PNL-6442
UC-11, 70

Status Report on Remedial Investigation of the 300 Area Process Ponds

D. I. Dennison
D. R. Sherwood
J. S. Young

September 1989

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

Battelle

PNL-6442

DISCLAIMER

This program was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any or their employees, makes **any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.** Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government of any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831;
prices available from (615) 576-8401. FTS 626-8401.

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

NTIS Price Codes, Microfiche A01

Printed Copy

Pages	Price Codes
001-025	A02
026-050	A03
051-075	A04
076-100	A05
101-125	A06
126-150	A07
151-175	A08
176-200	A09
201-225	A10
226-250	A11
251-275	A12
276-300	A13

3 3679 00048 9759

PNL-6442
UC-11,70

STATUS REPORT ON REMEDIAL INVESTIGATION OF THE 300 AREA PROCESS PONDS

D. I. Dennison
D. R. Sherwood
J. S. Young

September 1989

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

PREFACE

Remedial investigation of the 300 Area Process Ponds was initiated in 1987 in accordance with the then existing U.S. Department of Energy (DOE) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program described in DOE Order 5480, Chapter 14. Subsequently, the Hanford Site was proposed as a candidate for inclusion on the U.S. Environmental Protection Agency's (EPA) National Priorities List (NPL). Nomination to the NPL requires compliance with the CERCLA/SARA (Superfund Amendments and Reauthorization Act) Remedial Investigation/Feasibility Study (RI/FS) process. Consequently, further investigations in the 300 Area will proceed with an EPA-approved RI/FS Work Plan and according to provisions contained in the Hanford Federal Facility Agreement and Consent Order. The data in this report will be used in preparing RI/FS Work Plans for the 300 Area Operable Units. After work plan approval, the data may be audited to determine their suitability for future use as RI input.

ABSTRACT

A remedial investigation (RI) of the South and North Process Ponds adjacent to the 300 Area at the U.S. Department of Energy (DOE) Hanford Site was initiated in FY 1987 as partial implementation of the DOE Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program. The objective of FY 1987 activities was initial characterization of the quantity and distribution of contaminants in the sediments. Sediment samples from 14 locations in and adjacent to the ponds were collected and analyzed. Initial results indicated that contaminated sediments in the ponds typically contained high gross alpha and gross beta activities and concentrations of Ag, Al, Cr, Cu, Ni, and Zn that were elevated relative to background levels. Radiochemical analyses of the sediments showed that the primary radiological contaminant was uranium; cobalt-60 and cesium-137 were detected in several samples. Organic compounds, including polychlorinated biphenyls (PCBs), were also detected in several samples. Future RI activities will be undertaken under EPA-approved RI/FS work plans.

EXECUTIVE SUMMARY

A remedial investigation (RI) of the South and North Process Ponds adjacent to the 300 Area at the U.S. Department of Energy (DOE) Hanford Site was performed during 1987. The 300 Area Process Ponds were used from 1943 to 1975 for disposal of radioactively (principally uranium) and chemically contaminated wastewaters from laboratories and fuels fabrication facilities in the 300 Area. This RI was initiated under the guidance of DOE Order 5480.14, but with the enactment of the Superfund Amendments and Reauthorization Act (SARA) in October 1986, specifically Section 120 (Federal Facilities Compliance), the regulatory aspects governing this investigation were altered. Independent of the changing regulatory considerations, the 300 Area Process Ponds were identified as high-priority sites requiring site characterization.

This report describes the results of work performed as part of the RI of the ponds during FY 1987. The first phase of the RI process under SARA is to establish the extent of contamination and other important characteristics of a waste disposal facility. The purposes of site characterization are to determine if potential public health or environmental hazards exist at a site and to provide the basic information needed to assess remedial action alternatives. Activities during FY 1987 were primarily concerned with sampling and analysis of subsurface sediments to characterize the quantity and distribution of contaminants in and beneath the ponds. Review of existing data for other environmental media (i.e., ground water and surface water) indicated that some of these data will be useful for assessing the contribution to ground-water and/or surface-water contamination from the ponds.

Sediment samples were collected from excavations at 14 locations in and adjacent to the ponds. The samples were analyzed for several inorganic, organic, and radioactive hazardous substances. In addition, geochemical characterization of the sediments through the use of x-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive x-ray microanalysis (EDS) began.

Initial RI results indicated that contamination in the process ponds was typically associated with greenish sediments that contained high gross alpha

and gross beta activities and elevated concentrations of Ag, Al, Cr, Cu, Ni, and Zn relative to background levels. Additionally, As, F, Hg, Pb, Sb, Sr, V, and nitrate were present in concentrations above background levels at several locations in both ponds. Radiochemical analyses of the sediments showed that the primary radiological contaminant was uranium. Cobalt-60 and ^{137}Cs were also detected in several samples from both ponds. The highest activities and concentrations of the contaminants were found in sediments from the settling basins located on the west sides of both ponds. Contaminant concentrations tended to decrease with distance and with depth from the former inlets to the ponds. With the exception of one location in the North Pond, the contaminant concentrations approached background levels within 3 to 4 ft of the sediment surface. Several organic compounds were found in sediments at several locations in the ponds. The detection of polychlorinated biphenyls (PCBs) in several samples was of particular interest. There is no record of PCB disposal in the ponds.

Review of the existing data for ground-water samples collected beneath the 300 Area indicated that uranium was the only contaminant consistently found at elevated concentrations in wells near the ponds. A measurable plume of uranium exists in the ground water beneath the 300 Area; however, it is clear that there are other sources of uranium (e.g., the 300 Area Process Trenches) within the area. Other contaminants found in 300 Area ground-water samples included nitrate, fluoride, chromium, trichloroethylene perchloroethylene, and 1,2-dichloroethylene. No ground-water monitoring data were available for PCBs.

It is recommended that remedial investigation of the 300 Area Process Ponds continue, with primary focus on characterizing the horizontal extent of contamination through near-surface sediment sampling. Continued geochemical characterization of the sediments is needed to provide data on the release of hazardous substances from the sites. Sampling of biological media in and around the ponds will help to identify environmental impacts from the ponds. Initiation of ground-water monitoring for PCBs is also recommended.

CKNOWLEDGMENTS

Numerous people were responsible for conducting site characterization activities for the 300 Area Process Ponds during FY 1987. Important contributions were made by those people who collected samples, maintained equipment, provided laboratory analyses, managed data, and provided clerical support. Planning of site characterization work was principally conducted by C. J. English of ICF Northwest and D. A. Lamar of PNL. Historical and process information, essential to the planning, sampling, and data interpretation activities, was provided by R. B. Hall, E. A. Weakley, and M. G. Zimmerman of Westinghouse Hanford Company (WHC). Sampling operations were directed by C. A. Dupuis and D. L. Pursley of WHC. Technical guidance for this project was provided by J. C. Evans, T. J. McLaughlin, and R. J. Serne of PNL. Numerous PNL and WHC personnel provided technical reviews of this report.

CONTENTS

PREFACE iii

ABSTRACT v

EXECUTIVE SUMMARY vii

ACKNOWLEDGMENTS ix

1.0 INTRODUCTION 1.1

1.1 OBJECTIVE 1.1

1.2 SITE LOCATION AND HISTORY 1.4

1.3 GEOLOGY AND GEOHYDROLOGY OF THE 300 AREA 1.7

2.0 WORK PLAN APPROACH 2.1

3.0 FIELD DATA COLLECTION 3.1

3.1 RADIATION MONITORING 3.1

3.2 SUBSURFACE SEDIMENT SAMPLING 3.2

3.3 SURFACE SEDIMENT SAMPLING 3.5

3.4 GROUND-WATER SAMPLING 3.5

4.0 LABORATORY ANALYSIS 4.1

5.0 GEOCHEMICAL CHARACTERIZATION OF SEDIMENTS 5.1

6.0 SITE CHARACTERIZATION RESULTS 6.1

6.1 SUBSURFACE SEDIMENT DATA 6.1

6.2 GROUND-WATER DATA REVIEW 6.18

7.0 CONCLUSIONS 7.1

8.0 RECOMMENDATIONS 8.1

9.0 REFERENCES 9.1

APPENDIX A - WHC PROCEDURE A13057, INACTIVE WASTE SITE SOIL SAMPLING PROCEDURE ..... A.l

APPENDIX B - ANALYTICAL RESULTS ..... B.l

FIGURES

1 Hanford Site 1.2

2 Location of 300 Area Process Ponds 1.3

3 General Layout of South Process Pond. 300 Area 1.6

4 Genera1 Layout of North Process Pond. 300 Area 1.7

5 300 Area Ground-Water Monitoring Wells 2.2

6 Subsurface Sediment Sample Locations. South Process Pond. 300 Area 3.2

7 Subsurface Sediment Sample Locations. North Process Pond. 300 Area 3.3

8 Photomicrograph of Layered Green-and-White Grain from Sample 316002A02 ..... 6.9

9 Backscattered SEM Image of Grain Shown in Figure 8 ..... 6.11

10 Scanning Electron Micrograph of Grain Shown in Figure 8 ..... 6.11

11 X-Ray Spectrum of Area R1 (Figure 10): Calcium Predominates ... 6.12

12 X-Ray Spectrum of Area R2 (Figure 10): Copper Predominates 6.12

13 Backscattered SEM Image of Uranium Particle on Surface of Green-and-White Grain from Sample 316002A02 ..... 6.13

14 Uranium Concentrations in Ground Water Beneath the 300 Area During 1986 ..... 6.20

TABLES

1 Summary of Operational Data for **300** Area Process Ponds 1.5

2 Analytical Parameters and Methods for **300** Area Process Pond Characterization 4.1

3 Average Concentrations of Constituents in Background Soils from **300** Area Process Ponds 6.2

4 Concentrations of Inorganic Constituents in Contaminated Sediments from the South Process Pond, **300** Area 6.4

5 Concentrations of Inorganic Constituents in Contaminated Sediments from the North Process Pond, **300** Area 6.5

6 Estimated Contaminant Inventory for South and North Process Ponds, **300** Area 6.6

7 Radiochemical Results for Sediment Samples from the North and South Process Ponds, **300** Area 6.7

8 Summary of Organic Substances in Sediment Samples from the South Pond, **300** Area 6.15

9 Summary of Organic Substances in Sediment Samples from the North Pond, **300** Area 6.16

10 Concentrations of Constituents in Fly Ash Samples from North Process Pond, **300** Area 6.19

B.1 Key to Constituent Names in Data Tables B.1

1.0 INTRODUCTION

1.1 OBJECTIVE

Pacific Northwest Laboratory (PNL), in cooperation with Westinghouse Hanford Company, undertook a remedial investigation (RI) for the two inactive process ponds located next to the 300 Area at the U.S. Department of Energy (DOE) Hanford Site (Figures 1 and 2). This RI began under the guidance of the DOE Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program conducted under DOE Order 5480.14. The 300 Area Process Ponds were selected for site characterization on the basis of the recommendations of the DOE CERCLA Program's Phase I Installation Assessment[a].

The objectives of Phase I were to locate sites, to conduct preliminary assessment and inspection, and to score sites using the Environmental Protection Agency's Hazard Ranking System (HRS) and DOE's Modified Hazard Ranking System (mHRS). The 300 Area Process Ponds were assigned an HRS/mHRS migration score of 79.28 each, the highest scores attained by any inactive Hanford site and greater than the value of 28.5 used by the EPA to determine whether further site characterization action should be conducted. The 300 Area Process Ponds were selected for the first RI to be performed on the Hanford Site on the basis of the best available engineering judgment (e.g., proximity to population and distance to ground water and surface water).

Enactment of the Superfund Amendments and Reauthorization Act (SARA) in October 1986, specifically Section 120 (Federal Facilities Compliance), altered the regulatory aspects governing this investigation. As part of this regulatory process, the Hanford Site was proposed for nomination to the National Priorities List (NPL) requires rigorous compliance with the RI/FS process. Further RI work will proceed with an EPA-approved RI/FS Work Plan and according to provisions contained within the Hanford Federal Facility Agreement and Consent Order.

(a) U.S. Department of Energy (DOE). 1986. Draft Phase I Installation Assessment of Inactive Waste-Disposal Sites at Hanford, Richland, Washinston. U.S. Department of Energy, Richland, Washington.

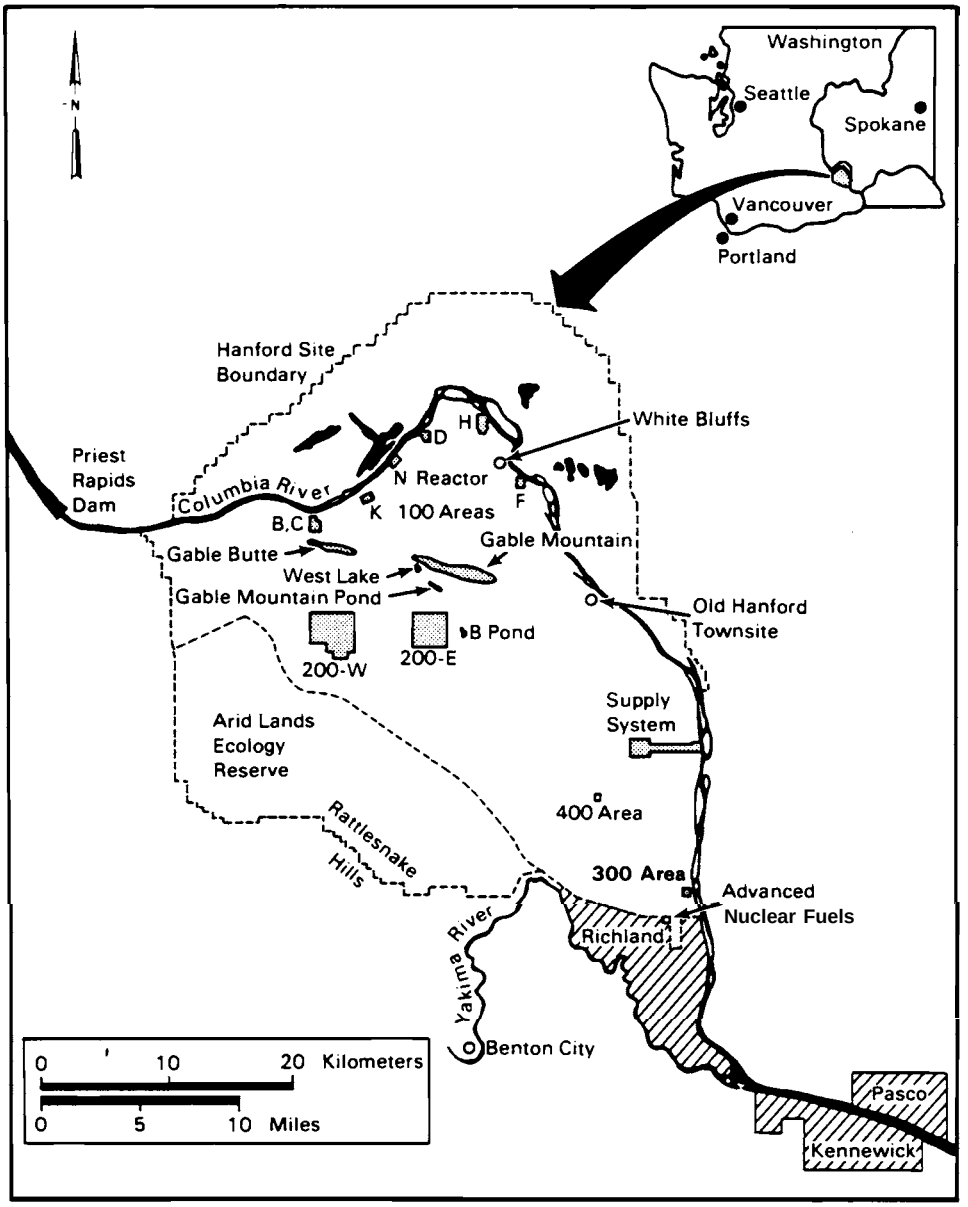

Figure 1. Hanford Site

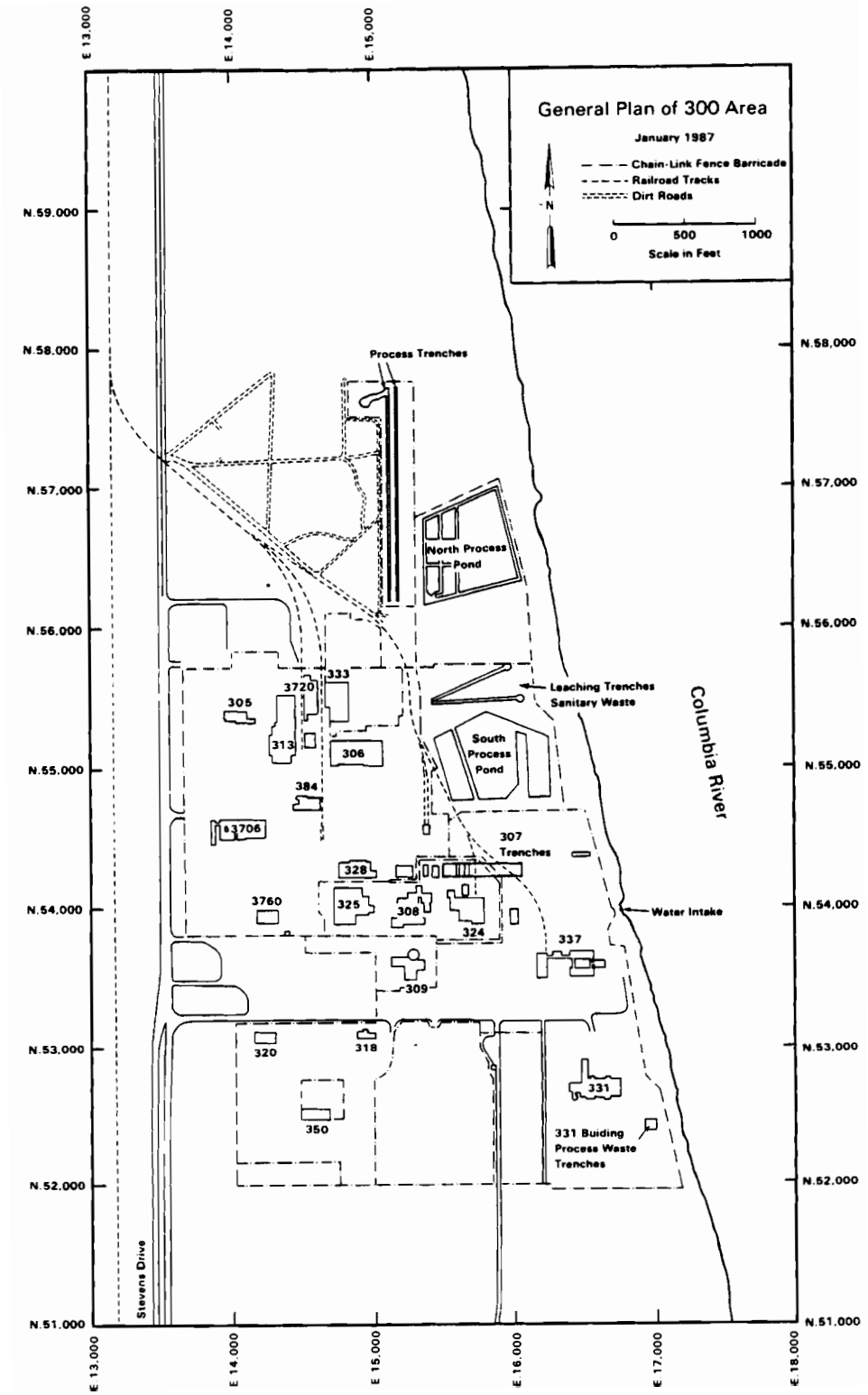

Figure 2. Location of 300 Area Process Ponds

This report describes the results of work performed as part of the RI of the 300 Area Process Ponds during FY 1987. The work corresponds to Level I of site characterization, as described in the general RI methodology plan for Hanford[a], and some Level II sampling and analysis, as outlined in the site-specific plan for the Process Ponds (ICF 1987). In addition, some initial interpretations of the data collected thus far in the investigation are presented.

1.2 SITE LOCATION AND HISTORY

The 300 Area Process Ponds are two inactive unlined surface impoundments located at the DOE Hanford Site in Benton County in south-central Washington State (Figures 1 and 2). The two impoundments, known as the South Pond (facility number 316-1) and the North Pond (facility number 316-2), are located east and north of the Hanford 300 Area (Figure 2). The ponds are approximately 300 ft west of the Columbia River and approximately 3 miles north of the city of Richland.

The South and North Process Ponds were constructed in 1943 and 1948, respectively, and used for disposal of radioactively (principally uranium) and chemically contaminated wastewaters from the 300 Area. The North Pond was built in response to a dike failure in the South Pond in 1948, which released liquid into the Columbia River. The South Pond was later repaired and the two ponds were operated simultaneously or alternately until retired in 1975. A summary of operational data for the 300 Area Process Ponds is given in Table 1. Until late 1986, the east infiltration basin of the South Pond was kept active for the disposal of water treatment filter backwash.

The ponds were operated as a series of basins (Figures 3 and 4). The South Pond consisted of three small settling basins and two infiltration basins separated by dikes approximately 15 ft high. The North Pond consisted of six small settling basins and one infiltration basin. The three settling basins on the west side of the North Pond were replaced in 1961 or 1962, and the original basins were retained for sediment disposal. The inlet to the

---

(a) Lamar, D. A., and T. J. McLaughlin. 1987. Draft Remedial Investigation Methodology Plan for the Inactive Waste Site Surveillance Project. Pacific Northwest Laboratory, Richland, Washington.

TABLE 1. Summary of Operational Data for 300 Area Process Ponds

Characteristics	South Pond	North Pond
Period of use	1943-1975	1948-1975
Bottom area	8.1 acres (3.3 ha)	10 acres (4.0 ha)
Depth to water table	33 ft (10 m)	33 ft (10 m)
Rate of inflow	410,000 to 2,000,000 gal/day	
Total uranium received	More than 62,000 kg	
Other radionuclides received	Pu, 55 mCi; ^{60}Co, trace; ^{234}Th, trace	
Unplanned releases	^{147}Pm, 750 mCi, 1967; Pu, 1950, trace	
Nonradioactive constituents received	Copper, approximately 110,000 kg	
pH range of pond influent[a]	1.8 to 11.4	
Significant process changes	(1) Changes in-314 Bldg. in 1953 reduced soluble and insoluble U discharges to ponds	
	(2) New laboratory facilities in 1954 eliminated routine Pu and fission product discharges to ponds	
	(3) Copper discharges from N Reactor fuel fabrication, 1959-1974	
	(4) Thorium fuel fabrication in 1969	

(a) The pH of the waste streams to the ponds varied over time as changes occurred in fuel fabrication operations in the 300 Area.

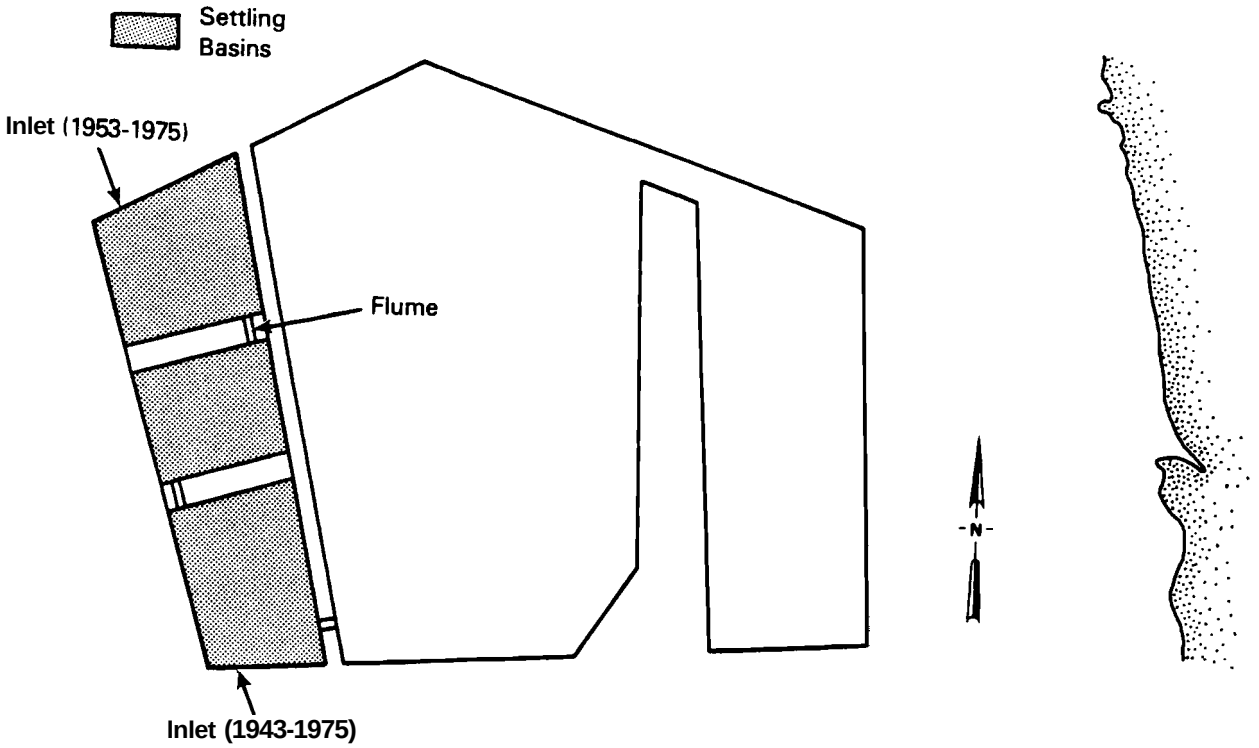

Figure 3. General Layout of South Process Pond, 300 Area

South Pond was originally located at its southwest corner. In 1953, a new process sewer allowing simultaneous or alternating use of the ponds was connected to a new inlet at the northwest corner of the South Pond. The inlet for the North Pond was at the southwest corner'. Influents entered the first of the settling basins and overflowed to the remaining basins through flumes constructed in the tops of the dikes. Operation of the ponds in this manner allowed removal of suspended and particulate contamination in the settling basins. The ponds were designed with no outlet structure so that all water would either infiltrate or evaporate. To improve infiltration, the ponds were periodically dredged and the dredged sediments were disposed by spreading on impoundment dikes and by burial in adjacent areas. Since closure, several of the dikes between the basins have been removed; uncontaminated material from the dikes was placed on the bottom of the basins to control wind erosion of contaminated sediments.

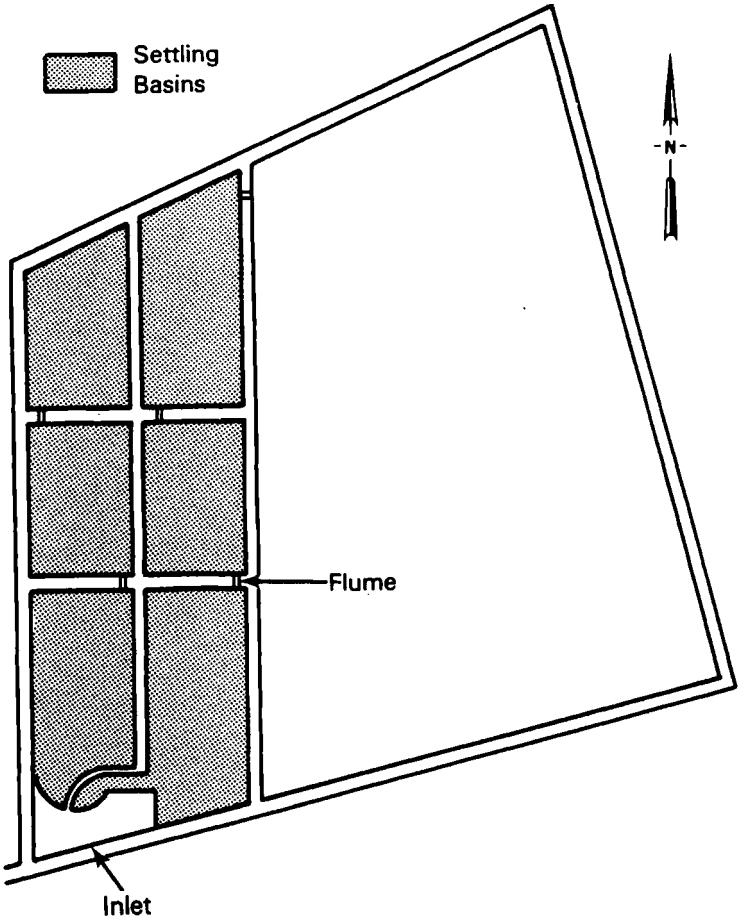

Figure 4. General Layout of North Process Pond., 300 Area

1.3 GEOLOGY AND GEOHYDROLOGY OF THE 300 AREA

The geology of the 300 Area is discussed in detail by Lindberg and Bond (1979). The main geologic units beneath the 300 Area include, in ascending order, the Columbia River Basalt Group, the Ringold Formation, and a series of glaciofluvial sediments informally known as the Hanford formation. The Columbia River Basalt Group is a thick series of basalt flows that form the bedrock beneath the Hanford Site (including the 300 Area). The basalts have been folded into a series of anticlines and synclines. The 300 Area is located in the Pasco Syncline with the top of the basalts at a depth of about 200 ft below land surface.

The Ringold Formation overlies the basalts and is approximately 120 ft thick at the location of the Process Ponds. The lower part of the formation

consists of approximately 40 ft of silt and clay with occasional sand and gravel. These deposits are overlain by a complex association of gravel and sand with occasional silt and clay lenses.

The Hanford formation in the 300 Area consists of coarse-grained deposits known as Pasco Gravels. The deposits are typically graded, with boulders at the base of each sequence, and range upward through cobbles, gravels, and sand. Blocks of silt, thin layers of caliche ($CaCO_3$), and carbonate coatings on the gravels also occur sporadically. The Pasco Gravels beneath the 300 Area are approximately 50 to 60 ft thick.

Surface sediments at and near the 300 Area consist of eolian deposits of sand and silt. These deposits have locally formed dunes, especially north and southwest of the 300 Area. In the vicinity of the Process Ponds, these deposits are thin.

The hydrogeology of the 300 Area is also described by Lindberg and Bond (1979). Ground water is found beneath the Process Ponds in both unconfined and confined aquifers. The uppermost aquifer, which is unconfined, is the most likely to be affected by current and past waste disposal operations in the 300 Area. The unconfined aquifer beneath the Process Ponds occurs in the Pasco Gravels and Ringold Formation. Depth to the water table beneath the ponds is less than 40 ft. The flow direction of the unconfined aquifer at the 300 Area is generally to the east toward the Columbia River but at any given time is subject to both natural and man-made influences. During periods of high river levels, gradient reversal and bank storage can occur. The aquifer is recharged locally by discharges to active liquid waste disposal units. The largest source of recharge is the 300 Area Process Trenches, which are located approximately 300 ft west of the North Pond (Figure 2). These trenches receive approximately 1,000,000 gal/day of process wastewaters. There is some slight mounding of ground water beneath the Process Trenches, increasing the water table gradient and flow divergence.

The transmissivity of the unconfined aquifer, as determined from aquifer tests on a well near the ponds, is on the order of 100,000 ft^2/day. A ground-water model of the 300 Area, which used transniissivity values ranging

from 20,000 to 2,000,000 ft^2/day for the area near the Process Ponds (Lindberg and Bond 1979), predicted ground-water travel times from the 300 Area to the Columbia River to be on the order of weeks to months.

2.0 WORK PLAN APPROACH

The work plan (ICF 1987) for site characterization for the 300 Area Process Ponds was developed by ICF Northwest under subcontract to PNL. The work plan summarized an initial evaluation of existing data and background information and defined the scope of the site characterization activities. Data that specifically characterize contamination associated with the ponds are needed (ICF 1987). Data for some media (e.g., ground water and surface water) are substantial, but data for other media (e.g., surface and subsurface sediments) are lacking. Existing ground-water and surface-water data were collected as part of other Hanford programs and, therefore, were collected to satisfy objectives different from those of the RI. The RCRA Compliance Ground-Water Monitoring Project for the 300 Area Process Trenches and the Hanford Site-Wide Ground-Water Program provide analytical data on ground-water samples taken from wells adjacent to the North and South Ponds (Figure 5). The Hanford Surface-Water Monitoring Program provides similar data on samples taken from the Columbia River at the surface-water monitoring station identified in Figure 5. It is likely, however, that some of these data will be useful for assessing the contribution to ground-water and/or surface-water contamination from the ponds. The primary focus of the work performed in FY 1987 was to identify substances of potential concern present in the sediments in and beneath the ponds and to begin to characterize the horizontal and vertical distribution of these substances. Information on the extent of sediment contamination would be combined with available ground-water data to assist in defining the potential hazards and evaluating remedial action alternatives associated with the North and South Ponds. To achieve this goal, sediment samples were taken at various depths from excavations at locations in and adjacent to the ponds. The rationale behind selection of sampling locations, and the sampling methods used, are described in Section 3.2.

Quality assurance requirements for site characterization activities are specified in PNL QA plans OHE-1 and OHE-1C.

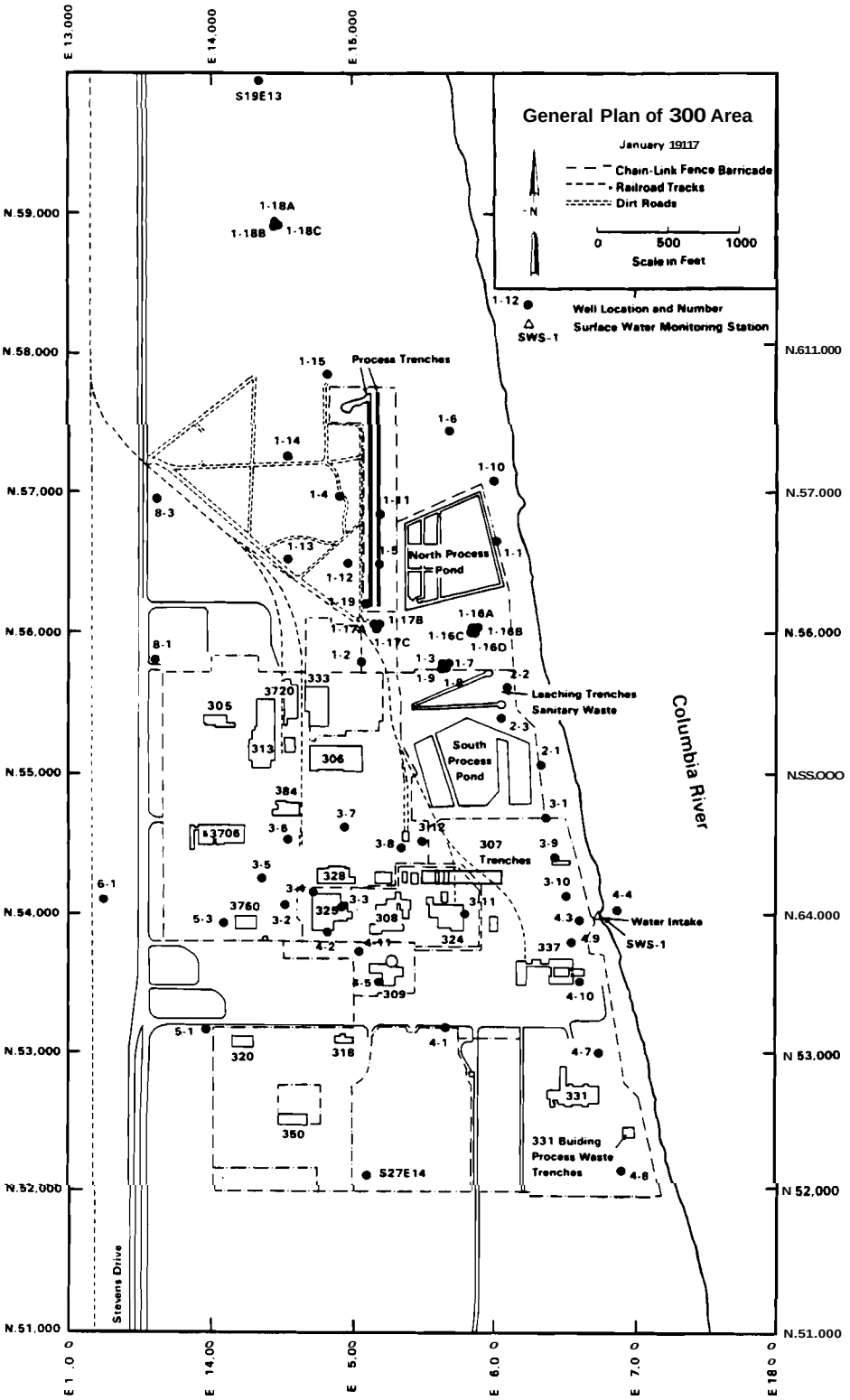

Figure 5. 300 Area Ground-Water Monitoring Wells

3.0 FIELD DATA COLLECTION

Field data collection activities during FY 1987 were primarily concerned with subsurface sediment sampling. Results of these activities are briefly discussed in the following sections.

3.1 RADIATION MONITORING

Surface radiation monitoring was performed by vehicle-mounted instruments before excavation of 14 sample locations in and adjacent to the South and North Ponds (Figures 6 and 7) and by hand-held instruments during excavation and sampling. The primary objective of the surface radiation monitoring was to determine health and safety requirements for work within the ponds. Access limitations restricted the survey with vehicle-mounted instruments to the large basin of each pond and the roads surrounding the ponds. This survey indicated that surface radiation was generally near background levels [approximately 50 counts per minute (cpm)] throughout the large basin of the North Pond, with the exception of one isolated area in the northwest corner of the basin. Further examination of this area with hand-held instruments indicated that surface radiation levels approximately 40 times greater than background extend roughly 20 ft from the former inlet to the basin. Similarly, measurements in the large basin of the South Pond, with the exception of an area in the southwest corner near the former inlet to the basin, were near background. Subsequent measurements with hand-held instruments indicated radiation levels approximately 6 times greater than background. No levels greater than background were measured during the survey of roads surrounding the ponds.

Before excavation at the sampling locations, surface radiation measurements were taken with hand-held instruments to determine the extent of surface contamination as well as the need for additional protective clothing or air-monitoring devices. Measurements, particularly of areas with obvious contamination (e.g., greenish-tinted sediments), were taken as the excavation progressed. In almost all instances, radiation levels greater than background were detected only in surface material or to a depth of a few feet. A notable exception was the level of radiation detected at location N-1

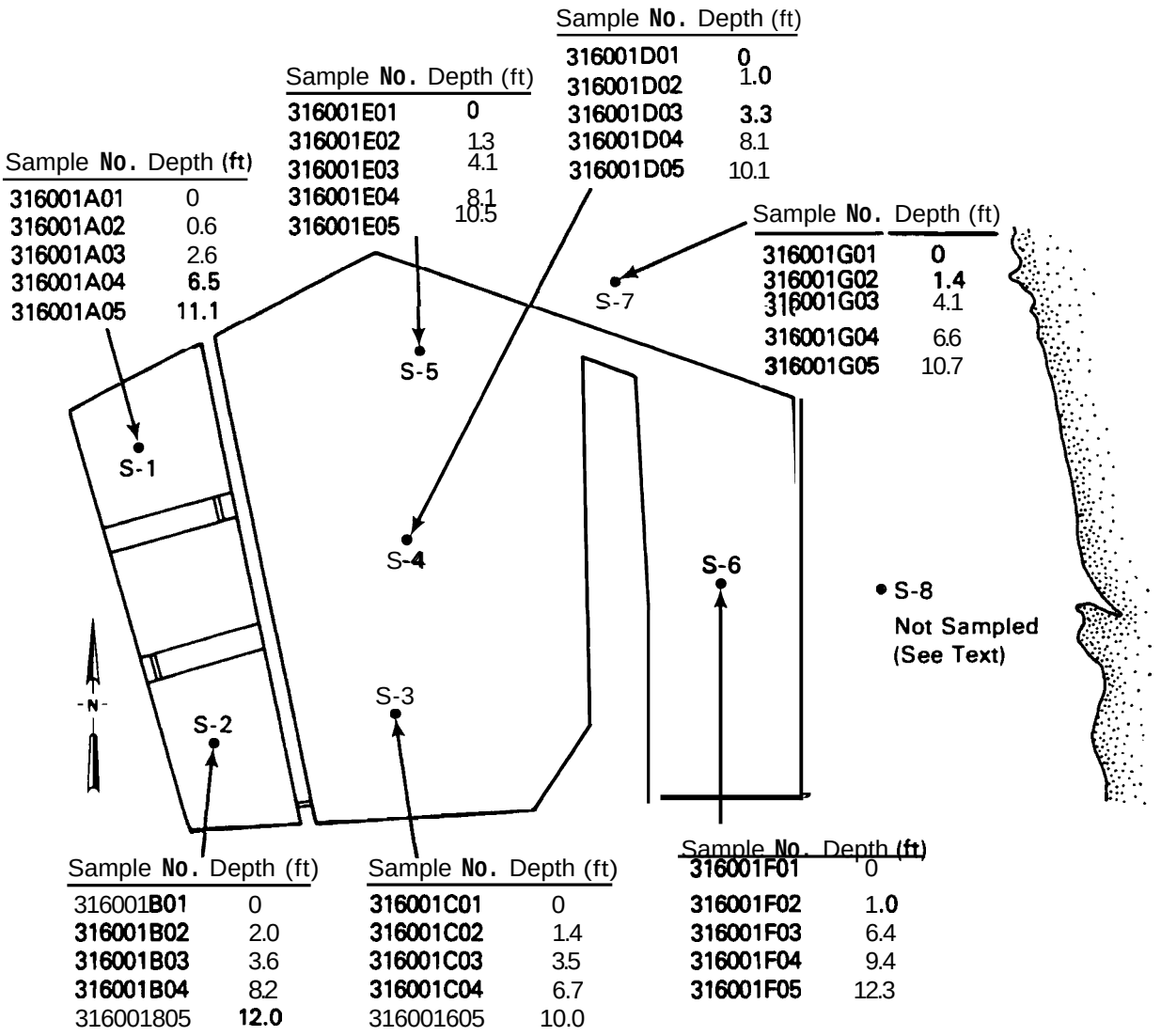

Figure 6. Subsurface Sediment Sample Locations, South Process Pond, 300 Area

(Figure 7), where contaminated sediments had been covered with approximately 8 ft of fly ash. Radiation measurements in the sediment below the fly ash decreased with depth but were greater than background to a depth of approximately 17 ft below the surface of the fly ash. Further detail on radiological contamination of the sediments can be found in Section 6.1.

3.2 SUBSURFACE SEDIMENT SAMPLING

Subsurface sediment samples were collected from 14 excavations in and adjacent to the Process Ponds (Figures 6 and 7). The number of sampling

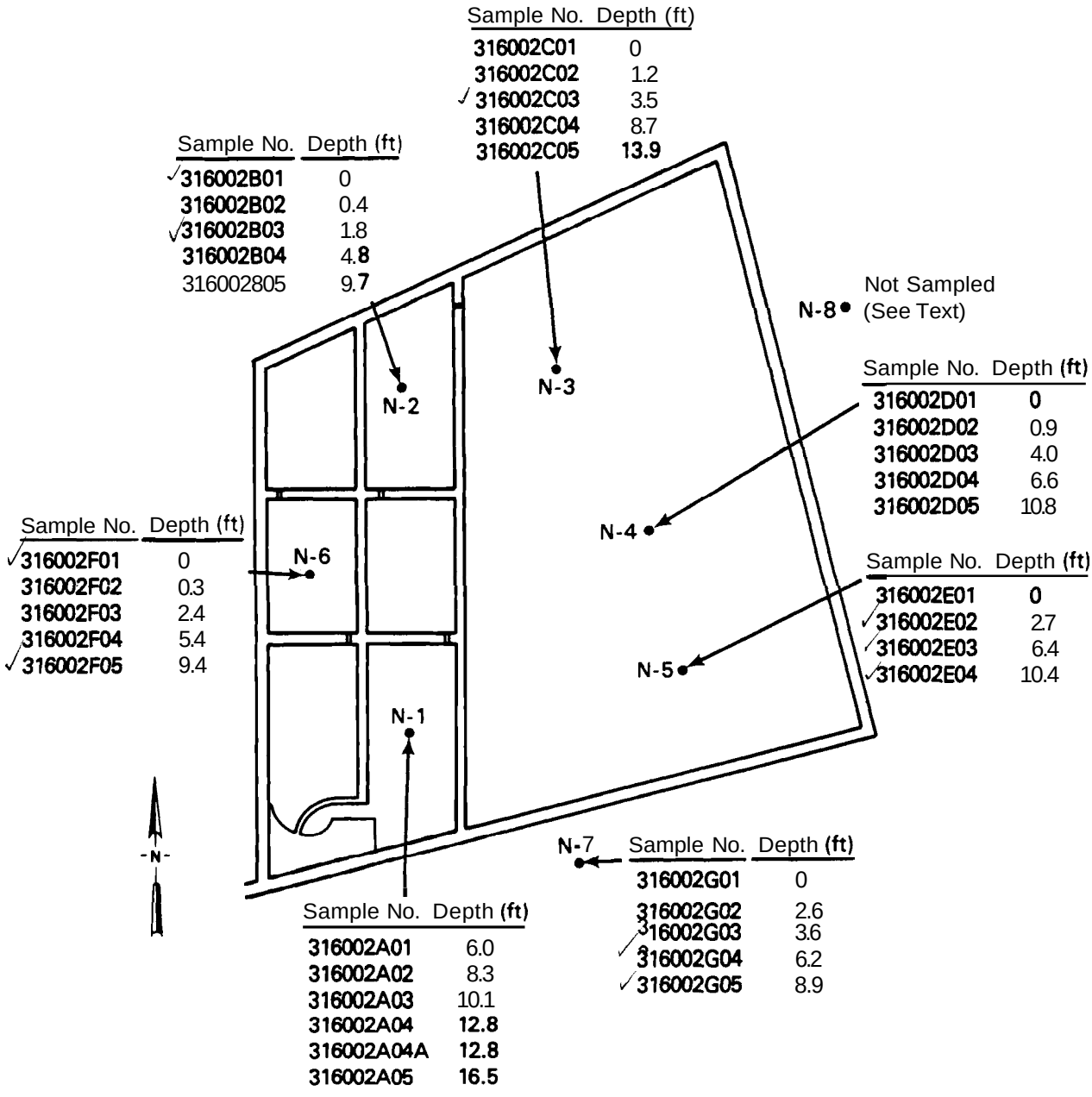

Figure 7. Subsurface Sediment Sample Locations, North Process Pond, 300 Area

locations deviated from the 16 locations specified in the work plan (ICF 1987) to avoid disturbing archaeological sites between the ponds and the Columbia River. Plans for excavations at locations N-8 and S-8 were abandoned after a Cultural Resources Survey conducted by PNL placed both these locations within the boundaries of archaeological site 45BN30 (Chatters 1987).

The sample locations were designed to gain an understanding of the distribution and movement of contaminants following discharge to the ponds (ICF 1987). The contaminants released to the ponds as precipitates, or already associated with suspended material, would be expected to settle quickly after discharge. The highest level of these contaminants along with those discharged as solutes that subsequently precipitated should be found at the surface and close to the inlet. Contaminants discharged as solutes that did not precipitate in the pond should be distributed in approximately the same concentrations over the entire pond area. The vertical distribution of these contaminants should depend on the nature of their interactions with the underlying glaciofluvial sediments. Those contaminants that interacted rapidly and strongly with the sediments should be found in highest concentrations near the surface. Those that interacted less strongly should be more evenly distributed with depth, and those having little interaction should have associated mainly with the dissolved phase and should not be found in high concentrations at any depth.

Sample locations S-1 through S-6 in the South Pond (Figure 6) were located along the approximate flow path through the pond basins. Sampling locations S-1 and S-2 were located near the pond inlets, and were intended to identify high concentrations associated with the pond inlets and settling basins. Sampling locations S-3, S-4, and S-5 in the main pond basin were intended to provide concentration data representative of the largest potentially contaminated area. Location S-6 was to provide data on concentrations from the final basin.

North Pond samples were similarly located (Figure 7), with location N-1 near the inlet; location N-2 in the final settling basin to determine possible concentration reductions across the settling basins; and locations N-3, N-4, and N-5 in the main pond area. Location N-6 was to identify contamination in the westernmost series of settling basins. Sample location N-7 was located outside the pond near an area used to dispose of sediments dredged from the bottom of the North Pond.

Each sampling location was excavated with a bulldozer creating a trench approximately 15 ft deep. Water was continually sprayed on the ground

surface during the operation to reduce airborne contaminated material. Air sampling devices were available if conditions warranted their use.

Samples were collected at five depths at each location according to the sampling procedure outlined in Appendix A; at location N-4, samples were taken at only four depths because of the uniformity of the sediments exposed. Strict chain of custody was maintained for all samples collected. The depths from which samples were taken were determined on the basis of the stratigraphy. Samples were taken at depths of approximately 0, 2.5, 5, 10, and 15 ft. In locations in which disturbed or green colored sediments were found, sample depths were modified so that the anomalous horizons were sampled. This approach was necessary to fulfill the objectives of the site characterization and to be sure the anomalous sediments in these horizons, which were generally found within a few feet of the surface, were collected. In all instances normal sediments underlying the anomalous sediments were also sampled. The sample locations were marked for a subsequent location survey performed by Kaiser Engineers Hanford (KEH).

3.3 SURFACE SEDIMENT SAMPLING

Surface sediment sampling activities consisted of the collection of surface samples at each subsurface sediment sampling location.

3.4 GROUND-WATER SAMPLING

Ground-water sampling as part of this RI will be initiated only if additional data are needed to assess contaminant release from the South and North Ponds. The ground-water data acquired by the monitoring programs was reviewed. Preliminary results are presented in Section 6.1.

4.0 LABORATORY ANALYSIS

Laboratory analyses of the subsurface sediment samples were conducted by U.S. Testing Laboratories (UST). The analytes measured and the analytical methods used are presented in Table 2. The analytical parameters identified for characterization were based upon estimated inventory information for the ponds presented in the Phase I Installation Assessment.[a] UST maintained an internal quality control program that involved routine calibration of instruments, analyses of blanks, replicates, matrix spikes, and reagents. Results above analytical detection limits for the various constituents are presented in Appendix B. Preliminary results of the radiochemical analyses are discussed in Section 6.1.

TABLE 2. Analytical Parameters and Methods for 300 Area Process Pond Characterization

Constituent	Extraction Method	Analysis Method
Zinc	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Calcium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Barium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Cadmium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Chromium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Silver	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Sodium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Nickel	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Copper	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Vanadium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Aluminum	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Manganese	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Potassium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Iron	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Magnesium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Beryllium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)

(a) U.S. Department of Energy (DOE). 1986. Draft Phase I Installation Assessment of Inactive Waste-Disposal Sites at Hanford, Richland, Washington. U.S. Department of Energy, Richland, Washington.

TABLE 2. (contd)

Constituent	Extraction Method	Analysis Method
Osmium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Strontium	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Antimony	SW-846 #3050 (EPA 1982)	SW-846 #6010 (EPA 1982)
Arsenic	SW-846 #3050 (EPA 1982)	SW-846 #7060 (EPA 1982)
Mercury	None	SW-846 #7471 (EPA 1982)
Selenium	SW-846 #3050 (EPA 1982)	SW-846 #7740 (EPA 1982)
Thallium	SW-846 #3050 (EPA 1982)	SW-846 #7841 (EPA 1982)
Lead	SW-846 #3050 (EPA 1982)	SW-846 #7421 (EPA 1982)
Polychlorinated biphenyls	SW-846 #3540 (EPA 1982)	SW-846 #8080 (EPA 1982)
Volatile organics	SW-846 #3540 (EPA 1982)	SW-846 #8240 (EPA 1982)
Acid/base/neutral extractable organics	SW-846 #3540 (EPA 1982)	SW-846 #8270 (EPA 1982)
Anions	Water extraction[a]	Ion chromatography[a]
Gross alpha	None	Proportional counter[a]
Gross beta	None	Proportional counter[a]

(a) In-house method.

5.0 GEOCHEMICAL CHARACTERIZATION OF SEDIMENTS

To determine the mobility of contaminants in the sediments, additional laboratory tests were performed. In particular, x-ray diffraction (XRD), scanning electron microscopy (SEM), and energy- dispersive x-ray (EDS) analyses of the sediments were used to characterize sediment mineralogy. Examination of the mineralogy by XRD and the fine structure of the pond sediments by SEM and EDS helps determine grain homogeneity and heterogeneity, the composition of surface coatings on the grains, the size and composition of respirable particulates, and the origin of leachable components. These factors aid in determining release rates for certain hazardous substances from the sediments, which are essential to the risk assessment process. Release rates for hazardous substances from contaminated sediments are needed to predict the transport of substances of concern. Results of these analyses are also valuable in identifying the chemical processes influencing contaminant mobility. EDS also supplements and verifies other analytical techniques.

Analyses by XRD were performed on several background and contaminated sediments. X-ray diffraction was performed on bulk samples and on grains of contaminated material selected from several samples. Preliminary SEM and EDS analyses were performed on grains of contaminated material from a sample from the North Pond. Grains were selected by color and appearance, mounted on spectrographic-grade graphite, photographed in color with a photomicroscope, coated with carbon, and analyzed by EDS using a JEOL[a] JSM-25SIII scanning electron microscope coupled to a Tracor Northern[b] TN-2000 x-ray analysis system. Both secondary and backscattered electron images were viewed, and x-ray spectra were collected in raster and spot modes. Initial results of these analyses are discussed in Section 6.1.

(a) JEOL is the trademark of JEOL Ltd., Tokyo, Japan.
(b) Tracor Northern is the trademark of Tracor Northern Co., Middleton, Wisconsin.

6.0 SITE CHARACTERIZATION RESULTS

The results of site characterization activities performed are presented in the followin'g sections. These activities included the collection of new field and laboratory data and the review of existing ground-water data collected by other programs.

6.1 SUBSURFACE SEDIMENT DATA

The establishment of accurate and representative background concentrations for the constituents of interest is fundamental to the interpretation of the sediment sample data. Background sediment samples were collected outside the ponds at a location presumably not contaminated by waste disposal activities (i.e., location S-7; Figure 6). The average background concentrations of those constituents that would indicate possible contamination from past disposal operations at the ponds (e.g., gross alpha, Ag, Cr, Cu) are very low (Table 3).

Contaminated sediments in the ponds were easily identified by the presence of one or more green compounds. Radioactivity detectable with hand-held instruments appeared to be confined to sediments consisting wholly or in part of these materials. The materials occurred in three forms: 1) flakes interspersed with gravels and sands; 2) thinly laminated layers composed almost entirely of the green material; and 3) thin coatings on gravels and coarse sands. The first occurrence was the most common in the North and South Ponds. These sediments were typically found as thin discontinuous layers on the pond bottoms and on the dike walls surrounding the individual basins of the ponds. Past dredging operations, particularly in the South Pond, removed most of these sediments from the pond bottoms while leaving material at numerous locations on the dike walls. This type of sediment was also found at depth at locations N-1 and N-6 in the North Pond and at N-7 outside the pond. The sediments were on or near the surface when the pond was retired but were subsequently covered with fly ash or other sediments to reduce possible airborne spreading of the material.

The second form of the green materials, thinly laminated layers, was exposed at location S-1 in the South Pond and at locations N-1 and N-6 in the

TABLE 3. Average Concentrations of Constituents in Background Soils from 300 Area Process Ponds

Constituent	Concentration[a]
Ag	<1.0
Al	9910 ± 2060
As	3.04 ± 1.36
Ba	96.6 ± 26.0
Be	0.65 ± 0.05
Ca	7782 ± 3135
Cd	0.5 ± 0.3
C1	1.84 ± 0.41
Cr	9.8 ± 1.2
Cu	18.4 ± 4.92
F	2.44 ± 0.94
Fe	27620 ± 3985
Hg	<0.1
K	1620 ± 330
Mg	6188 ± 1106
Mn	396.2 ± 63.5
Na	315.6 ± 123.9
Ni	7.6 ± 1.0
Os	<30.0
Pb	5.08 ± 0.88
Sb	<10.0
Se	<0.7
Sr	31 ± 0.8
T1	<1.0
V	60 ± 7.0
Zn	50.2 ± 8.2
Gross alpha	6.35 ± 2.08
Gross beta	21.44 ± 2.38
Nitrate	1.06[b]
Phosphate	<2.0
Sulfate	9.68 ± 4.88

(a) Average, plus or minus the standard deviation, of concentrations in five samples from location S-7 (Figure 6). Units are μg/g except for gross alpha and gross beta, which are pCi/g.

(b) Only one sample has a nitrate concentration above the detection limit.

North Pond. A discontinuous layer of this type of sediment approximately 5 in. thick is exposed at a depth of approximately 1 ft at location S-1 (sample 316001A02). At location N-1, a 1-ft-thick green layer covered with approximately 8 ft of fly ash was sampled (sample 316002A02). A similar light green-to-white layer at location N-6 (sample 316002F01) had been covered with 3 to 4 in. of sand and gravel. The third occurrence, thin green claylike coatings on gravels and coarse sands, was present at depths of up to 13 ft at location N-1.

Contaminated sediments in the South and North Ponds and at location N-7 outside the North Pond were typified by elevated gross alpha and gross beta activities and elevated concentrations of Ag, Al, Cr, Cu, Ni, and Zn. Analytical results for samples with the greatest contamination are presented in Tables 4 and 5. The most highly contaminated sediments generally also contained relatively high concentrations of Ca. Additionally, As, F, Hg, Pb, Sb, Sr, V, and nitrate were present in concentrations above background at several locations in both ponds. Many of these contaminants are known to have been discharged to the ponds during their operational history (Table 6). The high Pb concentration in sample 316002A02 may be partially attributable to disposal of lead-weighted drums of sodium metal in that portion of the North Pond during its operation.[a] The concentrations of most contaminants in South Pond samples were lower than in samples from the North Pond. Past dredging operations in the ponds removed much of the contamination that was present when the ponds were in use, and dredging appears to have been more extensive in the South Pond. Some of the spoils that were dredged from the North Pond were spread in a natural depression immediately south of the pond and subsequently covered with fly ash. Sediment and fly ash samples were collected to a depth of 8.9 ft at location N-7 within this depression. Sediment sample 316002603 was from a layer of sands and gravels intermixed with abundant fine-grained green material that was directly beneath the fly ash. The contaminant concentrations in this sample were similar to those measured in contaminated sediments from inside the pond (Table 5). Concentrations of the contaminants in samples collected at greater depths at 'this location were

---

(a) Personal communication to D. I. Dennison from R. B. Hall, Westinghouse Hanford Company, May 22, 1987.

TABLE 4. Concentrations of Inorganic Constituents in Contaminated Sediments from the South Process Pond, 300 Area

constituent[a]	Background[b]	316001A02	316001B02	316001C01	316001D01
Ag	<1.0	12.0	6.0	7.0	31.0
Al	9910 ± 2060	19500	16800	13300	21900
As	3.04 ± 1.36	15.1	27.0	21.8	35.5
Ba	96.6 ± 26.0	121	140	135	164
Be	0.65 ± 0.05	1.0	0.7	0.7	1.0
Ca	7782 ± 3135	20100	12800	8470	17200
Cd	0.5 ± 0.3	1.5	0.2	1.0	2.0
Cl	1.84 ± 0.41	<1.0	<1.0	<1.0	<1.0
Cr	9.8 ± 1.2	129	116	35.0	195
Cu	18.4 ± 4.92	7060	2090	1090	5800
F	2.44 ± 0.94	1.6	2.8	1.2	<1.0
Fe	27620 ± 3985	40100	40900	32400	31500
Hg	<0.1	0.7	1.0	0.7	2.3
K	1620 ± 330	1470	1750	2020	2120
Mg	6188 ± 1106	10600	9460	7290	9090
Mn	396.2 ± 63.5	395	441	381	412
Na	315.6 ± 123.9	309	771	784	328
Ni	7.6 ± 1.0	199	86.0	104	275
Os	<30.0	<30.0	<30.0	<30.0	<30.0
Pb	5.08 ± 0.88	22.8	21.2	15.2	39.4
Sb	<10.0	<10.0	<10.0	<10.0	<10.0
Se	<0.5	<0.5	<0.5	<0.5	<0.5
Sr	31 ± 0.8	45.0	37.0	31.0	46.0
Tl	<1.0	<1.0	<1.0	<1.0	<1.0
V	60 ± 7.0	86.0	80.0	79.0	80.0
Zn	50.2 ± 8.2	116	77.0	102	164
Gross alpha	6.35 ± 2.08	333	200	46.0	240
Gross beta	21.44 ± 2.38	314	149	67.2	201
Nitrate	1.06	3.8	2.6	5.1	13.2
Phosphate	<2.0	<2.0	<2.0	2.5	<2.0
Sulfate	9.68 ± 4.88	4.2	3.8	2.6	4.4

(a) Units are μg/g except for gross alpha and gross beta, which are in pCi/g.
(b) Average, plus or minus the standard deviation, of concentrations in samples from location S-7 (Figure 6).

TABLE 5. Concentrations of Inorganic Constituents in Contaminated Sediments from the North Process Pond, 300 Area

Constituent[a]	Background[b]	316002A02	316002B01	316002F01	316002603
Ag	<1.0	153	45	123	41
Al	9910 ± 2060	31400	20700	53800	22300
As	3.04 ± 1.36	7	14	61	8.8
Ba	96.6 ± 26.0	135	135	164	182
Be	0.65 ± 0.05	1	1	(0.5	0.9
Ca	7782 ± 3135	55100	16500	25100	12500
Cd	0.5 ± 0.3	(0.2	1	<0.2	0.3
C1	1.84 ± 0.41	32	1	<1.0	6.2
Cr	9.8 ± 1.2	519	205	546	384
Cu	18.4 ± 4.92	65600	3540	11600	4440
F	2.44 ± 0.94	10.4	4.3	6.1	1.5
Fe	27620 ± 3985	16100	29900	22400	31300
Hg	<0.1	8.5	4.7	8.1	2.4
K	1620 ± 330	469	871	568	1280
Mg	6188 ± 1106	12100	8830	12000	9130
Mn	396.2 ± 63.5	594	341	240	372
Na	315.6 ± 123.9	582	322	270	483
Ni	7.6 ± 1.0	1830	216	260	190
Os	<30.0	(30.0	<30.0	(30.0	(30.0
Pb	5.08 ± 0.88	191	20.4	79	27.5
Sb	t10.0	20	10	<10.0	<10.0
Se	<0.5	<0.5	0.5	1.8	<0.5
Sr	31 ± 0.8	91	57	93	53
T1	<1.0	<1.0	<1.0	<1.0	<1.0
V	60 ± 7.0	226	84	37	68
Zn	50.2 ± 8.2	11	132	122	112
Gross alpha	6.35 ± 2.08	1960	374	1430	371
Gross beta	21.44 ± 2.38	2140	295	1440	314
Nitrate	1.06	645	3.8	1.8	1030
Phosphate	<2.0	<2.0	2.0	<2.0	8.3
Sulfate	9.68 ± 4.88	502	10.3	18.6	325

(a) Units are μg/g except for gross alpha and gross beta, which are pCi/g.
(b) Average, plus or minus the standard deviation, of concentrations in samples from location S-7 (Figure 6).

TABLE 6. Estimated Contaminant Inventory (in kg) for South and North Process Ponds, 300 Area[a]

Chemical	South Pond	North Pond
Sodium[b]	2,000,000	2,000,000
Sodium hydroxide	1,000,000	800,000
Nitrite	900,000	700,000
Mercury	60	40
Chromium (VI)	5,000	3,000
Cadmium	80	60
Lead	4,000	2,000
Fluoride	7,000	5,000
Trichloroethylene	100,000	100,000
Uranium	40,000	30,000
Sodium aluminate	2,000,000	2,000,000
Nitrate[c]	1,000,000	800,000
Sodium silicate	100,000	90,000
Nickel	10,000	8,000
Zinc	5,000	3,000
Silver	1,000	900
Beryllium	40	30
Copper	60,000	50,000
Nitric acid	1,000,000	900,000

(a) U. S. Department of Energy (DOE). 1986. Draft Phase I Installation Assessment of Inactive Waste-Disposal Sites at Hanford, Richland, Washington.
(b) Includes sodium from compounds other than those listed.
(c) Includes nitrate from compounds other than those listed.

near background levels. Much of the material dredged from the South Pond was used to backfill the 307 trenches.

Radiochemical analyses of the sediment samples indicate that uranium is the primary radiological contaminant in the pond sediments (Table 7). The highest uranium levels were found in near-surface samples taken from within the settling basins in the North Pond (e.g., samples 316002A02 and 316002F01). The uranium levels in samples from the North Pond tend to decrease with distance from the inlet to the pond and with depth. Although the levels measured were somewhat lower, the uranium distribution in the South Pond appeared to follow the same trends as that in the North Pond.

TABLE 7. Radiochemical Results (in pCi/g) for Sediment Samples from the North and South Process Ponds, 300 Area

Sample Number	^{238}U	^{235}U	^{60}Co	^{137}Cs
316001A01	57.1	3.92	2.11[a]	1.03[a]
316001A03	17.9[a]	1.42[a]	12.3	0.56[a]
316001B01	62.2	3.24	1.04[a]	0.46[a]
316001B02	65.2	0.43	0.05	0.01[a]
316001B03	18.0[a]	<0.45	18.4	0.41[a]
316001B04	3.15[a]	0.34[a]	<0.83	0.70[a]
316001C01	6.01[a]	1.15[a]	87.7	1.04[a]
316001D01	83.2	9.54	21.5	1.63
316001D02	4.79[a]	0.66[a]	1.11[a]	<0.60
316001E01	16.7[a]	0.92[a]	29.1	1.71[a]
316001E02	1.97[a]	0.41[a]	<0.75	<0.50
316001F02	6.99[a]	0.50[a]	8.90	1.72
316001F04	3.46[a]	<0.34	0.48[a]	<0.55
316001G01[b]	(c)	<0.38	<0.23	0.13[a]
316001G03[b]	<6.56	41	<0.22	0.02[a]
316001G05[b]	1.53[a]	0.17[a]	<0.69	0.20[a]
216002A02	1270	114	23.8	0.70[a]
316002B01	112	7.76	3.24[a]	0.68[a]
316002B03	0.92[a]	<0.36	<1.00	0.65[a]
316002C03	2.72[a]	<0.34	<0.61	0.33[a]
316002E02	1.60[a]	<0.39	<0.22	0.11[a]
316002E03	2.78[a]	0.38[a]	<0.66	0.10[a]
316002E04	3.19[a]	0.36[a]	<0.67	<0.46
316002F01	943	74.9[a]	<0.26	0.32[a]
316002F05	4.39[a]	0.31[a]	<0.68	0.28[a]
316002G04	(c)	0.17[a]	<0.20	0.13[a]
316002G05	3.77[a]	<0.33	<0.65	<0.52

(a) This result is suspect because the counting error was at least 10% of the activity measured.
(b) Background sample.
(c) The ^{238}U peak for this sample was not detected.

Relatively high ^{60}Co levels were also measured in several samples from both ponds. Small amounts of ^{60}Co are known to have been discharged to the ponds (Table 1). Relatively low levels of ^{137}Cs were measured in two samples (samples 316001D01 and 316001F02) from the South Pond. Discharge of ^{137}Cs to the ponds was not documented.

The mineralogic composition of the sediments was investigated by XRD. The composition of the fine-grained (<2-mm) fraction of the background sediments is typical of detrital sediments found throughout the Pasco Basin, which consist predominantly of quartz and feldspar with small amounts of clay and mica. The XRD, SEM, and EDS analyses performed on the contaminated sediments revealed the complex nature of these sediments but have not identified which mineral or minerals control the distribution of the contaminants. Grains of green-and-white contaminated sediment from locations N-1, N-6, and N-7 were separated from the bulk sample and analyzed by XRD. The sediments were composed primarily of calcite, and the x-ray pattern of the calcite masked the presence of other minerals and compounds.

Several grains from sample 316002A02 were also analyzed by SEM and EDS. A typical green-and-white grain from that sample is shown in Figure 8. A backscattered image of the grain (the brightness of backscattering increases as the atomic numbers of the elements in the sample increase) indicated that the green layers contain a greater proportion of elements higher in atomic number than elements found in the white area (Figure 9). Analysis by EDS of the two layers (areas R1 and R2 in Figure 10) revealed that the white layer contains mostly Ca (Figure 11) and the green layer is mostly Cu (Figure 12). Small particles (<1 μm to 25 μm) on the surface of the grains appeared bright [illegible]r. The compositions of the particles varied widely and included Al, Ce, Cu, Fe, Pb, Ti, U, V, and Zr. Some of the particles contained mainly one element whereas others were mixtures of several elements. The bright particle shown in Figure 13 was composed predominantly of U. No obvious patterns in the distribution of these particles were observed. Other elements detected in the sample were Ba, Cr, Mg, Mn, Ni, S, and Si.

Numerous organic compounds were found in sediments at several locations in the ponds (Tables 8 and 9). Of particular interest was the detection of

Figure 8. Photomicrograph of Layered Green-and-White Grain from Sample 316002A02 (bar = 1.0 mm)

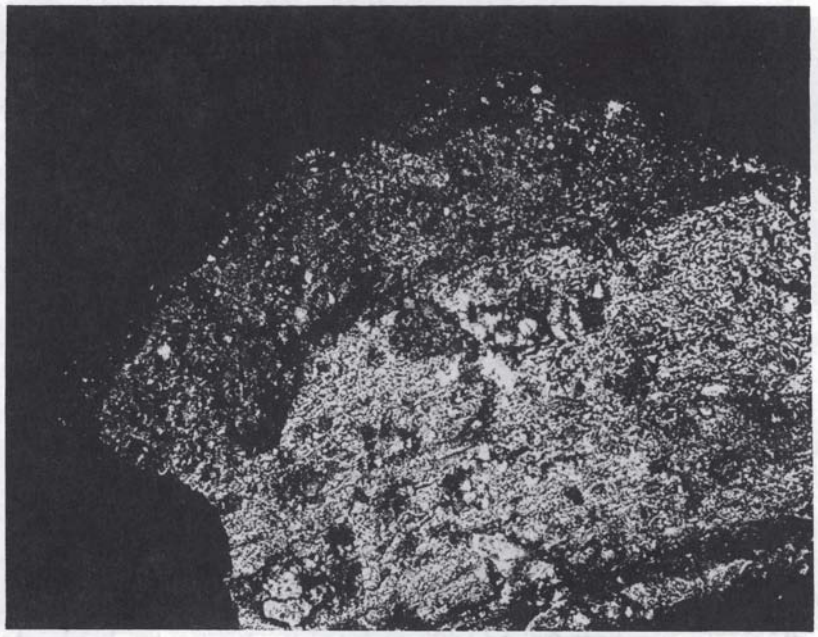

Figure 9. Backscattered SEM Image of Grain Shown in Figure 8 (bar = 1.0 mm)

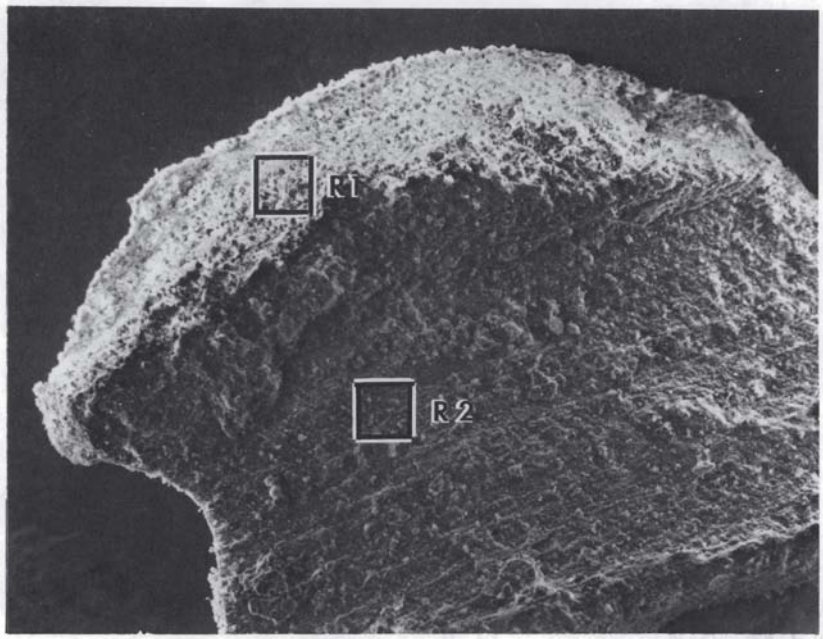

Figure 10. Scanning Electron Micrograph of Grain Shown in Figure 8 (bar = 1.0 mm)

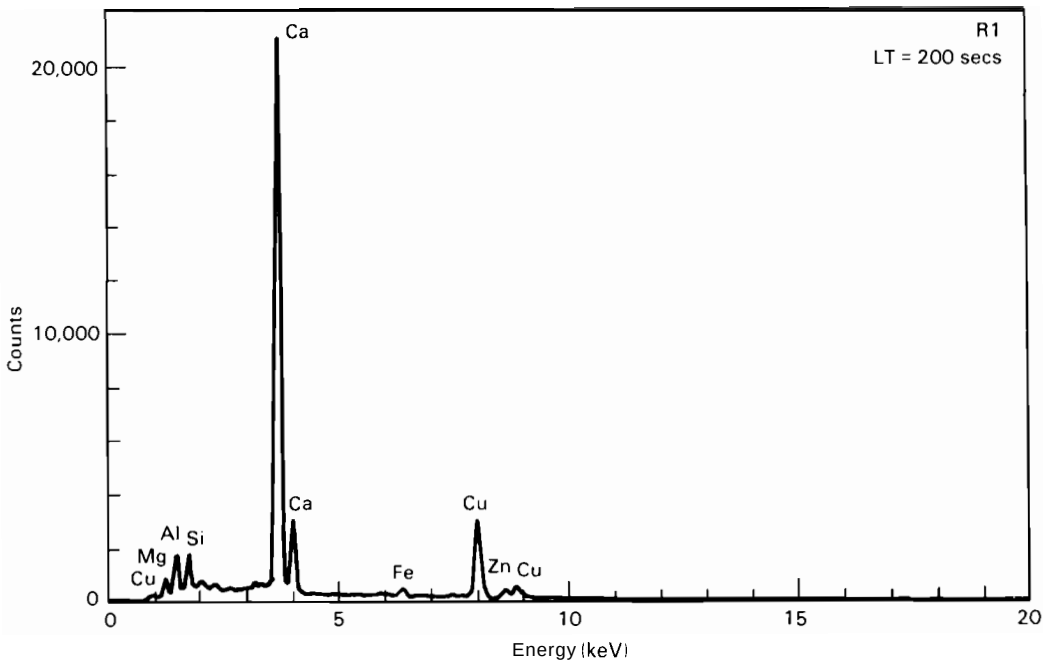

Figure 11. X-Ray Spectrum of Area R1 (Figure 10): Calcium Predominates

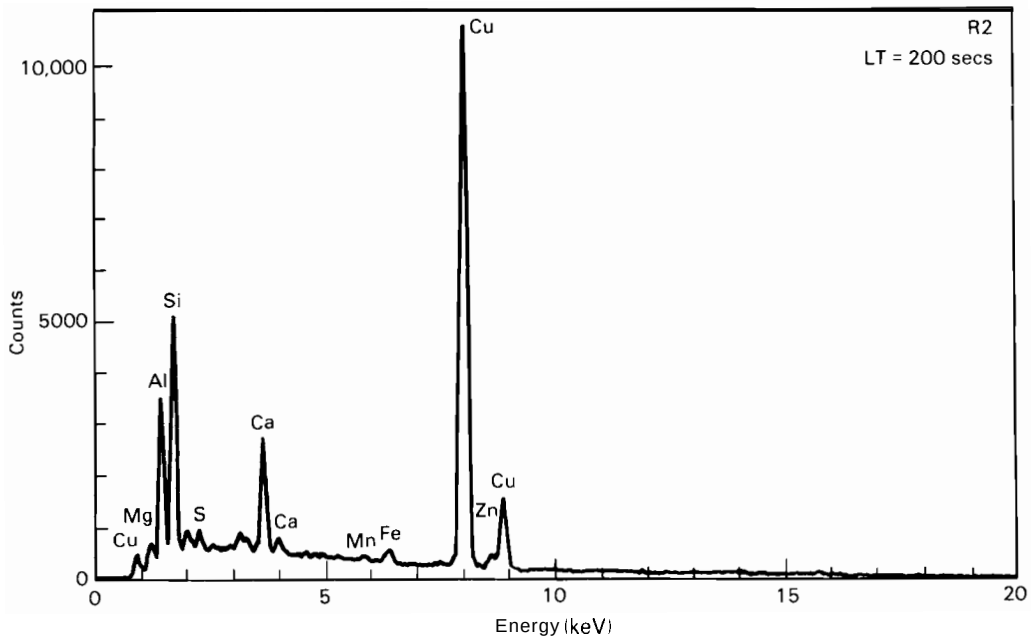

Figure 12. X-Ray Spectrum of Area R2 (Figure 10): Copper Predominates

Figure 13. Backscattered SEM Image of Uranium Particle on Surface of Green-and-White Grain from Sample 316002A02 (bar = 71 μm)

TABLE 8. Summary of Organic Substances in Sediment Samples from the South Pond, 300 Area

Constituent	Sample Number	Concentration (μg/g)
Acetone[a]	316001A01	0.04
	316001A02	0.03
	316001A03	0.04
	316001A04	0.03
	316001A05	0.03
	316001B01	0.03
	316001B02	0.03
	316001B03	0.03
	316001B04	0.03
	316001B05	0.02
Arochlor 1248	316001A01	0.89
	316001A02	2.30
	316001B01	0.48
	316001B02	0.91
	316001D01	0.31
Arochlor 1254	316001C01	0.12
	316001D01	0.44
Diethyl phthalate[a]	316001C01	2.10
Hexadecanoic acid[a]	316001F01	2.70
Methylene chloride	316001A02	0.89
	316001A03	0.40
	316001D01	0.03
	316001D03	0.02
1-Octadecanol[a]	316001F01	4.00
Pentatriacontane[a]	316001F01	5.00
Tributylphosphoric acid[a]	316001B01	1.00
Unknown aliphatic hydrocarbon[a]	316001F01[b]	4.70
		3.20
		3.00

(a) This constituent has been only tentatively identified, and the concentration reported is estimated.
(b) Three different unknown aliphatic hydrocarbons were detected in this sample.

TABLE 9. Summary of Organic Substances in Sediment Samples from the North Pond, 300 Area

Constituent	Sample Number	Concentration (μg/g)
Acetone[a]	316002B02	0.11
	316002F05	0.08
Arochlor 1248	316002A02	42.0
	316002A03	0.60
	316002A04	0.40
	316002A04A	0.60
	316002B01	2.00
	316002B02	0.62
	316002B03	0.10
	316002C01	0.40
	316002C02	0.14
	316002D02	0.34
	316002D03	0.22
	316002E01	0.34
	316002F01	3.40
	316002F02	1.60
	316002G03	1.76
Arochlor 1254	316002F03	0.04
Bis(2-ethylhexyl) phthalate[a]	316002E03	1.10
Butyl benzyl phthalate[a]	316002A05	1.10
	216002E03	1.80
Methylene chloride	316002A02	0.03
	316002B01	0.03
	316002C01	0.01
	316002C02	0.05

(a) This constituent has been only tentatively identified, and the concentration reported is estimated.

the polychlorinated biphenyls (PCBs) arochlor 1248 and arochlor 1254 in samples from numerous locations. The PCBs were detected only in samples that contain high gross alpha and gross beta activities and high concentrations of Ag, Al, Cr, Cu, Ni, and Zn. Although there is no record of PCB disposal in the ponds, oils containing PCBs were used for a variety of purposes in the 300 Area in the past and may have been discharged to the Process Ponds. Flameproof oils containing PCBs were used in the 313 and 333 Buildings in the 300 Area, and it was a common practice to dispose of oils and lubricants in

the process sewer until the late 1970s.[a] Trichloroethylene, the only organic compound known to have been discharged to the ponds (Table 6) and one that was detected in ground water beneath the 300 Area (Section 6.2), was not detected in the sediment samples. It is possible that several of the organic compounds listed in Tables 8 and 9 may have come from secondary contamination of the samples in the field and/or in the laboratory, although we have no evidence that this is the case. Acetone and methylene chloride are used for a wide range of purposes in the laboratory (e.g., cleaning glassware). Phthalates are common constituents of plastics and may result from collection of samples in plastic buckets. Review of the QA/QC data associated with the samples has not identified the source(s) of possible contamination. Several organic compounds were detected in sample 316001F01, a sample of filter-backwash sediment from the easternmost basin of the South Pond. This basin had recently been used for disposal of filter backwash from the water treatment plant. Pentatriacontane and the unknown aliphatic hydrocarbons are constituents of fuels and may have resulted from leakage of oil or diesel fuel from the equipment being used for excavating the sampling locations or from fumes from that equipment. Hexadecanoic acid and 1-octadecanol, fatty acids commonly found in soil algae and microbes, were detected in this sample.

As mentioned, the ponds were designed so that the influent would flow through a series of settling basins where suspended and particulate contaminants would be removed before the waste entered the large basins. Subsurface sediment analyses performed showed that the highest concentrations of contaminants in the ponds were found in samples taken in the settling basins (i.e., samples from locations N-1, N-2, N-6, S-1, and S-2) and that concentrations decreased with distance from the inlet. Contaminant concentrations at all sampling locations in the ponds decreased with depth. With the exception of location N-1 in the North Pond, the concentrations approached background levels within 3 to 4 ft of the surface. At N-1, concentrations of many of the contaminants, particularly copper and gross alpha activity, were

(a) Personal communication to D. R. Sherwood from E. A. Weakley, Westinghouse Hanford Company, December 29, 1987.

greater than background levels in all samples collected below the fly ash to a depth of 16.5 ft from the surface of the fly ash.

The large quantities of fly ash present at locations N-1 and N-7 may also pose a potential environmental hazard. Three samples of fly ash were collected and analyzed for the same constituents as the sediment samples (Table 10). The fly ash at location N-1 (sample 316002A01) contained high concentrations of Sr, sulfate, and several organic compounds. Samples from N-7 were similar but also contained high Pb and Se concentrations (samples 316002601 and 316002602). Sediment samples collected at depth at both locations did not indicate any introduction of these constituents, with the exception of sulfate, that could be directly attributed to the fly ash. Sediment samples collected directly beneath the fly ash at both locations contained relatively high sulfate concentrations (samples 316002A02 and 316002603; Table 5).

6.2 GROUND-WATER DATA REVIEW

Existing ground-water data collected by the 300 Area Process Trenches RCRA Compliance Monitoring Project and the Hanford Site-Wide Ground-Water Program are currently being evaluated in detail to identify their usefulness for characterization of the Process Ponds. An initial review was conducted to determine if any hazardous substances detected during sediment sampling or identified in waste inventories had been found in the unconfined aquifer beneath these facilities. A secondary concern of this review was to identify any substances detected in the waste sites that were not included in the surface-water and ground-water monitoring programs.

One contaminant of primary concern is uranium. A measurable plume of uranium exists in the ground water beneath the 300 Area (Figure 14). The highest uranium concentrations detected in the ground water in 1986 were in wells downgradient from the Process Ponds and the Process Trenches. The Process Trenches were constructed to replace the Process Ponds and began receiving waste, some of which contained uranium, in 1975. Although both the Process Ponds and Process Trenches could be sources of the uranium detected

TABLE 10. Concentrations of Constituents in Fly Ash Samples from North Process Pond, 300 Area

Constituent[a]	316002A01	316002G01	316002G02
Ag	<1.0	<1.0	<1.0
Al	18100	13200	13700
As	<0.5	7.0	3.2
Ba	270	453	994
Be	1	1	1
Ca	50000	38900	47300
Cd	0.4	0.3	<0.2
Cr	12	15	11
Cu	29	39	32
Fe	14900	13500	21800
Hg	<0.1	0.2	0.4
K	1300	856	809
Mg	5580	5090	14100
Mn	99	56	117
Na	2610	2940	1280
Ni	14	25	14
Os	<30	<30	<30
Pb	7.6	62	103
Sb	<10	<10	<10
Se	<0.5	8.3	0.7
Sr	410	357	369
T1	<1.0	<1.0	<1.0
V	38	53	44
Zn	56	48	29
Gross alpha (pCi/g)	22.9	10.1	10.2
Gross beta (pCi/g)	19.3	15.4	12.7
Nitrate	28.5	8.3	23.3
Sulfate	1010	18.1	60.7
Fluoride	1.7	1.9	<1.0
Chloride	3.7	<1.0	1.4
Phosphate	<2.0	<2.0	<2.0
Acetone[b]	0.0	0.0	0.1
DMMENAP[b][c] (ppb)	ND[d]	2.1	6.4
27DMNAP[b][e] (ppb)	ND	ND	4.6
Heptadecane[b]	8.2	2.6	7.8
Heptacosane[b]	15	ND	ND
Trichlornethylene	<0.01	<0.01	0.05
167TNAP[b][f] (ppb)	ND	ND	5.9
236TNAP[b][g] (ppb)	ND	ND	3.8
Unknown aliphatic hydrocarbon[b]	6.4	(h)	0.0
Unknown	5.7	0.0	0.0

(a) Units are μg/g except as noted.
(b) This constituent has been only tentatively identified and the concentration reported is estimated.
(c) 1,6-Dimethyl-4-(1-methylethyl) naphthalene.
(d) No analytical detection limit (ND) is reported.
(e) 2,7-Dimethyl naphtha1ene.
(f) 1,6,7-Trimethyl naphthalene.
(g) 2,3,6-Trimethyl naphthalene.
(h) Three different unknown aliphatic hydrocarbons detected in estimated concentrations of 3.1, 4.2, and 6.2 μg/g.

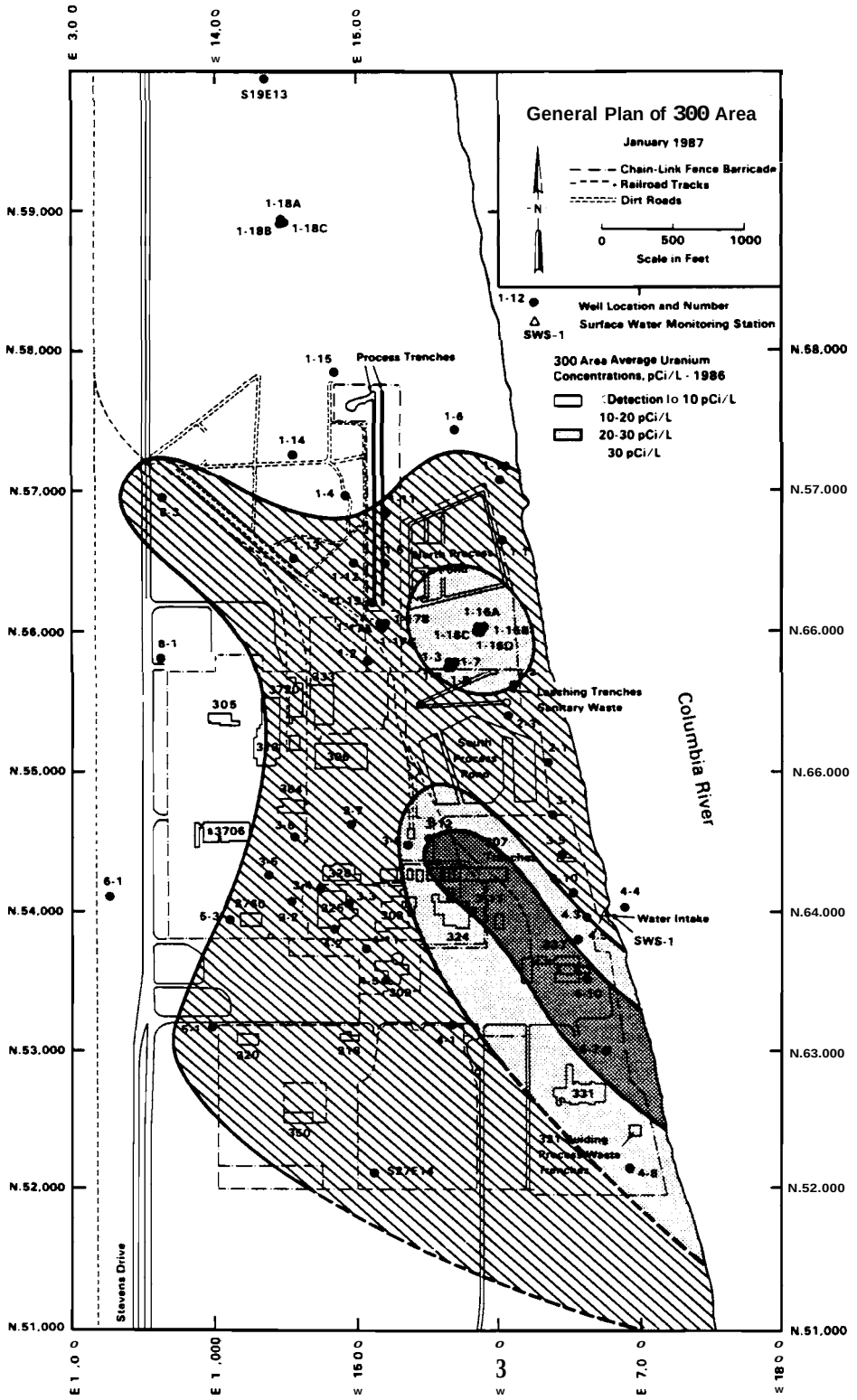

Figure 14. Uranium Concentrations in Ground Water Beneath the 300 Area During 1986 (DOE 1987)

in the ground water, the disposal of an estimated 1 million gal of wastewater per day to the trenches represents the primary driving force behind the mobility of the uranium, and other contaminants, in the ground water. Other contaminants found in the ground water are nitrate, fluoride, chromium, trichloroethylene, perchloroethylene, and 1,2-dichloroethylene.

As previously stated, a secondary concern of this review was to identify substances not measured in the ground water that are needed to complete a RI of the Process Ponds. PCBs were identified in the most highly contaminated materials within the Process Ponds, but no ground-water monitoring for these substances has been performed. PCBs are not highly mobile in the subsurface environment and are only slightly soluble in water, but they do represent an unknown when assessing ground-water impacts from the Process Ponds. Investigations into the extent and source of PCB contamination of the environmental media in and around the ponds are continuing.

7.0 CONCLUSIONS

Initial results of FY 1987 characterization activities indicated that the highest measured concentrations of hazardous substances in the pond sediments were found near the present ground surface or where the ground surface had been covered by fly ash or clean sediment to minimize wind erosion. It was also apparent that most of the residual contamination was located in the settling basins near the inlet structures along the western portion of the ponds.

Dredging of the pond bottoms during the operational period and during retirement of the sites removed most contaminated sediments from the large infiltration basins. Review of ground-water data indicated uranium concentrations beneath the ponds are significantly above background. Other regulated substances, including nitrate, fluoride, chromium, trichloroethylene, perchloroethylene, and 1,2-dichloroethylene also appear sporadically in wells near the ponds. Although all of these substances were disposed to the ponds, it was evident that other sources of these constituents also exist within the area. From this review, it appeared that uranium is the only hazardous substance consistently found at elevated concentrations beneath the ponds.

8.0 RECOMMENDATIONS

Remedial investigation of the 300 Area Process Ponds should continue, with its primary focus on near-surface and dike sediment sampling. The purpose of this sampling would be to better define the horizontal extent of contamination. Detailed geochemical characterization of the sediments should also continue. Sediment analysis by x-ray diffraction, supported by scanning electron microscopy and energy dispersive x-ray microanalysis should emphasize isolating and identifying contaminant-bearing minerals. These analyses in conjunction with contaminant leaching experiments will help determine contaminant mobility. Sampling of biological material in and around the ponds should also be initiated to assess the uptake of contaminants by these media. The radiochemical analyses performed in FY 1987 were not capable of detecting all radionuclides that may be present in sediment from the ponds (e.g., ^{99}Tc and ^{232}Th). Additional radiochemical analyses are needed to determine whether these radionuclides are present.

Finally, the presence of polychlorinated biphenyls (PCBs), predominantly arochlor 1248, represents a major issue to be resolved in this RI of the North and South Ponds. Disposal of PCBs to these facilities was not documented, nor have any ground-water analyses been performed to identify these substances. We recommend ground-water monitoring for PCBs be initiated within the CERCLA/SARA program as early as possible.

9.0 REFERENCES

Chatters, J. C. 1987. Cultural Resources Survey of Two Proposed Sample Locations for the Inactive Waste Site Surveillance Project, 300 Area, Hanford Site, Washington. HCRC 87-300-002. Letter Report. Prepared for the U.S. Department of Energy by the Pacific Northwest Laboratory, Richland, Washington.

DOE (U.S. Department of Energy). 1987. Environmental Monitoring at Hanford for 1986. PNL-6120. Prepared for the U.S. Department of Energy by the Pacific Northwest Laboratory, Richland, Washington.

EPA (U.S. Environmental Protection Agency). 1982. Test Methods for Evaluation of Solid Waste. SW-846, U.S. Environmental Protection Agency, Washington, D.C.

ICF (ICF Northwest). 1987. Level I Remedial Investigation Work Plan 300 Area Process Ponds. Prepared for the Pacific Northwest Laboratory by ICF Northwest, Richland, Washington.

Lindberg, J. W., and F. W. Bond. 1979. Geohydrolosv and Ground-Water Qualitv Beneath the 300 Area, Hanford Site, Washington. PNL-2949, Pacific Northwest Laboratory, Richland, Washington.

APPENDIX A

WHC PROCEDURE A13057, INACTIVE WASTE SITE SOIL SAMPLING PROCEDURE

PROCEDURE NUMBER	FACILITY	DATE
A13057	316-1, 316-2 and 316-3	4/30/87
TITLE		REVISION NO.
Inactive Waste Site Soil Sampling Procedure		0
PREPARED BY D. L. Pursley	REVIEWED BY See EDT A13057	APPROVED BY See EDT A13057

1.0 Purpose

This procedure defines the methods to be used in obtaining soil samples from the bottom of the 300 Area inactive waste sites and for preparing and handling these samples from the field to the laboratory. All samples must be taken and controlled per EPA Publication SW-846, Second Edition, July 1982, "Test Methods for Evaluating Solid Waste," such that they are compatible with State and Federal Regulatory compliance requirements.

2.0 General

2.1 The inactive waste sites include the South Process Pond (316-1), the North Process Pond (316-2) and the 307 Disposal Trench. These sites will be sampled at specific points determined by PNL. A stake will be placed in the site of each sample excavation. Each sample location will yield samples from several depths as determined by PNL. The sample hole will be excavated to the proper depth keeping in mind personnel safety and then sampled at each of the predetermined elevations starting at the bottom and working up to the surface. Excavations may be completed using hand tools or large excavating equipment.

2.2 Each complete sample will consist of a set of ( ) separate bottles of soil. Each bottle will be filled with soil leaving no head-space and then sealed tightly. Bottle caps must not be interchanged. A seal tape will be placed over each bottle lid and then the bottles will be packed in ice for transport to the laboratory. Each set of bottles will be pre-labeled to include the sample location code and other information as required by

PNL and to Indicate laboratory testing requirements. When each sample has been labeled and packed in ice in the transport cooler, a CHAIN-OF-CUSTODY form will be filled out (PNL Form #BC-1200-345 (7-85)). The sample information will then be entered in the "Sample Log" and a 'Sample Analysis Request Form" will be filled out. Each sample will have all except one bottle transported to U.S. Testing with one 250 ml sample kept by WHC in refrigeration at the 325 Building. Separate coolers will be used for samples transmitted to U.S. Testing and WHC Storage. For each delivery, the chain-of-.custody forms will be signed by both the person relinquishing the samples and the person receiving the samples. See the sample of "Chain-Of-Custody," "Sample Log Form" and "Sample Analysis Request Form" in Appendix A.

2.3 Samples must include only fine materials without stones. If separation of the finer materials from gravel and cobbles becomes a problem screens will be used along with hand brushing of the finer materials from the larger stones. Three U.S. standard screens will be available with screen sizing of Tyler #6, #9 and #16. The sample will be dug and transferred directly to a screen and shaken into a bucket until sufficient material is available for the sample bottles.

Prior to first sampling of the day and between samples the sampling tools will be steam cleansed. This cleaning will stop cross contanination between samples. Equipment required will include shovels, a pick, trowels, U.S. standard screens, brush, steam cleaner, coolers, ice, sample bottles and buckets.

2.4 Personnel present for the sampling shall include a Radiation Protection Technician (RPT), a Waste Systems Operation (WSO) Technician, a PNL IYSS representative and a Waste Systems Engineering (WSE) representative. The PNL IWSS representative will also be a geologist and will examine materials from which the samples are taken and keep a written log of stratigraphy encountered. The backhoe and backhoe operator will be available as required. The Waste Systems Engineering representative will fill out the "chain-of-custody" form, the "Sample Log Form" and the Sample Analysis Request Form. The USE representative will also keep a log of all unusual happenings or deviations. The PNL IWSS geologist will also complete the third party inspection checklist.

2.5 The U.S. Testing laboratory can handle a maximum fifteen samples per week so field personnel obtaining the samples must be aware of the laboratory status so their limit is not exceeded. U.S. Testing must also be notified each morning that samples will be delivered that day. PNL will make delivery of samples to the back door (North East side of Building) where lab personnel can be signaled by a bell. The cooler full of samples will be left and any empty coolers will be picked up.

2.6 Copies of sampling paperwork will be provided to Waste Systems Engineering and the PNL IWSS representative at the end of the day. This will include copies of the "chain-of-custody" form, "Sample Log Form," "Sample Analysis Request Form," and the geologists log. All paperwork will be completed in black ink.

2.7 All samples shall be transported in their coolers to the U.S. Testing laboratory or to WHC storage by the end of the day the samples are taken.

3.0 Safety

Safety concerns are those typical hazards associated with an outdoor worksite. These include steep sides on the process ponds and excavation sites with loose materials that are potential tripping hazards and extreme weather conditions. Personnel must be aware of the conditions- and plan accordingly. The ponds themselves contain uranium, potentially other radioactive or hazardous materials and standard radiological precautions must be observed. All work will be performed under a Radiation Work Procedure (RWP).

4.0 Prerequisites

4.1 The pond area to be sampled must be dry enough to move around in and dig without problems with surface water. Wet conditions will affect the sampling procedure and cause cross contamination of samples.

4.2 Radiological protection gear and clothing shall be available along with a copy of the applicable RWP.
Responsibilities: Radiological Clothing - Waste Systems Operations
RWP Copy: Project Engineering

4.3 All tools and equipment shall be available for locating and staking out the sample sites, digging, preparing the samples and transporting the samples. Pre-labeled sample bottles, trowels, coolers with ice, steam cleaner, sieves, brush, plastic sheet, pen, evidence seal tape, clipboard, field logbook and proper forms.

Responsibilities:

Hand Tools: Project Engineering/Waste System Engineering

Transporting Samples: IWSS Representative to US Testing; WSO to 325 Building.

Backhoe and Operator: Kaiser Engineers Hanford

4.4 Notify the testing laboratory that sampling is proceeding and verify the WHC sample storage area is available.
Responsibility: Waste Systems Engineering.

4.5 Notify the PNL IWSS representative.
Responsibility: Waste Systems Engineering

5.0 Procedure

5.1 Determine the first sample site in the correct waste site. Record the location. Measure and stake the site of the sample excavation.

5.2 At the location of the first sample, select a set of sample bottles for the surface sample. Collect materials from the surface of the ground and transfer to the sieve. Shake the

material through the sieve into a bucket until sufficient materials are collected to fill the sample bottles. Fill the bottles completely (no head space). Cap the bottles tightly without interchanging bottle caps and place the evidence seal tape on each bottle. Place the sample bottles in the proper ice chest and make sure they are packed with ice.

5.3 Register the sample in the "sample log" and provide any necessary or interesting observations. Fillout the "Chain-Of-Custody" form and the'Sample-Analysis Request" form for the sample. Steam clean all sampling tools.

5.4 Using the stakes for alignment, use the shovel and pick or the backhoe and dig a hole deep enough to provide samples from the proper lower sample elevations. Using a trowel, scrape some material from the wall and elevation of the lowest sample. This will remove material that might cause cross contamination of the sample. With the trowel, sample the materials at this elevation and transfer the material to a selected sieve. Shake the material through the sieve into a bucket and add more from the same location until enough material is available to fill the sample bottles (approximately 1-1/2 liters). Fill the pre-labeled sample bottles completely (no head space) from the sieved material in the bucket. Cap the bottles tightly as they are filled and place evidence seal tape over the cap. Bottle caps must not be interchanged. Place the sample bottles for U.S. Testing in the proper cooler and place the WHC backup sample in the proper cooler. Make sure all samples bottles are packed in ice.

5.5 Register the sample in the "sample log" and provide any necessary or interesting disruptions or observations. Fill out the "Chain-Of-Custody" forms and a "Sample Analysis Request" form for the sample. Steam clean all tools to prevent cross contamination between samples.

5.6 Select the next set of pre-labeled sample bottles. Scrape a small amount of soil from the side of the hole at the next elevation to remove material that may potentially cross contaminate the sample. Dig out and screen enough material into a clean bucket to provide a sample that will fill the sample bottles. Fill the sample bottles from the bucket, cap them tightly and place evidence seal tape on each cap. Place the bottles in the proper coolers for U.S. Testing and WHC and make sure they are packed in ice.

5.7 Register the sample in the "Sample Log Form" and provide any necessary or interesting disruptions or observations. Fill out the "Chain-Of-Custody" forms and a "Sample Analysis Request Form" for the sample. Steam clean all sampling tools.

5.8 Repeat steps 5.6 and 5.7 until all elevations at the site are sampled.

5.9 Select a new sample location from in the waste site, locate and stake the site.

5.10 Repeat steps 5.2 through 5.9, continue to sample the waste site until all locations have been completed.

NOTE: The testing laboratory can take a limited number of samples per week. Laboratory requirements must be coordinated as the sampling proceeds. Do not begin a sample excavation unless all samples from the excavation can be handled by the laboratory within the shelf life of the sample for the type analysis to be completed. (Five days maximum)

NOTE: Any deviations from this procedure will be noted in the WSE Representatives Log in detail.

Battelle
Pacific Northwest Laboratories
P.O. Box [illegible]
Richland, Washington [illegible]

CHAIN OF CUSTODY

Company Contact: _____ Telephone: _____

Samples Collected by: _____ Date: _____ Time: _____

Sample Location: _____

Ice Chest No.: _____ Field Logbook Page No.: _____

Remarks: _____

Method of Shipment: _____

Sample Identification

CHAIN OF POSSESSION

Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by.	Dare: Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time

Sample Log Form

Sample No.	Date	Time	Sample Size	Name of Collector	Signature	Description

SAMPLE ANALYSIS REQUEST

Westinghouse
W/B-46 / 337 Bldg. !/ WHC / 300 Area

United States Testing Company* In
2800 George Washington Way
Richland WA 99352

Collector _____

Date /Time Sampled _____

Company Contact Carolyn Dupuis 376-3318

Received by _____

Title _____

Date _____ Time _____

CHAIN OF CUSTODY NO- _____

SAMPLE ID _____

UST SAMPLE ID _____

☐ WATER ☒ SOIL a

☐ OTHER _____

COMMENTS

FULL ANALYSIS

	CODE	CONSTITUENT	(3) 40ml G	(2) 250ml G	(3) 125ml G			
1	725	ICP METALS 6010						
2	726	ICP METALS 6010 ENHANCED			X			
3	A20	ARSENIC			X			
4	A21	MERCURY			X			
5	A22	SELENIUM			X			
6	A23	THALLIUM			X			
7	A24	THIOUREA 8330						
8	727	METHOD 8330 ENHANCED		X				
9	A51	LEAD BY GFAA			X			
10	739	PCB						
11	728	PESTICIDES 8080						
12	729	PESTICIDES 8080 ENHANCED		X				
13	730	VOA METHOD 8240						
14	731	VOA METHOD 8240 ENHANCED	X					
15	732	A/B/N 8270						
16	733	A/B/N 8270 ENHANCED		X				
17	734	PESTICIDES METHOD 8140		X				
18	C68	TOX	A					
19	C69	TOC		X				
20	C70	CYANIDE			X			
21	735	NITRATE, SULPHATE,.... (IC)			X			
22	C77	PERCHLORATE			A			
23	C73	SULFIDE			X			
24	C90	AMMONIUM ION		X				
25	C81	ETHYLENE GLYCOL		X				
26	109	COLIFORM BACTERIA			X			
27	181	RADIUM			X			
28	212	ALPHA			X			
29	111	BETA			X			
30	C86	DIOXIN		X				
31	C87	CITRUS RED #2			X			
32	191	CONDUCTIVITY						
33	9	PH						
4	7 6	DIRECT AQUEOUS INJECTION		X				
35	738	HERBICIDE 2,4-D, 2,4,5-TP SILVEX						
36	737	HERBICIDE 8150 ENHANCED		X				

DR2:(7,9)66

SHALLOW SOILS SAMPLING

Third Party Inspection Checklist

Inspection Checklist			
*Sample location identification.			
*Date/Time sample taken.			
*Correct measurement for sample location.			
*Tools were cleaned before sampling.			
*Sample materials taken from the proper depth.			
*Seal tape applied to sample bottle caps.			
*Chain-Of-Custody Form and Analysis Request Form perpared.			
*Geologist sample taken.			

For comments put 1, 2, 3, ... at the point the comment applies and write the comment on the back of this sheet.

APPENDIX B

ANALYTICAL RESULTS

TABLE B.1. Key to Constituent Names in Data Tables

Constituent Name	Full Name of Constituent
ACETONE	Acetone
ALUMNUM	Alurninum
AR1248	Arochlor 1248
AR1254	Arochlor 1254
ARSENIC	Arsenic
BARIUM	Barium
BERYLAM	Beryllium
BETA	Gross beta
BIS2EPH	Bis(2-ethylhexyl) phthalate
BUTBENP	Butyl benzyl phthalate
CADMIUM	Cadrnium
CALCIUM	Calcium
CHLORID	Chloride
CHROMIUM	Chrornium
COPPER	Copper
DIEPHTH	Diethyl phthalate
DMMENAP	1,6-Dimethyl-4-(1-methyl ethyl) naphthalene
FLUORID	Fluoride
HXDECAC	Hexadecanoic acid
IRON	Iron
LEADGF	Lead by GFAA
LOALPHA	Gross alpha
MAGNES	Magnesium
MANGESE	Manganese
MERCURY	Mercury
METHYCH	Methylene chloride
MOLSULF	Molecular sulfur
NC17HC	Heptadecane
NC27HC	Heptacosane
NICKEL	Nickel
NITRATE	Nitrate
OCTDCOL	1-Octadecanol
PENTRCO	Pentatriacontane
PHOSPHA	Phosphate
POTASUM	Potassium
SELENUM	Selenium
SILVER	Silver
SODIUM	Sodium
STRONUM	Strontium
SULFATE	Sulfate
TRIBUPH	Tributylphosphoric acid
TRICENE	Trichloroethylene
UNKALI	Unknown aliphatic hydrocarbon
UNKNOWN	Unknown

TABLE B.1. (contd)

Constituent Name	Full Name of Constituent
VANADUM	Vanadium
ZINC	Zinc
167TNAP	1,6,7-Trimethyl naphthalene
236TNAP	2,3,6-Trimethyl naphthalene
27DMNAP	2,7-Dimethyl naphtha1ene

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE **DETECTION LIMIT**

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001A01	SAMPLE DATE	316001A02	SAMPLE DATE	316001A03	SAMPLE DATE	316001A04
BETA	PCI/G	3.00E+00	06/29/87	1.73E+02	06/29/87	3.14E+02	06/29/87	3.52E+01	06/29/87	1.29E+01
ALPHA	PCI/G	6.00E+00	06/29/87	1.63E+02	06/29/87	3.33E+02	06/29/87	1.83E+01	06/29/87	6.58E+00
BERYLUM	UG/G	5.00E-01	06/29/87	7.00E-01	06/29/87	1.00E+00	06/29/87	7.00E-01	06/29/87	9.00E-01
STRONUM	UG/G	3.00E+01	06/29/87	3.80E+01	06/29/87	4.50E+01	06/29/87	3.60E+01		
ZINC	UG/G	5.00E-01	06/29/87	7.70E+01	06/29/87	1.16E+02	06/29/87	6.90E+01	06/29/87	4.90E+01
CALCIUM	UG/G	5.00E+00	06/29/87	9.81E+03	06/29/87	2.01E+04	06/29/87	2.25E+04	06/29/87	1.08E+04
BARIUM	UG/G	6.00E-01	06/29/87	1.30E+02	06/29/87	1.21E+02	06/29/87	1.11E+02	06/29/87	6.90E+01
CADMIUM	UG/G	2.00E-01	06/29/87	1.00E+00	06/29/87	1.50E+00	06/29/87	1.50E+00	06/29/87	1.70E+00
CHROMUM	UG/G	1.00E+00	06/29/87	8.10E+01	06/29/87	1.29E+02	06/29/87	1.40E+01	06/29/87	4.00E+00
SILVER	UG/G	1.00E+00			06/29/87	1.20E+01				
SODIUM	UG/G	1.00E+01	06/29/87	2.59E+02	06/29/87	3.09E+02	06/29/87	2.82E+02	06/29/87	2.77E+02
NICKEL	UG/G	1.00E+00	06/29/87	1.15E+02	06/29/87	1.99E+02	06/29/87	7.90E+01	06/29/87	4.00E+00
COPPER	UG/G	1.00E+00	06/29/87	1.66E+03	06/29/87	7.06E+03	06/29/87	1.97E+03	06/29/87	2.30E+01
VANADUM	UG/G	5.00E-01	06/29/87	7.90E+01	06/29/87	8.60E+01	06/29/87	8.20E+01	06/29/87	7.20E+01
ALUMNUM	UG/G	1.50E+01	06/29/87	1.87E+04	06/29/87	1.95E+04	06/29/87	1.61E+04	06/29/87	8.06E+03
MANGESE	UG/G	5.00E-01	06/29/87	4.24E+02	06/29/87	3.95E+02	06/29/87	4.21E+02	06/29/87	3.17E+02
POTASUM	UG/G	1.00E+01	06/29/87	1.39E+03	06/29/87	1.47E+03	06/29/87	7.54E+02	06/29/87	4.83E+02
IRON	UG/G	5.00E+00	06/29/87	3.79E+04	06/29/87	4.01E+04	06/29/87	4.44E+04	06/29/87	3.64E+04
ARSENIC	UG/G	5.00E-01	06/29/87	5.60E+00	06/29/87	1.51E+01	06/29/87	2.42E+01	06/29/87	6.60E+00
MERCURY	UG/G	1.00E-01	06/29/87	5.70E-01	06/29/87	7.30E-01	06/29/87	3.40E-01		
MAGNES	UG/G	5.00E+00	06/29/87	9.72E+03	06/29/87	1.06E+04	06/29/87	1.20E+04	06/29/87	6.74E+03
LEADGF	UG/G	5.00E-01	06/29/87	1.87E+01	06/29/87	2.28E+01	06/29/87	3.60E+00	06/29/87	2.30E+00
AR1248	UG/G	1.00E-01	06/29/87	8.90E-01	06/29/87	2.30E+00				
METHYCH	UG/G	1.00E-02			06/29/87	8.90E-02	06/29/87	4.00E-02		
NITRATE	UG/G	1.00E+00	06/29/87	2.45E+00	06/29/87	3.77E+00	06/29/87	9.51E+00	06/29/87	5.92E+00
SULFATE	UG/G	1.00E+00	06/29/87	3.16E+00	06/29/87	4.21E+00	06/29/87	1.06E+01	06/29/87	3.82E+00
FLUORID	UG/G	1.00E+00	06/29/87	1.09E+00	06/29/87	1.57E+00	06/29/87	1.41E+00	06/29/87	1.25E+00
ACETONE	UG/G	0.00E+00	06/29/87	4.00E-02	06/29/87	3.00E-02	06/29/87	4.00E-02	06/29/87	3.00E-02

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001A05	SAMPLE DATE	316001B01	SAMPLE DATE	316001B02	SAMPLE DATE	316001B03
BETA	PCI/G	3.00E+00	06/29/87	1.40E+01	06/29/87	1.84E+01	06/29/87	1.49E+02	06/29/87	2.00E+02
ALPHA	PCI/G	6.00E+00			06/29/87	1.21E+02	06/29/87	2.00E+02	06/29/87	2.78E+01
BERYLUM	UG/G	5.00E-01	06/29/87	5.00E-01	06/29/87	7.00E-01	06/29/87	7.00E-01		
STRONUM	UG/G	3.00E+01			06/29/87	4.10E+01	06/29/87	3.70E+01		
ZINC	UG/G	5.00E-01	06/29/87	5.20E+01	06/29/87	7.10E+01	06/29/87	7.70E+01	06/29/87	5.90E+01
CALCIUM	UG/G	5.00E+00	06/29/87	1.13E+04	06/29/87	1.45E+04	06/29/87	1.28E+04	06/29/87	5.77E+03
BARIUM	UG/G	6.00E-01	06/29/87	6.20E+01	06/29/87	1.73E+02	06/29/87	1.40E+02	06/29/87	1.02E+02
CADMIUM	UG/G	2.00E-01	06/29/87	1.00E+00	06/29/87	1.00E+00	06/29/87	2.00E-01	06/29/87	6.00E-01
CHROMUM	UG/G	1.00E+00	06/29/87	3.00E+00	06/29/87	6.40E+01	06/29/87	1.16E+02	06/29/87	1.30E+01
SILVER	UG/G	1.00E+00					06/29/87	6.00E+00		
SODIUM	UG/G	1.00E+01	06/29/87	2.83E+02	06/29/87	2.77E+02	06/29/87	7.71E+02	06/29/87	7.59E+02
NICKEL	UG/G	1.00E+00	06/29/87	2.00E+00	06/29/87	4.60E+01	06/29/87	8.70E+01	06/29/87	4.20E+01
COPPER	UG/G	1.00E+00	06/29/87	1.80E+01	06/29/87	6.32E+02	06/29/87	2.09E+03	06/29/87	2.02E+02
VANADUM	UG/G	5.00E-01	06/29/87	7.50E+01	06/29/87	7.50E+01	06/29/87	8.00E+01	06/29/87	7.90E+01
ALUMNUM	UG/G	1.50E+01	06/29/87	7.56E+03	06/29/87	1.68E+04	06/29/87	2.12E+04	06/29/87	1.08E+04
MANGESE	UG/G	5.00E-01	06/29/87	3.16E+02	06/29/87	4.02E+02	06/29/87	4.41E+02	06/29/87	3.77E+02
POTASUM	UG/G	1.00E+01	06/29/87	4.64E+02	06/29/87	1.70E+03	06/29/87	1.75E+03	06/29/87	7.95E+02
IRON	UG/G	5.00E+00	06/29/87	2.72E+04	06/29/87	3.68E+04	06/29/87	4.09E+04	06/29/87	3.94E+04
ARSENIC	UG/G	5.00E-01	06/29/87	4.50E+00	06/29/87	9.80E+00	06/29/87	2.70E+01	06/29/87	8.00E+00
MERCURY	UG/G	1.00E-01			06/29/87	1.12E+00	06/29/87	9.80E-01	06/29/87	3.20E-01
MAGNES	UG/G	5.00E+00	06/29/87	4.61E+03	06/29/87	8.83E+03	06/29/87	9.46E+03	06/29/87	6.94E+03
LEADGF	UG/G	5.00E-01	06/29/87	2.90E+00	06/29/87	9.90E+00	06/29/87	2.12E+01	06/29/87	3.30E+00
AR1248	UG/G	1.00E-01			06/29/87	4.80E-01	06/29/87	9.10E-01		
NITRATE	UG/G	1.00E+00	06/29/87	1.82E+01	06/29/87	1.21E+00	06/29/87	2.61E+00		
SULFATE	UG/G	1.00E+00	06/29/87	8.69E+00	06/29/87	2.70E+00	06/29/87	3.83E+00	06/29/87	9.10E+00
FLUORID	UG/G	1.00E+00	06/29/87	1.27E+00	06/29/87	1.73E+00	06/29/87	2.78E+00	06/29/87	1.29E+00
PHOSPHA	UG/G	2.00E+00			06/29/87	2.70E+00				
ACETONE	UG/G	0.00E+00	06/29/87	3.00E-02	06/29/87	3.00E-02	06/29/87	3.00E-02	06/29/87	3.00E-02
TRIBUPH	UG/G	0.00E+00			06/29/87	1.00E+00				

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001B04	SAMPLE DATE	316001B05	SAMPLE DATE	316001C01	SAMPLE DATE	316001C02
BETA	PCI/G	3.00E+00	06/29/87	3.60E+01	06/29/87	1.49E+01	07/01/87	6.72E+01	07/01/87	1.54E+01
ALPHA	PCI/G	6.00E+00					07/01/87	4.60E+01	07/01/87	6.26E+00
BERYLUM	UG/G	5.00E-01					07/01/87	7.00E-01		
STRONUM	UG/G	3.00E+01					07/01/87	3.10E+01		
ZINC	UG/G	5.00E-01	06/29/87	4.80E+01	06/29/87	4.90E+01	07/01/87	1.02E+02	07/01/87	5.70E+01
CALCIUM	UG/G	5.00E+00	06/29/87	5.18E+03	06/29/87	5.18E+03	07/01/87	8.47E+03	07/01/87	5.43E+03
BARIUM	UG/G	6.00E-01	06/29/87	6.90E+01	06/29/87	8.50E+01	07/01/87	1.35E+02	07/01/87	8.60E+01
CADMIUM	UG/G	2.00E-01	06/29/87	5.00E-01	06/29/87	6.00E-01	07/01/87	1.00E+00	07/01/87	9.00E-01
CHROMUM	UG/G	1.00E+00	06/29/87	6.00E+00	06/29/87	8.00E+00	07/01/87	3.50E+01	07/01/87	1.00E+01
SILVER	UG/G	1.00E+00					07/01/87	7.00E+00		
SODIUM	UG/G	1.00E+01	06/29/87	7.35E+02	06/29/87	7.88E+02	07/01/87	7.84E+02	07/01/87	8.11E+02
NICKEL	UG/G	1.00E+00	06/29/87	6.00E+00	06/29/87	7.00E+00	07/01/87	1.04E+02	07/01/87	1.80E+01
COPPER	UG/G	1.00E+00	06/29/87	2.40E+01	06/29/87	3.60E+01	07/01/87	1.09E+03	07/01/87	1.46E+02
VANADUM	UG/G	5.00E-01	06/29/87	7.10E+01	06/29/87	7.40E+01	07/01/87	7.90E+01	07/01/87	8.20E+01
ALUMNUM	UG/G	1.50E+01	06/29/87	7.21E+03	06/29/87	1.14E+04	07/01/87	1.33E+04	07/01/87	1.05E+04
MANGESE	UG/G	5.00E-01	06/29/87	3.11E+02	06/29/87	3.46E+02	07/01/87	3.81E+02	07/01/87	3.56E+02
POTASUM	UG/G	1.00E+01	06/29/87	5.71E+02	06/29/87	9.00E+02	07/01/87	2.02E+03	07/01/87	8.30E+02
IRON	UG/G	5.00E+00	06/29/87	3.60E+04	06/29/87	3.97E+04	07/01/87	3.24E+04	07/01/87	4.17E+04
ARSENIC	UG/G	5.00E-01	06/29/87	4.60E+00	06/29/87	6.40E+00	07/01/87	2.18E+01	07/01/87	8.70E+00
MERCURY	UG/G	1.00E-01					07/01/87	7.20E-01		
MAGNES	UG/G	5.00E+00	06/29/87	6.11E+03	06/29/87	7.31E+03	07/01/87	7.29E+03	07/01/87	7.99E+03
LEADGF	UG/G	5.00E-01	06/29/87	2.50E+00	06/29/87	3.60E+00	07/01/87	1.52E+01	07/01/87	5.00E+00
AR1254	UG/G	1.00E-01					07/01/87	1.20E-01		
DIEPHTH	UG/G	1.00E+00					07/01/87	2.10E+00		
NITRATE	UG/G	1.00E+00	06/29/87	1.91E+00	06/29/87	8.26E+00	07/01/87	5.08E+00	07/01/87	2.83E+00
SULFATE	UG/G	1.00E+00	06/29/87	1.42E+01	06/29/87	1.77E+01	07/01/87	2.57E+00	07/01/87	1.81E+00
FLUORID	UG/G	1.00E+00	06/29/87	1.12E+00	06/29/87	1.42E+00	07/01/87	1.15E+00		
PHOSPHA	UG/G	2.00E+00					07/01/87	2.48E+00		
ACETONE	UG/G	0.00E+00	06/29/87	3.00E-02	06/29/87	2.00E-02				

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001C03	SAMPLE DATE	316001C04	SAMPLE DATE	316001C05	SAMPLE DATE	316001D01
BETA	PCI/G	3.00E+00	07/01/87	1.30E+01	07/01/87	1.48E+01	07/01/87	1.51E+01	07/07/87	2.01E+02
ALPHA	PCI/G	6.00E+00							07/07/87	2.40E+02
BERYLUM	UG/G	5.00E-01							07/07/87	1.00E+00
STRONUM	UG/G	3.00E+01							07/07/87	4.60E+01
ZINC	UG/G	5.00E-01	07/01/87	4.50E+01	07/01/87	4.30E+01	07/01/87	4.50E+01	07/07/87	1.64E+02
CALCIUM	UG/G	5.00E+00	07/01/87	5.17E+03	07/01/87	7.47E+03	07/01/87	7.69E+03	07/07/87	1.72E+04
BARIUM	UG/G	6.00E-01	07/01/87	9.80E+01	07/01/87	5.60E+01	07/01/87	1.03E+02	07/07/87	1.64E+02
CADMIUM	UG/G	2.00E-01	07/01/87	7.00E-01	07/01/87	1.00E+00	07/01/87	6.00E-01	07/07/87	2.00E+00
CHROMUM	UG/G	1.00E+00	07/01/87	6.00E+00	07/01/87	4.00E+00	07/01/87	5.00E+00	07/07/87	1.95E+02
SILVER	UG/G	1.00E+00							07/07/87	3.10E+01
SODIUM	UG/G	1.00E+01	07/01/87	7.49E+02	07/01/87	6.72E+02	07/01/87	6.94E+02	07/07/87	3.28E+02
NICKEL	UG/G	1.00E+00	07/01/87	6.00E+00	07/01/87	3.00E+00	07/01/87	4.00E+00	07/07/87	2.75E+02
COPPER	UG/G	1.00E+00	07/01/87	4.50E+01	07/01/87	1.50E+01	07/01/87	1.70E+01	07/07/87	5.80E+03
VANADUM	UG/G	5.00E-01	07/01/87	4.30E+01	07/01/87	1.60E+01	07/01/87	6.80E+01	07/07/87	8.00E+01
ALUMNUM	UG/G	1.50E+01	07/01/87	6.28E+03	07/01/87	6.78E+03	07/01/87	8.93E+03	07/07/87	2.19E+04
MANGESE	UG/G	5.00E-01	07/01/87	4.25E+02	07/01/87	2.81E+02	07/01/87	3.74E+02	07/07/87	4.12E+02
POTASUM	UG/G	1.00E+01	07/01/87	6.12E+02	07/01/87	5.36E+02	07/01/87	7.77E+02	07/07/87	2.12E+03
IRON	UG/G	5.00E+00	07/01/87	3.12E+04	07/01/87	3.72E+04	07/01/87	3.83E+04	07/07/87	3.15E+04
ARSENIC	UG/G	5.00E-01	07/01/87	4.10E+00	07/01/87	2.90E+00	07/01/87	5.30E+00	07/07/87	3.55E+01
MERCURY	UG/G	1.00E-01							07/07/87	2.25E+00
MAGNES	UG/G	5.00E+00	07/01/87	5.44E+03	07/01/87	6.37E+03	07/01/87	6.89E+03	07/07/87	9.09E+03
LEADGF	UG/G	5.00E-01	07/01/87	2.90E+00	07/01/87	2.80E+00	07/01/87	4.10E+00	07/07/87	3.94E+01
AR1248	UG/G	1.00E-01							07/07/87	3.10E-01
AR1254	UG/G	1.00E-01							07/07/87	4.40E-01
METHYCH	UG/G	1.00E-02							07/07/87	3.00E-02
NITRATE	UG/G	1.00E+00	07/01/87	3.18E+00	07/01/87	2.57E+00	07/01/87	6.15E+00	07/07/87	1.32E+01
SULFATE	UG/G	1.00E+00	07/01/87	1.28E+00	07/01/87	1.24E+00	07/01/87	3.27E+00	07/07/87	4.44E+00
FLUORID	UG/G	1.00E+00	07/01/87	1.06E+00						

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001D02	SAMPLE DATE	316001D03	SAMPLE DATE	316001D04	SAMPLE DATE	316001D05
BETA	PCI/G	3.00E+00	07/07/87	4.19E+01	07/07/87	1.57E+01	07/07/87	1.32E+01	07/07/87	2.35E+01
ALPHA	PCI/G	6.00E+00	07/07/87	4.49E+01						
BERYLUM	UG/G	5.00E-01	07/07/87	7.00E-01	07/07/87	7.00E-01	07/07/87	5.00E-01		
STRONUM	UG/G	3.00E+01	07/07/87	3.00E+01						
ZINC	UG/G	5.00E-01	07/07/87	6.90E+01	07/07/87	5.40E+01	07/07/87	5.00E+01	07/07/87	5.40E+01
CALCIUM	UG/G	5.00E+00	07/07/87	6.84E+03	07/07/87	5.62E+03	07/07/87	5.71E+03	07/07/87	9.56E+03
BARIUM	UG/G	6.00E-01	07/07/87	1.20E+02	07/07/87	9.50E+01	07/07/87	7.60E+01	07/07/87	9.10E+01
CADMIUM	UG/G	2.00E-01	07/07/87	6.00E-01	07/07/87	4.00E-01	07/07/87	5.00E-01	07/07/87	3.00E-01
CHROMUM	UG/G	1.00E+00	07/07/87	4.40E+01	07/07/87	1.00E+01	07/07/87	5.00E+00	07/07/87	1.40E+01
SODIUM	UG/G	1.00E+01	07/07/87	3.11E+02	07/07/87	3.14E+02	07/07/87	3.20E+02	07/07/87	3.10E+02
NICKEL	UG/G	1.00E+00	07/07/87	4.60E+01	07/07/87	9.00E+00	07/07/87	5.00E+00	07/07/87	1.60E+01
COPPER	UG/G	1.00E+00	07/07/87	5.94E+02	07/07/87	5.80E+01	07/07/87	2.40E+01	07/07/87	1.69E+02
VANADUM	UG/G	5.00E-01	07/07/87	6.40E+01	07/07/87	6.20E+01	07/07/87	6.60E+01	07/07/87	1.60E+01
ALUMNUM	UG/G	1.50E+01	07/07/87	1.16E+04	07/07/87	9.71E+03	07/07/87	7.24E+03	07/07/87	8.81E+03
MANGESE	µG/G	5.00E-01	07/07/87	4.15E+02	07/07/87	3.85E+02	07/07/87	3.37E+02	07/07/87	3.73E+02
POTASUM	UG/G	1.00E+01	07/07/87	1.29E+03	07/07/87	1.38E+03	07/07/87	8.69E+02	07/07/87	1.09E+03
IRON	UG/G	5.00E+00	07/07/87	2.83E+04	07/07/87	2.67E+04	07/07/87	2.75E+04	07/07/87	3.03E+04
ARSENIC	UG/G	5.00E-01	07/07/87	1.10E+01	07/07/87	6.90E+00	07/07/87	3.80E+00	07/07/87	9.40E+00
MERCURY	UG/G	1.00E-01	07/07/87	2.20E-01						
MAGNES	UG/G	5.00E+00	07/07/87	6.66E+03	07/07/87	5.99E+03	07/07/87	5.14E+03	07/07/87	5.95E+03
LEADGF	UG/G	5.00E-01	07/07/87	8.40E+00	07/07/87	6.60E+00	07/07/87	3.80E+00	07/07/87	5.80E+00
METHYCH	UG/G	1.00E-02			07/07/87	2.20E-02				
NITRATE	UG/G	1.00E+00	07/07/87	1.66E+00	07/07/87	3.89E+00	07/07/87	3.20E+00	07/07/87	5.48E+00
SULFATE	UG/G	1.00E+00	07/07/87	2.56E+00	07/07/87	3.35E+00	07/07/87	3.25E+00	07/07/87	5.27E+00
FLUORID	UG/G	1.00E+00	07/07/87	1.22E+00						
CHLORID	UG/G	1.00E+00					07/07/87	1.33E+00		

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001E01	SAMPLE DATE	316001E02	SAMPLE DATE	316001E03	SAMPLE DATE	316001E04
BETA	PCI/G	3.00E+00	07/07/87	3.46E+01	07/07/87	2.41E+01	07/07/87	1.75E+01	07/07/87	1.41E+01
ALPHA	PCI/G	6.00E+00	07/07/87	5.53E+01	07/07/87	7.47E+00	07/07/87	6.44E+00		
BERYLUM	UG/G	5.00E-01	07/07/87	8.00E-01	07/07/87	7.00E-01	07/07/87	7.00E-01	07/07/87	6.00E-01
STRONUM	UG/G	3.00E+01	07/07/87	3.50E+01	07/07/87	3.40E+01				
ZINC	UG/G	5.00E-01	07/07/87	1.10E+02	07/07/87	6.00E+01	07/07/87	6.00E+01	07/07/87	5.30E+01
CALCIUM	UG/G	5.00E+00	07/07/87	7.38E+03	07/07/87	8.34E+03	07/07/87	8.39E+03	07/07/87	5.59E+03
BARIUM	UG/G	6.00E-01	07/07/87	1.56E+02	07/07/87	1.14E+02	07/07/87	8.90E+01	07/07/87	6.10E+01
CADMIUM	UG/G	2.00E-01	07/07/87	1.00E+00	07/07/87	1.00E+00	07/07/87	5.00E-01	07/07/87	7.00E-01
CHROMUM	UG/G	1.00E+00	07/07/87	3.90E+01	07/07/87	1.40E+01	07/07/87	1.00E+01	07/07/87	4.00E+00
SILVER	UG/G	1.00E+00	07/07/87	4.00E+00						
SODIUM	UG/G	1.00E+01	07/07/87	3.32E+02	07/07/87	4.66E+02	07/07/87	3.23E+02	07/07/87	3.09E+02
NICKEL	UG/G	1.00E+00	07/07/87	1.27E+02	07/07/87	1.30E+01	07/07/87	9.00E+00	07/07/87	5.00E+00
COPPER	UG/G	1.00E+00	07/07/87	9.78E+02	07/07/87	4.10E+01	07/07/87	2.70E+01	07/07/87	1.60E+01
VANADUM	UG/G	5.00E-01	07/07/87	7.00E+01	07/07/87	7.50E+01	07/07/87	7.60E+01	07/07/87	7.80E+01
ALUMNUM	UG/G	1.50E+01	07/07/87	1.29E+04	07/07/87	1.31E+04	07/07/87	1.17E+04	07/07/87	6.10E+03
MANGESE	UG/G	5.00E-01	07/07/87	4.02E+02	07/07/87	4.38E+02	07/07/87	4.09E+02	07/07/87	3.41E+02
POTASUM	UG/G	1.00E+01	07/07/87	1.39E+03	07/07/87	1.79E+03	07/07/87	1.55E+03	07/07/87	4.89E+02
IRON	UG/G	5.00E+00	07/07/87	2.55E+04	07/07/87	2.85E+04	07/07/87	3.55E+04	07/07/87	3.30E+04
ARSENIC	UG/G	5.00E-01	07/07/87	8.20E+00	07/07/87	1.96E+01	07/07/87	5.70E+00	07/07/87	4.60E+00
MERCURY	UG/G	1.00E-01	07/07/87	6.60E-01						
MAGNES	UG/G	5.00E+00	07/07/87	6.95E+03	07/07/87	7.43E+03	07/07/87	7.51E+03	07/07/87	5.51E+03
LEADGF	UG/G	5.00E-01	07/07/87	1.48E+01	07/07/87	7.50E+00	07/07/87	5.60E+00	07/07/87	3.70E+00
NITRATE	UG/G	1.00E+00	07/07/87	1.71E+00						
SULFATE	UG/G	1.00E+00	07/07/87	2.73E+00	07/07/87	3.13E+00	07/07/87	3.65E+00		

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001E05	SAMPLE DATE	316001F01	SAMPLE DATE	316001F02	SAMPLE DATE	316001F03
BETA	PCI/G	3.00E+00	07/07/87	1.71E+01	07/08/87	3.29E+01	07/08/87	3.48E+01	07/08/87	1.43E+01
ALPHA	PCI/G	6.00E+00			07/08/87	2.48E+01	07/08/87	3.01E+01		
BERYLUM	UG/G	5.00E-01	07/07/87	5.00E-01	07/08/87	1.00E+00	07/08/87	5.00E-01	07/08/87	5.00E-01
STRONUM	UG/G	3.00E+01			07/08/87	7.10E+01				
ZINC	UG/G	5.00E-01	07/07/87	4.70E+01	07/08/87	6.40E+02	07/08/87	8.80E+01	07/08/87	4.80E+01
CALCIUM	UG/G	5.00E+00	07/07/87	6.89E+03	07/08/87	5.26E+03	07/08/87	4.27E+03	07/08/87	5.07E+03
BARIUM	UG/G	6.00E-01	07/07/87	7.70E+01	07/08/87	1.11E+02	07/08/87	1.17E+02	07/08/87	9.00E+01
CADMIUM	UG/G	2.00E-01	07/07/87	3.00E-01	07/08/87	9.00E-01	07/08/87	1.00E+00	07/08/87	1.00E+00
CHROMUM	UG/G	1.00E+00	07/07/87	5.00E+00	07/08/87	8.00E+01	07/08/87	4.70E+01	07/08/87	6.00E+00
SILVER	UG/G	1.00E+00					07/08/87	3.00E+00		
SODIUM	UG/G	1.00E+01	07/07/87	2.46E+02	07/08/87	2.44E+02	07/08/87	2.50E+02	07/08/87	2.68E+02
NICKEL	UG/G	1.00E+00	07/07/87	3.00E+00	07/08/87	1.90E+01	07/08/87	9.20E+01	07/08/87	1.00E+01
COPPER	UG/G	1.00E+00	07/07/87	1.50E+01	07/08/87	1.74E+02	07/08/87	2.12E+03	07/08/87	5.50E+01
VANADUM	UG/G	5.00E-01	07/07/87	6.10E+01	07/08/87	4.30E+01	07/08/87	6.60E+01	07/08/87	6.80E+01
ALUMNUM	UG/G	1.50E+01	07/07/87	6.00E+03	07/08/87	8.18E+04	07/08/87	1.34E+04	07/08/87	6.50E+03
MANGESE	UG/G	5.00E-01	07/07/87	3.14E+02	07/08/87	4.06E+02	07/08/87	7.46E+02	07/08/87	3.85E+02
POTASUM	UG/G	1.00E+01	07/07/87	7.33E+02	07/08/87	1.37E+03	07/08/87	8.13E+02	07/08/87	5.96E+02
IRON	UG/G	5.00E+00	07/07/87	2.52E+04	07/08/87	1.57E+04	07/08/87	3.36E+04	07/08/87	2.87E+04
ARSENIC	UG/G	5.00E-01	07/07/87	2.70E+00	07/08/87	1.48E+02	07/08/87	6.90E+00	07/08/87	4.40E+00
MERCURY	UG/G	1.00E-01			07/08/87	2.10E-01	07/08/87	1.13E+00	07/08/87	1.10E-01
THALIUM	UG/G	5.00E-01			07/08/87	2.80E+00				
MAGNES	UG/G	5.00E+00	07/07/87	4.72E+03	07/08/87	4.76E+03	07/08/87	7.45E+03	07/08/87	5.54E+03
LEADGF	UG/G	5.00E-01	07/07/87	4.50E+00	07/08/87	4.96E+01	07/08/87	1.12E+01	07/08/87	3.00E+00
NITRATE	UG/G	1.00E+00			07/08/87	5.34E+02	07/08/87	2.33E+01	07/08/87	2.88E+00
SULFATE	UG/G	1.00E+00			07/08/87	7.02E+02	07/08/87	6.05E+02	07/08/87	3.07E+01
CHLORID	UG/G	1.00E+00	07/07/87	1.41E+00	07/08/87	4.05E+02	07/08/87	1.39E+00		
PENTRCO	UG/G	0.00E+00			07/08/87	5.00E+00				
UNKALI	UG/G	0.00E+00			07/08/87	4.70E+00				
UNKALI	UG/G	0.00E+00			07/08/87	3.20E+00				
UNKALI	UG/G	0.00E+00			07/08/87	3.00E+00				
HXDECAC	UG/G				07/08/87	2.70E+00				
MOLSULF	UG/G						07/08/87	4.50E+00		
OCTDCOL	PPB				07/08/87	4.00E+00				

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001F04	SAMPLE DATE	316001F05	SAMPLE DATE	316001G01	SAMPLE DATE	316001G02
BETA	PCI/G	3.00E+00	07/08/87	2.14E+01	07/08/87	1.71E+01	05/20/87	2.36E+01	05/20/87	2.38E+01
ALPHA	PCI/G	6.00E+00	07/08/87	6.61E+00					05/20/87	8.50E+00
BERYLUM	UG/G	5.00E-01	07/08/87	5.00E-01	07/08/87	6.00E-01				
ZINC	UG/G	5.00E-01	07/08/87	5.40E+01	07/08/87	5.20E+01	05/20/87	3.80E+01	05/20/87	4.80E+01
CALCIUM	UG/G	5.00E+00	07/08/87	5.09E+03	07/08/87	5.44E+03	05/20/87	4.67E+03	05/20/87	3.84E+03
BARIUM	UG/G	6.00E-01	07/08/87	1.10E+02	07/08/87	1.14E+02	05/20/87	7.20E+01	05/20/87	9.80E+01
CADMIUM	UG/G	2.00E-01	07/08/87	9.00E-01	07/08/87	1.00E+00			05/20/87	2.00E-01
CHROMUM	UG/G	1.00E+00	07/08/87	9.00E+00	07/08/87	7.00E+00	05/20/87	9.00E+00	05/20/87	1.10E+01
SODIUM	UG/G	1.00E+01	07/08/87	2.69E+02	07/08/87	2.71E+02	05/20/87	1.54E+02	05/20/87	1.80E+02
NICKEL	UG/G	1.00E+00	07/08/87	9.00E+00	07/08/87	6.00E+00	05/20/87	6.00E+00	05/20/87	8.00E+00
COPPER	UG/G	1.00E+00	07/08/87	9.80E+01	07/08/87	2.90E+01	05/20/87	1.00E+01	05/20/87	1.60E+01
VANADUM	UG/G	5.00E-01	07/08/87	6.50E+01	07/08/87	6.90E+01	05/20/87	5.10E+01	05/20/87	5.50E+01
ALUMNUM	UG/G	1.50E+01	07/08/87	1.03E+04	07/08/87	1.06E+04	05/20/87	6.99E+03	05/20/87	1.07E+04
MANGESE	UG/G	5.00E-01	07/08/87	4.09E+02	07/08/87	6.12E+02	05/20/87	3.21E+02	05/20/87	3.87E+02
POTASUM	UG/G	1.00E+01	07/08/87	1.02E+03	07/08/87	9.54E+02	05/20/87	1.31E+03	05/20/87	2.21E+03
IRON	UG/G	5.00E+00	07/08/87	2.71E+04	07/08/87	2.94E+04	05/20/87	2.11E+04	05/20/87	2.57E+04
ARSENIC	UG/G	5.00E-01	07/08/87	5.00E+00	07/08/87	6.90E+00	05/20/87	1.03E+00	05/20/87	3.92E+00
MERCURY	UG/G	1.00E-01	07/08/87	2.10E-01						
MAGNES	UG/G	5.00E+00	07/08/87	5.70E+03	07/08/87	5.93E+03	05/20/87	4.61E+03	05/20/87	5.64E+03
LEADGF	UG/G	5.00E-01	07/08/87	4.90E+00	07/08/87	6.40E+00	05/20/87	3.43E+00	05/20/87	5.35E+00
NITRATE	UG/G	1.00E+00	07/08/87	2.72E+00	07/08/87	2.85E+00				
SULFATE	UG/G	1.00E+00	07/08/87	1.39E+01	07/08/87	1.13E+01			05/20/87	1.31E+00
CHLORID	UG/G	1.00E+00	07/08/87	1.16E+00			05/20/87	2.36E+00		

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316001G03	SAMPLE DATE	316001G04	SAMPLE DATE	316001G05	SAMPLE DATE	316002A01
BETA	PCI/G	3.00E+00	05/20/87	1.81E+01	05/20/87	2.26E+01	05/20/87	1.91E+01	06/03/87	1.93E+01
ALPHA	PCI/G	6.00E+00			05/20/87	9.19E+00			06/03/87	2.29E+01
BERYLUM	UG/G	5.00E-01	05/20/87	7.00E-01	05/20/87	6.00E-01			06/03/87	1.00E+00
STRONUM	UG/G	3.00E+01	05/20/87	3.20E+01	05/20/87	3.10E+01	05/20/87	3.00E+01	06/03/87	4.10E+02
ZINC	UG/G	5.00E-01	05/20/87	6.20E+01	05/20/87	5.60E+01	05/20/87	4.70E+01	06/03/87	5.60E+01
CALCIUM	UG/G	5.00E+00	05/20/87	1.23E+04	05/20/87	9.43E+03	05/20/87	8.67E+03	06/03/87	5.00E+04
BARIUM	UG/G	6.00E-01	05/20/87	1.33E+02	05/20/87	1.16E+02	05/20/87	6.40E+01	06/03/87	2.70E+02
CADMIUM	UG/G	2.00E-01	05/20/87	8.00E-01	05/20/87	5.00E-01			06/03/87	4.00E-01
CHROMUM	UG/G	1.00E+00	05/20/87	1.10E+01	05/20/87	1.00E+01	05/20/87	8.00E+00	06/03/87	1.20E+01
SODIUM	UG/G	1.00E+01	05/20/87	4.20E+02	05/20/87	4.49E+02	05/20/87	3.75E+02	06/03/87	2.61E+03
NICKEL	UG/G	1.00E+00	05/20/87	9.00E+00	05/20/87	8.00E+00	05/20/87	7.00E+00	06/03/87	1.40E+01
COPPER	UG/G	1.00E+00	05/20/87	2.30E+01	05/20/87	2.30E+01	05/20/87	2.00E+01	06/03/87	2.90E+01
VANADUM	UG/G	5.00E-01	05/20/87	6.90E+01	05/20/87	6.60E+01	05/20/87	5.90E+01	06/03/87	3.80E+01
ALUMNUM	UG/G	1.50E+01	05/20/87	1.27E+04	05/20/87	1.10E+04	05/20/87	8.16E+03	06/03/87	1.81E+04
MANGESE	UG/G	5.00E-01	05/20/87	5.07E+02	05/20/87	4.13E+02	05/20/87	3.53E+02	06/03/87	9.90E+01
POTASUM	UG/G	1.00E+01	05/20/87	1.63E+03	05/20/87	1.63E+03	05/20/87	1.32E+03	06/03/87	1.30E+03
IRON	UG/G	5.00E+00	05/20/87	3.24E+04	05/20/87	3.08E+04	05/20/87	2.81E+04	06/03/87	1.49E+04
ARSENIC	UG/G	5.00E-01	05/20/87	3.52E+00	05/20/87	4.77E+00	05/20/87	1.96E+00	06/03/87	4.60E+00
MAGNES	UG/G	5.00E+00	05/20/87	7.76E+03	05/20/87	7.06E+03	05/20/87	5.87E+03	06/03/87	5.58E+03
LEADGF	UG/G	5.00E-01	05/20/87	5.76E+00	05/20/87	5.85E+00	05/20/87	5.02E+00	06/03/87	7.60E+00
NITRATE	UG/G	1.00E+00					05/20/87	1.06E+00	06/03/87	2.85E+01
SULFATE	UG/G	1.00E+00	05/20/87	1.15E+01	05/20/87	1.34E+01	05/20/87	1.25E+01	06/03/87	1.01E+03
FLUORID	UG/G	1.00E+00	05/20/87	3.38E+00	05/20/87	1.50E+00			06/03/87	1.73E+00
CHLORID	UG/G	1.00E+00	05/20/87	1.35E+00			05/20/87	1.82E+00	06/03/87	3.70E+00
UNKALI	UG/G	0.00E+00							06/03/87	6.40E+00
UNKNOWN	UG/G	0.00E+00							06/03/87	5.70E+00
NC17HC	UG/G								06/03/87	8.20E+00
NC27HC	UG/G								06/03/87	1.50E+01

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002A02	SAMPLE DATE	316002A03	SAMPLE DATE	316002A04	DUPLICATE 316002A04A	SAMPLE DATE	316002A05
BETA	PCI/G	3.00E+00	06/03/87	2.14E+03	06/03/87	3.38E+02	06/03/87	2.01E+02	2.23E+02	06/03/87	5.80E+01
ALPHA	PCI/G	6.00E+00	06/03/87	1.96E+03	06/03/87	4.10E+02	06/03/87	2.31E+02	2.79E+02	06/03/87	4.00E+01
BERYLUM	UG/G	5.00E-01	06/03/87	1.00E+00	06/03/87	1.00E+00	06/03/87	6.00E-01	1.00E+00	06/03/87	6.00E-01
STRONUM	UG/G	3.00E+01	06/03/87	9.10E+01	06/03/87	3.50E+01					
ZINC	UG/G	5.00E-01	06/03/87	1.10E+01	06/03/87	6.80E+01	06/03/87	6.50E+01	6.30E+01	06/03/87	5.50E+01
CALCIUM	UG/G	5.00E+00	06/03/87	5.51E+04	06/03/87	1.20E+04	06/03/87	5.69E+03	1.36E+04	06/03/87	4.92E+03
BARIUM	UG/G	6.00E-01	06/03/87	1.35E+02	06/03/87	9.90E+01	06/03/87	7.00E+01	7.80E+01	06/03/87	6.80E+01
CADMIUM	UG/G	2.00E-01			06/03/87	2.00E-01	06/03/87	1.00E+00	1.00E+00	06/03/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/03/87	5.19E+02	06/03/87	2.11E+02	06/03/87	7.40E+01	9.80E+01	06/03/87	7.00E+00
SILVER	UG/G	1.00E+00	06/03/87	1.53E+02	06/03/87	8.00E+00	06/03/87	7.00E+00	1.50E+01		
SODIUM	UG/G	1.00E+01	06/03/87	5.82E+02	06/03/87	5.36E+02	06/03/87	4.42E+02	4.25E+02	06/03/87	3.61E+02
NICKEL	UG/G	1.00E+00	06/03/87	1.83E+03	06/03/87	1.42E+02	06/03/87	6.80E+01	8.70E+01	06/03/87	3.50E+01
COPPER	UG/G	1.00E+00	06/03/87	6.56E+04	06/03/87	1.19E+04	06/03/87	1.08E+04	1.63E+04	06/03/87	4.35E+03
VANADUM	UG/G	5.00E-01	06/03/87	2.26E+02	06/03/87	6.20E+01	06/03/87	7.60E+01	7.00E+01	06/03/87	6.60E+01
ANTIONY	UG/G	1.00E+01	06/03/87	2.00E+01							
ALUMNUM	UG/G	1.50E+01	06/03/87	3.41E+04	06/03/87	1.99E+04	06/03/87	1.35E+04	1.57E+04	06/03/87	1.16E+04
MANGESE	UG/G	5.00E-01	06/03/87	5.94E+02	06/03/87	3.17E+02	06/03/87	3.29E+02	3.10E+02	06/03/87	3.58E+02
POTASUM	UG/G	1.00E+01	06/03/87	4.69E+02	06/03/87	8.48E+02	06/03/87	5.55E+02	5.20E+02	06/03/87	4.05E+02
IRON	UG/G	5.00E+00	06/03/87	1.61E+04	06/03/87	2.68E+04	06/03/87	3.43E+04	3.36E+04	06/03/87	3.59E+04
ARSENIC	UG/G	5.00E-01	06/03/87	7.00E+00	06/03/87	7.60E+00	06/03/87	2.70E+00	2.20E+00	06/03/87	1.50E+00
MERCURY	UG/G	1.00E-01	06/03/87	8.51E+00	06/03/87	2.43E-01					
MAGNES	UG/G	5.00E+00	06/03/87	1.21E+04	06/03/87	6.04E+03	06/03/87	6.64E+03	6.23E+03	06/03/87	6.29E+03
LEADGF	UG/G	5.00E-01	06/03/87	1.91E+02	06/03/87	2.36E+01	06/03/87	1.99E+01	1.76E+01	06/03/87	2.50E+00
AR1248	UG/G	1.00E-01	06/03/87	4.20E+01	06/03/87	6.00E-01	06/03/87	4.00E-01	6.00E-01		
METHYCH	UG/G	1.00E-02	06/03/87	3.00E-02							
BUTBENP	UG/G	1.00E+00								06/03/87	1.10E+00
NITRATE	UG/G	1.00E+00	06/03/87	6.45E+02	06/03/87	1.40E+02	06/03/87	9.06E+01	7.94E+01	06/03/87	1.52E+02
SULFATE	UG/G	1.00E+00	06/03/87	5.02E+02	06/03/87	2.68E+01	06/03/87	3.85E+01	4.01E+01	06/03/87	2.10E+01
FLUORID	UG/G	1.00E+00	06/03/87	1.04E+01	06/03/87	1.31E+01	06/03/87	1.39E+01	9.88E+00	06/03/87	1.04E+01
CHLORID	UG/G	1.00E+00	06/03/87	3.20E+01	06/03/87	3.67E+00	06/03/87	4.70E+00	4.30E+00	06/03/87	1.81E+00

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002B01	SAMPLE DATE	316002B02	SAMPLE DATE	316002B03	SAMPLE DATE	316002B04
BETA	PCI/G	3.00E+00	06/08/87	2.95E+02	06/10/87	7.27E+01	06/08/87	2.49E+01	06/08/87	1.44E+01
ALPHA	PCI/G	6.00E+00	06/08/87	3.74E+02	06/10/87	4.21E+01	06/08/87	1.48E+01		
BERYLLUM	UG/G	5.00E-01	06/08/87	1.00E+00	06/10/87	1.00E+00	06/08/87	1.00E+00	06/08/87	1.00E+00
STRONUM	UG/G	3.00E+01	06/08/87	5.70E+01						
ZINC	UG/G	5.00E-01	06/08/87	1.32E+02	06/10/87	8.00E+01	06/08/87	5.90E+01	06/08/87	5.00E+01
CALCIUM	UG/G	5.00E+00	06/08/87	1.65E+04	06/10/87	4.76E+03	06/08/87	5.60E+03	06/08/87	5.54E+03
BARIUM	UG/G	6.00E-01	06/08/87	1.71E+02	06/10/87	9.30E+01	06/08/87	8.00E+01	06/08/87	7.60E+01
CADMIUM	UG/G	2.00E-01	06/08/87	1.00E+00	06/10/87	1.00E+00	06/08/87	1.00E+00	06/08/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/08/87	2.05E+02	06/10/87	3.40E+01	06/08/87	1.50E+01	06/08/87	4.00E+00
SILVER	UG/G	1.00E+00	06/08/87	4.50E+01	06/10/87	1.00E+00				
SODIUM	UG/G	1.00E+01	06/08/87	3.22E+02	06/10/87	2.50E+02	06/08/87	3.09E+02	06/08/87	2.62E+02
NICKEL	UG/G	1.00E+00	06/08/87	2.16E+02	06/10/87	1.32E+02	06/08/87	5.10E+01	06/08/87	1.00E+01
COPPER	UG/G	1.00E+00	06/08/87	3.54E+03	06/10/87	1.11E+03	06/08/87	2.64E+02	06/08/87	3.70E+01
VANADUM	UG/G	5.00E-01	06/08/87	8.40E+01	06/10/87	7.60E+01	06/08/87	8.30E+01	06/08/87	7.40E+01
ALUMNUM	UG/G	1.50E+01	06/08/87	2.07E+04	06/10/87	8.64E+03	06/08/87	7.42E+03	06/08/87	6.87E+03
MANGESE	UG/G	5.00E-01	06/08/87	3.41E+02	06/10/87	4.42E+02	06/08/87	3.92E+02	06/08/87	3.26E+02
POTASUM	UG/G	1.00E+01	06/08/87	8.71E+02	06/10/87	5.17E+02	06/08/87	5.61E+02	06/08/87	5.21E+02
IRON	UG/G	5.00E+00	06/08/87	2.99E+04	06/10/87	2.85E+04	06/08/87	3.46E+04	06/08/87	3.50E+04
ARSENIC	UG/G	5.00E-01	06/08/87	1.40E+01	06/10/87	8.60E+00	06/08/87	6.60E+00	06/08/87	7.80E+00
MERCURY	UG/G	1.00E-01	06/08/87	4.71E+00	06/10/87	1.31E+00	06/08/87	3.09E-01	06/08/87	1.51E-01
MAGNES	UG/G	5.00E+00	06/08/87	8.83E+03	06/10/87	5.19E+03	06/08/87	6.06E+03	06/08/87	5.83E+03
LEADGF	UG/G	5.00E-01	06/08/87	2.04E+01	06/10/87	8.40E+00	06/08/87	3.00E+00	06/08/87	2.70E+00
AR1248	UG/G	1.00E-01	06/08/87	2.00E+00	06/10/87	6.20E-01	06/08/87	1.00E-01		
METHYCH	UG/G	1.00E-02	06/08/87	3.00E-02						
NITRATE	UG/G	1.00E+00	06/08/87	3.83E+00	06/10/87	3.75E+00	06/08/87	3.50E+00	06/08/87	4.37E+00
SULFATE	UG/G	1.00E+00	06/08/87	1.03E+01	06/10/87	1.34E+01	06/08/87	6.98E+00	06/08/87	4.74E+00
FLUORID	UG/G	1.00E+00	06/08/87	4.32E+00	06/10/87	4.58E+00	06/08/87	3.84E+00	06/08/87	2.67E+00
ACETONE	UG/G	0.00E+00			06/10/87	1.10E-01				

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002B05	SAMPLE DATE	316002C01	SAMPLE DATE	316002C02	SAMPLE DATE	316002C03
BETA	PCI/G	3.00E+00	06/08/87	1.83E+01	06/10/87	8.82E+01	06/10/87	3.10E+01	06/10/87	2.06E+01
ALPHA	PCI/G	6.00E+00			06/10/87	8.96E+01	06/10/87	1.47E+01		
BERYLUM	UG/G	5.00E-01	06/08/87	1.00E+00	06/10/87	1.00E+00	06/10/87	1.00E+00	06/10/87	1.00E+00
STRONUM	UG/G	3.00E+01			06/10/87	3.00E+01				
ZINC	UG/G	5.00E-01	06/08/87	5.00E+01	06/10/87	1.26E+02	06/10/87	9.20E+01	06/10/87	5.50E+01
CALCIUM	UG/G	5.00E+00	06/08/87	4.71E+03	06/10/87	5.06E+03	06/10/87	7.57E+03	06/10/87	5.03E+03
BARIUM	UG/G	6.00E-01	06/08/87	5.90E+01	06/10/87	1.68E+02	06/10/87	1.44E+02	06/10/87	9.70E+01
CADMIUM	UG/G	2.00E-01	06/08/87	1.00E+00	06/10/87	2.00E+00	06/10/87	2.00E+00	06/10/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/08/87	5.00E+00	06/10/87	7.50E+01	06/10/87	2.20E+01	06/10/87	6.00E+00
SILVER	UG/G	1.00E+00			06/10/87	8.00E+00				
SODIUM	UG/G	1.00E+01	06/08/87	2.29E+02	06/10/87	2.55E+02	06/10/87	3.20E+02	06/10/87	2.35E+02
NICKEL	UG/G	1.00E+00	06/08/87	4.00E+00	06/10/87	5.20E+01	06/10/87	3.60E+01	06/10/87	5.00E+00
COPPER	UG/G	1.00E+00	06/08/87	1.40E+01	06/10/87	2.45E+03	06/10/87	3.25E+02	06/10/87	2.10E+01
VANADUM	UG/G	5.00E-01	06/08/87	7.70E+01	06/10/87	9.50E+01	06/10/87	1.07E+02	06/10/87	8.50E+01
ALUMNUM	UG/G	1.50E+01	06/08/87	7.48E+03	06/10/87	1.80E+04	06/10/87	1.36E+04	06/10/87	9.86E+03
MANGESE	UG/G	5.00E-01	06/08/87	3.72E+02	06/10/87	4.54E+02	06/10/87	4.73E+02	06/10/87	4.00E+02
POTASUM	UG/G	1.00E+01	06/08/87	7.05E+02	06/10/87	2.32E+03	06/10/87	1.32E+03	06/10/87	6.63E+02
IRON	UG/G	5.00E+00	06/08/87	3.42E+04	06/10/87	3.43E+04	06/10/87	3.93E+04	06/10/87	3.28E+04
ARSENIC	UG/G	5.00E-01	06/08/87	1.28E+01	06/10/87	1.05E+01	06/10/87	1.60E+00	06/10/87	5.90E+00
MERCURY	UG/G	1.00E-01			06/10/87	5.20E-01	06/10/87	4.31E-01		
MAGNES	UG/G	5.00E+00	06/08/87	6.05E+03	06/10/87	9.10E+03	06/10/87	7.41E+03	06/10/87	5.92E+03
LEADGF	UG/G	5.00E-01	06/08/87	2.50E+00	06/10/87	2.06E+01	06/10/87	4.40E+00	06/10/87	3.50E+00
AR1248	UG/G	1.00E-01			06/10/87	4.00E-01	06/10/87	1.40E-01		
METHYCH	UG/G	1.00E-02			06/10/87	1.00E-02	06/10/87	5.00E-02		
NITRATE	UG/G	1.00E+00	06/08/87	3.03E+00	06/10/87	2.05E+01	06/10/87	8.37E+00	06/10/87	2.97E+01
SULFATE	UG/G	1.00E+00	06/08/87	2.37E+00	06/10/87	1.16E+01	06/10/87	1.06E+01	06/10/87	1.23E+01
FLUORID	UG/G	1.00E+00	06/08/87	1.43E+00			06/10/87	2.46E+00	06/10/87	2.84E+00

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002C04	SAMPLE DATE	316002C05	SAMPLE DATE	316002D01	SAMPLE DATE	316002D02
BETA	PCI/G	3.00E+00	06/10/87	2.26E+01	06/10/87	2.24E+01	06/01/87	9.64E+01	06/01/87	4.29E+01
ALPHA	PCI/G	6.00E+00			06/10/87	9.54E+00	06/01/87	9.96E+01	06/01/87	4.32E+01
BERYLUM	UG/G	5.00E-01	06/10/87	1.00E+00	06/10/87	1.00E+00	06/01/87	6.00E-01	06/01/87	1.00E+00
STRONUM	UG/G	3.00E+01					06/01/87	3.20E+01	06/01/87	3.10E+01
ZINC	UG/G	5.00E-01	06/10/87	5.90E+01	06/10/87	6.30E+01	06/01/87	9.20E+01	06/01/87	7.70E+01
CALCIUM	UG/G	5.00E+00	06/10/87	5.27E+03	06/10/87	5.29E+03	06/01/87	5.09E+03	06/01/87	1.41E+04
BARIUM	UG/G	6.00E-01	06/10/87	9.10E+01	06/10/87	1.11E+02	06/01/87	1.52E+02	06/01/87	1.72E+02
CADMIUM	UG/G	2.00E-01	06/10/87	1.00E+00	06/10/87	1.00E+00	06/01/87	1.00E+00	06/01/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/10/87	1.20E+01	06/10/87	1.10E+01	06/01/87	6.70E+01	06/01/87	4.00E+01
SILVER	UG/G	1.00E+00					06/01/87	8.00E+00		
SODIUM	UG/G	1.00E+01	06/10/87	2.78E+02	06/10/87	2.78E+02	06/01/87	3.67E+02	06/01/87	3.22E+02
NICKEL	UG/G	1.00E+00	06/10/87	5.00E+00	06/10/87	3.00E+00	06/01/87	1.23E+02	06/01/87	4.60E+01
COPPER	UG/G	1.00E+00	06/10/87	2.50E+01	06/10/87	2.80E+01	06/01/87	2.45E+03	06/01/87	6.75E+02
VANADUM	UG/G	5.00E-01	06/10/87	7.00E+01	06/10/87	7.30E+01	06/01/87	7.60E+01	06/01/87	7.20E+01
ALUMNUM	UG/G	1.50E+01	06/10/87	1.19E+04	06/10/87	1.34E+04	06/01/87	1.28E+04	06/01/87	1.84E+04
MANGESE	UG/G	5.00E-01	06/10/87	4.25E+02	06/10/87	4.53E+02	06/01/87	3.94E+02	06/01/87	5.41E+02
POTASUM	UG/G	1.00E+01	06/10/87	1.79E+03	06/10/87	1.61E+03	06/01/87	9.24E+02	06/01/87	2.29E+03
IRON	UG/G	5.00E+00	06/10/87	3.38E+04	06/10/87	3.61E+04	06/01/87	3.29E+04	06/01/87	4.04E+04
ARSENIC	UG/G	5.00E-01	06/10/87	1.34E+01	06/10/87	2.16E+01	06/01/87	2.50E+00	06/01/87	8.50E+00
ARSENIC	UG/G	5.00E-01	06/10/87	1.57E+01	06/10/87	2.09E+01				
MERCURY	UG/G	1.00E-01					06/01/87	2.16E+00	06/01/87	4.42E-01
MAGNES	UG/G	5.00E+00	06/10/87	7.96E+03	06/10/87	8.12E+03	06/01/87	6.73E+03	06/01/87	9.94E+03
LEADGF	UG/G	5.00E-01	06/10/87	7.60E+00	06/10/87	9.00E+00	06/01/87	8.60E+00	06/01/87	9.00E+00
AR1248	UG/G	1.00E-01							06/01/87	3.40E-01
NITRATE	UG/G	1.00E+00	06/10/87	8.67E+00	06/10/87	2.19E+01	06/01/87	2.08E+01	06/01/87	9.65E+00
SULFATE	UG/G	1.00E+00	06/10/87	8.20E+00	06/10/87	1.83E+01	06/01/87	1.79E+01	06/01/87	5.46E+00
FLUORID	UG/G	1.00E+00	06/10/87	1.79E+00	06/10/87	2.64E+00	06/01/87	1.80E+00	06/01/87	2.08E+00

SEDIMENT SAMPLE ANALYTICAL RESULTS ABOVE DETECTION LIMIT

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002D03	SAMPLE DATE	316002D04	SAMPLE DATE	316002D05	SAMPLE DATE	316002E01
BETA	PCI/G	3.00E+00	06/01/87	2.53E+01	06/01/87	1.45E+01	06/01/87	2.84E+01	06/01/87	6.80E+01
ALPHA	PCI/G	6.00E+00	06/01/87	2.27E+01	06/01/87	6.39E+00	06/01/87	8.73E+00	06/01/87	8.19E+01
BERYLLUM	UG/G	5.00E-01	06/01/87	1.00E+00			06/01/87	5.00E-01	06/01/87	1.00E+00
STRONUM	UG/G	3.00E+01							06/01/87	3.30E+01
ZINC	UG/G	5.00E-01	06/01/87	7.00E+01	06/01/87	4.80E+01	06/01/87	5.90E+01	06/01/87	9.40E+01
CALCIUM	UG/G	5.00E+00	06/01/87	1.37E+04	06/01/87	5.84E+03	06/01/87	1.55E+04	06/01/87	7.52E+03
BARIUM	UG/G	6.00E-01	06/01/87	1.46E+02	06/01/87	8.30E+01	06/01/87	1.16E+02	06/01/87	1.93E+02
CADMIUM	UG/G	2.00E-01	06/01/87	1.00E+00	06/01/87	1.00E+00	06/01/87	1.00E+00	06/01/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/01/87	2.60E+01	06/01/87	4.00E+00	06/01/87	1.30E+01	06/01/87	1.04E+02
SILVER	UG/G	1.00E+00							06/01/87	1.20E+01
SODIUM	UG/G	1.00E+01	06/01/87	3.24E+02	06/01/87	3.59E+02	06/01/87	3.67E+02	06/01/87	2.65E+02
NICKEL	UG/G	1.00E+00	06/01/87	3.10E+01	06/01/87	4.00E+00	06/01/87	1.50E+01	06/01/87	2.04E+02
COPPER	UG/G	1.00E+00	06/01/87	5.30E+02	06/01/87	2.50E+01	06/01/87	1.10E+02	06/01/87	2.92E+03
VANADUM	UG/G	5.00E-01	06/01/87	7.40E+01	06/01/87	6.30E+01	06/01/87	6.60E+01	06/01/87	5.90E+01
ALUMNUM	UG/G	1.50E+01	06/01/87	1.31E+04	06/01/87	7.48E+03	06/01/87	1.28E+04	06/01/87	1.83E+04
MANGESE	UG/G	5.00E-01	06/01/87	6.21E+02	06/01/87	3.50E+02	06/01/87	4.96E+02	06/01/87	4.61E+02
POTASUM	UG/G	1.00E+01	06/01/87	1.88E+03	06/01/87	7.27E+02	06/01/87	2.04E+03	06/01/87	1.68E+03
IRON	UG/G	5.00E+00	06/01/87	3.68E+04	06/01/87	3.17E+04	06/01/87	3.47E+04	06/01/87	3.00E+04
ARSENIC	UG/G	5.00E-01	06/01/87	3.40E+00	06/01/87	1.50E+00	06/01/87	6.40E+00	06/01/87	9.20E+00
MERCURY	UG/G	1.00E-01	06/01/87	3.25E-01			06/01/87	2.36E-01	06/01/87	1.88E+00
SELENUM	UG/G	5.00E-01							06/01/87	6.90E-01
MAGNES	UG/G	5.00E+00	06/01/87	8.11E+03	06/01/87	5.46E+02	06/01/87	7.53E+03	06/01/87	9.34E+03
LEADGF	UG/G	5.00E-01	06/01/87	7.60E+00	06/01/87	3.70E+00	06/01/87	8.20E+00	06/01/87	6.10E+00
AR1248	UG/G	1.00E-01	06/01/87	2.20E-01					06/01/87	3.40E-01
NITRATE	UG/G	1.00E+00	06/01/87	1.42E+01	06/01/87	4.68E+00	06/01/87	2.32E+01	06/01/87	4.16E+00
SULFATE	UG/G	1.00E+00	06/01/87	5.63E+00	06/01/87	3.00E+00	06/01/87	6.49E+00	06/01/87	3.71E+00
FLUORID	UG/G	1.00E+00	06/01/87	1.89E+00	06/01/87	1.15E+00	06/01/87	1.17E+00	06/01/87	1.00E+00

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002E02	SAMPLE DATE	316002E03	SAMPLE DATE	316002E04	SAMPLE DATE	316002F01
BETA	PCI/G	3.00E+00	06/01/87	1.84E+01	05/27/87	1.70E+01	05/27/87	2.24E+01	06/08/87	1.44E+03
ALPHA	PCI/G	6.00E+00					05/27/87	6.51E+00	06/08/87	1.43E+03
BERYLUM	UG/G	5.00E-01					05/27/87	6.00E-01		
STRONUM	UG/G	3.00E+01			05/27/87	3.00E+01	05/27/87	3.00E+01	06/08/87	9.30E+01
ZINC	UG/G	5.00E-01	06/01/87	4.90E+01	05/27/87	4.70E+01	05/27/87	6.10E+01	06/08/87	1.22E+02
CALCIUM	UG/G	5.00E+00	06/01/87	7.90E+03	05/27/87	5.83E+03	05/27/87	6.29E+03	06/08/87	2.51E+04
BARIUM	UG/G	6.00E-01	06/01/87	8.20E+01	05/27/87	8.00E+01	05/27/87	1.20E+02	06/08/87	1.64E+02
CADMIUM	UG/G	2.00E-01	06/01/87	1.00E+00	05/27/87	4.00E-01	05/27/87	6.00E-01		
CHROMUM	UG/G	1.00E+00	06/01/87	1.30E+01	05/27/87	8.00E+00	05/27/87	8.00E+00	06/08/87	5.46E+02
SILVER	UG/G	1.00E+00							06/08/87	1.23E+02
SODIUM	UG/G	1.00E+01	06/01/87	2.85E+02	05/27/87	2.86E+02	05/27/87	3.42E+02	06/08/87	2.70E+02
NICKEL	UG/G	1.00E+00	06/01/87	1.40E+01	05/27/87	8.00E+00	05/27/87	6.00E+00	06/08/87	2.60E+02
COPPER	UG/G	1.00E+00	06/01/87	1.04E+02	05/27/87	3.40E+01	05/27/87	2.70E+01	06/08/87	1.16E+04
VANADUM	UG/G	5.00E-01	06/01/87	6.00E+01	05/27/87	5.40E+01	05/27/87	8.10E+01	06/08/87	3.70E+01
ALUMNUM	UG/G	1.50E+01	06/01/87	9.37E+03	05/27/87	8.90E+03	05/27/87	1.15E+04	06/08/87	5.38E+04
MANGESE	UG/G	5.00E-01	06/01/87	3.78E+02	05/27/87	3.66E+02	05/27/87	4.63E+02	06/08/87	2.40E+02
POTASUM	UG/G	1.00E+01	06/01/87	1.09E+03	05/27/87	9.47E+02	05/27/87	1.02E+03	06/08/87	5.68E+02
IRON	UG/G	5.00E+00	06/01/87	2.94E+04	05/27/87	2.89E+04	05/27/87	4.06E+04	06/08/87	2.24E+04
ARSENIC	UG/G	5.00E-01	06/01/87	1.80E+00	05/27/87	1.71E+00	05/27/87	1.55E+00	06/08/87	6.10E+01
MERCURY	UG/G	1.00E-01	06/01/87	3.18E-01	05/27/87	1.55E-01			06/08/87	8.08E+00
SELENUM	UG/G	5.00E-01							06/08/87	1.80E+00
MAGNES	UG/G	5.00E+00	06/01/87	6.61E+03	05/27/87	6.04E+03	05/27/87	6.59E+03	06/08/87	1.20E+04
LEADGF	UG/G	5.00E-01	06/01/87	4.40E+00	05/27/87	4.40E+00	05/27/87	4.61E+00	06/08/87	7.90E+01
AR1248	UG/G	1.00E-01							06/08/87	3.40E+00
BIS2EPH	UG/G	1.00E+00			05/27/87	1.10E+00				
BUTBENP	UG/G	1.00E+00			05/27/87	1.80E+00				
NITRATE	UG/G	1.00E+00	06/01/87	3.53E+00	05/27/87	3.13E+00	05/27/87	4.38E+00	06/08/87	1.84E+00
SULFATE	UG/G	1.00E+00	06/01/87	3.66E+00	05/27/87	2.14E+00	05/27/87	3.63E+00	06/08/87	1.86E+01
FLUORID	UG/G	1.00E+00	06/01/87	1.74E+00	05/27/87	1.26E+00	05/27/87	1.75E+00	06/08/87	6.09E+00

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002F02	SAMPLE DATE	316002F03	SAMPLE DATE	316002F04	SAMPLE DATE	316002F05
BETA	PCI/G	3.00E+00	06/08/87	3.92E+02	06/08/87	2.10E+02	06/08/87	2.04E+01	06/08/87	2.06E+01
ALPHA	PCI/G	6.00E+00	06/08/87	3.80E+02	06/08/87	2.35E+02				
BERYLUM	UG/G	5.00E-01	06/08/87	7.00E+00	06/08/87	1.00E+00	06/08/87	1.00E+00	06/08/87	1.00E+00
STRONUM	UG/G	3.00E+01	06/08/87	4.00E+01	06/08/87	5.70E+01				
ZINC	UG/G	5.00E-01	06/08/87	6.20E+01	06/08/87	6.50E+01	06/08/87	5.30E+01	06/08/87	5.20E+01
CALCIUM	UG/G	5.00E+00	06/08/87	9.55E+03	06/08/87	1.64E+04	06/08/87	7.70E+03	06/08/87	5.41E+03
BARIUM	UG/G	6.00E-01	06/08/87	1.62E+02	06/08/87	1.13E+02	06/08/87	8.00E+01	06/08/87	7.40E+01
CADMIUM	UG/G	2.00E-01			06/08/87	1.00E+00	06/08/87	1.00E+00	06/08/87	1.00E+00
CHROMUM	UG/G	1.00E+00	06/08/87	1.38E+02	06/08/87	6.10E+01	06/08/87	5.00E+00	06/08/87	6.00E+00
SILVER	UG/G	1.00E+00	06/08/87	2.20E+01	06/08/87	3.00E+00				
SODIUM	UG/G	1.00E+01	06/08/87	2.42E+02	06/08/87	4.19E+02	06/08/87	3.39E+02	06/08/87	3.78E+02
NICKEL	UG/G	1.00E+00	06/08/87	6.80E+01	06/08/87	5.10E+01	06/08/87	5.00E+00	06/08/87	5.00E+00
COPPER	UG/G	1.00E+00	06/08/87	2.26E+03	06/08/87	3.94E+02	06/08/87	2.20E+01	06/08/87	2.00E+01
VANADUM	UG/G	5.00E-01	06/08/87	5.70E+01	06/08/87	8.30E+01	06/08/87	8.50E+01	06/08/87	7.60E+01
ALUMNUM	UG/G	1.50E+01	06/08/87	1.67E+04	06/08/87	1.82E+04	06/08/87	7.04E+03	06/08/87	8.13E+03
MANGESE	UG/G	5.00E-01	06/08/87	2.89E+02	06/08/87	3.22E+02	06/08/87	3.50E+02	06/08/87	3.94E+02
POTASUM	UG/G	1.00E+01	06/08/87	1.27E+03	06/08/87	6.47E+02	06/08/87	6.39E+02	06/08/87	9.15E+02
IRON	UG/G	5.00E+00	06/08/87	2.42E+04	06/08/87	3.58E+04	06/08/87	3.34E+04	06/08/87	3.11E+04
ARSENIC	UG/G	5.00E-01	06/08/87	1.86E+01	06/08/87	1.54E+01	06/08/87	1.49E+01	06/08/87	1.25E+01
MERCURY	UG/G	1.00E-01	06/08/87	1.56E+00	06/08/87	7.60E-01				
MAGNES	UG/G	5.00E+00	06/08/87	6.67E+03	06/08/87	9.86E+03	06/08/87	6.16E+03	06/08/87	5.99E+03
LEADGF	UG/G	5.00E-01	06/08/87	1.88E+01	06/08/87	1.80E+01	06/08/87	2.70E+00	06/08/87	3.60E+00
AR1248	UG/G	1.00E-01	06/08/87	1.60E+00						
AR1254	UG/G	1.00E-01			06/08/87	4.00E-01				
NITRATE	UG/G	1.00E+00	06/08/87	3.93E+00	06/08/87	1.46E+01	06/08/87	7.63E+00	06/08/87	3.36E+01
SULFATE	UG/G	1.00E+00	06/08/87	2.39E+01	06/08/87	1.29E+02	06/08/87	2.17E+01	06/08/87	4.54E+01
FLUORID	UG/G	1.00E+00	06/08/87	4.02E+00	06/08/87	2.02E+00	06/08/87	1.64E+00	06/08/87	1.49E+00
CHLORID	UG/G	1.00E+00	06/08/87	1.16E+00	06/08/87	7.75E+00			06/08/87	2.93E+00
ACETONE	UG/G	0.00E+00							06/08/87	8.00E-02

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002G01	SAMPLE DATE	316002G02	SAMPLE DATE	316002G03	SAMPLE DATE	316002G04
BETA	PCI/G	3.00E+00	05/27/87	1.54E+01	05/27/87	1.77E+01	05/27/87	3.14E+02	05/27/87	2.15E+01
ALPHA	PCI/G	6.00E+00	05/27/87	1.01E+01	05/27/87	1.02E+01	05/27/87	3.71E+02		
BERYLUM	UG/G	5.00E-01	05/27/87	1.00E+00	05/27/87	1.00E+00	05/27/87	9.00E-01		
STRONUM	UG/G	3.00E+01	05/27/87	3.57E+02	05/27/87	3.69E+02	05/27/87	5.30E+01		
ZINC	UG/G	5.00E-01	05/27/87	4.80E+01	05/27/87	2.90E+01	05/27/87	1.12E+02	05/27/87	4.40E+01
CALCIUM	UG/G	5.00E+00	05/27/87	3.89E+04	05/27/87	4.73E+04	05/27/87	1.25E+04	05/27/87	3.28E+03
BARIUM	UG/G	6.00E-01	05/27/87	4.53E+02	05/27/87	9.94E+02	05/27/87	1.82E+02	05/27/87	9.40E+01
CADMIUM	UG/G	2.00E-01	05/27/87	3.00E-01			05/27/87	3.00E-01	05/27/87	2.00E-01
CHROMUM	UG/G	1.00E+00	05/27/87	1.50E+01	05/27/87	1.10E+01	05/27/87	3.84E+02	05/27/87	9.00E+00
SILVER	UG/G	1.00E+00					05/27/87	4.10E+01		
SODIUM	UG/G	1.00E+01	05/27/87	2.94E+03	05/27/87	1.28E+03	05/27/87	4.83E+02	05/27/87	1.78E+02
NICKEL	UG/G	1.00E+00	05/27/87	2.50E+01	05/27/87	1.40E+01	05/27/87	1.90E+02	05/27/87	7.00E+00
COPPER	UG/G	1.00E+00	05/27/87	3.90E+01	05/27/87	3.20E+01	05/27/87	4.44E+03	05/27/87	1.40E+01
VANADUM	UG/G	5.00E-01	05/27/87	5.30E+01	05/27/87	4.40E+01	05/27/87	6.80E+01	05/27/87	5.10E+01
ALUMNUM	UG/G	1.50E+01	05/27/87	1.32E+04	05/27/87	1.37E+04	05/27/87	2.23E+04	05/27/87	9.92E+03
MANGESE	UG/G	5.00E-01	05/27/87	5.60E+01	05/27/87	1.17E+02	05/27/87	3.72E+02	05/27/87	3.56E+02
POTASUM	UG/G	1.00E+01	05/27/87	8.56E+02	05/27/87	8.09E+02	05/27/87	1.28E+03	05/27/87	2.54E+03
IRON	UG/G	5.00E+00	05/27/87	1.35E+04	05/27/87	2.18E+04	05/27/87	3.13E+04	05/27/87	2.58E+04
ARSENIC	UG/G	5.00E-01	05/27/87	6.95E+00	05/27/87	3.19E+00	05/27/87	8.84E+00	05/27/87	2.12E+00
MERCURY	UG/G	1.00E-01	05/27/87	1.66E-01	05/27/87	4.21E-01	05/27/87	2.36E+00		
SELENUM	UG/G	5.00E-01	05/27/87	8.25E+00	05/27/87	6.80E-01				
MAGNES	UG/G	5.00E+00	05/27/87	5.09E+03	05/27/87	1.41E+04	05/27/87	9.13E+03	05/27/87	5.38E+03
LEADGF	UG/G	5.00E-01	05/27/87	6.20E+01	05/27/87	1.03E+02	05/27/87	2.75E+01	05/27/87	4.33E+00
AR1248	UG/G	1.00E-01					05/27/87	1.76E+00		
TRICENE	UG/G	1.00E-02			05/27/87	5.00E-02				
NITRATE	UG/G	1.00E+00	05/27/87	8.31E+00	05/27/87	2.33E+01	05/27/87	1.03E+03	05/27/87	1.56E+01
SULFATE	UG/G	1.00E+00	05/27/87	1.81E+01	05/27/87	6.07E+01	05/27/87	3.25E+02	05/27/87	4.86E+00
FLUORID	UG/G	1.00E+00	05/27/87	1.88E+00			05/27/87	1.46E+00		
CHLORID	UG/G	1.00E+00			05/27/87	1.38E+00	05/27/87	6.18E+00		
PHOSPHA	UG/G	2.00E+00					05/27/87	8.26E+00		
ACETONE	UG/G	0.00E+00			05/27/87	8.00E-02				
UNKALI	UG/G	0.00E+00	05/27/87	3.10E+00						
UNKALI	UG/G	0.00E+00	05/27/87	6.20E+00						
UNKALI	UG/G	0.00E+00	05/27/87	4.20E+00						
NC17HC	UG/G		05/27/87	2.60E+00	05/27/87	7.80E+00				
DMENAP	PPB		05/27/87	2.10E+00	05/27/87	6.40E+00				
27DMNAP	PPB				05/27/87	4.60E+00				
167TNAP	PPB				05/27/87	5.90E+00				
236TNAP	PPB				05/27/87	3.80E+00				

CONSTITUENT NAME	UNITS	DETECTION LIMIT	SAMPLE DATE	316002G05
BETA	PCI/G	3.00E+00	05/27/87	1.61E+01
BERYLUM	UG/G	5.00E-01	05/27/87	6.00E-01
STRONUM	UG/G	3.00E+01	05/27/87	3.40E+01
ZINC	UG/G	5.00E-01	05/27/87	5.90E+01
CALCIUM	UG/G	5.00E+00	05/27/87	8.46E+03
BARIUM	UG/G	6.00E-01	05/27/87	1.14E+02
CADMIUM	UG/G	2.00E-01	05/27/87	7.00E-01
CHROMUM	UG/G	1.00E+00	05/27/87	1.10E+01
SODIUM	UG/G	1.00E+01	05/27/87	4.78E+02
NICKEL	UG/G	1.00E+00	05/27/87	1.10E+01
COPPER	UG/G	1.00E+00	05/27/87	2.30E+01
VANADUM	UG/G	5.00E-01	05/27/87	8.20E+01
ALUMNUM	UG/G	1.50E+01	05/27/87	1.27E+04
MANGESE	UG/G	5.00E-01	05/27/87	4.26E+02
POTASUM	UG/G	1.00E+01	05/27/87	1.82E+03
IRON	UG/G	5.00E+00	05/27/87	3.65E+04
ARSENIC	UG/G	5.00E-01	05/27/87	3.42E+00
MAGNES	UG/G	5.00E+00	05/27/87	8.13E+03
LEADGF	UG/G	5.00E-01	05/27/87	4.95E+00
NITRATE	UG/G	1.00E+00	05/27/87	3.92E+01
SULFATE	UG/G	1.00E+00	05/27/87	5.22E+01
FLUORID	UG/G	1.00E+00	05/27/87	1.79E+00
CHLORID	UG/G	1.00E+00	05/27/87	5.26E+00

DISTRIBUTION

No. of Copies

OFFSITE

10 DOE/Office of Scientific and Technical Information

2 P. T. Day
U.S. Environmental Protection Agency
Box 550
A7-70
Richland, Washington 99352

2 L. S. Goldstein
Department of Ecology
Mail Stop PV-11
Olympia, Washington 98504-8711

ONSITE

4 DOE Richland Operations Office

J. J. Broderick
R. D. Freeberg
R. K. Stewart
K. M. Thompson

12 Westinghouse Hanford Company

M. R. Adams (5)
L. C. Brown
K. R. Fecht
L. C. Hulstrom
M. J. Lauterbach
E. C. Thornton
T. M. Wintczuk
R. D. Wojtasek

No. of Copies

53 Pacific Northwest Laboratory

C. A. Brandt
R. W. Bryer
P. J. Cowley
B. A. Denovan
J. C. Evans
J. W. Falco
C. A. Geffen
R. E. Gephart
W. H. Gray
J. M. Hales
M. S. Hanson
P. C. Hays
S. A. Kreml
D. A. Lamar
P. E. Long
T. J. McLauglin
J. R. Raymond
W. H. Rickard
R. G. Riley
R. Schalla
R. J. Serne
D. R. Sherwood
R. L. Skaggs
R. M. Smith
F. S. Spane
W. S. Weygandt
R. E. Wildung
J. S. Young (20)
Publishing Coordination
Technical Report Files (5)