Soil Sampling and Analysis Plan

Kuhio Park Terrace
Linapuni Street and Ahonui Street
Honolulu, Hawaii 96817

Prepared for:

Kaikor Construction
94-1388 Moaniani Street, Suite 401
Waipahu, Hawaii 96797

and

State of Hawaii Department of Health
Hazard Evaluation and Emergency Response (HEER) Office
919 Ala Moana Boulevard, Room 212
Honolulu, Hawaii 96814

Prepared by:

ENPRO Environmental
151 Hekili Street, Suite 210
Kailua, Hawaii 96734

808.262.0909 (t)

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1.0 INTRODUCTION

Kaikor Construction Company retained ENPRO Environmental (ENPRO) to prepare a Sampling and Analysis Plan (SAP) to conduct soil sampling of the paved roadways and associated sidewalks, and at fourteen utility pole sites at the Kuhio Park Terrace property located at Linapuni Street and Ahonui Street in Waipahu, Hawaii, identified as Tax Map Key number (TMK): (1) 1-3-039: 001 (the "project site").

The purpose of this SAP is to determine whether potential contaminants are present on the project site due to historical activities at levels that could present a potential hazard to human health or the environment during construction activities which will disturb the soil at the project site.

2.0 Background

2.1 Site Description

The project site is located on the south side of the island of Oahu, in the Kalihi District of Honolulu, Hawaii (Figure 1). The project site consists of a portion of the Kuhio Park Terrace property, identified as TMK: (1) 1-3-039: 001. For the purposes of this SAP, the project site is specifically defined as two roadways (Linapuni Street and Ahonui Street), its associated sidewalks, and fourteen utility pole sites within the Kuhio Park Terrace property. The project site is irregular-shaped and includes approximately 143,510 square feet.

2.2 Climate

The average annual rainfall at the site is approximately 50 inches, with the greatest amount of rainfall typically occurring in the months of December and January (NOAA, 2002). Average winter temperatures at the site vary between approximately 62 degrees Fahrenheit (ºF) and 82 ºF (NOAA, 2002). Average summer temperatures at the site vary between approximately 70 ºF and 89 ºF.

The project site area is exposed to the northeasterly “trade” winds, although southerly “kona” winds interrupt the trade winds at times, especially during the winter.

2.3 Soils/Geology

According to the U.S. Department of Agriculture Soil Conservation Service (Foote et. al., August 1972), the project site is situated on soils classified as Kaena clay (KaB) and Makiki stony clay loam (MlA).

Both of the soils developed from material weathering from Koolau lava parent sources. The Kaena clay is a very deep and poorly-drained soil, which is slightly acid to neutral. Permeability is slow, runoff is low, and the erosion hazard is slight. The Makiki stony clay loam is well-drained soil, which is neutral to slightly acid. The surface layer typically contains more abundant stones compared to the subsoil. The depth to basalt or cinders ranges from 20 to 60 inches. Permeability is moderately rapid, runoff is slow, and the erosion hazard is slight.

2.4 Surface Water

Surface water runoff flows into storm water drains located along Linapuni and Ahonui streets and eventually discharges to the Pacific Ocean.

The nearest body of water is Kalihi Stream, located approximately 200 feet to 600 feet to the east and south of Linapuni Street.

2.5 GROUNDWATER

Two aquifer systems underlie the site, both of which are included in the Moanalua aquifer system in the Honolulu aquifer sector.

The upper aquifer consists of an unconfined basal aquifer occurring in sedimentary aquifer types (non-volcanic lithology). The upper aquifer status is described as having a potential for use, but it is not considered a drinking water source or ecologically important. The salinity of the groundwater within this aquifer is described moderate (1,000 to 5,000 milligrams per liter [mg/L] chloride). The groundwater is further described as replaceable with a high vulnerability to contamination (Mink and Lau, 1990).

The lower aquifer consists of a confined basal aquifer occurring in flank aquifer types (horizontally extensive lavas). The lower aquifer status is described as currently used for a drinking water source. The salinity of the groundwater within this aquifer is described as fresh water (less than 250 mg/L chloride). The groundwater is further described as irreplaceable, with a low vulnerability to contamination (Mink and Lau, 1990).

The regional shallow groundwater flow direction is inferred to be to the south/southwest, based on surface topography and local drainage characteristics. However, topography is not always a reliable basis for predicting groundwater flow direction. The local gradient under the site may be influenced naturally by zones of higher or lower permeability, or artificially by nearby pumping or recharge, and may deviate from the regional trend. The groundwater beneath the site is expected to occur approximately 60 feet below the ground surface.

2.6 HISTORIC LAND USE

According to previous reports, from the mid-1930s to the 1940s, prior to development, the project site area was utilized for taro cultivation. Development of 62 low-rise townhouse buildings, known as the Kalihi War Homes occurred in the late 1940s. These townhouse buildings remained until August 1962. In 1963, construction of the current Kuhio Park Terrace property began.

2.7 CURRENT/FUTURE LAND USE

The project site is composed of two roadways (Linapuni Street and Ahonui Street), its associated sidewalks, and fourteen utility pole sites within the Kuhio Park Terrace property, a public housing complex.

The use of the site will remain the same; however, the *Site and Roadway Improvements at Kuhio Park Terrace* project calls for the demolition and reconstruction of the current roadways and sidewalks, and replacement of the utility poles as illustrated in figures 2 and 3.

3.0 PREVIOUS ENVIRONMENTAL REPORTS

Several environmental reports have been prepared for different portions of the Kuhio Park Terrace property. The reports have identified elevated concentrations of dieldrin and lead in soils near the project site area. The potential sources of the contamination have been reported to be pesticides which were applied to the soil at the buildings foundations to inhibit termites and other insects from damaging the building materials, in addition to former regular application of pesticides and herbicides associated with former taro cultivation on the site prior to residential development. None of the reports available included sampling of the project site's roadways and sidewalks improvements. Below is a brief summary of the previous reports.

Targeted Brownfields Assessment Report for Kuhio Park Terrace Property Buildings C-1 through C-8 and D-1 through D-4, 1472 to 1592 Linapuni Street, Honolulu, Oahu, Hawaii prepared by Ecology and Environment, Inc. and dated December 2010

This assessment included multi-incremental soil sampling around Buildings C-1 through C-8 and D-1 through D-4 at the Kuhio Park Terrace property, along the northern boundary of Linapuni Street. None of the soil samples collected included the roadways and sidewalks improvements included in our scope of work. Some samples may have included portion of the utility poles sites (Figure 4).

Multi-incremental soil samples collected indicated concentrations of lead in two samples from two locations at concentrations greater than the site specific environmental action level (EAL) of 200 mg/kg. The samples containing lead at concentrations above the site specific environmental action level were collected from the perimeter of building C3 and from the yard of buildings C2 and C3 at concentrations of 339 mg/kg and 209 mg/kg, respectively. It appears that utility pole #521735 is located within the lead-contaminated area identified as the "yard of buildings C2 and C3" (figures 3 and 4). None of the samples presented concentrations of pesticides equal to or greater than current applicable HDOH's EALs.

Environmental Hazard Evaluation and Environmental Hazard Management Plan, Portion of Kuhio Park Terrace Property, Buildings C-1 through C-8 and D-1 through D-4, TMK (1) 1-3-039: 008, Honolulu, Oahu, Hawaii prepared by EnviroServices & Training Center, LLC and dated September 2012.

This document evaluated and identified the following environmental hazards for the following locations:

- Direct exposure to lead in surface soils at the perimeter of Building C3
- Direct exposure to lead in surface soils at the yard of buildings C2 and C3.

The document recommended the placement and continued maintenance of a vegetated soil cap over the contaminated areas. The development of a Soil Management Plan (SMP) was also recommended to describe proper handling and disposal measures for the impacted soil in the event of breach of the cap due to further construction activities that disturb the underlying soil.

Draft Environmental Hazard Management Plan, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii prepared by Bureau Veritas and dated March 18, 2010

The Environmental Hazard Management Plan (EHMP) presented provided guidance for future handling and management of residual dieldrin and lead impacted soil located on portions of the property following the implementation of a Remedial Action Work Plan. The property was described as including approximately 15.2 acres of land area with several buildings, including Tower A, Tower B, Buildings C-1 through C-8, Buildings D-1 through D-4, Buildings E-1 and E-2, and the Community Center adjacent to Tower A (Figure 5).

The document stated that during future construction or renovation activities, the impacted soil must be properly managed in order to prevent the spread of contamination or the improper removal of impacted soil from the impacted areas. The EHMP required the following actions if impacted soil are excavated:

- Evaluation Prior to Excavation
- Erosion Control and Dust Control
- Proper Soil Excavation and Handling
- Proper Soil Stockpiling and Storage
- Proper Management of Impacted Soil
- Proper Disposal of Impacted Soil

Multi-Increment Soil Sampling, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii prepared by Bureau Veritas and dated June 21, 2010

This assessment included multi-incremental soil sampling of the areas to the south of Linapuni Street. The sampling included the areas surrounding the two 16-story apartment towers (Tower A and Tower B) and two single-family homes (Buildings E-1 and E-2). The site did not include the eight quadplexes (Buildings C-1 through C-8) or the four duplexes (Buildings D-1 through D-4) located on the north side of Linapuni Street. Based on updated/current EALs, the areas reported to contain contaminants of concern at concentrations exceeding the applicable EALs included the following:

- Building E-2 foundation area (1.6 mg/kg dieldrin)
- Tower B open area (408 mg/kg lead)

None of the areas discussed in the report included the roadways, sidewalks and utility poles sites.

Soil Management Plan, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii prepared by Bureau Veritas and dated November 23, 2010.

This SMP described proper handling and disposal measures for dieldrin and lead impacted soils during the implementation of construction and renovation activities at the Kuhio Park Terrace property. The SMP was specifically developed for the following areas, identified as the "impacted areas":

- Foundation area and open area around Building E-1
- The foundation area and open area around Building E-2
- The foundation area and a portion of the open area around Tower B
- Portion of land on the eastern end of the property.

The SMP required the following actions if impacted soil are excavated:

- Evaluation Prior to Excavation
- Erosion Control and Dust Control
- Proper Soil Excavation and Handling
- Proper Soil Stockpiling and Storage
- Proper Management of Impacted Soil
- Proper Disposal or Reuse of Impacted Soil (pending approval by HDOH)

None of the areas discussed in the SMP included the roadways, sidewalks and utility poles sites.

Remedial Action Work Plan, Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii prepared by Bureau Veritas and dated March 21, 2011

This document presented a proposed remedial action plan for the lead and dieldrin-impacted soils surrounding the areas south of Linapuni Street, defined as Tower A (and including the Community Center adjacent to Tower A), Tower B, Building E-1, Building E-2 and the areas surrounding these buildings (Figure 2). According to the plan, the results of previous environmental investigations had identified several areas with pesticide (specifically, dieldrin) and lead impacted soil that, at that time, potentially posed human health or environmental hazards. Based on updated/current EALs, the only areas reported to contain contaminants of concern at concentrations exceeding the applicable EALs included the following (Figure 5):

- Building E-2 foundation area (1.6 mg/kg dieldrin)
- Tower B open area and eastern portion (440 mg/kg and 290 mg/kg lead)

None of the areas discussed in the work plan included the roadways, sidewalks and utility poles sites.

4.0 Site Investigation Objectives/Data Quality Objectives

4.1 PROBLEM STATEMENT/CONCEPTUAL SITE MODEL

According to the previous reports, summarized in Section 3.0, the following activities may have led to environmental contamination of the project site:

- Former regular application of pesticides and herbicides associated with former taro cultivation on the site prior to residential development.
- Pesticides (containing dieldrin) formerly applied to buildings foundations

The source of the identified lead contamination has not been identified.

A basic conceptual site model (CSM) for the project site was developed to convey a summary of the source of contamination, mechanisms of contaminant release, and the environmental hazard associated with the concentrations of the contaminants reported for the project site. This basic CSM was developed using the Tier 1 EAL Surfer (Hawaii DOH, Fall 2011-Revised January 2012).

The CSM was devised for current conditions at the project site, as well as planned renovation activities. The EALs applicable to the project site are those for sites that are located less than 150 meters from a surface water body and for which the land use is unrestricted, and groundwater is a current or potential source of drinking water. The conceptual site model is presented in Table 1.

Table 1

Groupings of Chemicals of Potential Concern with Similar Environmental Hazards that Drive the Lowest Soil Environmental Action Levels/Conceptual Site Model

Primary Sources	Primary Release Mechanism	Secondary Source	Potential Environmental Hazards Driving Lowest EAL	Chemicals
Unknown	Unknown	Surface Soil	Direct Exposure	Lead*
Surface Sources	Historical Application of Termiticides and Agricultural Chemicals (Pesticides)	Surface Soil	Direct Exposure	Dieldrin

* Naturally occurring metal in addition to potential soil contaminant

4.2 OBJECTIVES AND CHEMICALS OF POTENTIAL CONCERN (COPCS)

The primary objective of this SAP is to determine whether potential contaminants are present in the soil of the project site due to historical activities at levels that could present a potential hazard to human health or the environment during the disturbance of soil associated with the planned demolition and reconstruction activities at the project site.

The construction activities are expected to include the disturbance of soils to a depth of approximately 16 inches below ground surface (excluding existing finish grades) along the roadways and approximately 18 inches along the sidewalks (also excluding existing finish grades). The soil at the utility pole sites will be disturbed to a depth of approximately 20 feet below ground surface. It is assumed that the existing finish grades, composed of concrete or asphalt and imported soil/gravel, consist of approximately eight inches along roadways and ten inches along the sidewalks.

For the purpose of this project, the sampling activities will be limited to the vertical extent that will be disturbed during the planned demolition and reconstruction activities at the project site. Therefore, the following vertical intervals of soil shall be evaluated:

- Roadways and associated sidewalks
  - Zero to eighteen inch depth interval
- Utility pole sites
  - Zero to eighteen inch depth interval
  - Eighteen to thirty-six inch depth interval (to be analyzed in the event that the chemical of potential concern is detected in the 0 to 18 inch interval at concentrations greater than the applicable HDOH EALs)

The previous environmental reports available for the Kuhio Park Terrace property have identified the presence of pesticides and lead in surface soils near the project site area; however, only dieldrin (pesticide) and lead were reported at concentrations greater than the current and applicable HDOH EALs.

The horizontal extent of the dieldrin contamination (at concentrations greater than the current and applicable HDOH EAL) has been delineated. It has been determined to be limited to the foundation area surrounding Building E-2 (1.6 mg/kg dieldrin).

The areas containing lead-impacted soils (at concentrations greater than the current and applicable HDOH EAL) were reported to be located at the perimeter of Building C3 (339 mg/kg), at the yard of buildings C2 and C3 (209 mg/kg), at the open area surrounding Tower B (440 mg/kg) and area to the east of Tower B (290 mg/kg). However, the horizontal extent of the lead contamination has not been determined.

Therefore, based on available data, the chemicals of potential concern (COPCs) have been narrowed down to lead.

4.3 DATA INFORMATION NEEDS

Data collected for this project supports screening purposes to evaluate the presence or absence of the COPC in soils to be disturbed at the project site during the project entitled *Site and Roadway Improvements at Kuhio Park Terrace*. The project site will be evaluated based on a comparison of the analytical results to Tier One EALs (HDOH, Fall 2011-Revised January 2012).

Under most circumstances, concentrations below the corresponding Tier One EALs can be assumed to pose no significant, long-term threat to human health and the environment. Therefore, the Tier One EALs will be used as indicators to aid in the determination of whether or not additional evaluation is warranted. The following table presents the Tier One EALs applicable to the project site.

Table 2
Tier One Environmental Action Levels
for Unrestricted and Commercial/Industrial Land Uses

Compound	Tier I EAL in Soil (mg/kg) UNRESTRICTED LAND USE	Tier I EAL in Soil (mg/kg) COMMERCIAL/INDUSTRIAL LAND USE*
Lead	200	800

mg/kg = Milligrams per kilogram
* = Land use restrictions may apply and an *Environmental Hazard Management Plan* should be prepared for sites where residual contamination in soil exceeds TOAL for unrestricted land use.

4.4 DECISION UNITS

The project site shall be divided into 21 decision units, DU-1 to DU-21 (figures 2 and 3). A multi-incremental sampling approach shall be employed. See Section 5.1 for details regarding the multi-incremental soil sampling approach.

The decision units scheduled for multi-incremental soil sampling are described below.

<u>Decision Unit 1 and Decision Unit 2- Ahonui Street</u>

- Each decision unit covers a surface area of approximately 460 feet by 22 feet (10,120 square feet)

<u>Decision Units 3 to 7- Linapuni Street & Associated Sidewalks</u>

- Each decision unit covers a surface area of approximately 431 feet by 56 feet (24,136 square feet).

Decision Units 8 to 21 – Utility Pole Sites

- Each decision unit covers a surface area of approximately 15 feet by 15 feet (225 square feet).

The decision units, their respective use, sizes and COPC are presented in the following table:

Table 3
Grouping of Decision Units, Current/Future Use, Estimated Sizes and COPC

Decision Unit	Current/Future Use	Size	COPC
DU-1 and DU-2	Roadway	10,120 square feet	Lead
DU-3 to DU-7	Roadway and Sidewalks	24,136 square feet	
DU-8 to DU-21	Utility Pole Sites	225 square feet	

4.5 DECISION STATEMENT

A multi-incremental sampling approach is to be employed to collect one, thirty-increment composite soil samples from each decision unit. Triplicate samples will be collected from DU-4, DU-7 and DU-11, and analyzed to calculate standard deviation of the samples.

If the concentration of lead in soil samples in a DU is greater than the corresponding Tier One EAL, the soil at that DU must be treated as contaminated and all of the required controls presented in the existing SMP, EHE and EHMP shall be followed (see Section 3.0).

If the lead concentration in the shallow soil layer (zero inches to eighteen inches) within the utility pole sites is less than the Tier One EAL, then it will be presumed that lead is not present at depth within the utility pole sites. If the lead concentration in any of the samples collected from the shallow soil layer within the utility pole sites is equal to or greater than the Tier One EAL, then the samples collected from the deeper soil layer (eighteen to thirty-six inch depth interval) at the utility pole sites will be analyzed. If the contaminant concentration in any of the deeper intervals is greater than the Tier One EAL, the decision unit shall be further evaluated.

A multi-incremental sampling approach shall be employed. See sections 5.1 and 5.2 for details regarding the multi-incremental soil sampling approach.

4.6 SCOPE OF WORK

The scope of work for implementing this SAP involves coordinating and attending meetings with the DOH, planning the environmental investigation, field identification of decision units and sampling locations, collection and packaging of multi-incremental samples, transport of samples to the designated laboratory, evaluating site information and laboratory results, documenting results, and providing recommendations based on these results.

5.0 Description of Sampling Activities

5.1 Soil Sampling Activities

The multi-increment sampling approach will entail subdividing each decision unit into rows and systematically collecting the soil increments along each row for a total of thirty sample increments.

Prior to executing the fieldwork, a random number generator will be used to select the starting location within the first row of each decision unit. The starting location for the first row will be repeated for the remaining rows. After the starting location is sited in the field, the remaining increment locations will be systematically located by pacing equal distances away from the starting location resulting in equally spaced sampling points over each row of the decision unit.

Sample increments shall be collected using a tractor-mounted hydraulic direct push sampling rig fitted with a split spoon sampling device. The sampling tool shall be driven a minimum of three feet into the ground of the decision units along the roadways/sidewalks to collect one vertical increment (zero to eighteen inches below finish grade). The sampling tool shall be driven a minimum of four feet into the ground of the decision units throughout the utility pole sites to collect two vertical increments (zero to eighteen inches, and eighteen to thirty-six inches below finish grade).

Each multi-increment sample will be placed into a properly labeled, plastic Ziploc®-type bag. Multi-increment samples shall subsequently be placed in a dedicated cooler with ice or "Blue Ice". Each multi-increment sample will be recorded on a chain-of-custody form and hand-delivered to the designated laboratory. Samples shall be delivered on the day or the day after they are generated.

Separate increments shall be collected from targeted depths at each increment collection location. An equal volume of soil, approximately 100 grams, shall be collected using a stainless steel measuring spoon from each of the increment sub-sample locations. Each increment shall be placed in a common Ziploc® bag as part of *Multi-Increment* sample representative of that DU and depth.

5.2 Soil Sub-Sampling for Laboratory Analysis of MI Samples

The collection of each thirty-increment soil sample will result in approximately three kilograms of soil for analysis (the bulk sample). A sub-sampling technique will be used by the analytical laboratory to reduce the bulk sample to a laboratory analysis quantity (the analytical sample). The sub-sampling process is described below.

The bulk sample shall be dried and then passed through a 2-millimeter (No. 10) sieve to remove larger debris. The total soil sample shall be spread out on a clean flat surface, by slowly pouring the sample out and then spreading it to a thin (approximately ¼-inch) even layer. The spread-out soil shall be incrementally sampled using a stratified-random pattern by collecting approximately thirty to fifty small increments to make up a minimum of 10-gram subsample for analysis. The small spatula used to collect the increments shall have a flat bottom and rectangular shape to give equal chance for selecting particles at the top and at the bottom of the sample. The goal is to represent the actual distribution of particle sizes in the sample. The minimum of 10-gram subsample will then be analyzed. Sub-sampling replicates shall be collected for each batch of samples.

5.3 LABORATORY SAMPLE PRESERVATION PROCEDURES

Multi-increment soil samples will be preserved in insulated sample chests with ice or frozen gel pack upon collection.

5.4 LABORATORY ANALYTICAL PROCEDURES

The proposed laboratory analytical method is listed in the following table.

Table 4

Summary of Compounds to be Analyzed, Laboratory Analytical Methods

Multi-Increment Samples for Land Use Classification			
Compound	**Laboratory Analytical Group**	**Laboratory Method**	**Proposed Laboratory**
Lead	Heavy Metals	6010/ 6020	ESN Pacific*

*ESN Pacific and ESN Pacific's affiliated laboratories

5.5 CHAIN-OF-CUSTODY AND TRANSPORTATION

Chain-of-Custody record forms shall be used to document sample collection and shipment to the laboratories for analysis.

Sample swill be clearly labeled and logged on the chain-of-custody form. Triplicates of the chain-of-custody forms will be used to track the samples from collection to final disposition. The sampler will retain a copy of the chain-of-custody forms. The original and one copy of the corresponding chain-of-custody form will be placed in a Ziploc®-type plastic bag and placed into the cooler with the soil samples.

The chain-of-custody forms will include the name, address, and telephone number of the sender; the project number and name; the sample identification numbers; the type and number of sample containers; the date and time of sampling; the sample matrix; the requested analytes and analytical methods; sample turnaround time information; special instructions; and the authorized signature of the person who relinquished custody of the samples.

5.6 SAMPLE IDENTIFICATION

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. The samples will have pre-assigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: decision unit number, station location (soil gas screening modules), date of collection, and method of preservation.

Replicate samples will be preserved, packaged, and sealed in the same manner as other samples. Separate sample identification will be assigned to each replicate, and it will be submitted blind to the laboratory.

5.7 DECONTAMINATION PROCEDURES

Between decision units, the soil coring device and stainless steel spoon utilized to remove sample increment from the soil coring device shall be decontaminated using a wash with Liquinox® and water followed by a double rinse with potable water. Following the wash and rinse, the soil coring device shall be air dried prior to re-use.

5.8 INVESTIGATION DERIVED WASTE (IDW)

In the process of collecting environmental samples the ENPRO sampling team will generate different types of potentially contaminated IDW that include the following:

- Used personal protective equipment (PPE)
- Decontamination fluids
- Unused soil

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3-02* (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill.

Decontamination fluids that will be generated in the sampling event will consist of Liquinox® and water. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and Liquinox®) will be poured onto the asphalt/paved area away from storm water drains and evaporated on-site.

5.9 LIST OF EQUIPMENT, CONTAINERS, AND SUPPLIES

The following equipment, containers and supplies will be used for obtaining surface soil samples and to support related activities:

- Sampling rig
- Macro-core sampler
- Acetate sleeve
- Split-spoon sampler
- Stainless steel sample tubes and plastic caps
- Stainless steel spoon
- Insulated sample chest
- Nitrile gloves
- Plastic bags
- Liquinox®
- Distilled water
- Ziploc®-type bags

5.10 HEALTH AND SAFETY

All personnel involved with the soil sampling activities, will have the appropriate level D personal protective equipment (PPE) to include: steel toe boots, safety glasses, hard hat, high visibility vests and work gloves. Furthermore, PPE should be selected based on the sampling equipment used, weather, and other expected hazards. All PPE will be used as specified and required.

Personnel shall stay upwind and keep first aid kits in their vehicles. Personnel collecting samples should use common sense to assess potential dangerous situations.

All personnel will wash their hands and face thoroughly with soap and water prior to eating, drinking, or smoking. Containers used during sampling activities, will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.

Primary hazards for this site are considered to be slip, trip and fall; hazards associated with the sampling equipment; and adjacent traffic. Results of previous environmental investigations have identified contaminants (lead and dieldrin) in the vicinity of the sampling areas at concentrations that are considered to be a direct exposure hazard. The utilization of PPEs and procedures described above will sufficiently address the direct exposure hazard.

6.0 QUALITY ASSURANCE/QUALITY CONTROLS PLAN

6.1 QUALITY ASSURANCE/QUALITY CONTROL DATA OBJECTIVES

Field and laboratory quality assurance/quality control (QA/QC) procedures will be implemented to ensure that the data gathered during the field investigation will meet the needs of the project objectives. Field activities will be performed as previously described. Analytical data generated will follow EPA methods and laboratory standard operating procedures (SOPs) and QA/QC guidelines for sample analysis. Adequate reporting levels of the chemicals of concern are dependent on the sample matrix, naturally occurring background concentrations, and laboratory instrumentation.

Quality assurance requirements shall be in accordance with the referenced analytical methods. The analyst generating the data and an experienced data reviewer will review the analytical data at the laboratory prior to its release. The analyst shall review the data to ensure that:

- Sample preparation information is correct and complete
- Analysis information is correct and complete
- The appropriate standard operating procedures were followed
- Analytical results are correct and complete
- Quality control samples were within established control limits
- Documentation, including the case narrative is complete

The data reviewer shall review the data package to verify that:

- Calibration data are scientifically sound and method compliant.
- QC samples were within established guidelines.
- Qualitative and quantitative results are correct.
- Documentation and the case narrative are complete.
- The data package is complete and ready for document archiving.

The data for this project shall be collected and documented in such a manner that will allow the generation of data packages that can be used by an external data auditor to reconstruct the analytical process.

6.2 Calibration Procedures and Frequency

Calibration will be performed regularly on all laboratory instruments. Each piece of equipment will be calibrated according to manufacturer's procedures.

Laboratory instruments are calibrated before use with a 5-point curve. To verify the calibration, continuing calibration verification standards are used to insure that the calibration curve has not drifted.

6.3 Data Reduction and Validation

Most analytical data are documented in computer records or on printouts generated by the instrument data-handling computer and transferred to the centralized acquisition server or acquired directly to the centralized acquisition server. Standard logs are maintained to document preparation of standards. The identity and number of the parent material is recorded and each prepared standard is assigned a number that is traceable to the parent material. The analyst verifies instrument data, calculations, transfers, and documentation, and corrects errors, if detected. Technical department managers, quality control specialists, and project managers perform review of reports and supporting documentation.

6.4 Soil Samples Field Quality Control Checks

Field duplicate and triplicate soil samples will be collected from DU-4, DU-7 and DU-11, all located near or within areas previously identified as containing lead in soil at concentrations greater than the applicable EAL. Field duplicate and triplicate samples will be collected in the same manner as the original samples through the collection of thirty-increment samples from the same decision units as the original samples. Sections 5.1 and 5.2 provide a description of the sampling approaches.

The duplicate and triplicate samples allow statistical calculation of several important values including the standard deviation, the relative standard deviation and the 95 percent (%) Upper Confidence Level (UCL) of the mean, as described below.

6.4.1 Standard Deviation

Standard deviation is a measure of the variation from the mean among a group of samples, and in this case it can be calculated for triplicate samples collected from a decision unit. The lower the standard deviation (the closer the replicate data are to the mean) the more precise the site data are as an estimate of average contaminant concentration in the decision unit under investigation.

Where replicate sampling is used to evaluate the variation from the mean of multiple DUs, the standard deviation of the contaminant(s) in the selected replicate DU is added to the contaminant levels of the other DUs in the batch for comparison to the relevant HDOH Tier One EALs. When a DU contaminant average concentration is close to the HDOH Tier One EALs, a lower standard deviation for the replicates provides a better chance to demonstrate that the contaminant concentration may be below the HDOH Tier One EALs. A low standard deviation for soil sampling data is achieved by reducing variation in sample results due to errors in field sampling/processing, lab sub-sampling/processing, or lab analysis, to the extent feasible.

6.4.2 95 Percent Upper Confidence Level

The 95% upper confidence level is another statistical measure of the precision for a series of measurements. In this case, the normal and triplicate samples are used to calculate a mean (or average) value and a standard deviation. The mean and standard deviation are used to calculate, with 95% confidence, the mean value for the individual decision unit.

6.4.3 Relative Standard Deviation

The field replicate data collected for DUs are also used to demonstrate that the investigation error for each contaminant is within a reasonable range that supports a conclusion that average contaminant concentrations (e.g., mean plus standard deviation or 95% UCL of the mean) is below or above the relevant HDOH Tier One EALs. Typically, the Relative Standard Deviation (RSD) of the field replicates (triplicates) is used for this evaluation. The RSD is expressed as a percentage and is calculated using the following formula:

$$RSD\% = \frac{100 \text{ X Standard Deviation}}{\text{Average}}$$

The lower the RSD% of the replicate data, the better. Generally, an RSD% of approximately 35% or less indicates the amount of estimated total error is within a reasonable range for decision making. However, this evaluation will also depend on the DQO established for the site investigation, as well as how close the contaminant concentrations are to the relevant HDOH EAL(s). In general, the closer the contaminant level is to the HDOH EAL, the more impact this statistical measure will have on site decisions. The higher the RSD%, the less confidence there is that the averages approximate a normal distribution, and that the average contaminant concentrations are adequately representative of the DU(s). As the RSD exceeds 50%, and if the average DU concentrations are near the relevant action levels, there is increasing uncertainty that the data are adequately representative. As the RSD% approaches 100% there is very little confidence that the sampling data is useful for decision-making.

6.5 SOIL SAMPLES LABORATORY QUALITY CONTROL CHECKS

Sample batch sizes will not exceed 20 samples. Batch QC will include method blanks, matrix spikes, matrix spike duplicates (laboratory control standard duplicate, if matrix spikes/matrix spike duplicates cannot be performed,) surrogate analysis for organics, and second source reference standard analysis for metals. One method blank sample will be analyzed for every 20 samples (minimum of one per day, one per matrix).

6.5.1 Method Blank

Method blanks will be analyzed for each analytical batch submitted to the laboratory. An aliquot (extraction blank) equal in weight to the sample is used for the method blank analysis. The method blank is taken through the whole analytical process. The analytical results of the method blank are then reported to show that the blank is free of analytical interference.

6.5.2 Matrix Spike/Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) are samples, to which known concentrations of analytes are added prior to sample preparation. The matrix spike and matrix spike duplicate are taken through the whole analytical process. Following the analytical process, the recoveries of the spike analytes are calculated and reported for assessment of accuracy. When a matrix spike duplicate is analyzed, the relative percent differences between the matrix spike and the matrix spike duplicate results will also be calculated and reported. The percent recoveries and the relative percent difference are used to evaluate the effect of the sample matrix on the accuracy and precision of the analysis.

6.5.3 Surrogate Spike

Surrogate spike is a known concentration of a non-target analyte added prior to sample preparation. The surrogate is chemically similar to the target analyte and behaves similar during extraction and analysis. The surrogate spike recovery must meet the established acceptance criteria, and measures the efficiency of the steps of the analytical method in recovering the non-target analytes.

6.5.4 Preventative Maintenance

To ensure that instruments are properly maintained and continue to operate properly, preventative maintenance activities are undertaken on a routine basis. An experienced analyst or a manufacturer's service representative performs maintenance. The types of preventative maintenance actions are dependent on the instrument. Any unusual conditions are investigated and resolved prior to beginning analysis of samples. Instrument maintenance records are maintained, and all non-routine maintenance activities are documented and stored in the department. A separate file is maintained for each instrument.

6.6 DATA QUALITY ASSESSMENT

The Laboratory Quality Assurance (QA) manual is designed to maintain the quality of its principal product, reliable and defensible analytical results. Staff members are trained in appropriate QA procedures to support the laboratory's QA plan. The laboratory applies acceptance criteria to all quality control data. When a sample analysis is complete, the quality control data are reviewed and evaluated by using acceptance criteria based on standard operating procedures or client specific data quality objectives. This evaluation is used to validate the corresponding data set. Evaluation is based on:

- Continuing Calibration Verification Standard
- Method Blank Evaluation
- Laboratory Control Evaluation
- Matrix Spike and Matrix Spike Duplicate Evaluation
- Surrogate Standard Evaluation

6.6.1 Accuracy

Accuracy will be calculated from analysis of matrix spike samples as follows:

$$\text{Accuracy} = \frac{(A - B) \times 100}{C}$$

Where "A" is the analyte determined experimentally from the spike sample; "B" is the background level by separate analysis of the unspiked sample; and "C" is the amount of spike added.

6.6.2 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions.

Precision will be determined through evaluation of percent difference in duplicate analysis of samples and by evaluating the standard deviation of multi-point calibrations.

Precision, as determined through percent difference in duplicate analysis of samples, standards and surrogates, is calculated as:

$$\text{Precision} = \frac{(A - B) \times 100}{(A + B)/2}$$

Where "A" is the larger value and "B" is the smaller value of duplicate analyses.

6.6.3 Completeness

Completeness will be evaluated by the percentage of valid analytical results compared to the total number of requested sample analytical results. The completeness objective for this project will be 90 percent or greater.

Percent completeness is calculated using the following equation:

$$\text{Completeness (\%C)} = \frac{T - R}{T \times 100}$$

Where "T" is the total number of sample results and R is the total number of rejected sample results.

6.7 CORRECTIVE ACTION

When a quality control problem is noted, the following steps are taken to identify and correct the problem:

- The hard copies of the data are re-examined;
- The analyst re-analyzes the standard or sample, as appropriate to meet criteria;
- If the problem is not resolved by standard re-analysis, the QA Manager or the Laboratory Director is consulted to provide additional information about rectifying the problem;
- If the problem cannot be solved in-house, equipment repair contractors, manufacturer's representatives, or outside consultants are contacted, as necessary to correct the problem.

7.0 Documentation and Reporting

7.1 FIELD DOCUMENTATION

Recording of field data will be entered in field data entry sheets. All documentation in the field data entry sheets shall be written in indelible ink. Changes made to the data entered in the log books or data entry sheets will be crossed out with a single line and the change will be initialed by the person changing the data entry. In addition, the field data entry sheets will be sequentially numbered. All field documentation will become part of the project files. At a minimum, the following information will be provided in the field data entry sheets:

- ENPRO personnel conducting field activities
- Subcontractor personnel conducting field activities
- Brief description of project and planned field activities
- Date and time of all field activities (time will be recorded in 24-hour format)
- Weather information at the start of the field day and during significant weather events
- Sample identification and time of sample collection
- Deviations from the proposed or approved sampling procedure
- Field conditions such as petroleum or chemical odor or soil staining

7.2 INVESTIGATION REPORT

Upon completion of the proposed Scope of Work, ENPRO will prepare and submit an Investigation Report that will contain all results obtained from soil sample analysis. The report will present a description of field procedures, observations and findings, photographic documentation, results of laboratory analyses, conclusions and recommendations.

7.3 SCHEDULE

Scheduling of soil investigation at the project site for the areas of concern will begin immediately following the authorization to proceed with this SAP by the client and the HDOH. Soil sampling is estimated to require approximately one to two weeks to complete. Analytical laboratory turnaround time will be approximately two weeks for all analytes. A report outlining the laboratory analytical results and the comparison to the regulatory limits is expected to require two weeks from the receipt of the final analytical results.

8.0 REFERENCES

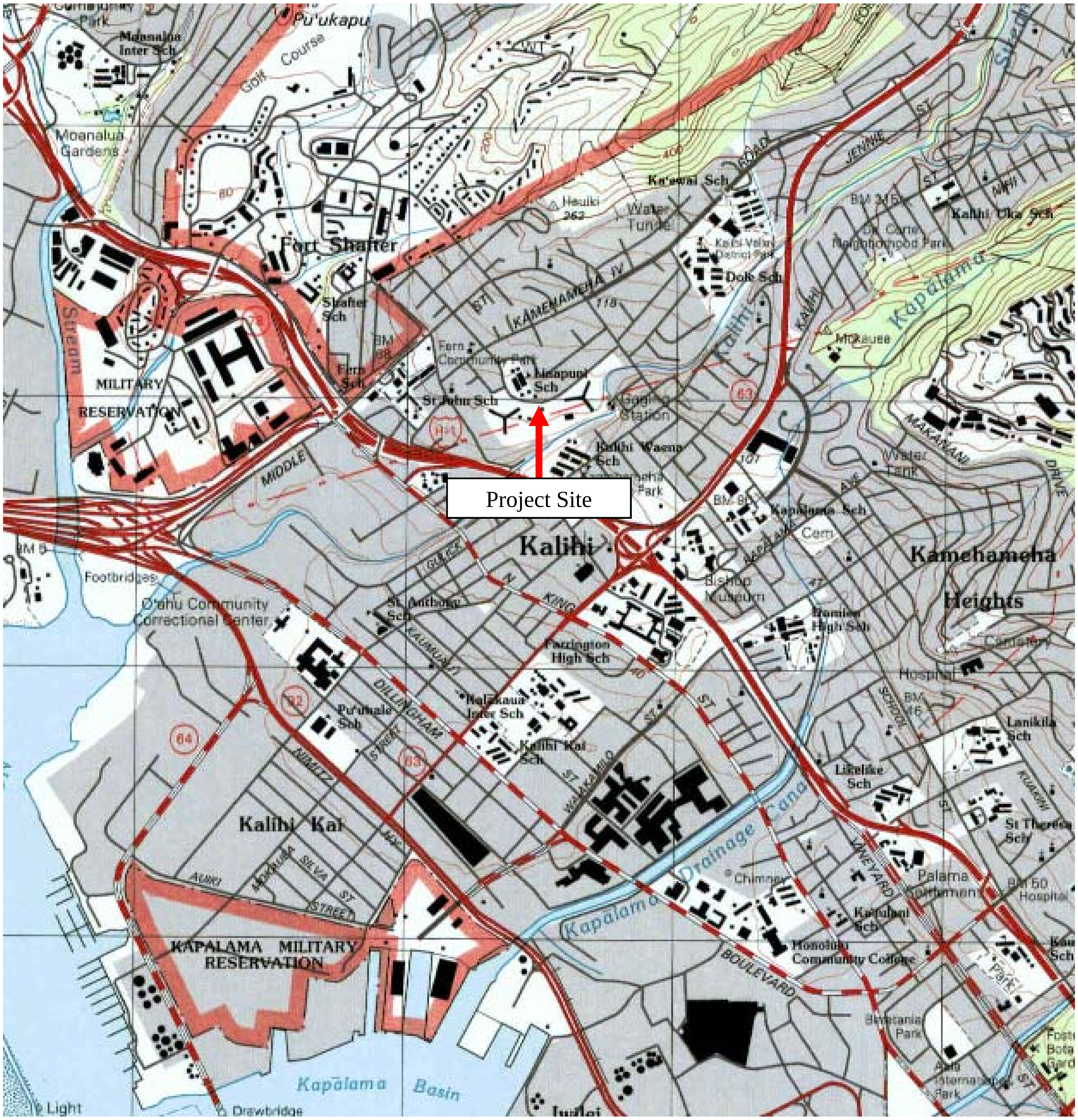
Publications:

Names of Publication:	Aquifer Identification and Classification for Oahu: Groundwater Protection Strategy For Hawaii
Author of Publication:	Mink, J.F. and L.S. Lau
Published by:	Water Resources Research Center, University of Hawaii at Manoa, Honolulu, Hawaii
Date of Publication:	1990
Names of Publication:	Soil Survey for the Islands of Oahu, State of Hawaii
Author of Publication:	Foote, Donald E. et al.
Published by:	U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawaii Agricultural Experiment Station. Also available at http://websoilsurvey.nrcs.usda.gov/app/
Date of Publication:	1972
Names of Publication:	Hawaii Department of Health (HDOH), Office of Hazard Evaluation and Emergency Response, Technical Guidance Manual (TGM), Interim Final, June 2009
Author of Publication:	HDOH, HEER
Published by:	HDOH, HEER
Date of Publication:	2009
Name of Publication:	Tire 1 EAL Surfer
Author of Publication:	DOH HEER Office
Date of Publication:	2011/2012
Names of Publication:	Targeted Brownfields Assessment Report for Kuhio Park Terrace Property Buildings C-1 through C-8 and D-1 through D-4, 1472 to 1592 Linapuni Street, Honolulu, Oahu, Hawaii
Author of Publication:	Ecology and Environment, Inc.
Date of Publication:	December 2010
Names of Publication:	Environmental Hazard Evaluation and Environmental Hazard Management Plan, Portion of Kuhio Park Terrace Property, Buildings C-1 through C-8 and D-1 through D-4, TMK (1) 1-3-039: 008, Honolulu, Oahu, Hawaii
Author of Publication:	EnviroServices & Training Center, LLC
Date of Publication:	September 2012

Names of Publication:	Draft Environmental Hazard Management Plan, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii
Author of Publication:	Bureau Veritas
Date of Publication:	March 18, 2010
Names of Publication:	Multi-Increment Soil Sampling, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii
Author of Publication:	Bureau Veritas
Date of Publication:	June 21, 2010
Names of Publication:	Soil Management Plan, Portion of Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii
Author of Publication:	Bureau Veritas
Date of Publication:	November 23, 2010
Names of Publication:	Remedial Action Work Plan, Kuhio Park Terrace Property, TMK (1) 1-3-039: 001 (Portion), Honolulu, Oahu, Hawaii
Author of Publication:	Bureau Veritas
Date of Publication:	March 21, 2011
Names of Publication:	*Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971 – 2000*. Climatography of the United States
Author of Publication:	National Oceanic and Atmospheric Administration (NOAA)
Date of Publication:	2002

9.0 APPENDICES

Site Figures



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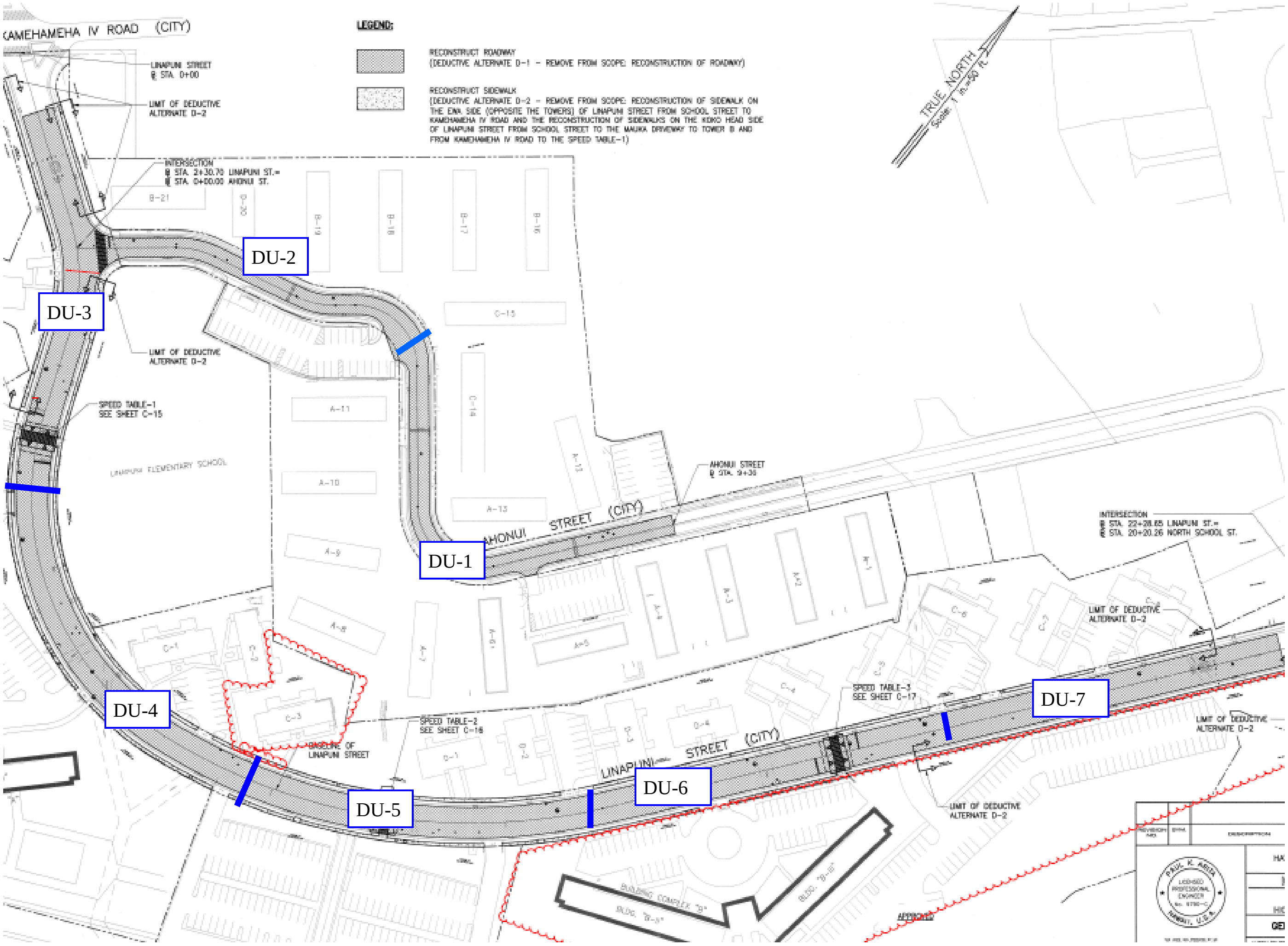
Source: U.S. Geological Survey, 1998

Figure 1
TOPOGRAPHIC MAP

Scale: 1 inch = 2,000 feet

environmental ENPRO

Project Number 1508-00368-CSL
Kuhio Park Terrace



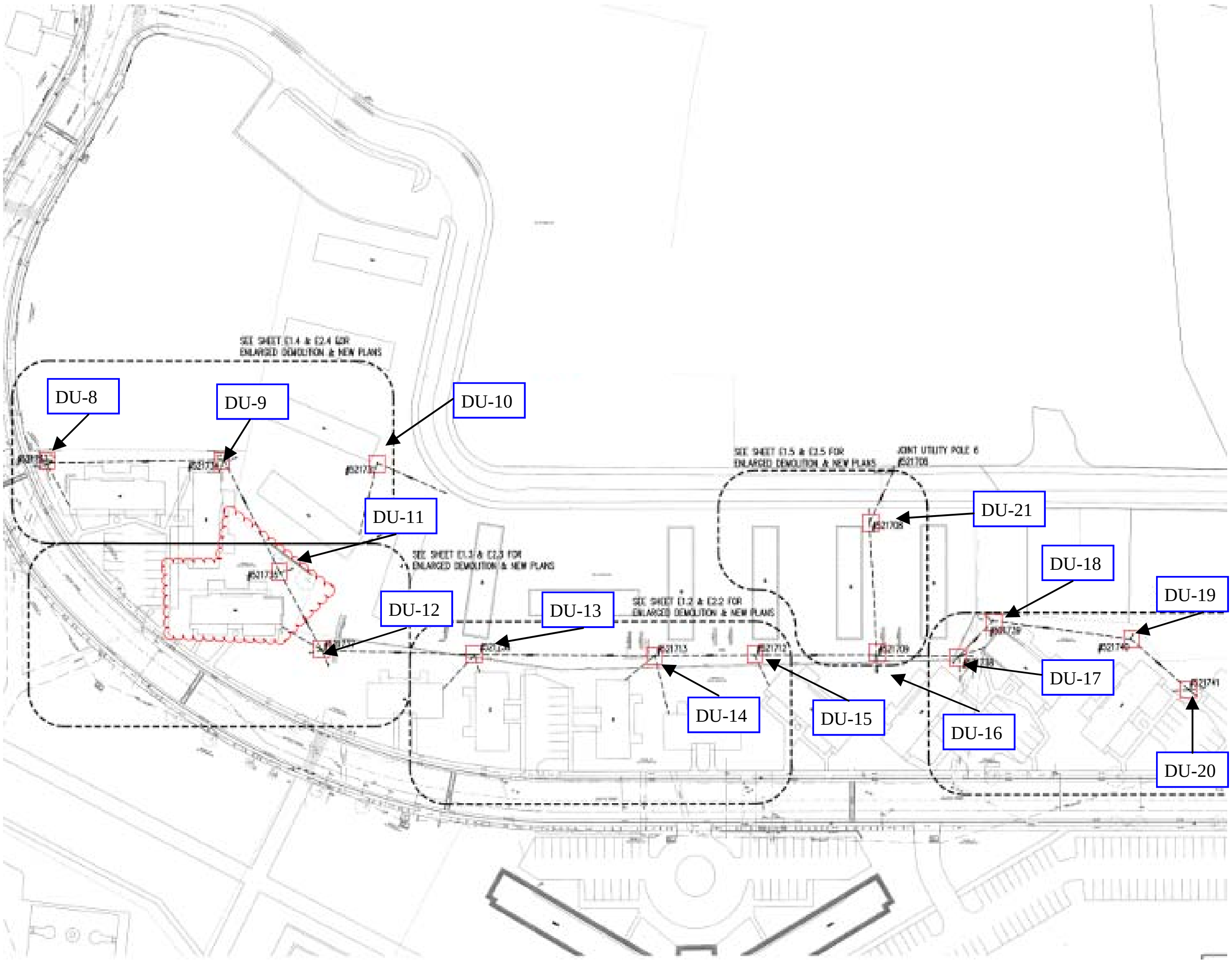
N

Pb-Impacted Area

Source: Austin Tsutsumi & Associates, Inc, 2014

Figure 2
Proposed DUs Along Ahounui Street and Linapuni Street

Scale: 1 inch = Approximately 195 feet



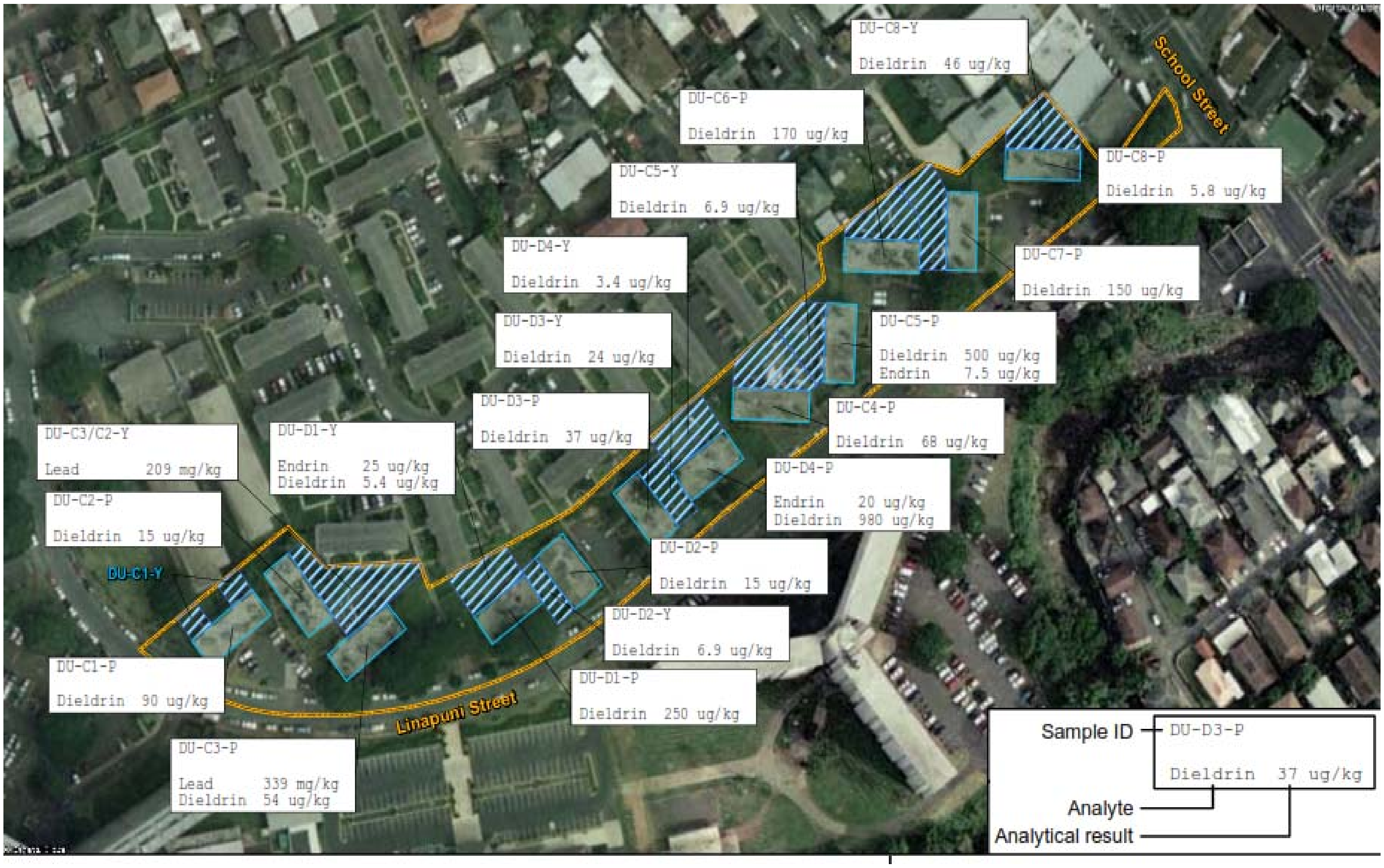
N

Pb-Impacted Area

Source: Austin Tsutsumi & Associates, Inc, 2014

Figure 3
Proposed DUs at Electrical Pole Sites

Scale: 1 inch = Approximately 195 feet



LEGEND

Decision Unit - Backyard

Decision Unit - Building perimeter

Site boundary

ABBREVIATIONS

mg/kg milligrams per kilogram

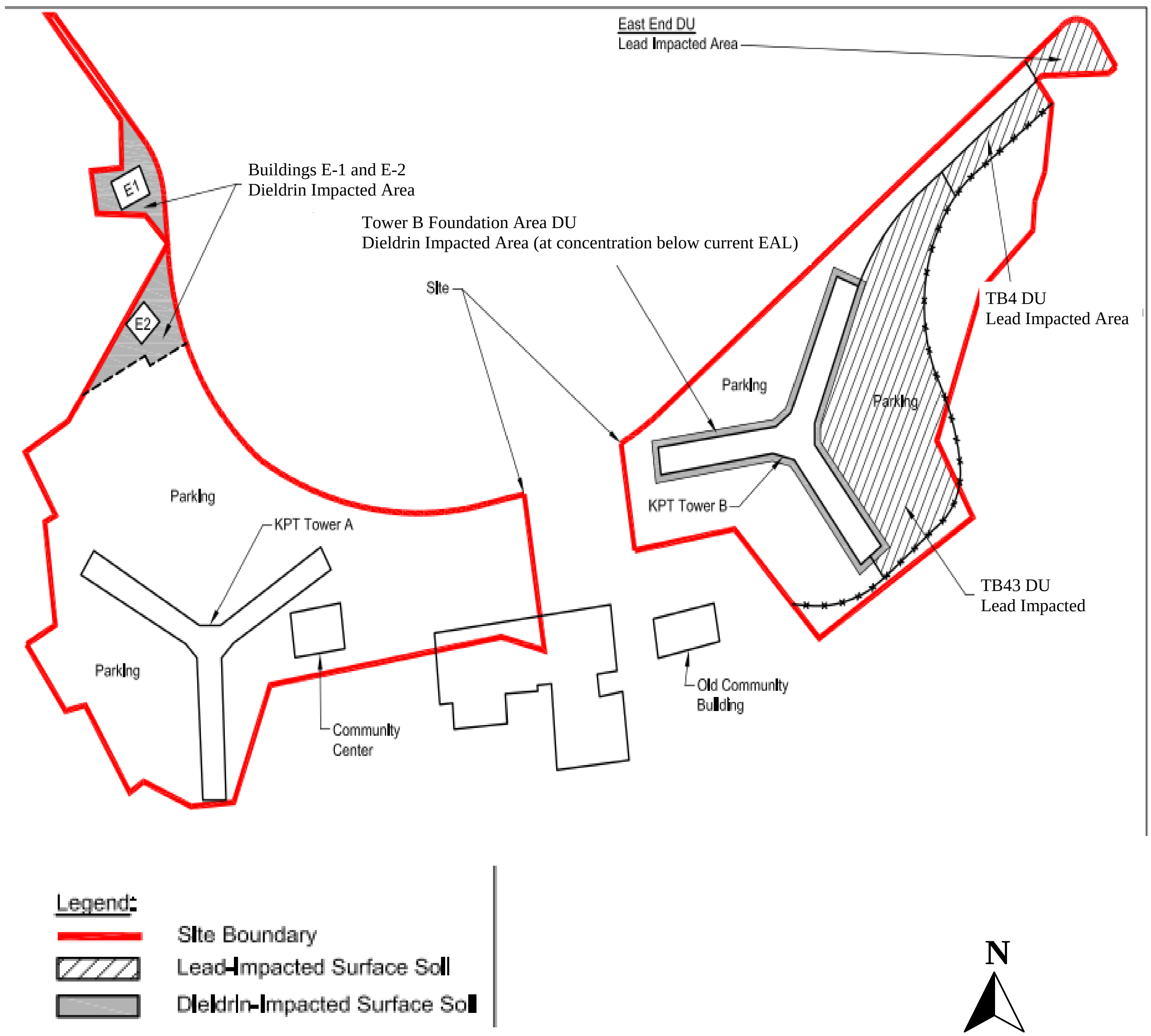
ug/kg micrograms per kilogram

Source: Ecology and Environment, Inc., 2010

Figure 4

Analytical Results of MIS Conducted by Ecology and Environment, Inc. in 2010

Scale: 1 inch = Approximately 175 feet



Source: Bureau Veritas, 2011

Figure 5
Remedial Action Areas Depicting Lead and Dieldrin Impacted Areas Presented in the Remedial Action Work Plan, Bureau Veritas, 2011

Not to Scale