
Depth	-2.671

160 cases were processed
4 cases (2.5 PCT) were missing

Multiple Classification Analysis for Sediment Manganese

by Position with Time and Depth as Covariates

Grand Mean = 255.88

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	28.00				27.86	
2 West reference	16	-11.56				-11.71	
3 East reference	15	-28.63				-27.93	
4 Fringe disposal	93	- 3.03				- 3.07	
			.27				.26

ANOVA Table for Sediment Mercury by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	11.822	2	5.911	3.568	.031
Time	2.326	1	2.326	1.404	.238
Depth	9.557	1	9.557	5.768	.018
Main effects	42.977	3	14.326	8.646	.001
Position	42.977	3	14.326	8.646	.001
Explained	54.799	5	10.960	6.615	.001
Residual	250.191	151	1.657		
Total	304.990	156	1.955		

Covariate	Beta
Time	.243
Depth	.493

160 cases were processed

3 cases (1.9 PCT) were missing

Multiple Classification Analysis for Sediment Mercury by Position with Time and Depth as Covariates

Grand Mean = .51

Variable + category	N	Unadjusted DEV'd	Eta	Adjusted for independents DEV'd	Beta	Adjusted for Independents + Covariates DEV'd	Beta
Position							
1 Central disposal	32	-.33				-.33	
2 West reference	16	-.28				-.29	
3 East reference	15	1.59				1.58	
4 Fringe disposal	94	-.09				-.09	
			.38				.38

ANOVA Table for Sediment Chromium by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	2537.371	2	1268.686	3.886	.023
Time	124.786	1	124.786	.382	.537
Depth	2412.586	1	2412.586	7.390	.007
Main Effects	37231.017	3	12410.339	38.014	.001
Position	34231.017	3	12410.339	38.014	.001
Explained	39768.388	5	7953.678	24.363	.001
Residual	50275.372	154	326.463		
Total	90043.759	159	566.313		

Covariate	Beta
Time	1.766
Depth	-7.766

160 cases were processed
0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Chromium by Position with Time and Depth as Covariates

Grand Mean = 76.79

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- 6.92				- 6.92	
2 West reference	16	44.58				44.58	
3 East reference	16	5.25				5.25	
4 Fringe disposal	96	- 6.00				- 6.00	
			.64				.64

ANOVA Table for Sediment Coarse Size Fraction 1(> 2mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	182.800	2	91.400	3.834	.024
Time	6.400	1	6.400	.268	.605
Depth	176.400	1	176.400	7.399	.007
Main effects	200.860	3	66.953	2.808	.041
Position	200.860	3	66.953	2.808	.041
Explained	383.660	5	76.732	3.219	.009
Residual	3671.315	154	23.840		
Total	4054.975	159	25.503		

Covariate	Beta
Time	- .400
Depth	2.100

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 1 (> 2mm) by Position with Time and Depth as Covariates

Grand Mean = 5.76

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	-1.29				-1.29	
2 West reference	16	1.43				1.43	
3 East reference	16	2.61				2.61	
4 Fringe disposal	96	- .24				- .24	
			.22				.22

ANOVA Table for Sediment Coarse Size Fraction ? (1 to 2mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	374.291	2	187.146	4.322	.015
Time	15.191	1	15.191	.351	.555
Depth	359.101	1	359.101	8.293	.005
Main effects	939.575	3	313.192	7.233	.001
Position	939.575	3	313.192	7.233	.001
Explained	1313.867	5	262.773	6.069	.001
Residual	6668.195	154	43.300		
Total	7982.062	159	50.202		

Covariate	Beta
Time	.616
Depth	2.996

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 2 (1 to 2mm) by Position with Time and Depth as Covariates

Grand Mean = 10.98

Variable + Category	N	Unadjusted DEV'N	Eta	Adjusted for independents DEV'N	Beta	Adjusted for independents + covariates DEV'N	Beta
Position							
1 Central disposal	32	-1.49				-1.49	
2 West reference	16	5.39				5.39	
3 East reference	16	-4.92				-4.92	
4 Fringe disposal	96	.42				.42	
			.34				34

ANOVA Table for Sediment Coarse Size Fraction 3 (0.5 - 1mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	263.081	2	131.540	1.869	.158
Time	102.881	1	102.881	1.462	.229
Depth	160.200	1	160.200	2.276	.133
Main effects	3116.202	3	1038.734	14.757	.001
Position	3116.202	3	1038.734	14.757	.001
Explained	3379.283	5	675.857	9.601	.001
Residual	10840.217	154	70.391		
Total	14219.499	159	89.431		

Covariate	Beta
Time	-1.604
Depth	-2.001

160 cases were processed

0 cases (0 PCT) were missing.

Multiple Classification Analysis for Sediment Coarse Size Fraction 3 (0.5 - 1mm) by Position with Time and Depth as Covariates

Grand Mean = 19.65

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- .60				- .60	
2 West reference	16	3.36				3.36	
3 East reference	16	-12.80				-12.80	
4 Fringe disposal	96	1.77				1.77	
			.47				.47

ANOVA Table for Sediment Coarse Size Fraction 4 (0.25 - 0.5mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	150.783	2	75.391	1.728	.181
Time	2.906	1	2.906	.067	.797
Depth	147.609	1	147.609	3.383	.068
Main effects	3484.783	3	1161.594	26.623	.001
Position	3484.783	3	1161.594	26.623	.001
Explained	3635.566	5	727.113	16.665	.001
Residual	6575.634	153	43.632		
Total	10311.200	158	65.261		

Covariate	Beta
Time	.270
Depth	-1.927

160 cases were processed

1 case (.6 PCT) was missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 4 (0.25 - 0.5mm) by Position with Time and Depth as Covariates

Grand Mean = 19.03

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- 2.23				- 2.24	
2 West reference	16	- .31				- .32	
3 East reference	16	-12.53				-12.53	
4 Fringe disposal	95	2.91				2.92	
			.58				.58

ANOVA Table for Sediment Silt Size Fraction (0.002 - 0.05mm) by

Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covarites	17.640	2	8.820	.042	.959
Time	1.764	1	1.764	.008	.927
Depth	15.876	1	15.876	.076	.783
Main effects	10222.910	3	3407.637	16.321	.001
Position	10222.910	3	3407.637	16.321	.001
Explained	10240.550	5	2048.110	9.810	.001
Residual	32153.261	154	208.787		
Total	42393.811	159	266.628		

Covariate	Beta
Time	-.210
Depth	-.630

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Silt Size Fraction (0.002 - 0.05mm) by Position with Time and Depth as Covariates

Grand Mean = 43.47

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	6.39				6.39	
2 West reference	16	- 8.25				- 8.25	
3 East reference	16	19.77				19.77	
4 Fringe disposal	96	- 4.05				- 4.05	
			.49				.49

ANOVA Table for Sediment Clay Size Fraction (<0.002mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	40.107	2	20.053	.742	.478
Time	9.448	1	9.448	.349	.555
Depth	30.659	1	30.659	1.134	.289
Main effects	683.896	3	227.965	8.430	.001
Position	683.896	3	227.965	8.430	.001
Explained	724.003	5	144.801	5.355	.001
Residual	4110.354	152	27.042		
Total	4834.357	157	30.792		

Covariate	Beta
Time	-.489
Depth	-.881

160 cases were processed

2 cases (1.3 PCT) were missing

Multiple Classification Analysis for Sediment Clay Size Fraction
(≤0.002m) by Position with Time and Depth as Covariates

Grand Mean = 3.52

Variable + category	N	Unadjusted DEV'N	Eta	Adjusted for independents DEV'N	Beta	Adjusted for independents + covariates DEV'N	Beta
Position							
1 Central disposal	32	-1.04				-1.04	
2 West reference	16	- .19				- .19	
3 East reference	16	6.16				6.16	
4 Fringe disposal	94	- .67				- .66	
			.38				.38

ANOVA Table for Interstitial Water Manganese by Position
with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11, west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12,13,14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	.354	2	.177	.036	.965
Time	.354	1	.354	.072	.789
Depth	.000	1	.000	.000	.993
Main Effects	324.870	3	108.290	22.062	.001
Position	324.870	3	108.290	22.062	.001
Explained	325.223	5	65.045	13.251	.001
Residual	721.549	147	4.908		
Total	1046.773	152	6.887		

Covariate	Beta
Time	.096
Depth	-.003

160 cases were processed
7 cases (4.4 PCT) were missing

Multiple Classification Analysis for Interstitial Water Manganese by Position with Time and Depth as Covariates

Grand Mean = 3.26

Variable + category	N	Unadjusted DEV'N	Eta	Adjusted for independents DEV'N	Beta	Adjusted for independents + covariates DEV'N	Beta
Position							
1 Central reference	30	.99				.99	
2 West reference	15	-2.81				-2.81	
3 East reference	16	-2.94				-2.94	
4 Fringe disposal	92	.65				.65	
			.56				.56

ANOVA Table for Interstitial Water Inorganic Phosphate

by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	9030.382	2	4515.191	18.117	.001
Time	8563.243	1	8563.243	34.359	.001
Depth	527.040	1	527.040	2.115	.148
Main effects	3182.612	3	1060.871	4.257	.007
Position	3182.612	3	1060.871	4.257	.007
Explained	12212.994	5	2442.599	9.801	.001
Residual	32898.386	132	249.230		
Total	45111.380	137	329.280		

Covariate	Beta
Time	-15.816
Depth	- 3.909

160 cases were processed
22 cases (13.8 PCT) were missing

Multiple Classification Analysis for Interstitial Water Inorganic Phosphate by Position with Time and Depth as Covariates

Grand Mean = 13.13

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	23	7.13				5.91	
2 West reference	13	-10.27				-10.06	
3 East reference	15	- 9.18				- 7.89	
4 Fringe disposal	87	1.23				1.30	
			.30				.27

ANOVA Table for Interstitial Water Ammonia by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	1786.749	2	893.375	6.272	.003
Time	1442.863	1	1442.863	10.131	.002
Depth	356.045	1	356.045	2.500	.116
Main Effects	2605.421	3	868.474	6.098	.001
Position	2605.421	3	868.474	6.098	.001
Explained	4392.171	5	878.434	6.168	.001
Residual	18373.146	129	142.427		
Total	22765.316	134	169.890		

Covariate	Beta
Time	6.548
Depth	-3.249

160 cases were processed
25 cases (15.6 PCT) were missing

Multiple Classification Analysis for Interstitial Water Ammonia

by Position with Time and Depth as Covariates

Grand Mean = 7.99

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	20	9.90				9.57	
2 West reference	13	-5.60				-5.44	
3 East reference	15	-4.67				-4.99	
4 Fringe disposal	87	- .64				- .53	
			.35				.34

Table 1

Listing of Experimental Data Broken Down by Position, Time, and Depth

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE SOL (Suspended Solids)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			70.9000	1.1817	.4500	.2025	(60)
POSITION	1.	OUVP-E6	12.4000	1.0333	.4779	.2479	(12)
TIME	1.	SEPTEMBER	7.9000	1.3167	.4750	.2257	(6)
DEPTH	1.	SURFACE	3.4000	1.7000	0	0	(2)
DEPTH	2.	MIDDLE	1.5000	.7500	.3536	.1250	(2)
DEPTH	3.	BOTTOM	3.0000	1.5000	0	0	(2)
TIME	2.	DECEMBER	4.5000	.7500	.3564	.1270	(6)
DEPTH	1.	SURFACE	.8000	.4000	0	0	(2)
DEPTH	2.	MIDDLE	1.6000	.8000	.2828	.0800	(2)
DEPTH	3.	BOTTOM	2.1000	1.0500	.3536	.1250	(2)
POSITION	2.	OUVP-E 10	16.4000	1.3667	.5483	.3006	(12)
TIME	1.	SEPTEMBER	10.0000	1.6667	.5164	.2667	(6)
DEPTH	1.	SURFACE	4.0000	2.0000	0	0	(2)
DEPTH	2.	MIDDLE	2.0000	1.0000	0	0	(2)
DEPTH	3.	BOTTOM	4.0000	2.0000	0	0	(2)
TIME	2.	DECEMBER	6.4000	1.0667	.4227	.1787	(6)
DEPTH	1.	SURFACE	1.7000	.8500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	2.6000	1.3000	.2828	.0800	(2)
DEPTH	3.	BOTTOM	2.1000	1.0500	.7778	.6050	(2)
POSITION	3.	REFERENCE-E17	14.2000	1.1833	.5006	.2506	(12)
TIME	1.	SEPTEMBER	6.4000	1.0667	.1751	.0307	(6)
DEPTH	1.	SURFACE	2.3000	1.1500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	2.1000	1.0500	.3536	.1250	(2)
DEPTH	3.	BOTTOM	2.0000	1.0000	0	0	(2)
TIME	2.	DECEMBER	7.8000	1.3000	.6876	.4880	(6)
DEPTH	1.	SURFACE	1.3000	.6500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	2.2000	1.1000	.1414	.0200	(2)
DEPTH	3.	BOTTOM	4.3000	2.1500	.2121	.0450	(2)
POSITION	4.	REFERENCE-E19	14.9000	1.2417	.3825	.1463	(12)
TIME	1.	SEPTEMBER	6.3000	1.0500	.4135	.1710	(6)
DEPTH	1.	SURFACE	3.0000	1.5000	.2828	.0800	(2)
DEPTH	2.	MIDDLE	1.3000	.6500	.2121	.0450	(2)
DEPTH	3.	BOTTOM	2.0000	1.0000	0	0	(2)
TIME	2.	DECEMBER	8.6000	1.4333	.2503	.0627	(6)
DEPTH	1.	SURFACE	3.0000	1.5000	0	0	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE SOL

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
DEPTH	2.	MIDDLE	2.3000	1.1500	.2121	.0450	(	2)
DEPTH	3.	BOTTOM	3.3000	1.6500	.0707	.0050	(	2)
POSITION	5.	DUWAMISH-44	13.0000	1.0833	.2552	.0652	(	12)
TIME	1.	SEPTEMBER	6.5000	1.0833	.3488	.1217	(	6)
DEPTH	1.	SURFACE	2.6000	1.3000	0	0	(	2)
DEPTH	2.	MIDDLE	1.3000	.6500	.2121	.0450	(	2)
DEPTH	3.	BOTTOM	2.6000	1.3000	0	0	(	2)
TIME	2.	DECEMBER	6.5000	1.0833	.1472	.0217	(	6)
DEPTH	1.	SURFACE	2.5000	1.2500	.0707	.0050	(	2)
DEPTH	2.	MIDDLE	2.1000	1.0500	.0707	.0050	(	2)
DEPTH	3.	BOTTOM	1.9000	.9500	.0707	.0050	(	2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE AS
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			169.6000	2.8267	.2939	.0864	(60)
POSITION	1.	DUMP-=6	34.9000	2.9083	.2875	.0827	(12)
TIME	1.	SEPTEMBER	18.6000	3.1000	.2608	.0680	(6)
DEPTH	1.	SURFACE	6.3000	3.1500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	6.1000	3.0500	.3536	.1250	(2)
DEPTH	3.	BOTTOM	6.2000	3.1000	.2828	.0800	(2)
TIME	2.	DECEMBER	16.3000	2.7167	.1602	.0257	(6)
DEPTH	1.	SURFACE	5.4000	2.7000	.2828	.0800	(2)
DEPTH	2.	MIDDLE	5.4000	2.7000	0	0	(2)
DEPTH	3.	BOTTOM	5.5000	2.7500	.2121	.0450	(2)
POSITION	2.	DUMP-= 10	34.7000	2.8917	.2234	.0499	(12)
TIME	1.	SEPTEMBER	17.9000	2.9833	.2927	.0857	(6)
DEPTH	1.	SURFACE	5.7000	2.8500	.2121	.0450	(2)
DEPTH	2.	MIDDLE	6.0000	3.0000	.5657	.3200	(2)
DEPTH	3.	BOTTOM	6.2000	3.1000	0	0	(2)
TIME	2.	DECEMBER	16.8000	2.8000	.0632	.0040	(6)
DEPTH	1.	SURFACE	5.5000	2.7500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	5.7000	2.8500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	5.6000	2.8000	0	0	(2)
POSITION	3.	REFERENCE-=17	31.5000	2.6250	.3671	.1348	(12)
TIME	1.	SEPTEMBER	16.4000	2.7333	.5125	.2627	(6)
DEPTH	1.	SURFACE	5.3000	2.6500	.9192	.8450	(2)
DEPTH	2.	MIDDLE	5.1000	2.5500	.4950	.2450	(2)
DEPTH	3.	BOTTOM	6.0000	3.0000	0	0	(2)
TIME	2.	DECEMBER	15.1000	2.5167	.0753	.0057	(6)
DEPTH	1.	SURFACE	5.2000	2.6000	0	0	(2)
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	(2)
DEPTH	3.	BOTTOM	4.9000	2.4500	.0707	.0050	(2)
POSITION	4.	REFERENCE-=19	24.8000	2.0000	.3394	.1145	(12)
TIME	1.	SEPTEMBER	18.8000	2.8000	.3162	.1000	(6)
DEPTH	1.	SURFACE	5.9000	2.9500	.4950	.2450	(2)
DEPTH	2.	MIDDLE	5.5000	2.7500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	5.4000	2.7000	.4243	.1800	(2)
TIME	2.	DECEMBER	18.0000	3.0000	.3578	.1280	(6)
DEPTH	1.	SURFACE	6.7000	3.3500	.4950	.2450	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE AS

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	5.6000	2.8000	.1414	.0200	(2)
DEPTH	3.	BOTTOM	5.7000	2.8500	.0707	.0050	(2)
POSITION	5.	DUWAMISH-44	33.7000	2.8083	.1379	.0190	(12)
TIME	1.	SEPTEMBER	16.9000	2.8167	.1169	.0137	(6)
DEPTH	1.	SURFACE	5.6000	2.8000	0	0	(2)
DEPTH	2.	MIDDLE	5.7000	2.8500	.2121	.0450	(2)
DEPTH	3.	BOTTOM	5.6000	2.8000	.1414	.0200	(2)
TIME	2.	DECEMBER	16.8000	2.8000	.1673	.0280	(6)
DEPTH	1.	SURFACE	5.8000	2.9000	0	0	(2)
DEPTH	2.	MIDDLE	5.4000	2.7000	.2828	.0800	(2)
DEPTH	3.	BOTTOM	5.6000	2.8000	.1414	.0200	(2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

POLLUTION DYNAMICS--WATER SAMPLES

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE MN
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1099.2000	18.3200	3.8611	14.9077	(60)
POSITION	1.	DUMP-E6	201.6000	16.8000	3.1652	10.0182	(12)
TIME	1.	SEPTEMBER	110.0000	18.3333	2.6583	7.0667	(6)
DEPTH	1.	SURFACE	33.5000	16.7500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	33.0000	16.5000	0	0	(2)
DEPTH	3.	BOTTOM	43.5000	21.7500	.3536	.1250	(2)
TIME	2.	DECEMBER	91.6000	15.2667	3.0546	9.3307	(6)
DEPTH	1.	SURFACE	24.3000	13.1500	.2121	.0450	(2)
DEPTH	2.	MIDDLE	29.5000	14.7500	.3536	.1250	(2)
DEPTH	3.	BOTTOM	35.8000	17.9000	4.8083	23.1200	(2)
POSITION	2.	DUMP-E10	265.8000	22.1500	5.2876	27.9591	(12)
TIME	1.	SEPTEMBER	152.5000	25.4167	5.3049	28.1417	(6)
DEPTH	1.	SURFACE	41.5000	20.7500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	47.5000	23.7500	1.0607	1.1250	(2)
DEPTH	3.	BOTTOM	63.5000	31.7500	3.1820	10.1250	(2)
TIME	2.	DECEMBER	113.3000	18.8833	2.7853	7.7577	(6)
DEPTH	1.	SURFACE	32.3000	16.1500	.9192	.8450	(2)
DEPTH	2.	MIDDLE	37.3000	18.6500	1.6263	2.6450	(2)
DEPTH	3.	BOTTOM	43.7000	21.8500	1.6263	2.6450	(2)
POSITION	3.	REFERENCE-E17	224.0000	18.6667	2.2395	5.0152	(12)
TIME	1.	SEPTEMBER	120.0000	20.0000	1.7321	3.0000	(6)
DEPTH	1.	SURFACE	37.5000	18.7500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	39.0000	19.5000	1.4142	2.0000	(2)
DEPTH	3.	BOTTOM	43.5000	21.7500	1.7678	3.1250	(2)
TIME	2.	DECEMBER	104.0000	17.3333	1.9408	3.7667	(6)
DEPTH	1.	SURFACE	31.5000	15.7500	1.0607	1.1250	(2)
DEPTH	2.	MIDDLE	34.0000	17.0000	1.4142	2.0000	(2)
DEPTH	3.	BOTTOM	38.5000	19.2500	1.7678	3.1250	(2)
POSITION	4.	REFERENCE-E19	216.3000	18.0250	1.8801	3.5348	(12)
TIME	1.	SEPTEMBER	114.0000	19.0000	1.6125	2.6000	(6)
DEPTH	1.	SURFACE	38.0000	19.0000	3.5355	12.5000	(2)
DEPTH	2.	MIDDLE	37.5000	18.7500	.3536	.1250	(2)
DEPTH	3.	BOTTOM	38.5000	19.2500	.3536	.1250	(2)
TIME	2.	DECEMBER	102.3000	17.0500	1.7015	2.8950	(6)
DEPTH	1.	SURFACE	34.8000	17.4000	1.9799	3.9200	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE MM

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	31.5000	15.7500	1.7678	3.1250	(2)
DEPTH	3.	BOTTOM	36.0000	18.0000	1.4142	2.0000	(2)
POSITION	5.	DUWAMISH-44	191.5000	15.9583	2.9324	8.5990	(12)
TIME	1.	SEPTEMBER	108.1000	18.0167	2.3121	5.3457	(6)
DEPTH	1.	SURFACE	34.8000	17.4000	3.3941	11.5200	(2)
DEPTH	2.	MIDDLE	33.3000	16.6500	.9192	.8450	(2)
DEPTH	3.	BOTTOM	40.0000	20.0000	1.4142	2.0000	(2)
TIME	2.	DECEMBER	83.4000	13.9000	1.8460	3.4040	(6)
DEPTH	1.	SURFACE	30.0000	15.0000	2.8284	8.0000	(2)
DEPTH	2.	MIDDLE	26.2000	13.1000	2.2627	5.1200	(2)
DEPTH	3.	BOTTOM	27.2000	13.6000	.1414	.0200	(2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

POPULATION VARIABLE: HG
BROKEN DOWN BY: POSITION
BY: TIME
BY: DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1549.0500	26.2551	18.2289	332.2942	(59)
POSITION	1.	OMMO-EA	229.5000	20.8636	14.7802	218.4545	(11)
TIME	1.	SEPTEMBER	79.0000	15.8000	15.0182	225.5750	(5)
DEPTH	1.	SURFACE	54.0000	24.0000	9.8995	98.0000	(2)
DEPTH	2.	MIDDLE	22.0000	22.0000	0	0	(1)
DEPTH	3.	BOTTOM	1.0000	.5000	0	0	(2)
TIME	2.	DECEMBER	150.5000	25.0833	14.4721	209.4417	(6)
DEPTH	1.	SURFACE	35.5000	17.7500	24.3952	595.1250	(2)
DEPTH	2.	MIDDLE	42.0000	24.0000	14.1421	200.0000	(2)
DEPTH	3.	BOTTOM	67.0000	33.5000	.7071	.5000	(2)
POSITION	2.	OMMO-E LO	245.5000	23.7917	10.8491	117.7027	(12)
TIME	1.	SEPTEMBER	115.0000	19.1667	4.4907	20.1667	(6)
DEPTH	1.	SURFACE	38.0000	19.0000	2.8284	8.0000	(2)
DEPTH	2.	MIDDLE	39.0000	19.5000	9.1924	84.5000	(2)
DEPTH	3.	BOTTOM	38.0000	19.0000	2.8284	8.0000	(2)
TIME	2.	DECEMBER	130.5000	28.4167	13.4909	182.4417	(6)
DEPTH	1.	SURFACE	69.0000	34.5000	.7071	.5000	(2)
DEPTH	2.	MIDDLE	67.0000	33.5000	.7071	.5000	(2)
DEPTH	3.	BOTTOM	34.5000	17.2500	23.6461	561.1250	(2)
POSITION	3.	REFERENCE-E17	282.0000	24.0000	12.4993	161.2727	(12)
TIME	1.	SEPTEMBER	86.0000	14.3333	10.1280	106.6667	(6)
DEPTH	1.	SURFACE	10.0000	5.0000	0	0	(2)
DEPTH	2.	MIDDLE	30.0000	15.0000	14.1421	200.0000	(2)
DEPTH	3.	BOTTOM	46.0000	23.0000	2.8284	8.0000	(2)
TIME	2.	DECEMBER	202.0000	33.6667	4.9854	22.2667	(6)
DEPTH	1.	SURFACE	73.0000	36.5000	2.1213	4.5000	(2)
DEPTH	2.	MIDDLE	70.0000	35.0000	0	0	(2)
DEPTH	3.	BOTTOM	59.0000	29.5000	7.7782	60.5000	(2)
POSITION	4.	REFERENCE-E19	514.0000	42.8333	26.2777	690.5152	(12)
TIME	1.	SEPTEMBER	298.0000	49.6333	11.1078	123.8667	(6)
DEPTH	1.	SURFACE	127.0000	63.5000	3.5355	12.5000	(2)
DEPTH	2.	MIDDLE	119.0000	59.5000	21.9203	480.5000	(2)
DEPTH	3.	BOTTOM	142.0000	71.0000	0	0	(2)
TIME	2.	DECEMBER	116.0000	19.3333	8.1158	65.8667	(6)
DEPTH	1.	SURFACE	35.0000	17.5000	4.9497	24.5000	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

CRITERION VARIABLE HG

Table 1 (Continued)

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
DEPTH	2.	MIDDLE	24.0000	13.0000	0	0	(	2)
DEPTH	3.	BOTTOM	55.0000	27.5000	9.1924	84.5000	(	2)
POSITION	5.	DUWAMISH-44	232.0500	19.3375	13.8112	190.7487	(	12)
TIME	1.	SEPTEMBER	104.5500	17.4250	14.3141	204.8937	(	6)
DEPTH	1.	SURFACE	46.0000	23.0000	2.8284	8.0000	(	2)
DEPTH	2.	MIDDLE	58.0000	29.0000	9.8995	98.0000	(	2)
DEPTH	3.	BOTTOM	.5500	.2750	.3182	.1012	(	2)
TIME	2.	DECEMBER	127.5000	21.2500	14.3518	205.9750	(	6)
DEPTH	1.	SURFACE	47.0000	23.5000	14.8492	220.5000	(	2)
DEPTH	2.	MIDDLE	33.5000	16.7500	22.9810	528.1250	(	2)
DEPTH	3.	BOTTOM	47.0000	23.5000	14.8492	220.5000	(	2)

TOTAL CASES = 60

MISSING CASES = 1.00 1.7 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE NO3 (Nitrate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1363.6000	22.7267	5.1667	26.6945	(60)
POSITION	1.	DUMP-E6	271.7000	22.6417	5.2372	27.4281	(12)
TIME	1.	SEPTEMBER	109.8000	18.3000	1.8612	3.4640	(6)
DEPTH	1.	SURFACE	36.7000	18.3500	2.4749	6.1250	(2)
DEPTH	2.	MIDDLE	34.9000	17.4500	2.6163	6.8450	(2)
DEPTH	3.	BOTTOM	38.2000	19.1000	1.2728	1.6200	(2)
TIME	2.	DECEMBER	161.9000	26.9833	3.4114	11.6377	(6)
DEPTH	1.	SURFACE	50.5000	25.2500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	60.1000	30.0500	5.4447	29.6450	(2)
DEPTH	3.	BOTTOM	51.3000	25.6500	.2121	.0450	(2)
POSITION	2.	DUMP-E10	275.0000	22.9167	4.3444	18.8742	(12)
TIME	1.	SEPTEMBER	118.5000	19.7500	4.1284	17.0270	(6)
DEPTH	1.	SURFACE	30.8000	15.4000	1.4142	2.0000	(2)
DEPTH	2.	MIDDLE	40.3000	20.1500	.4950	.2450	(2)
DEPTH	3.	BOTTOM	47.4000	23.7000	3.6770	13.5200	(2)
TIME	2.	DECEMBER	156.5000	26.0833	.6555	.4297	(6)
DEPTH	1.	SURFACE	50.8000	25.4000	.5657	.3200	(2)
DEPTH	2.	MIDDLE	52.9000	26.4500	.4950	.2450	(2)
DEPTH	3.	BOTTOM	52.8000	26.4000	.4243	.1800	(2)
POSITION	3.	REFERENCE-E17	271.7000	22.8083	4.4125	19.4699	(12)
TIME	1.	SEPTEMBER	114.8000	19.1333	3.2010	10.2467	(6)
DEPTH	1.	SURFACE	33.0000	16.5000	.1414	.0200	(2)
DEPTH	2.	MIDDLE	41.2000	20.6500	.7778	.6050	(2)
DEPTH	3.	BOTTOM	40.6000	20.3000	5.4447	29.6450	(2)
TIME	2.	DECEMBER	158.9000	26.4833	.4167	.1737	(6)
DEPTH	1.	SURFACE	51.9000	25.9500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	53.5000	26.7500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	53.5000	26.7500	.0707	.0050	(2)
POSITION	4.	REFERENCE-E19	267.1000	22.2583	4.8978	23.9881	(12)
TIME	1.	SEPTEMBER	108.3000	18.0500	3.1691	10.0430	(6)
DEPTH	1.	SURFACE	37.3000	18.6500	1.4849	2.2050	(2)
DEPTH	2.	MIDDLE	42.1000	21.0500	.4950	.2450	(2)
DEPTH	3.	BOTTOM	28.9000	14.4500	1.7678	3.1250	(2)
TIME	2.	DECEMBER	158.8000	26.4667	.4761	.2267	(6)
DEPTH	1.	SURFACE	53.1000	26.5500	.4950	.2450	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE NO3

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
DEPTH	2.	MIDDLE	53.0000	26.5000	0	0	(	2)
DEPTH	3.	BOTTOM	52.7000	26.3500	.9192	.8450	(	2)
POSITION	5.	DUWAMISH-44	276.1000	23.0083	7.2828	53.0390	(	12)
TIME	1.	SEPTEMBER	104.1000	17.3500	3.2587	10.6190	(	6)
DEPTH	1.	SURFACE	27.1000	13.5500	3.0406	9.2450	(	2)
DEPTH	2.	MIDDLE	38.9000	19.4500	.3536	.1250	(	2)
DEPTH	3.	BOTTOM	38.1000	19.0500	.4950	.2450	(	2)
TIME	2.	DECEMBER	172.0000	28.6667	5.4062	29.2267	(	6)
DEPTH	1.	SURFACE	66.1000	33.0500	9.4045	88.4450	(	2)
DEPTH	2.	MIDDLE	52.8000	26.4000	.1414	.0200	(	2)
DEPTH	3.	BOTTOM	53.1000	26.5500	.0707	.0050	(	2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE NH3 (Ammonia)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			61.7000	1.0283	1.3850	1.9181	(60)
POSITION	1.	DUMP=E6	15.7800	1.3150	1.7650	3.1151	(12)
TIME	1.	SEPTEMBER	4.8800	.8133	1.0371	1.0756	(6)
DEPTH	1.	SURFACE	4.3000	2.1500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	.3700	.1850	.0778	.0060	(2)
DEPTH	3.	BOTTOM	.2100	.1050	.0212	.0004	(2)
TIME	2.	DECEMBER	10.9000	1.8167	2.2746	5.1737	(6)
DEPTH	1.	SURFACE	2.6000	1.3000	.1414	.0200	(2)
DEPTH	2.	MIDDLE	6.9000	3.4500	4.1719	17.4050	(2)
DEPTH	3.	BOTTOM	1.4000	.7000	.2828	.0800	(2)
POSITION	2.	DUMP=E10	10.8700	.9058	1.0765	1.1589	(12)
TIME	1.	SEPTEMBER	5.8700	.9783	1.2815	1.6422	(6)
DEPTH	1.	SURFACE	5.2000	2.6000	.5657	.3200	(2)
DEPTH	2.	MIDDLE	.3000	.1500	0	0	(2)
DEPTH	3.	BOTTOM	.3700	.1850	.0212	.0004	(2)
TIME	2.	DECEMBER	5.0000	.8333	.9459	.8947	(6)
DEPTH	1.	SURFACE	3.6000	1.8000	1.2728	1.6200	(2)
DEPTH	2.	MIDDLE	.8000	.4000	.1414	.0200	(2)
DEPTH	3.	BOTTOM	.6000	.3000	.1414	.0200	(2)
POSITION	3.	REFERENCE=E17	4.8000	.4000	.3111	.0968	(12)
TIME	1.	SEPTEMBER	2.5000	.4167	.4082	.1666	(6)
DEPTH	1.	SURFACE	1.8400	.9200	.2546	.0648	(2)
DEPTH	2.	MIDDLE	.2400	.1200	0	0	(2)
DEPTH	3.	BOTTOM	.4200	.2100	0	0	(2)
TIME	2.	DECEMBER	2.3000	.3833	.2137	.0457	(6)
DEPTH	1.	SURFACE	1.3000	.6500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	.4000	.2000	0	0	(2)
DEPTH	3.	BOTTOM	.6000	.3000	0	0	(2)
POSITION	4.	REFERENCE=E19	15.2300	1.2692	1.3047	1.7022	(12)
TIME	1.	SEPTEMBER	8.4300	1.4050	1.6739	2.8019	(6)
DEPTH	1.	SURFACE	7.1000	3.5500	.3536	.1250	(2)
DEPTH	2.	MIDDLE	.4000	.2000	0	0	(2)
DEPTH	3.	BOTTOM	.9300	.4650	.1061	.0113	(2)
TIME	2.	DECEMBER	6.8000	1.1333	.9480	.8987	(6)
DEPTH	1.	SURFACE	4.6000	2.3000	0	0	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE NH3

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	.7000	.3500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	1.5000	.7500	.4950	.2450	(2)
POSITION	5.	DUWAMISH-44	15.0200	1.2517	1.8870	3.5606	(12)
TIME	1.	SEPTEMBER	4.4200	.7367	.5917	.3501	(6)
DEPTH	1.	SURFACE	3.0000	1.5000	0	0	(2)
DEPTH	2.	MIDDLE	.6600	.3300	0	0	(2)
DEPTH	3.	BOTTOM	.7600	.3800	.0141	.0002	(2)
TIME	2.	DECEMBER	10.6000	1.7667	2.6166	6.8467	(6)
DEPTH	1.	SURFACE	7.6000	3.8000	4.6669	21.7800	(2)
DEPTH	2.	MIDDLE	1.4000	.7000	.1414	.0200	(2)
DEPTH	3.	BOTTOM	1.6000	.8000	.1414	.0200	(2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE P04 (Inorganic Phosphate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			134.3000	2.2383	.3499	.1224	(60)
POSITION	1.	DUMP-E6	26.9000	2.2417	.3450	.1190	(12)
TIME	1.	SEPTEMBER	11.6000	1.9333	.1751	.0307	(6)
DEPTH	1.	SURFACE	4.2000	2.1000	.1414	.0200	(2)
DEPTH	2.	MIDDLE	3.6000	1.8000	.1414	.0200	(2)
DEPTH	3.	BOTTOM	3.8000	1.9000	.1414	.0200	(2)
TIME	2.	DECEMBER	15.3000	2.5500	.0548	.0030	(6)
DEPTH	1.	SURFACE	5.1000	2.5500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	(2)
DEPTH	3.	BOTTOM	5.2000	2.6000	0	0	(2)
POSITION	2.	DUMP-E10	27.6000	2.3000	.3275	.1073	(12)
TIME	1.	SEPTEMBER	12.2000	2.0333	.2503	.0627	(6)
DEPTH	1.	SURFACE	3.8000	1.9000	.1414	.0200	(2)
DEPTH	2.	MIDDLE	3.8000	1.9000	0	0	(2)
DEPTH	3.	BOTTOM	4.6000	2.3000	.2828	.0800	(2)
TIME	2.	DECEMBER	15.4000	2.5667	.0516	.0027	(6)
DEPTH	1.	SURFACE	5.2000	2.6000	0	0	(2)
DEPTH	2.	MIDDLE	5.1000	2.5500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	5.1000	2.5500	.0707	.0050	(2)
POSITION	3.	REFERENCE-E17	27.1000	2.2583	.3059	.0936	(12)
TIME	1.	SEPTEMBER	12.0000	2.0000	.2000	.0400	(6)
DEPTH	1.	SURFACE	3.7000	1.8500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	4.2000	2.1000	0	0	(2)
DEPTH	3.	BOTTOM	4.1000	2.0500	.3536	.1250	(2)
TIME	2.	DECEMBER	15.1000	2.5167	.0753	.0057	(6)
DEPTH	1.	SURFACE	4.9000	2.4500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	(2)
DEPTH	3.	BOTTOM	5.2000	2.6000	0	0	(2)
POSITION	4.	REFERENCE-E19	24.5000	2.2083	.4100	.1681	(12)
TIME	1.	SEPTEMBER	11.3000	1.8833	.3251	.1057	(6)
DEPTH	1.	SURFACE	4.3000	2.1500	.2121	.0450	(2)
DEPTH	2.	MIDDLE	4.0000	2.0000	0	0	(2)
DEPTH	3.	BOTTOM	3.0000	1.5000	.1414	.0200	(2)
TIME	2.	DECEMBER	15.2000	2.5333	.1033	.0107	(6)
DEPTH	1.	SURFACE	5.3000	2.6500	.0707	.0050	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

Table 1 (Continued)

CRITERION VARIABLE PO4

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	(2)
DEPTH	3.	BOTTOM	4.9000	2.4500	.0707	.0050	(2)
POSITION	5.	DUWAMISH-44	26.2000	2.1833	.3996	.1597	(12)
TIME	1.	SEPTEMBER	10.9000	1.8167	.1602	.0257	(6)
DEPTH	1.	SURFACE	3.3000	1.6500	.2121	.0450	(2)
DEPTH	2.	MIDDLE	3.8000	1.9000	0	0	(2)
DEPTH	3.	BOTTOM	3.8000	1.9000	0	0	(2)
TIME	2.	DECEMBER	15.3000	2.5500	.0548	.0030	(6)
DEPTH	1.	SURFACE	5.0000	2.5000	0	0	(2)
DEPTH	2.	MIDDLE	5.1000	2.5500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	5.2000	2.6000	0	0	(2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE SI (Reactive Silicate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			2757.9000	45.9650	6.5293	42.6189	(60)
POSITION	1.	DUMP-E6	533.1000	44.4250	6.8432	46.8293	(12)
TIME	1.	SEPTEMBER	234.9000	39.1500	5.9386	35.2670	(6)
DEPTH	1.	SURFACE	89.9000	44.9500	4.5962	21.1250	(2)
DEPTH	2.	MIDDLE	68.3000	34.1500	5.5861	31.2050	(2)
DEPTH	3.	BOTTOM	76.7000	38.3500	2.3335	5.4450	(2)
TIME	2.	DECEMBER	298.2000	49.7000	.9679	.9760	(6)
DEPTH	1.	SURFACE	99.9000	49.9500	.9192	.8450	(2)
DEPTH	2.	MIDDLE	99.2000	49.6000	.8485	.7200	(2)
DEPTH	3.	BOTTOM	99.1000	49.5500	1.7678	3.1250	(2)
POSITION	2.	DUMP-E10	554.6000	46.2167	5.5868	31.2124	(12)
TIME	1.	SEPTEMBER	250.0000	41.6667	3.9175	15.3467	(6)
DEPTH	1.	SURFACE	81.3000	40.6500	.0707	.0050	(2)
DEPTH	2.	MIDDLE	78.3000	39.1500	.2121	.0450	(2)
DEPTH	3.	BOTTOM	90.4000	45.2000	6.0611	36.9800	(2)
TIME	2.	DECEMBER	304.6000	50.7667	1.9065	3.6347	(6)
DEPTH	1.	SURFACE	101.9000	50.9500	3.7477	14.0450	(2)
DEPTH	2.	MIDDLE	102.6000	51.3000	1.5556	2.4200	(2)
DEPTH	3.	BOTTOM	100.1000	50.0500	.2121	.0450	(2)
POSITION	3.	REFERENCE-E17	552.1000	46.0083	5.7177	32.6917	(12)
TIME	1.	SEPTEMBER	247.3000	41.2167	4.0052	16.0417	(6)
	1.	SURFACE	81.4000	40.7000	.1414	.0200	(2)
	2.	MIDDLE	83.5000	41.7500	1.4849	2.2050	(2)
	3.	BOTTOM	[illegible]	[illegible]	[illegible]	[illegible]	(2)
TIME	2.	DECEMBER	304.8000	50.8000	.8809	.7760	(6)
DEPTH	1.	SURFACE	102.1000	51.0500	.7778	.6050	(2)
DEPTH	2.	MIDDLE	100.9000	50.4500	.0707	.0050	(2)
DEPTH	3.	BOTTOM	101.8000	50.9000	1.6971	2.8800	(2)
POSITION	4.	REFERENCE-E19	574.4000	47.8667	8.3896	70.3861	(12)
TIME	1.	SEPTEMBER	259.4000	43.0667	9.8297	96.6227	(6)
DEPTH	1.	SURFACE	97.3000	48.6500	6.1518	37.8450	(2)
DEPTH	2.	MIDDLE	99.2000	49.6000	1.1314	1.2800	(2)
DEPTH	3.	BOTTOM	61.9000	30.9500	1.6263	2.6450	(2)
TIME	2.	DECEMBER	314.0000	52.3333	1.7119	2.9307	(6)
DEPTH	1.	SURFACE	109.3000	54.6500	.6364	.4050	(2)

(Continued)

POLLUTION DYNAMICS--WATER SAMPLES

CRITERION VARIABLE SI

Table 1 (Continued)

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
DEPTH	2.	MIDDLE	104.5000	52.2500	1.0607	1.1250	(	2)
DEPTH	3.	BOTTOM	102.2000	51.1000	0	0	(	2)
POSITION	5.	DUWAMISH-44	543.7000	45.3083	6.3560	40.3990	(	12)
TIME	1.	SEPTEMBER	237.9000	39.6333	3.1399	9.8597	(	6)
DEPTH	1.	SURFACE	73.6000	36.8000	3.6770	13.5200	(	2)
DEPTH	2.	MIDDLE	85.3000	42.6500	1.2021	1.4450	(	2)
DEPTH	3.	BOTTOM	78.9000	39.4500	.0707	.0050	(	2)
TIME	2.	DECEMBER	305.9000	50.9833	1.3136	1.7257	(	6)
DEPTH	1.	SURFACE	99.0000	49.5000	.8485	.7200	(	2)
DEPTH	2.	MIDDLE	102.4000	51.2000	.2828	.0800	(	2)
DEPTH	3.	BOTTOM	104.5000	52.2500	.3536	.1250	(	2)

TOTAL CASES = 60

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE PH
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1029.2000	6.8613	.3654	.1335	(150)
POSITION	1.	CENTRAL DISPOSAL	207.6000	6.6968	.2536	.0643	(31)
TIME	1.	SEPTEMBER	102.0000	6.8000	.2449	.0600	(15)
DEPTH	1.	TOP--10CM	47.4000	6.7714	.1704	.0290	(7)
DEPTH	2.	BOTTOM--25CM	54.6000	6.8250	.3059	.0936	(8)
TIME	2.	DECEMBER	105.6000	6.6000	.2280	.0520	(16)
DEPTH	1.	TOP--10CM	52.3000	6.5375	.1685	.0284	(8)
DEPTH	2.	BOTTOM--25CM	53.3000	6.6625	.2722	.0741	(8)
POSITION	2.	WEST REFERENCE	117.8000	7.3625	.0719	.0052	(16)
TIME	1.	SEPTEMBER	58.8000	7.3500	.0926	.0086	(8)
DEPTH	1.	TOP--10CM	29.4000	7.3500	.0577	.0033	(4)
DEPTH	2.	BOTTOM--25CM	29.4000	7.3500	.1291	.0167	(4)
TIME	2.	DECEMBER	59.0000	7.3750	.0463	.0021	(8)
DEPTH	1.	TOP--10CM	29.5000	7.3750	.0500	.0025	(4)
DEPTH	2.	BOTTOM--25CM	29.5000	7.3750	.0500	.0025	(4)
POSITION	3.	EAST REFERENCE	117.8000	7.3625	.2473	.0612	(16)
TIME	1.	SEPTEMBER	58.7000	7.3375	.0744	.0055	(8)
DEPTH	1.	TOP--10CM	29.2000	7.3000	.0816	.0067	(4)
DEPTH	2.	BOTTOM--25CM	29.5000	7.3750	.0500	.0025	(4)
TIME	2.	DECEMBER	59.1000	7.3875	.3523	.1241	(8)
DEPTH	1.	TOP--10CM	29.1000	7.2750	.4573	.2092	(4)
DEPTH	2.	BOTTOM--25CM	30.0000	7.5000	.2160	.0467	(4)
POSITION	4.	FRINGE DISPOSAL	584.0000	6.7356	.2795	.0781	(87)
TIME	1.	SEPTEMBER	264.8000	6.7897	.2683	.0720	(39)
DEPTH	1.	TOP--10CM	134.0000	6.7000	.2271	.0516	(20)
DEPTH	2.	BOTTOM--25CM	130.8000	6.8842	.2814	.0792	(19)
TIME	2.	DECEMBER	321.2000	6.6917	.2835	.0804	(48)
DEPTH	1.	TOP--10CM	158.9000	6.6208	.2431	.0591	(24)
DEPTH	2.	BOTTOM--25CM	162.3000	6.7625	.3076	.0946	(24)

TOTAL CASES = 160
MISSING CASES = 10 OR 6.3 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE EH
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N.
FOR ENTIRE POPULATION			-45618.0000	-302.1060	53.2372	2834.2020	(151)
POSITION	1.	CENTRAL DISPOSAL	-9604.0000	-309.8065	28.8125	830.1613	(31)
TIME	1.	SEPTEMBER	-4425.0000	-295.0000	30.7060	942.8571	(15)
DEPTH	1.	TOP--10CM	-2055.0000	-293.5714	21.7398	472.6190	(7)
DEPTH	2.	BOTTOM--25CM	-2370.0000	-296.2500	38.4290	1476.7857	(8)
TIME	2.	DECEMBER	-5179.0000	-323.6875	18.8564	355.5625	(16)
DEPTH	1.	TOP--10CM	-2525.0000	-315.6250	20.2551	410.2679	(8)
DEPTH	2.	BOTTOM--25CM	-2654.0000	-331.7500	14.2503	203.0714	(8)
POSITION	2.	WEST REFERENCE	-3948.0000	-246.7500	82.9196	6875.6667	(16)
TIME	1.	SEPTEMBER	-1440.0000	-180.0000	57.5698	3314.2857	(8)
DEPTH	1.	TOP--10CM	-690.0000	-172.5000	71.3559	5091.6667	(4)
DEPTH	2.	BOTTOM--25CM	-750.0000	-187.5000	49.9166	2491.6667	(4)
TIME	2.	DECEMBER	-2508.0000	-313.5000	35.1446	1235.1429	(8)
DEPTH	1.	TOP--10CM	-1233.0000	-308.2500	40.0281	1602.2500	(4)
DEPTH	2.	BOTTOM--25CM	-1275.0000	-318.7500	34.7311	1206.2500	(4)
POSITION	3.	EAST REFERENCE	-4885.0000	-305.3125	74.6608	5574.2292	(16)
TIME	1.	SEPTEMBER	-2035.0000	-254.3750	67.1585	4510.2679	(8)
DEPTH	1.	TOP--10CM	-955.0000	-238.7500	62.2328	3872.9167	(4)
DEPTH	2.	BOTTOM--25CM	-1080.0000	-270.0000	77.4597	6000.0000	(4)
TIME	2.	DECEMBER	-2850.0000	-356.2500	38.7805	1503.9286	(8)
DEPTH	1.	TOP--10CM	-1375.0000	-343.7500	38.8877	1512.2500	(4)
DEPTH	2.	BOTTOM--25CM	-1475.0000	-368.7500	39.7524	1580.2500	(4)
POSITION	4.	FRINGE DISPOSAL	-27181.0000	-308.8750	42.6714	1820.8463	(88)
TIME	1.	SEPTEMBER	-11246.0000	-281.1500	40.5517	1644.4385	(40)
DEPTH	1.	TOP--10CM	-6240.0000	-297.1429	30.0654	903.9286	(21)
DEPTH	2.	BOTTOM--25CM	-5006.0000	-263.4737	43.9360	1930.3743	(19)
TIME	2.	DECEMBER	-15935.0000	-331.9792	28.4010	806.6166	(48)
DEPTH	1.	TOP--10CM	-7904.0000	-329.3333	25.9375	672.7536	(24)
DEPTH	2.	BOTTOM--25CM	-8031.0000	-334.6250	30.9990	960.9402	(24)

TOTAL CASES = 160
MISSING CASES = 9 OR 5.6 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE MNSED
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV.	VARIANCE	N
FOR ENTIRE POPULATION			39916.6800	255.8762	60.3823	3646.0252	(156)
POSITION	1.	CENTRAL DISPOSAL	9084.0000	283.8750	77.4854	6003.9839	(32)
TIME	1.	SEPTEMBER	4179.0000	261.1875	56.8509	3232.0292	(16)
DEPTH	1.	TOP--10CM	2138.0000	267.2500	36.9623	1366.2143	(8)
DEPTH	2.	BOTTOM--25CM	2041.0000	255.1250	73.9970	5475.5536	(8)
TIME	2.	DECEMBER	4905.0000	306.5625	89.8784	8078.1292	(16)
DEPTH	1.	TOP--10CM	2284.0000	285.5000	66.6097	4436.8571	(8)
DEPTH	2.	BOTTOM--25CM	2621.0000	327.6250	108.9009	11859.4107	(8)
POSITION	2.	WEST REFERENCE	3909.0000	244.3125	58.1546	3381.9625	(16)
TIME	1.	SEPTEMBER	1819.0000	227.3750	18.9431	358.8393	(8)
DEPTH	1.	TOP--10CM	873.0000	218.2500	21.1719	448.2500	(4)
DEPTH	2.	BOTTOM--25CM	946.0000	236.5000	12.9228	167.0000	(4)
TIME	2.	DECEMBER	2090.0000	261.2500	78.9462	6232.5000	(8)
DEPTH	1.	TOP--10CM	1179.0000	294.7500	103.8505	10784.9167	(4)
DEPTH	2.	BOTTOM--25CM	911.0000	227.7500	27.6571	764.9167	(4)
POSITION	3.	EAST REFERENCE	3408.6800	227.2453	82.7698	6850.8457	(15)
TIME	1.	SEPTEMBER	1657.6800	207.2100	100.1410	10028.2271	(8)
DEPTH	1.	TOP--10CM	983.0000	245.7500	77.5731	6017.5833	(4)
DEPTH	2.	BOTTOM--25CM	674.6800	168.6700	115.8479	13420.7289	(4)
TIME	2.	DECEMBER	1751.0000	250.1429	56.0251	3138.8095	(7)
DEPTH	1.	TOP--10CM	1129.0000	282.2500	45.9955	2115.5833	(4
DEPTH	2.	BOTTOM--25CM	622.0000	207.3333	37.8462	1432.3333	(3
POSITION	4.	FRINGE DISPOSAL	23515.0000	252.8495	45.6827	2086.9119	(93)
TIME	1.	SEPTEMBER	11431.0000	243.2128	44.4204	1973.1711	(47)
DEPTH	1.	TOP--10CM	5630.0000	234.5833	22.4943	505.9928	(24)
DEPTH	2.	BOTTOM--25CM	5801.0000	252.2174	58.5724	3430.7233	(23)
TIME	2.	DECEMBER	12084.0000	262.6957	45.3151	2053.4609	(46)
DEPTH	1.	TOP--10CM	6373.0000	265.5417	35.1205	1234.0851	(24)
DEPTH	2.	BOTTOM--25CM	5711.0000	259.5909	55.0391	3029.3009	(22)

TOTAL CASES = 160
MISSING CASES = 4 OR 2.5 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE MNIM
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			499.3900	3.2440	2.6242	6.8867	(153)
POSITION	1.	CENTRAL DISPOSAL	127.6800	4.2560	2.7701	7.6735	(30)
TIME	1.	SEPTEMBER	61.9000	3.8688	1.4559	2.1196	(16)
DEPTH	1.	TOP--10CM	35.4000	4.4250	1.9077	3.6393	(8)
DEPTH	2.	BOTTOM--25CM	26.5000	3.3125	.4422	.1955	(8)
TIME	2.	DECEMBER	65.7800	4.6986	3.7784	14.2766	(14)
DEPTH	1.	TOP--10CM	34.7000	4.9571	4.9980	24.9795	(7)
DEPTH	2.	BOTTOM--25CM	31.0800	4.4400	2.4077	5.7972	(7)
POSITION	2.	WEST REFERENCE	6.7800	.4520	.4532	.2054	(15)
TIME	1.	SEPTEMBER	4.4300	.5537	.5872	.3448	(8)
DEPTH	1.	TOP--10CM	3.0400	.7600	.9276	.6950	(4)
DEPTH	2.	BOTTOM--25CM	1.3900	.3475	.0780	.0061	(4)
TIME	2.	DECEMBER	2.3500	.3357	.2177	.0474	(7)
DEPTH	1.	TOP--10CM	1.4900	.4967	.2194	.0481	(3)
DEPTH	2.	BOTTOM--25CM	.8600	.2150	.1318	.0174	(4)
POSITION	3.	EAST REFERENCE	5.1900	.3244	.2035	.0414	(16)
TIME	1.	SEPTEMBER	1.8900	.2363	.1397	.0195	(8)
DEPTH	1.	TOP--10CM	1.3800	.3450	.1121	.0126	(4)
DEPTH	2.	BOTTOM--25CM	.5100	.1275	.0377	.0014	(4)
TIME	2.	DECEMBER	3.3000	.4125	.3269	.0515	(8)
DEPTH	1.	TOP--10CM	2.1900	.5475	.3421	.0506	(4)
DEPTH	2.	BOTTOM--25CM	1.1100	.2775	.1135	.0129	(4)
POSITION	4.	FRINGE DISPOSAL	359.7400	3.9102	2.3345	5.4498	(92)
TIME	1.	SEPTEMBER	185.9600	3.9566	2.3316	5.4365	(47)
DEPTH	1.	TOP--10CM	82.5000	3.5870	1.9335	3.7385	(23)
DEPTH	2.	BOTTOM--25CM	103.4600	4.3108	2.6513	7.0296	(24)
TIME	2.	DECEMBER	173.7800	3.8618	2.3628	5.5828	(45)
DEPTH	1.	TOP--10CM	84.2000	3.8273	2.2844	5.2183	(22)
DEPTH	2.	BOTTOM--25CM	89.5800	3.8948	2.4864	6.1822	(23)

TOTAL CASES = 160
MISSING CASES = 7 OR 4.4 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ASSFD
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			2589.0000	16.1812	10.1652	103.3317	(160)
POSITION	1.	CENTRAL DISPOSAL	445.0000	13.9063	4.1298	17.0554	(32)
TIME	1.	SEPTEMBER	214.0000	13.3750	3.4254	11.7333	(16)
DEPTH	1.	TOP--10CM	104.0000	13.0000	2.9641	8.7857	(8)
DEPTH	2.	BOTTOM--25CM	110.0000	13.7500	4.0247	16.2143	(8)
TIME	2.	DECEMBER	229.0000	14.3125	4.8127	23.1625	(16)
DEPTH	1.	TOP--10CM	103.0000	12.8750	4.1209	16.9821	(8)
DEPTH	2.	BOTTOM--25CM	126.0000	15.7500	5.2847	27.9286	(8)
POSITION	2.	WEST REFERENCE	154.0000	9.6250	2.3910	5.7167	(16)
TIME	1.	SEPTEMBER	72.0000	9.0000	2.8284	8.0000	(8)
DEPTH	1.	TOP--10CM	40.0000	10.0000	1.4142	2.0000	(4)
DEPTH	2.	BOTTOM--25CM	32.0000	8.0000	3.7417	14.0000	(4)
TIME	2.	DECEMBER	82.0000	10.2500	1.8783	3.5571	(8)
DEPTH	1.	TOP--10CM	45.0000	11.2500	2.0616	4.2500	(4)
DEPTH	2.	BOTTOM--25CM	37.0000	9.2500	.9574	.9167	(4)
POSITION	3.	EAST REFERENCE	297.0000	18.5625	10.7949	116.5292	(16)
TIME	1.	SEPTEMBER	159.0000	19.8750	14.8943	221.8393	(8)
DEPTH	1.	TOP--10CM	59.0000	14.7500	3.7749	14.2500	(4)
DEPTH	2.	BOTTOM--25CM	100.0000	25.0000	20.8167	433.3333	(4)
TIME	2.	DECEMBER	138.0000	17.2500	4.0917	22.9286	(8)
DEPTH	1.	TOP--10CM	76.0000	19.0000	5.1881	26.9167	(4)
DEPTH	2.	BOTTOM--25CM	59.0000	14.7500	3.5000	12.2500	(4)
POSITION	4.	PRINCE DISPOSAL	1693.0000	17.6354	11.4620	131.3025	(96)
TIME	1.	SEPTEMBER	861.0000	17.9375	14.4007	207.3790	(48)
DEPTH	1.	TOP--10CM	327.0000	13.6250	9.7393	94.8533	(24)
DEPTH	2.	BOTTOM--25CM	534.0000	22.2500	17.1326	293.4087	(24)
TIME	2.	DECEMBER	832.0000	17.3333	8.2097	67.3333	(48)
DEPTH	1.	TOP--10CM	329.0000	13.7083	4.1354	17.1014	(24)
DEPTH	2.	BOTTOM--25CM	504.0000	21.0000	9.4143	92.4348	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ASIW
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			3711.4000	50.1541	34.5574	1194.2110	(74)
POSITION	1.	CENTRAL DISPOSAL	855.0000	57.0000	50.9453	2595.4286	(15)
TIME	1.	SEPTEMBER	855.0000	57.0000	50.9453	2595.4286	(15)
DEPTH	1.	TOP--10CM	432.0000	54.0000	55.1802	3044.8571	(8)
DEPTH	2.	BOTTOM--25CM	423.0000	60.4286	49.7790	2477.9524	(7)
POSITION	2.	WEST REFERENCE	333.0000	55.5000	7.7395	59.9000	(6)
TIME	1.	SEPTEMBER	333.0000	55.5000	7.7395	59.9000	(6)
DEPTH	1.	TOP--10CM	169.0000	56.3333	10.5040	110.3333	(3)
DEPTH	2.	BOTTOM--25CM	164.0000	54.6667	6.1101	37.3333	(3)
POSITION	3.	EAST REFERENCE	352.4000	50.3429	23.6831	560.8895	(7)
TIME	1.	SEPTEMBER	352.4000	50.3429	23.6831	560.8895	(7)
DEPTH	1.	TOP--10CM	195.0000	65.0000	9.5394	91.0000	(3)
DEPTH	2.	BOTTOM--25CM	157.4000	39.3500	24.1755	685.1567	(4)
POSITION	4.	FRINGE DISPOSAL	2171.0000	47.1957	31.9372	1019.9831	(46)
TIME	1.	SEPTEMBER	2171.0000	47.1957	31.9372	1019.9831	(46)
DEPTH	1.	TOP--10CM	957.0000	41.6087	24.0978	580.7036	(23)
DEPTH	2.	BOTTOM--25CM	1214.0000	52.7826	37.9521	1440.3597	(23)

TOTAL CASES = 160
MISSING CASES = 86 OR 53.7 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE HGSED
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			80.3200	.5116	1.3982	1.9551	(157)
POSITION	1.	CENTRAL DISPOSAL	5.8500	.1828	.1557	.0242	(32)
TIME	1.	SEPTEMBER	1.4100	.0881	.0951	.0090	(16)
DEPTH	1.	TOP--10CM	1.0100	.1262	.1248	.0156	(8)
DEPTH	2.	BOTTOM--25CM	.4000	.0500	.0220	.0005	(8)
TIME	2.	DECEMBER	4.4400	.2775	.1481	.0219	(16)
DEPTH	1.	TOP--10CM	2.2100	.2762	.1859	.0346	(8)
DEPTH	2.	BOTTOM--25CM	2.2300	.2788	.1115	.0124	(8)
POSITION	2.	WEST REFERENCE	3.6500	.2281	.1643	.0270	(16)
TIME	1.	SEPTEMBER	.6600	.0825	.0219	.0005	(8)
DEPTH	1.	TOP--10CM	.3600	.0900	.0294	.0009	(4)
DEPTH	2.	BOTTOM--25CM	.3000	.0750	.0100	.0001	(4)
TIME	2.	DECEMBER	2.9900	.3738	.0943	.0089	(8)
DEPTH	1.	TOP--10CM	1.2200	.3050	.0173	.0003	(4)
DEPTH	2.	BOTTOM--25CM	1.7700	.4425	.0845	.0072	(4)
POSITION	3.	EAST REFERENCE	31.5200	2.1013	3.9607	15.6869	(15)
TIME	1.	SEPTEMBER	19.0200	2.3775	5.5056	30.3115	(8)
DEPTH	1.	TOP--10CM	1.6000	.4000	.1479	.0219	(4)
DEPTH	2.	BOTTOM--25CM	17.4200	4.3550	7.7638	60.2770	(4)
TIME	2.	DECEMBER	12.5000	1.7857	1.0107	1.0214	(7)
DEPTH	1.	TOP--10CM	3.0000	1.5000	.2646	.0700	(2)
DEPTH	2.	BOTTOM--25CM	8.6000	2.1500	1.2583	1.5833	(4)
POSITION	4.	FRINGE DISPOSAL	39.3000	.4181	.4619	.4381	(94)
TIME	1.	SEPTEMBER	10.4100	.2169	.2884	.0832	(48)
DEPTH	1.	TOP--10CM	3.2800	.1367	.1377	.0190	(24)
DEPTH	2.	BOTTOM--25CM	7.1300	.2971	.3709	.1376	(24)
TIME	2.	DECEMBER	28.8900	.6280	.8545	.7302	(46)
DEPTH	1.	TOP--10CM	7.5300	.3137	.2137	.0457	(24)
DEPTH	2.	BOTTOM--25CM	21.3600	.9709	1.1308	1.2788	(22)

TOTAL CASES = 160
MISSING CASES = 3 OR 1.9 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE HGIW
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			401.0000	5.2078	11.0016	121.0352	(77)
POSITION	1.	CENTRAL DISPOSAL	38.0000	2.5333	1.2459	1.5524	(15)
TIME	1.	SEPTEMBER	38.0000	2.5333	1.2459	1.5524	(15)
DEPTH	1.	TOP--10CM	20.0000	2.5000	1.4142	2.0000	(8)
DEPTH	2.	BOTTOM--25CM	18.0000	2.5714	1.1339	1.2857	(7)
POSITION	2.	WEST REFERENCE	53.0000	7.5714	4.9281	24.2857	(7)
TIME	1.	SEPTEMBER	53.0000	7.5714	4.9281	24.2857	(7)
DEPTH	1.	TOP--10CM	26.0000	6.5000	2.0817	4.3333	(4)
DEPTH	2.	BOTTOM--25CM	27.0000	9.0000	7.8102	61.0000	(3)
POSITION	3.	EAST REFERENCE	162.0000	20.2500	30.6769	941.0714	(8)
TIME	1.	SEPTEMBER	162.0000	20.2500	30.6769	941.0714	(8)
DEPTH	1.	TOP--10CM	34.0000	8.5000	1.7321	3.0000	(4)
DEPTH	2.	BOTTOM--25CM	128.0000	32.0000	42.7141	1824.6667	(4)
POSITION	4.	FRINGE DISPOSAL	148.0000	3.1489	2.5020	6.2599	(47)
TIME	1.	SEPTEMBER	148.0000	3.1489	2.5020	6.2599	(47)
DEPTH	1.	TOP--10CM	69.0000	3.0000	2.3741	5.6364	(23)
DEPTH	2.	BOTTOM--25CM	79.0000	3.2917	2.6618	7.0851	(24)

TOTAL CASES = 160
MISSING CASES = 83 OR 51.9 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ... CRSED
BROKEN DOWN BY ... POSITION
BY ... TIME
BY ... DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD. DEV	VARIANCE	N
FOR ENTIRE POPULATION			12286.7000	76.7919	23.7973	566.3130	(160)
POSITION	1.	CENTRAL DISPOSAL	2236.0000	69.8750	10.1814	103.6613	(32)
TIME	1.	SEPTEMBER	1098.0000	68.6250	8.5781	73.5833	(16)
DEPTH	1.	TOP--10CM	580.0000	72.5000	9.9139	98.2857	(8)
DEPTH	2.	BOTTOM--25CM	518.0000	64.7500	5.0071	25.0714	(8)
TIME	2.	DECEMBER	1138.0000	71.1250	11.7182	137.3167	(16)
DEPTH	1.	TOP--10CM	594.0000	74.2500	14.1497	200.2143	(8)
DEPTH	2.	BOTTOM--25CM	544.0000	68.0000	8.4684	71.7143	(8)
POSITION	2.	WEST REFERENCE	1942.0000	121.3750	43.1213	1859.4500	(16)
TIME	1.	SEPTEMBER	1032.0000	129.0000	61.3468	3763.4286	(8)
DEPTH	1.	TOP--10CM	643.0000	160.7500	74.7145	5582.2500	(4)
DEPTH	2.	BOTTOM--25CM	389.0000	97.2500	22.6035	510.9167	(4)
TIME	2.	DECEMBER	910.0000	113.7500	9.3922	88.2143	(8)
DEPTH	1.	TOP--10CM	432.0000	108.0000	6.4807	42.0000	(4)
DEPTH	2.	BOTTOM--25CM	478.0000	119.5000	8.6927	75.6667	(4)
POSITION	3.	EAST REFERENCE	1312.7000	82.0437	24.1794	584.6440	(16)
TIME	1.	SEPTEMBER	636.7000	79.5875	32.5996	1062.7327	(8)
DEPTH	1.	TOP--10CM	359.0000	89.7500	8.1803	66.9167	(4)
DEPTH	2.	BOTTOM--25CM	277.7000	69.4250	46.2319	2137.3892	(4)
TIME	2.	DECEMBER	676.0000	84.5000	13.2773	176.2857	(8)
DEPTH	1.	TOP--10CM	379.0000	94.7500	8.5391	72.9167	(4)
DEPTH	2.	BOTTOM--25CM	297.0000	74.2500	7.6322	58.2500	(4)
POSITION	4.	FRINGE DISPOSAL	6794.0000	70.7917	11.6699	136.1877	(96)
TIME	1.	SEPTEMBER	3305.0000	68.8750	11.8978	141.5585	(48)
DEPTH	1.	TOP--10CM	1709.0000	71.2083	11.0374	121.8243	(24)
DEPTH	2.	BOTTOM--25CM	1597.0000	66.5417	12.4934	156.0851	(24)
TIME	2.	DECEMBER	3490.0000	72.7083	11.2344	126.2110	(48)
DEPTH	1.	TOP--10CM	1756.0000	73.2500	10.4476	109.1522	(24)
DEPTH	2.	BOTTOM--25CM	1732.0000	72.1667	12.1715	148.1449	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE S (Free Sulfide)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			8.9528	.0560	.6420	.4121	(160)
POSITION	1.	CENTRAL DISPOSAL	.0028	.0001	.0001	.0000	(32)
TIME	1.	SEPTEMBER	.0014	.0001	.0001	.0000	(16)
DEPTH	1.	TOP--10CM	.0004	.0001	.0001	.0000	(8)
DEPTH	2.	BOTTOM--25CM	.0010	.0001	.0001	.0000	(8)
TIME	2.	DECEMBER	.0014	.0001	.0001	.0000	(16)
DEPTH	1.	TOP--10CM	.0009	.0001	.0002	.0000	(8)
DEPTH	2.	BOTTOM--25CM	.0005	.0001	.0001	.0000	(8)
POSITION	2.	WEST REFERENCE	.0046	.0003	.0004	.0000	(16)
TIME	1.	SEPTEMBER	.0000	.0000	0	0	(8)
DEPTH	1.	TOP--10CM	.0000	.0000	0	0	(4)
DEPTH	2.	BOTTOM--25CM	.0000	.0000	0	0	(4)
TIME	2.	DECEMBER	.0046	.0006	.0004	.0000	(8)
DEPTH	1.	TOP--10CM	.0035	.0009	.0002	.0000	(4)
DEPTH	2.	BOTTOM--25CM	.0012	.0003	.0003	.0000	(4)
POSITION	3.	EAST REFERENCE	8.8270	.5517	2.0192	4.0770	(16)
TIME	1.	SEPTEMBER	.0000	.0000	0	0	(8)
DEPTH	1.	TOP--10CM	.0000	.0000	0	0	(4)
DEPTH	2.	BOTTOM--25CM	.0000	.0000	0	0	(4)
TIME	2.	DECEMBER	8.8270	1.1034	2.8356	8.0407	(8)
DEPTH	1.	TOP--10CM	.6335	.1649	.3168	.1004	(4)
DEPTH	2.	BOTTOM--25CM	8.1675	2.0419	4.0389	16.3125	(4)
POSITION	4.	FRINGE DISPOSAL	.1184	.0012	.0056	.0000	(96)
TIME	1.	SEPTEMBER	.0454	.0009	.0028	.0000	(48)
DEPTH	1.	TOP--10CM	.0399	.0017	.0038	.0000	(24)
DEPTH	2.	BOTTOM--25CM	.0055	.0002	.0010	.0000	(24)
TIME	2.	DECEMBER	.0731	.0015	.0074	.0001	(48)
DEPTH	1.	TOP--10CM	.0578	.0024	.0104	.0001	(24)
DEPTH	2.	BOTTOM--25CM	.0153	.0006	.0015	.0000	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE CF1 (Coarse Fraction 1)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			922.0000	5.7625	5.0500	25.5038	(160)
POSITION	1.	CENTRAL DISPOSAL	143.0000	4.4688	2.9729	8.8377	(32)
TIME	1.	SEPTEMBER	69.0000	4.3125	1.6621	2.7625	(16)
DEPTH	1.	TOP--10CM	42.0000	5.2500	1.4880	2.2143	(8)
DEPTH	2.	BOTTOM--25CM	27.0000	3.3750	1.3025	1.6964	(8)
TIME	2.	DECEMBER	74.0000	4.6250	3.9306	15.4500	(16)
DEPTH	1.	TOP--10CM	40.0000	5.0000	4.7208	22.2857	(8)
DEPTH	2.	BOTTOM--25CM	34.0000	4.2500	3.2404	10.5000	(8)
POSITION	2.	WEST REFERENCE	115.0000	7.1875	3.2087	10.2958	(16)
TIME	1.	SEPTEMBER	76.0000	9.5000	2.9277	8.5714	(8)
DEPTH	1.	TOP--10CM	35.0000	8.7500	3.3040	10.9167	(4)
DEPTH	2.	BOTTOM--25CM	41.0000	10.2500	2.7538	7.5833	(4)
TIME	2.	DECEMBER	39.0000	4.8750	1.1260	1.2679	(8)
DEPTH	1.	TOP--10CM	19.0000	4.7500	.5000	.2500	(4)
DEPTH	2.	BOTTOM--25CM	20.0000	5.0000	1.6330	2.6667	(4)
POSITION	3.	EAST REFERENCE	134.0000	8.3750	6.2915	39.5833	(16)
TIME	1.	SEPTEMBER	53.0000	6.6250	3.3760	11.4107	(8)
DEPTH	1.	TOP--10CM	33.0000	8.2500	4.0311	16.2500	(4)
DEPTH	2.	BOTTOM--25CM	20.0000	5.0000	1.8257	3.3333	(4)
TIME	2.	DECEMBER	81.0000	10.1250	8.1493	66.4107	(8)
DEPTH	1.	TOP--10CM	45.0000	11.2500	10.6252	112.9167	(4)
DEPTH	2.	BOTTOM--25CM	36.0000	9.0000	6.2183	38.6667	(4)
POSITION	4.	FRINGE DISPOSAL	530.0000	5.5208	5.4599	29.8101	(96)
TIME	1.	SEPTEMBER	279.0000	5.8125	6.0763	36.9215	(48)
DEPTH	1.	TOP--10CM	78.0000	3.2500	2.4716	6.1087	(24)
DEPTH	2.	BOTTOM--25CM	201.0000	8.3750	7.4589	55.6359	(24)
TIME	2.	DECEMBER	251.0000	5.2292	4.8124	23.1591	(48)
DEPTH	1.	TOP--10CM	85.0000	3.5417	2.3215	5.3895	(24)
DEPTH	2.	BOTTOM--25CM	166.0000	6.9167	5.9994	35.9928	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE CFP (Coarse Fraction 2)
PROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1756.7000	10.9794	7.0853	50.2016	(160)
POSITION	1.	CENTRAL DISPOSAL	303.6000	9.4875	4.8356	23.3831	(32)
TIME	1.	SEPTEMBER	141.6000	8.8500	3.1845	10.1413	(16)
DEPTH	1.	TOP--10CM	82.0000	10.2500	3.0289	9.1743	(8)
DEPTH	2.	BOTTOM--25CM	59.6000	7.4500	2.8420	8.0771	(8)
TIME	2.	DECEMBER	162.0000	10.1250	6.1087	37.3167	(16)
DEPTH	1.	TOP--10CM	86.0000	10.7500	6.4087	41.0714	(8)
DEPTH	2.	BOTTOM--25CM	76.0000	9.5000	6.1644	38.0000	(8)
POSITION	2.	WEST REFERENCE	261.9000	16.3687	4.9617	24.6183	(16)
TIME	1.	SEPTEMBER	130.9000	16.3625	6.2951	39.6284	(8)
DEPTH	1.	TOP--10CM	69.4000	17.3500	8.0868	65.3967	(4)
DEPTH	2.	BOTTOM--25CM	61.5000	15.3750	4.9466	24.4692	(4)
TIME	2.	DECEMBER	131.0000	16.3750	3.6228	13.1250	(8)
DEPTH	1.	TOP--10CM	65.0000	16.2500	2.3629	5.5833	(4)
DEPTH	2.	BOTTOM--25CM	66.0000	16.5000	5.0000	25.0000	(4)
POSITION	3.	EAST REFERENCE	97.0000	6.0625	2.6949	7.2625	(16)
TIME	1.	SEPTEMBER	48.0000	6.0000	2.2039	4.8571	(8)
DEPTH	1.	TOP--10CM	25.0000	6.2500	2.0616	4.2500	(4)
DEPTH	2.	BOTTOM--25CM	23.0000	5.7500	2.6300	6.9167	(4)
TIME	2.	DECEMBER	49.0000	6.1250	3.3795	10.6964	(8)
DEPTH	1.	TOP--10CM	22.0000	5.5000	1.7321	3.0000	(4)
DEPTH	2.	BOTTOM--25CM	27.0000	6.7500	4.5735	20.9167	(4)
POSITION	4.	FRINGE DISPOSAL	1094.2000	11.3979	7.6401	61.4674	(96)
TIME	1.	SEPTEMBER	533.2000	11.1083	7.4543	55.5965	(48)
DEPTH	1.	TOP--10CM	200.1000	8.3375	5.2347	27.4233	(24)
DEPTH	2.	BOTTOM--25CM	333.1000	13.8792	8.3764	70.1643	(24)
TIME	2.	DECEMBER	561.0000	11.6875	8.2749	68.4747	(48)
DEPTH	1.	TOP--10CM	209.0000	8.7083	4.6202	21.3460	(24)
DEPTH	2.	BOTTOM--25CM	352.0000	14.6667	10.0029	100.0580	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE CF3 (Coarse Fraction 3)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			3144.3000	19.6519	9.4548	89.4308	(160)
POSITION	1.	CENTRAL DISPOSAL	609.7000	19.0531	11.2482	126.5219	(32)
TIME	1.	SEPTEMBER	311.7000	19.4813	12.1616	147.9043	(16)
DEPTH	1.	TOP--10CM	148.9000	18.6125	11.0002	121.0041	(8)
DEPTH	2.	BOTTOM--25CM	162.8000	20.3500	13.9359	194.2086	(8)
TIME	2.	DECEMBER	298.0000	18.6250	10.6388	113.1833	(16)
DEPTH	1.	TOP--10CM	149.0000	18.6250	11.5380	133.1250	(8)
DEPTH	2.	BOTTOM--25CM	149.0000	18.6250	10.4600	109.4107	(8)
POSITION	2.	WEST REFERENCE	368.2000	23.0125	13.9591	194.8558	(16)
TIME	1.	SEPTEMBER	201.2000	25.1500	19.7877	391.5514	(8)
DEPTH	1.	TOP--10CM	70.6000	17.6500	4.3882	19.2567	(4)
DEPTH	2.	BOTTOM--25CM	130.6000	32.6500	27.2830	744.3633	(4)
TIME	2.	DECEMBER	167.0000	20.8750	3.9438	15.5536	(8)
DEPTH	1.	TOP--10CM	88.0000	22.0000	3.5590	12.6667	(4)
DEPTH	2.	BOTTOM--25CM	79.0000	19.7500	4.5000	20.2500	(4)
POSITION	3.	EAST REFERENCE	109.6000	6.8500	3.9716	15.7733	(16)
TIME	1.	SEPTEMBER	49.6000	6.2000	1.9213	3.6914	(8)
DEPTH	1.	TOP--10CM	23.0000	5.7500	.5000	.2500	(4)
DEPTH	2.	BOTTOM--25CM	26.6000	6.6500	2.7979	7.8233	(4)
TIME	2.	DECEMBER	60.0000	7.5000	5.3084	28.1429	(8)
DEPTH	1.	TOP--10CM	31.0000	7.7500	5.1881	26.9167	(4)
DEPTH	2.	BOTTOM--25CM	29.0000	7.2500	6.3966	40.9167	(4)
POSITION	4.	FRINGE DISPOSAL	2054.8000	21.4250	6.6064	42.3335	(96)
TIME	1.	SEPTEMBER	1073.8000	22.3708	6.8102	46.3791	(48)
DEPTH	1.	TOP--10CM	603.7000	25.1542	6.6950	44.8235	(24)
DEPTH	2.	BOTTOM--25CM	470.1000	19.5875	5.8124	33.7838	(24)
TIME	2.	DECEMBER	981.0000	20.4792	6.1124	37.3613	(48)
DEPTH	1.	TOP--10CM	538.0000	22.4167	6.5136	42.4275	(24)
DEPTH	2.	BOTTOM--25CM	445.0000	18.5417	5.1074	26.0851	(24)

TOTAL CASES = 160

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

Table 1 (Continued)

FILE AGGREGAT (CREATION DATE = 09/22/77)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE SILT
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			6954.8000	43.4675	16.3287	266.6277	(160)
POSITION	1.	CENTRAL DISPOSAL	1595.4000	49.8563	21.5864	465.9742	(32)
TIME	1.	SEPTEMBER	826.4000	51.6500	21.0227	441.9533	(16)
DEPTH	1.	TOP--10CM	434.6000	54.3250	17.6038	309.8836	(8)
DEPTH	2.	BOTTOM--25CM	391.8000	48.9750	24.9157	620.7936	(8)
TIME	2.	DECEMBER	769.0000	48.0625	22.6759	514.1959	(16)
DEPTH	1.	TOP--10CM	387.0000	48.3750	23.4700	550.8393	(8)
DEPTH	2.	BOTTOM--25CM	382.0000	47.7500	23.4686	550.7857	(8)
POSITION	2.	WEST REFERENCE	563.5000	35.2188	8.4895	72.0723	(16)
TIME	1.	SEPTEMBER	265.5000	33.1875	9.1306	83.3670	(8)
DEPTH	1.	TOP--10CM	137.2000	34.3000	9.2941	86.3800	(4)
DEPTH	2.	BOTTOM--25CM	128.3000	32.0750	10.2393	104.8425	(4)
TIME	2.	DECEMBER	298.0000	37.2500	7.8513	61.6429	(8)
DEPTH	1.	TOP--10CM	141.0000	35.2500	8.8835	78.9167	(4)
DEPTH	2.	BOTTOM--25CM	157.0000	39.2500	7.3655	54.2500	(4)
POSITION	3.	EAST REFERENCE	1011.8000	63.2375	15.4484	238.6545	(16)
TIME	1.	SEPTEMBER	530.8000	66.3500	10.7964	116.5429	(8)
DEPTH	1.	TOP--10CM	241.0000	60.2500	12.3554	152.6557	(4)
DEPTH	2.	BOTTOM--25CM	289.8000	72.4500	4.4929	20.0967	(4)
TIME	2.	DECEMBER	481.0000	60.1250	19.3053	372.6964	(8)
DEPTH	1.	TOP--10CM	226.0000	56.5000	15.3514	235.6667	(4)
DEPTH	2.	BOTTOM--25CM	255.0000	63.7500	24.4728	598.9167	(4)
POSITION	4.	FRINGE DISPOSAL	3784.1000	39.4177	11.7271	137.5242	(96)
TIME	1.	SEPTEMBER	1863.1000	38.8146	11.3333	128.4447	(48)
DEPTH	1.	TOP--10CM	980.8000	40.8667	11.2924	127.5180	(24)
DEPTH	2.	BOTTOM--25CM	882.3000	36.7625	11.2324	126.1677	(24)
TIME	2.	DECEMBER	1921.0000	40.0208	12.1978	148.7858	(48)
DEPTH	1.	TOP--10CM	955.0000	39.7917	11.3673	129.2156	(24)
DEPTH	2.	BOTTOM--25CM	966.0000	40.2500	13.2181	174.7174	(24)

TOTAL CASES = 160

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE CLAY
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			555.6000	3.5165	5.5491	30.7921	(158)
POSITION	1.	CENTRAL DISPOSAL	79.4000	2.4813	4.4043	19.3977	(32)
TIME	1.	SEPTEMBER	41.4000	2.5875	4.8800	23.8145	(16)
DEPTH	1.	TOP--10CM	.4000	.0500	.1414	.0200	(8)
DEPTH	2.	BOTTOM--25CM	41.0000	5.1250	6.0244	36.2936	(8)
TIME	2.	DECEMBER	38.0000	2.3750	4.0311	16.2500	(16)
DEPTH	1.	TOP--10CM	12.0000	1.5000	2.0702	4.2857	(8)
DEPTH	2.	BOTTOM--25CM	26.0000	3.2500	5.3652	28.7857	(8)
POSITION	2.	WEST REFERENCE	53.3000	3.3312	3.7395	13.9836	(16)
TIME	1.	SEPTEMBER	37.3000	4.6625	3.0095	9.0570	(8)
DEPTH	1.	TOP--10CM	14.6000	3.6500	3.4569	11.9500	(4)
DEPTH	2.	BOTTOM--25CM	22.7000	5.6750	2.5395	6.4492	(4)
TIME	2.	DECEMBER	16.0000	2.0000	4.1057	16.8571	(8)
DEPTH	1.	TOP--10CM	14.0000	3.5000	5.6862	32.3333	(4)
DEPTH	2.	BOTTOM--25CM	2.0000	.5000	1.0000	1.0000	(4)
POSITION	3.	EAST REFERENCE	154.9000	9.6812	9.6425	92.9776	(16)
TIME	1.	SEPTEMBER	78.9000	9.8625	11.0074	121.1627	(8)
DEPTH	1.	TOP--10CM	61.3000	15.3250	13.9287	194.0092	(4)
DEPTH	2.	BOTTOM--25CM	17.6000	4.4000	3.0221	9.1333	(4)
TIME	2.	DECEMBER	76.0000	9.5000	8.9318	79.8000	(8)
DEPTH	1.	TOP--10CM	53.0000	13.2500	11.2953	127.5833	(4)
DEPTH	2.	BOTTOM--25CM	23.0000	5.7500	4.1130	16.9167	(4)
POSITION	4.	FRINGE DISPOSAL	268.0000	2.8511	4.5721	20.9040	(94)
TIME	1.	SEPTEMBER	134.0000	2.9565	4.3104	18.5794	(46)
DEPTH	1.	TOP--10CM	49.3000	2.1435	4.4381	19.6971	(23)
DEPTH	2.	BOTTOM--25CM	86.7000	3.7696	4.1139	16.9240	(23)
TIME	2.	DECEMBER	132.0000	2.7500	4.8532	23.5532	(48)
DEPTH	1.	TOP--10CM	108.0000	4.5000	6.1574	37.9130	(24)
DEPTH	2.	BOTTOM--25CM	24.0000	1.0000	1.9560	3.8261	(24)

TOTAL CASES = 160
MISSING CASES = 2 OR 1.2 PCT.

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE PO4 (Inorganic Phosphate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1811.7000	13.1283	18.1461	329.2801	(138)
POSITION	1.	CENTRAL DISPOSAL	465.3000	20.2565	25.7656	663.8680	(23)
TIME	1.	SEPTEMBER	431.0000	30.7857	29.4844	811.3598	(14)
DEPTH	1.	TOP--10CM	215.4000	26.9250	19.3529	374.5036	(8)
DEPTH	2.	BOTTOM--25CM	215.6000	35.9333	39.1094	1529.5427	(6)
TIME	2.	DECEMBER	34.3000	3.8778	3.3719	11.3694	(9)
DEPTH	1.	TOP--10CM	21.8000	4.3600	3.7293	13.9040	(5)
DEPTH	2.	BOTTOM--25CM	13.1000	3.2750	3.3019	10.9025	(4)
POSITION	2.	WEST REFERENCE	37.2000	2.8615	2.2262	4.9559	(13)
TIME	1.	SEPTEMBER	18.7000	2.6714	1.1600	1.3457	(7)
DEPTH	1.	TOP--10CM	6.4000	2.1333	.5196	.2700	(3)
DEPTH	2.	BOTTOM--25CM	12.1000	3.0250	1.4569	2.1225	(4)
TIME	2.	DECEMBER	18.5000	3.0833	3.1890	10.1697	(6)
DEPTH	1.	TOP--10CM	13.5000	4.5000	4.3301	18.7500	(3)
DEPTH	2.	BOTTOM--25CM	5.0000	1.6667	.8083	.6533	(3)
POSITION	3.	EAST REFERENCE	59.2000	3.9467	6.6175	43.7912	(15)
TIME	1.	SEPTEMBER	36.2000	5.1714	9.7345	94.7990	(7)
DEPTH	1.	TOP--10CM	3.4000	1.1333	.3215	.1033	(3)
DEPTH	2.	BOTTOM--25CM	32.8000	8.2000	12.6883	160.9933	(4)
TIME	2.	DECEMBER	23.0000	2.8750	1.8745	3.5136	(8)
DEPTH	1.	TOP--10CM	11.6000	2.9000	1.7108	2.9267	(4)
DEPTH	2.	BOTTOM--25CM	11.4000	2.8500	2.2956	5.2700	(4)
POSITION	4.	FRINGE DISPOSAL	1249.4000	14.3609	17.3534	301.1403	(87)
TIME	1.	SEPTEMBER	1038.3000	22.0915	17.4699	305.1969	(47)
DEPTH	1.	TOP--10CM	621.0000	27.0000	21.6961	470.7200	(23)
DEPTH	2.	BOTTOM--25CM	417.3000	17.3875	10.6281	112.9568	(24)
TIME	2.	DECEMBER	211.1000	5.2775	12.1422	147.4326	(40)
DEPTH	1.	TOP--10CM	139.5000	6.9750	16.8330	283.3514	(20)
DEPTH	2.	BOTTOM--25CM	71.6000	3.5800	3.6341	13.2069	(20)

TOTAL CASES = 160
MISSING CASES = 22 OR 13.7 PCT.

(Continued)

Table 1 (Concluded)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE NH4 (Ammonia)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1078.6800	7.9902	13.0342	169.8904	(135)
POSITION	1.	CENTRAL DISPOSAL	357.9000	17.8950	12.7140	161.6458	(20)
TIME	1.	SEPTEMBER	152.8000	15.2800	9.6376	92.8840	(10)
DEPTH	1.	TOP--10CM	80.2000	13.3667	10.3303	106.7147	(6)
DEPTH	2.	BOTTOM--25CM	72.6000	18.1500	9.0824	82.4900	(4)
TIME	2.	DECEMBER	205.1000	20.5100	15.2700	233.1721	(10)
DEPTH	1.	TOP--10CM	131.3000	26.2600	10.4823	109.8780	(5)
DEPTH	2.	BOTTOM--25CM	73.8000	14.7600	18.2237	332.1030	(5)
POSITION	2.	WEST REFERENCE	31.0700	2.3900	2.8735	8.2570	(13)
TIME	1.	SEPTEMBER	3.6700	.5243	.2509	.0630	(7)
DEPTH	1.	TOP--10CM	1.0400	.3467	.1553	.0241	(3)
DEPTH	2.	BOTTOM--25CM	2.6300	.6575	.2337	.0546	(4)
TIME	2.	DECEMBER	27.4000	4.5667	3.0303	9.1827	(6)
DEPTH	1.	TOP--10CM	19.2000	6.4000	3.1575	9.9700	(3)
DEPTH	2.	BOTTOM--25CM	8.2000	2.7333	1.7039	2.9033	(3)
POSITION	3.	EAST REFERENCE	49.9600	3.3240	3.1421	9.8730	(15)
TIME	1.	SEPTEMBER	3.4600	.4943	.4256	.1811	(7)
DEPTH	1.	TOP--10CM	.5800	.1933	.0757	.0057	(3)
DEPTH	2.	BOTTOM--25CM	2.8800	.7200	.4471	.1999	(4)
TIME	2.	DECEMBER	46.4000	5.8000	2.1394	4.5771	(8)
DEPTH	1.	TOP--10CM	25.6000	6.4000	.2944	.0867	(4)
DEPTH	2.	BOTTOM--25CM	20.8000	5.2000	3.1038	9.6333	(4)
POSITION	4.	FRINGE DISPOSAL	639.8500	7.3546	13.9456	194.4789	(87)
TIME	1.	SEPTEMBER	187.9300	3.9985	11.8791	141.1135	(47)
DEPTH	1.	TOP--10CM	119.7400	5.2061	16.6247	276.3819	(23)
DEPTH	2.	BOTTOM--25CM	68.1900	2.8412	3.8738	15.0060	(24)
TIME	2.	DECEMBER	451.9200	11.2980	15.2606	232.8863	(40)
DEPTH	1.	TOP--10CM	257.4000	13.5474	19.5550	382.3982	(19)
DEPTH	2.	BOTTOM--25CM	194.5200	9.2629	10.0406	100.8144	(21)

TOTAL CASES = 160
MISSING CASES = 25 OR 15.6 PCT.

Table 2

Concentrations of Trace Metals and Nutrients in Water

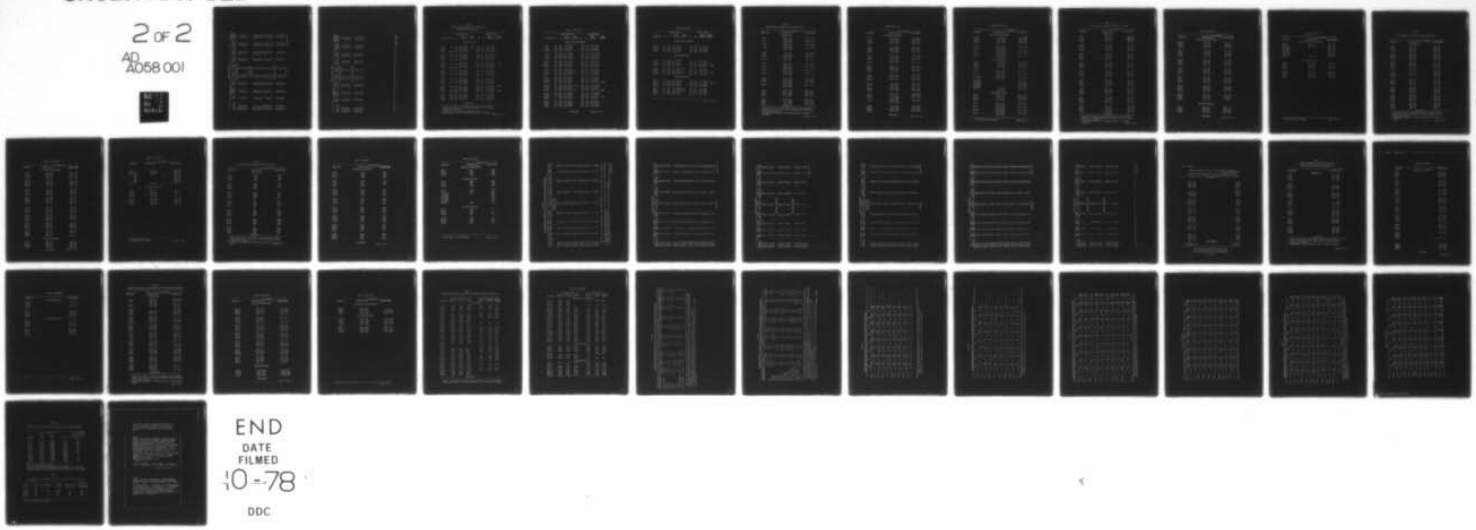
Sample No.*	Depth m	Suspended Solids mg/l	Arsenic µg/l	Manganese µg/l	Mercury ng/l	Nitrate µg/l-N	Ammonia µg/l-N	Phosphate µg/l-P	Reactive Silicate mg/l-Si
				September 1976					
				Disposal Area					
6-1-S	2	1.7	2.9	16.5	35	282	30.5	67.9	1.36
6-2-S	2	1.7	3.4	17.0	21	232	29.9	60.0	1.17
6-1-M	47	0.5	3.3	16.5	--	270	1.8	60.0	1.07
6-2-M	47	1.0	2.8	16.5	22	218	3.4	52.0	.85
6-1-D	57	1.5	3.3	21.5	<10	255	1.7	57.0	1.03
6-2-D	57	1.5	2.9	22.0	<10	280	1.3	60.0	1.13
10-1-S	2	2.0	2.7	20.5	17	215	41.6	60.0	1.14
10-2-S	2	2.0	3.0	21.0	21	201	31.0	56.0	1.15
10-1-M	50	1.0	2.6	23.0	13	277	2.1	60.0	1.10
10-2-M	50	1.0	3.4	24.5	26	287	2.1	60.0	1.10
10-1-D	60	2.0	3.1	29.5	21	360	30.0	76.0	1.39
10-2-D	60	2.0	3.1	34.0	17	295	2.8	65.0	1.15
				West Reference Site					
17-1-S	2	1.1	2.0	19.0	<10	229	15.0	58.0	1.14
17-2-S	2	1.2	3.3	18.5	<10	233	10.4	55.0	1.15
17-1-M	51	0.8	2.2	20.5	25	281	1.7	63.0	1.14
17-2-M	51	1.3	2.9	18.5	<10	296	1.7	64.0	1.20
17-1-D	61	1.0	3.0	23.0	25	336	2.9	69.7	1.33
17-2-D	61	1.0	3.0	20.5	21	229	2.9	54.0	0.98
				East Reference Site					
19-1-S	2	1.3	3.3	21.5	71	246	45.5	63.0	1.25
19-2-S	2	1.7	2.6	16.5	66	275	53.0	70.7	1.49
19-1-M	39	0.5	2.7	19.0	75	290	2.8	62.0	1.37
19-2-M	39	0.8	2.3	18.5	44	299	2.8	63.0	1.42
19-1-D	49	1.0	2.4	19.0	71	185	7.6	43.0	0.84
19-2-D	49	1.0	3.0	19.5	71	219	5.5	50.0	0.90

(Continued)

* First digit indicates station location, second digit indicates cast, letter indicates depth location, surface, middle, deep.

AD-A058 001 WASHINGTON UNIV SEATTLE LAB OF RADIATION ECOLOGY F/G 13/2
AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSA--ETC(U)
JUN 78 S SUGAI, W R SCHELL, A NEVISSI DACW39-76-C-0167
UNCLASSIFIED WES-TR-D-77-24-APP-D-VOL-2 NL

2 OF 2
AD A058 001



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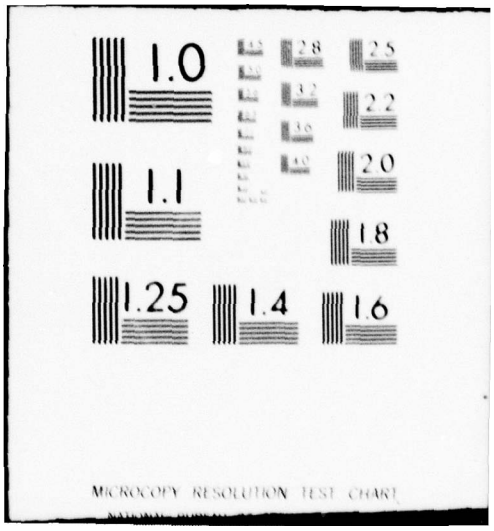
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1.4
1.6
2.8
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3.2
2.2
3.6
2.0
4.0
1.8
MICROCOPY RESOLUTION TEST CHART

Table 2 (Continued)

Sample No.	Depth m	Suspended Solids mg/l	Arsenic µg/l	Manganese µg/l	Mercury ng/l	Nitrate µg/l-N	Ammonia µg/l-N	Phosphate µg/l-P	Reactive Silicate mg/l-Si
				Duwamish River Mouth					
44-1-S	2	1.3	2.8	19.8	21	219	21.3	54.0	1.11
44-2-S	2	1.3	2.8	15.0	25	159	20.8	46.0	0.96
44-1-M	39	0.5	3.0	16.0	36	259	4.5	58.6	1.17
44-2-M	39	0.8	2.7	17.3	22	276	4.6	60.0	1.22
44-1-D	49	1.3	2.9	21.0	<10	271	5.5	60.0	1.11
44-2-D	49	1.3	2.7	19.0	<10	261	5.2	58.3	1.11
				December 1976					
				Disposal Area					
6-1-S	2	0.4	2.9	13.0	10	350	16.9	78.0	1.39
6-2-S	2	0.4	2.5	13.3	35	357	19.5	80.0	1.42
6-1-M	49	0.6	2.7	14.5	34	367	6.4	77.8	1.38
6-2-M	49	1.0	2.7	15.0	14	475	89.5	78.0	1.41
6-1-D	59	1.3	2.9	21.3	33	357	6.7	80.0	1.43
6-2-D	59	0.8	2.6	14.5	34	361	2.3	80.0	1.36
10-1-S	2	0.9	2.8	15.5	34	361	12.3	80.0	1.35
10-2-S	2	0.8	2.7	15.8	35	350	37.0	81.0	1.51
10-1-M	49	1.1	2.9	19.8	33	366	3.5	76.0	1.47
10-2-M	49	1.5	2.8	17.5	34	375	6.4	79.0	1.42
10-1-D	59	0.5	2.8	20.7	34	366	2.9	77.8	1.41
10-2-D	59	1.6	2.8	23.0	<10	373	5.6	80.0	1.40
				West Reference Site					
17-1-S	2	0.7	2.6	15.0	35	368	10.1	77.0	1.42
17-2-S	2	0.6	2.6	16.5	33	364	7.7	76.0	1.45
17-1-M	56	1.0	2.5	16.0	35	374	2.7	78.0	1.42
17-2-M	56	1.2	2.5	18.0	35	373	2.2	79.0	1.42
17-1-D	65	2.0	2.5	18.0	24	374	4.2	80.0	1.40
17-2-D	66	2.3	2.4	20.5	35	373	3.8	80.0	1.47

(Continued)

Table 2 (Concluded)

Sample No.	Depth m	Suspended Solids mg/l	Arsenic µg/l	Manganese µg/l	Mercury ng/l	Nitrate µg/l-N	Ammonia µg/l-N	Phosphate µg/l-P	Reactive Silicate mg/l-Si
				East Reference Site					
19-1-S	2	1.5	3.0	16.0	14	367	32.0	81.0	1.52
19-2-S	2	1.5	2.7	18.8	21	376	31.8	81.0	1.55
19-1-M	47	1.3	2.7	17.0	13	370	5.6	76.0	1.49
19-2-M	47	1.0	2.9	14.5	13	370	4.2	77.0	1.45
19-1-D	57	1.7	2.8	17.0	21	360	5.9	75.0	1.44
19-2-D	57	1.6	2.9	19.0	34	377	15.9	77.0	1.44
				Duwamish River Mouth					
44-1-S	2	1.2	2.9	13.0	13	556	99.4	78.0	1.38
44-2-S	2	1.3	2.9	17.0	34	369	7.1	77.0	1.41
44-1-M	18	1.0	2.9	11.5	33	369	11.3	77.8	1.43
44-2-M	18	1.1	2.5	14.7	<10	370	7.8	80.0	1.45
44-1-D	28	1.0	2.9	13.7	34	373	9.7	79.0	1.46
44-2-D	28	0.9	2.7	13.5	13	371	12.3	81.0	1.48

Table 3

Elliott Bay Sediment pH, Eh, and Free and Total Sulfide Concentrations

Sample No.*	September 1976 pH	Eh	Free Sulfide**	Total Sulfide†	December 1976 pH	Eh	Free Sulfide**	Total Sulfide†
			Disposal Site					
1-1-T	7.2	-330	$<3.2 \times 10^{-13}$	38.4	7.0	-270	3.2×10^{-11}	
1-2-T		-330	1.3×10^{-8}		7.0	-325	$<3.2 \times 10^{-13}$	
1-1-B			5.1×10^{-11}		7.0	-270	3.2×10^{-10}	
1-2-B	6.8	-330	1.3×10^{-10}		7.0	-320	1.6×10^{-11}	
2-1-T	7.1	-275	5.1×10^{-12}		6.9	-325	6.4×10^{-11}	
2-2-T	6.8	-330	3.2×10^{-10}		6.7	-365	2.5×10^{-11}	
2-1-B			$<3.2 \times 10^{-13}$		6.9	-300	5.1×10^{-13}	
2-2-B	7.2	-200	$<3.2 \times 10^{-13}$		7.1	-300	6.4×10^{-13}	
3-1-T			3.2×10^{-9}		6.7	-330	5.1×10^{-11}	560
3-2-T	6.5	-320	1.6×10^{-10}		6.7	-380	2.5×10^{-10}	
3-1-B			8.1×10^{-12}		7.2	-360	6.4×10^{-11}	27.5
3-2-B	6.8	-330	$<3.2 \times 10^{-13}$		7.1	-340	2.5×10^{-10}	
4-1-T	6.9	-330	4.0×10^{-10}		6.7	-300	2.0×10^{-11}	
4-2-T			1.3×10^{-8}		6.8	-330	1.0×10^{-10}	
4-1-B	7.1	-225	$<3.2 \times 10^{-13}$		7.2	-340	2.0×10^{-10}	
4-2-B			6.4×10^{-11}		6.8	-320	1.6×10^{-10}	
5-1-T	6.7	-225	$<3.2 \times 10^{-13}$		6.6	-300	6.4×10^{-12}	
5-2-T			6.4×10^{-9}		6.5	-330	$<3.2 \times 10^{-13}$	
5-1-B	6.8	-270	$<3.2 \times 10^{-13}$		6.9	-355	1.6×10^{-9}	
5-2-B			5.1×10^{-9}		6.5	-350	5.1×10^{-13}	
6-1-T	7.0	-260	$<3.2 \times 10^{-13}$		6.4	-350	$<3.2 \times 10^{-13}$	1466
6-2-T			$<3.2 \times 10^{-13}$		6.6	-300	1.3×10^{-10}	
6-1-B	7.1	-330	$<3.2 \times 10^{-13}$		6.4	-345	1.6×10^{-11}	
6-2-B	6.6	-240	3.2×10^{-12}		6.9	-310	8.1×10^{-12}	1043
7-1-T	6.6	-300	$<3.2 \times 10^{-13}$		6.7	-300	1.3×10^{-10}	
7-2-T	6.6	-285	$<3.2 \times 10^{-13}$		6.8	-330	5.1×10^{-10}	
7-1-B	6.8	-325	4.0×10^{-10}		6.7	-305	1.6×10^{-10}	
7-2-B	7.1	-320	1.3×10^{-10}		7.2	-330	2.0×10^{-10}	

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in milligrams per litre.

† Concentrations measured in micrograms per gram (wet weight).

Table 3 (Continued)

Sample No.	September 1976 pH	Eh	Free Sulfide**	Total Sulfide†	December 1976 pH	Eh	Free Sulfide**	Total Sulfide†
Disposal Site (Continued)								
8-1-T	6.4	-279	$<3.2 \times 10^{-13}$		6.6	-310	6.4×10^{-10}	
8-2-T	6.5	-280	5.1×10^{-10}		6.2	-355	1.0×10^{-9}	
8-1-B	6.4	-310	1.0×10^{-11}		6.4	-345	5.1×10^{-9}	
8-2-B	6.5	-295	1.3×10^{-10}		6.2	-350	2.5×10^{-10}	
9-1-T	6.5	-285	5.1×10^{-11}		6.1	-287	6.4×10^{-10}	
9-2-T	6.6	-275	$<3.2 \times 10^{-13}$		6.3	-340	8.1×10^{-10}	
9-1-B	6.5	-300	$<3.2 \times 10^{-13}$		6.7	-290	3.2×10^{-11}	
9-2-B	6.9	-200	$<3.2 \times 10^{-13}$		7.1	-300	2.0×10^{-10}	
10-1-T	6.7	-300	8.0×10^{-11}		6.4	-230	5.1×10^{-12}	
10-2-T	7.1	-300	1.0×10^{-12}		6.6	-320	4.0×10^{-11}	
10-1-B	6.2	-240	2.0×10^{-11}		6.6	-335	$<3.2 \times 10^{-13}$	
10-2-B	6.8	-280	1.6×10^{-11}		6.6	-350	$<3.2 \times 10^{-13}$	
11-1-T	6.7	-280	1.3×10^{-10}		6.3	-325	1.3×10^{-12}	
11-2-T	6.8	-300	2.0×10^{-10}	870	6.5	-340	1.6×10^{-10}	
11-1-B	7.0	-305	2.0×10^{-10}		6.5	-330	2.0×10^{-11}	
11-2-B	7.0	-305	2.0×10^{-10}		6.4	-320	5.1×10^{-11}	
12-1-T	6.5	-350	5.1×10^{-13}		6.5	-340	1.6×10^{-10}	
12-2-T	6.5	-250	$<3.2 \times 10^{-13}$		6.3	-350	3.2×10^{-10}	
12-1-B	6.8	-280	$<3.2 \times 10^{-13}$		6.3	-340	5.0×10^{-11}	
12-1 B	6.6	-320	$<3.2 \times 10^{-13}$		6.4	-365	2.0×10^{-10}	198.4
13-1-T	7.0	-285	$<3.2 \times 10^{-13}$	16.6	6.6	-327	3.2×10^{-10}	
13-2-T	6.7	-240	$<3.2 \times 10^{-13}$		6.5	-340	8.1×10^{-11}	
13-1-B	7.3	-225	$<3.2 \times 10^{-13}$		6.5	-295	1.6×10^{-10}	
13-2-B	7.1	-250	$<3.2 \times 10^{-13}$	48	6.3	-365	1.0×10^{-10}	972.8
14-1-T	7.0	-310	1.6×10^{-12}		6.6	-290	1.6×10^{-10}	
14-2-T	6.7	-300	$<3.2 \times 10^{-13}$		6.8	-360	6.4×10^{-10}	
14-1-B	7.2	-260	$<3.2 \times 10^{-13}$		6.9	-280	5.1×10^{-11}	44.8
14-2-B	7.3	-240	$<3.2 \times 10^{-13}$		6.8	-370	5.1×10^{-9}	
15-1-T	6.7	-320	1.0×10^{-9}		6.7	-350	4.0×10^{-12}	
15-2-T	6.4	-310	$<3.2 \times 10^{-13}$		6.4	-350	4.0×10^{-12}	
15-1-B	7.0	-240	$<3.2 \times 10^{-13}$		6.5	-350	$<3.2 \times 10^{-13}$	
15-2-B	6.8	-195	$<3.2 \times 10^{-13}$		6.7	-375	1.0×10^{-12}	

(Continued)

Table 3 (Concluded)

Sample No.	September 1976 pH	Eh	Free Sulfide**	Total Sulfide	December 1976 pH	Eh	Free Sulfide**	Total Sulfide
Disposal Site (Continued)								
16-1-T	6.7	-300	$<3.2 \times 10^{-13}$		6.7	-325	8.1×10^{-10}	
16-2-T	6.7	-295	2.0×10^{-9}		7.0	-368	6.4×10^{-10}	
16-1-B	7.1	-260	$<3.2 \times 10^{-13}$		7.0	-355	4.0×10^{-10}	
16-2-B	6.6	-270	$<3.2 \times 10^{-13}$		6.8	-344	5.1×10^{-10}	
West Reference Site								
17-1-T	7.3	-100	$<3.2 \times 10^{-13}$		7.3	-304	6.4×10^{-10}	
17-2-T	7.3	-150	$<3.2 \times 10^{-13}$		7.4	-365	1.0×10^{-9}	
17-1-B	7.3	-200	$<3.2 \times 10^{-13}$		7.4	-370	6.4×10^{-10}	23.0
17-2-B	7.3	-240	$<3.2 \times 10^{-13}$		7.4	-370	4.0×10^{-12}	64.0
18-1-T	7.4	-170	$<3.2 \times 10^{-13}$	9.9	7.4	-290	1.0×10^{-9}	
18-2-T	7.5	-270	$<3.2 \times 10^{-13}$		7.3	-273	8.1×10^{-10}	
18-1-B	7.5	-120	$<3.2 \times 10^{-13}$	41.6	7.4	-309	1.0×10^{-11}	20.8
18-2-B	7.5	-190	$<3.2 \times 10^{-13}$		7.3	-295	1.0×10^{-11}	
East Reference Site								
19-1-T	7.3	-220	$<3.2 \times 10^{-13}$		7.0	-303	6.4×10^{-11}	
19-2-T	7.3	-160	$<3.2 \times 10^{-13}$		6.8	-360	1.3×10^{-8}	166.4
19-1-B	7.3	-180	$<3.2 \times 10^{-13}$		7.2	-345	1.3×10^{-8}	
19-2-B	7.4	-240	$<3.2 \times 10^{-13}$		7.6	-325	5.1×10^{-10}	
20-1-T	7.2	-275	3.2×10^{-13}	67.2	7.8	-390	6.4×10^{-7}	
20-2-T	7.4	-300	3.2×10^{-13}	16.3	7.5	-322	6.4×10^{-9}	
20-1-B	7.4	-360	3.2×10^{-13}		7.7	-409	7.1×10^{-4}	
20-2-B	7.4	-300	3.2×10^{-13}		7.5	-395	8.1×10^{-6}	

Table 4

Concentration of Arsenic in Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	57.7 ± 1.7	12.8 ± 1.0
	55.7 ± 1.1	
1-2-T	10.0 ± 0.95	18.4 ± 0.83
	12.5 ± 1.1	
1-1-B	73.3 ± 1.5	12.3 ± 0.86
	60.8 ± 1.2	
1-2-B	14.4 ± 0.94	19.5 ± 0.78
	16.9 ± 1.1	
2-1-T	9.6 ± 1.1	7.7 ± 0.85
2-2-T	9.7 ± 1.0	17.7 ± 1.1
2-1-B	12.6 ± 0.82	32.7 ± 1.3
	13.3 ± 1.1	
2-2-B	20.4 ± 1.1	29.7 ± 1.0
3-1-T	18.4 ± 1.3	11.8 ± 1.0
	24.5 ± 1.2	
3-2-T	16.8 ± 1.4	14.3 ± 0.79
	13.9 ± 0.76	
3-1-B	64.1 ± 1.6	33.8 ± 1.2
	55.9 ± 1.1	
3-2-B	9.8 ± 0.74	41.0 ± 1.0
	12.1 ± 0.85	
4-1-T	12.9 ± 0.90	22.4 ± 1.2
4-2-T	13.4 ± 0.87	10.3 ± 0.93
4-1-B	12.9 ± 0.65	27.0 ± 0.95
	23.9 ± 0.84	
4-2-B	28.1 ± 0.70	13.4 ± 1.1
	44.5 ± 0.89	
5-1-T	10.0 ± 0.80	18.0 ± 1.1
5-2-T	10.5 ± 0.84	20.5 ± 1.1
5-1-B	13.1 ± 0.85	8.6 ± 0.90
5-2-B	10.8 ± 0.81	27.0 ± 1.5
6-1-T	13.8 ± 1.0	17.3 ± 1.0
6-2-T	10.7 ± 0.86	11.0 ± 0.88
6-1-B	7.4 ± 0.78	26.9 ± 0.86
6-2-B	9.1 ± 1.1	14.3 ± 0.86

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 1 standard deviation.

Table 4 (Continued)

Sample No.	Concentration September 1976	December 1976
	Disposal Site (Continued)	
7-1-T	11.6 ± 0.87	9.4 ± 0.75
7-2-T	9.4 ± 0.75	9.6 ± 1.3
7-1-B	15.5 ± 1.0	12.9 ± 0.77
7-2-B	17.3 ± 0.87	13.4 ± 0.87
8-1-T	8.9 ± 0.80	14.6 ± 1.1
8-2-T	10.4 ± 0.78	8.9 ± 0.80
8-1-B	15.2 ± 0.84	15.5 ± 1.2
8-2-B	9.5 ± 0.81	17.9 ± 1.1
9-1-T	13.7 ± 0.82	21.5 ± 0.75
9-2-T	12.8 ± 0.90	9.2 ± 0.78
9-1-B	5.9 ± 0.74 11.1 ± 0.61	32.3 ± 1.3
9-2-B	15.9 ± 0.95	13.8 ± 0.85
10-1-T	14.6 ± 1.1	21.4 ± 1.4
10-2-T	18.5 ± 1.1	12.2 ± 0.92
10-1-B	13.4 ± 0.94	15.8 ± 0.71
10-2-B	12.8 ± 1.0	15.9 ± 0.87
11-1-T	13.4 ± 1.0	13.4 ± 0.94
11-2-T	13.0 ± 0.85	9.6 ± 0.91
11-1-B	18.2 ± 1.1	17.6 ± 0.97
11-2-B	17.0 ± 1.2	9.2 ± 0.83
12-1-T	8.2 ± 0.74	12.6 ± 0.82
12-2-T	9.0 ± 0.59 7.3 ± 0.62	10.2 ± 0.87
12-1-B	23.9 ± 0.96	16.8 ± 0.84
12-2-B	9.4 ± 0.61	10.9 ± 0.82
13-1-T	16.8 ± 0.67	10.2 ± 0.82
13-2-T	11.7 ± 0.76	13.6 ± 0.95
13-1-B	5.3 ± 0.64 5.3 ± 0.85	20.5 ± 0.82
13-2-B	83.7 ± 0.84 23.3 ± 0.93	11.5 ± 0.81
14-1-T	8.7 ± 0.87	13.2 ± 0.73
14-2-T	9.1 ± 0.91	9.7 ± 0.87
14-1-B	19.6 ± 0.88	40.0 ± 1.0
14-2-B	34.8 ± 1.0	16.1 ± 0.81

(Continued)

Table 4 (Concluded)

Sample No.	Concentration, September 1976	Concentration, December 1976
	Disposal Site (Continued)	
15-1-T	11.8 ± 0.89	12.0 ± 0.90
15-2-B	11.7 ± 0.99	12.8 ± 0.77
15-1-B	20.5 ± 0.92	9.6 ± 0.72
15-2-B	13.1 ± 0.72	13.6 ± 1.0
16-1-T	11.5 ± 0.75	12.2 ± 0.92
	11.0 ± 0.88	
16-2-T	11.2 ± 0.73	11.6 ± 0.81
	11.5 ± 0.92	
16-1-B	15.9 ± 0.64	14.4 ± 0.94
	20.2 ± 0.91	
16-2-B	13.9 ± 0.70	17.4 ± 0.87
	15.3 ± 0.92	
	West Reference Site	
17-1-T	9.3 ± 0.65	11.3 ± 0.73
17-2-T	9.1 ± 0.68	9.4 ± 0.75
17-1-B	7.9 ± 0.67	10.1 ± 0.81
17-2-B	3.5 ± 0.35	8.2 ± 0.66
18-1-T	11.4 ± 0.80	14.3 ± 0.86
	13.5 ± 0.61	
18-2-T	9.9 ± 0.74	11.0 ± 0.77
	10.4 ± 0.52	
18-1-B(1)†	13.1 ± 0.65	9.6 ± 0.72
	13.5 ± 0.61	
18-1-B(2)		11.4 ± 0.80
18-1-B(3)		9.5 ± 0.71
18-1-B(4)		13.2 ± 0.73
18-1-B(5)		2.7 ± 0.19
18-1-B(6)		11.5 ± 0.75
18-2-B	7.7 ± 0.54	8.7 ± 0.70
	6.3 ± 0.41	
	East Reference Site	
19-1-T	17.6 ± 1.4	16.3 ± 0.98
19-2-T	17.9 ± 1.3	22.3 ± 1.0
19-1-B	17.7 ± 1.5	18.9 ± 0.85
19-2-B	15.7 ± 1.0	16.2 ± 0.89
20-1-T	11.6 ± 0.70	15.0 ± 0.98
	16.1 ± 1.6	
20-2-T	10.3 ± 0.67	25.5 ± 0.89
	14.0 ± 1.1	
20-1-B	12.2 ± 0.92	11.4 ± 0.86
	12.5 ± 1.2	
20-2-B	14.3 ± 0.79	13.4 ± 0.80
	12.6 ± 1.1	

† Six aliquots of same sample.

Table 5

Concentration of Chromium in Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	77 ± 1.4	66 ± 1.7
1-2-T	81 ± 1.6	55 ± 0.8
1-1-B	68 ± 1.4	78 ± 1.2
1-2-B	85 ± 1.7	64 ± 1.3
2-1-T	63 ± 1.3	64 ± 1.3
2-2-T	86 ± 1.7	78 ± 1.2
2-1-B	64 ± 1.0	91 ± 1.4
2-2-B	59 ± 0.9	70 ± 1.4
3-1-T	55 ± 0.8	74 ± 1.1
3-2-T	81 ± 1.6	71 ± 1.1
3-1-B	84 ± 1.3	61 ± 1.2
3-2-B	74 ± 1.5	73 ± 1.8
4-1-T	82 ± 1.6	74 ± 1.1
4-2-T	69 ± 1.4	75 ± 1.5
4-1-B	46 ± 1.2	64 ± 1.3
4-2-B	74 ± 1.5	73 ± 1.8
5-1-T	59 ± 0.9	109 ± 1.6
5-2-T	60 ± 0.9	76 ± 1.1
5-1-B	54 ± 0.8	59 ± 0.9
5-2-B	83 ± 1.3	85 ± 1.7
6-1-T	64 ± 1.0	74 ± 1.5
6-2-T	53 ± 0.9	68 ± 1.4
6-1-B	59 ± 0.9	82 ± 1.2
6-2-B	70 ± 1.1	58 ± 0.9
7-1-T	84 ± 1.3	71 ± 1.1
7-2-T	81 ± 0.8	68 ± 1.4
7-1-B	68 ± 1.0	64 ± 1.0
7-2-B	61 ± 1.2	62 ± 1.2
8-1-T	59 ± 0.9	69 ± 1.4
8-2-T	64 ± 1.0	65 ± 1.3
8-1-B	77 ± 1.5	62 ± 1.2
8-2-B	67 ± 1.3	67 ± 1.3
9-1-T	83 ± 1.7	66 ± 1.0
9-2-T	89 ± 1.3	79 ± 1.6
9-1-B	70 ± 1.4	68 ± 1.0
9-2-B	78 ± 1.6	65 ± 1.0

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 1 standard deviation.

Table 5 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
10-1-T	70 ± 1.4	106 ± 2.1
10-2-T	64 ± 1.3	59 ± 1.2
10-1-B	58 ± 0.9	69 ± 1.0
10-2-B	64 ± 1.3	76 ± 1.1
11-1-T	83 ± 1.3	68 ± 1.4
11-2-T	76 ± 0.8	80 ± 1.6
11-1-B	67 ± 1.3	73 ± 1.5
11-2-B	71 ± 1.4	60 ± 1.2
12-1-T	75 ± 1.5	86 ± 1.3
12-2-T	64 ± 1.0	82 ± 1.6
12-1-B	60 ± 1.2	68 ± 1.4
12-2-B	58 ± 1.2	65 ± 1.0
13-1-T	59 ± 0.9	76 ± 1.5
13-2-T	63 ± 1.3	69 ± 1.0
13-1-B	30 ± 0.8	64 ± 1.0
13-2-B	64 ± 1.3	68 ± 1.0
14-1-T	71 ± 1.1	71 ± 1.1
14-2-T	63 ± 0.6	77 ± 1.2
14-1-B	68 ± 1.0	115 ± 1.7
14-2-B	75 ± 1.1	82 ± 1.2
15-1-T	62 ± 0.6	75 ± 1.1
15-2-T	69 ± 1.0	59 ± 0.9
15-1-B	56 ± 0.8	69 ± 1.0
15-2-B	65 ± 1.0	76 ± 1.1
16-1-T	86 ± 1.3	66 ± 1.0
16-2-T	89 ± 1.3	76 ± 1.5
16-1-B	71 ± 1.1	74 ± 1.1
16-2-B	67 ± 1.0	71 ± 1.1
	West Reference Site	
17-1-T	152 ± 1.5	117 ± 1.2
17-2-T	269 ± 2.7	108 ± 1.1
17-1-B	124 ± 1.2	131 ± 1.3
17-2-B	69 ± 0.7	115 ± 1.2

(Continued)

Table 5 (Concluded)

Sample No.	Concentration	
	September 1976	December 1976
	West Reference Site (Continued)	
18-1-T	110 ± 1.1	102 ± 1.5
18-2-T	112 ± 1.7	105 ± 1.6
18-1-B(1)†	95 ± 1.4	88 ± 1.3
18-1-B(2)		109 ± 1.1
18-1-B(3)		114 ± 1.7
18-1-B(4)		135 ± 1.4
18-1-B(5)		160 ± 1.6
18-1-B(6)		122 ± 1.2
18-2-B	101 ± 1.5	111 ± 1.7
	East Reference Site	
19-1-T	92 ± 1.4	91 ± 1.4
19-2-T	86 ± 0.9	96 ± 1.0
19-1-B	87 ± 0.9	64 ± 1.3
19-2-B	95 ± 1.4	79 ± 1.2
20-1-T	100 ± 1.5	106 ± 1.6
20-2-T	81 ± 1.2	86 ± 1.3
20-1-B	89 ± 1.3	81 ± 1.6
20-2-B	101 ± 1.0	73 ± 1.5

† Six aliquots of same sample.

Table 6

Concentration of Manganese in Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	227 ± 4	204 ± 72
1-2-T	262 ± 32	192 ± 16
1-1-B	258 ± 43	252 ± 36
1-2-B	276 ± 13	244 ± 40
2-1-T	238 ± 28	231 ± 22
2-2-T	248 ± 35	287 ± 53
2-1-B	313 ±134	327 ± 53
2-2-B	248 ± 15	305 ± 41
3-1-T	238 ± 75	267 ± 7
3-2-T	262 ± 95	276 ± 10
3-1-B	179 ± 19	223 ± 33
3-2-B	289 ± 15	248 ± 28
4-1-T	254 ± 52	339 ± 41
		307 ± 95
4-2-T	245 ± 15	260 ± 13
4-1-B	239 ± 16	203 ± 52
4-2-B		303 ± 76
5-1-T	255 ± 45	297 ± 29
5-2-T	199 ± 5	331 ± 35
5-1-B	257 ± 31	233 ± 28
5-2-B	269 ± 14	383 ± 16
6-1-T	300 ± 42	405 ± 74
6-2-T	248 ± 20	236 ± 17
6-1-B	147 ± 51	441 ± 31
6-2-B	216 ± 20	256 ± 21
7-1-T	221 ± 98	255 ± 23
7-2-T	272 ± 69	243 ± 21
7-1-B	240 ± 21	274 ± 35
7-2-B	301 ± 0	280 ± 65
8-1-T	241 ± 13	299 ± 37
8-2-T	225 ± 39	244 ± 43
8-1-B	287 ± 33	243 ± 13
8-2-B	230 ± 34	339 ± 77

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 95% confidence intervals.

Table 6 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
9-1-T	207 ± 44	314 ± 120
9-2-T	227 ± 38	254 ± 28
9-1-B	233 ± 21	161 ± 28
9-2-B	255 ± 72	188 ± 30
10-1-T	275 ± 41	356 ± 51
10-2-T	269 ± 56	262 ± 14
10-1-B	274 ± 44	268 ± 26
10-2-B	219 ± 44	290 ± 50
11-1-T	330 ± 57	314 ± 36
11-2-T	223 ± 19	213 ± 46
11-1-B	244 ± 60	552 ±170
11-2-B	400 ± 33	260 ± 22
12-1-T	194 ± 20	241 ± 34
12-2-T	236 ±100	235 ± 17
12-1-B	230 ± 31	262 ± 25
12-2-B	216 ± 63	268 ± 77
		259 ± 29
13-1-T	177 ± 11	266 ± 31
13-2-T	258 ± 33	259 ± 19
13-1-B	321 ± 49	226 ± 48
13-2-B	167 ± 41	323 ± 48
14-1-T	249 ± 42	234 ± 71
14-2-T	237 ± 13	263 ± 23
14-1-B	225 ± 31	186 ± 62
14-2-B	160 ± 25	--
15-1-T	229 ± 18	251 ± 19
15-2-T	219 ± 73	298 ± 17
15-1-B	183 ± 17	296 ± 30
15-2-B	223 ± 15	268 ± 23
16-1-T	242 ± 43	293 ± 84
16-2-T	261 ± 54	253 ± 20
16-1-B	171 ± 6	--
16-2-B	269 ± 37	233 ± 38
	West Reference Site	
17-1-T	190 ± 27	236 ± 14
17-2-T	234 ± 47	222 ± 20
17-1-B	222 ± 52	251 ± 92
17-2-B	252 ± 92	193 ± 70

(Continued)

Table 6 (Concluded)

Sample No.	Concentration, September 1976	Concentration, December 1976
18-1-T	214 ± 28	447 ± 95
18-2-T	235 ± 32	274 ± 35
18-1-B(1)†	241 ± 58	231 ± 40
(2)		224 ± 32
(3)		221 ± 12
(4)		350 ± 11
(5)		225 ± 26
(6)		243 ± 59
18-2-B	231 ±110	218 ± 27
East Reference Site		
19-1-T	283 ± 22	321 ± 31
19-2-T	324 ± 72	309 ± 21
19-1-B	266 ± 18	--
19-2-B	210 ±107	251 ± 36
20-1-T	244 ± 84	281 ± 20
20-2-T	232 ± 49	218 ± 29
20-1-B	198 ± 12	187 ± 47
20-2-B	268 ± 25	184 ± 16

† Six aliquots of same sample.

Table 7

Concentration of Mercury in Elliott Bay Sediment

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	0.68	0.19
1-2-T	0.04	1.2
1-1-B	1.1	0.32
1-2-B	0.06	1.5
2-1-T	0.16	0.23
2-2-T	0.18	0.27
2-1-B	0.21	1.2
2-2-B	1.3	
3-1-T	0.22	0.22
3-2-T	0.25	0.23
3-1-B	0.73	2.3
3-2-B	0.18	4.2
4-1-T	0.15	0.27
4-2-T	0.06	0.33
4-1-B	0.46	3.6
4-2-B	1.1	2.0
5-1-T	0.25	0.23
5-2-T	0.19	0.34
5-1-B	0.30	0.13
5-2-B	0.26	0.52
6-1-T	0.11	0.66
6-2-T	0.03	0.15
6-1-B	0.03	0.40
6-2-B	0.03	0.16
7-1-T	0.42	0.16
7-2-T	0.09	0.16
7-1-B	0.07	0.12
7-2-B	0.06	0.22

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 20% analytical error.

Table 7 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
8-1-T	0.19	0.26
8-2-T	0.15	0.22
8-1-B	0.08	0.71
8-2-B	0.05	0.29
9-1-T	0.05	0.32
9-2-T	0.07	0.24
9-1-B	0.08	0.59
9-2-B	0.06	
10-1-T	0.05	0.44
10-2-T	0.14	0.12
10-1-B	0.03	0.32
10-2-B	0.03	0.37
11-1-T	0.05	0.26
11-2-T	0.12	0.26
11-1-B	0.03	0.41
11-2-B	0.07	0.23
12-1-T	0.06	0.25
12-2-T	0.04	0.29
12-1-B	0.15	0.15
12-2-B	0.13	0.08
13-1-T	0.18	0.25
13-2-T	0.06	0.12
13-1-B	0.02	0.28
13-2-B	0.25	0.33
14-1-T	0.04	0.21
14-2-T	0.08	0.65
14-1-B	0.12	0.57
14-2-B	0.16	1.3
15-1-T	0.04	0.20
15-2-T	0.04	0.33
15-1-B	0.08	0.38
15-2-B	0.05	0.16

(Continued)

Table 7 (Concluded)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
16-1-T	0.04	0.42
16-2-T	0.05	0.26
16-1-B	0.12	0.33
16-2-B	0.07	0.42
	West Reference Site	
17-1-T	0.08	0.32
17-2-T	0.06	0.29
17-1-B	0.07	0.40
17-2-B	0.07	0.43
18-1-T	0.09	0.32
18-2-T	0.13	0.29
18-1-B(1)†	0.09	0.25
18-1-B(2)		0.50
18-1-B(3)		0.42
18-1-B(4)		0.52
18-1-B(5)		1.2
18-1-B(6)		0.56
18-2-B	0.07	0.37
	East Reference Site	
19-1-T	0.42	1.1
19-2-T	0.58	
19-1-B	0.54	1.2
19-2-B	0.41	1.8
20-1-T	0.38	1.2
20-2-T	0.22	1.6
20-1-B	0.53	4.0
20-2-B	0.35	1.6

† Six aliquots of the same sample.

Table 8

Particle Size Distribution and Percent Water in Elliott Bay Sediments

Sample No.*	CF1** >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt† 0.002-.05mm	Clay <.002mm	% H_2O
					September 1976				
					Disposal Site				
1-1-T	1	1	7	25	14	13	43	0	36
1-2-T	1	0	2	6	26	28	40	0	40
1-1-B	1	1	8	21	19	9	39	3	31
1-2-B	2	1	2	6	15	21	42	12	40
2-1-T	0	0	1	8	37	27	51	0	37
2-2-T	0	0	1	6	24	28	45	0	38
2-1-B	0	0	1	5	19	29	39	7	36
2-2-B	1	2	6	20	23	18	40	0	37
3-1-T	1	1	1	5	25	2	47	17	45
3-2-T	0	1	2	6	10	10	71	1	46
3-1-B	10	4	9	24	20	11	25	0	33
3-2-B	0	1	2	14	24	19	44	0	40
4-1-T	0	0	1	4	13	25	55	1	42
4-2-T	0	0	0	3	18	29	58	0	42
4-1-B	0	1	6	13	11	14	53	0	40
4-2-B	0	0	2	8	11	14	56	9	40
5-1-T	0	0	2	13	28	26	26	5	33
5-2-T	0	1	2	9	34	27	29	0	37
5-1-B	3	1	2	7	10	30	34	6	41
5-2-B	0	1	1	4	24	28	37	3	35
6-1-T	1	4	2	12	23	21	47	0	44
6-2-T	2	1	2	9	29	24	33	0	38
6-1-B	0	1	2	9	34	24	25	5	32
6-2-B	1	1	2	9	32	25	23	7	34

(Continued)

* Note: First digit of sample indicates station number, second digit indicates cast number, and letter indicates section of core; top or bottom.

** Numbers indicate per cent retained in sieves for coarse fraction of sediment.

† Numbers indicate per cent of sediment in the size range indicated as determined by pipette analyses.

Table 8 (Continued)

Sample No.*	CF1** >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
7-1-T	0	1	3	14	35	18	31	0	38
7-2-T	0	1	5	8	10	9	68	0	41
7-1-B	4	1	1	5	9	15	69	0	46
7-2-B	0	0	2	8	9	7	70	3	46
8-1-T	1	1	1	9	29	26	34	2	36
8-2-T	0	0	1	7	32	28	34	0	35
8-1-B	0	1	1	5	28	30	34	1	36
8-2-B	1	1	2	8	23	28	25	1	39
9-1-T	1	1	2	9	26	20	45	0	40
9-2-T	1	1	2	9	34	27	31	0	39
9-1-B	0	1	2	5	24	31	27	11	36
9-2-B	2	1	2	11	24	26	34	1	39
10-1-T	0	1	2	5	10	11	72	0	39
10-2-T	1	1	4	10	10	11	69	0	50
10-1-B	0	1	2	9	27	21	32	8	35
10-2-B	0	1	3	12	39	20	27	0	41
11-1-T	0	1	3	10	6	8	72	0	47
11-2-T	1	1	5	13	26	15	44	0	41
11-1-B	1	0	1	3	7	10	60	18	44
11-2-B	1	0	2	5	6	8	87	0	49
12-1-T	0	1	1	2	30	26	27	12	39
12-2-T	2	1	2	8	28	25	26	9	33
12-1-B	13	0	5	12	20	21	38	0	42
12-2-B	1	1	2	7	26	31	40	0	42
13-1-T	0	2	8	21	20	20	39	0	36
13-2-T	0	4	2	10	26	23	44	0	40
13-1-B	7	3	16	37	8	4	15	10	26
13-2-B	9	3	11	23	14	9	25	6	27
14-1-T	1	1	2	8	29	33	33	0	43
14-2-T	0	0	1	7	28	28	33	2	39
14-1-B	0	1	4	15	19	21	37	3	35
14-2-B	1	2	7	21	21	17	23	9	30

(Continued)

Table 8 (Continued)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
15-1-T	0	0	2	8	30	28	31	1	40
15-2-T	1	1	2	9	19	27	46	0	45
15-1-B	1	3	14	27	16	10	21	8	36
15-2-B	1	1	4	9	18	24	50	0	37
16-1-T	0	0	5	4	20	28	43	0	46
16-2-T	0	0	1	4	23	28	52	0	42
16-1-B	0	1	3	14	20	21	43	0	39
16-2-B	1	1	3	20	15	13	55	0	43
					West Reference Site				
17-1-T	5	2	5	27	13	13	26	8	31
17-2-T	0	3	4	21	18	20	30	3	27
17-1-B	5	4	4	14	20	18	28	8	29
17-2-B	3	2	7	21	22	14	25	7	28
18-1-T	2	1	2	9	16	22	48	0	40
18-2-T	2	3	6	12	23	18	33	4	33
18-1-B	2	2	3	9	16	20	47	2	36
18-2-B	3	2	4	18	23	16	28	6	28
					East Reference Site				
19-1-T	1	1	2	6	5	6	45	34	49
19-2-T	1	4	3	6	6	2	62	17	51
19-1-B	1	2	3	8	6	7	72	3	43
19-2-B	1	1	2	3	4	5	76	9	38
20-1-T	3	1	2	4	6	6	76	2	49
20-2-T	9	2	3	9	9	5	59	8	44
20-1-B	2	2	3	8	11	7	67	2	37
20-2-B	1	1	1	4	6	7	76	4	41

Table 8 (Continued)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
					December 1976				
					Disposal Site				
1-1-T	0	0	1	5	18	26	45	7	37
1-2-T	2	1	5	17	12	13	46	5	30
1-1-B	0	0	1	3	20	31	46	0	41
1-2-B	5	1	8	29	14	10	35	0	33
2-1-T	0	1	2	11	25	26	37	0	33
2-2-T	0	1	2	7	29	29	41	0	37
2-1-B	0	1	2	12	19	26	42	0	38
2-2-B	1	2	6	25	13	11	42	0	38
3-1-T	0	0	1	7	26	24	33	8	31
3-2-T	0	1	1	6	18	25	47	2	35
3-1-B	4	3	12	36	16	9	23	0	33
3-2-B	2	1	7	21	17	13	48	0	37
4-1-T	1	4	2	3	15	28	52	0	41
4-2-T	0	0	1	7	22	28	43	0	40
4-1-B	0	1	7	17	13	11	46	4	37
4-2-B	0	1	4	12	17	20	45	1	38
5-1-T	0	1	2	12	15	12	52	6	37
5-2-T	1	2	2	5	6	12	73	1	46
5-1-B	0	1	2	12	25	22	41	0	30
5-2-B	0	0	2	2	3	13	85	0	45
6-1-T	2	3	4	8	6	9	70	0	46
6-2-T	0	1	3	14	30	24	31	0	32
6-1-B	0	1	0	3	3	7	86	0	51
6-2-B	0	1	2	6	29	34	29	0	32
7-1-T	0	1	2	12	30	27	27	2	38
7-2-T	0	0	1	7	31	28	30	2	38
7-1-B	1	1	1	7	22	31	32	6	34
7-2-B	0	1	5	17	17	22	43	0	38

(Continued)

Table 8 (Continued)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
8-1-T	0	1	1	9	27	28	41	0	38
8-2-T	0	1	1	8	29	25	26	10	39
8-1-B	0	0	2	9	24	27	33	0	38
8-2-B	1	1	2	6	27	29	39	0	42
9-1-T	0	1	6	23	20	16	33	1	37
9-2-T	0	1	2	6	31	27	34	0	38
9-1-B	1	1	9	31	16	11	37	0	29
9-2-B	2	2	13	30	17	13	22	2	30
10-1-T	1	1	2	7	8	9	80	0	40
10-2-T	2	3	10	25	21	13	25	0	30
10-1-B	2	3	6	20	26	18	32	0	37
10-2-B	1	1	2	12	16	12	41	15	39
11-1-T	0	0	2	7	4	7	73	6	41
11-2-T	0	0	2	6	20	22	48	2	36
11-1-B	0	0	1	5	5	11	84	0	45
11-2-B	1	1	3	6	31	18	35	5	36
12-1-T	1	1	2	14	29	26	32	0	34
12-2-T	0	1	2	8	31	25	16	17	35
12-1-B	0	0	1	8	18	24	48	1	36
12-2-B	1	1	1	4	24	32	36	1	35
13-1-T	0	0	1	4	25	27	37	5	39
13-2-T	0	1	2	9	18	22	53	0	38
13-1-B	3	1	4	24	21	17	33	0	30
13-2-B	0	1	2	7	21	28	34	8	35
14-1-T	2	2	4	12	22	25	38	0	35
14-2-T	0	0	1	5	18	28	46	2	41
14-1-B	3	3	11	27	23	16	13	4	27
14-2-B	3	4	14	24	17	12	34	0	32
15-1-T	2	2	3	5	25	13	30	20	40
15-2-T	1	1	3	13	30	19	37	0	41
15-1-B	0	1	2	6	23	29	36	3	33
15-2-B	1	1	2	6	23	25	43	0	37

(Continued)

Table 8 (Concluded)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
16-1-T	0	1	2	6	26	25	35	6	40
16-2-T	0	1	1	7	21	25	28	18	39
16-1-B	0	0	3	10	18	23	47	0	43
16-2-B	0	0	3	12	16	19	53	0	37
				West Reference Site					
17-1-T	1	1	3	16	22	19	39	0	34
17-2-T	1	1	3	18	27	18	22	12	28
17-1-B	2	1	3	15	20	19	39	2	31
17-2-B	1	1	3	17	26	26	30	0	30
18-1-T	1	1	3	18	20	18	39	1	37
18-2-T	1	1	2	13	19	22	41	1	31
18-1-B	0	2	5	23	15	15	40	0	31
18-2-B	0	1	2	11	17	21	48	0	31
				East Reference Site					
19-1-T	2	1	1	4	3	4	60	27	40
19-2-T	1	1	1	4	4	5	76	10	39
19-1-B	5	0	1	2	2	5	82	3	39
19-2-B	2	1	1	4	3	5	84	2	43
20-1-T	13	4	4	7	10	7	50	0	46
20-2-T	7	2	3	7	14	10	40	16	46
20-1-B	10	4	4	12	16	12	32	11	41
20-2-B	1	3	4	9	8	11	57	7	37

Table 9

Arsenic Concentration in Interstitial Water from Elliott Bay Sediments, September 1976

Sample No.*	Concentration**
Disposal Site	
1-1-T	34 ± 6.5
1-2-T	68 ± 6.1
1-1-B	50 ± 5.4
1-2-B	54 ± 6.5
2-1-T	
2-2-T	54 ± 5.9
2-1-B	42 ± 5.9
2-2-B	65 ± 5.2
3-1-T	60 ± 5.7
3-2-T	26 ± 6.2
3-1-B	95 ± 7.6
3-2-B	47 ± 5.9
4-1-T	41 ± 6.2
4-2-T	32 ± 5.6
4-1-B	49 ± 5.9
4-2-B	34 ± 5.3
5-1-T	37 ± 4.6
5-2-T	49 ± 4.9
5-1-B	37 ± 4.6
5-2-B	34 ± 5.3
6-1-T	73 ± 11.7
6-2-T	179 ± 32.2
6-1-B	163 ± 30.2
6-2-B	
7-1-T	62 ± 2.8
7-2-T	40 ± 6.0
7-1-B	61 ± 6.1
7-2-B	70 ± 6.3

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations in micrograms per litre ± 1 standard deviation.

Table 9

Arsenic Concentration in Interstitial Water

from Elliott Bay Sediments, September 1976

Sample No.*	Concentration**
Disposal Site	
1-1-T	34 ± 6.5
1-2-T	68 ± 6.1
1-1-B	50 ± 5.4
1-2-B	54 ± 6.5
2-1-T	
2-2-T	54 ± 5.9
2-1-B	42 ± 5.9
2-2-B	65 ± 5.2
3-1-T	60 ± 5.7
3-2-T	26 ± 6.2
3-1-B	95 ± 7.6
3-2-B	47 ± 5.9
4-1-T	41 ± 6.2
4-2-T	32 ± 5.6
4-1-B	49 ± 5.9
4-2-B	34 ± 5.3
5-1-T	37 ± 4.6
5-2-T	49 ± 4.9
5-1-B	37 ± 4.6
5-2-B	34 ± 5.3
6-1-T	73 ± 11.7
6-2-T	179 ± 32.2
6-1-B	163 ± 30.2
6-2-B	
7-1-T	62 ± 2.8
7-2-T	40 ± 6.0
7-1-B	61 ± 6.1
7-2-B	70 ± 6.3

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations in micrograms per litre ± 1 standard deviation.

Table 9 (Continued)

Sample No.	Disposal Site (Continued)	Concentration
8-1-T		22 ± 9.1
8-2-T		132 ± 31.7
8-1-B		108 ± 25.9
8-2-B		106 ± 29.7
9-1-T		37 ± 9.8
9-2-T		13 ± 1.3
9-1-B		32 ± 8.6
9-2-B		182 ± 28.2
10-1-T		8 ± 0.8
10-2-T		14 ± 3.4
10-1-B		7 ± 0.7
10-2-B		29 ± 5.3
11-1-T		28 ± 5.3
11-2-T		28 ± 5.5
11-1-B		50 ± 6.0
11-2-B		43 ± 6.0
12-1-T		36 ± 5.4
12-2-T		42 ± 6.9
12-1-B		32 ± 5.9
12-2-B		20 ± 5.4
13-1-T		46 ± 5.8
13-2-T		24 ± 5.3
13-1-B		11 ± 4.8
13-2-B		25 ± 4.5
14-1-T		41 ± 5.3
14-2-T		40 ± 5.6
14-1-B		31 ± 3.7
14-2-B		36 ± 4.5
15-1-T		38 ± 4.4
15-2-T		
15-1-B		
15-2-B		61 ± 5.2
16-1-T		40 ± 4.8
16-2-T		40 ± 5.0
16-1-B		40 ± 5.0
16-2-B		43 ± 5.0

(Continued)

Table 9 (Concluded)

Sample No.	Concentration
West Reference Site	
17-1-T	67 ± 4.8
17-2-T	
17-1-B	56 ± 5.0
17-2-B	
18-1-T	46 ± 4.8
18-2-T	56 ± 5.3
18-1-B	48 ± 4.6
18-2-B	60 ± 4.5
East Reference Site	
19-1-T	76 ± 4.9
19-2-T	
19-1-B	56 ± 5.0
19-2-B	56 ± 4.5
20-1-T	59 ± 4.7
20-2-T	60 ± 4.8
20-1-B	48 ± 4.1
20-2-B	53 ± 4.8

Table 10

Manganese Concentration in Interstitial Water from Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	3.8 ± 1.3	3.0 ± 1.6
1-2-T	1.3 ± 1.5	4.0 ± 1.3
	1.8 ± 1.7	
1-1-B	1.8 ± 1.0	3.1 ± 0.1
1-2-B	8.3 ± 3.0	3.8 ± 1.3
2-1-T		2.5 ± 0.8
2-2-T	5.4 ± 1.9	3.1 ± 0.9
2-1-B	9.5 ± 2.4	4.6 ± 1.8
2-2-B	2.7 ± 1.3	2.8 ± 1.0
3-1-T	4.5 ± 1.0	7.1 ± 2.7
3-2-T	6.4 ± 2.4	
3-1-B	2.5 ± 1.0	0.33± 0.62
3-2-B	4.4 ± 2.2	1.1 ± 0.3
4-1-T	9.6 ± 8.2	2.6 ± 0.8
4-2-T	3.9 ± 3.0	4.8 ± 1.6
4-1-B	3.6 ± 1.8	1.4 ± 1.0
4-2-B	7.9 ± 3.5	5.2 ± 1.7
5-1-T	3.4 ± 1.3	3.9 ± 1.1
5-2-T	2.0 ± 1.2	3.0 ± 1.4
5-1-B	4.0 ± 1.3	4.4 ± 1.4
5-2-B	6.3 ± 1.3	3.0 ± 1.0
6-1-T	2.3 ± 0.7	15.6 ± 6.7
6-2-T	2.7 ± 1.2	
6-1-B	3.8 ± 2.0	2.7 ± 1.1
6-2-B	2.6 ± 1.5	0.78± 0.60
7-1-T	6.0 ± 1.7	2.5 ± 1.0
7-2-T	5.0 ± 4.3	1.3 ± 0.5
7-1-B	3.7 ± 0.9	5.9 ± 2.2
7-2-B	3.1 ± 1.8	6.3 ± 3.0
8-1-T	3.9 ± 1.3	1.9 ± 1.2
8-2-T	2.1 ± 1.3	2.6 ± 1.5
8-1-B	7.3 ± 3.4	4.7 ± 1.2
8-2-B	2.1 ± 0.9	3.7 ± 1.5
9-1-T	5.2 ± 3.0	
9-2-T	4.3 ± 1.3	1.4 ± 0.9
9-1-B	5.0 ± 1.8	
9-2-B	6.1 ± 2.3	2.1 ± 0.4

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in milligrams per litre ± 95% confidence limits.

Table 10 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
10-1-T	3.5 ± 1.3	3.7 ± 1.4
10-2-T	5.4 ± 1.9	4.9 ± 1.6
10-1-B	3.0 ± 1.5	3.0 ± 0.8
10-2-B	3.6 ± 1.7	4.1 ± 1.1
11-1-T	7.7 ± 2.2	3.6 ± 1.6
11-2-T	2.8 ± 0.9	2.7 ± 1.3
11-1-B	3.7 ± 1.1	
11-2-B	3.0 ± 1.7	7.7 ± 4.6
12-1-T	3.1 ± 1.3	6.8 ± 2.6
12-2-T	2.2 ± 0.7	2.6 ± 0.9
12-1-B	6.3 ± 2.3	6.1 ± 2.0
12-2-B	8.7 ± 2.5	9.0 ± 5.0
13-1-T	2.2 ± 1.3	9.9 ± 4.0
13-2-T	1.2 ± 0.7	3.2 ± 0.7
13-1-B	1.2 ± 0.6	4.7 ± 1.4
13-2-B	0.36± 0.09	6.1 ± 2.9
14-1-T	2.9 ± 0.5	1.2 ± 0.4
14-2-T	5.2 ± 1.8	4.4 ± 1.1
14-1-B	3.5 ± 3.1	0.41± 0.15
14-2-B	1.6 ± 1.3	0.84± 0.65
15-1-T	2.0 ± 1.1	1.7 ± 0.7
15-2-T	5.7 ± 1.7	8.2 ± 2.8
15-1-B	1.3 ± 1.2	6.8 ± 2.9
15-2-B	3.5 ± 1.5	9.2 ± 3.0
16-1-T	1.8 ± 0.6	4.2 ± 1.0
16-2-T	2.1 ± 0.9	2.1 ± 0.5
16-1-B	3.3 ± 0.8	4.6 ± 1.3
16-2-B	2.2 ± 1.1	1.6 ± 0.8
	West Reference Site	
17-1-T	0.29 ± 0.13	0.37 ± 0.17
17-2-T	0.37 ± 0.21	0.37 ± 0.10
17-1-B	0.33 ± 0.13	0.071± 0.050
17-2-B	0.46 ± 0.14	0.20 ± 0.11

(Continued)

Table 10 (Concluded)

Sample No.	Concentration September 1976	December 1976
	West Reference Site (Continued)	
18-1-T	2.0 ± 1.4	
18-2-T	0.38 ± 0.18	0.75 ± 0.12
18-1-B	0.32 ± 0.15	0.39 ± 0.12
18-2-B	0.28 ± 0.15	0.20 ± 0.13
	East Reference Site	
19-1-T	0.30 ± 0.11	0.32 ± 0.19
19-2-T	0.41 ± 0.18	0.50 ± 0.13
19-1-B	0.10 ± 0.02	0.41 ± 0.13
19-2-B	0.16 ± 0.08	0.16 ± 0.04
20-1-T	0.21 ± 0.03	0.89 ± 0.78
20-2-T	0.46 ± 0.16	0.48 ± 0.10
20-1-B	0.16 ± 0.03	0.33 ± 0.15
20-2-B	0.092± 0.03	0.21 ± 0.06

Table 11

Nutrient Concentrations in Interstitial Water from Elliott Bay Sediments

Sample No.	September 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N	December 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N
			Disposal Site			
1-1-T	1.24	3.09	4.87	0.10	1.68	6.05
1-2-T	0.60	2.91	1.31	0.03	1.73	
1-1-B	0.16	2.99	4.97	0.35	1.54	8.61
1-2-B	0.17	1.87	2.58			13.5
2-1-T				0.09	1.13	7.98
2-2-T	0.36	2.45	1.78	0.28	4.27	31.1
2-1-B	1.02	2.86	3.84	0.01	1.27	10.7
2-2-B	0.80	1.98	1.41	0.02	0.67	2.11
3-1-T	0.68	2.09	0.31			
3-2-T	1.96	9.24	81.5			
3-1-B	0.78	4.59	0.75	0.63	1.14	3.90
3-2-B	0.64	4.06	19.0			
4-1-T	0.31	2.14	0.95	0.02	1.14	9.95
4-2-T	0.72	2.10	0.91	0.17	2.04	5.80
4-1-B	0.43	2.02	0.17	0.07	1.59	11.0
4-2-B	0.29	1.88	2.15	1.49	2.95	10.2
5-1-T	1.76	2.57	1.06	0.05	1.64	9.79
5-2-T	0.62	1.91	1.14	0.28	2.49	32.5
5-1-B	0.83	2.53	1.57			
5-2-B	0.39	2.44	2.82	0.44	2.87	50.3
6-1-T	1.49	2.55	4.92	0.24	1.67	29.9
6-2-T	0.74	2.20	4.45			
6-1-B				0.21	2.93	47.9
6-2-B				0.03	1.33	6.95
7-1-T	0.36	2.02	17.7	0.05	2.30	9.25
7-2-T	0.20	2.26	23.8	0.28	7.66	35.7
7-1-B	0.51	3.59	26.5	0.02	1.23	7.76
7-2-B	0.08	3.60	26.4			2.40
8-1-T	0.44	4.00	1.05	0.05	1.60	5.29
8-2-T	1.12	4.01	5.79	2.41	3.79	5.42
8-1-B	0.70	3.50	5.49	0.19	1.51	9.70
8-2-B	0.65	4.37	5.39	0.21	2.42	11.5
9-1-T	2.07	5.05	5.88			
9-2-T	0.40	4.46	3.13	0.10	1.37	8.46
9-1-B	0.71	3.27	4.27			
9-2-B	0.77	4.65	5.67	0.05	2.06	4.43
10-1-T	0.28	2.52	3.95	0.05	2.28	34.2
10-2-T	1.89	6.12	27.4			
10-1-B	1.36	4.16	9.65			
10-2-B	3.45	4.41	11.7			

(Continued)

* Note: First digit of sample number indicates station number, second digit indicates cast number, and letter indicates section of core, top or bottom.

Table 11 (Concluded)

Sample No.	September 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N	December 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N
			Disposal Site (Continued)			
11-1-T	0.76	1.28		0.04	1.16	24.1
11-2-T	0.97	1.67				
11-1-B	0.61	1.51				
11-2-B	0.69	4.45		0.11	1.28	9.80
12-1-T	0.63	1.58	1.82			
12-2-T	0.83	1.37	1.84	0.03	4.23	5.83
12-1-B	0.70	1.48	0.72	0.11	0.70	3.00
12-2-B	1.47	1.59	1.97	0.02	1.03	3.13
13-1-T	0.35	1.72	0.54	0.09	0.95	2.71
13-2-T	0.73	1.37	0.28	0.02	0.92	11.7
13-1-B	0.22	1.73	0.36	0.05	1.45	7.52
13-2-B	0.16	1.34	0.18	0.13	1.61	10.2
14-1-T	1.25	1.63	0.24	0.13	1.46	3.25
14-2-T	0.27	1.27	0.21	0.02	0.87	3.78
14-1-B	0.46	1.24	0.49	0.03	1.24	2.60
14-2-B	0.11	1.62	0.86	0.05	1.86	5.98
15-1-T	0.49	1.58	0.19	0.04	1.11	8.68
15-2-T	0.31	1.57	0.29	0.13	1.31	87.0
15-1-B	0.41	1.80	1.35	0.01	0.84	8.46
15-2-B	0.62	1.48	1.03	0.10	1.25	13.1
16-1-T	0.03	0.88	5.28	0.10	0.86	5.37
16-2-T	0.25	1.17	0.52	0.18	3.68	8.87
16-1-B	0.16	1.27	0.96	0.04	1.26	6.67
16-2-B	0.29	1.30	1.03	0.06	0.71	0.72
			West Reference Site			
17-1-T	0.03	1.05	0.30	0.06	2.27	5.11
17-2-T	0.08	1.36	0.52	0.05	1.42	4.10
17-1-B	0.16	0.95	0.79	0.02	1.83	1.19
17-2-B	0.10	1.10	0.88	0.05	2.14	2.69
18-1-T				0.22	3.88	10.7
18-2-T	0.05	0.85	0.22			
18-1-B	0.05	0.92	0.61			
18-2-B	0.07	1.74	0.35	0.08	3.09	4.51
			East Reference Site			
19-1-T	0.03	0.86	0.14	0.10	3.00	6.66
19-2-T				0.08	2.74	6.22
19-1-B	0.05	1.02	0.80	0.13	2.76	4.17
19-2-B	0.09	1.21	0.53	0.03	2.74	3.08
20-1-T	0.05	1.07	0.16	0.15	2.86	6.18
20-2-T	0.03	0.90	0.28	0.05	3.24	6.75
20-1-B	0.04	1.07	0.25	0.19	2.25	9.85
20-2-B	0.84	1.30	1.33	0.04	2.42	3.98

Table 12

Significance of Temporal, Depth, and Spatial Differences in Chemical Variables in Elliott Bay Water

DEPENDENT VARIABLES	INDEPENDENT VARIABLES*									
	Time†			Depth			Position††			
	1	2	3,4	1	2	3,4	1 & 3,4	2 & 3,4	1 & 2	3 & 4
Suspended solids	$P \leq 0.01$**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Arsenic	$P \leq 0.01$	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Manganese	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	N.S.	$P \leq 0.01$	N.S.	$P \leq 0.01$	$P \leq 0.01$	N.S.
Mercury	N.S.	N.S.	$P \leq 0.01$	N.S.	N.S.	N.S.	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$
Nitrate	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	N.S.	N.S.	$P \leq 0.01$	N.S.	N.S.	N.S.	N.S.
Ammonia	N.S.	$P \leq 0.01$	N.S.	$P \leq 0.01$	N.S.	$P \leq 0.01$	N.S.	N.S.	N.S.	N.S.
Inorganic Phosphate	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	N.S.	$P \leq 0.05$	$P \leq 0.01$	N.S.	N.S.	N.S.	N.S.
Reactive Silicate	$P \leq 0.01$	$P \leq 0.01$	$P \leq 0.01$	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

* Note: Time = sampling time: September or December, 1976; Depth = sampling depth: surface, middle, or deep; Position = station location: 1 - disposal site (stations 6, 7, 2 - mouth of Duwamish River (station 44), 3 - west reference site (station 17), 4 - east reference site (station 19).

** P = significance level: $P \leq 0.05$, 95% significance level; $P \leq 0.01$, 99% significance level; N.S. = not significant

† The independent variables of time and depth are analyzed by analysis of covariance at the indicated positions

†† The independent variable, position, is analyzed by analysis of covariance with the significance of position compared by Scheffé's multicomparison test

Table 13

Significance of Temporal, Depth, and Spatial Differences in Chemical Variables in Elliott Bay Sediments

DEPENDENT VARIABLES*	INDEPENDENT VARIABLES**								
	Time‡		Depth‡		Position‡‡				
	1	2,3	1	2,3	1 & 2	1 & 3	2 & 4	1 & 4	2 & 3
pH	$p \leq 0.01$†	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	N.S.
Eh	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$
Mn (Sed)	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.05$	N.S.	$p \leq 0.05$	N.S.	N.S.	N.S.
Mn (IW)	N.S.	N.S.	N.S.	$p \leq 0.05$	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.
As (Sed)	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	$p \leq 0.05$	N.S.	N.S.
As (IW)	††	††	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Hg (Sed)	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$
Cr (Sed)	N.S.	N.S.	$p \leq 0.05$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$
Free sulfide	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
CF1 (> 2mm)	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
CF2 (1 - 2mm)	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	$p \leq 0.01$
CF3 (0.5 - 1mm)	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$
CF4 (0.25 - 0.5mm)	N.S.	$p \leq 0.05$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$
silt (0.002 - 0.05mm)	N.S.	N.S.	N.S.	N.S.	$p \leq 0.05$	$p \leq 0.05$	N.S.	$p \leq 0.01$	$p \leq 0.01$
clay (< 0.002mm)	N.S.	N.S.	N.S.	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.05$	$p \leq 0.01$
Inorganic phosphate	$p \leq 0.01$	-N.S.	N.S.	N.S.	$p \leq 0.05$	$p \leq 0.05$	N.S.	N.S.	N.S.
Ammonia	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.05$	$p \leq 0.01$	N.S.

* Note: Sed = sediment, IW = interstitial water, CF = coarse fraction from pipette analysis

** Time = sampling time: September or December, 1976; depth = section of core: top or bottom; position = station location: 1 - center of disposal site (stations 6, 7, 10, 11), 2 - west reference site (stations 17, 18), 3 - east reference site (stations 19, 20), 4- edge of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16).

† p = significance level; $p \leq 0.05$, 95% significance level; $p \leq 0.01$, 99% significance level; N.S. = not significant

†† Analysis done only on September samples

‡ The independent variables of time and depth are analyzed by analysis of covariance at the indicated positions

‡‡ The independent variable, position, is analyzed by analysis of covariance with the significance of position compared by Scheffé's multicomparison test.

Table 14

Pearson Correlation Coefficients Matrix for Seawater at Stations 6 and 10 (Disposal Site)

	SOL*	AS	MN	HG	NO3	NH3	PO4	SI
SOL	1.0000**	.3261	.6309	-.2913	-.3917	.0719	-.3243	-.2339
	(0)	(24)	(24)	(23)	(24)	(24)	(24)	(24)
	S= .001	S= .060	S= .001	S= .097	S= .029	S= .369	S= .061	S= .136
AS	.3261	1.0000	.3920	-.2693	-.4329	-.2508	-.5120	-.4308
	(24)	(0)	(24)	(23)	(24)	(24)	(24)	(24)
	S= .060	S= .001	S= .029	S= .107	S= .017	S= .119	S= .005	S= .018
MN	.6309	.3920	1.0000	-.2826	-.1945	-.3637	-.2690	-.2409
	(24)	(24)	(0)	(23)	(24)	(24)	(24)	(24)
	S= .001	S= .029	S= .001	S= .096	S= .181	S= .040	S= .102	S= .128
HG	-.2913	-.2693	-.2826	1.0000	.2283	.0122	.4122	.4348
	(23)	(23)	(23)	(0)	(23)	(23)	(23)	(23)
	S= .097	S= .107	S= .096	S= .001	S= .147	S= .478	S= .025	S= .019
NO3	-.3917	-.4329	-.1945	.2283	1.0000	.2394	.8769	.8144
	(24)	(24)	(24)	(23)	(0)	(24)	(24)	(24)
	S= .029	S= .017	S= .181	S= .147	S= .001	S= .130	S= .001	S= .001
NH3	.0719	-.2508	-.3637	.0122	.2394	1.0000	.1301	.2404
	(24)	(24)	(24)	(23)	(24)	(0)	(24)	(24)
	S= .369	S= .119	S= .040	S= .478	S= .130	S= .001	S= .272	S= .129
PO4	-.3243	-.5120	-.2690	.4122	.8769	.1301	1.0000	.9436
	(24)	(24)	(24)	(23)	(24)	(24)	(0)	(24)
	S= .061	S= .005	S= .102	S= .025	S= .001	S= .272	S= .001	S= .001
SI	-.2339	-.4308	-.2409	.4348	.8144	.2404	.9436	1.0000
	(24)	(24)	(24)	(23)	(24)	(24)	(24)	(0)
	S= .136	S= .018	S= .128	S= .019	S= .001	S= .129	S= .001	S= .001

* Note: SOL= suspended solids, NO3= nitrate, NH3= ammonia, PO4=inorganic phosphate, SI= reactive silicate.

** Matrix gives coefficients, number of points considered, and significance of coefficients.

Table 15

Pearson Correlation Coefficients Matrix for Seawater at Stations 17 and 19 (Reference Stations)

	SOL*	AS	MN	HG	NO3	NH3	PO4	SI
SOL	1.0000**	.0698	.0401	-.1956	.3093	.3063	.4295	.3112
	(0)	(24)	(24)	(24)	(24)	(24)	(24)	(24)
	S= .001	S= .373	S= .390	S= .180	S= .071	S= .073	S= .018	S= .069
AS	.0698	1.0000	.1327	-.0408	.0324	.3445	.0526	.1090
	(24)	(0)	(24)	(24)	(24)	(24)	(24)	(24)
	S= .373	S= .001	S= .268	S= .425	S= .440	S= .050	S= .404	S= .306
MN	.0401	.1327	1.0000	.1855	-.4282	-.0497	-.4115	-.4513
	(24)	(24)	(0)	(24)	(24)	(24)	(24)	(24)
	S= .390	S= .268	S= .001	S= .193	S= .018	S= .409	S= .023	S= .013
HG	-.1956	-.0408	.1855	1.0000	-.3544	.2694	-.3779	-.2219
	(24)	(24)	(24)	(0)	(24)	(24)	(24)	(24)
	S= .180	S= .425	S= .193	S= .001	S= .045	S= .102	S= .034	S= .149
NO3	.3093	.0324	-.4282	-.3544	1.0000	-.1093	.9574	.8693
	(24)	(24)	(24)	(24)	(0)	(24)	(24)	(24)
	S= .071	S= .440	S= .018	S= .045	S= .001	S= .306	S= .001	S= .001
NH3	.3063	.3445	-.0497	.2694	-.1093	1.0000	.1160	.2374
	(24)	(24)	(24)	(24)	(24)	(0)	(24)	(24)
	S= .073	S= .050	S= .409	S= .102	S= .306	S= .001	S= .295	S= .132
PO4	.4295	.0526	-.4115	-.3779	.9574	.1160	1.0000	.9071
	(24)	(24)	(24)	(24)	(24)	(24)	(0)	(24)
	S= .018	S= .404	S= .023	S= .034	S= .001	S= .295	S= .001	S= .001
SI	.3112	.1090	-.4513	-.2219	.8693	.2374	.9071	1.0000
	(24)	(24)	(24)	(24)	(24)	(24)	(24)	(0)
	S= .069	S= .306	S= .013	S= .149	S= .001	S= .132	S= .001	S= .001

* Note: SOL= suspended solids, NO3= nitrate, NH3= ammonia, PO4= inorganic phosphate, SI= reactive silicate.

** Matrix gives coefficients, number of points considered, and significance of coefficients.

Table 16

Pearson Correlation Coefficients Matrix for Sediments at Stations 6, 7, 10, and 11 (Disposal Site)

	PH	EH	MNSED	MNIW	ASSED	ASIW	HGSED	HGIW	CRSED	S
PH	1.0000	.2510	-.2332	-.3001	.3407	.0891	.2765	-.1569	-.2047	-.0219
	(0)	(118)	(116)	(112)	(118)	(51)	(116)	(52)	(118)	(118)
	S= .001	S= .003	S= .006	S= .001	S= .001	S= .267	S= .001	S= .133	S= .013	S= .407
EH	.2510	1.0000	-.1516	-.2047	.0507	.0594	-.2086	.0623	-.2009	-.0974
	(118)	(0)	(117)	(113)	(119)	(52)	(117)	(53)	(119)	(119)
	S= .003	S= .001	S= .051	S= .015	S= .292	S= .338	S= .012	S= .329	S= .014	S= .146
MNSED	-.2332	-.1516	1.0000	.2767	-.0502	-.1248	-.0108	.0092	.0958	-.0128
	(116)	(117)	(0)	(119)	(125)	(60)	(123)	(61)	(125)	(125
	S= .006	S= .051	S= .001	S= .001	S= .289	S= .171	S= .453	S= .475	S= .144	S= .444
MNIW	-.3001	-.2047	.2767	1.0000	-.1993	-.0489	-.1373	.0070	.0652	.0697
	(112)	(113)	(119)	(0)	(122)	(61)	(120)	(62)	(122)	(122)
	S= .001	S= .015	S= .001	S= .001	S= .014	S= .354	S= .067	S= .478	S= .238	S= .223
ASSED	.3407	.0507	-.0502	-.1993	1.0000	-.0593	.4356	.0220	.1710	-.0752
	(118)	(119)	(125)	(122)	(0)	(61)	(126)	(62)	(128)	(128)
	S= .001	S= .292	S= .289	S= .014	S= .001	S= .325	S= .001	S= .433	S= .027	S= .199
ASIW	.0891	.0594	-.1248	-.0489	-.0593	1.0000	-.0319	-.0085	.0066	-.0088
	(51)	(52)	(60)	(61)	(61)	(0)	(61)	(61)	(61)	(61)
	S= .267	S= .338	S= .171	S= .354	S= .325	S= .001	S= .404	S= .474	S= .480	S= .473
HGSED	.2765	-.2086	-.0108	-.1373	.4356	-.0319	1.0000	.1223	.0228	-.0291
	(116)	(117)	(123)	(120)	(126)	(61)	(0)	(62)	(126)	(126)
	S= .001	S= .012	S= .453	S= .067	S= .001	S= .404	S= .001	S= .172	S= .400	S= .373
HGIW	-.1569	.0623	.0092	.0070	.0220	-.0085	.1223	1.0000	.1567	.0456
	(52)	(53)	(61)	(62)	(62)	(61)	(62)	(0)	(62)	(62)
	S= .133	S= .329	S= .475	S= .478	S= .433	S= .474	S= .172	S= .001	S= .112	S= .362
CRSED	-.2047	-.2009	.0958	.0652	.1710	.0066	.0228	.1567	1.0000	.0416
	(118)	(119)	(125)	(122)	(128)	(61)	(126)	(62)	(0)	(128)
	S= .013	S= .014	S= .144	S= .238	S= .027	S= .480	S= .400	S= .112	S= .001	S= .321
S	-.0219	-.0974	-.0128	.0697	-.0752	-.0088	-.0291	.0456	.0416	1.0000
	(118)	(119)	(125)	(122)	(128)	(61)	(126)	(62)	(128)	(0)
	S= .407	S= .146	S= .444	S= .223	S= .199	S= .473	S= .373	S= .362	S= .321	S= .001

(Continued)

* Note: MNSED= sediment manganese, MNIW= interstitial water manganese, ASSED= sediment arsenic, ASIW= interstitial water arsenic, HGSED= sediment mercury, HGIW= interstitial water mercury, CRSED= sediment chromium, S= free sulfide.

** Matrix gives coefficients, number of points considered, and significance of coefficients.

Table 16 (Concluded)

	CF1	CF2	CF3	CF4	SILT	CLAY	PO4	NH4	SI
PH	.3773	.4092	-.1947	-.2154	-.0740	-.0226	-.0624	-.2681	-.1019
	(118)	(118)	(118)	(118)	(118)	(117)	(100)	(97)	(100)
	S= .001	S= .001	S= .017	S= .010	S= .213	S= .405	S= .269	S= .004	S= .157
EH	.2511	.2480	.0550	-.0528	-.1400	-.0651	.2673	-.3216	.0196
	(119)	(119)	(119)	(119)	(119)	(118)	(101)	(98)	(101)
	S= .003	S= .003	S= .276	S= .284	S= .064	S= .242	S= .003	S= .001	S= .423
MNSED	-.2273	-.2740	-.4731	-.2307	.6010	-.1037	-.1278	.4098	.0249
	(125)	(125)	(125)	(124)	(125)	(123)	(107)	(104)	(107)
	S= .005	S= .001	S= .001	S= .005	S= .001	S= .127	S= .095	S= .001	S= .400
MNIW	-.2801	-.3279	-.0997	.1137	.2198	-.0279	.0120	.1809	-.0224
	(122)	(122)	(122)	(121)	(122)	(120)	(110)	(107)	(110)
	S= .001	S= .001	S= .166	S= .107	S= .007	S= .381	S= .450	S= .029	S= .408
ASSED	.5107	.4903	-.3466	-.4903	.0389	-.0628	-.1073	-.0111	.0130
	(128)	(128)	(128)	(127)	(128)	(126)	(110)	(107)	(110)
	S= .001	S= .001	S= .001	S= .001	S= .331	S= .243	S= .132	S= .455	S= .446
ASIW	-.0774	-.0739	.2864	-.1857	-.1945	-.1030	-.0605	-.0316	.1444
	(61)	(61)	(61)	(60)	(61)	(59)	(60)	(56)	(60)
	S= .277	S= .286	S= .013	S= .078	S= .067	S= .219	S= .323	S= .408	S= .136
HGSED	.2672	.3461	-.2191	-.3024	.0254	-.0953	-.2140	.0439	-.1000
	(126)	(126)	(126)	(125)	(126)	(124)	(109)	(105)	(109)
	S= .001	S= .001	S= .007	S= .001	S= .389	S= .173	S= .013	S= .332	S= .152
HGIW	-.1257	-.0102	-.0726	-.0445	.1703	-.0927	-.1196	.0163	.0919
	(62)	(62)	(62)	(61)	(62)	(60)	(61)	(57)	(61)
	S= .165	S= .469	S= .287	S= .366	S= .092	S= .241	S= .179	S= .452	S= .241
CRSED	-.1650	-.1922	-.0938	-.0184	.2204	-.0666	-.1635	.1589	.0786
	(128)	(128)	(128)	(127)	(128)	(126)	(110)	(107)	(110)
	S= .031	S= .015	S= .146	S= .419	S= .006	S= .229	S= .044	S= .051	S= .207
S	-.1049	-.0919	.0892	.1076	-.0465	.0856	.0047	-.1210	-.0091
	(128)	(128)	(128)	(127)	(128)	(126)	(110)	(107)	(110)
	S= .119	S= .151	S= .158	S= .114	S= .301	S= .170	S= .481	S= .107	S= .463

Table 17

Pearson Correlation Coefficients Matrix for Sediments at Stations 17 and 19 (Reference Stations)

	PH *	EH	MNSED	MNIW	ASSED	ASIW	HGSED	HGIW	CRSED	S
PH	1.0000 **	-.2150	-.1824	.0945	-.0562	-.2830	.1582	.1960	-.0876	.1773
	(0)	(32)	(31)	(31)	(32)	(13)	(31)	(15)	(32)	(32)
	S= .001	S= .119	S= .163	S= .306	S= .380	S= .174	S= .198	S= .242	S= .317	S= .166
EH	-.2150	1.0000	.0597	.1457	-.0239	.1200	-.0867	-.1943	.2979	-.2837
	(32)	(0)	(31)	(31)	(32)	(13)	(31)	(15)	(32)	(32)
	S= .119	S= .001	S= .375	S= .217	S= .448	S= .348	S= .321	S= .244	S= .049	S= .058
MNSED	-.1824	.0597	1.0000	.1857	.0615	.0965	-.0778	-.0037	-.0131	-.1285
	(31)	(31)	(0)	(30)	(31)	(13)	(30)	(15)	(31)	(31)
	S= .163	S= .375	S= .001	S= .163	S= .371	S= .377	S= .341	S= .495	S= .472	S= .245
MNIW	.0945	.1457	.1857	1.0000	-.0796	-.0340	-.1406	-.1666	.0728	-.0729
	(31)	(31)	(30)	(0)	(31)	(13)	(30)	(15)	(31)	(31)
	S= .306	S= .217	S= .163	S= .001	S= .335	S= .456	S= .229	S= .276	S= .349	S= .348
ASSED	-.0562	-.0239	.0615	-.0796	1.0000	-.8395	.8880	.9050	-.5516	-.0210
	(32)	(32)	(31)	(31)	(0)	(13)	(31)	(15)	(32)	(32)
	S= .380	S= .448	S= .371	S= .335	S= .001	S= .001	S= .001	S= .001	S= .001	S= .455
ASIW	-.2830	.1200	.0965	-.0340	-.8395	1.0000	-.8869	-.9161	.7903	99.0000
	(13)	(13)	(13)	(13)	(13)	(0)	(13)	(12)	(13)	(13)
	S= .174	S= .348	S= .377	S= .456	S= .001	S= .001	S= .001	S= .001	S= .001	S=99.000
HGSED	.1582	-.0867	-.0778	-.1406	.8880	-.8869	1.0000	.9771	-.5310	.0320
	(31)	(31)	(30)	(30)	(31)	(13)	(0)	(15)	(31)	(31)
	S= .198	S= .321	S= .341	S= .229	S= .001	S= .001	S= .001	S= .001	S= .001	S= .432
HGIW	.1960	-.1943	-.0037	-.1666	.9050	-.9161	.9771	1.0000	-.5599	99.0000
	(15)	(15)	(15)	(15)	(15)	(12)	(15)	(0)	(15)	(15)
	S= .242	S= .244	S= .495	S= .276	S= .001	S= .001	S= .001	S= .001	S= .015	S=99.000
CRSED	-.0876	.2979	-.0131	.0728	-.5516	.7903	-.5310	-.5599	1.0000	-.1310
	(32)	(32)	(31)	(31)	(32)	(13)	(31)	(15)	(0)	(32)
	S= .317	S= .049	S= .472	S= .349	S= .001	S= .001	S= .001	S= .015	S= .001	S= .237
S	.1773	-.2837	-.1285	-.0729	-.0210	99.0000 †	.0320	99.0000	-.1310	1.0000
	(32)	(32)	(31)	(31)	(32)	(13)	(31)	(15)	(32)	(0)
	S= .166	S= .058	S= .245	S= .348	S= .455	S=99.000	S= .432	S=99.000	S= .237	S= .001

(Continued)

* Note: MNSED= sediment manganese, MNIW= interstitial water manganese, ASSED= sediment arsenic, ASIW= interstitial water arsenic, HGSED= sediment mercury, HGIW= interstitial water mercury, CRSED= sediment chromium, S= free sulfide.

** Matrix gives coefficients, number of points considered, and significance of coefficients.

† 99.0000= uncomputable

Table 17 (Concluded)

	CF1	CF2	CF3	CF4	SILT	CLAY	PO4	NH4	SI
PH	.5325	.1202	.2319	.1488	-.2241	-.2762	.1052	.1071	.0595
	(32)	(32)	(32)	(32)	(32)	(32)	(28)	(28)	(28)
	S= .001	S= .254	S= .101	S= .208	S= .109	S= .063	S= .297	S= .294	S= .382
EH	-.1189	.2666	.1702	.1740	-.1942	.0637	-.0625	-.5728	-.5237
	(32)	(32)	(32)	(32)	(32)	(32)	(28)	(28)	(28)
	S= .257	S= .070	S= .176	S= .170	S= .143	S= .364	S= .376	S= .001	S= .002
MNSED	.0041	.1010	.0156	.0018	-.1246	.1903	-.4335	.4161	.4442
	(31)	(31)	(31)	(31)	(31)	(31)	(27)	(27)	(27)
	S= .491	S= .294	S= .467	S= .496	S= .252	S= .153	S= .012	S= .015	S= .010
MNIW	.1820	-.0145	.0263	.2283	-.1350	-.1216	-.1406	.3964	.2729
	(31)	(31)	(31)	(31)	(31)	(31)	(27)	(27)	(27)
	S= .164	S= .469	S= .444	S= .108	S= .235	S= .257	S= .242	S= .020	S= .084
ASSED	-.1630	-.5448	-.4090	-.4856	.5220	.2466	-.0123	.0572	.0925
	(32)	(32)	(32)	(32)	(32)	(32)	(28)	(28)	(28)
	S= .186	S= .001	S= .010	S= .002	S= .001	S= .087	S= .475	S= .386	S= .320
ASIW	.3701*	.4031	.1636	.0874	-.4469	.3251	-.0469	-.2231	-.1876
	(13)	(13)	(13)	(13)	(13)	(13)	(12)	(12)	(12)
	S= .107	S= .086	S= .297	S= .388	S= .063	S= .139	S= .443	S= .243	S= .280
HGSED	-.0461	-.3181	-.2254	-.2984	.3202	.1027	-.0196	.0301	-.0097
	(31)	(31)	(31)	(31)	(31)	(31)	(27)	(27)	(27)
	S= .403	S= .041	S= .111	S= .051	S= .040	S= .291	S= .461	S= .441	S= .481
HGIW	-.3125	-.3317	-.2212	-.3005	.3804	.0130	-.0870	.0038	.0781
	(15)	(15)	(15)	(15)	(15)	(15)	(13)	(13)	(13)
	S= .128	S= .114	S= .214	S= .138	S= .081	S= .482	S= .389	S= .495	S= .400
CBSED	.0258	.5727	.2378	.4798	-.4738	-.1994	-.0017	-.1317	-.0960
	(32)	(32)	(32)	(32)	(32)	(32)	(28)	(28)	(28)
	S= .444	S= .001	S= .095	S= .003	S= .003	S= .137	S= .497	S= .252	S= .313
S	.0640	-.0712	-.1027	-.0563	.0750	.0006	-.0779	.0868	.1407
	(32)	(32)	(32)	(32)	(32)	(32)	(28)	(28)	(28)
	S= .364	S= .349	S= .288	S= .382	S= .342	S= .499	S= .347	S= .330	S= .238

Table 18

Effect of Storage Upon Concentration of Arsenic in Interstitial Waters

Sample No.	Arsenic Concentration* As1 11/76	As2 5/77	As1 - As2	Percent change in As concentration $\frac{As1 - As2}{As1}(100)$
3-2-T	0.026	0.016	-0.01	-38
5-2-B	0.034	0.013	-0.021	-62
6-2-T	0.179	0.056	-0.123	-69
6-1-B	0.163	0.068	-0.095	-58
7-2-B	0.070	0.025	-0.045	-64
8-1-B	0.108	0.044	-0.064	-59
8-2-B	0.106	0.057	-0.049	-46
9-2-T	0.013	0.043	+0.03	+231
9-2-B	0.182	0.069	-0.113	-62
11-1-T	0.028	0.018	-0.010	-36
11-2-T	0.028	0.020	-0.008	-29
11-2-B	0.043	0.048	+0.005	+12
20-1-T	0.059	0.025	-0.034	-58
20-2-B	0.053	0.013	-0.04	-75

*Note: All concentrations in mg/l.
Percent change in arsenic concentration = -75% to +231%;
mean decrease in arsenic concentration after 6 months = -55% (12 samples);
and mean increase in arsenic concentration after 6 months = +122% (2 samples.

Table 19

Effect of Storage and Sample Size Upon Concentration of Mercury in Interstitial Waters

Sample No.	Mercury concentration* 11/76	6/77	Sample size ml	Change in Hg concentration	Percent change in Hg concentration
17-2-B	18	14	0.53	4	22
13-2-T	9	5	4.0	4	44
19-2-T	10	2	7.7	8	80
20-1-B	22	3	5.5	19	86

*Note: All concentrations in µg/l.

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Sugai, S

Aquatic disposal field investigations, Duwamish Waterway disposal site, Puget Sound, Washington; Appendix D: Chemical and physical analyses of water and sediment in relation to disposal of dredged material in Elliott Bay; Volume II: September-December 1976 / by S. Sugai ... [et al.], University of Washington, College of Fisheries, Laboratory of Radiation Ecology, Seattle, Washington. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.

24, [106] p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; D-77-24, Appendix D, v.2)

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Tables 1-19 on microfiche in pocket.

References: p. 24.

1. Aquatic environment. 2. Bottom sediment. 3. Chemical analysis. 4. Dredged material. 5. Dredged material disposal.

(Continued on next card)

Sugai, S

Aquatic disposal field investigations, Duwamish Waterway disposal site, Puget Sound, Washington; Appendix D: Chemical and physical analyses of water and sediment ... 1978. (Card 2)

6. Duwamish Waterway. 7. Elliott Bay. 8. Field investigations. 9. Waste disposal sites. 10. Water analysis. 11. Water quality. I. United States. Army. Corps of Engineers. II. Washington (State). University. Laboratory of Radiation Ecology. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; D-77-24, Appendix D, v.2)

TA7.W34 no. D-77-24 Appendix D v.2