4748

TECHNICAL ASSISTANCE TEAM

Factory Street Lead Site
Assessment Report

Honolulu, Hawaii

TAT No: 099505-T-001
TDD No: T09-9410-011
PAN No: EHI-0073-SBA

Submitted To:

William E. Lewis
Deputy Project Officer
U.S. Environmental Protection Agency
Region IX Emergency Response Section (H-8-3)
75 Hawthorne Street
San Francisco, CA 94105

Contract No. 68-WO-0037

Prepared By:

John H. Whitaker, R.G.

Technical Assistance Team
Ecology and Environment, Inc.

September 30, 1995

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BACKGROUND AND SITE DESCRIPTION 1

3.0 SITE ASSESSMENT ACTIVITIES 6
- 3.1 SITE RECONNAISSANCE 6
- 3.2 AERIAL PHOTOGRAPH SEARCH 7
- 3.3 SOIL SAMPLING 7
  - 3.3.1 On-Site Soil Samples 7
  - 3.3.2 Off-Site Soil Samples 10
  - 3.3.3 Stream Sediment Samples: 15
  - 3.3.4 pH Testing 16
  - 3.3.5 Confirmation Samples: 16

4.0 CONCLUSIONS: 17

LIST OF APPENDICES

APPENDIX A: PHOTODOCUMENTATION

APPENDIX B: XRF DATA REVIEW

APPENDIX C: WORK PLAN AND QUALITY ASSURANCE SAMPLING PLAN

1.0 INTRODUCTION

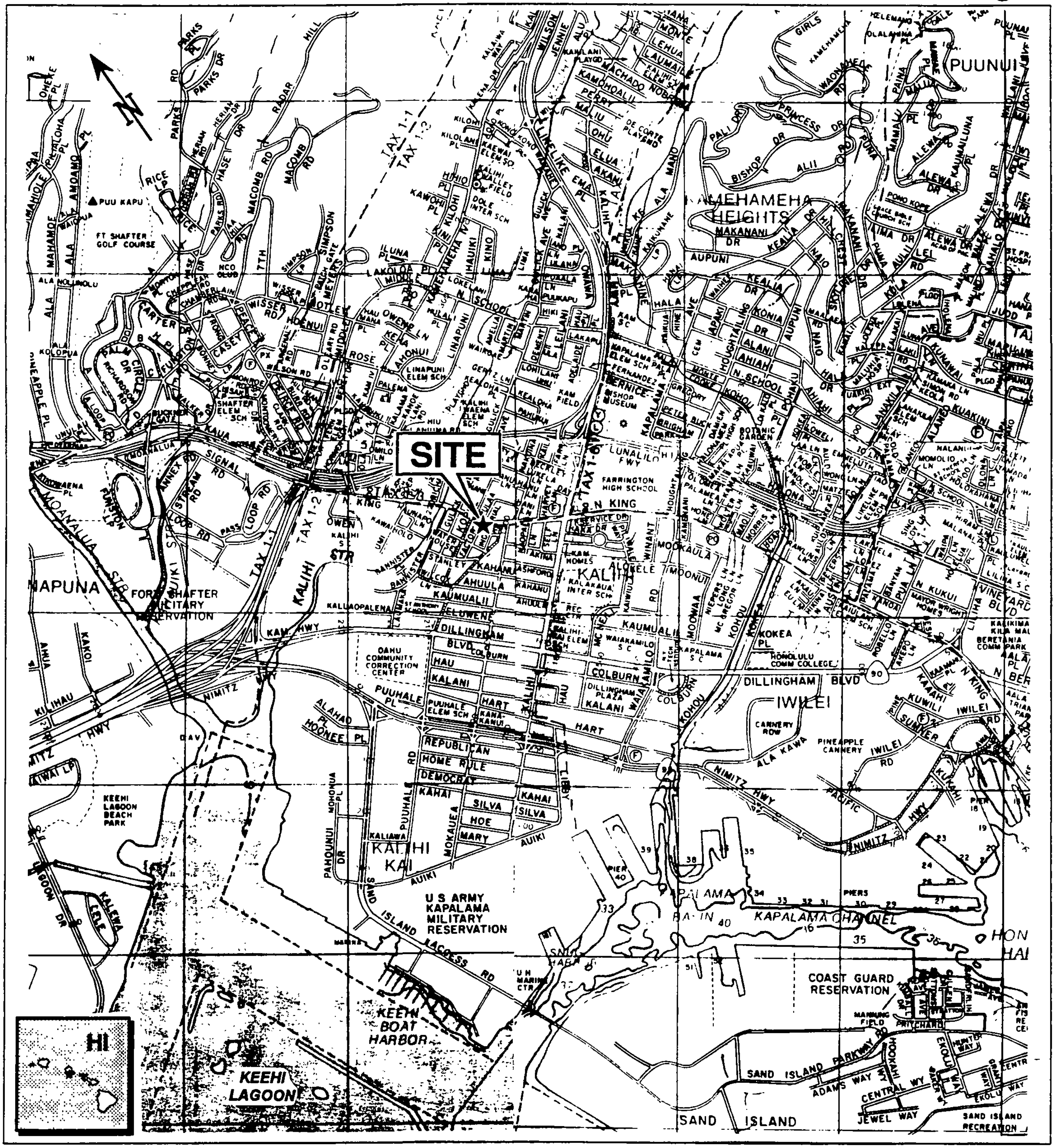
On July 11, 1994 the U.S. Environmental Protection Agency (EPA) Emergency Response Section (ERS) directed the Zone II Region IX Technical Assistance Team (TAT) to conduct a site assessment at the Factory Street Lead Site in Honolulu, Hawaii. Of concern was the presence of lead contamination in soils at an apartment complex and in the surrounding neighborhood. The contamination was the result of poor housekeeping practices during the manufacture of fishing weights at a small fishing supply shop formerly located at the site. Investigations conducted by the State of Hawaii Department of Health (DOH) Human Services Branch and Hazard Evaluation and Emergency Response (HEER) Branch revealed that residents at the site had been exposed to lead. In addition, HEER officials felt that contamination was a potential threat to surface water and groundwater. The HEER was concerned that removal activities conducted by the current property owner were incomplete.

The TAT collected soil samples from the surface and at depth at the site and at the surface in the surrounding neighborhood. The samples were analyzed in the field with a Spectrace 9000 x-ray fluorescence spectrometer (XRF). Results indicated that lead contamination in soils was confined primarily to areas near the source at depths of three feet or less. The EPA Investigation and Enforcement Section determined that ownership of land near the apartment complex found to be contaminated was under dispute. Moderate lead levels were also found in surface soils away from the apartment complex site. This contamination could not be directly attributed to a source on the site.

2.0 BACKGROUND AND SITE DESCRIPTION

The HEER has defined the Factory Street Lead Site as a four block area centered on the intersection of Factory and King Streets in the Kalihi Subdivision, City and County of Honolulu, Island of Oahu, Hawaii (Figure 1). For the purposes of this report the site is defined as the parcel encompassing the suspected source area for lead contamination located at 2003 North King Street and 922 Factory Street, and curbside portions of parcels on the other side of Factory Street where contamination was reportedly found and removed by the landowner (Figure 2). The parcels are occupied by several shops, a small apartment complex, and a parking lot.

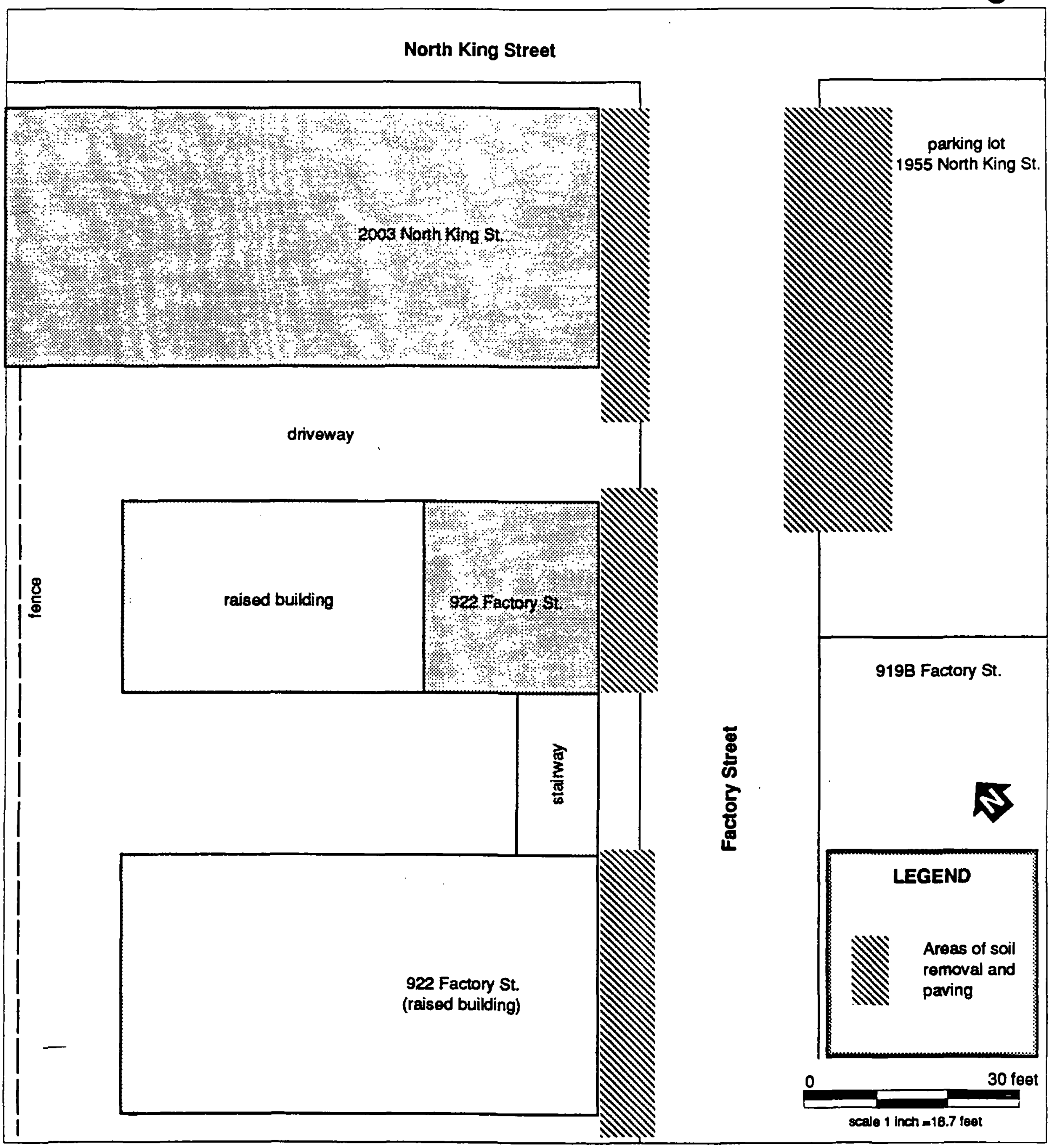
In April of 1993, two children living in the apartments were found to have blood lead levels of 33 micrograms per deciliter (µg/dl) in samples taken by their physician. These values exceeded the



ecology and environment, inc.

source: Bryans sectional maps, 1988
scale. 1:24,000

Figure 1
SITE LOCATION MAP
Factory Street Lead Site
Honolulu, Hawaii



ecology and environment, inc.

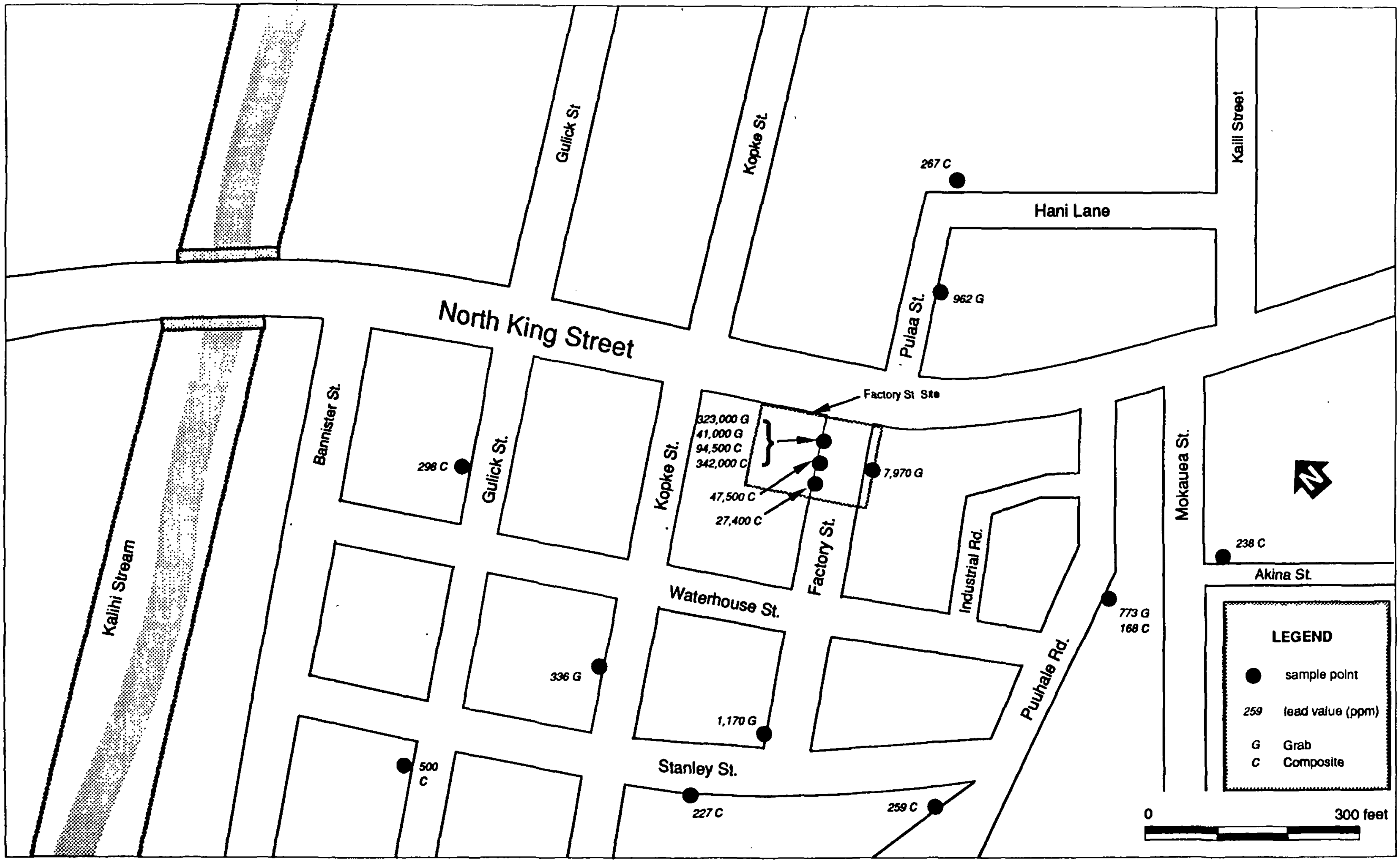
Figure 2
APPROXIMATE EXTENT OF SOIL REMOVAL AND PAVING COMPLETED BY LANDOWNER
Factory Street Lead Site
Honolulu, Hawaii

Center for Disease Control's blood lead level of concern of 10 µg/dl. The State of Hawaii DOH and HEER conducted a follow-up study to determine the source of the lead exposure in the Fernandez household (Apartment H) on April 28, 1993. The family was interviewed and samples were collected of wall paint, vacuum cleaner bag dust, and drinking water. In addition, soil samples were collected from four areas of exposed soil around the apartment complex where the children played (Figure 3). The results indicated high lead levels in the soils and vacuum cleaner bag dust. Lead in soil samples ranged from 41,000 mg/kg to 342,000 mg/kg. The vacuum cleaner bag dust contained 6,400 mg/kg of lead. On June 1, 1993 the family was relocated. Sampling continued through August 1993 and on August 24, 1993 the HEER issued an Emergency Response Order to the landowner, Mr. Merton Lau, who complied with the order by paving the "hot spots" after removing contaminated soils to a depth of approximately 6 to 12 inches.

On August 26, 1993 a citizen who grew up in the affected area called the HEER and identified the "Kalihi Pawn Shop," currently located at 2003 N. King St., as having once been the site of a fishing supply store. Mr. Ronald Ahina reported that "Kalihi Fishing Supply" dumped lead ash from the manufacture of sinkers on the ground behind the store from at least 1955 through 1966. Mr. Ahina indicated that the lead may have been derived from discarded automobile batteries. Other former commercial tenants of the site include a dental office and a sign printing shop. They were identified by the HEER as having stored chemicals on site.

The HEER collected six soil samples in a two block radius around the site on June 6, 1993 (Figure 3). Analytical results revealed lead levels that ranged from 168 mg/kg to 1,170 mg/kg. Based on these findings, the HEER suspected that lead contamination from the Factory Street site had migrated off site potentially impacting the surrounding residential neighborhood and surface water in the Kalihi Stream located approximately 2000 feet to the south of the site. The Kalihi Stream lies approximately 1.5 miles to the west of the site and flows southwest into Keehi Lagoon. Storm water runoff from the Factory Street neighborhood flows on the surface to collection drains which empty directly into the stream. Residents utilize Keehi Lagoon for fishing and recreational activities.

The HEER also expressed concern that lead contamination might be impacting groundwater beneath the site. According to HEER estimates, the upper Kalihi aquifer lies at a depth of approximately nine feet beneath the site. It is not currently used for drinking water purposes. The basal lower Kalihi aquifer begins at approximately 128 feet below ground surface (bgs). There are three drinking water wells in this aquifer located between 0.5 and 1.0 miles from the site. These wells are upslope to the east and at a similar elevation to the southeast. The direction of shallow groundwater



ecology and environment, inc.

Figure 3
HEER SAMPLE LOCATION MAP
Factory Street Lead Site
Honolulu, Hawaii

flow at the site is not known but is suspected to be to the southwest (downslope towards the ocean). There are no known monitoring wells within the area previously sampled by the HEER.

A Preliminary Assessment (PA) was submitted to the EPA by the HEER on February 11, 1994. In it, the HEER recommended further CERCLA evaluations of the site based on the above information.

3.0 SITE ASSESSMENT ACTIVITIES

3.1 SITE RECONNAISSANCE

In April 1994, the TAT met with HEER officials at Hawaii Department of Health offices in Honolulu to review site files and determine whether EPA ERS involvement was warranted. The TAT also conducted a site reconnaissance visit with the HEER. The TAT made the following observations at the conclusion of the visit:

- The landowner, Mr. Lau, did not submit documentation of the soil volume removed from the site nor did he submit post-removal confirmation sample results to the HEER.
- All formerly exposed areas of the site, where contaminated soils were reportedly removed, were paved.
- It could not be determined from the available data whether relatively high lead values in soils away from the site (Figure 3) were due to off-site migration or represented local background levels.

The TAT concluded that the original or current extent of contamination was unknown, both laterally and at depth. Also, it could not be determined whether contamination originating at the site was threatening or impacting groundwater or had travelled off site to neighborhood households or to Kalihi Stream. It did appear that pavement capping on-site soils identified as source areas was preventing exposure to residents and surface migration from the site. The EPA ERS subsequently determined that a site assessment would be required to determine the extent of contamination and the necessity of a removal action or subsequent EPA Remedial action.

3.2 AERIAL PHOTOGRAPH SEARCH

At the request of the EPA ERS, a historical aerial photograph search was conducted by the EPA Environmental Monitoring Systems Laboratory (EMSL) in Las Vegas, Nevada during April and May 1994. The objective of the search was to locate photographs which showed the site during the time period when fishing weights were being manufactured. This might pinpoint the location of source areas and identify surface migration pathways that existed at that time. Photographs might also reveal other potential sources of lead contamination.

The search identified aerial photographs taken between 1951 and 1992. Photographs from 1952 and 1988 were selected for retrieval and enlargement. The two photographs revealed that buildings at the site itself had changed between 1952 and 1988 and that some changes had occurred in the surrounding neighborhood, such as construction of the H-1 freeway approximately one quarter mile north of the site. The photographs also showed that the neighborhood has been primarily residential since 1952. There was not enough detail or resolution to see small-scale manufacturing operations or waste piles as might be expected at the site. Other potential sources were also not apparent.

3.3 SOIL SAMPLING

The soil sampling phase of the site assessment took place in February and March 1995. The TAT utilized sampling trowels, hand augers, and power augers to collect a total of 86 soil samples at the Factory Street site, in surrounding neighborhoods, and in Kalihi Stream. Subsurface soil grab samples were collected with soil augers and surface soil composite samples were collected with sampling trowels. All samples were analyzed with the XRF. Due to a lack of laboratory space at the site, XRF analysis took place at the U.S. Coast Guard (USCG) Marine Safety Office (MSO) in Honolulu. Eleven samples were sent to the Region IX laboratory in Richmond, California for confirmation analysis. Sampling and field analytical procedures are described in the attached Quality Assurance Sampling Plan (Appendix III). XRF and confirmation sample results are listed in Table 1.

3.3.1 On-Site Soil Samples

The TAT completed a total of 20 soil borings on site. From these soil borings, the TAT collected 57 soil grab samples. Sampling encompassed the parking lot behind the shops at 2003 North King

Table 1
Factory Street Lead Site
Analytical Results

SAMPLE ID	SAMPLE NUMBER	STREET ADDRESS	SAMPLE TYPE	SAMPLE DEPTH	SAMPLE COLLECTION DATE	XRF RESULT Pb - mg/kg ND = < 60 (1)	LAB RESULT Pb - mg/kg ND = < 7.1 (2)
PU-1032-1-0'	1	1032 Pulaa Street	Grab	0 - 6"	2/22/95	150	
PU-1032-2-1'	2	1032 Pulaa Street	Grab	1' - 1' 6"	2/22/95	ND	
PU-1032-3-2'	3	1032 Pulaa Street	Grab	2' - 2' 6"	2/22/95	ND	
KSAK-4	4	Kalihi Stream	Stream sediment	surface	2/22/95	ND	
KSBK-5	5	Kalihi Stream	Stream sediment	surface	2/22/95	75	
KSBK-6	6	Kalihi Stream	Stream sediment	surface	2/22/95	115	207
KSBK-7	7	Kalihi Stream	Stream sediment	surface	2/22/95	126	
FS-915-8-0'	8	915 Factory Street	Grab	0' - 6"	2/22/95	188	
FS-915-9-1'	9	915 Factory Street	Grab	1' - 1' 6"	2/22/95	124	
FS-915-10-2'	10	915 Factory Street	Grab	2' - 2' 6"	2/22/95	106	
WA-2003-11-0'	11	2003 Waterhouse St	Grab	0' - 6"	2/22/95	ND	
WA-2003-12-1'	12	2003 Waterhouse St	Grab	1' - 1' 6"	2/22/95	ND	
WA-2003-13-2'	13	2003 Waterhouse St	Grab	2' - 2' 6"	2/22/95	ND	ND
FS-806-14-0'	14	806 Factory St	Grab	0' - 4"	2/22/95	320	
FS-806-15-4"	15	806 Factory St	Grab	4" - 10"	2/22/95	369	
FS-919B-16-3"	16	919B Factory St	Grab	0' - 6"	2/23/95	679	
FS-919B-17-1'	17	919B Factory St	Grab	1' - 1' 6"	2/23/95	ND	
FS-919B-18-2'	18	919B Factory St	Grab	2' - 2' 6"	2/23/95	ND	
NK-2003-19-3"	19	2003 North King St	Grab	3" - 6"	2/23/95	289	
NK-2003-20-1'	20	2003 North King St	Grab	1' - 1' 6"	2/23/95	ND	
NK-2003-21-4"	21	2003 North King St	Grab	0' - 6"	2/23/95	ND	
NK-2003-22-1'	22	2003 North King St	Grab	1' - 1' 6"	2/23/95	ND	
NK-2003-23-2'	23	2003 North King St	Grab	2' - 2' 6"	2/23/95	ND	
FS-910-24-0'	24	910 Factory St	Grab	0' - 1' 6""	2/23/95	289	
FS-910-25-2'	25	910 Factory St	Grab	2' - 2' 6"	2/23/95	ND	
FS-904-26-0'	26	904 Factory St	Grab	0' - 6"	2/23/95	449	
FS-904-27-1'	27	904 Factory St	Grab	1' - 1' 6"	2/23/95	ND	
FS-904-28-2'	28	904 Factory St	Grab	2' - 2' 6"	2/23/95	ND	
FS-922-29-3"	29	922Factory St	Grab	3" - 6"	2/23/95	74	
FS-922-30-1'	30	922 Factory St	Grab	1' - 1' 6"	2/23/95	ND	172
FS-922-31-2'	31	922 Factory St	Grab	2' - 2' 6"	2/23/95	ND	
FS-922-32-3'	32	922 Factory St	Grab	3' - 3' 6"	2/23/95	ND	
NK-2003-33-3"	33	2003 North King St	Grab	3" - 6"	2/24/95	18,570	
NK-2003-34-1'	34	2003 North King St	Grab	1' - 1' 6"	2/24/95	12,850	37,400
NK-2003-35-2'	35	2003 North King St	Grab	2' - 2' 6"	2/24/95	72	
NK-2003-36-3'	36	2003 North King St	Grab	3' - 3' 6"	2/24/95	200	
NK-2003-37-4'	37	2003 North King St	Grab	4' - 4' 6"	2/24/95	ND	308
NK-2003-38-5'	38	2003 North King St	Grab	5' - 5' 6"	2/24/95	ND	
NK-2003-39-3"	39	2003 North King St	Grab	3" - 6"	2/24/95	90	
FS-922-40-4"	40	922 Factory St	Grab	4" - 6"	2/24/95	ND	27
FS-922-41-1'	41	922 Factory St	Grab	1' - 1' 6"	2/24/95	619	
FS-922-42-2'	42	922 Factory St	Grab	2' - 2' 6"	2/24/95	111	
FS-922-43-3'	43	922 Factory St	Grab	3' - 3' 5"	2/24/95	ND	

Table 1
Factory Street Lead Site
Analytical Results

SAMPLE ID	SAMPLE NUMBER	STREET ADDRESS	SAMPLE TYPE	SAMPLE DEPTH	SAMPLE COLLECTION DATE	XRF RESULT Pb - mg/kg ND = < 60 (1)	LAB RESULT Pb - mg/kg ND = < 7.1 (2)
FS-922-44-3"	44	922 Factory St	Grab	3" - 6"	2/25/95	ND	
FS-922-45-1'	45	922 Factory St	Grab	1' - 1' 6"	2/25/95	ND	
FS-922-46-2'	46	922 Factory St	Grab	2' - 2' 6"	2/25/95	ND	
FS-922-47-3'	47	922 Factory St	Grab	3' - 3' 6"	2/25/95	ND	
FS-922-48-4'	48	922 Factory St	Grab	4' - 4' 6"	2/25/95	ND	
FS-922-49-3"	49	922 Factory St	Grab	3" - 6"	2/25/95	98	
FS-922-50-1'	50	922 Factory St	Grab	1' - 1' 6"	2/27/95	ND	
FS-922-51-2'	51	922 Factory St	Grab	2' - 2' 6"	2/27/95	ND	
FS-922-52-3'	52	922 Factory St	Grab	3' - 3' 6"	2/27/95	ND	
HA-1927-53-SC	53	1927 Hani Lane	surface composite	surface	2/27/95	351	
HA-1020-54-SC	54	1020 Hani Lane	surface composite	surface	2/27/95	ND	
NK-1955-55-SC	55	1955 North King St	surface composite	surface	2/27/95	883	
FS-915-56-SC	56	915 Factory St	surface composite	surface	2/27/95	554	
FS-902-57-SC	57	902Factory St	surface composite	surface	2/27/95	902	
IN-902-58-SC	58	902 Industrial Road	surface composite	surface	2/27/95	325	
WA-2016-59-SC	59	2016 Waterhouse St	surface composite	surface	2/27/95	336	
KO-757-60-SC	60	757 Kopke St	surface composite	surface	2/27/95	511	
PA-774-61-SC	61	774 Puuhale Road	surface composite	surface	2/27/95	951	
NK-1955-62-3"	62	1955 North King St	Grab	3" - 6"	2/27/95	23,780	117,000
NK-1955-63-1'	63	1955 North King St	Grab	1' - 1' 6"	2/27/95	521	
NK-1955-64-2'	64	1955 North King St	Grab	2' - 2' 6"	2/27/95	216	
NK-2003-65-3"	65	2003 North King St	Grab	3" - 6"	2/27/95	585	
NK-2003-66-2"	66	2003 North King St	Grab	2" - 6"	2/27/95	13,850	
NK-2003-67-1'	67	2003 North King St	Grab	1' - 1' 6"	2/27/95	223	
NK-2003-68-2'	68	2003 North King St	Grab	2' - 2' 6"	2/27/95	361	
FS-922-69-3"	69	922 Factory St	Grab	3" - 6"	2/27/95	6,980	
FS-922-70-1'	70	922 Factory St	Grab	1' - 1' 6"	2/27/95	3,130	4,710
FS-922-71-2"	71	922 Factory St	Grab	2" - 6"	2/28/95	1,231	14,900
FS-922-72-1'	72	922 Factory St	Grab	1' - 1' 6"	2/28/95	263	
FS-922-73-2'	73	922 Factory St	Grab	2' - 2' 6"	2/28/95	ND	
FS-922-74-3"	74	922 Factory St	Grab	3" - 6"	2/28/95	175	
FS-922-75-1'	75	922 Factory St	Grab	1' - 1' 6"	2/28/95	263	
FS-922-76-2'	76	922 Factory St	Grab	2' - 2' 6"	2/28/95	ND	
FS-CTR-77-3"	77	Center of Factory St	Grab	3" - 6"	2/28/95	10,690	
FS-CTR-78-1'	78	Center of Factory St	Grab	1' - 1' 6"	2/28/95	421	1,820
FS-CTR-79-2'	79	Center of Factory St	Grab	2' - 2' 6"	2/28/95	93	
FS-CTR-80-3"	80	Center of Factory St	Grab	3" - 6"	2/28/95	1,281	
FS-CTR-81-1'	81	Center of Factory St	Grab	1' - 1' 3"	2/28/95	ND	
FS-922-82-2"	82	922 Factory St	Grab	2" - 6"	2/28/95	1,120	
FS-922-83-1'	83	922 Factory St	Grab	1' - 1' 6"	2/28/95	60	
FS-CTR-84-4"	84	Center of Factory St	Grab	4" - 6"	2/28/95		
NK-1955-85-2"	85	1955 North King St	Grab	2" - 6"	2/28/95	1,118	
NK-1955-86-1'	86	1955 North King St	Grab	1' - 1' 6"	2/28/95	ND	

Notes Shading indicates samples grouped by borehole or street address
(1) Detection limit for XRF samples = 60 mg/kg
(2) Detection limit for laboratory samples = 7 1 mg/kg

Pb = Lead
ND = Non-detect (value below detection limit)
mg/kg = milligrams per kilogram

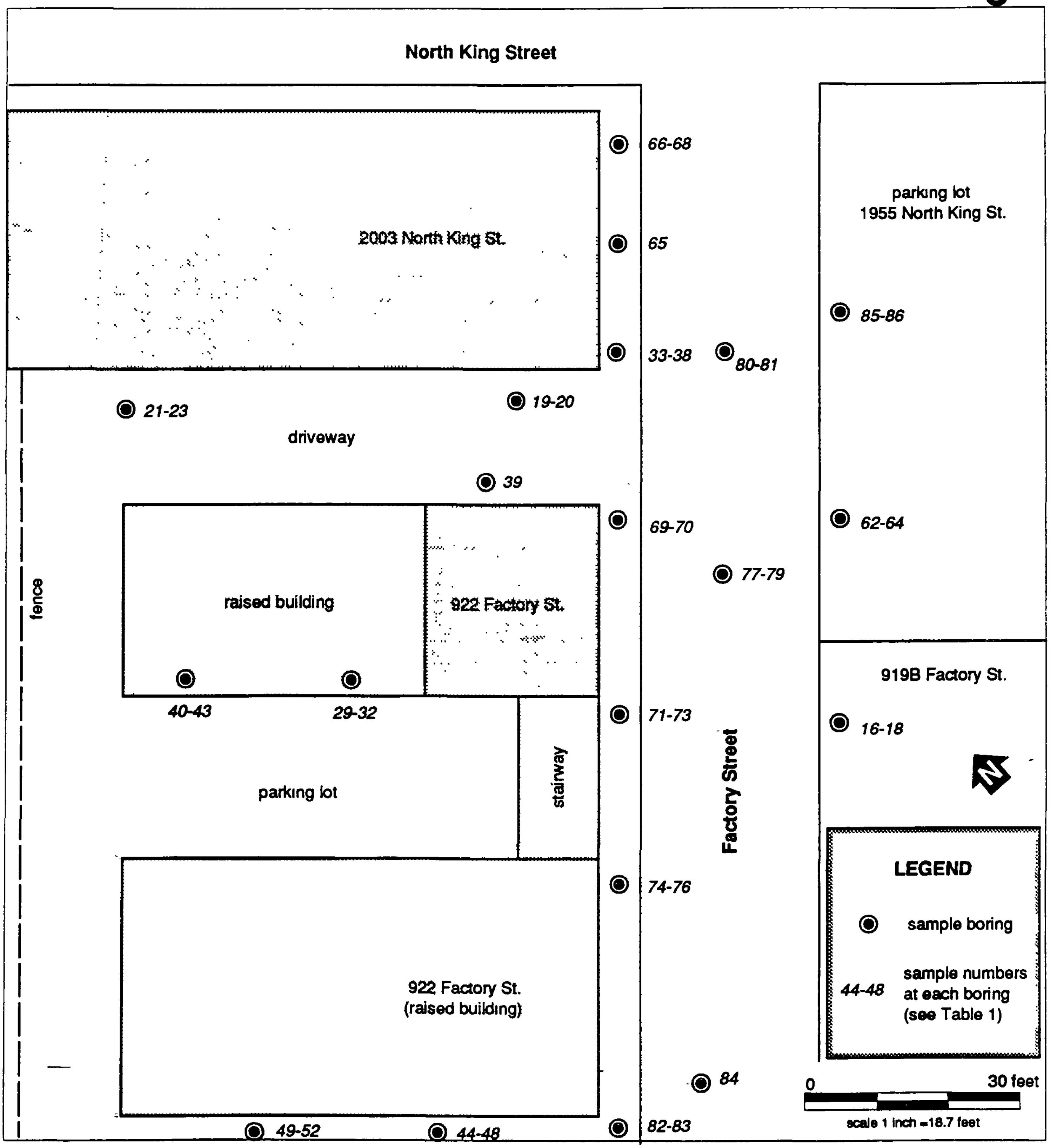
Street and surrounding the apartment complex at 915 Factory Street as well as curb side areas along both sides of Factory Street adjacent to the above addresses (Figure 4). Samples were also collected in the center of Factory Street beneath the asphalt. Most borings were completed to a depth of two to three feet using hand augers and power augers. All soil borings were advanced to refusal in an effort to reach groundwater. The deepest sample was collected at five feet. Soil augers encountered an extremely hard layer at two to five feet. Refusal at these depths was probably due to the presence of bedrock. The TAT observed a construction excavation approximately three blocks to the northwest on North King Street which revealed shallow, coarsely fractured basaltic bedrock.

Lead contamination, as determined by XRF analysis, was generally confined to near-surface soils. In borings which reached a depth of three feet bgs or greater, only one sample at the three-foot interval contained lead above the XRF detection limit. The TAT therefore concludes that lead contamination is not impacting or threatening groundwater. Also, the soils beneath surface fill were very rich in clay, which would inhibit downward migration of surface water containing lead. The contaminated soils are not likely to migrate in surface water or in the air because of the pavement cover. Exposure during excavation is possible but volumes of contaminated soil are low.

Areas which had the highest near-surface contamination were located adjacent to Factory Street on the shoulder or in narrow areas between buildings and the street (Figure 5). The highest lead levels were found in the narrow strip between the building at 2003 North King Street and Factory Street, and across the street at the edge of the parking lot at 1955 North King Street (Figure 5). These are both locations where Mr. Lau reportedly had soil removed. Three soil samples contained lead at greater than 10,000 mg/kg and one sample contained greater than 20,000 mg/kg lead. All were within one foot of the surface. One sample just beneath the asphalt in the center of Factory Street also contained greater than 10,000 mg/kg lead.

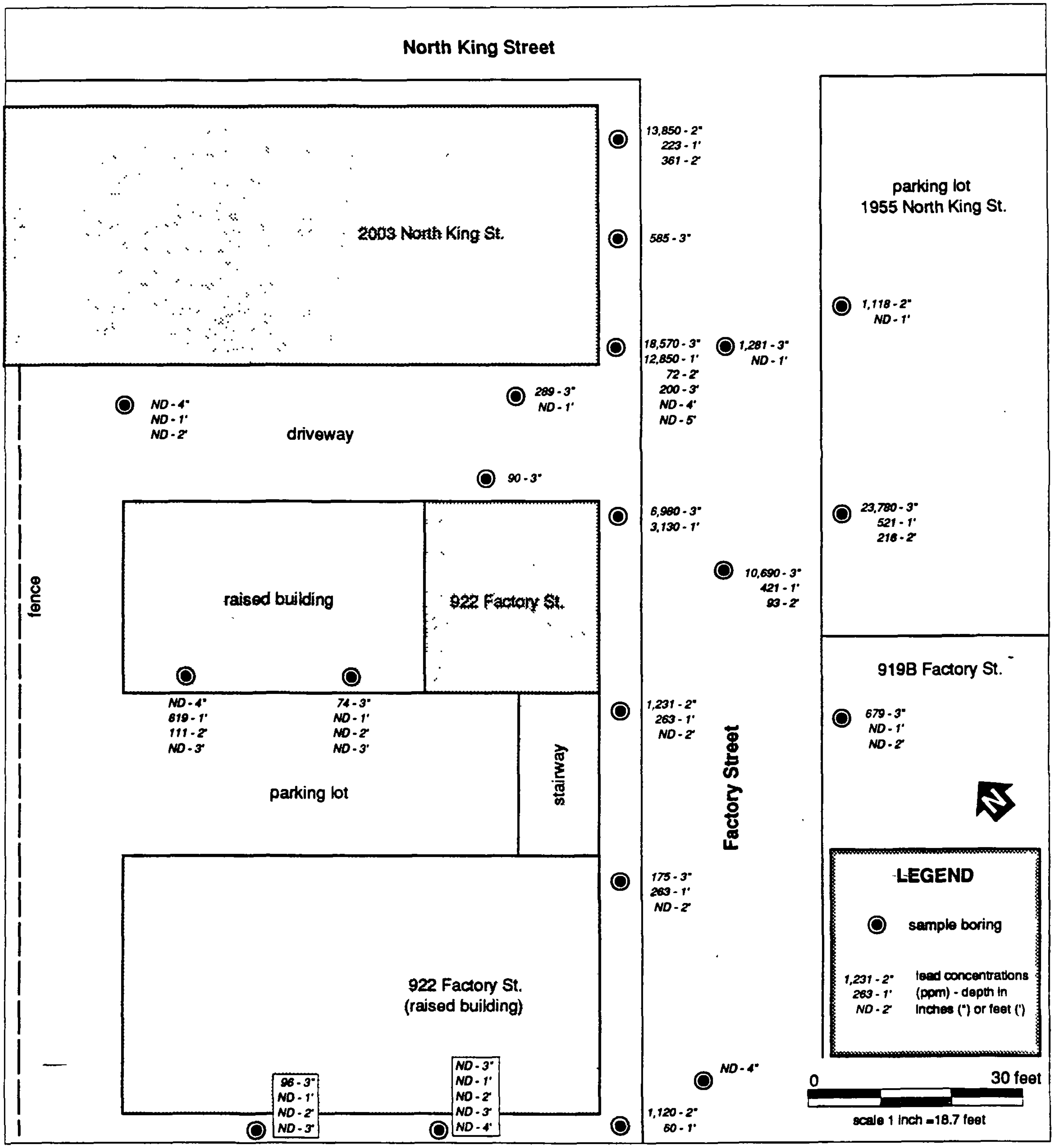
3.3.2 Off-Site Soil Samples

The TAT collected nine surface composite soil samples and drilled six soil borings within a three block radius of the site (Figure 6). The TAT concentrated sampling efforts in areas to the southwest of the site, which is the downslope or downgradient direction for surface water-born contamination migration. Background samples were collected to the northeast on Pulaa Street and Hani Lane. Most off-site samples were collected from roadside areas of exposed soil or gravel. Two borings were drilled in garden plots on parcels adjacent to the site (904 and 910 Factory Street). There were three objectives of off-site sample collection:



ecology and environment, inc.

Figure 4
TAT ON-SITE SOIL BORING LOCATIONS AND SAMPLE NUMBERS
Factory Street Lead Site
Honolulu, Hawaii



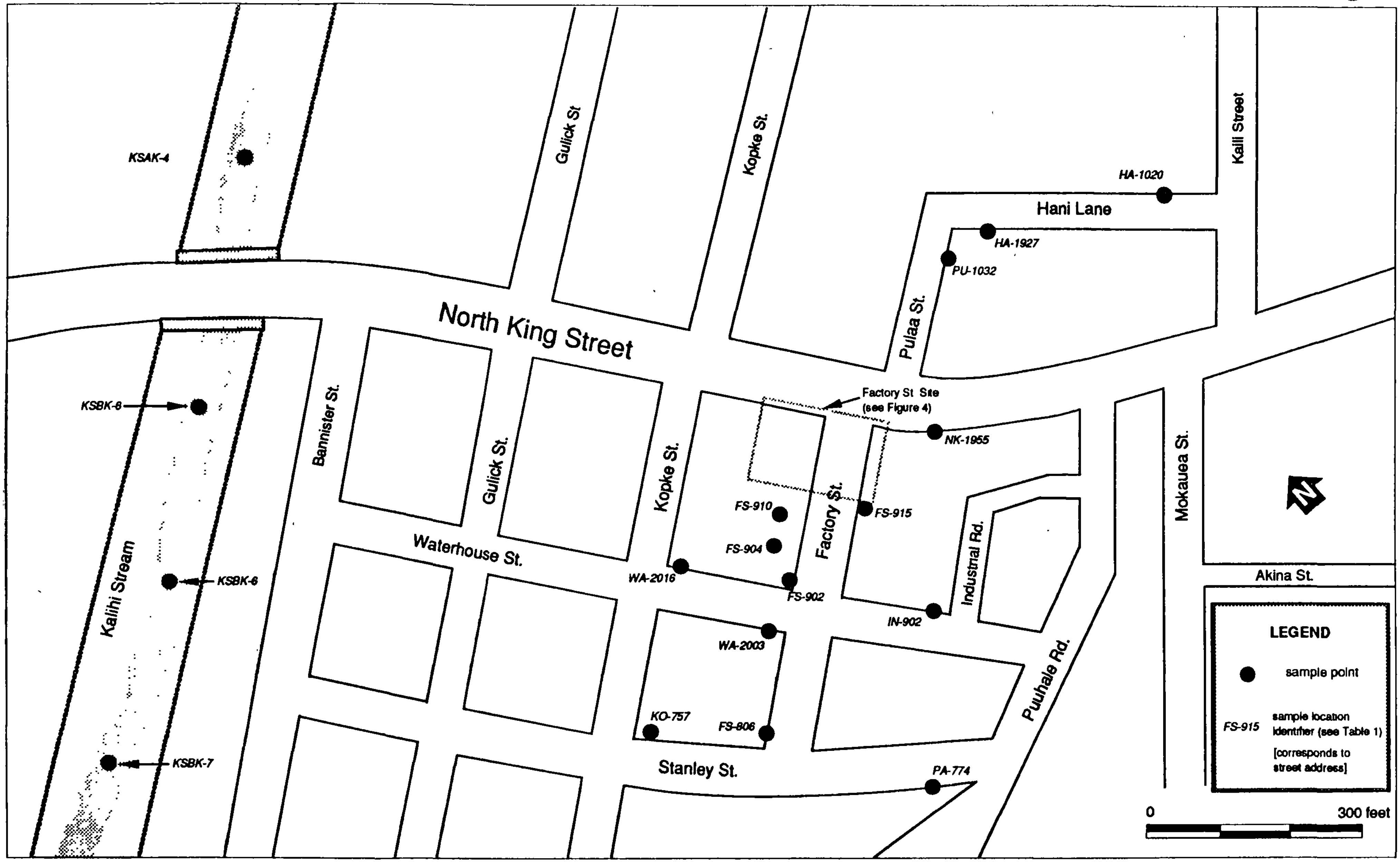
ecology and environment, inc.

Figure 5

TAT ON-SITE SOIL SAMPLE LEAD CONCENTRATIONS

Factory Street Lead Site

Honolulu, Hawaii



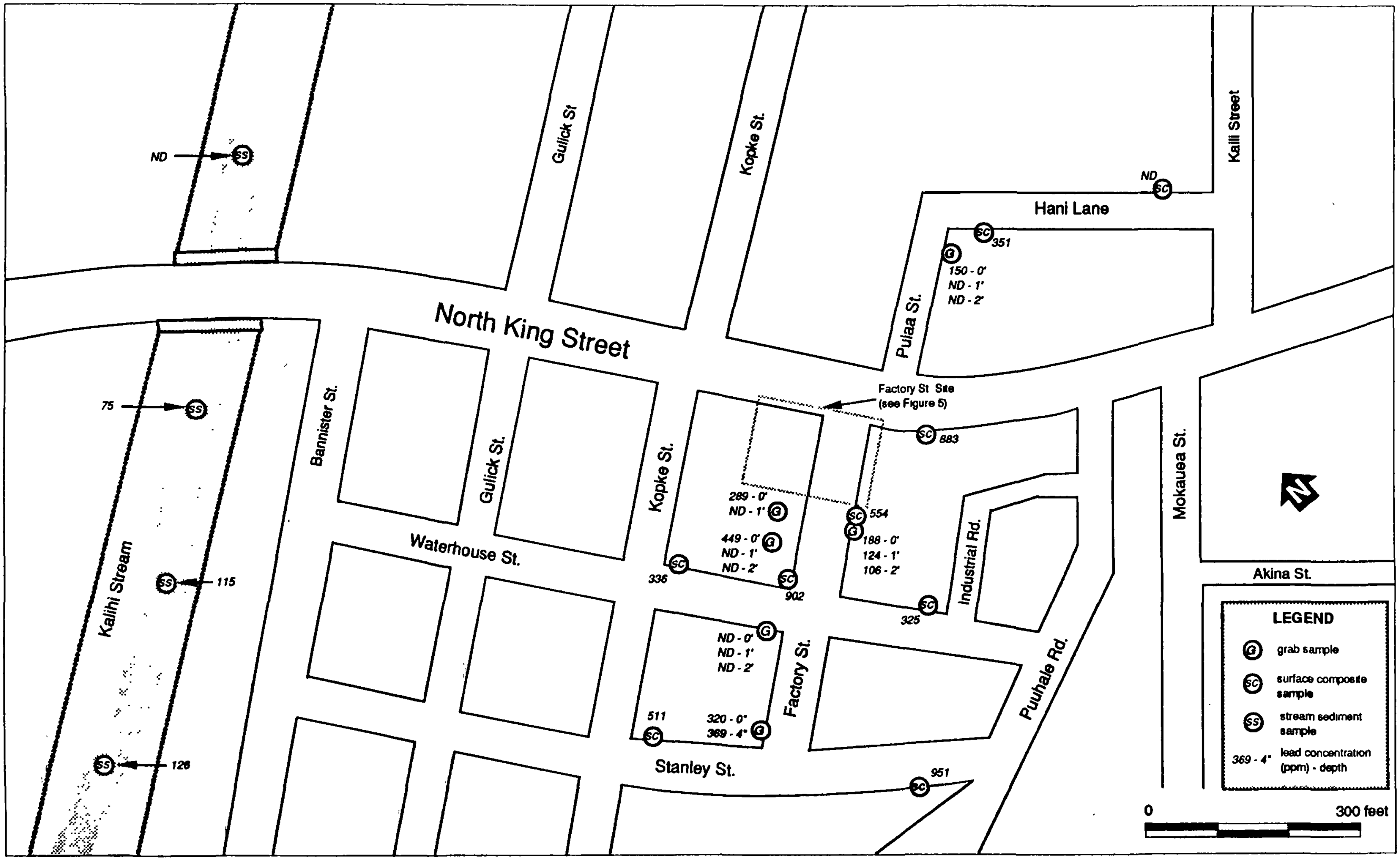
ecology and environment, inc.

Figure 6

TAT OFF-SITE SAMPLE LOCATION MAP

Factory Street Lead Site

Honolulu, Hawaii



ecology and environment, inc.

Figure 7

TAT OFF-SITE SOIL SAMPLE XRF LEAD CONCENTRATIONS

Factory Street Lead Site

- To determine if lead contamination originating at the site had migrated off site
- To determine whether any other lead contamination sources exist locally
- To establish background levels of lead concentrations in soil

XRF sample results indicate shallow lead contamination ranging from non-detect (ND) to 951 mg/kg (Figure 7). While some of the higher values were located adjacent to the site, there did not appear to be any consistent distribution pattern such as might be expected in a downgradient surface migration plume. The off-site sample with the highest value was collected at 774 Puuhale Street. That sample contained 951 mg/kg lead. The TAT noted a pile of three discarded automobile batteries located on the 774 Puuhale Street property within 20 feet of the sample location (Appendix A, Photo 5). Eight more discarded automobile batteries were noted approximately 100 feet to the northwest at 2003 Stanley Street. Other discarded batteries were noted scattered throughout the neighborhood.

The TAT believes that off-site lead contamination cannot be attributed to contamination originating at the Factory Street site. Based on XRF results, background lead levels in soil appear to range from ND to 500 mg/kg with anomalous values attributed to proximity to household battery disposal areas or major streets. The TAT considers these background lead levels to be normal for an urban environment based on experience at other sites.

3.3.3 <u>Stream Sediment Samples:</u>

During the TAT sampling event, the HEER collected four composite stream sediment samples in the Kalihi Stream bed (Figure 6). The Kalihi Stream is channeled by man-made walls at least 10 feet in height on both sides. There are no storm sewers in the site neighborhood; however, rain water runoff from the site flows into the stream through drain pipes in the wall of the stream channel.

The HEER collected one sample upstream from North King Street and three samples downstream. Results do indicate higher levels downstream (Figure 7); however, the values are lower than local background levels as determined in this sampling event. Lead contamination in Kalihi Stream could easily come from sources other than the site, such as runoff from North King Street related to historical use of leaded gasoline, lead paint, or from street corner automotive battery disposal.

3.3.4 pH Testing

The TAT conducted pH tests on 10 soil samples from the Factory Street site. The objective of these tests was to determine whether soil acidity might contribute to lead mobility. Extremely acidic or basic soil conditions are known to increase the mobility of lead in soil. Soil pH results are listed in Table 2. All samples tested were within one pH unit of 7.00 indicating neutral conditions. Acidity was therefore not a factor in lead mobility in soils at the site.

3.3.5 Confirmation Samples:

Confirmation sample results are explained fully in Appendix II. In general, confirmation sample results revealed higher lead levels in Factory Street site soils than did XRF sample results. The TAT believes that this is due primarily to the clay matrix of the soils. High density clay-rich soils, such as those found at the site, tend to reduce the response sensitivity of the XRF to metals in soil. As a result there may have been some false negatives. The TAT believes that confirmation sample data should not alter our conclusions or recommendations.

TABLE 3
pH Values of Selected Factory Street Soil Samples

Sample Identification Number	Soil pH
NK-2003-33-3"	7.20
NK-2003-34-1'	7.25
NK-2003-35-2'	6.90
NK-2003-36-3'	6.75
NK-1955-62-3"	7.53
NK-1955-63-1'	7.65
NK-1955-64-2'	7.41
NK-2003-66-2"	7.05
FS-922-69-3"	7.54
FS-922-70-1'	7.67

4.0 CONCLUSIONS

The analytical results of the assessment at the Factory Street Lead Site indicate that lead is present in shallow soils at above background levels. Sampling indicated limited areas of such contamination located in curbside strips along either side of Factory Street adjacent to 2003 North King Street, 922 Factory Street, and 1955 North King Street. These were areas where the landowner, Mr. Lau had reportedly removed contaminated soil and paved over exposed soil.

During a meeting with the EPA ERS, the EPA Investigation and Enforcement Section, the HEER, and the TAT, it was determined that, since all soils contaminated with lead were capped with asphalt, that there was no immediate threat to public health and no further federal involvement was warranted. Also, through a land title search conducted by the EPA Investigation and Enforcement Section, it was determined that no one officially claimed ownership to the contaminated land. Originally, the land had been owned by the Kalihi Taro and Land Company. The land was subsequently subdivided and sold and the Kalihi Taro and Land Company no longer exists. This means that the land which the street occupies has been abandoned. Currently, no local or state agency has laid claim to or accepted responsibility for Factory Street. The HEER considered ordering further cleanup, or placement of a deed restriction disallowing excavation on the property. However, Mr. Lau claimed that his property ends at the edge of his building or one inch into the curbside area, outside the area with lead values above background. Without further surveying or legal action, enforcement of additional cleanup by the HEER or other state agency would be difficult.

APPENDIX A

PHOTODOCUMENTATION

ECOLOGY AND ENVIRONMENT, INC.
Technical Assistance Team

Factory Street Lead Site - Honolulu, Hawaii

PAN: EHI0073-SB
Photographer: J. Whitaker

TDD: T099410-011
Date: 02-22-95

Photo 1: TAT collecting soil sample with hand auger at 915 Factory Street

ECOLOGY AND ENVIRONMENT, INC.
Technical Assistance Team

Factory Street Lead Site - Honolulu, Hawaii

PAN: EHI0073-SB
Photographer: J. Whitaker

TDD: T099410-011
Date: 02-23-95

Photo 2: TAT and HEER drilling to sampling depth with power auger in parking lot at 922 Factory Street

ECOLOGY AND ENVIRONMENT, INC.
Technical Assistance Team

Factory Street Lead Site - Honolulu, Hawaii

PAN: EHI0073-SB
Photographer: J. Whitaker

TDD: T099410-011
Date: 02-24-95

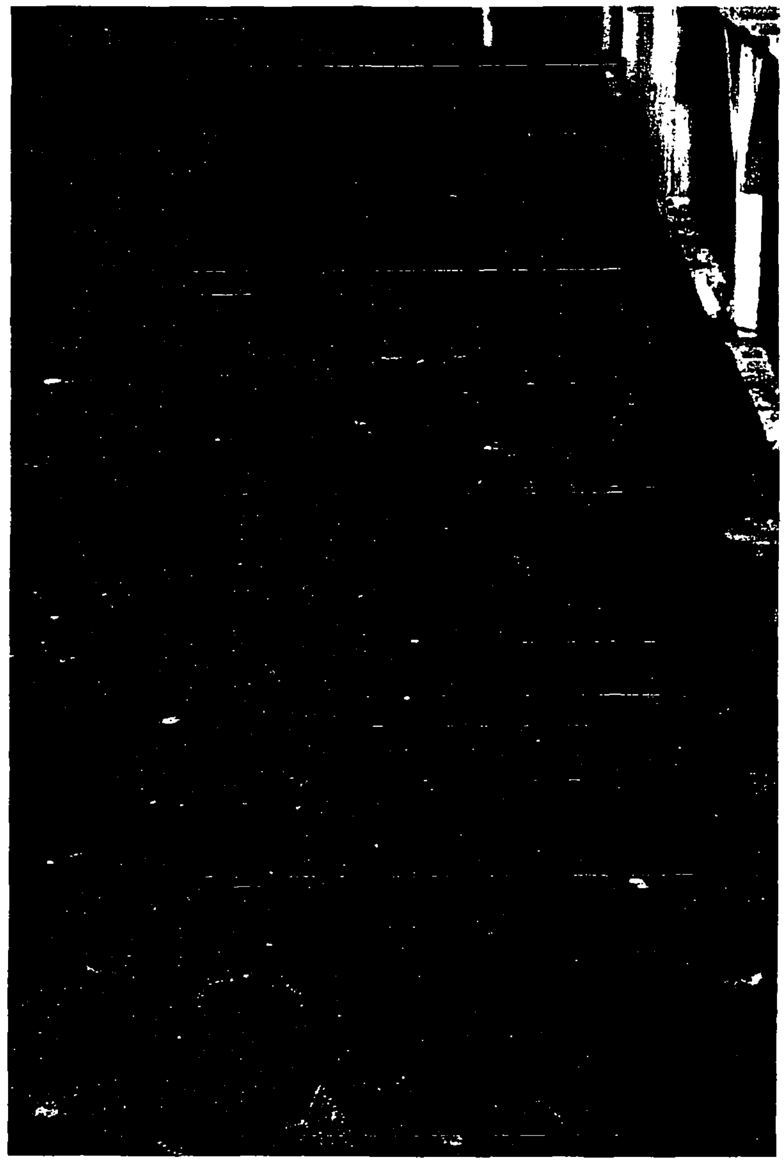


Photo 3: Parking lot at 2003 North King Street showing patched sample borings.

ECOLOGY AND ENVIRONMENT, INC.
Technical Assistance Team

Factory Street Lead Site - Honolulu, Hawaii

PAN: EHI0073-SB
Photographer: J. Whitaker

TDD: T099410-011
Date: 02-28-95

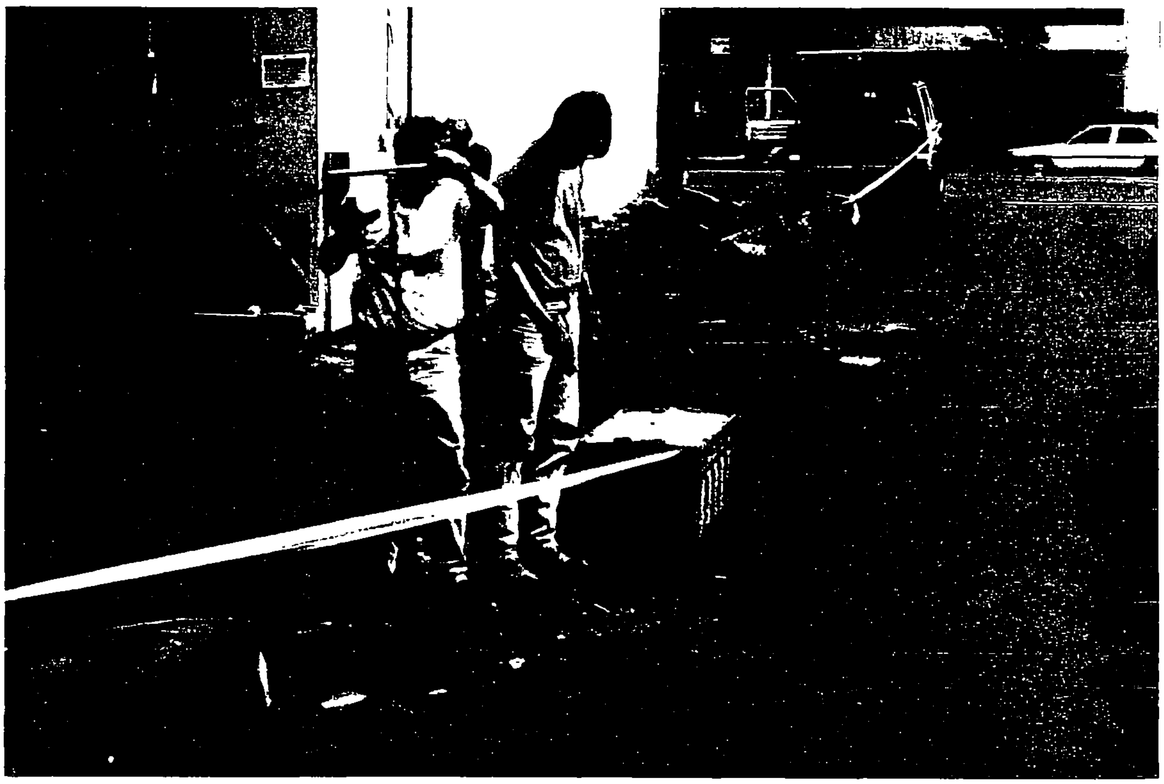


Photo 4: The TAT collecting soil samples beneath the asphalt in the center of Factory Street

ECOLOGY AND ENVIRONMENT, INC.
Technical Assistance Team

Factory Street Lead Site - Honolulu, Hawaii

PAN: EHI0073-SB
Photographer: J. Whitaker

TDD: T099410-011
Date: 02-28-95

Photo 5: Discarded batteries curbside on Stanley Street adjacent to 774 Puuhale Street.

APPENDIX B

XRF DATA REVIEW

Memorandum

To: *John Whitaker*

From: *Keith Kuerzel*

Date: *9/28/95*

Subject: *XRF Data Review for Factory Street Lead Site* *PAN: EHI0073SBA*

At the Factory Street Lead Site in Honolulu, HI the Spectrace 9000 field portable X-Ray Fluorescence (XRF) instrument was utilized between 2/22/95 and 3/1/95 to screen 86 soil samples for lead (Table 1). Over ten percent of the samples screened with the XRF were submitted for confirmatory analysis to the EPA Region IX laboratory in Richmond, California following all Contract Laboratory Program (CLP) protocols for sample handling and documentation. The samples were analyzed by Inductively Coupled Plasma (ICP), EPA method 6010 for lead only (report attached).

All XRF instrument performance criteria were checked daily and met the established performance requirements. Blanks, low-level standards, action level standards, and performance standards were all run daily. Action level check standards were analyzed after every ten samples and met the instrument performance requirements. All blanks, low level standards, and performance standards were within the plus or minus 50% expected concentrations.

The XRF data meet the TAT requirements for screening data. This data set correlated favorably with the CLP definitive data generated by the EPA lab with an r-value of .97 and thus meets Screening Plus 10% Definitive Data criteria. The intrument detection limit established for the site, based on a soil matrix blank, was 60mg/kg (ppm). Two false negative XRF results were exposed by the CLP data; SYE951 and SYE953. A blind field duplicate sample was submitted to test sample homogeneity and the two results were 14,900 and 19,000 a 28% difference which indicates a potential for matrix related error.

In Table 2 and in Chart 1 it is apparent that the XRF response was considerably lower than the ICP response to lead in the samples. The slope of the linear regression plot is 4.51, outside of the recommended slope value of >0.5 to <2.0. The TAT believes that this is related to matrix interferences of the soils collected. The samples were dense, saturated clays which made homogenization difficult if not impossible and high moisture content is a documented interference for XRF analysis. When the samples were dried in an oven and reanalyzed there was no appreciable increase in instrument response but this could be related to a number of interrelated matrix, sample handling, and analyte factors. The data is accepted by the TAT because of the high r-value (.97) which shows that the XRF and CLP data are directly related and can be converted using the linear equation of the line expressed as:

$$\text{ICP Result} = (4.51)\ \text{XRF Result} + (-1176).$$

Table 1
Factory Street Lead Site
Analytical Results

SAMPLE ID	XRF RESULT	CLP ID	CLP RESULT
	Pb - ppm		Pb - ppm
	ND = < 60		ND = < 7.1
PU-1032-1-0'	150		
PU-1032-2-1'	ND		
PU-1032-3-2'	ND		
KSAK-4	ND		
KSBK-5	75		
KSBK-6	115	SYE949	207
KSBK-7	126		
FS-915-8-0'	188		
FS-915-9-1'	124		
FS-915-10-2'	106		
WA-2003-11-0'	ND		
WA-2003-12-1'	ND		
WA-2003-13-2'	ND	SYE950	ND
FS-806-14-0'	320		
FS-806-15-4"	369		
FS-919B-16-3"	679		
FS-919B-17-1'	ND		
FS-919B-18-2'	ND		
NK-2003-19-3"	289		
NK-2003-20-1'	ND		
NK-2003-21-4"	ND		
NK-2003-22-1'	ND		
NK-2003-23-2'	ND		
FS-910-24-0'	289		
FS-910-25-2'	ND		
FS-904-26-0'	449		
FS-904-27-1'	ND		
FS-904-28-2'	ND		
FS-922-29-3"	74		
FS-922-30-1'	ND	SYE951	172
FS-922-31-2'	ND		
FS-922-32-3'	ND		
NK-2003-33-3"	18570		
NK-2003-34-1'	12850	SYE952	37400
NK-2003-35-2'	72		
NK-2003-36-3'	200		
NK-2003-37-4'	ND	SYE953	308
NK-2003-38-5'	ND		
NK-2003-39-3"	90		
FS-922-40-4"	ND	SYE954	27
FS-922-41-1'	619		
FS-922-42-2'	111		
FS-922-43-3'	ND		
FS-922-44-3"	ND		

Table 1
Factory Street Lead Site
Analytical Results

SAMPLE ID	XRF RESULT	CLP ID	CLP RESULT
	Pb - ppm		Pb - ppm
	ND = < 60		ND = < 7.1
FS-922-45-1'	ND		
FS-922-46-2'	ND		
FS-922-47-3'	ND		
FS-922-48-4'	ND		
FS-922-49-3"	96		
FS-922-50-1'	ND		
FS-922-51-2'	ND		
FS-922-52-3'	ND		
HA-1927-53-SC	351		
HA-1020-54-SC	ND		
NK-1955-55-SC	883		
FS-915-56-SC	554		
FS-902-57-SC	902		
IN-902-58-SC	325		
WA-2016-59-SC	336		
KO-757-60-SC	511		
PA-774-61-SC	951		
NK-1955-62-3"	23780	SYE955	117000
NK-1955-63-1'	521		
NK-1955-64-2'	216		
NK-2003-65-3"	585		
NK-2003-66-2"	13850		
NK-2003-67-1'	223		
NK-2003-68-2'	361		
FS-922-69-3"	6980		
FS-922-70-1'	3130	SYE956	4710
FS-922-71-2"	1231	SYE957	14900
FS-922-72-1'	263		
FS-922-73-2'	ND		
FS-922-74-3"	175		
FS-922-75-1'	263		
FS-922-76-2'	ND		
FS-CTR-77-3"	10690		
FS-CTR-78-1'	421	SYE958	1820
FS-CTR-79-2'	93		
FS-CTR-80-3"	1281		
FS-CTR-81-1'	ND		
FS-922-82-2"	1120		
FS-922-83-1'	60		
FS-CTR-84-4"	ND		
NK-1955-85-2"	1118		
NK-1955-86-1'	ND		

Table 2
Factory Street Lead Site
CLP and XRF Data Sets
Statistical Data

SAMPLE ID	CLP ID	ICP RESULT	XRF RESULT
		Pb - ppm	Pb - ppm
KSBK-6	SYE949	207	115
WA-2003-013-2'	SYE950	<7.1	<60
FS-922-030-1'	SYE951	172	<60
NK-2003-034-1'	SYE952	37400	12854
NK-2003-037-4'	SYE953	308	<60
FS-922-040-4"	SYE954	27	<60
NK-1955-062-3"	SYE955	117000	23784
FS-CTR-078-1'	SYE958	1820	421
FS-922-070-1'	SYE956	4710	3134
FS-922-090-2"	SYE959	14900	1231
FS-922-071-2"	SYE957	19000	1231

SUMMARY OUTPUT						
Regression Statistics						
Multiple R	0.97176243					
R Square	0.94432222					
Adjusted R Square	0.9373625					
Standard Error	9221.53488					
Observations	10					
ANOVA						
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	1	11538111841	1.1538E+10	135.6839	2.6884E-06	
Residual	8	680293644.5	85036705.6			
Total	9	12218405485				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1176.6265	3334.269124	-0.3528889	0.733289	-8865.469877	6512.2168
X Variable 1	4.50746464	0.386961867	11.6483432	2.69E-06	3.615128397	5.3998008

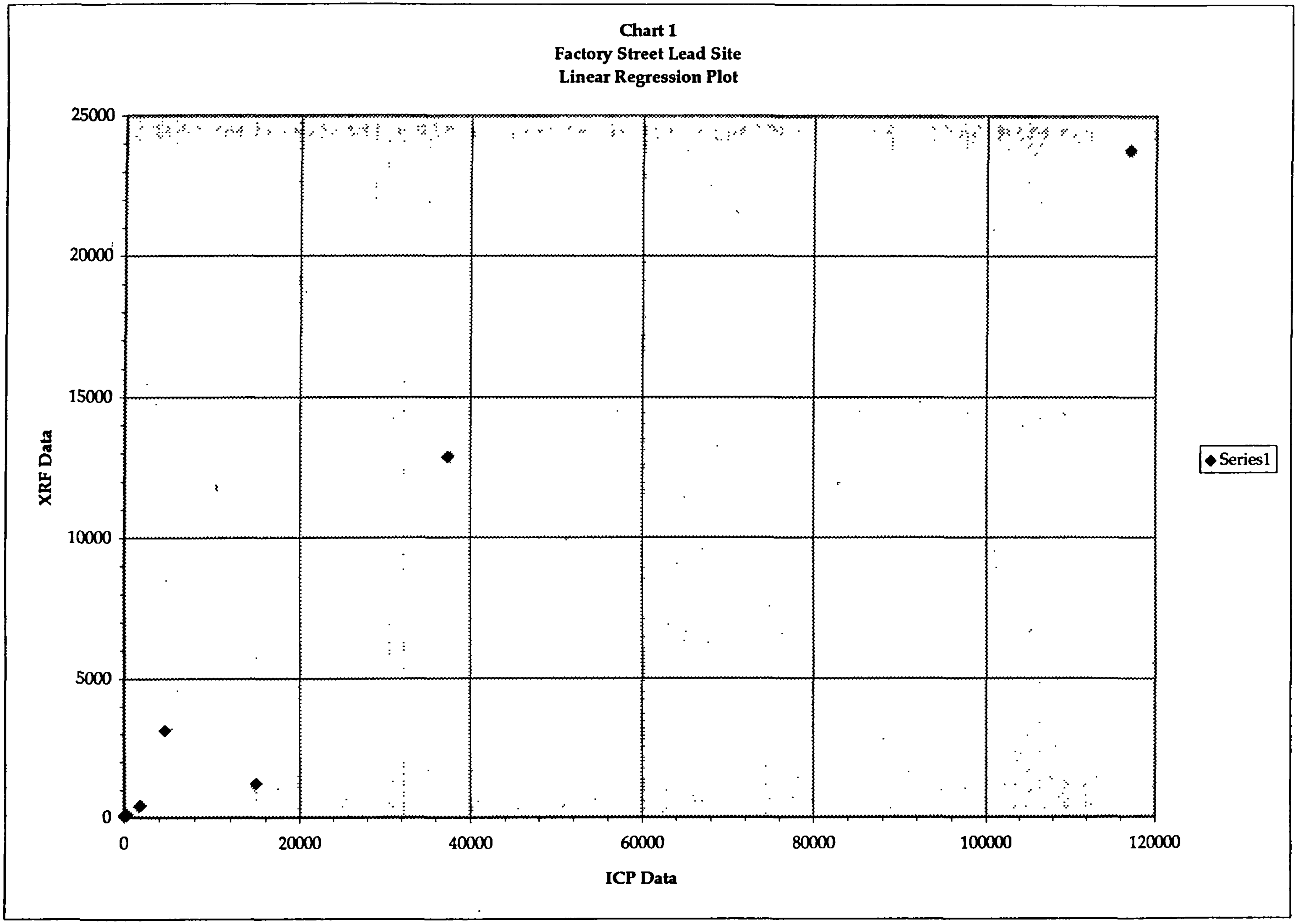


Chart 1
Factory Street Lead Site
Linear Regression Plot
XRF Data
ICP Data
25000
20000
15000
10000
5000
0
0
20000
40000
60000
80000
100000
120000
Series1

APPENDIX C

WORK PLAN AND
QUALITY ASSURANCE SAMPLING PLAN

Technical Assistance Team

Work Plan and
Quality Assurance Sampling Plan

Factory Street Lead Site Assessment
Honolulu, Hawaii

TAT No.: 099409-T-001
TDD No.: T09-9410-011
PAN No.: EHI-0073-SBA

U.S. Environmental Protection Agency
Contract No.: 68-WO-0037

Prepared By:

Keith Kuerzel
Ecology & Environment, Inc.

November 16, 1994

TABLE OF CONTENTS
QUALITY ASSURANCE SAMPLING PLAN

TOPIC		PAGE
1.0	Introduction	1
2.0	Background and Site Description	1
3.0	Data Use Objectives	3
4.0	Quality Assurance Objectives	3
5.0	Approach and Sampling Methodologies	4
	5.1 Sampling Rationale	4
	5.2 Sample Collection	4
	5.3 Sampling Equipment	4
	5.4 Field QA Samples	5
	5.5 Sample Handling and Equipment	5
	5.6 Sampling Equipment Decontamination	6
	5.7 Sample Documentation	7
	5.7.1 Field Logbook	7
	5.7.2 Sample Labels	8
	5.7.3 Chain of Custody Form	8
	5.7.4 Custody Seals	8
	5.8 Sample Numbering	8
6.0	Schedule of Sampling Activities	9
7.0	Analytical Methods and Procedures	9
	7.1 Field Screening: XRF	9
	7.2 Soil pH Testing	10
8.0	Project Organization and Responsibilities	10
9.0	Quality Assurance Requirements	10
	9.1 Screening Data	11
	9.2 Screening Plus 10% Definitive Date	11
	9.3 Definitive Data	11
10.0	Deliverables	12
	10.1 Quality Assurance Sampling Plan and Work Plan	12
	10.2 Data Validation Report	12
	10.3 Final Report	13
11.0	Site Assessment Objectives	13
Figure 1.		14
Figure 2.		15
Appendix A: XRF Standard Operating Procedures		
Appendix B: Soil pH Standard Operating Procedures		

1.0 INTRODUCTION

On July 11, 1994 the Environmental Protection Agency (EPA) Emergency Response Section (ERS) tasked the Zone II, Region IX Technical Assistance Team (TAT) to conduct a site assessment at the Factory Street Lead Site in Honolulu, Hawaii. Of concern was the presence of lead in soils at an apartment complex and the surrounding neighborhood. Investigations conducted by the State of Hawaii Department of Health (DOH) Human Services Branch and Hazard Evaluation and Emergency Response (HEER) Branch determined that residents at the site had been exposed and contamination was a potential threat to groundwater.

In accordance with the EPA directive, the TAT has developed this Work Plan and Quality Assurance Sampling Plan to assess the extent and magnitude of lead contamination at the site. The TAT will collect soil samples from the surface and at depth in the vadose zone using hand augers and hand operated power augers. The HEER has agreed to be responsible for property access and cuttings disposal.

The samples will be analyzed for lead on site with a portable X-ray fluorescence spectrometer (XRF). Confirmation of these results will be obtained by submitting 10 percent of the samples to an approved laboratory. Soil samples will also be tested for pH to assist in determining if conditions exist that will effect mobility of lead ions.

2.0 BACKGROUND AND SITE DESCRIPTION

The Factory Street Site is located in the general area of 2003 North King Street at the corner of Factory and King Streets in the Kalihi Subdivision, City and County of Honolulu, Island of Oahu, Hawaii (Figure 1). The site is now occupied by a small apartment complex and several small shops. In April of 1993 two children living in the apartments were found to have lead levels of 33 micrograms per deciliter (μg/dl) in blood samples taken by their physician. These values exceeded the Center for Disease Control's blood lead level of concern of 10 μg/dl. The State of Hawaii DOH and HEER conducted a follow-up study to determine the source of the lead exposure in the Fernandez household (Apartment H) on April 28, 1993. The family was interviewed and samples were collected of wall paint, vacuum cleaner bag dust, and drinking water. Soil samples were collected from four areas of exposed soil around the apartment complex where the children played (Figure 2). The results indicated high lead levels in the soils and vacuum cleaner bag dust. Lead in soil samples ranged from 41,000 mg/kg to 342,000 mg/kg. The vacuum cleaner bag dust contained 6,400 mg/kg of lead. On June 1, 1993 the family was relocated. Sampling continued through August 1993 and on August 24, 1993 an Emergency Response

Order was issued to the landowner, Mr. Merton S. C. Lau, who complied with the order by paving the "hotspots" after removing contaminated soils to a depth of approximately 6 to 12 inches.

On August 26, 1993 a citizen who grew up in the affected area called the HEER and identified the "Kalihi Pawn Shop," currently located at 2003 N. King St., as having once been the site of a fishing supply store. Mr. Ronald Ahina reported that "Kalihi Fishing Supply" dumped lead ash from the manufacture of sinkers from at least 1955 through 1966. It is believed that the lead was derived from discarded automobile batteries in the form of elemental lead and lead sulfate.

The TAT has also learned, through investigations conducted by the HEER, that an automobile battery rebuilding shop existed at a gas station at 919 B Factory Street across the street from the fishing supply shop (Figure 2). Battery rebuilding operations took place between approximately 1962 and 1970. According to the HEER, soil samples were collected during removal of an underground storage tank (UST) at the site. Analytical results confirmed the presence of lead in subsurface soils adjacent to the UST.

The HEER collected six soil samples in a two block radius around the site on June 6, 1993, which revealed high lead levels (Figure 2). Values ranged from 168 mg/kg to 1,170 mg/kg. Typical background lead levels for soils in this area are not known; they will be determined during the upcoming sampling event. The lateral limits of contamination may have not been found at the Factory Street site. It is also possible that other sources for lead contamination exist in the area. The TAT observed curbside abandonment of automobile batteries during a reconnaissance visit in April 1994. No other industrial sources in the immediate area are known.

The HEER has expressed concern that lead contamination may be impacting groundwater beneath the site and surface water in the Kalihi Stream located approximately 2000 feet to the south of the site. According to HEER estimates, the upper Kalihi aquifer lies at a depth of approximately 9 feet beneath the site. It is not currently used for drinking water. The basal lower Kalihi aquifer begins at approximately 128 feet below ground surface (bgs). There are three drinking water wells in this aquifer located between 0.5 and 1.0 miles from the site. These wells are upslope to the east and at a similar elevation to the southeast. The direction of shallow groundwater flow at the site is not known but is suspected to be to the southwest (downslope towards the ocean). There are no known monitoring wells within the area previously sampled by the HEER.

The Kalihi Stream lies approximately 1.5 miles to the west of the site and flows southwest into Keehi Lagoon. Storm runoff from the Factory Street neighborhood flows on the surface to collection drains which empty directly into the stream. Residents utilize Keehi Lagoon for fishing and recreational activities.

3.0 DATA USE OBJECTIVES

The TAT will collect soil samples beneath the parking lots at 2003 King Street and in the neighborhood surrounding the site. For this phase of the investigation, samples will be collected in soils above groundwater only. The sample data will be used to determine:

- The presence, magnitude, and vertical extent of lead contamination in soils above groundwater at 2003 N King St.
- The lateral extent of lead contamination in shallow soils in the Factory Street neighborhood.
- Background lead concentrations in the area.

Analysis of samples collected beneath the parking lots at 2003 N. King Street will help determine the effectiveness of cleanup activities completed by Mr. Lau. Also, samples will be collected at various depths down to the water table. This strategy will help determine whether lead contamination is threatening or has entered the saturated soils of the upper Kalihi aquifer. At other locations in the surrounding neighborhoods soil samples will be collected at the surface and at shallow depths. This data will help determine the lateral extent of contamination originating at the Factory Street site. This data may also indicate whether other sources exist. Background samples will be collected from locations in the neighborhood but away from direct surface water and prevailing wind pathways. Prevailing winds blow from the north and surface water flows down Factory Street southwest to Stanley Street, then northwest to Kalihi Stream (Figure 2). Please see section 5.0 for sample collection details.

Results of TAT sampling and analysis will be used to determine whether further action by the EPA ERS will be necessary. Such actions could include removal and disposal of lead-contaminated soil and investigation of potential groundwater contamination. Levels and quantities of contaminated soil at which these actions will be implemented will be determined by the EPA ERS after analytical results are confirmed, reviewed, and compared to background levels found in the area.

4.0 QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives for this assessment were determined following the requirements stated in "Data Quality

Objectives Process for Superfund" Interim Final Guidance, September, 1993, EPA/540/G-93/071, Publication No. 9355.9-01. They are outlined below in Table 1.

Table 1
Quality Assurance Objectives

Parameter	Matrix	Data Use	QA Objective
Total Lead XRF	Soil	Site Characterization	Screening +10%
Total Lead 6010 (CLPAS-ICP)	Soil	Site Characterization and Screening Data Confirmation	Definitive

5.0 APPROACH AND SAMPLING METHODOLOGIES

5.1 SAMPLING RATIONALE

Due to anticipated difficulties of accessing sample locations throughout residential areas the sampling design is non-probabilistic. The EPA Region IX Preliminary Remediation Goal (PRG) for lead is 400 ppm (August 1994) and this will function as a cleanup level in the absence of site specific guidance. Sampling locations will be determined by the EPA OSC and TAT project manager in the field and will extend beyond the two block radius of the previous HEER efforts. Sampling efforts will focus on the residential neighborhood surrounding 2003 North King Street and the area between the Factory Street site and Kalihi Stream with the goal of determining if lead contamination may have been carried off site by surface water or wind. Samples collected at 2003 North King Street will have the primary goal of determining whether the property owner removed all soil contaminated by lead at levels above 400 ppm (the stated goal) and the depth of lead contamination and whether groundwater may have been impacted or is threatened.

XRF field screening results will be the primary criteria for directing sampling efforts. For example, when areas of concentrations above the PRG for lead of 400 ppm are bounded by samples below the PRG, sampling activities will be concluded for that location. A higher concentration decision level may be assigned if it is determined that background levels samples

Other criteria for determining sampling locations will include access issues, augering equipment limitations, time restrictions, and historical information provided by individuals and agencies previously involved in this site. For these reasons statistical analysis of the results will not be necessary.

5.2 SAMPLE COLLECTION

Six soil grab samples (0,2,4,6,8,10 feet bgs) will be collected at up to ten locations at 2003 N. King street. Surface composite samples will be collected at approximately 30 locations in surrounding neighborhoods. Approximately 90 to 100 samples will be collected for screening. Of these, approximately 10 samples will be submitted for confirmation analysis. Sampling locations will consist of areas of "likely human exposure" such as schoolyards, parks, exposed soil on streetcorners, residential yards, and drainage channels. Additional samples may be collected as requested by the OSC, the HEER, or the TAT project manager.

5.3 SAMPLING EQUIPMENT AND CONTAINERS

Surface samples will be collected with clean trowels. Any sample compositing will be done in dedicated paper buckets. A stainless steel soil auger will be used to collect soil samples at two, four, six, eight, and ten feet bgs. Where hardened soil exists, a hand operated power auger will be used to advance the sample boring to the top of the desired sample depth. The samples to be shipped for laboratory analysis will be transferred to eight ounce jars and handled as described in section 5.5.

Table 2
Sampling Equipment

Parameter	Sampling Equipment	Fabrication	Dedicated
Total Lead by XRF; Lead by EPA Method 6010, (CLPAS-ICP)	Hand Auger Slam Bar Trowel Composite Bucket #10 Sieve	Stainless Steel Stainless Steel Steel Paper Stainless Steel	No No No Yes No

5.4 FIELD QA SAMPLES

The project manager (PM) will select at least 10 percent of the total number of screening samples for confirmatory analysis by the EPA Region IX laboratory. The PM will select at a minimum the three highest concentration samples, three non-detect samples, and two samples with lead concentrations near the XRF instrument quantitation limit of approximately 90 mg/kg. Confirmatory analyses will be by Inductively Coupled Plasma (ICP), EPA Method 6010, for total lead. The field duplicate samples will be randomly picked from the samples sent to the lab. The background sample will be collected at a location outside of the contaminant plume as delineated by field screening results. Matrix spike/matrix spike duplicate sample(s) will be designated by the PM in the field and will be confirmed as medium level samples with the XRF. Equipment blank samples will be collected as deionized water rinsate after the last decontamination rinse of augering equipment at the frequency of one per piece of sampling equipment per day.

5.5 SAMPLE HANDLING AND SHIPMENT

TAT personnel will prepare samples for XRF screening by passing each sample through a number 10 sieve and returning the sample to the collection bag. If the sample is wet, the sample will be mixed as best as possible and a subsample collected by compositing from at least three different locations within the bag. One duplicate per day will be prepared using this method to check for sample homogeneity and subsample collection precision. The subsample will then be dried in an oven, sieved, and then placed in a small poly bag. The TAT will thoroughly mix all samples in their poly bags by shaking prior to analysis. Field samples will be stored in a cooler while awaiting XRF screening. Samples selected for laboratory confirmation will be sealed in 8 oz. jars and labeled according to the following protocol. Bottle labels will contain all required information including site name and sample number, time and date of collection, analysis requested, and preservative used. Caps will be secured with custody seals. Sealed bottles will be placed in large metal or plastic coolers along with double-bagged ice, and padded with cushioning materials such as bubble wrap, or popcorn.

A chain of custody form will be completed as described in Section 5.7 and affixed to the underside of each cooler lid. The lid will be sealed and affixed on three sides with custody seals so that any sign of tampering will be easily visible. Containers and preservatives are listed in Table 3.

Table 3
Containers & Preservation

Matrix	Analysis	Container	Preservative	Holding Time
Soil	Total Lead Screening	32-oz poly bag	4°C, cool	6 months
Soil	Total Lead	8-oz widemouth jar	4°C, cool	6 months
Water (Rinsate Blanks)	Total Lead	1-Liter poly bottle	4°C, cool	6 months

5.6 SAMPLING EQUIPMENT DECONTAMINATION

The decontamination procedure for sampling equipment will be as follows:

1) Detergent wash and scrub
2) Potable water rinse
3) Distilled water rinse
4) Air dry

5.7 SAMPLE DOCUMENTATION

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialling the error.

5.7.1 Field Logbook

The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries will be dated and signed by the individuals making the entries, and should include the following:

1. Site name and project number.
2. Names of personnel on-site.
3. Dates and times of all entries (military time preferred).
4. Descriptions of all site activities, including site entry and exit times.
5. Noteworthy events and discussions.

6. Weather conditions.
7. Site observations.
8. Identification and description of samples and locations.
9. Subcontractor information and names of on-site personnel.
10. Date and time of sample collections, along with chain of custody information.
11. Record of photographs.
12. Site sketches.

5.7.2 Sample Labels

Sample labels will include the following:

1. Site name and number.
2. Time and date sample was taken.
3. Sample preservation.
4. Analysis requested.
5. Sample ID Number
6. Sample Location

Sample labels will be securely affixed to the sample container. Tie-on labels can be used if properly secured.

5.7.3 Chain of Custody Form

A Chain of Custody Form will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a Custody Seal.

The Chain of Custody Form should include the following:

1. Sample identification number.
2. Sample matrix.
3. Sample location.
4. Sample date.
5. Name(s) and signature(s) of sampler(s).
6. Signature(s) of any individual(s) with custody of samples.
7. Project Number.
8. Deliverables requirements.
9. Type of analysis required.
10. Sample type (composite or grab).
11. Name, address, and phone number of individual(s) to receive results, raw data package, and billing correspondence.

5.7.4 Custody Seals

Custody Seals demonstrate that a sample container has not been tampered with or opened.

The individual in possession of the samples will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

5.8 SAMPLE NUMBERING

Each sample will be labeled with a two-letter street name designator followed by an address number, a sequential number, and the sample depth. Where street addresses are not available or inappropriate, another descriptive designator will be added such as the abbreviated name of a park or school. The sequential number will start from the number one with each sample given a unique number. The depth for each sample will be indicated by the top of the sample interval. For example, the first sample collected during the assessment at 2003 North King Street from a depth of 0 to 6 inches will be numbered as follows:

NK-2003-001-0"

The exact location of the sample will be logged in the log book and marked on a field map. Measurements to permanent structures will be taken when possible. Field duplicate samples will be labeled F-100 and the background sample will be labeled B-1.

6.0 SCHEDULE OF SAMPLING ACTIVITIES

The proposed work schedule is presented in Table 4.

Table 4
Proposed Schedule of Work

Activity	Start Date	End Date
Pre-Mobilization Planning Sampling Plan Preparation	11-01-95	02-20-95
Field sampling and Spectrace analysis for field screening	02-21-95	03-10-95
Soil sampling for laboratory confirmation	02-21-95	03-10-95
Lab Analysis - Verbal - Written	TBD	TBD

TBD - To Be Determined

7.0 ANALYTICAL METHODS AND PROCEDURES

7.1 FIELD SCREENING: X-RAY FLUORESCENCE SPECTROMETER (XRF)

All collected samples will be submitted to a TAT member who will use the Spectrace 9000 field-portable XRF instrument to analyze the soil to determine the lead concentration. The TAT will follow the U.S. EPA Environmental Response Team (ERT) Response Engineering and Analytical Contract (REAC) SOPs as presented in Appendix A.

The sample analyses will be performed after instrument performance procedures and quality control checks have been completed and documented in the instrument logbook. An instrument duplicate, sand blank and lead standard will be analyzed after every 10 samples. The QC samples will be used to determine method detection limits, variance of standard analysis, and relative accuracy. The TAT will analyze a single sample ten times to determine the matrix related precision.

The TAT will be primarily concerned with the lead concentration of the soil samples, however the TAT will monitor and document elevated concentrations of other metallic elements present in soil.

After analyses of soil in poly bags, the bags will be sealed and stored at or below 4 degrees Celsius for potential use as confirmatory samples.

7.2 *SOIL PH TESTING*

Each sampling location will be tested for pH of soils to assist in determining the potential leachability/mobility of lead ions. American Society of Testing Methods (ASTM) method D-4972-89 "Standard Test Method for pH of Soils" (Appendix B) will be used in determining soil pH. This method utilizes a pH probe to test soils in a suspension of deionized water and calcium chloride solution.

8.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator William Lewis will provide overall direction to Ecology and Environment staff concerning project sampling needs, objectives and schedule.

The Ecology & Environment Project Manager John Whitaker is the primary point of contact with the EPA On-Scene Coordinator. The project manager is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables.

The Ecology And Environment Site QC Coordinator Keith Kuerzel is responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Site QC Coordinator is also the primary project team contact with the lab.

The following personnel will work on this project:

Personnel	Responsibility
William Lewis	EPA On-Scene Coordinator
John Whitaker	Project Manager
Keith Kuerzel	QA/QC Officer, Site Safety Officer
Eric Hamrick	XRF Operator, sampling support

9.0 QUALITY ASSURANCE REQUIREMENTS

The following requirements apply to the respective QA Objectives and parameters identified in Section 3.0 and apply to analyses performed by TAT and contracted laboratories:

9.1 SCREENING DATA

The following QA Protocols for screening data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks and appropriate field data sheets. Chain-of-custody records are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the instrument logbook.

3. The detection limit will be determined and recorded, along with all data generated, in the instrument logbook.

4. Analytical error determination in the form of replicate samples must be performed on at least one sample per batch.

9.2 SCREENING PLUS 10% DEFINITIVE DATA

The following QA Protocols for this QA level data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks and appropriate field data sheets. Chain-of-custody records are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the instrument logbook.

3. The detection limit will be determined and recorded, along with all data generated, in the instrument logbook.

4. Analytical error determination in the form of replicate samples will be performed on 10 percent of the samples.

5. Ten percent of the samples must be confirmed with definitive data. All confirmatory measurements must be within the range of 50% - 200% of the field measurement to be considered confirmatory.

9.3 DEFINITIVE DATA

The following QA Protocols for Definitive data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, appropriate field data sheets and chain-of-custody forms.

2. Initial and continuing calibrations will be documented.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

4. Analytes will be identified and quantified.

5. QC blanks will be analyzed.

6. Matrix spike recoveries will be documented.

7. Analytical error determination in the form of replicate samples must be performed on 10 percent of the samples.

8. Total measurement error documenting the precision of the measurement system from sample acquisition through analysis will be determined

10.0 DELIVERABLES

The Ecology And Environment Project Manger John Whitaker will maintain contact with the EPA On-Scene Coordinator William Lewis to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

10.1 QUALITY ASSURANCE SAMPLING PLAN AND WORK PLAN

This report is meant to fulfill the requirement for this report. It is due in final form by December, 31 1994 so as to be used as a field document.

10.2 DATA VALIDATION REPORT

All data generated under this plan will be validated with the criteria contained in the Removal Program Validation Procedures which accompany OSWER Directive #9360.4-1. The assessment of data acceptability or useability will be provided separately, or as part of the analytical report.

The data validation report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain of custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

10.3 FINAL REPORT

A final report will be prepared to correlate available background information with data generated under this sampling event and identify supportable conclusions and recommendations which satisfy the objectives of this sampling QA/QC plan. A draft report will be submitted before the final report if so requested by the OSC.

11.0 SITE ASSESSMENT OBJECTIVES

OBJECTIVE 1: Prepare QASP; prepare work plan.

OBJECTIVE 2: Mobilize to site; recon. site; stage equipment.

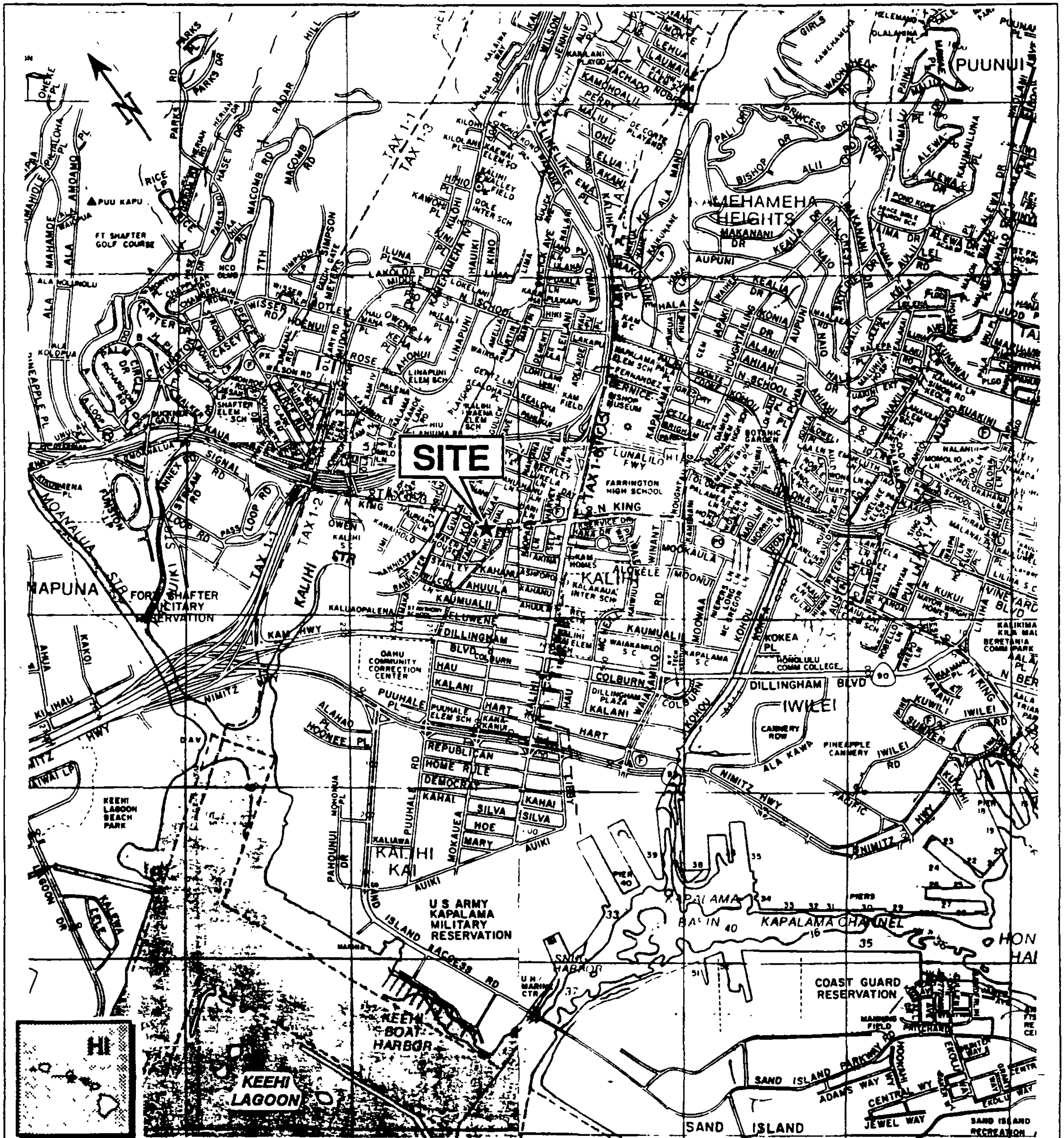
OBJECTIVE 3: Sample collection and field analysis with XRF. Selection and containerization of soil samples for laboratory confirmation.

OBJECTIVE 4: Search out and document sources of potential lead contamination.

OBJECTIVE 5: Demobilization and shipment of samples to EPA Region IX Laboratory.

OBJECTIVE 6: Evaluation of verbal data and field test data. Offer observations and recommendations to OSC on validity of samples and possible actions.

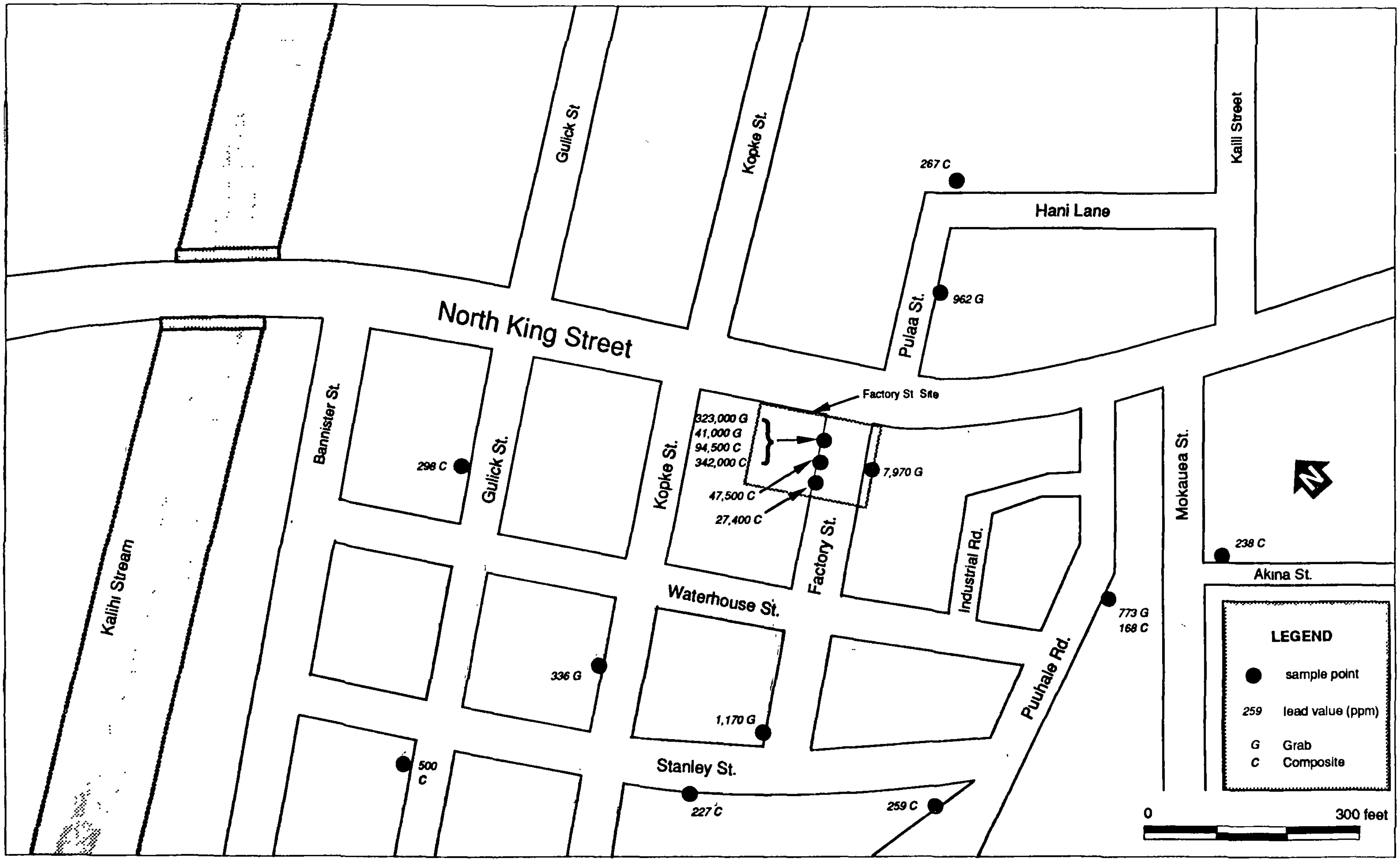
OBJECTIVE 7: Data Validation report. Final site assessment report.



ecology and environment, inc.

source: Bryans sectional maps, 1988
scale: 1:24,000

Figure 1
SITE LOCATION MAP
Factory Street Lead Site
Honolulu, Hawaii



ecology and environment, inc.

Figure 2
HEER SAMPLE LOCATION MAP
Factory Street Lead Site
Honolulu, Hawaii