CDM

NEW RIVER IMPROVEMENTS PROJECT SITE
LANDFILL INVESTIGATION REPORT
DELIVERY ORDERS NOS. 003 AND 004

Camp Dresser & McKee

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

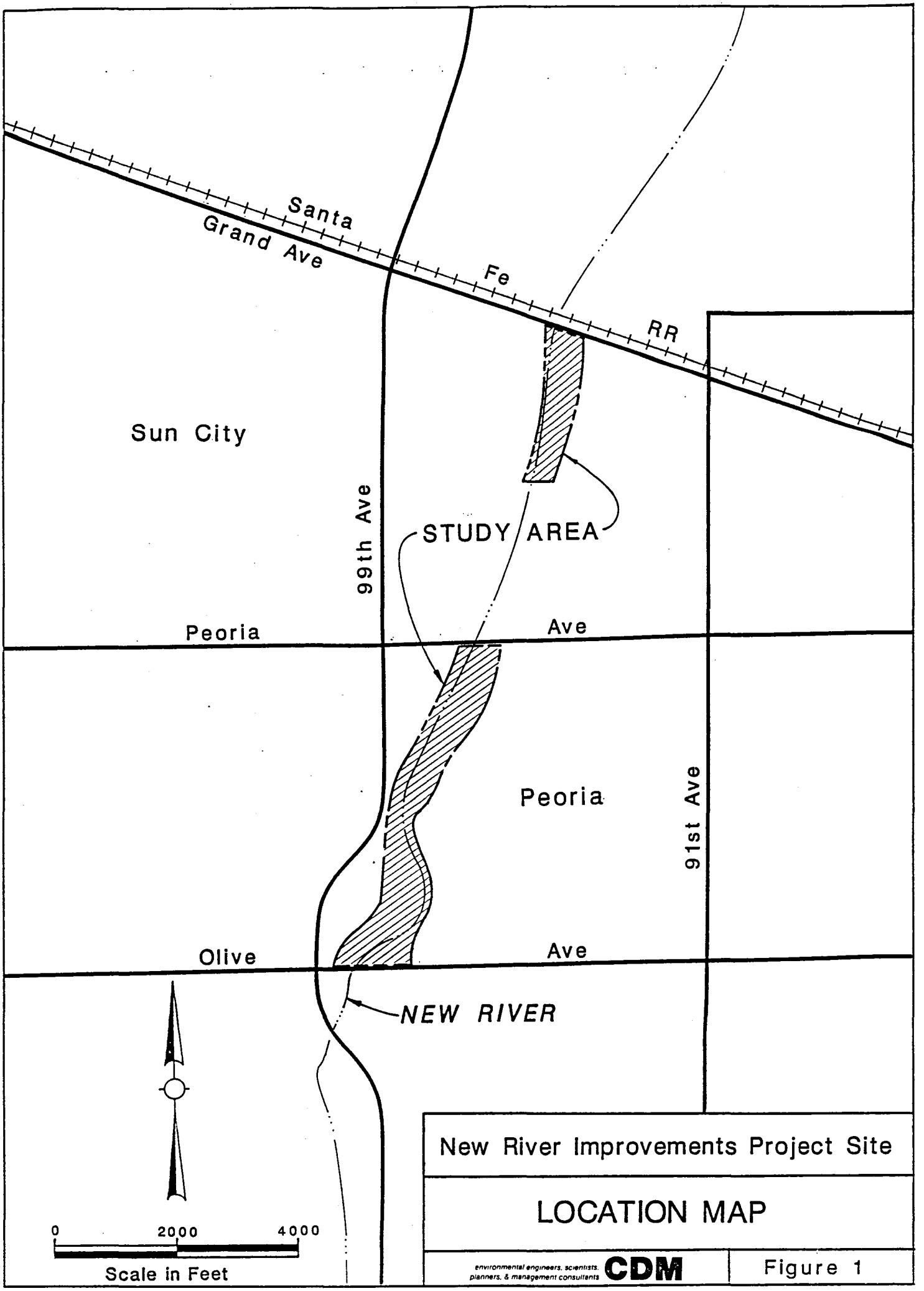
1.0 INTRODUCTION

Camp Dresser & McKee Inc. was contracted by the Department of the Army, Corps of Engineers, Los Angeles District to perform a landfill investigation along the New River near Phoenix, Arizona. The purpose of the investigation was to: (a) determine the geographic extent of trash and debris; (b) determine the type and quality of trash and debris present in order to estimate the excavatability of the material; and (c) determine the presence and type of possible hazardous waste. The study area covers portions of both the east and west banks of the New River between Grand Avenue and Olive Avenue as shown on Figure 1.

This report presents a summary of the landfill investigation including an outline of general procedures for field activities, the results of field investigation programs and laboratory analyses, and the conclusions and recommendations for removing, handling and disposing trash and hazardous wastes. The appendices to this report contain the lithologic logs for all subsurface explorations, chain of custody forms for all samples collected, the Site Health and Safety Plan, and a summary of laboratory results.

The original scope of work consisted of drilling 30 soil borings/trenches, collecting 30 soil samples from these borings/trenches for chemical analyses and performing a walking survey for mapping the extent and types of trash and debris at the surface. The drilling was completed ahead of schedule so that drilling an additional eight soil borings and excavating eight backhoe trenches was permitted within the originally negotiated landfill investigation budget.

A total of 30 solids/soil samples from selected soil borings and trenches were analyzed for chemical parameters in order to detect and characterize potentially hazardous materials. Of the 30 soil samples, 26 were collected from the 38 soil borings and 4 were collected from the 8 backhoe trenches.



New River Improvements Project Site

LOCATION MAP

environmental engineers, scientists, planners, & management consultants CDM

Figure 1

2.0 GENERAL PROCEDURES

Field work in support of the New River Improvements Project began at the project site on March 1, 1988. The following sections describe the various sample collection techniques and field mapping procedures. Field activities were completed on March 9, 1988. In addition, the locations of all of the boreholes and backhoe trenches were surveyed.

2.1 SOIL BORING PROGRAM

The soil boring program consisted of drilling and sampling the 38 soil borings listed in Table 2-1. Drilling and sampling were performed by the subcontractor, Heber Mining and Exploration Company of Phoenix, Arizona using a truck-mounted CME model 75 hollow stem auger drilling rig, equipped with 5-foot long, 8-inch outside diameter (OD), 3.25-inch inside diameter (ID) augers. The auger rig was used to drill all soil borings. CDM hydrogeologists monitored all drilling activities closely and were responsible for the description and handling of the samples.

Soil Sampling

Soil samples were obtained from all 38 soil borings. Lithologic and laboratory samples were collected using both a 1.5-inch ID, 2-inch OD standard split spoon sampler, and a 2.5-inch ID, 3-inch OD modified California ring-lined sampler (use of each for specific samples noted on lithologic logs, Appendix A). A standard safety drive 140 pound hammer was used to advance the sampler ahead of the 8-inch diameter auger hole. Lithologic samples were collected every five feet during drilling. Laboratory samples were not collected from pre-determined depths but rather were collected based upon observations of the physical character of the material as related to the apparent presence of hazardous material. Auger returns, drilling rate, and drill rig performance were monitored for indications of lithologic changes, and in areas covered with trash and debris for determining the contact between the trash and native material. In most instances, lithologic and laboratory samples were collected using a modified California

TABLE 2-1

SOIL BORING PROGRAM

Borehole	Total Depth (feet below g.s.)	Depth to Bottom of Non-native Material (feet below g.s.)
PL-1	10.5	0.0
PL-2	10.5	7.0[d]
PL-3	10.5	2.0[c]
PL-4	9.8	2.0[c]
PL-5	10.5	2.0[c]
PL-6	10.5	0.5[c]
PL-7	10.5	7.0[d]
PL-8	20.5	13.5[d]
PL-9	11.0	8.0[d]
PL-10	20.0	2.0[c]
PL-11	10.5	0.5[c]
PL-12	14.5	6.0[d]
PL-13	10.5	8.0[d]
PL-14	11.0	0.0
PL-15	10.5	1.7[d]
PL-15A	4.5	0.0
PL-16	11.0	0.6[c]
PL-17	10.5	1.0[d]
PL-18	11.0	0.0
PL-19	10.5	0.0
PL-20	10.5	0.2[d]
PL-21	10.5	0.0
PL-22	10.5	0.0
PL-23	10.5	0.0
PL-24	10.5	0.5[d]
PL-25	10.5	0.0
PL-26	10.5	0.0
PL-27	10.5	0.0
PL-28	10.5	0.0
PL-29	10.5	0.5[d]
PL-30	10.5	3.0[d]
PL-31	24.0	12.0[d]
PL-32	10.5	0.0
PL-33	20.5	12.0[d]
PL-34	16.0	12.0[d]
PL-35	18.0	12.0[d]
PL-36	15.5	9.5[d]
PL-37	16.0	13.0[d]

[c] = Relatively clean fill, predominately sand and gravel.
[d] = Trash (composition ranges from broken concrete to household refuse).
gs = ground surface

sampler with three 4-inch long brass rings placed end to end. Either the bottom ring or the middle ring were used for the laboratory sample because generally they were the least disturbed. The two rings not used as laboratory samples were used to describe the sample lithology. The number of blows required to drive the modified California sampler 12-inches and the number of blows per 6-inch increment for the standard split spoon sampler were recorded in the field log book, along with percentage of recovery and a description of sample lithology. The blow counts give an indication of relative density of the material being sampled; the higher the number of blows, the denser the material. Erroneously high counts were occasionally obtained when the sampler encountered a rock larger than the sampler's ID. In these instances the sampler was driven until the rock broke or the sampler could not be advanced any further. The Unified Soil Classification System (USCS) was used for lithologic sample descriptions and classification. The samples were screened for organic and inorganic vapor emissions using a photoionization analyzer (Hnu meter), and these readings also were recorded. Copies of the lithologic logs are included in Appendix A. Table 2-2 is a matrix of the borehole numbers, the intervals sampled for laboratory analyses, and the laboratories performing the analyses.

The samples used for lithologic descriptions which were not sent for laboratory analyses were wrapped in aluminum foil, placed in zip lock bags, labeled with borehole number, interval footage, date and time of collection, and placed in boxes for temporary storage at the CDM Phoenix, Arizona file library. Table 2-3 is a listing of these samples and the numbers of the boxes in which they are stored.

Once drilling and sampling were completed, the boreholes were grouted with a mixture of bentonite and auger cuttings. Both powdered and granular bentonite were used.

2.2 BACKHOE TRENCH PROGRAM

Twelve locations were chosen by the U.S. Army Corps of Engineers as sites for backhoe trenches; because of time constraints only 8 of these were

TABLE 2-2

SAMPLE MATRIX FOR BOREHOLE SAMPLES

Sample # Site	Sample Interval Depth (feet below g.s.)	Laboratory (AT or RMA)[a]	AT Accession #	AT Lab ID	Sampler	Carrier Airbill #	Lab Analysis Group[b] 1-5	Lab Analysis Group[c] 6-9	Lab Analysis 10 Metal[d] 11 Vol 12 Semi	Date To Lab
PL-10	19.5-20.5	AT	16025	1	SR/DEB		X			3/1/88
PL-12	4.5-6.0	AT	16025	2	SR/DEB		X	X		3/1/88
PL-14	4.5-5.5	AT	16034	1	SR/DEB		X	X		3/2/88
PL-19	9.5-10.5	AT	16034	2	SR/DEB		X			3/2/88
PL-8	9.5-10.5	AT	16034	3	SR/DEB		X	X		3/2/88
PL-9	0.0-1.0	AT	16034	4	SR/DEB		X			3/2/88
PL-7	0.0-1.0	AT	16034	5	SR/DEB		X	X		3/2/88
PL-5	0.0-1.0	AT	16034	6	SR/DEB		X			3/2/88
PL-8	9.5-10.5	RMA			SR/DEB	7450177136 FED. EX.			X	3/2/88
PL-2	4.5-5.5	AT	16039	1	DEB/SR		X			3/3/88
PL-3	0.0-1.0	AT	16039	2	DEB/SR		X			3/3/88
PL-4	0.0-1.0	AT	16039	3	DEB/SR		X			3/3/88
PL-25	4.5-5.5	AT	16039	4	DEB/SR		X			3/3/88
PL-26	0.0-1.0	AT	16039	5	DEB/SR		X			3/3/88
PL-29	0.0-1.0	AT	16039	6	DEB/SR		X			3/3/88
PL-30	0.0-1.0	AT	16039	7	DEB/SR		X			3/3/88
PL-31	9.5-10.5	RMA			DEB	7450177162 FED. EX.			X	3/4/88
PL-17	0.0-1.0	AT	16049	1	DEB		X			3/7/88
PL-13	4.5-5.5	AT	16049	2	DEB		X			3/7/88
PL-22	4.5-5.5	AT	16049	3	DEB		X			3/7/88
PL-20	0.0-1.0	AT	16049	4	DEB		X			3/7/88
PL-15	1.0-1.7	AT	16049	5	DEB		X			3/7/88
PL-31	9.5-10.5	AT	16049	6	DEB		X	X		3/7/88
PL-33	4.5-5.5	AT	16049	7	DEB		X	X		3/7/88

TABLE 2-2 (cont.)

SAMPLE MATRIX FOR BOREHOLE SAMPLES

Sample # Site	Sample Interval Depth (feet below g.s.)	Laboratory (AT or RMA)[a]	AT Accession #	AT Lab ID	Sampler	Carrier Airbill #	Lab Analysis Group[b] 1–5	Group[c] 6–9	10 Metal[d] 11 Vol 12 Semi	Date To Lab
PL-34	0.0–1.0	AT	16049	8	DEB		X	X		3/1/88
PL-35	9.5–10.5	AT	16049	9	DEB		X	X		3/1/88
PL-36	0.0–1.0	AT	16049	10	DEB		X			3/1/88
PL-37	9.5–10.5	AT	16049	11	DEB		X			3/1/88

[a] AT = Analytical Technologies, Inc. RMA = Rocky Mountain Analytical Laboratory.

[b] Group 1 – pH
Group 2 – Flash Point
Group 3 – Sulfides and Cyanides
Group 4 – Ep Toxicity (Metals 8)
Group 5 – Total Halides

[c] Group 6 – Base Neutral Acids
Group 7 – Volatile Compounds
Group 8 – Pesticides/PCB
Group 9 – Metals

[d] Group 10 – Metals Scan
Group 11 – Volatile Compounds Scan
Group 12 – Base, Neutral, Acids Scan

gs = ground surface

TABLE 2-3

SAMPLE INVENTORY - SAMPLES STORED AT CAMP DRESSER & McKEE
PHOENIX, AZ

Sample	Storage Box #	Comments
3/4/88		
PL-1	127	
PL-2	128	
PL-3	129	
PL-4	129	
PL-5	130	
PL-6	131	
PL-7	132	
PL-8	133	
PL-9	134	
PL-10	135	
PL-11	136	
PL-12	137	
PL-13	138	
PL-14	139	
PL-15 & 15A	140	
PL-16	141	
PL-17	142	
PL-18	143	
PL-19	144	
PL-20	145	
PL-21	145	
PL-22	146	
PL-23	147	
PL-24	148	
PL-25	149	
PL-26	149	
PL-27	150	
PL-28	150	
PL-29	151	
PL-30	152	
PL-31	153	
PL-32	154	
3/8/88		
PL-33	155	
PL-34	156	
PL-35	157	
PL-36	158	
PL-37	159	
	160	Contains brass ring soil samples not sent to laboratory for the following boreholes: PL-11, PL-15A, PL-21, PL-23, PL-31, PL-32, PL-33, PL-35

excavated and these are listed in Table 2-4. The digging was performed by CDM's subcontractor, Wright's Excavating, Inc. of Tempe, Arizona using a Case 780B backhoe. The backhoe bucket was used to collect a large volume of material from the interval targeted to be sampled and analyzed. As a general rule, samples were taken of portions of the material which physically exhibited the most suspect hazardous character. In instances where no suspect material was present, or where the size and nature of materials was not conducive to sampling, a composite sample was derived from all native and non-native materials that could be sampled within a given interval. All samples were taken using stainless steel hand-held sampling equipment and were placed into glass jars that had been provided by the laboratory. After completion of sampling activities, the trenches were backfilled. All excavations were closely monitored by a CDM hydrogeologist.

Table 2-5 is a matrix of the backhoe trench numbers, the intervals sampled for laboratory analyses and the laboratories performing the analyses. No additional samples were collected and the lithologic descriptions were made by examining the walls of the trenches. For health and safety purposes, the air in the trenches was monitored for organic and inorganic vapors using a photoionization analyzer (Hnu meter) and the readings were recorded in the field log book. Copies of the lithologic logs for the trenches are included in Appendix B.

2.3 WALKING SURVEY AND SURFACE MAPPING PROGRAM

Aerial photographs, at a scale of approximately 1 inch equal to 100 feet were obtained from Landis Aerial Photographers of Phoenix, Arizona. Five photographs, taken on November 7, 1986, give complete coverage of the New River Improvements Project from Grand Avenue to Olive Avenue. A CDM hydrogeologist performed a walking survey of the entire study area using the photographs as a base on which to map the geographic extent of trash, type, range of size and frequency, of surficial materials, and boundaries of landfill and disturbed areas. The resultant walking survey maps are presented in Figures 2 through 6.

TABLE 2-4

BACKHOE TRENCH PROGRAM

Backhoe Trench	Total Depth (feet below g.s.)	Depth to Bottom of Non-Native Material (feet below g.s.)
T-1	—	—
T-2	8.0	5.0[d]
T-3	—	—
T-4	13.5	11.0[d]
T-5	—	—
T-6	6.0	1.0[c]
T-7	8.0	6.0[d]
T-8	8.5	7.0[d]
T-9	—	—
T-10	6.0	0.0
T-11	5.0	0.0
T-12	5.0	0.0

[c] = Relatively clean fill, predominately sand and gravel.
[d] = Trash composition ranges from broken concrete to household refuse.
g.s. = ground surface
— = not excavated

TABLE 2-5

SAMPLE MATRIX FOR BACKHOE TRENCH SAMPLES

Sample #							Lab Analysis			
Site	Sample Interval Depth (feet below g.s.)	Laboratory[a] (AT or RMA)	AT Accession #	AT Lab ID	Sampler	Carrier Airbill #	Group[b] 1-5	Group[c] 6-9	10 Metal[d] 11 Vol 12 Semi	Date To Lab
T-2	4.0	AT	16049	12	DEB		X	X		3/7/88
T-4	10.0	AT	16049	13	DEB		X			3/7/88
T-7	2.0-3.0	AT	16049	14	DEB		X			3/7/88
T-8	5.0-5.5	AT	16049	15	DEB		X			3/7/88
T-4	10.0	RMA			DEB	7450177140 FED. EX.			X	3/8/88

[a] AT = Analytical Technologies, Inc. RMA = Rocky Mountain Analytical Laboratory.

[b] Group 1 - pH
Group 2 - Flash Point
Group 3 - Sulfides and Cyanides
Group 4 - Ep Toxicity (Metals 8)
Group 5 - Total Halides

[c] Group 6 - Base Neutral Acids
Group 7 - Volatile Compounds
Group 8 - Pesticides/PCB
Group 9 - Metals

[d] Group 10 - Metals Scan
Group 11 - Volatile Compounds Scan
Group 12 - Base, Neutral, Acids Scan

g.s. = ground surface

2.4 SAMPLE IDENTIFICATION

Because the field work entailed collecting a relatively small number of samples and because all of the samples were soil, a simple numbering system was devised. The boreholes were numbered from 1 to 37 with the prefix of PL indicating Peoria Landfill, i.e., PL-1. The only exception to this was PL-15A where native material was immediately encountered during drilling. The rig was offset approximately 500 feet to PL-15 where it was anticipated fill would be, and indeed was, encountered. The trenches were numbered 1 to 12 with a prefix of T indicating a backhoe trench. Sample identifications only reflect the fact that eight trenches were actually excavated.

2.5 EQUIPMENT DECONTAMINATION

To minimize the chances of cross-contamination all sample collection equipment was cleaned after each use. Split-spoon samplers, modified California samplers, brass rings, and stainless steel hand held tools were decontaminated between each sample using the following procedure:

1. Wash with nonphosphate detergent.
2. Rinse with tap water.
3. Rinse with reagent grade methanol.
4. Rinse twice with tap water.
5. Rinse twice with deionized water.

All downhole drilling equipment (augers, drill rods, etc.) was steam cleaned in between each borehole. The drill rig was completely steam cleaned before the rig was mobilized to the site and, after the completion of the drilling, prior to its demobilization from the site. The bucket of the backhoe was thoroughly steam cleaned before it moved on location and in between excavating each trench.

2.6 SAMPLING, HANDLING AND SHIPMENT

Most subsurface soil samples were collected with a modified California sampler fitted with 4-inch long, 2-inch diameter brass rings provided by the drilling contractor. Aluminum foil was placed over the ends of the rings and then plastic caps placed over the foil. Duct tape was used to seal the edge of the plastic cap to the ring. The other subsurface soil samples collected using either a standard split-spoon sampler or the backhoe were placed in pre-cleaned glass jars provided by the analytical laboratories. The samples shipped by a professional carrier were also placed in ziplock freezer bags. All samples were kept chilled in coolers containing ice. All thirty of the soil samples selected for analysis by Analytical Technologies, Inc. (AT,Inc.), Tempe, Arizona, were hand-carried to the laboratory by a CDM hydrogeologist. Three duplicate samples were sent by Federal Express to Rocky Mountain Analytical Laboratory (RMA), Arvada, Colorado. Chain-of-custody (COC) forms provided by the two laboratories were completed for each sample every day. Copies of both the COCs and the Federal Express airbills are included in Appendix C.

2.7 LABORATORY METHODS

Soil samples collected for the New River Improvements Project were analyzed by Analytical Laboratories, Inc. and by Rocky Mountain Analytical Laboratory. All 30 of the soil samples selected were analyzed by Analytical Laboratories, Inc. Three duplicate samples were analyzed by Rocky Mountain Analytical Laboratory and the results of these analyses serve as a quality assurance/quality control (QA/QC) check against the results reported by Analytical Laboratories, Inc. Table 2-6 lists the analyses performed, methods used, and the analytical laboratories at which each analysis was performed. Tables 2-3 and 2-5 list the samples and the analytical parameters for which they were analyzed.

TABLE 2-6

ANALYTICAL METHODS
NEW RIVER IMPROVEMENTS PROJECT

Group	Lab	Matrix	Contaminant/ Characteristic	EPA Standard Test Method
			All Samples	
1	AT[a]	Soil	pH	9045
2	AT[a]	Soil	Flash Point	1010
3	AT[a]	Soil	Sulfides and Cyanides	9030/9010
4	AT[a]	Soil	EP Toxicity (Metals 8)	1310
5	AT[a]	Soil	Total Halides	9020
			Samples Suspected of Being Contaminated	
6	AT[a]	Soil	Base Neutral Acids (Semi-volatile)	8270
7	AT[a]	Soil	Volatile Compounds	8240
8	AT[a]	Soil	Pesticides/PCB	8080
9	AT[a]	Soil	Metals: Arsenic	7060
			Cadmium	7130
			Chromium	7190
			Lead	7420
			Mercury	7471
			Selenium	7740
			Zinc	7950
			Duplicate Confirmation Samples	
10	RMA[b]	Soil	Metals Scan*	6010
11	RMA[b]	Soil	Volatile Compounds Scan*	8240
12	RMA[b]	Soil	Base, Neutral, Acids (semi-volatile) Scan*	8270

* Scan for tentatively identified compounds.
[a] Analytical Technologies, Inc.
[b] Rocky Mountain Analytical Laboratory

2.8 BOREHOLE AND BACKHOE TRENCH SURVEY

After completion of sampling activities, all of the soil boring and backhoe trench excavation locations were clearly marked with surveying stakes, which were flagged, spray painted, and labeled with site identification numbers. A map showing the approximate locations of all the sites and another map showing the U.S. Army Corps of Engineers survey control points were delivered to the subcontractor, Vaughn & Standage Engineering, Inc., Mesa, Arizona. Using this information, Vaughn and Standage surveyed the horizontal locations of all of the boreholes and backhoe trenches within an accuracy of $\pm$ 0.1 foot. The north and east state plane coordinates for each site and the survey control points are listed in Table 2-7.

2.9 DOCUMENTATION

All field work was documented in a bound, water resistant log book. Photographs of selected sites and backhoe trenches were taken and recorded in the log book and on the maps of the surface material. Upon delivery of the sample-filled coolers to the laboratory, the appropriate signatures were collected on the COC forms. All sample labels were filled out with the date and time of sampling, sample numbers, analyses requested, and any special instructions where applicable.

2.10 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

The quality assurance/quality control (QA/QC) program in effect during the performance of all field activities included the following items:

- Complete documentation of all field activities in a field log book.
- Use of appropriate COC forms.
- Use of duplicate confirmation samples.
- Use of clean sample containers provided by the analytical laboratory.
- Proper equipment decontamination according to procedures established in the Work Plan.

TABLE 2-7

SOIL BORING/BACKHOE TRENCH STATE PLANE COORDINATES
AND SURVEY CONTROL POINTS

Boring/Trench No.	Northing	Easting
PL 1	944036.8283	394672.2469
PL 2	943635.2973	394685.0153
PL 3	943236.7067	394652.5504
PL 4	942842.2585	394563.5673
PL 5	943779.1017	394996.4896
PL 6	943299.0967	394947.3607
PL 7	942798.5562	394917.8685
PL 8	942296.8410	394868.3448
PL 9	942047.3797	394791.2959
PL 10	938785.6629	393487.6776
PL 11	938324.1198	393273.8858
PL 12	937727.8916	393093.0375
PL 13	937421.4734	392911.2288
PL 14	936921.2462	392673.8951
PL 15A	938050.0296	393305.0406
PL 15	938512.2592	393531.8209
PL 16	938208.1926	393535.4391
PL 17	937656.7672	393269.4876
PL 18	937286.0895	393078.8701
PL 19	936191.7844	392341.6142
PL 20	936140.1977	391956.2416
PL 21	935656.6471	391996.5770
PL 22	935077.6965	392021.2830
PL 23	934611.9699	392008.4648
PL 24	934220.1255	391714.3641
PL 25	933861.2020	391445.0582
PL 26	935578.9902	392300.8009
PL 27	935243.5722	392370.0755
PL 28	934627.8015	392398.7026

TABLE 2-7
(continued)

SOIL BORING/BACKHOE TRENCH STATE PLANE COORDINATES
AND SURVEY CONTROL POINTS

Boring/Trench No.	Northing	Easting
PL 29	934054.4285	392195.6140
PL 30	933779.1980	391990.6385
PL 31	934402.0950	392272.5507
PL 32	934904.3649	392414.1244
PL 33	942543.9795	394892.8567
PL 34	942279.0726	394965.6804
PL 35	942028.2158	394891.3236
PL 36	941835.3263	394871.2141
PL 37	941685.6181	394954.8121
T 2	942112.3033	394832.9094
T 4	942555.8688	395034.5886
T 6	943154.8938	394929.3613
T 7	933945.1296	392053.6884
5 8	934505.4999	392375.5960
T 10	934986.5959	392386.5666
T 11	942045.8797	394722.7845
T 12	941861.9688	394763.2291
12*	938900.7400	394480.1100
A*	938868.8655	393497.8204
B*	938863.5566	393334.2165
C*	938857.0796	393134.6115
13*	938813.3900	391788.2200
D*	942835.4864	395055.5207
14*	933520.9651	391832.7953

* Survey Control Points

A total of three duplicate confirmation samples were collected and submitted to Rocky Mountain Analytical Laboratory.

2.11 HEALTH AND SAFETY PROGRAM

All on-site personnel were familiar with the contents of the Health and Safety Plan developed for this work. Available personnel protective equipment consisted of Tyvek coveralls, steel toe boots, rubber outer boots, rubber outer gloves, latex surgical gloves, hard hats, half-face respirators, Hnu and combustible gas indicator. Because it was never necessary to upgrade to a higher level of protection, all field work was carried out in Level D attire. A copy of the Health and Safety Plan is included in Appendix D.

3.0 FIELD PROGRAM RESULTS

3.1 SOIL BORING PROGRAM

Soils or other materials encountered during drilling, which exhibited any characteristics leading to the suspicion of hazardous materials, were sampled for chemical analysis. The drilled material in most of the boreholes did not exhibit any hazardous character, and in these cases, the most suspect material encountered in each borehole was sampled. The original intent of the program was to have at least one soil sample from each boring chemically analyzed. As mentioned previously, however, with the advent of the out of scope work, the number of boreholes increased from 30 to 38. In addition, 8 backhoe trenches were also excavated. In order to keep the number of chemical analyses at the original number of 30, soil samples from 26 of the boreholes and 4 of the backhoe trenches were analyzed. The 12 boreholes from which samples were not selected for chemical analyses had only clean native material and were not suspected of containing any hazardous material. Two duplicate soil boring samples were collected for quality control/quality assurance purposes.

The native material encountered in the study area is comprised of the recent alluvial deposits of the New River. These deposits consist primarily of interbedded, loose silty sand, gravel, cobbles, and boulders. In several boreholes a more cohesive, sandy, conglomeratic clay was encountered. The depth below ground level of the top of the native material ranges from 0.0 to 13.5 feet.

Borings PL-1, -2, -3, and -4 are located along the west bank of the New River just south of Grand Avenue (Figure 6). At PL-1, native material occurs at the surface and at PL-3 and -4, it is buried under a thin (<2.0 feet) cover of relatively clean, non-native fill material. However, at PL-2, 6.0 feet of fill, containing asphalt and concrete, overlies the native material. No indication of hazardous material presence was observed at any of these boreholes.

Soil borings PL-5, -6, -7, -8, -9, -33, -34, -35, -36, and -37 are located along the east bank of the New River south of Grand Avenue (Figures 5 and 6). PL-5 and -6 encountered thin (0.5 to 2.0 feet), relatively clean fill overlying native sand and gravel. PL-7, -8, -9, -33, -34, -35, -36, and -37 are located in what was once the active Peoria Landfill. The depth to the bottom of the non-native fill material varies from 4.0 to 13.5 feet and it consists of household trash, landscaping trimmings, wood, lumber, and construction debris. The only indication of hazardous material presence was observed in PL-8 where the downhole HNu reading was 0.5 ppm above the background HNu reading. This reading indicates the presence of volatile of semi-volatile organic emissions. The very low level indicates that the emissions may be a result of natural decay processes or originate from volatile and/or semi-volatile compounds within the landfilled materials.

Borings PL-10, -11, -12, -13, -14, -15, -15A, -16, -17, -18, and -19 are located along the east bank of the New River south of Peoria Avenue on a river terrace that, for the most part, is capped with a thin cover of relatively clean fill (Figures 3 and 4). No fill material was encountered in PL-14, -15A, and -19. At PL-15 and -12, fill was encountered and the contacts between fill and native material occurred at 1.7 and 6.0 feet, respectively. The fill at these locations includes concrete, asphalt, and other construction debris. Eight feet of household trash as well as construction debris overlies the native sands and gravels at PL-13. No indication of hazardous material presence was observed at any of these locations.

Soil borings PL-20, -21, -22, -23, -24, and -25 are located along the west bank of the New River north of Olive Avenue (Figures 2 and 3). None of these borings encountered more than 0.5 feet of relatively clean, non-native fill material overlying the native sand and gravel. The boring did not penetrate any hazardous material nor were there indications of such.

Soil borings PL-26, -27, -28, -29, -30, -31, and -32 are located along the east bank of the New River north of Olive Avenue (Figure 2). Only native material was encountered in PL-26, -27, -28, and -32. PL-29, -30, and -31 are located in an area that has been used as a landfill. The fill ranges

in thickness from 0.5 to 12.0 feet and consists of asphalt, wood, concrete, sand, and gravel. The only indication of hazardous material presence came from the sample collected from PL-31 at 9.5 to 10.5 feet. This sample contained sand soaked in a black, oily-smelling substance. A sample of this material was placed in a glass jar and allowed to sit for about 10 minutes. The head space of this jar was then screened with an HNu and a reading of 2.0 above background was obtained. The odor indicates the presence of a petroleum hydrocarbon compound(s), however, the low level reading indicates that it is present in low concentration. The lithologic log for PL-31 (Appendix A) shows that this material has a limited vertical distribution.

3.2 BACKHOE TRENCH PROGRAM

Eight backhoe trenches were excavated and detailed lithologic logs of these are included in Appendix B. A total of four soil samples and one duplicate soil sample were collected for laboratory analyses. No soil samples were collected for analysis from four of the backhoe trenches. Three of these trenches (T-10, -11, -12) encountered only clean native material. The fourth trench (T-6) encountered 1 foot of relatively clean fill overlying clean native material. Neither the native material nor the fill were suspected of containing any hazardous material.

Trenches T-2 and -4 were excavated in the old Peoria Landfill area south of Grand Avenue on the east side of the New River (Figure 5). The depth to the bottom of fill material varies from 5.0 to 11.0 feet and consists of concrete, construction debris, household trash, and landscaping trimmings. No indication of any hazardous material was observed in T-2; however, in T-4, air in the trench had a musty odor and had an HNu reading of 0.3 above background. This reading is likely attributable to natural decay processes.

Trench T-6 was located north of the Peoria Landfill (Figure 6). The trench exposed the contact between the large concrete slabs that have been used to stabilize the river bank and the native sands and gravels. No household

trash or construction debris, other than concrete, were encountered and there was no indication of hazardous material in this trench.

Trenches T-7 and -8 were located along the east bank of the New River north of Olive Avenue in an area that has been used as a landfill (Figure 2). Both of these trenches encountered fill ranging in depth from 6.0 to 7.0 feet and containing concrete, household trash, metal strips, wood, and construction debris. No indications of hazardous materials were observed in either of these trenches.

Trenches T-11 and T-12 were located in the river bottom just below the toe of the old Peoria landfill (Figure 5). Both of these trenches immediately encountered native sands and gravel and there were no indications of any hazardous materials in either of these trenches.

3.3 WALKING SURVEY AND SURFACE MAPPING PROGRAM

A walking survey was made over the entire study area, the surficial material was described and mapped, and the geographical extent of trash and debris and boundaries of landfill and suspected refuse burial areas were delineated. Figures 2 through 6 show the results of the survey. Throughout the entire study area, the river bottom is clean with only occasional occurrences of trash, concrete, tires, and appliances. In many places (Figures 3, 4, and 6), the trash appears to be construction debris, concrete, and asphalt that has been used as bank and channel stabilization material. In general, this material extends down the bank to the river bottom and 10 to 20 feet away from the edge of the bank onto the alluvial terraces. These areas also may have occasional piles of household trash and other debris but apparently have not been used consistently as areas for disposing of this kind of material. The results of the soil boring and backhoe trench programs in these areas support this.

Figure 2 covers the area north of Olive Avenue. Along the east bank of the New River, unlicensed dumping activities are current and several areas are covered with large quantities of household trash, construction debris, and landscape trimmings. A large area immediately adjacent to the river

channel is presently covered by disturbed, but relatively clean sand, gravel, and boulders. Numerous small ridges created by earth moving machinery are clearly visible on this photo. Although the entire disturbed area appears similar on the surface, investigation of the subsurface indicates that buried trash is not present throughout the entirety of the disturbed area. T-7 and -8 and borehole PL-31 encountered household trash and construction debris ranging in thickness from 6.0 to 12.0 feet buried under a thin cap of relatively clean silty sand and gravel. However, in PL-27, -28, -32, and T-10, no trash was encountered. The surface has been reworked by machinery, but the subsurface immediately below the disturbed material is composed of native sand and gravel. The approximate extent and depth to the bottom of buried trash is delineated with contours on Figure 2. Four empty 55-gallon steel drums and a commercial trash can are located in Area C but pose no hazard as they were used for burning trash. There are no indications of spills from drums in the area nor are there any obvious indications that other drums might be buried in the area.

On the west bank of the New River, the trash generally consists of large blocks and slabs of concrete and other construction debris that has been used for channel stabilization. However, the areas labeled I and I_1 have larger quantities of trash that contain metal sheeting, brush, and slabs of asphalt.

Figure 3 covers the area south of Peoria and east of 99th Avenue. Along the northern exposures of the east bank of the New River, the trash appears to be construction debris, concrete blocks, slabs and pillars, asphalt and bricks. The southern exposures of the east bank are covered predominantly with piles of trees and tree litter. The central exposures of the west bank are moderately covered with concrete blocks and slabs and household trash, including bed springs, couches, piping and large appliances.

Figure 4 covers the area immediately south of Peoria Avenue. The east bank of the New River in this area is well covered with concrete slabs and culvert pipes, car body parts, asphalt, household trash, wood and metal strips. PL-12 is located in an area that was occupied by an automobile body shop where numerous (50±) cans (pint, 1, 5, and 15-gal sizes), some of

which have leaked and some still containing liquids, are found (Area B, Figure 4). These paint and solvent cans were apparently disposed of by dumping them over the river bank behind the shop buildings. A minor area of tar and oil-stained soils is located at Area D (Figure 4). The tar occurs in large (up to 30 x 30 feet), relatively contained patches up to 1.5 inches thick and is gelatinous to hard in texture. An area of the west bank is covered with concrete slabs and pillars, and piles of brush and household trash. An area of buried trash may be located along the east terrace of the river. Contours showing the extent and approximate depth to the bottom of trash in this area are based upon the presence of 8, 6, and 1 feet of trash in boreholes PL-13, -12 and -17, respectively.

Figure 5 covers the area of the old Peoria Landfill along the east side of the New River south of Grand Avenue. Soil borings, backhoe trenches, and field observations all confirm that the area has been used to dispose of construction debris, household trash, landscape trimmings, furniture, lumber, concrete, and asphalt. The depth to the bottom of the trash ranges from about 7 feet in PL-7 on the northern edge to 12 to 13.4 feet at PL-8, -35, and -37 along the western and southern edges. The approximate extent and thickness of the trash is delineated with contours on Figure 5 (northern extremity of landfill shown on Figure 6). The river bottom itself is clean with only occasional trash including tires, household trash, and appliances.

Figure 6 covers the area immediately south of Grand Avenue. The west bank of the New River in this area is predominately covered with concrete blocks, slabs and pillars, asphalt, car parts and household trash. An area of oil-stained soil is located adjacent to a concrete slab upon the west terrace of the river. The stain has penetrated the soil approximately 4 inches. There are also some small, isolated oil stains all along the area behind the nearby automobile shop and a general oil/diesel fuel odor in the soils of that area.

The east bank is covered with concrete blocks, slabs and pillars, construction debris, furniture, appliances and household trash (Figure 6). Two drums are located near Area E but pose no hazard as they are both

empty. There are no obvious indications of buried drums in the area. A man-made levee, constructed predominantly of concrete blocks, slabs and pillars, lines each bank.

4.0 CHEMICAL ANALYSES RESULTS

4.1 PURPOSE/OBJECTIVES

Chemical analyses were performed on solids/soil samples collected from the New River project area in order to determine the presence of and characterize any hazardous materials present in the landfill material located along the river.

4.2 ANALYTICAL SCHEME

Thirty samples were collected for laboratory analyses at Analytical Technologies, Inc. (AT). Twenty-six of these samples were collected from soil borings and four were collected from backhoe shovels. Twenty-five were collected from landfill material and five were collected from native soils located outside the landfill, in close proximity to the fill material along the river (Figures 2 through 6 show the locations of all borings).

In addition to the 30 samples analyzed by AT, three duplicate samples were collected for analysis at Rocky Mountain Analytical Laboratories, Inc. (RMA) as a QA/QC check of the results determined by AT, and to obtain more analytical data. These three samples were collected from fill material.

Table 4-1 lists each boring and backhoe sample collected along with the location number ID and sample collection depth for each. It also identifies the laboratory at which each sample was analyzed and the analyses performed.

TABLE 4-1

SAMPLE MATRIX FOR BOREHOLE AND BACKHOE SAMPLES

Sample I.D.	Collection Method (bore or back)[a]	Depth (ft.)	Laboratory (AT or RMA)[b]	RCRA Parameters[c]	Tox	Total Metals	Volatiles Semi-Volatiles Pesticides	QA/QC Parameters[d]
PL-2	Bore	4.5-5.5	AT	X	X			
PL-3	Bore	0.0-1.0	AT	X	X			
PL-4	Bore	0.0-1.0	AT	X	X			
PL-5	Bore	0.0-1.0	AT	X	X			
PL-7	Bore	0.0-1.0	AT	X	X	X	X	
PL-8	Bore	9.5-10.5	AT	X	X	X	X	
PL-9	Bore	0.0-1.0	AT	X	X			
PL-10	Bore	19.5-20.5	AT	X	X			
PL-12	Bore	4.5-6.0	AT	X	X	X	X	
PL-13	Bore	4.5-5.5	AT	X	X			
PL-14	Bore	4.5-5.5	AT	X	X	X	X	
PL-15	Bore	1.0-1.7	AT	X	X			
PL-17	Bore	0.0-1.0	AT	X	X			
PL-19	Bore	9.5-10.5	AT	X	X			
PL-20	Bore	0.0-1.0	AT	X	X			
PL-22	Bore	4.5-5.5	AT	X	X			
PL-25	Bore	4.5-5.5	AT	X	X			
PL-26	Bore	0.0-1.0	AT	X	X			
PL-29	Bore	0.0-1.0	AT	X	X			
PL-30	Bore	0.0-1.0	AT	X	X			
PL-31	Bore	9.5-10.5	AT	X	X	X	X	
PL-33	Bore	4.5-5.5	AT	X	X	X	X	
PL-34	Bore	0.0-1.0	AT	X	X	X	X	
PL-35	Bore	9.5-10.5	AT	X	X	X	X	
PL-36	Bore	0.0-1.0	AT	X	X			
PL-37	Bore	9.5-10.5	AT	X	X			

TABLE 4-1
(continued)

SAMPLE MATRIX FOR BOREHOLE AND BACKHOE SAMPLES

Sample I.D.	Collection Method (bore or back)[a]	Depth (ft.)	Laboratory (AT or RMA)[b]	RCRA Parameters[c]	Tox	Total Metals	Volatiles Semi-Volatiles Pesticides	QA/QC Parameters[d]
T-2	Back	4.0	AT	X	X	X	X	
T-4	Back	10.0	AT	X	X			
T-7	Back	2.0-3.0	AT	X	X			
T-8	Back	5.0-5.5	AT	X	X			
PL-8	Bore	9.5-10.5	RMA					X
PL-31	Bore	9.5-10.5	RMA					X
T-4	Back	10.0	RMA					X

[a] Bore or Back = Boring or Backhoe.
[b] AT or RMA = Analytical Technologies, Inc. or Rocky Mountain Analytical Laboratory.
[c] RCRA Parameters: corrosivity (pH), ignitability (flashpoint), reactivity (sulphide, cyanide), ep-toxicity (leachability).
[d] QA/QC Parameters: volatiles, semi-volatiles, T.I.C. scan for volatiles and semi-volatiles, ICP analysis for 25 metals.

4.3 ANALYTICAL PARAMETERS AND METHODS

A number of analytical parameters were tested in order to characterize the fill material and the native alluvium. Tables 4-2 and 4-3 list the parameters and These analyses can be discussed in terms of four sets; RCRA parameters, total organic halogens (TOX), Safe Drinking Waters Act (SDWA) primary metals, and specific organic compounds.

RCRA parameters are used to determine if solid wastes are hazardous under the Resource Conservation and Recovery Act (RCRA). These four parameters include corrosivity (pH), ignitability (flashpoint), reactivity (cyanide and sulfide), and extraction procedure toxicity (EP-Tox). The definition of a RCRA hazardous waste and the test procedures performed to characterize a waste as such are outlined in 40 CFR § 261.21-261.24 and are summarized in Table 4-4. If the results of any one sample analysis matches any of the characteristics of the definitions on Table 4-4 there is potential for the material to be classified as hazardous. All 30 solids/soil samples were analyzed for RCRA parameters.

Total organic halogen (TOX) analysis determines the levels of halogenated organic compounds such as chlorinated solvents and pesticides. It is primarily used as a screening tool since it does not identify specific compounds. However, it is very useful in that it determines if relatively uncommon compounds not specifically analyzed for by other techniques are present in a waste. It can also be used as a check in determining if halogenated volatile or semi-volatile compounds were not identified during the analysis for specific organic compounds. All 30 samples sent to AT and two selected samples sent to RMA Laboratory underwent TOX analysis.

Safe Drinking Waters Act (SDWA) primary metals analysis determines the presence of eight metals which, at certain levels, are considered to pose adverse health effects. Table 4-5 lists these metals and the maximum contaminant levels (MCLs) allowable for each by the SDWA in waters

TABLE 4-2

ANALYTICAL PARAMETERS AND METHODS
Analytical Technologies, Inc.

Parameters	Number of Samples Analyzed	Extraction[a]/ Digestion[b] Method	EPA Standard Test Method	Technique
RCRA Parameters:				
Corrosivity[c]	30	9045[b,j]	9045	Suspension/electrometric
Ignitability[d]	30	1010[b,j]	1010	Pensky-Martens closed cup
Reactivity[e]	30	9030/9010[b,j]	9030/9010	Distillation/titration
EP-Toxicity[f]	30	1310[a]	1310	Acid extraction/GF and ICP[i]
TOX[g]	30	9020 (modified)	9020 (modified)	Micro-coulometric titration
Specific Organic Compounds[h]:				
Volatiles	9	Purge and Trap[a]	8240	GC/MS
Semi-Volatiles	9	3550[a,j]	8270	GC/MS
Pesticides/PCB	9	3550[a,j]	8080	GC
Metals:				
Arsenic	9	3050[b,j]	7060	GF/AA[k]
Cadmium	9	3050[b,j]	7130	GF/AA[k]
Chromium	9	3050[b,j]	7190	GF/AA[k]
Lead	9	3050[b,j]	7420	GF/AA[k]
Mercury	9	7471[b,j]	7471	Cold vapor
Selenium	9	3050[b,j]	7740	GF/AA[k]
Zinc	9	3050[b,j]	7950	GF/AA[k]

[a] Extraction
[b] Digestion
[c] Corrosivity = pH
[d] Ignitability = Flashpoint
[e] Reactivity = Sulphides and Cyanides
[f] Ep-toxicity = Leachability test for 8 metals
[g] TOX = Total Organic Halogens
[h] Compounds on the Hazardous Substances List
[i] Graphite Furnace and ICP
[j] Extraction or digestion performed according to this EPA Std. Test method.
[k] Graphite Furnace/Atomic Absorption

TABLE 4-3

ANALYTICAL PARAMETERS AND METHODS
Rocky Mountain Analytical Laboratory

Parameters	Number of Samples Analyzed	Extraction[a]/ Digestion[b] Method	EPA Standard Test Method	Technique
Total Organic Halogens	2	9020 (modified)	9020 (modified)	Micro-coulometric titration
Specific Organic Compounds[c]:				
Volatiles	3	Purge and Trap[a]	8240	GC/MS
Semi-Volatiles	3	3550[a,d]	8270	GC/MS
Organic Compounds Tentative ID:				
Volatiles	3	Purge and Trap[a]	8240	GC/MS
Semi-Volatiles	3	3550[a,d]	8270	GC/MS
ICP Scan:				
Total Metals	3	3050[b,d]	6010	ICP

[a] Extraction
[b] Digestion
[c] Organic compounds on the Hazardous Substances List.
[d] Extraction/digestion performed according to this EPA Std. Test Method.

TABLE 4-4

DEFINITION OF RCRA HAZARDOUS WASTE

Corrosivity: pH <2 and pH >12.5
Ignitability: Flashpoint <60°C
Reactivity: Sulphide >250 mg HCN/kg waste
Cyanide >500 mg H_2S/kg waste
EP Toxicity: Concentration[b] for the following metals:

EPA Hazardous Waste No.	Metal	Concentration Greater Than: (mg/l)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chormium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0

[a] EPA Memorandum from Eileen Claussen to Solid Waste Branch Chiefs (WH-562B), July 12, 1985.

[b] Concentration in acetic acid extract (extract prepared from 100 g sample in 2 liters of extract solution).

TABLE 4-5

MCLs[a] FOR PRIMARY METALS ACCORDING TO THE SAFE DRINKING WATER ACT

Metal	MCL[a] (mg/L)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.005

[a] MCL = Maximum Contaminant Level allowable by the Safe Drinking Water Act.

considered non-toxic. Nine selected samples sent to AT were analyzed for seven of the eight SDWA primary metals (Barium not analyzed). The samples underwent total metals analyses, according to the methods listed on Table 4-2, in order to determine if any additional metals were present.

Analyses for specific organic compounds were performed on nine select samples sent to AT. Volatile and semi-volatile compounds on the Hazardous Substance List (HSL) (by EPA under CERCLA) were analyzed by GC/MS. Tables 4-6 and 4-7 list these volatile and semi-volatile compounds, respectively, and provide the detection limits employed for each. Pesticides and PCBs appearing on the HSL were also analyzed. Table 4-8 lists these compounds and their detection limits.

The three samples sent to RMA Laboratory were analyzed for the same set of volatiles and semi-volatiles analyzed at AT. In addition, they were scanned by GC/MS for compounds not appearing on the HSL. This technique provides a tentative compound identification (TICs) and it is also used to determine if significant quantities of organic compounds (including halogenated compounds) not specifically analyzed, are present. As such it is a means of identifying compounds which contribute TOX and it provides a check that levels determined by the TOX analyses are relatively accurate. These samples were also subjected to an ICP analysis for twenty-five elements to determine whether any metals in addition to those listed by the SDWA might be present at levels of concern in the fill material. These 25 metals and the ICP detection limits are listed in Table 4-9.

4.4 BACKGROUND ANALYSES AND COMPARISONS

Samples were collected from both landfill material and native soils. The chemical analyses of the native soils are used as background levels for the purposes of comparison with relatively clean samples. Table 4-10 lists the mean values of metals observed in the native soils analyzed at New River and the literature observed means for average soils in the western United States. No other analyzed compounds (volatiles, semi-volatiles, etc.) were detected in the native soils. Table 4-10 nevertheless lists national

TABLE 4-6

VOLATILES ANALYZED ON HAZARDOUS SUBSTANCES LIST

Compound	Detection Limit (mg/kg)
Acetone	2.5
Benzene	0.5
Bromoform	0.5
Bromomethane	1.0
2-Butanone	2.5
Carbon disulfide	0.5
Carbon Tetrachloride	0.5
Chlorobenzene	0.5
Dibromochloromethane	0.5
Chloroethane	1.0
2-Chloroethyl vinyl ether	1.0
Chloroform	0.5
Chloromethane	1.0
Bromodichloromethane	0.5
1,1-Dichloroethane	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
1,2-Dichloropropane	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Ehtylbenzene	0.5
2-Hexanone	1.0
Methylene chloride	2.5
4-Methyl-2-pentanone	1.0
Styrene	0.5
1,1,2,2-Tetrachloroethane	0.5
Tetrachloroethene	0.5
Toluene	0.5
trans-1,2-Dichloroethene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethene	0.5
Vinyl acetate	1.0
Vinyl chloride	1.0
Total Xylenes	0.5

TABLE 4-7

SEMI-VOLATILES ANALYZED ON HAZARDOUS SUBSTANCES LIST

Compound	Detection Limit (mg/kg)	Compound	Detection Limit (mg/kg)
Acenaphthlene	0.33	Hexachlorobenzene	0.33
Acenphthylene	0.33	Hexachlorobutadiene	0.33
Anthracene	0.33	Hexachlorocyclopentadiene	0.33
Benzo(a)anthracene	0.33	Hexachloroethane	0.33
Benzo(a)pyrene	0.33	Indeno(1,2,3-c,d)pyrene	0.33
Benzo(b)fluoranthene	0.33	Isophorone	0.33
Benzo(g,h,i)perylene	0.33	2-Methylnaphthalene	0.33
Benzo(k)fluoranthene	0.33	Naphthalene	0.33
Benzyl alcohol	0.33	2-Nitroaniline	1.6
bis(2-Chloroethoxy)methane	0.33	3-Nitroaniline	1.6
bis(2-Chloroethyl)ether	0.33	4-Nitroaniline	1.6
bis(2-Ethylhexyl)phthalate	0.33	Nitrobenzene	0.33
4-bromophenyl phenyl ether	0.33	N-Nitrosodi-n-propylamine	0.33
Butylbenzyl phthalate	0.33	N-Nitrosodiphenylamine	0.33
4-Chloroaniline	0.33	Phenanthrene	0.33
2-Chloronaphthalene	0.33	Pyrene	0.33
4-Chlorophenyl phenyl ether	0.33	1,2,4-Trichlorobenzene	0.33
Chrysene	0.33	Benzoic acid	1.6
Dibenzo(a,h)anthracene	0.33	2-Chlorophenol	0.33
Dibenzofuran	0.33	2,4-Dichlorophenol	0.33
1,2-Dichlorobenzene	0.33	2,4-Dimethylphenol	0.33
1,3-Dichlorobenzene	0.33	4,6-Dinitro-2-methylphenol	1.6
1,4-Dichlorobenzene	0.33	2,4-Dinitrophenol	1.6
3,3'-Dichlorobenzidine	0.66	2-Methylphenol	0.33
Diethyl phthalate	0.33	4-Methylphenol	0.33
Dimethyl phthalate	0.33	2-Nitrophenol	0.33
Di-n-butyl phthalate	0.33	4-Nitrophenol	1.6
2,4-Dinitrotoluene	0.33	4-Chloro-3-methylphenol	0.33
2,6-Dinitrotoluene	0.33	Pentachlorophenol	1.6
Di-n-octyl phthalate	0.33	Phenol	0.33
Fluoranthene	0.33	2,4,5-Trichlorophenol	1.6
Fluorene	0.33	2,4,6-Trichlorophenol	0.33

TABLE 4-8

PESTICIDES AND PCBs ANALYZED ON THE
HAZARDOUS SUBSTANCES LIST

Constituent Name	Detection Limit[a] mk/kg
Alpha-BHC	0.002-0.02
Beta-BHC	0.002-0.02
Delta-BHC	0.002-0.02
Gamma-BHC (Lindane)	0.002-0.02
Heptachlor	0.002-0.02
Aldrin	0.002-0.02
Heptachlor Epoxide	0.002-0.02
Endosulfan I	0.002-0.02
4-4 DDE	0.004-0.04
Dieldrin	0.004-0.04
Endrin	0.004-0.04
Endosulfan II	0.004-0.04
4-4 DDD	0.004-0.04
Endrin Aldehyde	0.004-0.04
4-4 DDT	0.004-0.04
Endosulfan Sulfate	0.004-0.04
Chlordane	0.004-0.04
Toxaphene	0.16 -1.6
PCB 1016	0.07-0.70
PCB 1221	0.07-0.70
PCB 1232	0.07-0.70
PCB 1242	0.07-0.70
PCB 1248	0.07-0.70
PCB 1254	0.04-0.40
PCB 1260	0.04-0.40
Methoxychlor	0.07-0.70

[a] Range of detection limits for differing sample dilutions. Lowest detection limit is for no dilution.

TABLE 4-9

ICP SCAN TOTAL METALS

Parameter	Detection Limit (mk/kg)
Aluminum	7
Antimony	5
Arsenic	10
Barium	0.5
Beryllium	0.1
Boron	2
Cadmium	0.5
Calcium	10
Chromium	1
Cobalt	1
Copper	0.6
Iron	5
Lead	5
Magnesium	10
Manganese	0.5
Molybdenum	2
Nickel	4
Potassium	500
Silver	0.5
Sodium	5
Thallium	40
Tin	8
Titanium	0.5
Vanadium	1
Zinc	1

TABLE 4-10

COMPARISON OF NATIVE SOIL AND LITERATURE REPORTED VALUES
OF BACKGROUND FOR METALS AND SELECTED PESTICIDES

	Native Soils at New River			Literature[a,b]		
Metals	Min. (mg/kg)	Max. (mg/kg)	Mean (mg/kg)	Min. (mg/kg)	Max. (mg/kg)	Mean (mg/kg)
Al	530.0	11,900	8,630[c]	5,000	100,000	58,000
Sb	<5.0	<5.0	<5.0[c]	<1.0	2.6	0.47
As	6.7	7.8	7.3[d]	<0.1	97	5.5
Ba	<10.0	<10.0	<10.0[c]	70	5,000	580
Be	0.2	0.6	0.4[d]	<1.0	15	0.68
Cd	0.4	0.9	0.7[d]	<0.5	<0.5	<0.5
Ca	11,400	17,300	14,800[c]	600	320,000	18,000
Cr	10.5	13.2	11.8[d]	3	2,000	41
Co	5.0	9.0	7.0[c]	3	50	7.1
Cu	13.0	40.0	23.0[c]	2	300	21
Fl	7,900	16,700	11,700[c]	1,000	>100,000	21,000
Pb	1.6	6.6	4.1[d]	10	700	17
Mg	3,900	6,600	5,200[c]	300	>100,000	7,400
Mn	220	290	270[c]	30	5,000	380
Hg	<0.1	<0.1	<0.1[d]	<0.01	4.6	0.046
Mo	<1.5	<1.5	<1.5[c]	<3	7	0.85
Ni	17	26	21[c]	5	700	15
K	1,100	2,500	2,030[c]	1,900	63,000	18,000
Se	<1.0	<1.0	<1.0[d]	<0.1	4.3	0.23
Ag	<0.5	<0.5	<0.5[c]	<0.01	3.2	<0.1
Na	230	360	290[c]	500	100,000	9,700
S	<1.0	9.0	1.0[d]	<800	48,000	1,300
Tl	<40.0	<40.0	<40.0[c]	<0.01	2.8	<0.01
Sn	6.0	10.0	<7.0[c]	<0.1	7.4	0.90
V	15	29	21[c]	7	500	70
Zn	24.7	27.0	25.9	10	2,100	55

TABLE 4-10

(continued)
COMPARISON OF NATIVE SOIL AND LITERATURE REPORTED VALUES
OF BACKGROUND FOR METALS AND SELECTED PESTICIDES

	Native Soils at New River			Literature[a,b]		
Metals	Min. (mg/kg)	Max. (mg/kg)	Mean (mg/kg)	Min. (mg/kg)	Max. (mg/kg)	Mean (mg/kg)
Pesticides						
4-4,DDE	<0.00	<0.00	<0.00	0.015[e]	0.069[e]	0.04[e]
4-4,DDD	<0.00	<0.00	<0.00	—[f]	—[f]	—[f]
4-4,DDT	<0.00	<0.00	<0.00	0.015[e]	0.069[e]	0.04[e]
Dieldrin	<0.00	<0.00	<0.00	0.01	6.02	0.004[g]
Toxaphene	<0.00	<0.00	<0.00	0.23	4.95	0.24[g]

[a] Metals concentrations are for soils of the western United States after Schacklette and Boerngen, 1984, Element Concentrations in Soils and Other Surfical Materials of the Conterminous United States, U.S.G.S Prof. Paper 1270.
[b] Background concentrations of Pesticides from urban soils surveys: 4-4 DDE, 4-4 DDT after Carcy, A.E., 1979a. Pest. Monit. J., 13(1): 23-27. Dieldrin and Toxaphene after Carcy, A.E., 1979b. Pest. Monit. J., 13 1): 17-22.
[c] n = 3
[d] n = 11
[e] Range and mean values are for DDE and DDT combined.
[f] No known literature reported background values

background concentrations for pesticides in soils so that accepted relative levels of these compounds can be used for comparison with levels detected in the fill. A comparison of mean levels for the native soils with those from the literature indicates that, except for arsenic, the native soil levels fall below the literature reported means. The arsenic values all fall within the literature observed range. The results of the analyses for the native soils are thus suitable for background levels comparisons.

Results of all the chemical analyses performed at AT are presented in Appendix E. Appendix E presents the results of the analyses conducted at RMA Laboratory. A discussion of the results follows.

4.5 ANALYSES RESULTS

RCRA Parameters

All thirty solid/soil samples were analyzed for corrosivity (pH), ignitability (flash point), reactivity (cyanide and sulfide), and EP-Toxicity. The results of these tests are summarized in Table 4-11 (because ignitability is a qualitative determination it is not listed).

The mean pH for both the fill materials and the native soils falls into the non-corrosive range (pH between 2 and 12.5) for corrosivity. Two samples, PL-5 and PL-9, from the fill material showed ignitability due to the presence of wood and roots from trees but no flash point thresholds related to any other substances were exceeded. Since the analyses for cyanide and sulfide were below detection limits for all samples no reactivity was observed. A comparison of the results of the EP-Toxicity tests with the RCRA standards (Table 4-4) show that all EP-Toxicity levels detected fall below the maximums allowable. In summary, all samples tested passed the RCRA parameters tests except for samples PL-5 and PL-9, which failed the ignitability test.

TABLE 4-11

RESULTS OF ANALYSES FOR RCRA PARAMETERS

		Fill Material			Native Soils		
Corrosivity	Units	Min.	Max.	Mean[a]	Min.	Max.	Mean[b]
pH	S.U.	7.5	9.7	8.23	8.0	9.0	8.44
Reactivity	mg/kg						
Cyanide	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity	mg/l						
As	<0.010	0.029	0.006	<0.010	<0.010	<0.010	<0.010
Cd	<0.003	0.072	0.012	<0.003	0.005	0.002	0.002
Cr	<0.020	0.056	0.013	<0.020	<0.020	<0.020	<0.020
Pb	<0.020	0.470	0.145	<0.020	0.090	0.064	0.026
Hg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ba	0.190	1.510	0.580	0.170	0.890	0.440	0.290
Se	<0.010	0.013	0.001	<0.010	<0.010	<0.010	<0.010
Ag	<0.010	0.025	0.006	<0.010	<0.010	<0.010	<0.010

[a] n = 30
[b] n = 5
S.U.= Standard Units

TABLE 4-12

EP-TOXICITY - VARIATION WITH DEPTH

EP-Tox Metal	All Soils[a]			Fill Material Only[a]		
	0.0-1.0 ft.[b] (mg/kg)	4.5-6.5 ft.[c] (mg/kg)	9.5-10.5 ft.[d] (mg/kg)	0.0-1.0 ft.[e] (mg/kg)	4.5-6.5 ft.[f] (mg/kg)	9.5-10.5 ft.[g] (mg/kg)
As	0.002	0.005	0.013	0.003	0.007	0.015
Cd	0.014	0.007	0.007	0.016	0.009	0.008
Cr	0.007	0.013	0.004	0.009	0.018	0.004
Pb	0.123	0.124	0.128	0.133	0.152	0.135
Hg	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.566	0.505	0.727	0.573	0.557	0.784
Se	0.001	0.000	0.000	0.001	0.000	0.000
Ag	0.004	0.006	0.004	0.005	0.008	0.005

[a] Mean concentration values
[b] n = 12
[c] n = 8
[d] n = 6
[e] n = 11
[f] n = 6
[g] n = 5

A comparison of the results of the fill material versus the native soils shows that, except for selenium and mercury, EP-Toxicity levels are higher in the fill material than in the native soils. On the average, the values are higher by 11 percent. EP-Toxicity values for the fill were analyzed for variation with depth (Table 4-12). No consistent variation was noted.

Total Organic Halogens

Total organic halogens (TOX) were measured in all 30 samples sent to AT. The results of the analyses are summarized in Table 4-13. As indicated, detected values for fill and native background material range between 65 and 232 mg/kg and the average values are slightly higher in the background soils than in the fill material. Overall, the analyses indicate that the level of TOX compounds are high.

The results of the TOX analyses performed at AT contrasted unexpectedly with the results of the chemical analyses performed for specific and TIC halogenated compounds because the latter sets of analyses indicated that only low levels of halogenated compounds (present as pesticides at <2 mg/kg per sample) were present in fill samples and no halogenated organic compounds were present in the native soil samples. Therefore, as an analytical check, RMA Laboratory performed TOX analyses on duplicate samples from PL-8 and PL-31 which were also analyzed by AT.

Table 4-13B compares the results of the TOX analyses performed by both laboratories for the two samples. The comparison shows that the results produced by AT are higher than the RMA Laboratory results by a factor of more than 100. As discussed above, the results of other chemical analyses performed by both labs support the TOX results produced by RMA Laboratory. This in combination with the fact that the TOX results for background soils analyzed by AT were also high indicates that the results produced by AT are in error.

TABLE 4-13

RESULTS OF TOTAL ORGANIC HALOGENS ANALYSES

TOX (mg/kg)	Fill Material			Native Soils		
	Min.	Max.	Mean[a]	Min.	Max.	Mean[b]
	65	232	117	122	204	150

[a] n = 25
[b] n = 5

TABLE 4-13B

RESULTS OF TOX ANALYSES PERFORMED AT BOTH AT, INC. AND RMA LABORATORY

Sample I.D.	Units	Total Organic Halogens			
		Results from AT, Inc.	Detection Limit	Results from RMA Lab	Detection Limit
PL-8	mg/kg	98.0	0.01	0.64	0.05
PL-31	mg/kg	67.0	0.01	0.16	0.05

AT was asked to help explain why the TOX analyses appeared to be in error. Their QA/QC personnel agreed that a laboratory contamination problem appeared to have been introduced during an analytical procedure involving methanol extraction of halogenated compounds from the soil samples. This procedure is performed in an area at AT's lab designated solely for organic extractions. Cross-contamination of the methanol extracting solvent with chlorinated solvents is suspected to have occurred in this area. RMA Laboratory specifically attempts to control cross-contamination of this sort by performing the methanol extraction for their TOX analyses in the inorganic area of their laboratory. AT expressed their concern for the apparent laboratory contamination and indicated that they would consider moving the location of extractions performed for TOX analyses. They also said they were considering the introduction of a laboratory soil blank as part of the TOX routine analysis. They presently use a water blank to check for errors in their analyses, but because no extraction is performed on this water blank, errors in this part of their TOX analysis procedure cannot be detected.

Total Metals

Nine samples were selected for analyses at AT for seven of the eight primary metals of concern listed by the SDWA (Table 4-5). Seven of the samples analyzed were from fill material and two were from native soils. The results of these analyses are summarized in Table 4-14. Three of these same samples were analyzed as duplicates for additional metals at RMA Laboratory. The results of these analyses are presented in Appendix E.

A comparison of the results presented in Table 4-14 for the fill versus native soils shows that for all metals except selenium, levels are higher in the fill than in the native soils. Even though they are higher, the levels are still comparable to mean values found in natural soils of the western United States (Table 4-10) and so do not indicate a departure from conditions considered natural. Similarly none of the metal levels detected by the ICP analyses performed by RMA Laboratory were above conditions suggested to be natural.

TABLE 4-14

RESULTS OF TOTAL METALS ANALYSES - ANALYTICAL LABORATORIES, INC.

Parameter	Units	Fill Material[a]	Native Soils[b]	Literature Background[c]		
				Min.	Max.	Mean
As	mg/kg	8.5	7.3	<0.1	97	5.5
Cd	mg/kg	.83	0.65	<0.5	<0.5	<0.5
Cr	mg/kg	17.8	11.9	3	2,000	41
Pb	mg/kg	21.4	4.1	10	700	17
Hg	mg/kg	0.100	<0.03	<0.01	4.6	0.046
Se	mg/kg	<1.0	<1.0	<0.1	4.3	0.23
Zn	mg/kg	57.1	25.9	10	2,100	55

[a] Mean value, n=7
[b] Mean value, n=2
[c] Reference on Table 4-10

Volatiles and Semi-Volatiles

Twelve samples were selected for the analyses of specific volatile and semi-volatile compounds on the HSL. Nine of these samples were analyzed at AT and three were analyzed at RMA Laboratory. None of these compounds (other than the pesticides discussed below) were detected in the samples. A GC/MS scan for volatile and semi-volatile TICs was performed on the three samples sent to RMA Laboratory. Only one sample showed the presence of TICs (PL-31, Appendix E). The compounds were as follows:

- 3 alkanes detected at 0.44 mg/kg, 0.82 mg/kg, and 0.4 mg/kg
- 2 hydrocarbons detected at 0.88 mg/kg, and 0.51 mg/kg
- 1 oxygenated hydrocarbon detected at 0.57 mg/kg
- Sulfur detected at 9.2 mg/kg

These organic compounds occur at low concentrations and are not considered toxic at these levels. Sulfur occurs naturally at the level detected in this sample according to background concentrations listed on Table 4-10.

Pesticides

Nine soil/solid samples, seven from fill material and two from native soils, were selected for analyses of pesticide/PCB contaminants at AT. Five pesticides were detected in fill samples only:

- 4-4,DDE detected in seven samples (PL-8, -12, -31, -33, -34, -35, and T-2).
- Toxaphene detected in four samples (PL-31, -33, -35, and T-2).
- Dieldrin detected in one sample (T-2).
- 4-4,DDD and 4-4,DDT detected in one sample (PL-31).

Table 4-15 summarizes the results of the pesticide analyses. It also lists the maximum EP-Toxicity level allowable (for a waste to be non-hazardous)

TABLE 4-15

RESULTS OF PESTICIDE ANALYSES

	Units	4-4,DDE	4-4,DDD	4-4,DDT	Dieldrin	Toxaphene
Mean[a]	mg/kg	0.090	0.003	0.003	0.016	0.41
Maximum[a]	mg/kg	0.410	0.022	0.025	0.140	1.90
Ep-Tox Standard[b]	mg/l	—	—	—	—	0.50
SDWA MCL	mg/l	—	—	—	—	0.005
Solubility	mg/L	0.014[c]	0.09[c]	0.025[c]	0.186[c]	0.50[c]
log K_{ow}	—	5.69[c]	5.99[c]	3.98[c]	3.21[c]	3.3[c]

[a] n=9
[b] From 40 CFR § 261.24
[c] From Water-Related Env. Fate of 129 Priority Pollutants, EPA-440/4-79-029a, 1979.
log K_{ow} = log of octanol/water partitioning coefficient

for pesticides listed by 40 CFR § 264.24 and it provides MCLs listed by the SDWA for certain pesticides. In addition, compound solubilities and log K_{ow}'s (log of the octanol/water partition coefficient) are provided.

The solubilities and the log K_{ow}'s of the pesticides can be used to determine their potential of being leached from the fill material into water. The solubilities of each compound are very low (<1 mg/L) and the log K_{ow}'s are greater than two. Both of these factors indicate there will be relative immobility of the compounds from soil into water if the organic content of the soil is 0.1 percent or greater.

Only toxaphene is listed in 40 CFR § 261.24 as a characterizable hazardous waste with a maximum allowable EP-Tox concentration. An actual level detected in soil is comparable to an EP-Tox standard if the soil level is diluted by a factor of 20. After this dilution the mean and maximum levels of toxaphene detected in the samples both fall below the EP-Tox standard. Two other comparisons are relevant for evaluating the results of the pesticide analyses. One is a comparison of the range and mean levels of the concentrations found in the fill samples to the ranges and mean levels of concentrations that have been observed as background in the literature. Table 4-16 summarizes this comparison and shows the following for each compound:

- 4-4DDD -- Cannot be directly compared to background levels since none exist.
- 4-4DDT -- The mean concentration detected is below the background mean; the detected range falls within the background range.
- 4-4DDE -- The mean concentration in the fill is above the background level by a factor of more than two; the maximum concentration in the fill is above the background maximum by a factor of more than four.
- Dieldrin -- The mean detected concentration is above the background mean by a factor of four, but the detected range falls within the background range.
- Toxaphene -- The mean detected concentration is above the background mean by a factor of less than two, but the detected range falls within the background range.

TABLE 4-16

COMPARISON OF PESTICIDE DETECTIONS WITH LITERATURE BACKGROUND VALUES

Compound	Units	Concentration in Fill			Literature Background[b]		
		Min.	Max.	Mean[a]	Min.	Max.	Mean[b]
4-4 DDE	mg/kg	0.015[c]	0.069[c]	0.004[c]	<0.004	0.41	0.088
4-4 DDD	mg/kg	—[d]	—[d]	—[d]	<0.004	0.022	0.003
4-4 DDT	mg/kg	0.015[c]	0.069[c]	0.04[c]	<0.004	0.025	0.003
Dieldrin	mg/kg	0.01	6.02	0.004	<0.004	0.14	0.016
Toxaphene	mg/kg	0.23	4.95	0.24	<0.16	1.9	0.41

[a] n=9
[b] Refer to Table 4-10 for references; n=380 Urban samples.
[c] Literature reports 4-4DDE and 4-4DDT together at combined levels.
[d] No known literature reported background values.

In summary, the levels detected for three of the five pesticides (4-4DDT, dieldrin, toxaphene) fall within the range of literature observed background levels. No background comparison values were available for 4-4DDD but its mean detected value was similar to 4-4DDT which fell well below the observed background mean. For 4-4DDE, the mean and the maximum detected sample levels were higher than the mean and maximum background levels. However, as discussed in detail above, the compound still occurs at low levels (<1 mg/kg) and is not very mobile from soil to water media.

For some of the fill samples where pesticide was detected, a comparison of analytical detection limits with the level of the contaminant actually measured is relevant. Table 4-17 compares the detected pesticide levels with the detection limit used for each sample analyzed. The detection limits varied from sample to sample for some analyses due to interferences which were resolved by performing sample dilutions. As Table 4-17 illustrates, several compound detections were close to the limits of detection, as follows:

- PL33 -- 4-4DDE detected at 0.053 mg/kg with detection limit at 0.04 mg/kg
- T2 -- 4-4DDE detected at 0.04 mg/kg with detection limit at 0.04 mg/kg
- PL33 -- Toxaphene detected at 0.16 mg/kg with detection limit at 0.16 mg/kg

If the detections for 4-4DDE in PL33 and T2 are not included in the calculation of the mean concentration detected, the mean is still above the literature observed background and the range comparison is not changed. For toxaphene the sample detected mean is also still above the literature observed mean and the range comparison is not changed if its detection in PL33 is not included in the calculation. Therefore the detection limits do not appear to be introducing a strong effect of possible false positive detections into a comparison with literature background levels.

TABLE 4-17

COMPARISON OF PESTICIDE ANALYTICAL RESULTS WITH DETECTION LIMITS

		Compound Concentrations and Detection Limits[a]									
Sample ID	Units	4-4,DDE	D.L.	4-4,DDE	D.L.	4-4,DDT	D.L.	Dieldrin	D.L.	Toxaphene	D.L.
PL07	mg/kg	0.15	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04
PL08	mg/kg	0.11	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04
PL12	mg/kg	0.039	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.16	0.16
PL14	mg/kg	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.16	0.16
PL31	mg/kg	0.030	0.004	0.022	0.004	0.025	0.004	<0.004	0.004	1.1	0.16
PL33	mg/kg	0.053	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	0.16	0.16
PL34	mg/kg	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.80	0.80
PL35	mg/kg	0.41	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	0.54	0.16
T2	mg/kg	0.04	0.04	<0.04	0.04	<0.04	0.04	0.04	0.04	1.9	1.6

[a] Detection limit abbreviated D.L.

No spatial significance was noted in the occurrence of pesticide detections in samples. Samples selected for analysis were from borings and backhoe shovels distributed somewhat evenly across the landfill site.

4.6 DUPLICATE LABORATORY ANALYSES

Three samples were analyzed at RMA Laboratory to provide both additional analytical information and QA/QC checks. The three samples were collected from the same sample depth interval as 30 other samples for two borings and one backhoe sample. The field sampling technique did not allow for compositing and homogenization of a sample depth interval to obtain true sample splits since the samples were to be analyzed for volatile organic compounds. Therefore they are actually co-located samples rather than true splits or duplicates.

Results of the analyses at RMA Laboratory for HSL volatile and semi-volatile compounds agree one-hundred percent with the results obtained at AT. Neither lab detected any of these compounds. In addition to being a QA/QC check that the HSL GC/MS scans were accurate, the volatile and semi-volatile TIC scans performed at RMA Laboratory indicate that few non-HSL compounds were present in the samples. As discussed above, only one sample showed low concentrations of hydrocarbons and sulfur.

Two of the three samples sent to RMA Laboratory, PL-8 and PL-31, were analyzed for total organic halogens (TOX). As previously discussed, RMA's results for this procedure do not agree with the results produced by AT. A summary comparison of the results is provided in Table 4-13B. As the discussion suggested, results of the volatile and semi-volatile analyses for specific and tentatively identified compounds support a low concentration of TOX compounds present in the soil samples. As mentioned previously, this indicates that the results of the TOX analyses performed at RMA Laboratory are more accurate.

Table 4-18 compares the analyses performed at both laboratories for total metals. A large variation in levels detected between both labs was expected since the nature of the fill material is naturally heterogeneous

TABLE 4-18

COMPARISON OF LAB ANALYSES FOR TOTAL METALS

Sample I.D.	Metal	Units	Analytical Technologies, Inc. Result	Analytical Technologies, Inc. Detection Limit	Rocky Mountain Analytical Result	Rocky Mountain Analytical Detection Limit
PL-8	As	mg/kg	10.3	5.0	<10.0	10
	Cd	mg/kg	1.3	0.3	<0.5	0.5
	Cr	mg/kg	27.9	2.0	12	1.0
	Pb	mg/kg	10.4	4.0	16	5.0
	Zn	mg/kg	80	2.0	44	1.0
PL-31	As	mg/kg	11.2	5.0	<10.0	10
	Cd	mg/kg	0.8	0.3	<0.5	0.5
	Cr	mg/kg	20.2	2.0	20	1.0
	Pb	mg/kg	59.0	4.0	63	5.0
	Zn	mg/kg	67.9	2.0	86	1.0
T-2	As	mg/kg	9.4	5.0	<10.0	10
	Cd	mg/kg	0.8	0.3	0.6	0.5
	Cr	mg/kg	22.8	2.0	11.0	1.0
	Pb	mg/kg	7.2	4.0	8.0	5.0
	Zn	mg/kg	111.0	2.0	82.0	1.0

and duplicate samples were not derived from a composited source. Another source of variation is due to a difference in detection limits employed by each lab. For instance, the detection limit for arsenic at RMA Laboratory was higher than that used at AT by a factor of two which is a significant source of variation since arsenic occurs at low levels in the fill samples. Considering the inhomogeneity of the fill material and the different detection limits used by the labs, the comparisons of the total metals are reasonable and provide a QA/QC check that indicates acceptability of data from both labs.

4.7 SUMMARY

Four sets of chemical analyses were performed on the thirty soil samples collected at New River; RCRA parameters, total organic halogens (TOX), Safe Drinking Water Act (SDWA) primary metals, and specific organic compounds. Under RCRA parameters, four tests were performed to determine if the fill material could be characterized as a RCRA hazardous waste. The results of three of the tests -- corrosivity, reactivity, an EP-Toxicity -- characterize the fill material as non-hazardous. Two samples tested positive for ignitability due to woody material. This does not characterize the material as hazardous because the flash point was reached for wood, a non-hazardous substance.

The results of the total metals analyses performed at AT for SDWA metals (excluding Barium) indicated all that all detected concentrations were below the literature observed mean background levels except for arsenic. The mean arsenic levels fall on the low end of the literature observed range and do not indicate a departure from background conditions. The ICP analyses performed for 25 metals also showed detections below the means or within the literature observed background ranges.

The results of analyses performed for volatile and semi-volatile compounds on the HSL showed non-detectable levels of these compounds. TIC scans run for additional identifications of volatiles and semi-volatiles not on the HSL determined only low concentrations of alkanes, hydrocarbons and sulfur (not considered toxic) in one sample. TOX analyses were performed at two

laboratories. High concentrations were detected by one lab and low concentrations at the other. Several lines of reasoning suggest that the high concentrations detected by AT are due to a laboratory contamination problem. The general levels of TOX are thus determined to be low (<1 mg/kg) based on the results of RMA Laboratory.

Five pesticides -- 4-4DDE, 4-4DDD, 4-4DDT, Dieldrin, and Toxaphene -- were detected at low levels in seven of nine fill samples analyzed. The mean occurrences of all pesticides were below 1 mg/kg. This in combination with the low solubility and high log K_{ow}s of the compounds indicates that the pesticides will tend to remain in the soil and solubilize at concentrations less than the detected levels. Toxaphene, the only pesticide detected that is addressed by the EP-Tox standards, occurred at levels below the EP-Toxicity standard (its level adjusted by the 20/1 dilution factor). All the ranges of occurrence for pesticide, except for 4-4DDE, fall within literature observed background level ranges. Even though the range of occurrence of 4-4DDE fell outside the literature observed mean, the concentrations detected were very low (<1 mg/kg).

QA/QC checks were implemented by performing additional analyses of samples at a second laboratory (RMA Laboratory). Samples at the second lab were analyzed for volatile and semi-volatile compounds on the HSL. The results of these analyses for both labs are in one hundred percent agreement. TIC and ICP scans that were performed for volatiles, semi-volatiles, and a wide range of metals indicated that only background levels of compounds and metals not analyzed for by specific methods were present in the samples. The results of these analyses agree with the results for similar tests performed by the primary lab (AT) except for the TOX analyses. Inquiries into QA/QC procedures indicate that the results produced by the second lab (RMA Laboratory) are correct. A laboratory contamination problem at the primary laboratory was thus detected by analysis at the second lab.

CAMP DRESSER & McKEE INC.

TRANSMITTAL SHEET

2302 Martin Street
Irvine, California 92715
714 752-5452

environmental engineers, scientists, planners, & management consultants **CDM**

Date 6/30/88

Job 9200-004-RT-REPT

To U.S. Army Corps of Engineers
Geotechnical Branch Room 6036 Fed. Bldg.
300 N. Los Angeles St. LA, CA 90012

Att. Mr. Mark Russell, P.E.

FLOOD CONTROL DISTRICT RECEIVED
JUL 06 '88

	CH ENG		P & PM
	DEP		HYDRO
	ADMIN		LNGT
	FINANCE		
	C & D		
	SMDR		

RELEASED

We are sending
- herewith ☒
- under separate cover ☐
- by messenger ☐

5 print(s) each of the following: Sections 5 + 6 of the New Rio Improvements Project Landfill Investigation Report

which are
- approved ☐
- approved as noted ☐
- returned to you for correction and resubmittal ☐
- for your information ☒
- ☐

The changes you requested re: potential for encountering hazardous materials in the landfill, have been incorporated in the enlosed text. Please remove sections 5+6 from your Report copies and replace them with the enclosed sections. Please call us if you have any questions.

By Cecelia Edwards for
Suzanne Rowe

5.0 CONCLUSIONS

5.1 EXTENT OF TRASH

In general, trash is predominantly located along the banks of the New River. Exceptions are (1) the area to the north of Olive Avenue on the east bank where data indicate the presence of buried trash in the river bottom, (2) areas to the north of Olive Avenue and south of Peoria Avenue on the east bank where data indicate the presence of trash in river terraces, and (3) at and adjacent to the old Peoria landfill. The river bottom and most of the river terrace areas exhibit minor quantities of surface trash. In the areas where trash is buried, the depth to the bottom of trash ranges from surface cover to 13.5 feet. The thickness and depth to the bottom of trash in areas between borehole data points may be greater or lesser than indicated by the contours since surface data are not an indicator of trash presence at depth.

5.2 SIGNIFICANCE OF LABORATORY ANALYSES RESULTS

Based on the data, the majority of the results of the chemical analyses in comparison with RCRA regulatory standards and background level information indicate that the fill material is composed of non-hazardous waste. The exceptions of note were two samples containing wood that failed the RCRA test for ignitability and the mean and maximum levels of detected 4-4DDE fuel which were above observed background levels. However, wood is not generally considered hazardous and thus the wood and brush at the site is a non-hazardous waste. The 4-4DDE detected represents what is found adhered to the fill materials. Only a small percentage of 4-4DDE has the potential to solubilize from its adsorbed state and since detected concentrations are already very low, the compound should not be a hazardous waste. In addition, all of the values for detected pesticides fall within the ranges common to agricultural areas.

The metals analyses show that all detected metals occur at levels below the mean, or within the range, of literature observed background levels. These values indicate that metals do not occur at levels of concern in fill materials.

Analyses for volatiles and semi-volatiles show that these compounds do not appear to be present in fill materials in concentrations of concern.

While the data indicate that fill materials pose no regulated or non-regulated chemical hazard, the potential for encountering such material during excavation may exist. However, this potential is limited by the fact that no hazardous wastes were encountered at any of the subsurface points of exploration for this investigation.

5.3 SUITABILITY OF SITE FOR CONSTRUCTION

Since no geotechnical information has been gathered from the site during this study, i.e., compaction, shear strength, grain size distribution, etc., the determination of the site's suitability for construction is based solely on the occurrence/absence of trash. The presence of the trash as characterized, is only an impediment to construction. Providing the trash is successfully removed, problems related to construction suitability should be limited to the character of native soils. It is important to note that, due to the wide distribution of data points and the inherent nature of indiscriminate dumping, the potential for encountering hazardous materials may exist. As stated above, this potential is limited by the lack of hazardous wastes in any of the boreholes and test pits in this study.

6.0 RECOMMENDATIONS

The following recommendations are based upon the premise that some volume of trash will be removed from the site and disposed of in an appropriate manner. The final determination of the removal volume will be largely dependent on the extent of excavation needed to accommodate the anticipated facilities. The technical recommendations made here are intended to be general guidelines for the excavation, removal, and disposal of the trash.

The Arizona Department of Health Services requires that a contingency plan outlining the expected procedures necessary to remediate the trash be prepared prior to the commencement of excavation activities. Specific technical recommendations should be addressed in that document.

6.1 EXCAVATION AND REMOVAL OF TRASH

Excavation of the trash will likely require the following heavy equipment:

- Bulldozer - for surface scraping and general pre-loading management of materials.

- Front-end loader - for loading trucks and for the pre-loading management of large, bulky items. The soil bearing capacity and slopes will determine whether this should be a wheel or track-mounted unit. The handling nature of the trash materials will determine the appropriate bucket size.

- Dump trucks - for hauling materials, particularly non-regulated fill. Trucks should be of the "rock-body" style in order to deal with the concrete slabs, etc.

- Refuse trucks - for hauling regulated wastes. It may be necessary for these trucks to have a sealed load capability in the event that loads emit noxious odors or leak fluids.

Since the potential for encountering hazardous materials may exist in areas between boreholes/excavations, a Health and Safety Plan should be developed so that on-site personnel can be adequately prepared to protect themselves. This plan should include such items as contingency definitions for protection level upgrades, health and safety monitoring procedures, access and transport to emergency organizations and facilities, design requirements for operating equipment, etc.

6.2 DISPOSAL COMPLIANCE

Based on the data, the material in the landfill appears to be compliant with Resource Conservation and Recovery Act (RCRA) standards and should not require disposal at a RCRA approved facility. In the event that all waste is RCRA compliant, officials at Arizona (DHS) indicate that regulations (Title 18, Chapter 8, Article 5) require that solid wastes be disposed of in one of two manners. All inert materials such as sand, gravel, rocks, bricks, concrete, etc., can be disposed of in off-site areas accepting clean-fill or can be re-landfilled on-site. All other materials must be disposed of at an approved municipal solid waste landfill. The material could be disposed of on-site if the site is approved as a solid waste landfill through a 6 to 8 month permit application process. In the event that unforeseen hazardous wastes are encountered, disposal under RCRA manifest would be required.

If more than 100 kilograms of hazardous waste or 1 kilogram of acutely hazardous waste were to require disposal, it would be necessary to apply for a RCRA Hazardous Waste Generator's Identification Number (EPA ID number). Without this number, generators are barred from treating, sorting, disposing of, transporting, or offering for transportation any hazardous waste.

After obtaining an ID number (10 day to 2 week process), a Treatment, Storage and Disposal Facility (TSD) must be contracted to receive the material. Generally, these facilities operate transportation systems or can recommend an appropriate organization for that task. Both the TSD and transporter must have EPA ID numbers as well. In addition, EPA requires adherence to certain protocols for pre-transport packaging and labeling.

In order to make transportation cost-effective, EPA allows generators to accumul (depending on volume of waste and the distance to the TSD) as long as it is prop personnel are trained in the proper handling of hazardous waste. EPA also requires the use of shipping manifests in order to track the wastes from origin to destination, as well as requiring that a specific record keeping and reporting procedure be followed.

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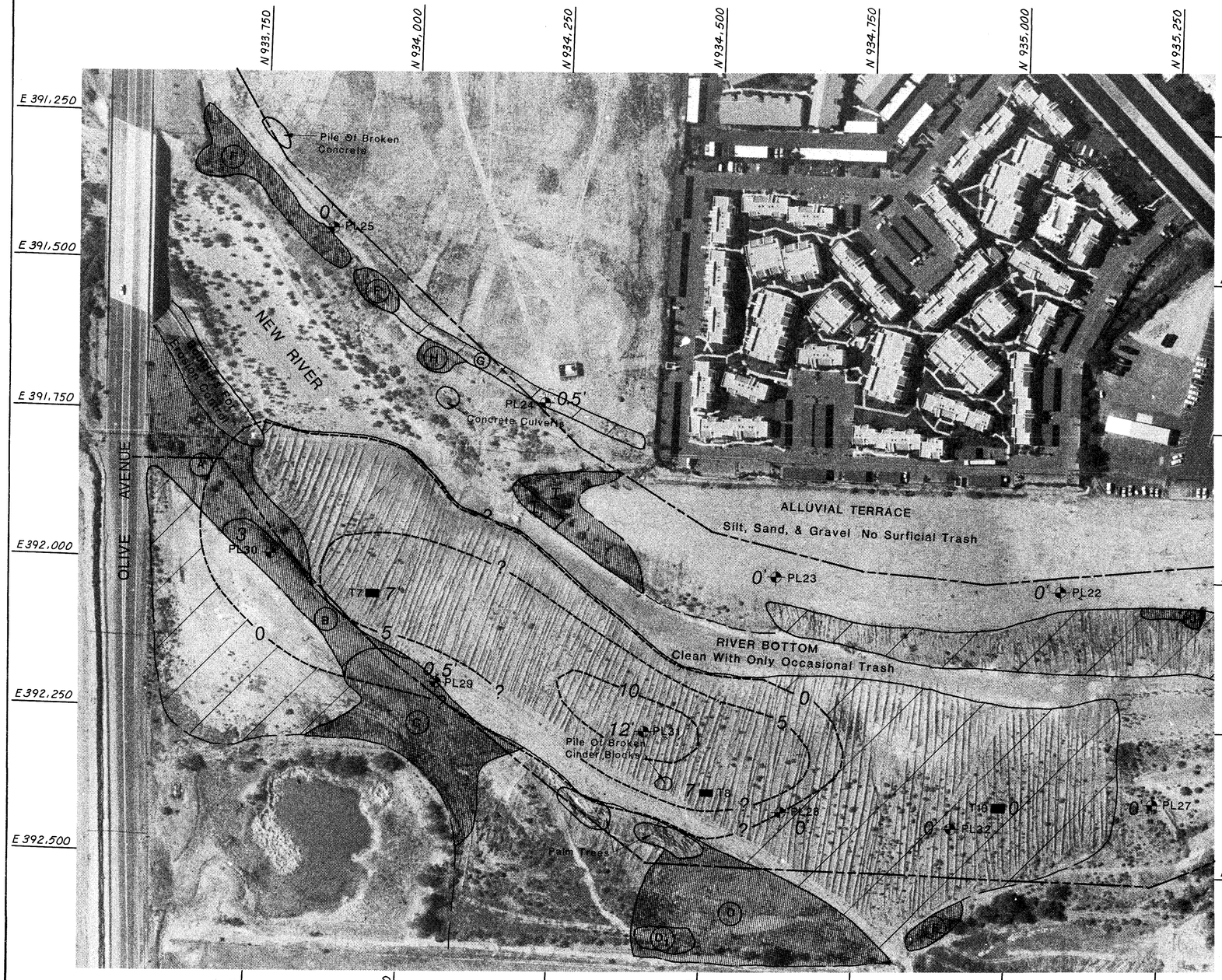


EXPLANATION

DISTURBED AREAS–SURFACE IS PRIMARILY CLEAN, SILTY SAND, GRAVEL AND COBBLES WITH OCCASIONAL TRASH INCLUDING WOOD, CLOTH, PLASTIC, TIRES, APPLIANCES.

DISTURBED AREAS–SURFACE COVERED WITH SIGNIFICANT QUANTITIES OF TRASH AND/OR CONSTRUCTION DEBRIS.

A. 20% SURFACE COVERED WITH RANDOM PILES OF GRAVEL, BROKEN BRICKS AND CONCRETE. HUMMOCKY LAND SURFACE MAY INDICATE BURIED MATERIAL.

B. 40–50% SURFACE COVERED WITH BLOCKS AND CHUNKS OF ASPHALT.

C. HOUSEHOLD TRASH INCLUDING PLASTIC, CLOTHES, LUMBER, CLOTH, RUGS, CRUMPLED PIECES OF METAL (2' X 4'), APPLIANCES, ASPHALT BLOCKS, SEVERAL UNIDENTIFIABLE DRUMS. TRASH HAS BEEN PARTIALLY BURNED.

D. 10–15% SURFACE COVERED WITH PILES OF CINDER BLOCKS, ASPHALT BLOCKS, HOUSEHOLD TRASH INCLUDING RUGS, WOOD, PLASTIC PAPER.

D_1. SEVERAL HOT WATER HEATERS AND LARGE CEMENT CULVERTS. HUMMOCKY LAND SURFACE MAY INDICATE BURIED MATERIAL.

E. LARGE PILE OF HOUSEHOLD TRASH INCLUDING WATER HEATER, BRUSH, BUNDLES OF THIN GAGE WIRE.

F. 30–80% SURFACE COVERED WITH PILES OF DIRT AND GRAVEL, ASPHALT, & CONCRETE BLOCKS. (CONCRETE RANGES IN SIZE FROM 1' X 1' X 1 TO 4' X 4' X 4')

G. OCCASIONAL BURIED CONCRETE, METAL & TRASH. PREDOMINANTLY SAND, GRAVEL & COBBLES AT SURFACE.

H. BURIED APPLIANCES, WIRE, CONCRETE.

I. 10–40% TRASH, INCLUDING WIRE, STUMPS, BRANCHES, ASPHALT CONCRETE, BRUSH BURIED UNDER SAND AND GRAVEL.

I_1. MORE TRASH EXPOSED AT SURFACE.

J. 20–30% SURFACE COVERED WITH TRASH INCLUDING TREES, BRANCHES, WIRE, CABLE, & CONCRETE BLOCKS UP TO 2' X 2' X 2'.

12' PL23 — BOREHOLE WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

7' T10 — BACKHOE TRENCH WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

–?–5– CONTOUR OF APPROXIMATE DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

R/W AND LIMIT OF CONSTRUCTION

BASE PHOTOGRAPH FROM NOVEMBER 7, 1986 AERIAL SURVEY

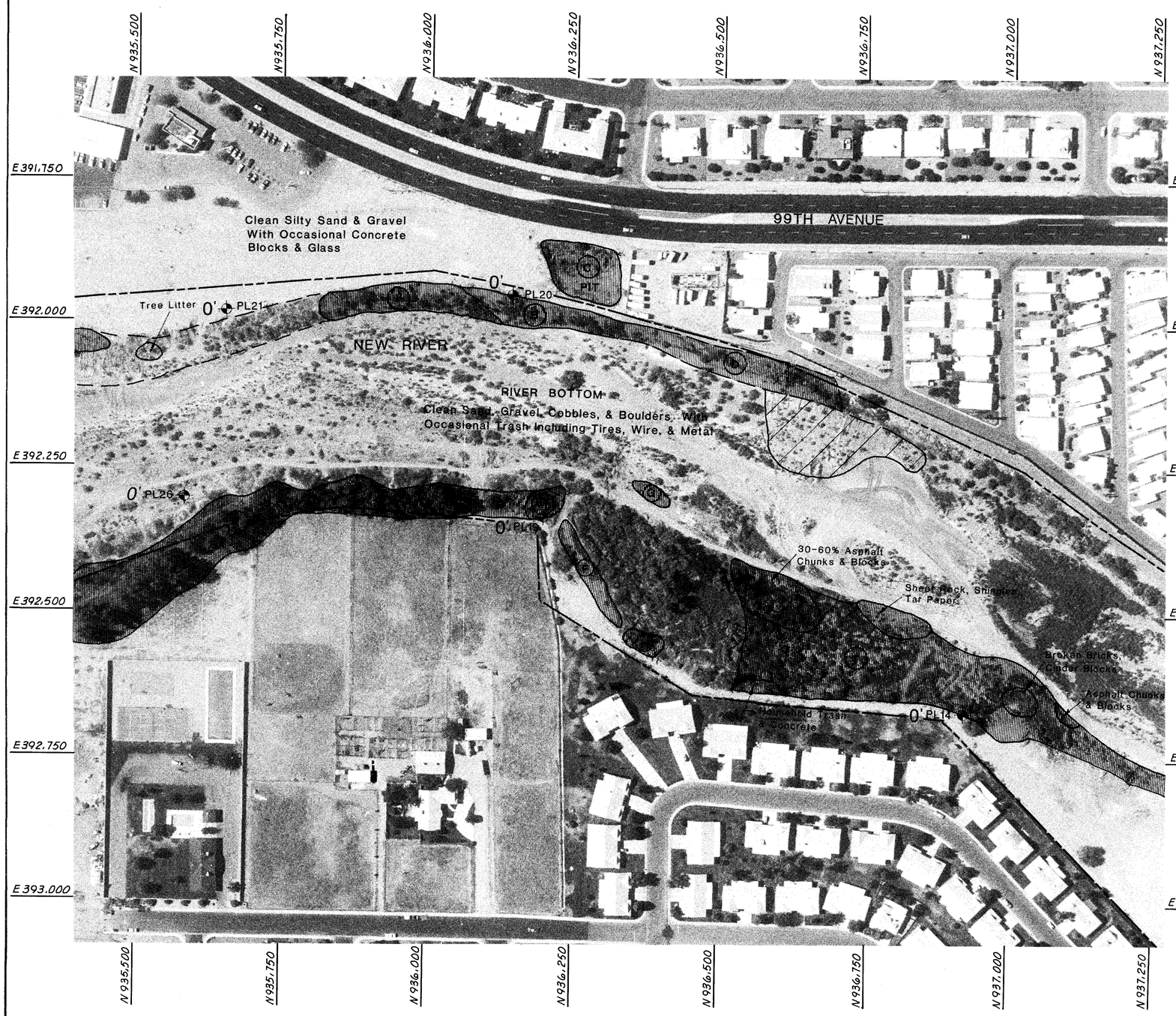
0 100 200 300
Scale In Feet

U.S. ARMY CORPS OF ENGINEERS
NEW RIVER IMPROVEMENTS PROJECT

MAP OF SURFICIAL MATERIAL

CAMP DRESSER & McKEE INC.
CDM
environmental engineers, scientists, planners, & management consultants

Figure 2



EXPLANATION

DISTURBED AREAS–SURFACE IS PRIMARILY CLEAN, SILTY SAND, GRAVEL AND COBBLES WITH OCCASIONAL TRASH.

DISTURBED AREAS–SURFACE COVERED WITH SIGNIFICANT QUANTITIES OF TRASH AND/OR CONSTRUCTION DEBRIS.

A. 30% SURFACE COVERED WITH BRUSH AND TREES WITH OCCASIONAL HOUSEHOLD TRASH INCLUDING BED SPRINGS, BUCKETS, WIRE, CANS.

B. 25% SURFACE COVERED WITH CONCRETE BLOCKS AND SLABS UP TO 3' X 4'.

C. EXCAVATED PIT: 2% SURFACE COVERED WITH CONCRETE SLABS, PLASTIC AND NUMEROUS PVC PIPES (8" X 3').

D. 60% SURFACE COVERED BY LARGE (2' X 2' X 8') SLABS AND BLOCKS OF CONCRETE. 10–15% HOUSEHOLD TRASH INCLUDING COUCHES, PIPES, WATER HEATER, PVC PIPES, METAL BANDS, ASPHALT.

E. PILES OF TREES AND TREE LITTER WITH SAND AND GRAVEL. NO VISIBLE LARGE QUANTITIES OF CONSTRUCTION OR HOUSEHOLD TRASH.

E_1. PILE OF TRASH INCLUDING LUMBER, WOOD, WIRE, CONCRETE BLOCKS, METAL.

F. PILE OF TRASH INCLUDING LUMBER, WOOD, WIRE, CONCRETE BLOCKS, METAL.

G. HUMMOCKY LAND SURFACE MAY INDICATE BURIED MATERIAL INCLUDING WIRE, CONCRETE.

H. PILE OF CONSTRUCTION DEBRIS INCLUDING SHEETROCK (2" X 4" UP TO 5' X 10'), CONCRETE BLOCKS WITH SOME HOUSEHOLD TRASH.

I. PILE OF REINFORCED CONCRETE SLABS AND PILLARS.

J. 60–70% SURFACE COVERED WITH CONCRETE SLABS UP TO 10' X 10', WITH SOME PILES OF OTHER HOUSEHOLD AND CONSTRUCTION DEBRIS.

0' PL14 BOREHOLE WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

R/W AND LIMIT OF CONSTRUCTION

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Figure 3

N 937.250 | N 937.500 | N 937.750 | N 938.000 | N 938.250 | N 938.500 | N 938.750

E 392,500 | E 392,750 | E 393,000 | E 393,250 | E 393,500

NEW RIVER

RIVER BOTTOM
Clean Sand, Gravel, Cobbles, And Boulders With Occasional Trash

Corrugated Tin, Wood, & Tires

Surface Covered With Sand & Gravel With Occasional Small Trash & Broken Glass

PL Easement

PEORIA AVENUE

PL13 8'
PL12 6'
PL18 0'
PL17 1'
PL15A 0'
PL16 0'
PL11 0'
PL15 1.7
PL10 0'

N 938,854.38
E 939,051.56

N 938,856.24
E 939,109.01

N338,676.89
E393,745.07

EXPLANATION

FENCING AND STRUCTURES STANDING AS OF MARCH 1988

DISTURBED AREAS-SURFACE COVERED WITH SIGNIFICANT QUANTITIES OF TRASH AND/OR CONSTRUCTION DEBRIS.

A. 80-90% SURFACE COVERED WITH CONCRETE SLABS UP TO 6' X 6', BLOCKS AND CHUNKS, SOME REINFORCED WITH REBAR AND WIRE. OCCASIONAL PILES OF HOUSEHOLD TRASH AND METAL STRIPS.

B. PILES OF REINFORCED CONCRETE SLABS UP TO 2' X 3' X 4', CRUMPLED CAR BODY PARTS, ASPHALT, PLANT TRIMMINGS, SOME HOUSEHOLD TRASH, CINDER BLOCKS.

B_1. PILE OF TRASH CONTAINS NUMEROUS PAINT CANS, STILL CONTAINING LIQUID. AN EMPTY DRUM OF "R-M LACQUER THINNER" (CONTAINED KETONE, TOLUOL, ALCOHOL AND PETROLEUM DISTILLATES)

C. 60% SURFACE COVERED WITH CONCRETE, BLOCKS, SLABS (1' X 4'), AND CONCRETE CULVERTS (3' X 5' -10'), GRAVEL, WOOD, FENCE POSTS, SOME PILES OF HOUSEHOLD TRASH.

D. 40-70% SURFACE COVERED WITH VERY LARGE CONCRETE SLABS UP TO 4' X 10'.

D_1. PILE OF HOUSEHOLD TRASH, GROUND SURFACE SHOWS TAR AND OIL STAINS.

E. SURFACE COVERED WITH SCATTERED CONCRETE SLABS, PILLARS UP TO 2' X 2' X 5'-10').

F. PILE OF BRUSH AND HOUSEHOLD TRASH

8' PL15 BOREHOLE WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

-?--5- CONTOUR OF APPROXIMATE DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

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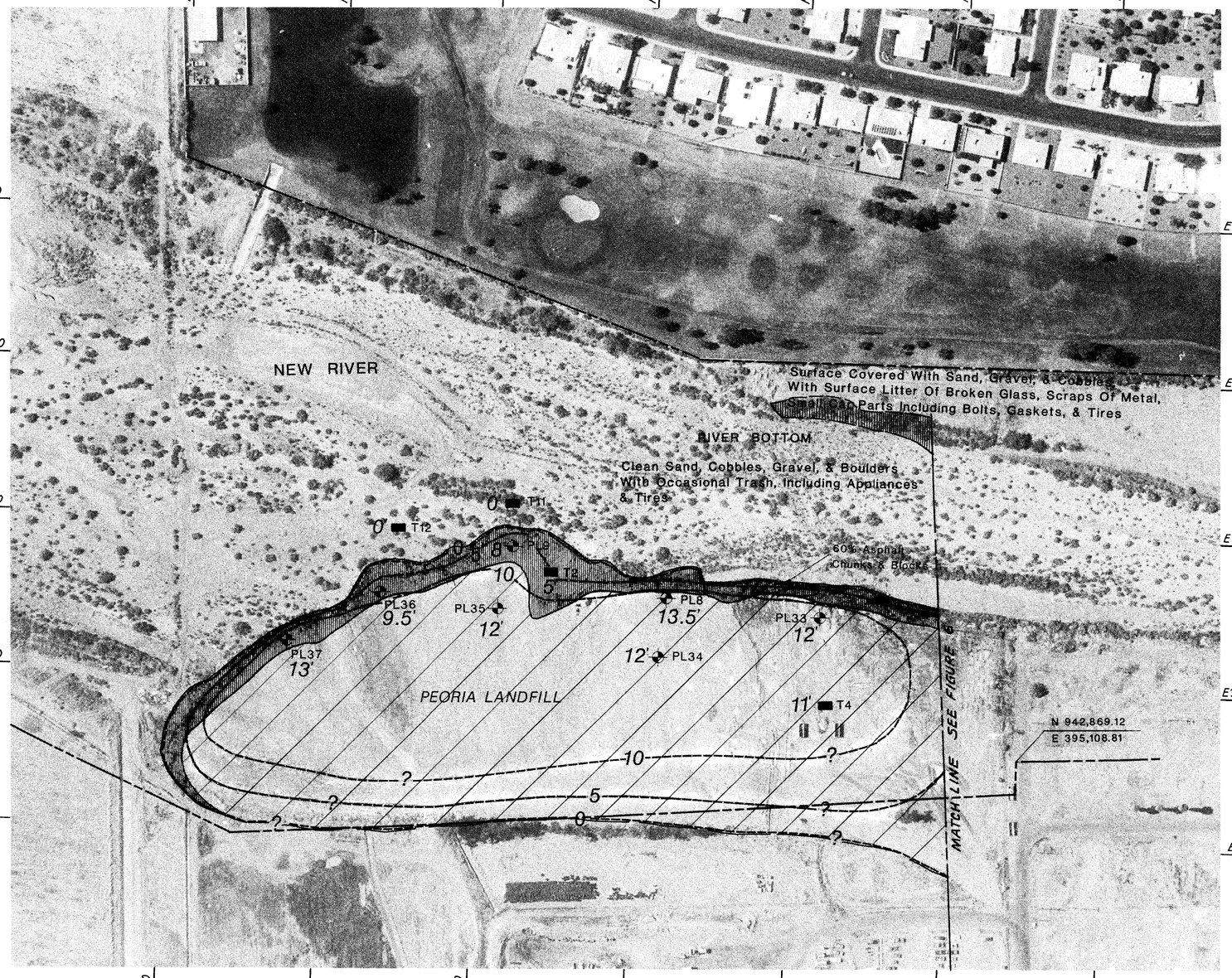
Figure 4



EXPLANATION

DISTURBED AREAS–SURFACE IS PRIMARILY CLEAN, SILTY SAND, GRAVEL AND COBBLES WITH SOME SURFACE LITTER OF HOUSEHOLD TRASH AND CONCRETE. PROBABLY MATERIAL CAPPING LANDFILL.

DISTURBED AREA – EXPOSED EDGE OF LANDFILL. 70–90% TRASH INCLUDING HOUSEHOLD TRASH (FURNITURE, METAL, LUMBER, MATTRESSES, PAPER, PLASTIC, LANDSCAPING TRIMMINGS, APPLIANCES) AND CONSTRUCTION DEBRIS (CONCRETE SLABS AND BLOCKS, ASPHALT, PIPES, CONDUIT).

12' PL34 — BOREHOLE WITH DEPTH TO BOTTOM OF NON–NATIVE MATERIAL.

0' T4 — BACKHOE TRENCH WITH DEPTH TO BOTTOM OF NON–NATIVE MATERIAL.

–?–5– — CONTOUR OF APPROXIMATE DEPTH TO BOTTOM OF NON–NATIVE MATERIAL

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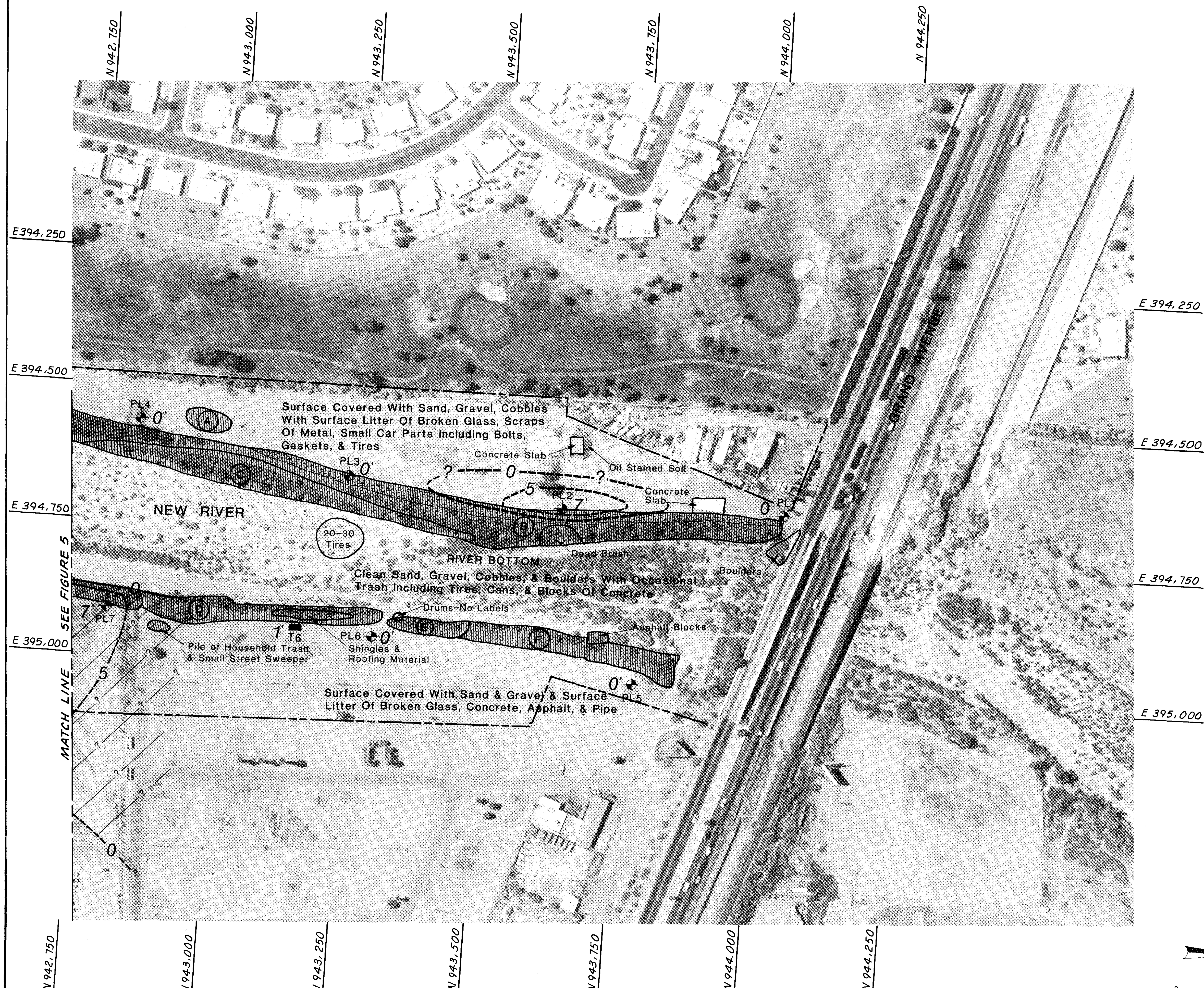
Figure 5



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RAISED LEVEE HELD UP BY BURIED CONCRETE.

DISTURBED AREAS–SURFACE COVERED WITH SIGNIFICANT QUANTITIES OF TRASH AND/OR CONSTRUCTION DEBRIS.

A. LARGE (2' X 1') SLABS OF CONCRETE PROTRUDING THROUGH SURFACE COVER.

B. 30–70% OF BANK SURFACE COVERED WITH LARGE (UP TO 3' X 4' X 15) SLABS, PILLARS, BLOCKS OF REINFORCED CONCRETE AND CONCRETE. OCCASIONAL PILES OF HOUSEHOLD TRASH.

C. 30–70% SURFACE COVERED WITH ASPHALT CHUNKS (0.5–2.0'), GRAVEL, COBBLES AND SAND, WITH OCCASIONAL CAR PARTS, INCLUDING GAS TANKS, MUFFLERS, METAL, TIRES.

D. 30–70% SURFACE COVERED WITH LARGE SLABS AND BLOCKS OF REINFORCED CONCRETE, HOUSEHOLD TRASH, LANDSCAPING TRIMMINGS, WOODEN PALLETS, SAND, GRAVEL ROOFING MATERIAL, LUMBER, SCRAP PIPE.

E. 60% SURFACE COVERED WITH TRASH INCLUDING LANDSCAPE TRIMMINGS (BRUSH, PALM FRONDS), MATTRESSES, FURNITURE, WOOD, APPLIANCES AND LARGE, CONCRETE PILLARS. DRUMS WITH NO CONTENT LABELS.

F. MAN-MADE LEVEE CONTAINING 40–70% REINFORCED CONCRETE PILLARS (2' X 2' X 10–15'), SLABS AND BLOCKS, LARGE WOODEN (2" X 6" X 20') MOLDS, CORRUGATED TIN ROOFING, SAND, GRAVEL AND COBBLES.

0' PL3 BOREHOLE WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

1' T6 BACKHOE TRENCH WITH DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

–?––5– CONTOUR OF APPROXIMATE DEPTH TO BOTTOM OF NON-NATIVE MATERIAL

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Figure 6

APPENDIX A

SOIL BORING LITHOLOGIC LOGS

Proj_4/9200-003-FI/U.S. Army Corps/980

The lithologic logs provide the following information:

North & South: State Plane Coordinates for the borehole and backhoe trench locations.

Driller/Operator:

Borehole	Driller's and subcontractor's names.
Trench	Backhoe operator's and subcontractor's names.

Rig/Backhoe:

Borehole	Drill rig make and model.
Trench	Backhoe make and model.

Start Date: Date the drilling or excavation started.

Finish Date: Date the drilling or excavation was completed.

Depth:

From-To	Interval described under "lithologic description". Maybe an interval sampled using a California or split spoon sampling tool or an interval drilled using hollow stem augers only.

Blow Count:

13-R	California Sampler. Number of blows needed to advance the sampler 1 foot. "R" designates ring sampler.
12-10-20	Split Spoon Sampler. Number of blows needed to advance sampler 18 inches. Blows given for each 6-inch interval.
SPT	Standard penetration tool (i.e., split spoon sampler).

Hnu:

0.2	Reading obtained from "sniffing" the sample with a photoionization analyzer.
NR	No reading taken.

Unified Soil Class:

SM — Unified soil classification system group symbol. Types of grading suggested by this symbol are in engineering terms.

Chem Sample:

Y — A sample of interval was sent to laboratory for chemical analysis.

Lithologic Description:

Detailed description made for intervals sampled using California or split spoon sampler. More general description made from auger returns for non-sampled intervals.

Color — Color descriptions were made using the Munsell Soil Color Charts notations. The colors that occurred in the sediments and fill encountered during this project follow.

Muncell Notation	Color
HUE 5 YR	
5 YR 4/2	- Dark reddish gray
5 YR 4/4	- Reddish brown
5 YR 4/6	- Yellowish red
5 YR 5/2	- Reddish gray
5 YR 5/3	- Reddish brown
5 YR 5/4	- Reddish brown
5 YR 5/6	- Yellowish red
5 YR 6/2	- Pinkish gray
5 YR 6/3	- Light reddish brown
5 YR 6/4	- Light reddish brown
5 YR 6/6	- Reddish yellow
5 YR 7/3	- Pink
5 YR 7/4	- Pink
HUE 7.5 YR	
7.5 YR 2/2	- Very dark brown
7.5 YR 4/4	- Dark brown
7.5 YR 5/2	- Brown
7.5 YR 5/4	- Brown
7.5 YR 5/6	- Strong brown
7.5 YR 6/4	- Light brown
7.5 YR 6/6	- Reddish yellow
7.5 YR 7/4	- Pink

Abbreviations: The following abbreviations were used in the lithologic descriptions.

ABT	Abundant
ANG	Angular, shape of grains
CALC	Calcareous, determined using dilute hydrochloric acid
FELDS	Feldspar
FRAG(s)	Fragment(s)
MED	Medium
MOD	Moderate
PREDOM	Predominately
SL	Slightly
SPT	Standard penetration tool (i.e., split spoon)
SUBANG	Subangular, shape of grains
SUBROUND & SUBRND	Subrounded, shape of grains

BOREHOLE LOG for PL-1

PROJECT: New River Improvements Project USA Corps of Eng

North 944036.80 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 394672.20 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	13-R	100%	3.0	SM-SW		ALLUVIUM-SILTY SAND, FINE TO MED WITH ABOUT 5% COARSE. SUBROUND TO SUBANG. 10% GRAVEL FINE TO COARSE. NON-PLASTIC FINES. 7.5YR6/4. DRY. LOOSE. SL CALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SILTY SAND & GRAVEL
4.5 -	5.5	38-R	100%	2.9	SP		ALLUVIUM-SAND,FINE TO MED WITH SOME COARSE, SUBROUNDED TO SUBANG. ABOUT 5% FINE TO COARSE GRAVEL. MOIST. LOOSE. CLEAN. NON-CALCAREOUS. SAND IS PREDOM QUARTZ WITH FELDSPAR & LITHIC
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SITLY SAND & GRAVEL
9.5 -	10.5	50/7"-R	100%	2.9	SM-GM-GC		ALLUVIUM-VERY SILTY SAND, FINE TO MED WITH SOME COARSE. WITH ABOUT 20-40% FINE TO COARSE GRAVEL. 7.5YR6/4. MOIST. LOOSE. BECOMES CLAYEY TOWARDS BASE - SANDY CONGLOMERATE IN CLAY MATRIX (GC). MOIST. SL DENSE.

BOREHOLE LOG for PL-2

PROJECT: New River Improvements Project USA Corps of Eng

North 943635.30 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 394685.00 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	16-R	100%	NR	FILL		FILL-SANDY SILT, WITH PIECES OF ASPHALT. 7.5YR6/4. DRY. SOFT. CALCAREOUS. WITH ABT ROOTS. HIT CONCRETE AT 1.0' OFFSET RIG WEST 9.0'
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL-ASPHALT, SITLY SAND, GRAVEL
4.5 -	5.5	16-R	100%	NR	FILL	Y	FILL-ASPHALT, SILTY SAND, GRAVEL
5.5 -	7.0			NR	FILL		AUGER RETURNS- FILL.
7.0 -	9.5			NR			AUGER RETURNS- ALLUVIUM-ABT GRAVEL & COBBLES
9.5 -	10.5	50/11"-R		NR	SW		ALLUVIUM-SAND, WELL GRADED,COARSE TO FINE. ABOUT 10-20% GRAVEL & COBBLES (LARGE BROKEN ROCKS). SL SILTY. 7.5YR5/4. MOIST. LOOSE. SL CALC. SAND IS FREDOM QUARTZ WITH FELDS & LITHIC FRAGS. GRAVEL IS GRANITE,QUARTZITE,CHERT.& OTHER LITHIC FRAGS.

BOREHOLE LOG for PL-3

PROJECT: New River Improvements Project USA Corps of Eng

North 943236.70 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 394652.60 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	7-R	100%	NR	FILL	Y	FILL-VERY SILTY SAND, VERY FINE GRAINED, WITH ABOUT 5-10% MED. SL PLASTIC FINES. 7.5YR6/4. MOD DENSE. CALCAREOUS.
1.0 -	2.0				FILL		AUGER RETURNS-FILL AS ABOVE.
2.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM- SAND & GRAVEL
4.5 -	5.5	12-R		NR	SP-SM		ALLUVIUM-SAND AND VERY FINE GRAVEL. SAND IS FINE TO MED, SUBROUNDED. 7.5YR5/4. DRY. SL DENSE TO LOOSE. SL DRY STRENGTH. CLEAN. GRADES DOWNWARD INTO SILTY-CLAYEY SAND WITH ABOUT 3-5% COARSE SAND, SOME GRAVEL. SL PLASTIC FINES.
5.5 -	6.5			NR	SP-SM		AUGER RETURNS- ALLUVIUM-SAND & GRAVEL AS ABOVE.
6.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL & SAND
9.5 -	10.5	12-R		NR	SW		ALLUVIUM-SAND, MED TO FINE, SUBROUND TO ANGULAR, WITH <1% FINE GRAVEL. SL MOIST. LOOSE. NONCALCAREOUS. CLEAN. SAND IS PREDOM QUARTZ WITH LITHIC FRAGS & FELDSPAR.

BOREHOLE LOG for PL-4

PROJECT: New River Improvements Project USA Corps of Eng

North 942842.30 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 394563.60 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	16-R	100%	NR	FILL	Y	FILL-VERY SILTY SAND, FINE. WITH PLASTIC FINES. ABOUT 1% FINE TO COARSE GRAVEL CONTAINING ROCK, BROKEN GLASS & WIRE.
1.0 -	2.0			NR	FILL		AUGER RETURNS-FILL
2.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL,COBBLES & SAND WITH SOME BOULDERS.
4.5 -	6.0	51/3 IN	0%	NR			
6.0 -	7.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL & COBBLES WITH SOME BOULDERS.
7.5 -	9.0	16-35-36		NR	SW		ALLUVIUM-SAND, FINE TO COARSE. WITH ABOUT 30-40% GRAVEL AND LARGE ROCK FRAGS. (7.5YR6/4). DRY. LOOSE. SL CALCAREOUS. NOT A GOOD SAMPLE MOSTLY BROKEN ROCKS AND LOTS OF ROCK DUST AND PULVERIZED ROCK.
9.0 -	9.8	+50/1 IN	0%	NR			AUGER RETURNS- ALLUVIUM-GRAVEL, COBBLES, BOULDERS.

BOREHOLE LOG for PL-5

PROJECT: New River Improvements Project USA Corps of Eng

North 943779.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 394996.50 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	-R	100%	2.9	FILL	Y	FILL-SILTY SAND, COARSE TO FINE, SUBROUND TO SUBANG. WITH ABOUT 2% GRAVEL, MED TO COARSE (0.5-2.0 IN), INCLUDING BROKEN GLASS. 5YR6/4. DRY. LOOSE. SL CALCAREOUS.
1.0 -	2.0			NR	FILL		AUGER RETURNS- FILL-AS ABOVE.
2.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL & SAND
4.5 -	6.0	15-16-12	10%	NR	SW		ALLUVIUM-SAND, FINE TO COARSE, SL SILTY. WITH ABOUT 15% FINE TO COARSE GRAVEL & BROKEN ROCKS. 5YR6/3-7/3. SL MOIST. LOOSE. SL CALCAREOUS.
6.0 -	9.5			NR	SW		AUGER RETURNS-SAND AS ABOVE
9.5 -	10.5			NR	SW		ALLUVIUM-SAND FINE TO COARSE, SL SILTY, SUBROUND TO SUBANG. WITH ABOUT 10% GRAVEL FINE TO COARSE. 5YR6/4. GRAVEL INCLUDES QUARTZITE, BASALT AND UNIDENTIFIED ROCKS.

BOREHOLE LOG for PL-6

PROJECT: New River Improvements Project USA Corps of Eng

North 943299.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 394947.30 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	36-R	100%	NR	FILL-SM		0.0-0.5-APPROXIMATE THICKNESS. FILL SILTY SAND. 0.5-1.0-ALLUVIUM-SILTY SAND FINE TO VERY FINE, SL CLAYEY. WITH ABOUT 5% GRAVEL AND BROKEN ROCKS. 5YR6/6. SL DENSE TO LOOSE. CALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SILTY SAND.
4.5 -	6.0	23-R	100%	2.9	SW		ALLUVIUM-SAND, SL SILTY, FINE TO MED WITH <5% COARSE, SUBROUND TO SUBANG. WITH ABOUT 2% GRAVEL. 5YR5/4. DAMP. LOOSE.
6.0 -	9.5			NR	SM		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5	41-R	100%	NR	SM-SW		ALLUVIUM-SAND AS ABOVE, BUT SILTIER. PREDOM QUARTZ WITH ABT ROCK FRAGS AND FELDSPAR.

BOREHOLE LOG for PL-7

PROJECT: New River Improvements Project USA Corps of Eng

North 942798.60 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 394917.80 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	15-R	100%	2.9	FILL	Y	FILL-PLASTIC, PAPER, METAL SCRAPS, BROKEN GLASS IN SILTY SAND, COARSE TO FINE WITH ABOUT 5% GRAVEL. GRAVEL IS FINE TO MED. DRY. LOOSE. SL CALCAREOUS.
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL
4.5 -	5.5	22-R	100%	2.8	FILL-SM		FILL-VERY SILTY SAND. WITH ABOUT 15-25% GRAVEL, FINE TO COARSE. GRAVEL CONTAINS PIECES OF CONCRETE & FEW PIECES OF SLAG. 7.5YR6/4-5/4
5.5 -	7.0			NR	FILL		AUGER RETURNS- FILL
7.0 -	9.5			NR			ALLUVIUM-GRAVEL & SAND.
9.5 -	10.5	26-R	100%	2.8	SP		ALLUVIUM-SAND, MED TO FINE WITH SOME COARSE, SUBROUND TO SUBANG. ABOUT 1% FINE GRAVEL. 5YR6/4. MOIST. LOOSE. NONCALCAREOUS. SAND IS ABOUT 80% QUARTZ WITH SOME FELDSPAR.

BOREHOLE LOG for PL-2

PROJECT: New River Improvements Project USA Corps of Eng

North 942296.80 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 394868.30 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	23-R	100%	2.9	FILL-SM		FILL-VERY SILTY SAND, FINE TO MED. SL PLASTIC FINES. SL CALCAREOUS. 0.0-0.5-WITH ABOUT 10% GRAVEL FINE TO COARSE. DRY. MOD DENSE. ABT ROOTS. 0.5-1.0-WITH ABOUT 20% FINE GRAVEL TO COARSE SAND. LOOSE-MOD DENSE.
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL.
4.5 -	5.5	12-R	100%	2.9	FILL-SM		FILL-SILTY SAND, SL CLAYEY. SAND IS FINE TO MED, SUBROUND TO SUBANG. WITH <5% GRAVEL, FINE TO MED, MAY CONTAIN SLAG. CLAYEY LAYERS ARE MED STIFF.
5.5 -	9.5			NR	FILL		AUGER RETURNS- FILL-SANDY CLAY, 5YR5/2.
9.5 -	10.5		100%	NR	FILL-CL	Y	FILL-SANDY CLAY WITH CHUNKS OF ASPHALT AND GRAVEL. SAND IS FINE. 5YR5/2. MOIST. MED STIFF. PLASTIC. CALCAREOUS.
10.5 -	11.5			NR	FILL		AUGER RETURNS- FILL-SANDY CLAY WITH NAILS, WOOD, CARPET FRAGMENTS. HIT WATER AT 10.0 FT. **HNU READING DOWNHOLE IS 3.4, BREATHING ZONE IS STILL BACKGROUND=2.9**
11.5 -	12.5	-R	30%	2.9	FILL		FILL-AS ABOVE WITH PIECES OF PLASTIC. CLAYEY SAND AT BASE. SAND IS MED TO FINE, ANGULAR TO SUBROUND, ABOUT 80% QUARTZ. 5YR4/2. WET.
12.5 -	13.5			NR	FILL		AUGER RETURNS- FILL.
13.5 -	14.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL
14.5 -	16.0		75%	2.8	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX. SAND IS FINE TO COASRS, ANG TO SUBROUND, PRIMARILY QUARTZ, WITH TRACE MICA FLAKES, ROCK FRAGMENTS AND DARK MINERALS. GRAVEL AND ROCK FRAGS, FINE TO COARSE. 5YR5/6-5/4. SL PLASTIC. NONCALCAREOUS.
16.0 -	19.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE AS ABOVE.
19.5 -	20.5	14-39-42	60%	NR	GC		ALLUVIUM-SANDY CONGLOMERATE AS ABOVE. ABOUT 60% GRAVEL, 20% CLAY, 10% SAND. MOIST. MOD DENSE. GRAVEL IS FINE TO COARSE AND CONTAINS WEATHERED GRANITE, CHERT, AND BROKEN ROCK FRAGS.

BOREHOLE LOG for PL-9

PROJECT: New River Improvements Project USA Corps of Eng

North 942047.40 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 394791.30 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	15-R	80%	2.9	FILL-SM	Y	FILL-VERY SILTY SAND, FINE TO MED WITH <5% COARSE. WITH ABOUT 15% GRAVEL FINE TO MED. CONTAINS BROKEN WOOD, TAR PAPER, GLASS. 5YR6/2. DRY LOOSE. CALCAREOUS.
1.0 -	4.5			NR	FILL		AUGER RETURNS-FILL.
4.5 -	5.0	REFUSAL		NR	FILL		FILL-PROBABLY ON A PIECE OF WOOD. CAN LOOK DOWN HOLE AND SEE WOOD, CONCRETE, PLASTIC.
5.0 -	8.0			NR	FILL		AUGER RETURNS-FILL.
8.0 -	9.5			NR			AUGER RETURNS- ALLUMIUM-SAND & GRAVEL. CHANGE IN DRILLING AT 8.0 FT.=CONTACT OF FILL & NATIVE ALLUVIUM.
9.5 -	11.0	20-21-15	80%	2.9	SP/SP-SC		ALLUVIUM- 9.5-10.0-SAND, SUBROUND TO ANG. WITH 5-10% FINE TO COARSE AND BROKEN ROCKS >2 IN. GRAVEL IS COMPOSED OF QUARTZITE, CHERT, GRANITE AND OTHER UNIDENTIFIED ROCKS. (SP). 10.0-11.0-CLAYEY SAND, MED, SUBRD-ANG. PLASTIC. 5YR5/6. MOIST.

BOREHOLE LOG for PL-10

PROJECT: New River Improvements Project USA Corps of Eng

North 938785.70 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/01/88
South 393487.70 Rig/Backhoe: CME-75 Finish Date :03/01/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.5	7-9-10	100%	NR	FILL-SM		FILL-SILTY SAND. ABOUT 15% FINE GRAVEL. LESS SILTY TOWARDS BASE. 7.5YR5/4. DRY TO MOIST AT BASE.
1.5 -	4.5			NR			1.5-2.0- FILL- SILTY SAND WITH GRAVEL AND SMALL PIECES OF METAL. 2.0-4.5- ALLUVIUM- SILTY SAND WITH GRAVEL.
4.5 -	6.0	3-5-6	100%	NR	SP-SW		ALLUVIUM-SAND, COARSE TO MED. SUBROUND TO SUBANG. 7.5YR5/6. SL MOIST. LOOSE. NO STRATIFICATION. ABOUT 75% QUARTZ.
6.0 -	9.5			NR	SP-SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE WITH ABOUT 5% COBBLES & 10% GRAVEL.
9.5 -	11.0	7-25-12	100%	NR	SP-SW		ALLUVIUM-SAND AS ABOVE. ABOUT 75% QUARTZ. WITH FELDSPAR & LITHIC FRAGMENTS. WITH LARGE ROCK FRAGMENTS (BROKEN COBBLE?) AT 10.5.
11.0 -	13.0			NR	SP-SW		AUGER RETURNS- ALLUVIUM- SAND AS ABOVE.
13.0 -	14.5			NR	SC		AUGER RETURNS- ALLUVIUM-CLAYEY SAND
14.5 -	15.2	37-50/3IN	44%	NR	GP-GM		ALLUVIUM-SANDY GRAVEL, SL CLAYEY, ROUND TO SUBANG. 5YR5/3. GRAVEL IS COMPOSED OF SCHIST, QUARTZ, CHERT, AND UNIDENTIFIED ROCKS.
15.2 -	19.5			NR	SW		ALLUVIUM-SAND WITH ABOUT 5% COBBLES & 40% GRAVEL.
19.5 -	20.5		33%	NR	SM	Y	ALLUVIUM-SAND, SL SILTY & SL CLAYEY. 5YR5/4. MOIST.

BOREHOLE LOG for PL-11

PROJECT: New River Improvements Project USA Corps of Eng

North 938324.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 393273.90 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	8-R	60%	0.1	SM-ML		0.0-0.5-FILL-SILTY SAND WITH SMALL PIECES OF CONCRETE,GLASS,GRAVEL. 0.5-1.0-ALLUVIUM-VERY SILTY SAND, PREDOM FINE WITH SOME MED. WITH ABOUT 5% MED TO COARSE GRAVEL. SL CLAYEY FINES. 7.5YR5/4-4/4. DRY. DENSE.
1.0 -	4.5			NR	SM-ML		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
4.5 -	5.5	13-R	60%	0.1	ML-SM-SW		ALLUVIUM- 4.5-4.9- SAND AS ABOVE. (SM-ML). 4.9-5.5- SAND (SM-SW), FINE TO MED WITH ABOUT 10-20% COARSE SAND, ROUND TO SUBANG. WITH ABOUT 5% FINE TO MED GRAVEL, ROUND TO SUBROUND. 7.5YR5/4. DRY. LOOSE. CALCAREOUS.
5.5 -	9.5			NR	SM-SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5		100%	0.1	SM-SW		ALLUVIUM-SAND AS ABOVE. WITH TRACE COARSE GRAVEL. SL MOIST.

BOREHOLE LOG for PL-12

PROJECT: New River Improvements Project USA Corps of Eng

North 937727.90 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/01/88
South 393093.00 Rig/Backhoe: CME-75 Finish Date :03/01/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.5	13-15-12	66%	2.9	FILL-SM		FILL-SILTY SAND, FINE. WITH ABOUT 10% GRAVEL, FINE. 5YR5/4. DRY DENSE.
1.5 -	4.5			NR	FILL		FILL-WIRE VISIBLE IN BOREHOLE.
4.5 -	6.0	REFUSAL		NR			OFFSET 5 FT TO NORTH AND REDRILLED TO 4.5
4.5 -	6.0	6-6-6		NR	FILL-SM	Y	SAND, FINE TO COARSE. WITH ABOUT 5% GRAVEL, WITH SOME BROKEN PIECES OF LARGER ROCKS. MAY BE NATIVE MATERIAL BUT FIRST ATTEMPT HIT CONCRETE AT SAME DEPTH.
6.0 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	11.0	4-5-7	80%	NR	SP		ALLUVIUM-SAND, MED TO COARSE, SL SILTY, SUBROUND TO ANG. WITH ABOUT 10% GRAVEL. 5YR5/4. SL MOIST. LOOSE. CLEAN. SAND IS ABOUT 75% QUARTZ & FELDSPAR WITH ABOUT 10-20% DARK MINERALS.
11.0 -	13.0			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
13.0 -	14.5			NR			ALLUVIUM-COARSE GRAVEL AND COBBLES.

BOREHOLE LOG for PL-13

PROJECT: New River Improvements Project USA Corps of Eng

North 937421.50 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 392911.20 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	26-R	100%	0.1	FILL		0.0-0.5-FILL- SILTY SAND,FINE, 7.5YR5/4. DRY. LOOSE TO SL DENSE. FEW ROOTS. (SM-ML). 0.5-1.0-FILL AS ABOVE WITH ABOUT 10% GRAVEL, ROUND TO SUBROUND. (SM-ML).
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL- TRASH IN CUTTINGS.
4.5 -	5.5		100%	0.1	FILL	Y	FILL-SILTY SAND, FINE. 7.5YR6/4. DRY. LOOSE TO SL DENSE. WITH BITS OF RUG AND OTHER DEBRIS INCLUDING CONCRETE. (SM).
5.5 -	8.0			NR	FILL		AUGER RETURNS-FILL
8.0 -	9.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL.
9.5 -	10.5	38-R	100%	0.1	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAYEY MATRIX. GRAVEL IS FINE TO COARSE SUBROUND TO SUBANG. SAND IS FINE TO MED WITH SOME COARSE, SUBROUND TO ANG. ABOUT 15% PLASTIC FINES. MOIST. DENSE. NONCALCAREOUS.

BOREHOLE LOG for PL-14

PROJECT: New River Improvements Project USA Corps of Eng

North 936921.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 392673.90 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0		100%	NR	SM		ALLUVIUM-SILTY SAND, FINE TO VERY FINE. SL PLASTIC FINES. 7.5YR6/4. DRY. LOOSE. CALCAREOUS. ABT VERTICAL ROOTS.
1.0 -	4.0			NR	SM		AUGER RETURNS- ALLUVIUM-SILTY SAND.
4.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-GRAVEL, CHERT, GNEISS, & QUARTZITE.
4.5 -	5.5	38-R	100	NR	SW	Y	ALLUVIUM-SAND MED TO VERY COARSE, ANG TO SUBROUND. WITH ABOUT 15% GRAVEL, FINE TO COARSE (UP TO 2 IN). 5YR5/4. DRY TO SL MOIST. LOOSE. CLEAN. NONCALCAREOUS.
5.5 -	9.5			NR	SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE
9.5 -	11.0	35-50-35	100%	2.9	SW-GM		ALLUVIUM- 9.5-10.5- SAND AS ABOVE. (SW). 10.5-11.0-SANDY GRAVEL, SILTY. WITH BROKEN PIECES OF LARGER ROCKS. SL MOIST. LOOSE. NONCALCAREOUS.

BOREHOLE LOG for PL-15

PROJECT: New River Improvements Project USA Corps of Eng

North 938512.30 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 393531.80 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	REFUSAL	0%	NR	FILL		FILL-BLOCKS OF CONCRETE IN THE HOLE.
1.0 -	1.7	50/8 IN-R	8 IN	0.1	FILL	Y	FILL-SAND, FINE TO MED. WITH ABOUT 20% GRAVEL AND PIECES OF ASPHALT. 7.5YR4/4. MOIST. LOOSE.
1.7 -	4.5			NR			AUGER RETURNS- ALLUVIUM- SAND, FINE.
4.5 -	5.5	41-R	40%	0.1	SM-SP/SW		ALLUVIUM-INTERBEDDED SAND SM-SP AND SW. (SM-SP) SILTY SAND, FINE TO MED, SUBROUND TO ANG, PREDOM QUARTZ. WITH <5% GRAVEL. SL MOIST. SL CALCAREOUS. (SW) SAND, FINE TO COARSE. WITH ABOUT 20% FINE TO MED GRAVEL, ROUND TO SUBROUND. SL MOIST.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND
9.5 -	10.5		100%	0.1	SW		ALLUVIUM-SAND, FINE TO COARSE, ABOUT 5-10% COARSE, SUBROUND TO SUBANG. WITH ABOUT 5% MED TO FINE GRAVEL, SUBROUND TO ROUND. 7.5YR5/4. SL MOIST. SL COHESIVE. CLEAN.

BOREHOLE LOG for PL-15A

PROJECT: New River Improvements Project USA Corps of Eng

North 938050.00 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 393531.80 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	DEPTH TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	41-R	100%	NR	SM		ALLUVIUM-SILTY SAND, SL CLAYEY. SAND IS ROUND TO SUBROUND, PREDOM QUARTZ. WITH ABOUT 20-30% FINE TO COARSE GRAVEL, ROUND TO SUBROUND. 7.5YR5/4. SL MOIST. MOD DENSE TO LOOSE.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM- SAND & GRAVEL

BOREHOLE LOG for PL-16

PROJECT: New River Improvements Project USA Corps of Eng

North 938208.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/01/88
South 393535.40 Rig/Backhoe: CME-75 Finish Date :03/01/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.5	3-4-2	100%	2.9	FILL/SM		FILL- 0.0-0.6-SILTY SAND, FINE. WITH ABOUT 10% GRAVEL. SL COHESIVE FINES. 5YR6/4. DRY. MOD DENSE. ALLUVIUM-0.6-1.5-SILTY SAND. SL PLASTIC FINES. WITH ABOUT 5% GRAVEL. MOIST LOOSE.
1.5 -	3.0			NR			AUGER RETURNS- ALLUVIUM-SILTY SAND
3.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-ABOUT 30% GRAVEL & 5% COBBLES WITH SAND.
4.5 -	6.0	8-15-24	66%	2.9	SW		ALLUVIUM-GRAVELLY SAND, SL SILTY, SUBROUND TO SUBANG. WITH ABOUT 25% GRAVEL, SUBROUND & BROKEN PIECES OF LARGER ROCKS. 5YR5/6. DRY. LOOSE. SAND IS ABOUT 85% QUARTZ.
6.0 -	9.5			NR			AUGER RETURNS- ALLUVIUM-GRAVELLY SAND.
9.5 -	11.0	20-25-34	66%	NR	GW		ALLUVIUM-SANDY GRAVEL, 75% GRAVEL OR BROKEN COBBLES >1 IN. ABOUT 25% SAND, COARSE TO FINE, SUBROUND TO SUBANG. 5YR5/4.

BOREHOLE LOG for PL-17

PROJECT: New River Improvements Project USA Corps of Eng

North 937656.80 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 393269.50 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	44-R	100%	0.1	FILL	Y	FILL-VERY SILTY SAND, FINE TO MED. WITH GRAVEL, FINE TO COARSE, ROCKS AND PIECES OF ASPHALT. 7.5YR5/4. DRY, SL DENSE. SL CALCAREOUS.
1.0 -	3.0			NR			AUGER RETURNS- ALLUVIUM- SAND, FINE.
3.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM- GRAVEL & COBBLES.
4.5 -	5.5		0%	NR			SAMPLE ATTEMPTED=0% RECOVERY. FROM AUGER RETURNS- ALLUVIUM- CLEAN SAND AND GRAVEL.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	10.5	32-R	20%	0.1	SP		ALLUVIUM-SAND, FINE TO MED, SUBROUND TO ANG. WITH ABOUT 10% FINE TO COARSE GRAVEL. 7.5YR5/4. SL MOIST. LOOSE. CLEAN. NONCALCAREOUS.

BOREHOLE LOG for FL-18

PROJECT: New River Improvements Project USA Corps of Eng

North 937286.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 393078.90 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.5	5-8-5	66%	NR	SM-SW		ALLUVIUM- 0.0-0.5-SAND, FINE TO MED, SL CLAYEY. 5YR7/4. CALCAREOUS. 0.5-1.0-SAND, COARSE TO FINE. WITH GRAVEL AND BROKEN 1 IN PIECES OF ROCK. 5YR7/4. MOIST. LOOSE. CLEAN.
1.5 -	4.5			NR	SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
4.5 -	5.5	-R	100%	NR	SW		ALLUVIUM-SAND, SUBROUND TO ANG. 5YR6/4. MOIST. LOOSE. CLEAN. HOMOGENEOUS.
5.5 -	9.5			NR	SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE WITH ABOUT 5% GRAVEL.
9.5 -	11.0	20-40-50/3	66%	2.9	SP-GM		ALLUVIUM- 9.5-10.5-SAND, VERY COARSE, SUBROUND TO ANG. LOOSE. CLEAN. NONCALCAREOUS. SAND IS ABOUT 80% QUARTZ WITH 20% FELDSPAR & DARK MINERALS. 10.5-11.0-BROKEN COBBLE (0.5-1.0 IN). NONCALCAREOUS. SEQUENCE FINES UPWARDS. CHANNEL LAG.

BOREHOLE LOG for PL-19

PROJECT: New River Improvements Project USA Corps of Eng

North 936191.80 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/02/88
South 392341.60 Rig/Backhoe: CME-75 Finish Date :03/02/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	-R	100%	2.9	SM		ALLUVIUM-SILTY SAND, FINE TO MED SAND. SL PLASTIC FINES. WITH ABOUT 2% FINE GRAVEL. 7.5YR6/4 DRY. LOOSE. SL CALCAREOUS. ABT VERTICAL ROOTS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SILTY SAND.
4.5 -	5.5	5-15-12	50%	2.9	SW		ALLUVIUM-SAND, FINE TO MED, SL SILTY. 5YR6/4. LOOSE. NONCALCAREOUS.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & CLAYEY SAND.
9.5 -	10.5	33-R	100%	2.9	SC	Y	ALLUVIUM-CLAYEY SAND, FINE TO COARSE, WELL GRADED, PLASTIC FINES. SL MOIST. MED STIFF TO STIFF. SL CALCAREOUS. FINELY LAMINATED. FEW FINE ROOTS.

BOREHOLE LOG for PL-20

PROJECT: New River Improvements Project USA Corps of Eng

North 936140.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 391956.20 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	DEPTH TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	5-R	100%	0.2	SM-ML	Y	FILL- 0.0-0.2- SILTY SAND,VERY FINE TO FINE WITH CONCRETE AND WIRE. ALLUVIUM- 0.2-1.0- SILTY SAND, VERY FINE TO FINE, <5% MED SAND. WITH TRACE GRAVEL. SL PLASTIC FINES. 7.5YR6/4. DRY. LOOSE. SL COHESIVE TOWARDS BASE.
1.0 -	4.5			NR	SM-ML		AUGER RETURNS- ALLUVIUM-SILTY SAND AS ABOVE.
4.5 -	5.5	8-R	100%	0.2	SM-ML		ALLUVIUM-SAND AS ABOVE
5.5 -	9.5			NR	SM-ML		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5	12-R	30%	0.2	SM-ML		ALLUVIUM-SAND AS ABOVE

BOREHOLE LOG for PL-21

PROJECT: New River Improvements Project USA Corps of Eng

North 935656.60 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 391996.60 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	5-R	100%	0.3	SP-SM		ALLUVIUM-VERY SILTY SAND, FINE TO VERY FINE. WITH TRACE FINE TO MED GRAVEL. 7.5YR6/4. DRY. LOOSE. NON-COHESIVE. CALCAREOUS. ABT ROOTS.
1.0 -	4.5			NR	SP-SM		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
4.5 -	5.5	20-R	100%	0.2	SP-SM		ALLUVIUM-SAND AS ABOVE. WITH ABOUT 5% FINE TO MED GRAVEL, TRACE COARSE GRAVEL, ROUND TO SUBROUND. SL MOIST.
5.5 -	7.0			NR			AUGER RETURNS- ALLUVIUM-GRAVEL
7.0 -	9.5			NR	SP-SM		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5	41-R	30%	0.2	SP-SM		ALLUVIUM-SAND AS ABOVE. WITH ABOUT 1% GRAVEL. SL MOIST. SL COHESIVE.

BOREHOLE LOG for PL-22

PROJECT: New River Improvements Project USA Corps of Eng

North 935077.70 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 392021.30 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	11-R	75%	0.3	SM		ALLUVIUM-VERY SILTY SAND. FINE TO MED WITH SOME COARSE. ABOUT 5% GRAVEL, ROUND TO SUBROUND. 7.5YR6/4. DRY. LOOSE. SL CALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
4.5 -	5.5	23-R	100%	0.3	SM	Y	ALLUVIUM-SAND, FINE TO VERY FINE WITH ABOUT 10% MED SAND. WITH ABOUT 5% FINE TO MED GRAVEL. 7.5YR5/4. MOIST. SL COHENSIVE. SL CALCAREOUS.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	10.5	21-R	100%	0.3	SM-SW		ALLUVIUM-INTERBEDDED SAND SM AND SW. (SM)-SAND, FINE TO VERY FINE SAND, SILTY, 7.5YR5/4, SL COHESIVE, SL DENSE, SL CALCAREOUS. (SW)- SAND COARSE TO FINE WITH FINE GRAVEL, ROUND TO SUBROUND. 7.5YR5/4. LOOSE.

BOREHOLE LOG for PL-23

PROJECT: New River Improvements Project USA Corps of Eng

North 934612.00 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 392008.50 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	DEPTH TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	12-R	100	0.3	SM		ALLUVIUM-VERY SILTY SAND, FINE TO COARSE, SUBROUND TO SUBANG. WITH ABOUT 5% GRAVEL, FINE TO COARSE, ROUND TO SUBROUND. 7.5YR6/4. DRY. LOOSE. NONCALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND.
4.5 -	5.5	22-R	100%	0.3	SW		ALLUVIUM-SAND, FINE TO MED, WITH ABOUT 5% COARSE, SUBROUND TO SUBANG. <2% FINE GRAVEL.7.5YR5/4. SAND IS PREDOM QUARTZ WITH LITHIC FRAGS & FELDSPAR. MOIST. LOOSE. CLEAN. NONCALCAREOUS.
5.5 -	9.5			NR	SW		AUGER RETURNS- ALLUVIUM- SAND AS ABOVE
9.5 -	10.5	25-R	100%	0.3	SW		ALLUVIUM-SAND AS ABOVE. SLIGHTLY CLAYEY TOWARDS BASE. FROM AUGER RETURNS SAND AS ABOVE FROM ABOUT 2.0 TO 10.0 FT WITH VERY LITTLE GRAVEL.

BOREHOLE LOG for PL-24

PROJECT: New River Improvements Project USA Corps of Eng

North 934220.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 391714.40 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	12-R	66%	2.8	SM		0.0-0.5-FILL-VERY SILTY SAND WITH SMALL PIECES OF BROKEN CONCRETE AND ASPHALT. 0.5-1.0-ALLUVIUM-VERY SILTY SAND, VERY FINE TO MED SAND. SL CLAYEY.ABOUT 15% GRAVEL. 7.5YR6/4. DRY. LOOSE. CALCAREOUS.
1.0 -	4.5			NR	SM		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
4.5 -	5.5	20-R	66%	NR	SM		ALLUVIUM-SAND AS ABOVE
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	10.5	50/11 IN	66%	2.9	SW-SM		ALLUVIUM-GRAVELLY SAND,FINE TO MED, SUBROUND TO SUBANG. 25-30% GRAVEL, ROUNDED TO SUBROUND. SAND IS PREDOM QUARTZ. 7.5YR6/4. SL MOIST. LOOSE. NONCALCAREOUS.

BOREHOLE LOG for PL-25

PROJECT: New River Improvements Project USA Corps of Eng

North 933861.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 391445.10 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	16-R	100%	NR	SW		ALLUVIUM-SAND, FINE TO MED WITH 5% COARSE, SUBROUND TO ANGULAR. <1% GRAVEL FINE TO MED. SL SILTY TOWARDS TOP. 7.5YR7/4. DRY TO SL MOIST AT BASE. LOOSE. NON-CALCAREOUS. WITH
1.0 -	4.5			NR	SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
4.5 -	5.5	8-R	100%	NR	SW/SM-SC	Y	ALLUVIUM-4.5-5.0 SAND AS ABOVE WITH ABOUT 2% GRAVEL FINE. SHARP LOWER CONTACT. 5.0-5.5 CLAYEY,SILTY, V FINE SAND, WITH <5% MED TO COARSE SAND. SL PLASTIC FINES. 7.5YR4/4. MOIST. SL DENSE, COHESIVE. CALCAREOUS.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	10.5	13-R	50%	NR	SW		ALLUVIUM-SAND, FINE TO MED, SUBROUND TO SUBANG. WITH ABOUT 5% GRAVEL FINE TO MED & TRACE COARSE GRAVEL & COBBLES. SAND IS PREDOM QUARTZ WITH FELDS & LITHIC FRAGS. MOIST. LOOSE. CLEAN. NON-CALCAREOUS.

BOREHOLE LOG for FL-26

PROJECT: New River Improvements Project USA Corps of Eng

North 935579.00 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 392300.80 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	10-R	100%	2.6	SW/SP	Y	ALLUVIUM- 0.0-0.2 SAND, COARSE TO FINE, (SW). DRY. LOOSE. 0.2-1.0 SAND, FINE, SUBROUND TO ANG, (SP). 7.5YR5/4. SL MOIST. LOOSE. CLEAN. NONCALCAREOUS. ABT VERTICAL ROOTS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
4.5 -	5.5	38-R	40%	2.8	GM-GC		ALLUVIUM-VERY CLAYEY SAND & GRAVEL CONGLOMERATE. SAND IS FINE TO COARSE. GRAVEL & COBBLES, ROUND TO SUBROUND, PREDOM BASALT & QUARTZITE. PLASTIC FINES. 7.5YR5/4. NONCALCAREOUS.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
9.5 -	10.5	30/5" SPT	0%	NR			ALLUVIUM-NO SAMPLE RECOVERED. FROM AUGER RETURNS NATIVE MATERIAL CONSISTING OF COBBLES AND GRAVEL.

BOREHOLE LOG for PL-27

PROJECT: New River Improvements Project USA Corps of Eng

North 935243.60 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 392370.10 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	50/8 IN-R	66%	2.8	GM/SM-SW		ALLUVIUM-GRAVEL & COBBLES, SUBROUND, UP TO 2 IN PIECES IN THE SAMPLER. WITH SILTY SAND, FINE TO MED. 7.5YR6/4. DRY, LOOSE, NONCALCAREOUS. (BOULDERS ALSO PRESENT ON SURFACE)
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
4.5 -	5.5	50/7 IN-R	5%	NR			ALLUVIUM-2 IN PIECE OF GRAVEL WEDGED UP INSIDE SAMPLER. NO OTHER MATERIAL RECOVERED.
5.5 -	8.0			NR	SP		AUGER RETURNS- ALLUVIUM-SAND, FINE TO MED. LOOSE. MOIST. CLEAN
8.0 -	9.5			NR			AUGER RETURNS- ALLUVIUM-COBBLES, LARGE
9.5 -	10.5	35 SPT	0%	NR			ALLUVIUM-PROBABLY IN VERY LARGE COBBLES. NO SAMPLE COLLECTED. MATERIAL IS TO COBBLEY TO ATTEMPT ANOTHER SAMPLE. FINER SAND AT 5.0 WAS CLEAN, NO EVIDENCE OF CONTAMINATION & ALL NATIVE MATERIAL. CHOOSE NOT TO RESAMPLE AT AN OFFSET LOCATION.

BOREHOLE LOG for PL-28

PROJECT: New River Improvements Project USA Corps of Eng

North 934627.80 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 392398.70 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	10-R	30%	NR	SW		ALLUVIUM-GRAVELLY SAND, FINE TO COARSE, SL SILTY. ABOUT 30% GRAVEL, FINE TO COARSE, ROUND TO SUBROUND. DRY. LOOSE. NONCALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL
4.5 -	5.5	36-R	100%	2.9	SP		ALLUVIUM-SAND, FINE TO MED WITH ABOUT 5% COARSE, SUBROUND TO SUBANG. <2% GRAVEL. 7.5YR5/4. MOIST. LOOSE. CLEAN.
5.5 -	9.5			NR	SP		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5	25-R	100	2.9	SP		ALLUVIUM-SAND, FINE TO MED, SUBROUND TO SUBANG. 7.5YR5/4 MOIST. LOOSE. CLEAN. NONCALCAREOUS.

BOREHOLE LOG for PL-29

PROJECT: New River Improvements Project USA Corps of Eng

North 934054.40 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 392195.60 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	32-R	100%	2.9	SM/SW-SM	Y	0.0-0.5-FILL- SILTY SAND WITH ASPHALT CHUNKS. (SM) 0.5-1.0-ALLUVIUM-GRAVELLY SAND, FINE TO COARSE SAND WITH SILTY-CLAY MATRIX. MOIST. DENSE. CALCAREOUS.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
4.5 -	5.5	10-R	40%	2.9	SW		ALLUVIUM-SAND, FINE TO MED, ROUND TO SUBROUND. WITH ABOUT 2% GRAVEL, MED TO COARSE, MED TO COARSE. MOIST. LOOSE. NONCALCAREOUS.
5.5 -	9.5			NR	SW		AUGER RETURNS- ALLUVIUM-SAND AS ABOVE.
9.5 -	10.5	24-R	60%	2.9	SW/GC		ALLUVIUM-9.5-10.2 SAND AS ABOVE WITH ABOUT 20% MED TO COARSE GRAVEL. 10.2-10.5 VERY CLAYEY SAND & GRAVEL CONGLOMERATE. 50% SAND, FINE TO MED, SUBROUND TO SUBANG. 30-40% GRAVEL, FINE TO COARSE, SUBROUND, PREDOM GRANITE, CHERT, QUARTZ, & LITHIC

BOREHOLE LOG for PL-30

PROJECT: New River Improvements Project USA Corps of Eng

North 933779.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/03/88
South 391990.60 Rig/Backhoe: CME-75 Finish Date :03/03/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	8-R	60%	2.9	FILL	Y	FILL-VERY SILTY SAND, FINE TO MED WITH SOME COARSE SAND. GRAVELLY WITH ROCK AND ASPHALT CHUNKS. DRY. LOOSE.
1.0 -	3.0			NR	FILL		AUGER RETURNS- FILL-SAND WITH ASPHALT AS ABOVE.
3.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SAND & GRAVEL.
4.5 -	5.5	15-R	100%	NR	SW		ALLUVIUM-SAND, FINE TO MED, SUBROUND TO ANGULAR. <1% FINE TO MED GRAVEL, SUBROUND TO ANGULAR. 7.5YR6/4. MOIST. LOOSE. CLEAN. NONCALCAREOUS. SAND IS PREDOM QUARTZ WITH LITHIC FRAGS & FELDSPAR.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-SAND & SILT
9.5 -	10.5	32-R	100%	NR	ML/SW		ALLUVIUM- 9.5-10.2-SILT WITH VERY FINE SAND. SL PLASTIC FINES. 7.5YR5/2. CALCAREOUS. 10.2-10.5-VERY GRAVELLY SAND. COARSE TO FINE SAND, SUBROUND TO SUBAND. FINE TO COARSE, SUBROUND GRAVEL AND BROKEN ROCK. 7.5YR5/4. NONCALCAREOUS.

BOREHOLE LOG for PL-31

PROJECT: New River Improvements Project USA Corps of Eng

North 934402.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 392272.60 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	10-R	50%	0.0	FILL		FILL-SAND, SILTY, FINE TO COARSE, SUBROUND TO SUBANG. WITH ABOUT 5% FINE TO MED GRAVEL. 7.5YR5/4. DRY. LOOSE.
1.0 -	4.5			NR	FILL		AUGER RETURNS-FILL.
4.5 -	5.5	11-R	100%	0.1	FILL		FILL-SAND AS ABOVE WITH PIECES OF WOOD AND CLAYEY IN PLACES. LOOSE TO MOD DENSE.
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5	25-R	100%	0.1	FILL	Y	FILL-SAND (SM) TO SILTY CLAY OR CLAYEY SILT (MH-ML). WITH SOME GRAVEL. SL PLASTIC FINES. 7.5YR2/2. MOIST. MOD DENSE TO SOFT. NONCALCAREOUS. **OILY SMELL, HNU HAD SL DEFLECTION. PLACED SPLIT IN JAR SNIFFED HEAD SPACE AFTER ABOUT 10 MIN
10.5 -	12.0			NR	FILL		AUGER RETURNS-FILL, DRILLER THOUGHT FILL ENDED AT ABOUT 12.0 FT.
12.0 -	14.5			NR			AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE.
14.5 -	16.0	50/6"-R	0%	NR			ALLUVIUM- RESAMPLED WITH SPT- 100/1', VERY POOR SAMPLE, BROKEN ROCKS MAY BE IN CLAYEY CONGLOMERATE.
16.0 -	19.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX.
19.5 -	20.5	100/6"-R	1%	NR			ALLUVIUM-RECOVERED ONE ROCK
20.5 -	22.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX.
22.5 -	24.0		100%	0.1	GC		ALLUVIUM-SANDY CONGLOMERATE IN A CLAYEY MATRIX. SAND IS FINE TO MED, WELL GRADED, SUBROUND TO ANG. WITH ABOUT 5-10% GRAVEL. SL PLASTIC FINES. 7.5YR6/6. MOIST SL DENSE.

BOREHOLE LOG for PL-32

PROJECT: New River Improvements Project USA Corps of Eng

North 934904.40 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/04/88
South 392414.10 Rig/Backhoe: CME-75 Finish Date :03/04/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0		2%	NR			ALLUVIUM-SILTY SAND AND GRAVEL. LARGE ROCK WEDGED IN SAMPLER.
1.0 -	4.5			NR			AUGER RETURNS- ALLUVIUM-SILTY SAND & GRAVEL.
4.5 -	5.5		100%	0.1	SC		ALLUVIUM-SANDY CONGLOMERATE IN A CLAY MATRIX. SAND IS MED TO FINE, WITH SOME COARSE, SUBROUND TO SUBANG. WITH ABOUT 20% FINE TO COARSE GRAVEL, ROUNDED TO SUBROUND. SL PLASTIC FINES. 7.5YR5/4. MOIST. SL DENSE.
5.5 -	9.5			NR			AUGER RETURNS- ALLUVIUM-CLEAN SAND.
9.5 -	10.5	100/9"-R	75%	NR	SW		ALLUVIUM-SAND, MED TO FINE WITH SOME COARSE, SUBROUND TO SUBANG. WITH ABOUT 30% FINE TO COARSE GRAVEL AND LARGER BROKEN ROCKS. MOIST. LOOSE. NONCALCAREOUS.

BOREHOLE LOG for PL-33

PROJECT: New River Improvements Project USA Corps of Eng

North 942544.00 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394892.90 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	32-R	100%	0.3	FILL		FILL-VERY SILTY SAND WITH ABOUT 30% GRAVEL. 7.5YR6/4. DRY. LOOSE TO SL DENSE. CALCAREOUS
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL-PLASTIC, WIRE, WOOD, & TRASH IN RETURNS.
4.5 -	5.0	13-R	66%	0.4	FILL	Y	FILL-SAND AS ABOVE WITH METAL, CONCRETE, & WOOD. **SL DEFLECTION ON HNU**
5.0 -	9.5			NR	FILL		AUGER RETURNS- FILL.
9.5 -	10.5	44-R	80%	NR	FILL		FILL-TRASH, CONCRETE, LANDSCAPING DEBRIS, WOOD IN SILTY SAND MATRIX
10.5 -	12.0			NR	FILL		AUGER RETURNS-FILL.
12.0 -	14.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX.
14.5 -	15.5	100/10"	80%	0.3	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX. SAND IS FINE TO COARSE WITH ABOUT 30% FINE TO COARSE GRAVEL. WET. MOD DENSE. NONCALCAREOUS.
15.5 -	19.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX AS ABOVE.
19.5 -	20.5	70-80 SPT	66%	0.2	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX AS ABOVE.

BOREHOLE LOG for PL-34

PROJECT: New River Improvements Project USA Corps of Eng

North 942279.10 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394965.60 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	31-R	100%	0.3	FILL	Y	FILL-SILTY SAND WITH CONCRETE CHUNCKS, WOOD FRAGMENTS, AND GRAVEL. MUSTY ODOR.
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL-HOUSEHOLD TRASH, WOOD, STYRAFOAM, CONCRETE, WIRE.
4.5 -	5.5		5%	0.3	FILL		FILL-SAMPLER CONTAINED ONLY A CHUNK OF WOOD.
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5		10%	NR	FILL		FILL-PIECE OF WOOD, LANDSCAPING DEBRIS, & GRAVEL
10.5 -	12.0			NR	FILL		AUGER RETURNS-FILL.
12.0 -	14.5			NR			AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE.
14.5 -	16.0	14-20-14	65%	0.2	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX. SAND IS MED TO FINE WITH SOME COARSE, SUBROUND TO SUBANG. GRAVEL IS FINE TO COARSE AND BROKEN PIECES OF LARGER ROCKS. CLAY MATRIX IS COHESIVE AND SL PLASTIC. SL DENSE.

BOREHOLE LOG for PL-35

PROJECT: New River Improvements Project USA Corps of Eng

North 942028.20 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394891.30 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	33-R	100	0.2	FILL		FILL-VERY SILTY SAND, FINE TO VERY FINE WITH SOME MED & COARSE. WITH ABOUT 20% GRAVEL. 7.5YR6/4. DRY. LOOSE. WITH ABT ROOTS. CONTAINS ASPHALT AND CONCRETE FRAGMENTS.
1.0 -	4.5			NR	FILL		AUGER RETURNS-FILL.
4.5 -	5.5		100%	0.2	FILL		FILL-CLAYEY, SILTY SAND, FINE GRAINED. FINES ARE PLASTIC TO SL PLASTIC. ABOUT 15% OF THE SAMPLE IS TRASH MADE UP OF CHUNKS OF CONCRETE & ASPHALT, PLASTIC COATED WIRE, & WOOD.
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5		66%	0.3	FILL	Y	FILL-BROKEN UP ASPHALT & SAND & GRAVEL. 5YR3/1 BLACK, ASPHALTIC OR OILY SMELL. **SL DEFLECTION ON HNU**
10.5 -	12.0			NR	FILL		AUGER RETURNS-FILL.
12.0 -	14.5			NR			AUGER RETURNS-ALLUVIUM
14.5 -	15.5		0%	NR			
15.5 -	16.5			NR	GC		AUGER RETURNS-SANDY CONGLOMERATE IN CLAY MATRIX.
16.5 -	18.0	35-37-50	30%	0.2	SC-GC		ALLUVIUM-CLAYEY SAND WITH GRAVEL. SAND IS FINE TO MED WITH SOME COARSE, PREDOM QUARTZ. WITH FINE TO COARSE GRAVEL. ABOUT 15% CLAY. FINES ARE COHESIVE AND PLASTIC. 7.5YR5/6. WET. SL DENSE. NONCALCAREOUS.

BOREHOLE LOG for PL-36

PROJECT: New River Improvements Project USA Corps of Eng

North 941835.30 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394871.20 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	40-R	100%	0.2	FILL	Y	FILL-VERY SILTY SAND WITH PAPER, ASPHALT, CONCRETE CHUNKS. 7.5YR5/4. DRY. LOOSE. CALCAREOUS.
1.0 -	4.5			NR	FILL		AUGER RETURNS-FILL.
4.5 -	5.5	REFUSAL		NR	FILL		FILL-HAD TO OFFSET BOREHOLE 10' EAST. NO SAMPLE OBTAINED BUT HAD BLOCKS OF CONCRETE, STYRAFOAM, WOOD & PLASTIC IN AUGER RETURNS.
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5		65%	0.2	SP-SW		ALLUVIUM-SAND, SUBROUND TO SUBANG, PREDOM QUARTZ. <1% GRAVEL. WITH SOME CLAYEY LAYERS. 7.5YR. MOIST. LOOSE. CLEAN. 9.5 MAY BE RIGHT AT THE FILL-ALLUVIUM CONTACT.
10.5 -	12.0			NR			AUGER RETURNS- ALLUVIUM-SAND.
12.0 -	14.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX.
14.5 -	15.5		60%	0.2	GC		ALLUVIUM-SANDY CONGLOMERATE IN A CLAY MATRIX. SAND IS FINE TO COARSE, SUBROUND TO SUBANG, ABOUT 80% QUARTZ WITH LITHIC FRAGMENTS AND FELDSPAR. GRAVEL IS FINE TO COARSE. WITH ABOUT 30% CLAY. 5YR4/6. MOIST. SL DENSE. CLAY IS PLASTIC & COHESIVE.

BOREHOLE LOG for PL-36

PROJECT: New River Improvements Project USA Corps of Eng

North 941835.30 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394871.20 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	40-R	100%	0.2	FILL	Y	FILL-VERY SILTY SAND WITH PAPER, ASPHALT, CONCRETE CHUNKS. 7.5YR5/4. DRY. LOOSE. CALCAREOUS.
1.0 -	4.5			NR	FILL		AUGER RETURNS-FILL.
4.5 -	5.5	REFUSAL		NR	FILL		FILL-HAD TO OFFSET BOREHOLE 10' EAST. NO SAMPLE OBTAINED BUT HAD BLOCKS OF CONCRETE, STYRAFOAM, WOOD & PLASTIC IN AUGER RETURNS.
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5		65%	0.2	SP-SW		ALLUVIUM-SAND, SUBROUND TO SUBANG, PREDOM QUARTZ. <1% GRAVEL. WITH SOME CLAYEY LAYERS. 7.5YR. MOIST. LOOSE. CLEAN. 9.5 MAY BE RIGHT AT THE FILL-ALLUVIUM CONTACT.
10.5 -	12.0			NR			AUGER RETURNS- ALLUVIUM-SAND.
12.0 -	14.5			NR	GC		AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX.
14.5 -	15.5		60%	0.2	GC		ALLUVIUM-SANDY CONGLOMERATE IN A CLAY MATRIX. SAND IS FINE TO COARSE, SUBROUND TO SUBANG, ABOUT 80% QUARTZ WITH LITHIC FRAGMENTS AND FELDSPAR. GRAVEL IS FINE TO COARSE. WITH ABOUT 30% CLAY. 5YR4/6. MOIST. SL DENSE. CLAY IS PLASTIC & COHESIVE.

BOREHOLE LOG for PL-37

PROJECT: New River Improvements Project USA Corps of Eng

North 941685.60 Driller/Operator K. HEINRICK - HEBER MINING Start Date :03/05/88
South 394954.80 Rig/Backhoe: CME-75 Finish Date :03/05/88

Logged by :D. E. BALDWIN

DEPTH FROM	TO	BLOW COUNT	RECOVERY	HNU	UNIFIED SOIL CLASS	CHEM SAMPLE	LITHOLOGIC DESCRIPTION
0.0 -	1.0	20-R	80%	0.1	FILL		FILL-VERY SILTY SAND WITH ABOUT 25% GRAVEL CONTAINING CHUNCKS OF ASPHALT. 5YR6/4. DRY. LOOSE. ABT ROOTS. CALCAREOUS.
1.0 -	4.5			NR	FILL		AUGER RETURNS- FILL-PAPER, PLASTIC, WOOD.
4.5 -	5.5		0%	NR			
5.5 -	9.5			NR	FILL		AUGER RETURNS-FILL.
9.5 -	10.5	22-R		0.2	FILL	Y	FILL-CLAYEY SAND (SM-SC), VERY FINE. PLASTIC FINES. WITH ABOUT 30% TRASH CONTAINING ASPHALT, WOOD, FIBERGLASS, PAPER. 5YR4/2. MOIST. MOD STIFF. COHESIVE. SL CALCAREOUS.
10.5 -	13.0			NR	FILL		AUGER RETURNS-FILL.
13.0 -	14.5			NR			AUGER RETURNS- ALLUVIUM-SANDY CONGLOMERATE.
14.5 -	16.0	25-30-57	100%	0.1	GC		ALLUVIUM-SANDY CONGLOMERATE IN CLAY MATRIX. SATURATED.

APPENDIX B

BACKHOE TRENCH LITHOLOGIC LOGS

BACKHOE TRENCH LOG for TRENCH T-2

Project: New RIver Improvements Project USA Corps Eng

North 942112.30 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 394832.90 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	5.0	0.3	FILL		FILL-PREDOM CONCRETE, WITH >10' PIECES OF ELECTRICAL CONDUIT, CONCRETE BLOCKS & REINFORCED CONCRETE, WOOD, METAL, CINDER BLOCKS, REBAR, CLOTH, ALUMINUM PIPES, BOARDS (2"X4", 1"X4"), AND SILTY SAND, GRAVEL & COBBLES.
5.0	8.0				ALLUVIUM- SAND & GRAVEL.

BACKHOE TRENCH LOG for TRENCH T-4

Project: New RIver Improvements Project USA Corps Eng

North 942555.90 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 395034.60 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	4.0		FILL		FILL-SILTY SAND WITH ABOUT 20-30% ASPHALT BLOCKS, LARGE SLABS OF CONCRETE, BRICKS. NO VISIBLE HOUSEHOLD TRASH. MOIST.
4.0	6.0		FILL		FILL-LAYER OF VERY LARGE REINFORCED CONCRETE SLABS. 30-90% FILL.
6.0	11.0	0.6	FILL		FILL-30% HOUSEHOLD TRASH CONTAINING PIECES OF FURNITURE, WOOD, WIRE, PAPER, LARGE PALM FRONDS & OTHER VEGETATION DEBRIS, CLOTH, & PLASTIC. WITH 20% SILTY SAND & GRAVEL. **HNU IN TRENCH=0.6, BACKGROUND=0.3**
11.5	13.5		SW		ALLUVIUM-SAND, CLEAN, FINELY LAMINATED.

BACKHOE TRENCH LOG for TRENCH T-6

Project: New RIver Improvements Project USA Corps Eng

North 0.00 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 0.00 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
					TRENCH ENCOUNTERED ASPHALT BLOCKS & CONCRET SLABS LARGER THAN 4'X2'. BACKHOE COULD NOT DIG THROUGH MATERIAL THIS LARGE. HAD TO MOVE BACKHOE 10' EAST TO AVOID THIS ZONE OF BANK STABLIZATION MATERIAL.
0.0	1.0		FILL/SM		FILL-SILTY SAND WITH GRAVEL AND <5% WIRE & METAL.
1.0	6.0		SM-SW		ALLUVIUM-SILTY SAND TO CLEAN SAND WITH ABOUT 15% GRAVEL & COBBLES AND A FEW BOULDERS. DRY TO SL MOIST. LOOSE.

BACKHOE TRENCH LOG for TRENCH T-7

Project: New RIver Improvements Project USA Corps Eng

North 933945.10 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 392053.70 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	6.0		FILL		FILL-ABOUT 20-30% TRASH & FILL MATERIAL CONTAINING REBAR, METAL STRIPS, PLASTIC, PLASTIC COATED WIRE, CONCRETE, PIECES OF WOOD IN A SILTY SAND MATRIX WITH ABOUT 20% GRAVEL. AT 2.0-2.5- BLACK LAYER OF DECOMPOSED WOOD.
6.0	8.0		SM		ALLUVIUM-SILTY SAND AND GRAVEL. 7.5YR6/4-5/4.

BACKHOE TRENCH LOG for TRENCH T-8

Project: New RIver Improvements Project USA Corps Eng

North 934505.50 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 392375.60 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	1.5		FILL-SM		FILL-PREDOM SILTY SAND & GRAVEL WITH SOME WOOD & PLASTIC. CLEAN CAP MATERIAL.
1.5	7.0		FILL		FILL-ABOUT 70% TRASH CONSISTING OF CONCRETE BLOCKS UP TO 3'X2', LARGE WIRES, PIPES, PLASTIC, WOOD, RAGS, SOME CANS. AT 5.0-5.5-FINE SILTY SAND, SL MOIST, NO OBVIOUS CONTAMINATION,
7.0	8.5		SM		ALLUVIUM-SILTY SAND & GRAVEL.

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BACKHOE TRENCH LOG for TRENCH T-10

Project: New RIver Improvements Project USA Corps Eng

North 934986.60 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 392386.60 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	4.0		SM		ALLUVIUM-TOP 2' HAVE BEEN DISTURBED BUT NO VISIBLE TRASH. SAND AND GRAVEL TO COBBLES, ROUNDED TO SUBROUNDED. SHARP LOWER CONTACT.
4.0	6.0		SW		ALLUVIUM-SAND, FINE TO MED WITH ABOUT 5% COARSE, SUBROUND TO SUBANG, FINELY LAMINATED, PREDOM QUARTZ. SL MOIST. LOOSE.

BACKHOE TRENCH LOG for TRENCH T-11

Project: New RIver Improvements Project USA Corps Eng

North 942045.90 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 394722.80 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	5.0				ALLUVIUM- INTERBEDDED SAND & GRAVEL. SOME HOUSEHOLD TRASH & CEMENT BLOCKS ON GROUND SURFACE.

BACKHOE TRENCH LOG for TRENCH T-12

Project: New RIver Improvements Project USA Corps Eng

North 0.00 Driller/Operator S. WRIGHT - WRIGHT EXCAVATION Start Date :03/07/88
South 0.00 Rig/Backhoe: CASE 780B Finish Date :03/07/88

Logged by :D. E. BALDWIN

DEPTH BEGINNING	DEPTH ENDING	HNU	UNIFIED SOIL CLASS	SAMPLED	LITHOLOGIC DESCRIPTION
0.0	5.0				ALLUVIUM-INTERBEDDED SAND AND GRAVEL.

APPENDIX C

CHAIN OF CUSTODY FORMS AND AIRBILLS

Analytical Technologies, Inc.

San Diego ● Phoenix ● Seattle

Chain of Custody

DATE 3/1/88 PAGE 1 OF 1

PROJ. MGR. Dave Chamberlin
COMPANY Camp Dresser & McKee Inc
ADDRESS ~~592~~ 2302 Martin St. Suite 270
Irvine, CA 92715

SAMPLERS (SIGNATURE) (PHONE NO.) 714 752-5452
Dorothy J Baldwin 303-758-1311

SAMPLE ID	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	pH # 9045	Flashpoint # 1010	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX EPA 1310 METALS (8)	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	Sulfide Reactivity Cyanide 9030	metals +		NUMBER OF CONTAINERS
PLID-12.5-20.0	3/1/88	1300	Soil	1									X		X	X			X			X			1
PLID-4.5-6.0	3/1/88	1500	Soil	2	X	X	X						X		X	X			X			X	X		1

16025

PROJECT INFORMATION

PROJECT: 9200-003-ET-ETF1
PO NO.
SHIPPING ID. NO.
VIA:

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	2
CHAIN OF CUSTODY SEALS	N/
REC'D GOOD CONDITION/COLD	Y
CONFORMS TO RECORD	Y
LAB NO.	

SPECIAL INSTRUCTIONS/COMMENTS:

metals: Arsenic 7060 Mercury 7471
Cadmium 7130 Selenium 7740
Chromium 7190 Zinc 7950
Lead 7420

INVOICE TO:

CDM
- same as above

RELINQUISHED BY

Suzanne M Rowe 1700
(Signature) (Time)
Suzanne M Rowe 3/1/88
(Printed Name) (Date)
CDM
(Company)

RECEIVED BY

(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY

Dorothy J Baldwin 1700
(Signature) (Time)
DOROTHY J BALDWIN 3/1/88
(Printed Name) (Date)
CDM
(Company)

RECEIVED BY (LABORATORY)

Brian Hamer 2:10
(Signature) (Time)
Brian Hamer 3-1-88
(Printed Name)
ANALYTICAL TECHNOLOGIES, INC.

ATI LABORATORIES: SAN DIEGO (619) 458-9141 PHOENIX (602) 438-1530

DISTRIBUTION: WHITE, CANARY - ANALYTICAL TECHNOLOGIES, INC. ● PINK - ORIGINATOR

Analytical**Technologies,**Inc.
San Diego ● Phoenix ● Seattle

Chain of Custody

DATE 3/3/88 PAGE 1 OF 1

PROJ. MGR. Dave Chamberlin
COMPANY Camp Dresser & McKee
ADDRESS 2302 Martin St Suite 275
Irvine, CA 92715

SAMPLERS (SIGNATURE) Dorothy E Baldwin (PHONE NO.)

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	pH # 7045	flashpoint # 1010	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8) # 1310	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	Sulfides & Cyanides # 9010 & 9030			NUMBER OF CONTAINERS
PL-2 4.5-5.5	3/3/88	0915	Soil	16039/1									X		X	X			X			X			1
~~PL-2 D&P 4.5-5.5 103~~	~~3/3/88~~	~~0920~~	~~Soil~~										X		X	X			X			X			1
PL-3 0.0-1.0	3/3/88	0811	Soil	2									X		X	X			X			X			1
PL-4 0.0-1.0	3/3/88	0735	Soil	3									X		X	X			X			X			1
PL-25 4.5-5.5	3/3/88	1053	Soil	4									X		X	X			X			X			1
PL-26 0.0-1.0	3/3/88	1455	Soil	5									X		X	X			X			X			1
PL-29 0.0-1.0	3/3/88	1253	Soil	6									X		X	X			X			X			1
PL-30 0.0-1.0	3/3/88	1207	Soil	7									X		X	X			X			X			1

PROJECT INFORMATION
PROJECT: 4200-003-FI-FIEL
PO NO.
SHIPPING ID. NO.
VIA:

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	7
CHAIN OF CUSTODY SEALS	no
REC'D GOOD CONDITION/COLD	yes
CONFORMS TO RECORD	yes
LAB NO.	16039

SPECIAL INSTRUCTIONS/COMMENTS:
16039

INVOICE TO:
CDM
Same as above

RELINQUISHED BY
Dorothy E Baldwin 1720
(Signature) (Time)
DOROTHY E BALDWIN 3/3/88
(Printed Name) (Date)
CDM
(Company)

RECEIVED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
Lorraine Davis
(Signature) (Time)
LORRAINE DAVIS 1321
(Printed Name)
ATI
ANALYTICAL TECHNOLOGIES, INC.

ATI LABORATORIES: SAN DIEGO (619) 458-9141 PHOENIX (602) 438-1530

DISTRIBUTION: WHITE, CANARY - ANALYTICAL TECHNOLOGIES, INC. ● PINK - ORIGINATOR

AnalyticalTechnologies,Inc.
San Diego • Phoenix • Seattle

Chain of Custody

DATE 3/2/88 PAGE 1 OF 1

PROJ. MGR. Dave Chamberlin
COMPANY Camp Dresser & McKee
ADDRESS 2 Park Plaza [illegible] Suite 275
Irvine, CA 92715

SAMPLERS (SIGNATURE) Suzanne McRowe (PHONE NO.) 714 752 5452

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	pH #9045	Ignitability #1010	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8) #1310	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	Sulfide + Cyanide #9010 + 9030	metals*		NUMBER OF CONTAINERS
PL-14 4.5-5.5	3/2/88	0805	Soil		X	X	X						X		X	X			X			X	X		1
PL-19 7.5-10.5	3/2/88	0700	Soil										X		X	X			X			X			1
PL-8 9.5-10.5	3/2/88	1245	Soil		X	X	X						X		X	X			X			X	X		1
PL-9 0.0-1.0	3/2/88	1345	Soil										X		X	X			X			X			1
PL-7 0.0-1.0	3/2/88	1126	Soil		X	X	X						X		X	X			X			X	X		1
PL-5 0.0-1.0	3/2/88	1030	Soil										X		X	X			X			X			1

16034

PROJECT INFORMATION
PROJECT: 1201-CA-FT-FIEL
PO NO.
SHIPPING ID. NO.
VIA:

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	6
CHAIN OF CUSTODY SEALS	N
REC'D GOOD CONDITION/COLD	Y
CONFORMS TO RECORD	Y
LAB NO.	16034

INVOICE TO:
CDM
Same as above

RELINQUISHED BY
(Signature) Suzanne McRowe (Time) 1822
(Printed Name) Suzanne McRowe (Date) 3/2/88
(Company) CDM

RELINQUISHED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
(Signature) Brian Henner (Time) 1825
(Printed Name) Brian Henner (Date) 3-2-88
ATI
ANALYTICAL TECHNOLOGIES, INC.

*SPECIAL INSTRUCTIONS/COMMENTS:
metals: Arsenic 7060 Mercury 7471
Cadmium 7130 Selenium 7740
Chromium 7190 Zinc 7950
Lead 7420

Analytical**Technologies,**Inc.
San Diego ● Phoenix ● Seattle

Chain of Custody

DATE 3/7/88 PAGE 1 OF 2

PROJ. MGR. DAVE CHAMBERLIN
COMPANY CAMP DRESSER & MCKEE
ADDRESS 2302 MARTIN ST. SUITE 275
IRVINE CA. 92715

SAMPLERS (SIGNATURE) Dorothy Q Baldwin (PHONE NO.) 714-752-545

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	PH # 9045	FLASH POINT # 1010	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX # 1310 METALS (8)	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	SULFIDES & CYANIDES 9010 & 9030	METALS *		NUMBER OF CONTAINERS
PL 17 (0.0-1.0)	3/4/88	1220	Soil	1									X		X	X			X			X		1
PL-13 (4.5-5.5)		1150		2																				
PL-22 (4.5-5.5)		0805		3																				
PL-20 (0.0-1.0)		0910		4																				
PL-15 (1.0-1.7)		1055		5																				
PL-31 (9.5-10.5)	↓	1320		6	X	X	X																X	
PL-33 (4.5-5.5)	3/5/88	0710		7	X	X	X																X	
PL-34 (0.0-1.0)	>	0757		8	X	X	X											16049					X	
PL-35 (9.5-10.5)	↓		↓	9	X	X	X						↓		↓	↓						↓	X	

PROJECT INFORMATION	
PROJECT:	
PO NO.	
SHIPPING ID. NO.	
VIA:	

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS	15
CHAIN OF CUSTODY SEALS	N
REC'D GOOD CONDITION/COLD	Y
CONFORMS TO RECORD	Y
LAB NO.	16049

SPECIAL INSTRUCTIONS/COMMENTS:
Metals Arsenic 7060 Hg 7471
Cadmium 7130 Se 7740
Chromium 7190
Pb 7420 Zn 7950

INVOICE TO:
CDM
AA

RELINQUISHED BY
Dorothy Q Baldwin
(Signature) (Time)
DOROTHY E. BALDWIN 3/7 88
(Printed Name) (Date)
CDM
(Company)

RECEIVED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
(Signature) (Time)
Brian Hennessy 18:5
(Printed Name) 3-7-88
ANALYTICAL TECHNOLOGIES, INC.

ATI LABORATORIES: SAN DIEGO (619) 458-9141 PHOENIX (602) 438-1530

DISTRIBUTION: WHITE, CANARY - ANALYTICAL TECHNOLOGIES, INC. ● PINK - ORIGINATOR

Analytical**Technologies,**Inc.
San Diego ● Phoenix ● Seattle

Chain of Custody

DATE 3/7/88 PAGE 2 OF 2

PROJ. MGR. D. CHAMBERLIN
COMPANY CDM
ADDRESS 2302 MARTIN ST SUITE 275 IRVINE, CA 92715

SAMPLERS (SIGNATURE) Dorothy Q Baldwin (PHONE NO.) 714-752-5452

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	PH 9045	FLASH POINT 1010	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8) 1310	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	SULFIDES & CYANIDES	METALS *		NUMBER OF CONTAINERS
PL-36 (0.0-1.0)	3/5/88	1000	SOIL	10									X		X	X			X			X		1
PL-37 (9.5-10.5)	3/5/88	1104		11																				
T-2 (4.0)	3/7/88	1445		12	X	X	X																X	
T-4 (10.0)		1320		13																				
T-7 (2.0-3.0)		0810		14																				
T-8 (5.0-5.5)				15																				

16049

PROJECT INFORMATION	
PROJECT:	
PO NO.	
SHIPPING ID. NO.	
VIA:	

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS	15
CHAIN OF CUSTODY SEALS	N
REC'D GOOD CONDITION/COLD	Y
CONFORMS TO RECORD	Y
LAB NO.	16049

SPECIAL INSTRUCTIONS/COMMENTS:
Metals Ar 7060 Hg 7471
Cadmium 7130 Se 7740
Chromium 7190 Zn 7950
Pb 7420

INVOICE TO:
CDM
AA

RELINQUISHED BY	
Dorothy Q Baldwin	
(Signature) (Time) Dorothy Baldwin 3/7/88	
(Printed Name) (Date) CDM	
(Company)	
RECEIVED BY	
(Signature) (Time)	
(Printed Name) (Date)	
(Company)	

RELINQUISHED BY	
(Signature) (Time)	
(Printed Name) (Date)	
(Company)	
RECEIVED BY (LABORATORY)	
(Signature) (Time) Susan Henner 1805	
(Printed Name) 3-7-88	
ANALYTICAL TECHNOLOGIES, INC.	

ATI LABORATORIES: SAN DIEGO (619) 458-9141 PHOENIX (602) 438-1530

DISTRIBUTION: WHITE, CANARY - ANALYTICAL TECHNOLOGIES, INC. ● PINK - ORIGINATOR

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL NUMBER 7450177136

7450177136

Sender's Federal Express Account Number: 3802962

Date:

Your Name) Please Print:

Your Phone Number (Very Important):

Department/Floor No.:

Street Address:

State:

ZIP Required For Correct Invoicing:

To (Recipient's Name) Please Print:

Recipient's Phone Number (very important):

Company:

Department/Floor No.:

Exact Street Address (Use of P.O. Boxes or P.O. • Zip Codes Will Delay Delivery And Result In Extra Charges.)

City:

State:

ZIP Street Address Zip Required:

YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

200-003-FE-FIEL

PAYMENT: Bill Sender | Bill Recipient's FedEx Acct. No. | Bill 3rd Party FedEx Acct. No. | Bill Credit Card | Cash

HOLD FOR PICK-UP AT THIS FEDERAL EXPRESS LOCATION:
Street Address (See Service Guide or Call 800-238-5355)

City: State:

ZIP • Zip Code of Street Address Required

Federal Express Use

Base Charges

Declared Value Charge

Origin Agent Charge

Other

Total Charges

SERVICES (CHECK ONLY ONE BOX)

- PRIORITY 1 (Overnight Delivery Using Your Packaging) 6
- OVERNIGHT LETTER* (Our Packaging) 9½"x12½"
- OVERNIGHT DELIVERY USING OUR PACKAGING
- Courier-Pak Overnight Envelope* 15½"
- Overnight Box 12½"x 17½"x 3" A
- Overnight Tube 6"x 6"x 6" B
- Declared Value Limit $100.
- STANDARD AIR (Delivery not later than second business day)

SERVICE COMMITMENT

PRIORITY 1 - Delivery is scheduled early next business morning where it may take two or more business days if the destination is outside our primary service areas.

STANDARD AIR - Delivery is generally next business day or not later than second business day. It may take three or more business days if the destination is outside our primary service areas.

DELIVERY AND SPECIAL HANDLING (CHECK SERVICES REQUIRED)

1. HOLD FOR PICK-UP (Fill in Section H at right)
2. [X] DELIVER WEEKDAY
3. DELIVER SATURDAY (Extra charge)
4. DANGEROUS GOODS (P-1 and Standard Air Packages only. Extra charge)
5. CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Do Not Complete Section 9)
6. DRY ICE _____ Lbs.
7. OTHER SPECIAL SERVICE _____
8.
9. SATURDAY PICK-UP (Extra charge)
10.

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
	LBS		
	LBS		
	LBS		
	LBS		
Total 1	Total 5	Total	

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box
4 ☐ B.S.C.
5 [X] Station

Federal Express Corp. Employee No.: 52163

Date/Time For Federal Express Use: 3/21 E/S

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Re[illegible]
Si[illegible]

YOUR DECLARED VALUE

DAMAGE OR LOSS

We are liable for no more than $100 per package in the event of physical loss or damage, unless you fill in a higher Declared Value to the left and document higher actual loss in the event of a claim. We charge 30¢ for each additional $100 of declared value up to the maximum shown in our Service Guide. Declared value restrictions are shown on the back of the Sender's Copy of this airbill. We make no expressed or implied warranties.

DELAY

There is always a risk of late delivery or non-delivery. In the event of a late delivery Federal Express will, at your request and with some limitations, refund all transportation charges paid. See back of Sender's Copy of this airbill for further information.

CONSEQUENTIAL DAMAGES

We will not be responsible or liable for any loss or damage resulting from delay, non-delivery or damage to a package, except as noted above. This includes loss of sales, income, interest, profits, attorney fees and other costs, but is not limited to these items. Such damages are called "consequential damages."

DO NOT SHIP CASH OR CURRENCY

PART #2041738900
FEC-S-750-40/25
REVISION DATE 5/87
PRINTED U.S.A. SRCE

007

SENDER'S COPY/RETAIN FOR TRACE PURPOSES

Enseco

CHAIN-OF-CUSTODY RECORD

SAMPLER: *(Signature)* Suzanne M Rowe Date Shipped 3/2/88 Carrier Federal Express

Phone 714 752 5452 Airbill No. 7450 77136 Cooler No. 1

SHIP TO:

Enseco-Rocky Mountain Analytical
4955 Yarrow St.
Arvada, CO 80002
(303) 421-6611

ATTENTION: _____

SEND RESULTS TO:

Client Name Camp Dresser & McKee Inc

Company & Attn: Suzanne Rowe

Address 2302 Martin St. Suite 275
Irvine, CA 92715

Phone 714-752 5452

PROJECT NAME Peoria Landfill PROJECT NO. 9200-003-FI-FIEL P.O. NO. _____

Relinquished by: *(Signature)*	Received by: *(Signature)*	Date	Time
Suzanne M Rowe			
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date	Time
Relinquished by: *(Signature)*	Received at lab by: *(Signature)*	Date	Time
Relinquished from lab by: *(Signature)*	Received by: *(Signature)*	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
PL-8 (9.5-10.5)	Soil	3/2/88 1240	Metals Scan #6010 Volatile Organic Scan 8240 Semi Volatile Organic Scan 8270	

Special Instructions/Comments:

Scan for tentatively identified compounds
Any questions call Roger Olsen at 458-1311

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical T.A.T.'s: _____ Immediate Attention (200% surcharge) _____ RUSH (50-100% surcharge) X Standard

RMAL Project Number: *(for lab use only)*

Client Retains White Copy Only.

SS-012E

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL NUMBER 7450177162

7450177162

Sender's Federal Express Account Number	Date
3802962	3/4/88

From (Your Name) Please Print: Dave Chamberlin

Your Phone Number (Very Important): (714) 752-5452

Company: Camp Dresser & McKee Inc.

Department/Floor No.:

Street Address: 2302 Martin Street, #275

City: Irvine **State:** CA **ZIP Required For Correct Invoicing:** 92715

To (Recipient's Name) Please Print: Susan Wyatt

Recipient's Phone Number (Very Important): ( )

Company: Rocky Mountain Analytical Laboratory

Department/Floor No.:

Exact Street Address *(Use of P.O. Boxes or P.O. • Zip Codes Will Delay Delivery And Result In Extra Charges.)*: 4955 Yarrow Street

City: Arvada **State:** CO **ZIP Street Address Zip Required:** 80002

YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

9200-003-WI-FIXL

HOLD FOR PICK-UP AT THIS FEDERAL EXPRESS LOCATION:
Street Address (See Service Guide or Call 800-238-5355)

City State

ZIP • Zip Code of Street Address Required

PAYMENT: ☒ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

SERVICES — CHECK ONLY ONE BOX

- ☒ **PRIORITY 1** Overnight Delivery 6 ☐ **OVERNIGHT LETTER*** (Our Packaging) 9¾"x12½"
- **OVERNIGHT DELIVERY USING OUR PACKAGING**
  - Courier-Pak Overnight Envelope* 12"x 15½"
  - ☐ Overnight Box 12¾"x 17½"x 3" A ☐
  - ☐ Overnight Tube 38"x 6"x 6" B ☐
  - *Declared Value Limit $100.
- ☐ **STANDARD AIR** Delivery not later than second business day

SERVICE COMMITMENT

PRIORITY 1 - Delivery is scheduled early next business morning locations. It may take two or more business days if the n is outside our primary service areas.
2D AIR - Delivery is generally next business day or not second business day. It may take three or more business s destination is outside our primary service areas.

DELIVERY AND SPECIAL HANDLING — CHECK SERVICES REQUIRED

1 ☐ **HOLD FOR PICK-UP** (Fill in Section H at right)
2 ☒ **DELIVER WEEKDAY**
3 **DELIVER SATURDAY** (Extra charge) ☐
4 ☐ **DANGEROUS GOODS** (P-1 and Standard Air Packages only. Extra charge)
5 ☐ **CONSTANT SURVEILLANCE SERVICE (CSS)** (Extra charge) (Do Not Complete Section B)
6 ☐ **DRY ICE** _____ Lbs.
7 ☐ **OTHER SPECIAL SERVICE** _____
8 ☐
9 ☐ **SATURDAY PICK-UP** (Extra charge)
10 ☐

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
	LBS		
	LBS		
	LBS		
	LBS		
Total	Total	Total	

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box 4 ☐ B.S.C. 5 ☐ Station

Federal Express Corp. Employee No.:

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature:

Date/Time For Federal Express Use

YOUR DECLARED VALUE

DAMAGE OR LOSS

We are liable for no more than $100 per package in the event of physical loss or damage, unless you fill in a higher **Declared Value** to the left and document higher actual loss in the event of a claim. We charge 30¢ for each additional $100 of declared value up to the maximum shown in our Service Guide. Declared value restrictions are shown on the back of the Sender's Copy of this airbill. We make no expressed or implied warranties.

DELAY

There is always a risk of late delivery or non-delivery. In the event of a late delivery Federal Express will, at your request and with some limitations, refund all transportation charges paid. See back of Sender's Copy of this airbill for further information.

CONSEQUENTIAL DAMAGES

We will not be responsible or liable for any loss or damage resulting from delay, non-delivery or damage to a package, except as noted above. This includes loss of sales, income, interest, profits, attorney fees and other costs, but is not limited to these items. Such damages are called "consequential damages."

DO NOT SHIP CASH OR CURRENCY

Federal Express Use	
Base Charges	
Declared Value Charge	
Origin Agent Charge	
Other	
Total Charges	

PART #2041738900
FEC-S-750-40/25
REVISION DATE 5/87
PRINTED U.S.A. SRCE

007

SENDER'S COPY/RETAIN FOR TRACE PURPOSES

Enseco

CHAIN-OF-CUSTODY RECORD

SAMPLER: (Signature) Dorothy E Baldwin
Phone 303 458 1311
Date Shipped 3/4/88
Airbill No. 7450177162
Carrier Federal Express
Cooler No. 1

SHIP TO:
Enseco-Rocky Mountain Analytical
4955 Yarrow St.
Arvada, CO 80002
(303) 421-6611
ATTENTION: Susan Wyatt

SEND RESULTS TO:
Client Name Camp Dresser & McKee INC
Company ATTN SUZANNE ROWE
Address 2302 MARTIN SUITE 275
IRVINE CA 92715
Phone 714-752-5452

PROJECT NAME Peoria Landfill AZ PROJECT NO. _____ P.O. NO. _____

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Dorothy E Baldwin			
Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Received at lab by: (Signature)	Date	Time
Relinquished from lab by: (Signature)	Received by: (Signature)	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
PL-31(9.5-10.5)	SOIL	3/4/88 1320	Metals Scan #6010	
			Vol Org. Scan #8240	
			Semi Vol. Or. Scan # 8270	

Special Instructions/Comments:

Scan for tentatively identified compounds
Any questions call Rodger Olsen @ 303-458-1311

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical T.A.T.'s: _____ Immediate Attention (200% surcharge) _____ RUSH (50-100% surcharge) X Standard

RMAL Project Number: *(for lab use only)*

Client Retains White Copy Only.

SS-012E

EXPRESS

7450177340

nd Federal Express Account Number: 103802962 | Date: 3/8/88

om ur Name) Please Print: ave Chamberlin | Your Phone Number (Very Important): (714) 752-5452

ompany: Camp Dresser & McKee Inc. | Department/Floor No.:

ree ddress: 02 Martin Street, #275

ty: Irvine | State: CA | ZIP Required For Correct Invoicing: 92715

To (Recipient's Name) Please Print: 2 Susan Wyatt | Recipient's Phone Number (Very Important): ( )

Company: Rocky Mountain Analytical Laboratory | Department/Floor No.:

Exact Street Address (Use of P.O. Boxes or P.O. • Zip Codes Will Delay Delivery And Result in Extra Charges.): 4955 Yarrow Street

City: Arvada | State: CO | ZIP Street Address Zip Required: 80002

YO BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): 9200-003-FI-FIKL

H HOLD FOR PICK-UP AT THIS FEDERAL EXPRESS LOCATION: Street Address (See Service Guide or Call 800-238-5355)

City: State:

ZIP • Zip Code of Street Address Required

- Federal Express Use

Base Charges

Declared Value Charge

Origin Agent Charge

Other

Total Charges

SENDER'S COPY/RETAIN FOR TRACE PURPOSES

PART #2041738900
FEC-S-750-40/25
REVISION DATE 5/87
PRINTED U.S.A. SRCE

007

IYI W Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

SERVICES CHECK ONLY ONE BOX

RIORITY 1 Overnight Delivery 6 ☐ **OVERNIGHT LETTER*** (Our Packaging) 9½"x12½"

OVERNIGHT DELIVERY USING OUR PACKAGING

☐ Courier-Pak Overnight Envelope* 12" x 15½"

☐ Overnight Box A ☐ 12½"x 17½"x 3"

☐ Overnight Tube B ☐ 38"x 6" x 6"

*Declared Value Limit $100.

STANDARD AIR Delivery not later than second business day

SERVICE COMMITMENT

PRIO... 1 - Delivery is scheduled early next business morning to most locations. It may take two or more business days if the destination is outside our primary service areas.

STANDARD AIR - Delivery is generally next business day or not later than second business day. It may take three or more business days if destination is outside our primary service areas.

DELIVERY AND SPECIAL HANDLING CHECK SERVICES REQUIRED

1 ☐ HOLD FOR PICK-UP (Fill in Section H at right)

2 ☒ DELIVER WEEKDAY

3 DELIVER SATURDAY (Extra charge) ☐

4 ☐ DANGEROUS GOODS (P-1 and Standard Air Packages only. Extra charge)

5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Do Not Complete Section 5)

6 ☐ DRY ICE _____ Lbs.

7 ☐ OTHER SPECIAL SERVICE _____

8 ☐

9 ☐ SATURDAY PICK-UP (Extra charge)

10 ☐

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
	LBS		
	LBS		
	LBS		
	LBS		
Total	Total	Total	

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box 4 ☐ B.S.C. 5 ☐ Station

Federal Express Corp. Employee No.:

Date/Time For Federal Express Use

noter authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify d hold harmless Federal Express from any claims resulting therefrom.

nature Release Signature:

YOUR DECLARED VALUE

DAMAGE OR LOSS

We are liable for no more than $100 per package in the event of physical loss or damage, unless you fill in a higher Declared Value to the left and document higher actual loss in the event of a claim. We charge 30¢ for each additional $100 of declared value up to the maximum shown in our Service Guide. Declared value restrictions are shown on the back of the Sender's Copy of this airbill. We make no expressed or implied warranties.

DELAY

There is always a risk of late delivery or non-delivery. In the event of a late delivery Federal Express will, at your request and with some limitations, refund all transportation charges paid. See back of Sender's Copy of this airbill for further information.

CONSEQUENTIAL DAMAGES

We will not be responsible or liable for any loss or damage resulting from delay, non-delivery or damage to a package, except as noted above. This includes loss of sales, income, interest, profits, attorney fees and other costs, but is not limited to these items. Such damages are called "consequential damages."

DO NOT SHIP CASH OR CURRENCY

CHAIN-OF-CUSTODY RECORD

SAMPLER: *(Signature)* Dorothy E Baldwin Date Shipped 3/8/88 Carrier Federal Express

Phone ~~303~~ - 303-456-1311 Airbill No. 745017714O Cooler No. 1

SHIP TO:

Enseco-Rocky Mountain Analytical
4955 Yarrow St.
Arvada, CO 80002
(303) 421-6611

ATTENTION: Susan Wyatt

SEND RESULTS TO:

Client Name CDM

Company attn. Suzanne Rowe

Address 2302 Martin St. Suite 275
Irvine CA 92715

Phone 714-752-5452

PROJECT NAME Peoria Landfill PROJECT NO. 9200-003-FI-FIEL P.O. NO. _____

Relinquished by: *(Signature)*	Received by: *(Signature)*	Date	Time
Dorothy E Baldwin			
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date	Time
Relinquished by: *(Signature)*	Received at lab by: *(Signature)*	Date	Time
Relinquished from lab by: *(Signature)*	Received by: *(Signature)*	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
~~PL~~ T-2 (40)	SOIL	3/7/88 1445	Metals Scan ~~#6010~~ 6010 DCB	
			Vol Org Scan 8240	
			Semi Vol Org Scan 8270	

Special Instructions/Comments:

Scan for tentatively identified compounds
Any questions call Rodger Olsen 458-1311

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical T.A.T.'s: Immediate Attention (200% surcharge) _____ RUSH (50-100% surcharge) _____ X Standard

RMAL Project Number: *(for lab use only)*

APPENDIX D

HEALTH AND SAFETY PROGRAM

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

Revision 3/1/87

SITE NAME New River Improvement Project SITE # _____ LOCATION Near 94th St & Scotland Ave Peoria, AZ REGION 8

PREPARED BY Karen S. Lewis DATE 2-18-88

FIRM CDM

( ) AMENDMENT TO EXISTING APPROVED HSP ( ) DATE EXISTING APPROVED HSP _____

DESCRIPTION OF ACTIVITIES:

Preliminary Assessment	( )	Clean-Up	( )
Initial Investigation "Walk Through"	(X)	Oversight	( )
Initial Investigation "Sampling"	(X)	Other *specify*	( )
USEPA Designated Task	( )		
Remedial Investigation (RI)	( )		
Feasibility Study (FS)	( )		

SITE TYPE: *Check as many as applicable*

Active (possibly)	(X)	Landfill	(X)	Unknown	( )
Inactive	( )	Uncontrolled	( )	Other *specify*	
Secure	( )	Industrial	( )		
Unsecure	(X)	Recovery	( )		
Enclosed space	( )	Well Field	( )		

SITE DESCRIPTION AND FEATURES: *Summarize below*

The site covers less than 0.25 acres of land within the designated site boundaries.

No documentation exits as to the quantity or quality of refuse present. But the site has been in use for at least 20-30 years by local authorities and residents for a refuse dump.

SURROUNDING POPULATION: (X) Residential ( ) Industrial ( ) Rural ( ) Urban OTHER:

SITE HISTORY: *Summarize below*

The site is an unregulated landfill used for the past 20-30 years. The site has been a construction debris dump for the surrounding area. All types of discarded materials may have been entrained there, but the consulting firm of Deleuw Cather stated there was an apparent absence of hazardous waste, this has also been the general consensus of other parties familiar with the site.

KNOWN OR SUPECTED WASTES DISPOSED: *Summarize below*

No hazardous wastes are suspected or have been identified in the past. All historical data obtained advocates this was only used as a construction landfill and rubble heap.

HAZARD EVALUATION:

( ) Heat Stress *attach quidelines*
( ) Cold Stress *attach Quidelines*
( ) Explosion/Flammable
( ) Oxygen Deficient
( ) Radiological
( ) Biological
( ) Noise
( ) Inorganic Chemicals
( ) Organic Chemicals
(x) Other *specify*

physical hazards

PRINCIPAL DISOSAL METHODS AND PRACTICES: *Summarize below*

Concrete, boards, asphalt and other construction debris were dumped. Other inter-mixed debris such as household trash and refuse are present to a lesser degree. No debris covering or back filling has been used and loads of trash still may be currently discarded there.

PREVIOUS SAMPLING RESULTS/ANALYSES: *Summarize and list those with Health and Safety Concerns*

No previous sampling has taken place. All information obtained has been by site observation.

ENVIRONMENTAL INFLUENCES: *Summarize below*

Sampling is proposed to occur in March which should not cause either heat or cold stress problems for Arizona.

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (x) Low ( ) Unknown *(Where multiple tasks are being performed ,complete Hazard Evaluation for each. Attach additional sheets as neccessary).*

JUSTIFICATION:

Survey instrumentation will be used continuously while drilling, sampling and excavation to monitor any release of gases or a presence of methane. Any intrusive activities into excavated trenches will only occur where proper shoring and jack placement.

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

CONTAMINANT	HIGHEST OBSERVED CONCENTRATION *(specify units and media)*	PEL/TLV *ppm or mg/m3 (specify)*	IDLH *ppm or mg/m3 (specify)*	WARNING CONCENTRATION *ppm or mg/m3 (specify)*	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	Photo Ionization Potential	PID Factor	FID Factor
No known contaminants are present.								

NA = Not Avaliable NE = None Established U = Unknown

S = Soil SW = Surface Water GW = Groundwater A = Air T = Tailings

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

FIELD INVESTIGATION ACTIVITIES COVERED UNDER THIS PLAN

Attach additional sheets as necessary

TASK DESCRIPTON / SPECIFIC TECHNIQUE·STANDARD OPERATING PROCEDURES / SITE LOCATION	TYPE	LEVEL OF PROTECTION Primary	Contingency	SCHEDULE
1 Initial Site Walkthrough	Intrusive (Non-intrusive)	A B C (D) Modified	Site Exit	Feb. 22, 1988
2 Deep Soil Borings	(Intrusive) Non-intrusive	A B C (D) Modified	A B (C) D Modified	Mar. 1988
3 Grab Samples from Excavation Trench	(Intrusive) Non-intrusive	A B C (D) Modified	A B (C) D Modified	Mar, 1988
4	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	
5	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	
6	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	
7	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	
8	Intrusive Non-intrusive	A B C D Modified	A B C D Modified	

ACTIVITIES / TASKS OF GREATEST CONCERN: *Summarize below*

Physical hazards associated with landfills (rusty metal, unstable rubble piles and trip hazards) are·the primary caution.

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

PROTECTIVE EQUIPMENT: *Specify by task Indicate type and/or material, as necessary.*

BLOCK A

TASKS: (1-2-3-4-5-6-7-8)
LEVEL: A-B-C-(D) Modified ( ) Contingency
(X) Primary

Respiratory: (X) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
( ) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots: Steel toe & shank
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
(X) Other: field clothes

Gloves: ( ) Not needed

( ) Undergloves:_____
(X) Gloves: latex (sampling
( ) Overgloves:_____

Other: *Specify below*

BLOCK B

TASKS: 1-(2)-3-4-5-6-7-8
LEVEL: A-B-C-D Modified (X) Contingency
( ) Primary

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
*(X) APR:_____
(X) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
(X) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots: Steel toe & shank
Overboots: rubber

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
(X) Tyvek Coverall
( ) Saranex Coverall or
(X) Coverall: cotton
( ) Other:_____

Gloves: ( ) Not needed

(X) Undergloves: surgicals
(X) Gloves: latex
( ) Overgloves:_____

Other: *Specify below*

*APR used only if at least 19.5% O_2 is present.

BLOCK C

TASKS: 1-2-3-4-5-6-7-8
LEVEL: A-B-C-D-Modified ( ) Contingency
( ) Primary

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
( ) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots:_____
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
( ) Other:_____

Gloves: ( ) Not needed

( ) Undergloves:_____
( ) Gloves:_____
( ) Overgloves:_____

Other: *Specify below*

BLOCK D

TASKS: 1-2-3-4-5-6-7-8
LEVEL: A-B-C-D-Modified ( ) Contingency
( ) Primary

Respiratory: ( ) Not needed

( ) SCBA, Airline:_____
( ) APR:_____
( ) Cartridge:_____
( ) Escape Mask:_____
( ) Other:_____

Head and Eye: ( ) Not needed

( ) Safety Glasses:_____
( ) Face Shield:_____
( ) Goggles:_____
( ) Hard Hat:_____
( ) Other:_____

Boots: ( ) Not needed

Boots:_____
Overboots:_____

Prot. Clothing ( ) Not needed

( ) Encapsulating Suit:_____
( ) Splash Suit:_____
( ) Apron:_____
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:_____
( ) Other:_____

Gloves: ( ) Not needed

( ) Undergloves:_____
( ) Gloves:_____
( ) Overgloves:_____

Other: *Specify below*

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

MONITORING EQUIPMENT: *Specify by task Indicate type, as necessary.* *Attach additional sheets, as necessary.*

INSTRUMENT	TASKS	ACTION GUIDELINES	COMMENTS
Combustible Gas Indicator	(1)—(2)—(3)—4 5—6—7—8	0 - 10% LEL *No explosion hazard.* 10 - 25% LEL *Potential explosion hazard; notify SHSC.* > 25% LEL *Explosion hazard; interrupt task/evacuate* 21.0% O_2 *Oxygen normal.* < 21.0% O_2 *Oxygen deficient; notify SHSC.* < 19.5% O_2 *Interrupt task/evacuate*	
Radiation Survey Meter	1—2—3—4 5—6—7—8	3 x Background: *Notify SHSC.* > 2 mR/hr: *Interrupt task/evacuate*	*Note: Annual exposure not to exceed 100 mrem/ yr, or 50 urem/hr average*
Photoionization Detector ( ) 11.7 ev (x) 10.2 ev ( ) 09.8 ev ( ) _ ev Type HNu	(1)—(2)—(3)—4 5—6—7—8	*Specify:* If at anytime needle indicates HNu readings above 1 ppm a site exit must be employed to don a respirator.	
Flame Ionization Detector Type_____	1—2—3—4 5—6—7—8	*Specify:*	
Detector Tubes/ Monitox Type_____ Type_____	1—2—3—4 5—6—7—8	*Specify:*	
Respirable Dust Monitor Type_____ Type_____	1—2—3—4 5—6—7—8	*Specify:*	
Other *Specify*	1—2—3—4 5—6—7—8	*Specify*	

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES

Personnel Decontamination *Summarize below and/or attach diagram; discuss use of work zones.*	Sampling Equipment Decontamination *Summarize below and/or attach diagram; discuss use of work zones.*	Heavy Equipment Decontamination *Summarize below and/or attach diagram; discuss use of work zones.*
The only decontamination for personnel with no hazardous waste identified is to dispose of gloves used in sampling. If hazardous waste is identified then all disposable items will be bagged and left on-site. Respirators if utilized will be bagged and properly sanitized. ( ) Not needed	(x) Not needed	Decontamination of the backhoe/drill rig will consist of spraying the rig. Although hazardous substances present have yet to be identified this procedure will insure appropriate cross contamination controls. ( ) Not needed
Containment and Disposal Method Place in a plastic bag and put in proper trash bin.	**Containment and Disposal Method**	**Containment and Disposal Method** Washwater will remain on-site.

SITE HEALTH AND SAFETY PLAN FORM

CAMP DRESSER & McKEE INC.

Health and Safety Program

SITE PERSONNEL AND RESPONSIBILITIES (include subcontractors)
(indicate if all personnel listed will be on-site)

NAME	FIRM/REGION	CDM HEALTH* CLEARANCE	RESPONSIBILITIES	
Debbie Baldwin	CDM	Yes	On-Site Manager/Coordinator	1-2-3-4-5-6-7-8
" "			SHSC	1-2-3-4-5-6-7-8
Suzanne Rowe	CDM	No	Sampler/Observer	

(Since no hazardous waste have been identified, Susan will assist Debbie until such time that the presence of a potential health concern has been identified. If the HNu picks up any gases, Susan will evacuate the area and act only as an observer.)

2-man drilling team — Drilling/Excavation

* Personnel listed on this page have been trained in accordance with the requirements of 29CFR Part 1910, and have met the requirements of the REM II medical monitoring and respiratory protection programs. The medical monitoring program entails, at a minimum, an initial, annual and exit medical examinations and the provision for additional examinations based on exposure and at the request of the employee. The respiratory protection program requires FIT testing and training in the proper selection, use and maintenance of respirators.

SITE HEALTH AND SAFETY PLAN FORM

Health and Safety Program

CAMP DRESSER & McKEE INC.

EMERGENCY CONTACTS	
USEPA Environmental Response Team	201-321-6660
US Coast Guard Environmental Response Team	800-424-8802
Association of American Railroads Response Team	202-293-4048
CHEMTREC	800-424-9300

CONTINGENCY PLANS *Summarize below*

All utility agencies will be contacted prior to digging. If any gases are encountered site activities will stop until respiratory protection is donned. ~~Susan~~ Rowe will site exit is gases are encountered. Instructions for contingency of encountering methane are on page 8 of this plan. The route to the hospital must be driven at least once prior to site intrusive activities. See the attached pages for excavation regulations.

Suzanne

SITE HEALTH AND SAFETY PLAN APPROVALS

RHSS Signature Karen A. Lewis Date 2-19-88

WEST REGION HSM Signature [illegible] Date 2/22/88

EMERGENCY CONTACTS	NAME	PHONE
CDM 24-Hour Emergency Line	N/A	202-896-4138
REM II Health and Safety Manager	M. Mathamel	703-642-0544
Regional Health and Safety Supervisor	Karen Lewis	303-458-1311
Project/Site Manager	Dave Chamberlin	714-752-5452
On-site Coordinator/Manager	Debbie Baldwin	303-458-1311
Regional Site Project Manager		
Hazardous Material Unit	(Peoria, AZ)	979-3710
State Environmental Agency		
State Spill Contractor		
Fire Department	(Peoria, AZ)	979-3710
Police Department	(Peoria, AZ)	979-4222
State Police	(Arizona)	223-2000
Health Department		
Poison Control Center	Good Samaritan	253-3334
	State Wide Poison Control	1-800-362-0101

MEDICAL EMERGENCY

Hospital Name: Valley View Hospital — **Phone:** 933-0155

Hospital Address: 12207 113 Avenue, Youngstown, AZ

Name of Contact At Hospital: ---- — **Phone:**

Name of 24-Hour Ambulance: Associated Ambulance Service — 933-0155 ext. 366

Route to Hospital:

From Peoria Ave. moving west turn right on 111th Avenue follow signs to 113th Avenue. Hospital is on right.

Distance to hospital 3 miles or 10 minutes

Attach map with route to hospital attached

APPENDIX E

LABORATORY ANALYSES

APPENDIX E

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 2	PL 3	PL 4	PL 5	PL 7	PL 8
Sample Depth	Feet		4.5-5.5	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	9.5-10.5
RCRA Parameters								
pH	S.U.		8.2	7.9	8.4	8.4	8.5	8.3
Ignitability	Pos/Neg		Neg.	Neg.	Neg.	Pos.-Roots	Neg.	Neg.
Cyanide	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfide	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity Metals								
Arsenic	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.017
Barium	mg/l	0.06	0.55	0.64	0.72	0.43	0.89	1.51
Cadmium	mg/l	0.003	0.003	0.012	0.012	0.072	0.015	0.014
Chromium	mg/l	0.02	<0.02	<0.02	0.021	<0.02	<0.02	<0.02
Lead	mg/l	0.02	0.04	0.14	0.13	0.12	0.19	0.17
Mercury	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mgl	0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01
Silver	mg/l	0.01	<0.01	0.011	<0.01	<0.01	<0.01	0.012
Total Organic Halogens	mg/kg	0.01	88	82	187	110	106	98
Total Metals								
Arsenic	mg/kg	4.0	NA	NA	NA	NA	6.2	10.3
Cadmium	mg/kg	0.3	NA	NA	NA	NA	0.6	1.3
Chromium	mg/kg	2.0	NA	NA	NA	NA	14.4	27.9
Lead	mg/kg	2.0	NA	NA	NA	NA	34.8	10.4
Mercury	mg/kg	0.03	NA	NA	NA	NA	<0.03	<0.03
Selenium	mg/kg	1.0	NA	NA	NA	NA	<1.0	<1.0
Zinc	mg/kg	1.0	NA	NA	NA	NA	47.5	80

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 2	PL 3	PL 4	PL 5	PL 7	PL 8
Volatiles	mg/kg	0.05-0.5	NA	NA	NA	NA	NA	ND
Semi-volatiles	mg/kg	0.17-1.7	NA	NA	NA	NA	NA	ND
PCBs	mg/kg	0.04-0.07	NA	NA	NA	NA	NA	ND
Pesticides								
4-4,DDE	mg/kg	0.004	NA	NA	NA	NA	NA	0.15
4-4,DDD	mg/kg	0.004	NA	NA	NA	NA	NA	ND
4-4,DDT	mg/kg	0.004	NA	NA	NA	NA	NA	ND
Dieldrin	mg/kg	0.004	NA	NA	NA	NA	NA	ND
Toxapene	mg/kg	0.16	NA	NA	NA	NA	NA	ND

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 9	PL 10	PL 12	PL 13	PL 14	PL 15
Sample Depth	Feet		0.0-1.0	19.5-20.5	4.5-6.0	4.5-5.5	4.5-5.5	1.0-1.7
RCRA Parameters								
pH	S.U.		8.0	8.2	8.5	7.5	9.0	9.2
Ignitability	Pos./Neg.		Pos.-Wood	Neg.	Neg.	Neg.	Neg.	Neg.
Cyanide	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfide	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity Metals								
Arsenic	mg/l	0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01
Barium	mg/l	0.06	0.24	0.19	0.57	0.63	0.20	0.62
Cadmium	mg/l	0.003	0.01	<0.003	0.008	0.012	<0.003	<0.003
Chromium	mg/l	0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02
Lead	mg/l	0.02	0.13	<0.02	0.10	0.16	0.03	0.03
Mercury	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	0.01	0.011	<0.01	<0.01	0.011	<0.01	<0.01
Total Organic Halogens	mg/kg	0.01	205	97	83	104	146	65
Total Metals								
Arsenic	mg/kg	4.0	10.3	NA	7.8	NA	6.7	NA
Cadmium	mg/kg	0.3	1.3	NA	0.9	NA	0.4	NA
Chromium	mg/kg	2.0	27.9	NA	13.2	NA	10.5	NA
Lead	mg/kg	2.0	10.4	NA	6.6	NA	1.6	NA
Mercury	mg/kg	0.03	<0.03	NA	<0.03	NA	<0.03	NA
Selenium	mg/kg	1.0	<1.0	NA	<1.0	NA	<1.0	NA
Zinc	mg/kg	1.0	80	NA	24.7	NA	27	NA

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 9	PL 10	PL 12	PL 13	PL 14	PL 15
Volatiles	mg/kg	0.05-0.5	NA	NA	ND	ND	ND	NA
Semi-volaties	mg/kg	0.17-1.7	NA	NA	ND	ND	ND	NA
PCBS	mg/kg	0.04-0.07	NA	NA	ND	ND	ND	NA
Pesticides								
4-4,DDE	mg/kg	0.004	NA	NA	0.039	ND	ND	NA
4-4,DDD	mg/kg	0.004	NA	NA	ND	ND	ND	NA
4-4,DDT	mg/kg	0.004	NA	NA	ND	ND	ND	NA
Dieldrin	mg/kg	0.004	NA	NA	ND	ND	ND	NA
Toxaphene	mg/kg	0.16	NA	NA	ND	ND	ND	NA

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 17	PL 19	PL 20	PL 22	PL 25	PL 26
Sample Depth	Feet		0.0-1.0	9.5-10.5	0.0-1.0	4.5-5.5	4.5-5.5	0.0-1.0
RCRA Parameters								
pH	S.U.		8.4	8.6	8.1	8.0	8.6	8.5
Ignitability	Pos./Neg.		Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cyanide	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfide	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity Metals								
Arsenic	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Barium	mg/l	0.06	0.61	0.44	0.89	0.50	0.47	0.17
Cadmium	mg/l	0.003	0.009	0.003	0.005	0.004	0.004	<0.004
Chromium	mg/l	0.02	0.023	<0.02	<0.02	<0.02	<0.02	<0.02
Lead	mg/l	0.02	0.14	0.09	0.09	0.05	0.08	0.06
Mercury	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01
Total Organic Halogens	mg/kg	0.01	232	122	122	154	122	204
Total Metals								
Arsenic	mg/kg	4.0	NA	7.8	NA	NA	NA	NA
Cadmium	mg/kg	0.3	NA	0.9	NA	NA	NA	NA
Chromium	mg/kg	2.0	NA	13.2	NA	NA	NA	NA
Lead	mg/kg	2.0	NA	6.6	NA	NA	NA	NA
Mercury	mg/kg	0.02	NA	<0.03	NA	NA	NA	NA
Selenium	mg/kg	1.0	NA	<1.0	NA	NA	NA	NA
Zinc	mg/kg	1.0	NA	24.7	NA	NA	NA	NA

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 17	PL 19	PL 20	PL 22	PL 25	PL 26
Volatiles	mg/kg	0.05-0.5	NA	ND	NA	NA	NA	NA
Semi-volatiles	mg/kg	0.17-1.7	NA	ND	NA	NA	NA	NA
PCBs	mg/kg	0.04-0.07	NA	ND	NA	NA	NA	NA
Pesticides								
4-4,DDE	mg/kg	0.004	NA	<0.004	NA	NA	NA	NA
4-4,DDD	mg/kg	0.004	NA	<0.004	NA	NA	NA	NA
4-4,DDT	mg/kg	0.004	NA	<0.004	NA	NA	NA	NA
Dieldrin	mg/kg	0.004	NA	<0.004	NA	NA	NA	NA
Toxaphene	mg/kg	0.16	NA	<0.004	NA	NA	NA	NA

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 29	PL 30	PL 31	PL 33	PL 34	PL 35
Sample Depth	Feet		0.0-1.0	0.0-1.0	9.5-10.5	4.5-5.5	0.0-1.0	9.5-10.5
RCRA Parameters								
pH	S.U.		9.1	8.4	8.0	8.1	7.8	9.7
Ignitability	Pos./Neg.		Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cyanide	mg/kg	0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulfide	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity Metals								
Arsenic	mg/l	0.01	<0.01	<0.1	0.018	<0.01	<0.01	<0.01
Barium	mg/l	0.06	0.31	0.67	0.92	0.87	0.67	0.48
Cadmium	mg/l	0.003	0.004	0.007	0.009	0.017	0.010	0.003
Chromium	mg/l	0.02	<0.02	<0.02	<0.02	0.050	0.021	<0.02
Lead	mg/l	0.02	0.07	0.10	0.18	0.26	0.14	0.07
Mercury	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	0.01	<0.01	<0.01	<0.01	0.016	<0.01	<0.01
Total Organic Halogens	mg/kg	0.01	133	111	67	57	147	131
Total Metals								
Arsenic	mg/kg	4.0	NA	NA	11.2	6.4	NA	8.0
Cadmium	mg/kg	0.3	NA	NA	0.8	0.8	NA	0.6
Chromium	mg/kg	2.0	NA	NA	20.2	14.4	NA	11.6
Lead	mg/kg	2.0	NA	NA	59	27	NA	4.7
Mercury	mg/kg	0.03	NA	NA	0.07	<0.03	NA	<0.03
Selenium	mg/kg	1.0	NA	NA	<1.0	<1.0	NA	<1.0
Zinc	mg/kg	1.0	NA	NA	67.9	45.4	NA	23.2

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 29	PL 30	PL 31	PL 33	PL 34	PL 35
Volatiles	mg/kg	0.05-0.5	NA	NA	ND	ND	ND	ND
Semi-Volatiles	mg/kg	0.17-1.7	NA	NA	ND	ND	ND	ND
PCBs	mg/kg	0.04-0.07	NA	NA	ND	ND	ND	ND
Pesticides								
4-4,DDE	mg/kg	0.004	NA	NA	0.030	0.053	<0.004	0.41
4-4,DDD	mg/kg	0.004	NA	NA	0.022	<0.004	<0.004	<0.004
4-4,DDT	mg/kg	0.004	NA	NA	0.025	<0.004	<0.004	<0.004
Dieldrin	mg/kg	0.004	NA	NA	<0.004	<0.004	<0.004	<0.004
Toxaphene	mg/kg	0.16	NA	NA	1.1	0.16	<0.16	0.54

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 36	PL 37	T 2	T 4	T 7	T 8
Sample Depth	Feet		0.6-1.0	9.5-10.5	4.0	10.0	2.0-3.0	5.0-5.5
RCRA Parameters								
pH	S.U.		7.9	8.0	7.6	7.7	7.7	7.6
Ignitability	Pos./Neg.		Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cyanide	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfide	mg/kg	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ep-Toxicity Metals								
Arsenic	mg/l	0.01	0.015	0.017	<0.01	0.023	<0.01	0.029
Barium	mg/l	0.06	0.55	0.37	0.39	0.64	0.32	0.25
Cadmium	mg/l	0.003	0.010	<0.003	0.010	0.014	0.029	0.011
Chromium	mg/l	0.02	0.022	<0.02	0.041	0.021	0.056	0.037
Lead	mg/l	0.02	0.17	0.06	0.20	0.26	0.47	0.27
Mercury	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/l	0.01	0.011	<0.01	0.016	0.013	0.025	<0.020
Total Organic Halogens	mg/kg	0.01	131	125	117	98	115	115
Total Metals								
Arsenic	mg/kg	4.0	NA	NA	9.4	NA	NA	NA
Cadmium	mg/kg	0.3	NA	NA	0.8	NA	NA	NA
Chromium	mg/kg	2.0	NA	NA	22.8	NA	NA	NA
Lead	mg/kg	2.0	NA	NA	7.2	NA	NA	NA
Mercury	mg/kg	0.03	NA	NA	0.63	NA	NA	NA
Selenium	mg/kg	1.0	NA	NA	<1.0	NA	NA	NA
Zinc	mg/kg	1.0	NA	NA	111	NA	NA	NA

APPENDIX E (continued)

ANALYTICAL RESULTS - ANALYTICAL TECHNOLOGIES, INC.

Parameter	Units	Detection Limits	PL 36	PL 37	T 2	T 4	T 7	T 8
Volatiles	mg/kg	0.05–0.5	NA	NA	ND	NA	NA	NA
Semi-Volatiles	mg/kg	0.17–1.7	NA	NA	ND	NA	NA	NA
PCBs	mg/kg	0.04–0.07	NA	NA	ND	NA	NA	NA
Pesticides								
4-4,DDE	mg/kg	0.004	NA	NA	0.04	NA	NA	NA
4-4,DDD	mg/kg	0.004	NA	NA	<0.004	NA	NA	NA
4-4,DDT	mg/kg	0.004	NA	NA	<0.004	NA	NA	NA
Dieldrin	mg/kg	0.004	NA	NA	0.14	NA	NA	NA
Toxaphene	mg/kg	0.16	NA	NA	1.9	NA	NA	NA

NA = Not analyzed
ND = Not detected

APPENDIX E

ANALYTICAL RESULTS - ROCKY MOUNTAIN ANALYTICAL LABORATORY

PARAMETER	UNITS	DETECTION LIMITS	PL 8	PL 31	T2
SAMPLE DEPTH	FEET		9.5-10.5	9.5-10.5	4.0
TOTAL METALS					
ALUMINUM	MG/KG	6.0	8,680	11,900	5,300
ANTIMONY	MG/KG	5.0	<5.0	<5.0	<5.0
ARSENIC	MG/KG	10.0	<10.0	<10.0	<10.0
BARIUM	MG/KG	0.5	99	120	71
BERYLLIUM	MG/KG	0.1	0.4	0.6	0.2
BORON	MG/KG	2.0	4.0	21	9
CADMIUM	MG/KG	0.5	<0.5	<0.5	0.6
CALCIUM	MG/KG	20	11,400	15,800	17,300
CHROMIUM	MG/KG	1.0	12	20	11
COBALT	MG/KG	1.0	7	9	5
COPPER	MG/KG	0.6	17	40	13
IRON	MG/KG	5.0	10,400	16,700	17,900
LEAD	MG/KG	5.0	16	63	8
MAGNESIUM	MG/KG	10.0	5,100	6,600	3,900
MANGANESE	MG/KG	0.5	290	290	220
MOLYBDENUM	MG/KG	1.5	<1.5	<1.5	<1.5
NICKEL	MG/KG	4.0	19	26	17
POTASSIUM	MG/KG	500	2,500	2,500	1,100
SILVER	MG/KG	0.5	<0.5	<0.5	<0.5
SODIUM	MG/KG	5.0	230	360	280
THALLIUM	MG/KG	40.0	<40.0	<40.0	<40.0
TIN	MG/KG	6.0	10	<6.0	<6.0
TITANIUM	MG/KG	0.5	190	320	260
VANADIUM	MG/KG	1.0	19	29	15
ZINC	MG/KG	2.0	44	86	82

APPENDIX E (continued)

ANALYTICAL RESULTS - ROCKY MOUNTAIN ANALYTICAL LABORATORY

Parameter	Units	Detection Limits	PL 8	PL 31	T2
HSL					
Volatiles	mg/kg	.5-2.5	ND[a]	ND[a]	ND[a]
Semi-Volatiles	mg/kg	6.6-32.0	ND[a]	ND[a]	ND[a]
TICs					
Volatiles	mg/kg	—	ND[a]	ND[a]	ND[a]
Semi-Volatiles	mg/kg	—	ND[a]		ND[a]
Alkanes				1.60	
Hydrocarbons				1.39	
Oxy-hydrocarbon				.57	
Sulfur				9.20	

[a] ND = Not detected