DEPARTMENT OF VETERANS AFFAIRS
Veterans Health Administration
National Health Physics Program
2200 Fort Roots Drive
North Little Rock, AR 72114

OCT 22 2008

In Reply Refer To: 598/115HP/NLR

Cassandra F. Frazier
Division of Nuclear Material Safety
Region III, Nuclear Regulatory Commission (NRC)
2443 Warrenville Road, Suite 210
Lisle, Illinois 60532-4352

Re: NRC License 03-23853-01VA

Dear Ms. Frazier:

We request review and approval for the enclosed workplan to be completed at VA Greater Los Angeles Healthcare System, Los Angeles, California. Per the Letter of Understanding to the master materials license, we are required to have approval to change the status of the former waste burial site.

The workplan entitled, "Initial VOC & Radiological Subsurface Investigation Workplan," was prepared by an environmental contractor to conduct a surface and subsurface investigation that would assist in evaluating potential human health risks associated with medical wastes resulting from historic medical research and disposal practices at the healthcare system.

Please contact Thomas E. Huston, Ph.D., CHP, VHA National Health Physics Program, at (501) 257-1578, if you have any questions.

Sincerely,

E. Lynn McGuire
Director, National Health Physics Program

Enclosure

RECEIVED OCT 2 8 2008

From: John Gery [mailto:john.gery@sbcglobal.net]
Sent: Friday, October 10, 2008 12:07 PM
To: Spivey, Ben K; Williams, Gary E; Nusbaum, Ronald A.
Cc: Joel Cehn; Jay Boughter
Subject: VA GLAHS Radiological Study

Attached is a copy of our Notification to commence field exploration and sampling at the site and our Workplan with the SAP/QAPP, HASP & IDW Plan attached as appendices. Please review as soon as possible.

We also are giving notice that we plan to start the field exploration work on October 27, 2008.

As discussed with Ben, we will have a kickoff meeting with all the personnel to be on-site on the morning of October 27, with the field sampling beginning on Tuesday, October 28.

Please contact me by email or my cell phone listed below for any comments or questions.

Note:
My Email address has been changed to john.gery@allwestg.com
Please change in your contact list accordingly.

John Gery
Allwest Geoscience, Inc.
1751 Jenks Dr. / Corona, CA 92880
Cell: 714-308-7525

INITIAL VOC & RADIOLOGICAL SUBSURFACE INVESTIGATION WORKPLAN

VETERANS ADMINISTRATION
GREATER LOS ANGELES HEALTHCARE SYSTEM
11301 WILSHIRE BOULEVARD
LOS ANGELES, CA 90073

PROJECT NO. 02-3454EI-2

October 2, 2008

Prepared For:

Department of Veterans Affairs
Veterans Administration - Greater Los Angeles Healthcare System
11301 Wilshire Boulevard, Building 218, Room 308
Los Angeles, CA 90073

Prepared By:

ALLWEST GEOSCIENCE Inc.
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Corona, CA 92880

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Project No. 02-3454EI-2
October 2, 2008

Veterans Administration Greater Los Angeles Healthcare System
11301 Wilshire Boulevard
Building 218, Room 308
Los Angeles, CA 90073

Attention: Mr. Ben Spivey
Chief, Occupational Safety and Health

Subject: **INITIAL VOC & RADIOLOGICAL SUBSURFACE INVESTIGATION WORKPLAN**

Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS)
11301 Wilshire Boulevard
Los Angeles, CA 90073

Dear Mr. Spivey:

Pursuant to the conditions of the contract, Allwest Geoscience, Inc., has prepared this *Initial VOC and Radiological Subsurface Investigation Workplan* to conduct a surface and subsurface investigation that would assist in evaluating potential human health risks associated with buried medical waste resulting from historic medical research and disposal practices at the Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS) campus.

Allwest Geoscience, Inc., has developed a workplan that has utilized the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) Data Quality Objectives (DQO), which are established to provide information necessary to conduct the overall investigation, evaluation and risk assessment.

We appreciate the opportunity to provide the requested environmental services. If you have any questions concerning this report, please contact the undersigned.

Sincerely,

ALLWEST GEOSCIENCE, INC.

REGISTERED PROFESSIONAL ENGINEER
JOHN R. GERY
No. 336
Expires 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

JOHN R. GERY
Principal Geotechnical Engineer
California Registration No. RGE 336
Expires 12/31/09

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INITIAL VOC & RADIOLOGICAL SUBSURFACE INVESTIGATION WORKPLAN

1.0 INTRODUCTION

Allwest Geoscience has prepared this *Initial VOC and Radiological Subsurface Investigation Workplan* to conduct an initial subsurface investigation that would assist in evaluating potential human health risks associated with buried medical waste resulting from historic medical research and disposal practices at the Veterans Administration (VA) Greater Los Angeles Healthcare System (GLAHS) property (Figures 1 and 2).

2.0 PROJECT DESCRIPTION

The VA GLAHS property encompasses an area of approximately 450 acres (URS, 2000). Two (2) investigation areas include a baseball field and an area known as the "Arroyo" or "Eastern Canyon" (MECA, 2007). The Arroyo or Eastern Canyon has been previously identified as a burial area for former medical waste from animal experiments, including animal carcasses, medical isotope waste in radiological scintillation vials and other miscellaneous medical debris including syringes (MECA, 2007).

Two (2) sites have been selected for this investigation: the "Ball Field" which measures approximately 200 feet by 200 feet and the adjacent "Arroyo" or "Eastern Canyon" which measures approximately 125 feet wide by 1,000 feet long (Figure 3).

3.0 PUBLIC PARTICIPATION

Community residents are concerned with potential health threats posed by the buried medical waste. Therefore, periodic public involvement meetings will be required.

4.0 GEOLOGY AND HYDROGEOLOGY

4.1 Geology

The investigation areas are located in the Sawtelle Plain portion of the Santa Monica Basin portion of the larger Coastal Plain of Los Angeles County (DWR, 1961), approximately 1-1/2 miles south of the base of the Santa Monica Mountains and approximately 4 to 5 miles east of the Pacific Ocean. The "Ball Field" is situated at an elevation ranging from approximately 400 to 420 feet above mean sea level (AMSL) and the "Arroyo/Eastern Canyon" is situated at an elevation ranging from approximately 350 to 380 feet AMSL in the proposed investigation area. UCLA is located approximately 1 mile northeast of the site and the gently rolling Beverly Hills is located approximately 2 to 3 miles east of the site (USGS, 1981). Surface deposits in the site area consist of marine and continental gravel, sand, sandy silt, silt, and clay with shale pebbles of the upper Pleistocene-age Lakewood Formation and Recent-age alluvium comprised of gravel, sand, silt, and clay. Marine conglomerate, sandstone and shale of the Miocene-age Modelo and Topanga Formations outcrop at the ground surface further to the north of the site (DWR, 1961).

4.2 Hydrogeology

The site is located north/northwest of the Charnock Fault where the DWR does not differentiate groundwater aquifers within undifferentiated Pleistocene Formations. South/southeast of the Charnock Fault, the first-encountered water-bearing zone is designated as the Ballona Aquifer ("50 Ft Gravel") within Recent-age Alluvium extending from approximately 20 to 60 feet bgs followed by the Silverado Aquifer within the San Pedro Formation which extends from approximately 160 to 425 feet bgs (DWR, 1961).

Groundwater beneath the VA property is within the Santa Monica Hydrologic Subarea of the Coastal Plain Hydrologic Area of the Los Angeles-San Gabriel Hydrologic Unit. Groundwater in the Santa Monica Hydrologic Subarea is designated as existing beneficial use for municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply (LARWQCB, 1995).

Groundwater is estimated to be at a depth of approximately 60 feet bgs in the investigation areas.

5.0 MARSSIM DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQOs) for the surface and subsurface investigation include the collection of appropriate data to support a future assessment of human health risks associated with potential VOC and radiological impacts resulting from buried medical waste. To ensure that a sufficient quality and quantity of subsurface (soil and hydrogeologic) and chemical data of are collected during field activities described in the workplan outline, the following seven-step process is presented:

- Step 1 - State the Problem
  - Describe the problem and identify the resources available to resolve the problem;
- Step 2 - Identify the Decision
  - Identify the questions the study would attempt to answer;
- Step 3 - Inputs to the Decision
  - Identify the information needed to support the decision and the measurements requiring to be collected to resolve the decision statement;
- Step 4 - Define the Study Boundaries
  - Specify the spatial and temporal aspects of the environmental media the data must represent to support the decision;
- Step 5 - Develop a Decision Rule
  - Develop unambiguous "If…then" statements that define the conditions that would trigger an alternative action;
- Step 6 - Specify the Limits on Decision Factors
  - Specify the acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data; and
- Step 7 - Optimize the Design for Obtaining Data
  - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

Step 1

The problem statement (Step 1) is as follows: "VOC and low level radioactive medical waste have been determined to be buried in the Arroyo/Eastern Canyon. A previous surface radiological survey was conducted and determined there was no evidence of elevated single readings in any of the surveyed areas. It was determined that the average reading in the two (2) canyons (Arroyos) and the Brentwood School lower soccer fields bordering the GLAHS, were somewhat higher than other surveyed areas or the control areas, but there was no obvious explanation for the differences. Nothing was revealed by the surface "Walkover" scanning that would warrant additional surface scanning. It was concluded that, overall, there was nothing detected by surface scanning that appeared to be distinguishable from natural background radiation, and any external gamma radiation exposure received by current visitors to the parks or the surrounding areas that may be due to potential impacts on or near the ground surface is minimal (MECA, 2006). However, the local public is convinced otherwise, and therefore, the VA GLAHS determined that a surface and subsurface investigation combined with a human health risk assessment would aid in collecting the proper data required to dispel the notion of any potential threats to human health and the environment."

Step 2

Step 2 of the DQO process (Identify the Inputs to the Decision) asks the key question(s) that this Scoping Document attempts to address: "What initial surface and subsurface data including passive soil gas survey (PSG) sampling and analysis, borehole characterization, groundwater monitoring well installation, sampling and chemical analysis, and human health risk assessment would: 1) improve understanding of the potential impacts to sensitive receptors at the ground surface (public health); and 2) support the development and evaluate potential groundwater impacts?" The criteria necessary to determine whether the proposed surface and subsurface investigation would answer this question include, but may not necessarily be limited to:

- Adequacy of collected data to initially document the fate and transport of chemicals of concern (COCs) in vadose zone soil and possibly groundwater beneath the site at present, and COCs that may pose potential threats to public health in the future; and
- Adequacy of collected data to initially define "background" or "ambient" chemical concentrations in groundwater in the nearby area of buried medical waste.

Step 3

Step 3 of the DQO process (Identify the Inputs to the Decision) identifies the kind of initial surface and subsurface information that is required to address the question posed in accordance with Step 2. This information would include:

- Three-dimensional lithologic and geochemical information;
- Determining source areas of COCs;
- Defining potential impacts to vadose zone soil and groundwater;
- Obtaining groundwater elevation and quality data through measurements and sampling; and
- Determining the potential for impacts to public health.

Step 4

Step 4 of the DQO process (Define the Study Boundaries) defines the spatial and temporal aspects of the field monitoring, sampling and analytical activities proposed in this Scoping Document. The areas of investigation described in this Scoping Document are shown in Figure 3. The timeframe for conducting the field activities described in this Scoping Document would be June through July of 2008. The field investigation would proceed in a series of three steps. The first step would be to conduct the PSG survey, followed by surface and subsurface sampling utilizing a direct-push sampling rig and/or hollow stem auger drilling rig, followed by groundwater monitoring well installation utilizing a hollow-stem auger drilling rig. Analytical data collected during these 3 steps will go through the validation process, and a human health risk assessment will be conducted. A final report summarizing all field screening, sampling and analysis activities and conclusions of the human health risk assessment would be available in mid August.

Step 5

Step 5 of the DQO process (Develop a Decision Rule) determines whether the proposed data collection activities would be of sufficient quantity and quality to satisfy the DQOs. Given that Visual Sampling Plan and MARSSIM procedures were followed in generating this document, Allwest anticipates that the field screening data and surface and subsurface analytical results would achieve adequacy standards.

Step 6

Step 6 of the DQO process (Specify the Limits on Decision Errors) would be based on measurement errors, rather than sampling errors, provided that measurement errors would likely be the primary factors affecting any decision error. Laboratory-validated data would be required to limit measurement errors. Sampling errors would be limited, to the extent practicable, by following the procedures described in this Scoping Document and in the Quality Assurance Project Plan, along with federal and local regulatory guidelines.

Step 7

Step 7 of the DQO process (Optimize the Design for Obtaining Data) will be accomplished by applying the DOE's Quality Assurance Tool Visual Sampling Plan and the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) DQOs.

The DQOs listed above and the associated field and laboratory analytical activities described in this Scoping Document would be conducted including, but not necessarily limited to:

- Conducting a passive soil gas (PSG) survey and laboratory analysis;
- Collecting vegetation transpiration samples and laboratory analysis;
- Collecting subsurface soil samples and laboratory analysis;
- Groundwater monitoring well installation, development, and sampling; and
- Conducting a human health risk assessment.

A more detailed description of the DQO process is provided in the Sampling and Analysis plan and QA/QC Plan included as Appendix 1.

6.0 MARSSIM

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. The MARSSIM guidance focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

The radiological survey design is developed and documented using the DQO Process. The DQOs for the project are established and preliminary surveys (e.g., scoping, characterization) are performed to provide information necessary to design the final status survey for compliance demonstration.

A minimum amount of information is required from the preliminary surveys to develop an effective final status survey design. This includes:

- Sufficient information to justify classification and specification of boundaries for survey units (the default is Class 1 which results in the highest level of survey effort); and
- An estimate of the variability of the contaminant concentration in the survey unit (σ_s) and the reference area (σ_r) if necessary.

After the preliminary surveys are completed, the final status survey design can be developed. There are approximately 10 major steps in the development of a survey design that integrates scanning surveys with direct measurements and sampling. Several of these steps are:

- Classify Areas by Contamination Potential
- Group/Separate Areas into Survey Units
- Determine Number of Data Points
- Select Instrumentation
- Develop an Integrated Survey Design

A more detailed description of MARSSIM as it pertains to this project is provided in the Sampling and Analysis plan and QA/QC Plan included as Appendix 1.

7.0 U.S. DOE QUALITY ASSURANCE TOOL, VISUAL SAMPLING PLAN (VSP)

Allwest will implement the U.S. Department of Energy's Quality Assurance tool, Visual Sampling Plan (VSP) to develop a conceptual site model and preliminary soil boring locations using the data from the Phase I Radiological Survey. VSP is a software tool for selecting the correct number and location of environmental samples so that statistical test results performed on the data collected via the sampling plan have the required confidence for decision making. VSP provides sample designs and sample-size equations needed for specific statistical tests appropriate for several types of environmental problems.

The following is a list of the sampling goals that can be addressed in the current version of VSP:

Sampling Goal	User's Guide Section
Compare Average to Fixed Threshold	3.2.1
Compare Average to Reference Average	3.2.2
Estimate the Mean	3.2.3
Construct Confidence Interval on Mean	3.2.4
Compare Proportion to Fixed Threshold	3.2.5
Compare Proportion to Reference Proportion	3.2.6
Estimate the Proportion	3.2.7
Locating a Hot Spot	3.2.8
Find UXO Target Areas	3.2.9
Assess degree of confidence in UXO presence	3.2.10
Non-statistical approach	3.2.11
Establish boundary of contamination	3.2.12
Sampling within buildings	3.2.13

Allwest conducted VSP modeling with data input using U.S. EPA Region IX Preliminary Remediation Goals (PRGS). The VSP modeling revealed that soil samples should be collected at a total of 30 locations for the two (2) investigation areas (approximately 8 in the Ball Field Area and approximately 22 in the Arroyo/Eastern Canyon Area).

Allwest anticipates that continuous soil samples will be collected from each soil boring location within the two (2) investigation areas, with two (2) to three (3) soil samples submitted to the laboratory for chemical analysis. Proposed soil boring locations are presented on Figure 4 and VSP modeling output data is provided in the Sampling and Analysis Plan and QA/QC Plan included in Appendix 1. A list of radionuclides of interest for the proposed investigation is also provided in the Sampling and Analysis Plan and QA/QC Plan included in Appendix 1.

8.0 PROPOSED SCOPE OF WORK

This workplan describes initial VOC and radiologic subsurface investigation activities designed to achieve the DQOs presented in Section 5. Implementation of this workplan would provide:

1) Subsurface lithologic determination;
2) Screening for the presence of potential contaminants of concern;
3) Determine the potential for human health impacts; and
4) The basis to conduct subsequent investigations if necessary.

The proposed activities to be performed during this initial investigation described in this workplan include the following tasks:

- TASK 1: Generate workplan including SAP and QAPP, HASP, and IDW Plan
- TASK 2: Obtain necessary permits for groundwater (GW) monitoring well installation
- TASK 3: Aerial flyover, topographic survey and map preparation
- TASK 4: Underground utility clearance
- TASK 5: Passive soil gas (PSG) survey and analysis
- TASK 6: Soil boring, soil sampling, and analysis
- TASK 7: GW monitoring well installation, soil sampling, analysis and surveying
- TASK 8: GW monitoring well development, GW sampling and chemical analysis
- TASK 9: Human health risk assessment and analysis
- TASK 10: Data analysis and report preparation

8.1 TASK 1: Workplan

This comprehensive workplan was generated as a requirement by the VA GLAHS and includes descriptions of tasks and operating procedures required to conduct the initial VOC and radiological subsurface investigation. Included as appendices to this document are the Sampling and Analysis and QA/QC Plan, Health and Safety Plan, and Investigative Derived Waste Plan.

8.2 TASK 2: Permits

Allwest will obtain a groundwater monitoring well installation permit from the County of Los Angeles Department of Public Health, Water & Sewage/Mountain & Rural Programs – Environmental Health Division prior to commencing well installation activities.

8.3 TASK 3: Aerial Flyover, Topographic Survey and Map Preparation

Allwest will have the site mapped by aerial flyover survey followed by manual field surveyor verification, under the direction of a California licensed Professional Land Surveyor. A digital topographic map will be produced from the survey with an accuracy of ±0.1 inch vertically and ±0.01 inch horizontally, with a one-foot contour interval. The estimated area will include mapping 100 feet into all adjoining properties.

Allwest will also provide a field survey to locate the horizontal and vertical locations of boring and well locations that will be utilized by this project.

The topographic survey map will be used as the base map for all graphics in the final report.

8.6 TASK 6: Underground Utility Clearance

Prior to mobilizing into the field to conduct soil boring advancement and soil sampling activities, Allwest will notify underground service alert to clear underground utilities in the investigation area. In addition, Allwest will subcontract a private utility locating firm to clear underground utilities in the investigation area utilizing geophysical methods. Of special concern are irrigation lines in the ball field and the storm drain in the Arroyo/Eastern Canyon.

8.7 TASK 7: Passive Soil Gas Survey

Prior to mobilizing sampling rigs to advance soil borings and collecting soil samples, Allwest will conduct a passive soil gas (PSG) survey on the site. The PSG survey utilizes adsorbent samplers that are emplaced in the subsurface to adsorb compounds in soil gas without forcing the flow rate of soil gas, yielding a more representative sample than active soil gas methods. The samplers will be placed in a grid pattern, approximately 50 sample points spaced on approximately 28.5- to 35-foot centers. This allows for simultaneous sampling trace levels of compounds in soil gas that may originate from impacted soil and/or groundwater. By sampling all locations simultaneously, the temporal variations in soil gas concentrations that are known to occur daily, and even hourly, are normalized. At each PSG survey point, a ¾" metal stake will be hammered into the subsurface to a depth of approximately 3 feet below ground surface (bgs). A borosilicate glass vial containing 2 sets of hydrophobic sorbent cartridges will be hung via a wire at a depth of approximately 4" bgs. The glass vial will then be covered with aluminum foil and surrounding surface soil. The PSG survey point location will be marked and recorded on a field note sheet. The PSG survey point locations will be pre-surveyed in the field.

The PSG borosilicate glass vials containing the hydrophobic sorbent cartridges will be left downhole for a period of approximately 14 days upon which time they will be retrieved, sealed, and shipped via overnight delivery to Beacon Environmental Services, Inc. in Maryland under strict chain-of-custody procedures for analysis of VOCs using EPA method 8260B.

Analytical results for a PSG method are not presented as a concentration, but in units of mass for comparison between sample locations to identify where vapor migration pathways are present.

8.8 TASK 8: Soil Boring, Sampling, and Analysis

Soil borings will be advanced at approximately 30 locations in the two (2) investigation areas. Eight (8) soil borings will be advanced in the ball field and twenty two (22) soil borings will be advanced in the arroyo/eastern canyon.

Soil borings will be advanced to depths ranging from 20 to approximately 60 feet bgs utilizing a Geoprobe® brand direct-push sampling rig. Where applicable, some soil borings may be advanced to depths exceeding 60 feet bgs. Soil borings requiring advancement beyond 60 feet bgs may require advancement utilizing a hollow-stem auger-type drilling rig. When utilizing the direct-push sampling rig, soil will be retrieved continuously utilizing a 4-foot long large bore sampler fitted with acetate liners, and 5-foot long California split-spoon samplers will be utilized when a hollow-stem auger rig is employed. Lithology will be described continuously and boring logs will be generated for each soil boring. Two (2) to three (3) selected soil samples will be retrieved from the soil cores and will be submitted to a California-certified laboratory for chemical analysis. Soil samples will be based on lithology from visual inspection and chemical impacts determined by field screening methods. Soil retrieved will be screened in the field for VOCs using a photoionization detector (PID) and for possible radiation using radiation detectors.

A detailed description of soil sampling activities is provided in the Sampling and Analysis Plan and QA/QC Plan included in Appendix 1.

8.9 TASK 9: Groundwater Monitoring Well Design, Installation, Sampling, and Analysis

To verify the depth to groundwater in the vicinity of the three (3) medical waste burial areas in the arroyo/eastern canyon and assess the possibility of groundwater impacts, three (3) groundwater monitoring wells will be installed in the southernmost medical waste burial area, as accessible.

The groundwater monitoring wells will be installed using a truck-mounted mobile drill rig equipped with continuous-flight hollow-stem augers. The wells will be installed to a depth of approximately 70 feet bgs, depending on encountered groundwater levels. Soil samples will be collected continuously utilizing a 5-foot long modified California split-spoon sampler. Soil retrieved will be screened in the field for VOCs using a photoionization detector (PID) and for possible radiation using radiation detectors. The screened vapor concentrations, along with all other pertinent information, will be recorded on boring logs generated by the Professional Geologist in the field. Up to five (5) soil samples collected from each well location will be submitted to a stationary laboratory for chemical analysis. E-MAX Laboratories, Inc. of Torrance California will be utilized to provide VOC analysis and PIKA International/MKM Engineers will be utilized for radiological analysis in their Sacramento, California laboratory. Soil samples will be collected in accordance with EPA Method 5035 sample preservation techniques for VOC analysis.

The groundwater monitoring wells will be constructed of 4-inch diameter schedule 40 PVC slotted casing (0.01-inch) extending from the bottom of the borehole (approximately 70 feet bgs) to a depth of approximately 60 feet bgs followed by blank PVC casing to the ground surface. All casing will be shipped to the site in factory-sealed boxes or wrapping. The filter will consist of #2/12 Monterey sand. The filter pack will extend to a depth of approximately 2 feet above the top of screen.

A 3-foot bentonite seal will be placed above the filter pack and the remaining annulus will be filled with bentonite grout to within 1-foot of the ground surface. The surface completion will consist of a steel, flush-mount, traffic-rated well box placed in 1-foot of concrete. Prior to commencing the proposed well installation activities, a well installation permit will be obtained from the Los Angeles County Department of Public Health, Environmental Health, Water & Sewage/Mountain & Rural Programs. Following the installation activities, the wells will be developed using either a surge block and bailer or an electrical submersible pump until sediment-free water is produced. Subsequently, the well will be surveyed to a known benchmark. Upon 72 hours following well development, groundwater samples will be collected from each groundwater monitoring well.

A mobile pneumatic bladder or electrical submersible pump will be utilized to purge groundwater monitoring wells prior to sample collection utilizing a disposable bailer. Groundwater will be purged in accordance with low-flow sampling methods. Details regarding the low-flow sampling method and procedures are provided in the Sampling and Analysis Plan and QA/QC Plan included in Appendix 1.

8.10 TASK 10: Groundwater Monitoring Well Development, Monitoring & Sampling

Upon a minimum waiting time of 48 to 72 hours following well installation to allow the bentonite seal to properly cure and equilibrate, the newly installed groundwater monitoring wells will be developed by either bailing, surging, pumping, or a combination thereof until sediment-free water is produced from each well. Where access permits, well development activities will be conducted utilizing a mobile well development rig.

Water and sediment removed from the wells will be placed into DOT-approved 55-gallon drums and will be stored temporarily onsite pending chemical analysis.

Upon completion of well installation activities, each well will be surveyed to a known benchmark by a licensed land surveyor. Depth to groundwater will be measured and groundwater samples will be collected in accordance with provisions specified in the Sampling and Analysis and QA/QC Plan included Appendix 1. This data will be utilized to generate a groundwater elevation contour map to determine the local groundwater flow direction and gradient and to provide an initial assessment of groundwater quality in the localized area.

8.11 TASK 11: Baseline Human Health Risk Assessment and Analysis

A baseline risk assessment is intended to provide a logical framework from which decisions can be made concerning exposure or potential exposure to a hazardous material. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires the U.S. Environmental Protection Agency (EPA) to assess the risks to human health posed by uncontrolled hazardous waste sites on the National Priorities List (NPL). That assessment is conducted in the remedial investigation/feasibility study (RI/FS) phase of the evaluation process. This baseline risk assessment will evaluate the potential health consequences of exposure to chemicals or radionuclides released and/or threatened to be released into the environment from the two (2) investigation sites.

A baseline risk assessment is a process by which information and experience is integrated to quantify or otherwise describe risk. The overall objective of this baseline risk assessment is to provide risk bases for remedial decision making (i.e., deciding whether or not remediation of the (2) investigation sites may be needed because of potential threats to human health).

According to the concepts established by the National Academy of Sciences in 1983, a risk assessment generally consists of the following basic procedures:

(1) Hazard Identification

The identity of chemicals or radionuclides present in the soils, air and water at the two (2) investigation sites will be established based on the present and previous investigations. From the data gathered during the proposed remedial investigation and data historically available, a list of the chemical or radionuclide agents of potential concern will be developed. The quality of data will be evaluated and validated. After the validation process appropriate data qualifiers will be established and attached to each data point. A final list of chemical or radionuclide agents of concern and their respective concentrations (soil, water, and air) will be developed and carried forward in the exposure assessment portion of the baseline risk assessment.

(2) Dose- Response/ Toxicity Assessment

The dose-response evaluation will be slightly different for chemicals as compared to radioactive materials. For chemicals, exposure generally refers to the intake (e.g. inhalation, ingestion, dermal exposure) of the toxic chemical, expressed in units of mg/kg-day. For radiation the potential adverse effects in tissues are proportional to energy deposited per mass of tissue resulting from either internal and/or external exposures. The assessment of risks will be limited to those chemicals or radionuclides where published toxicity values or slope factors are readily available. It is not within the scope of this baseline risk assessment to develop specific toxicity values or slope factors for either chemicals or radionuclides.

(3) Exposure Assessment

Exposure is defined as the contact of an organism with a chemical or physical agent. Exposure assessment is the qualitative or quantitative estimation of the magnitude, frequency, duration and route of contact of a chemical or physical agent with an organism. As a part of this assessment potentially exposed populations will be identified and pathways for expected present or future exposures will be evaluated. Current exposure conditions will be evaluated and present and future land use will be considered. Reasonable maximum exposures will be evaluated with conservative fate and transport modeling where necessary. It is beyond the scope of this baseline risk assessment to develop or utilize site specific fate and transport models.

(4) Risk Characterization/Uncertainty Analysis

This last procedure integrates the findings of the previous three processes. In this baseline risk assessment the numerical risk values for carcinogenic chemicals, non-carcinogenic chemicals, and radionuclides will be presented with a brief explanation the confidence about data and method used. An attempt will be made to present a full and complete picture of risks and recommendations will be made as the need for action or further investigation.

8.12 TASK 12: Risk Characterization/Uncertainty Analysis and Report Preparation

This last procedure integrates the findings of the previous three processes. In this baseline risk assessment the numerical risk values for carcinogenic chemicals, non-carcinogenic chemicals, and radionuclides will be presented with a brief explanation the confidence about data and method used. An attempt will be made to present a full and complete picture of risks and recommendations will be made as the need for action or further investigation. All data, findings, summary, and conclusions will be compiled into a final report to be presented to the VA.

9.0 PERMITS

A groundwater monitoring well installation permit will be required from the County of Los Angeles Department of Public Health, Water & Sewage/Mountain & Rural Programs – Environmental Health Division prior to commencing with well installation activities.

10.0 PROJECT TEAM

Allwest has assembled a team of well qualified personnel including licensed professionals and individuals with higher education degrees. The following is a list of key personnel:

Project Team Member	Company	Responsibilities
John R. Gery, RGE, RCE	Allwest Geoscience, Inc.	Project Director
Romeo Balbas	Allwest Geoscience, Inc.	Project Manager
Karl H. Kerner, PE	Atlas Environmental Engineering. Inc.	Document Review
Jay Boughter, PG, CHMM	Atlas Environmental Engineering Inc.	Field Sampling Director
Joel Cehn, CHP, RSO	PIKA International	Radiation Safety Officer
Harry L. Skalsky, PhD	Skalsky & Associates	Health Risk Assessment
Monica Oscarson, CIH, MPH	Premiere Environmental Consultants	H&S Director

11.0 REFERENCES

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2. LARWQCB (Los Angeles Regional Water Quality Control Board), *Water Quality Control Plan Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties*, 1995
3. Millenium Environmental Consulting Associates (MECA), *Final Radiological Inspection Report for Veterans Administration Greater Los Angeles & Brentwood Dog Park*, March 2, 2007
4. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August, 2000
5. URS Greiner Woodward Clyde (URS), *Environmental Documents – Request 13: Documents Given to Contractors Regarding Environmental Issues at West Los Angeles – 79. Phase I, Environmental Site Assessment, Brentwood School*, January 2000
6. U.S. Department of Energy (DOE), *Visual Sampling Plan Version 4.0*, July 2005
7. U.S. EPA, *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A, Baseline Risk Assessment*," EPA/540/1-89/002, December, 1989
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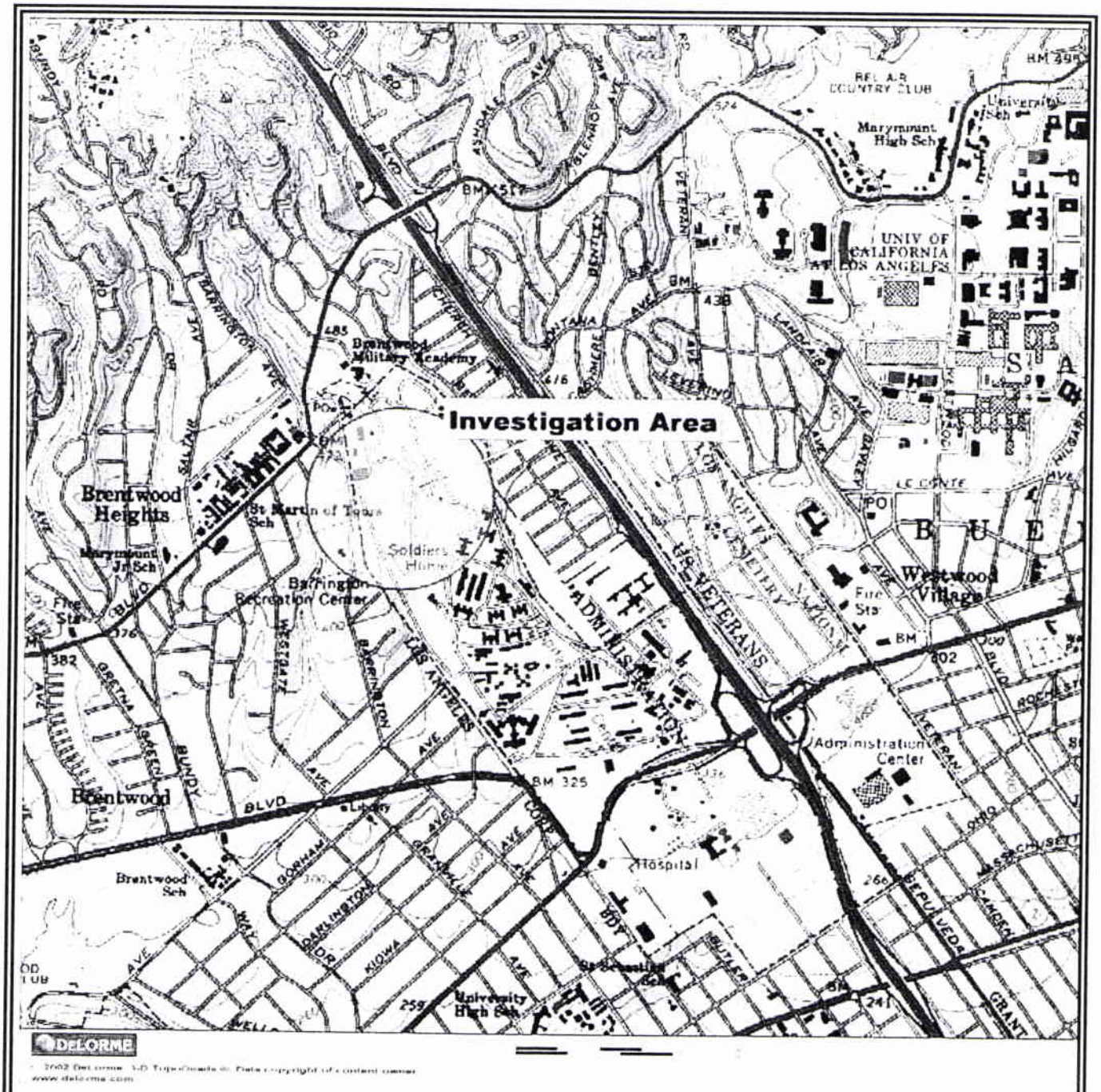
9. U.S. EPA, *Guidance for Exposure Assessment*," EPA/600-Z-92/001, May 29, 1992
10. U.S. EPA, *Superfund Exposure Assessment Manual*," EPA/540/1-88/001, OSWER Directive No. 9285.5-1, April, 1988
11. U.S. EPA, *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors*," OSWER Directive No. 9285.6-03, March, 1991
12. U.S.G.S. (United States Geologic Survey), *7.5-Minute Series Topographic Map, Beverly Hills Quadrangle*, 1966, Photorevised 1981

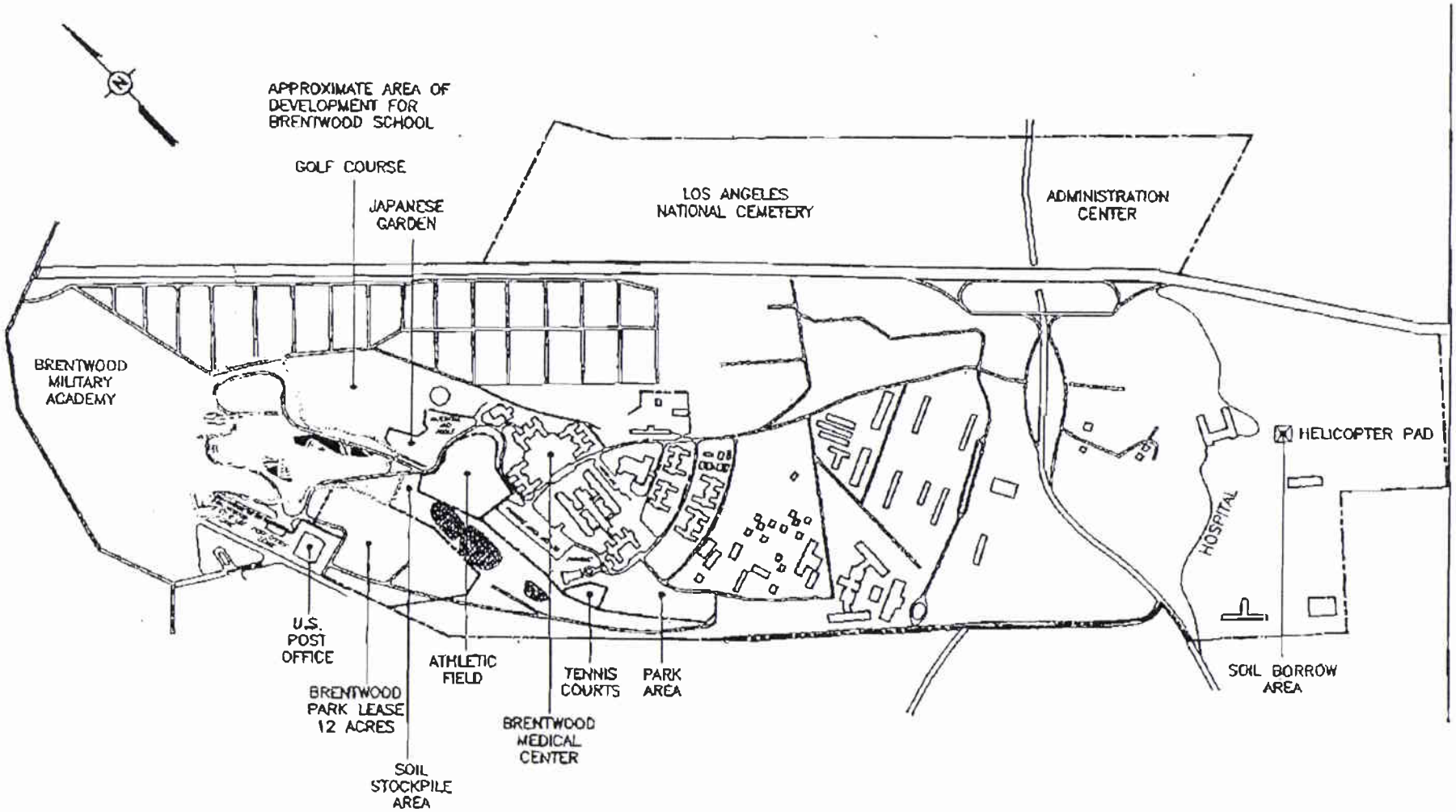
APPENDIX 1

FIGURES



Map: 7.5' USGS Topographic Map Beverly Hills Quadrangle
Date: <1980> (photorevised 1989)
Scale: 1: 25000

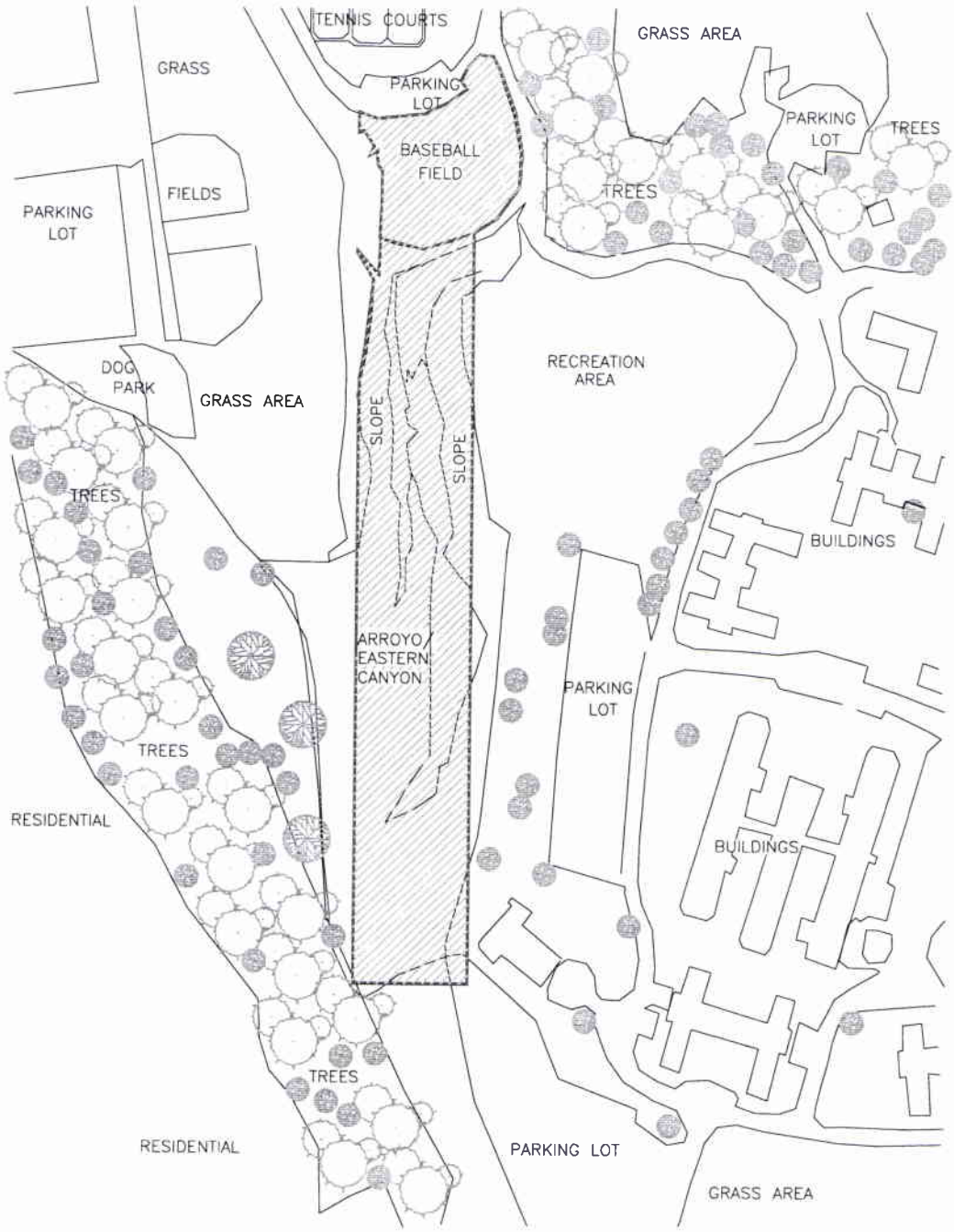
ALLWEST GEOSCIENCE	**VA GLAHS** 11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	SITE VICINITY MAP NORTH FIGURE 1



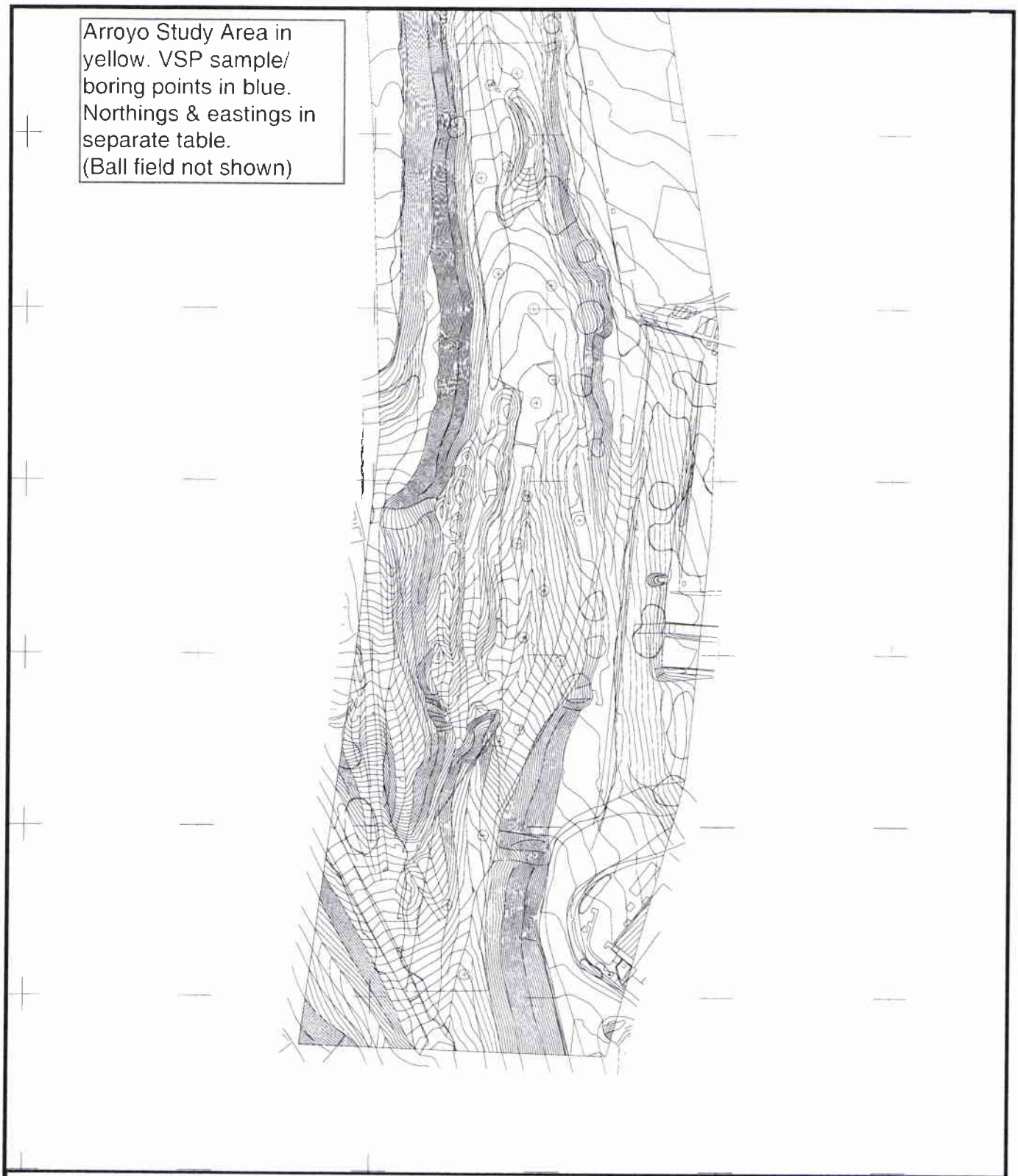
LEGEND:

- BURIED HISTORICAL SOLID WASTE DISPOSAL AREA
- BURIED HISTORICAL MEDICAL WASTE DISPOSAL AREA

NORTH	Design By: ADAPTED FROM A SITE PLAN PROVIDED BY LOCUS TECHNOLOGIES	Drawn By: EFD	Date: 05/07/2008
	NOT TO SCALE	VA GLAHS	SITE FACILITY MAP
ALLWEST GEOSCIENCE		11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	DRAWING NUMBER: DVA-F2
			FIGURE 2



NORTH	Design By: ADAPTED FROM AN AERIAL PHOTOGRAPH PROVIDED BY ALLWEST GEOSCIENCE	Drawn By: EFD	Date: 05/07/2008
	0 SCALE 300' (APPROXIMATE DIMENSIONS)		
ALLWEST GEOSCIENCE	VA GLAHS 11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	INVESTIGATION AREAS	
		DRAWING NUMBER: DVA-F3	FIGURE 3



VA GLAHS

11301 Wilshire Boulevard
Los Angeles, California

PROPOSED SOIL BORING LOCATIONS

ALLWEST GEOSCIENCE Inc.

Scalee: NTS

Date: 10/2008

FIGURE 4

APPENDIX 2

SAMPLING AND ANALYSIS
AND
QA/QC PLAN

SAMPLING AND ANALYSIS PLAN
AND
QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN

INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION

VETERANS ADMINISTRATION
GREATER LOS ANGELES HEALTHCARE SYSTEM
11301 WILSHIRE BOULEVARD
LOS ANGELES, CA 90073

PROJECT NO. 02-3454EI-3

October 2, 2008

Prepared For:

Department of Veterans Affairs
Veterans Administration - Greater Los Angeles Healthcare System
11301 Wilshire Boulevard, Building 218, Room 308
Los Angeles, CA 90073

Prepared By:

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Project No. 02-3454EI-3
October 2, 2008

Veterans Administration Greater Los Angeles Healthcare System
11301 Wilshire Boulevard
Building 218, Room 308
Los Angeles, CA 90073

Attention: Mr. Ben Spivey
Chief, Occupational Safety and Health

Subject: **SAMPLING AND ANALYSIS PLAN**
AND QUALITY ASSURANCE PROJECT PLAN
INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION
Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS)
11301 Wilshire Boulevard
Los Angeles, CA 90073

Dear Mr. Spivey:

Pursuant to the conditions of the contract, Allwest Geoscience, Inc., has prepared this *Initial VOC and Radiological Subsurface Investigation – Sampling and Analysis Plan and Quality Assurance Project Plan* to conduct a surface and subsurface investigation that would assist in evaluating potential human health risks associated with buried medical waste resulting from historic medical research and disposal practices at the Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS) campus.

Allwest Geoscience, Inc., has developed a workplan that has utilized the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) Data Quality Objectives (DQO), which are established to provide information necessary to conduct the overall investigation, evaluation and risk assessment.

We appreciate the opportunity to provide the requested environmental services. If you have any questions concerning this report, please contact the undersigned.

Sincerely,

ALLWEST GEOSCIENCE, INC.

JOHN R. GERY
Principal Geotechnical Engineer
California Registration No. RGE 336
Expires 12/31/09

REGISTERED PROFESSIONAL ENGINEER
JOHN R. GERY
No. 336
Expires 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

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SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION

1.0 INTRODUCTION

This Draft Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) have been prepared for the Department of Veteran Affairs (VA) by Allwest Geoscience, Inc. in accordance with VA Solicitation No. VA-262-08-RP-0126. This Draft SAP and QAPP was prepared to support the Initial VOC and Radiological Subsurface Investigation at the baseball field and arroyo/eastern canyon areas of the VA Greater Los Angeles Healthcare System facility (GLAHS). A site Location Map is included as **Figure 1** (Appendix B), a site plan showing property features is included as **Figure 2** (Appendix B), and the two (2) initial investigation areas are shown on **Figure 3** (Appendix B).

The purpose of the SAP and QAPP is to provide guidance on sampling, analysis, and quality assurance (QA) for the proposed initial VOC and radiological subsurface investigation activities proposed at the VA GLAHS facility. The SAP and QAPP will be used as a reference document by all field and laboratory personnel engaged in the sampling and analysis for this program and quality assurance (QA) and quality control (QC).

Included in this SAP and QAPP are field sampling procedures, QA/QC requirements, and data gathering methods that will be used during initial investigation activities for the VA GLAHS. Data quality objectives (DQOs) are also provided in this document. The QA elements of this SAP and QAPP were prepared in accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS* [U.S. Environmental Protection Agency (EPA), 2001] to ensure that all data collected are precise, accurate, representative, complete, and comparable to meet their intended use.

The following table provides the elements of EPA QA/R-5 and where each element is addressed in this SAP and QAPP:

ELEMENTS OF EPA QA/R-5 IN RELATION TO THIS SAP AND QAPP

EPA QA/R-5 QAPP ELEMENT*		ALLWEST SAP AND QAPP	
A1	Title and Approval Sheet		Title and Approval Sheet
A2	Table of Contents		Table of Contents
A3	Distribution List		Distribution List
A4	Project/Task Organization	7.0	Project Organization
A5	Problem Definition/Background	2.0	Background
A6	Project/Task Description	1.1	Objective
A7	Quality Objectives and Criteria	8.0	Quality Assurance Objectives
A8	Special Training/Certification	9.1	Laboratory Qualification
A9	Documents and Records	6.6	Field Documentation
B1	Sampling Process Design	4.0	Sampling Strategy
B2	Sampling Methods	6.0	Field Methods and Sampling Procedures

ELEMENTS OF EPA QA/R-5 IN RELATION TO THIS SAP AND QAPP

EPA QA/R-5 QAPP ELEMENT*		ALLWEST SAP AND QAPP	
B3	Sample Handling and Custody	6.0	Field Methods and Sampling Procedures
B4	Analytical Methods	5.1	Analytical Requirements
B5	Quality Control	9.0	Analytical Quality Control Procedures
B6	Instrument/Equipment Calibration and Frequency	9.4.1	Calibration
B7	Inspection/Equipment Calibration and Frequency	9.4.1	Calibration
B8	Inspection/Acceptance of Supplies & Consumables	9.5	Preventative Maintenance
B9	Non-direct Measurements		Not Applicable
B10	Data Management	10.1	Data Quality Management
C1	Assessment and Response Actions	11.1.1	Corrective Action
C2	Reports to Management	9.6.4	Management Review
D1	Data Review, Verification, and Validation	10.2	Data Evaluation
D2	Validation and Verification Methods	10.2	Data Evaluation
D3	Reconciliation with User Requirements	11.0	Quality Assurance and Oversight

Notes:

* EPA. 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." Office of Environmental Information. Washington, DC. EPA/240/B-01/003. March.

EPA U.S. Environmental Protection Agency
MSC Miscellaneous Sites of Concern
QA Quality Assurance
QAPP Quality Assurance Project Plan
SAP Sampling and Analysis Plan

1.1 OBJECTIVES

The specific objectives of this SAP and QAPP are to: 1) provide guidance for the field sampling activities at the VA GLAHS; 2) describe and establish consistent field sampling procedures; 3) establish data gathering, handling, and documentation methods; and 4) define QA/QC measures to ensure consistency and confidence in the data obtained at any point in the program.

The information collected will be used to:

- Determine whether VOCs and buried low-level radioactive medical waste materials are present in surface and subsurface soil at concentrations that may pose a risk to human health and the environment; and
- Determine whether groundwater in the area of the buried medical waste in the "Arroyo/Eastern Canyon" may have been impacted with VOCs and low-level radioactive material.

1.2 REGULATORY REQUIREMENTS

Although the proposed initial VOC and radiological subsurface investigation is intended for VA internal purposes only, any work and data collected pertaining to soil issues will adhere to DOE, DOD, DTSC, and DPH guidelines, protocols, and requirements while any work and data collected pertaining to groundwater issues will adhere to DTSC and Los Angeles Regional Water Quality Control Board (LARWQCB) guidelines, protocols, and requirements. Allwest also understands that the Arroyo/Eastern Canyon falls under the jurisdiction of the Integrated Waste Management District.

2.0 BACKGROUND

This section provides a brief summary of background information including site locations and the general geology and hydrogeology at the VA GLAHS.

2.1 SITE LOCATION

The VA GLAHS property encompasses an area of approximately 450 acres (URS, 2000). Two (2) investigation areas include a baseball field and an area known as the "Arroyo" or "Eastern Canyon" (MECA, 2007). The Arroyo or Eastern Canyon has been previously identified as a burial area for former medical waste from animal experiments, including animal carcasses, medical isotope waste in radiological scintillation vials and other miscellaneous medical debris including syringes (MECA, 2007).

Two (2) sites have been selected for this investigation: the "Baseball Field" which measures approximately 200 feet by 200 feet and the adjacent "Arroyo" or "Eastern Canyon" which measures approximately 125 feet wide by 1,000 feet long (**Figure 3** – Appendix B).

2.2 GEOLOGY

The investigation areas are located in the Sawtelle Plain portion of the Santa Monica Basin portion of the larger Coastal Plain of Los Angeles County (DWR, 1961), approximately 1-1/2 miles south of the base of the Santa Monica Mountains and approximately 4 to 5 miles east of the Pacific Ocean. The "Ball Field" is situated at an elevation ranging from approximately 400 to 420 feet above mean sea level (AMSL) and the "Arroyo/Eastern Canyon" is situated at an elevation ranging from approximately 350 to 380 feet AMSL in the proposed investigation area.

UCLA is located approximately 1 mile northeast of the site and the gently rolling Beverly Hills are located approximately 2 to 3 miles east of the site (USGS, 1981). Surface deposits in the site area consist of marine and continental gravel, sand, sandy silt, silt, and clay with shale pebbles of the upper Pleistocene-age Lakewood Formation and Recent-age alluvium comprised of gravel, sand, silt, and clay. Marine conglomerate, sandstone and shale of the Miocene-age Modelo and Topanga Formations outcrop at the ground surface further to the north of the site (DWR, 1961).

2.3 HYDROGEOLOGY

The site is located north/northwest of the Charnock Fault where the DWR does not differentiate groundwater aquifers within undifferentiated Pleistocene Formations. South/southeast of the Charnock Fault, the first-encountered water-bearing zone is designated as the Ballona Aquifer ("50 Ft Gravel") within Recent-age Alluvium extending from approximately 20 to 60 feet bgs followed by the Silverado Aquifer within the San Pedro Formation which extends from approximately 160 to 425 feet bgs (DWR, 1961).

Groundwater beneath the VA property is within the Santa Monica Hydrologic Subarea of the Coastal Plain Hydrologic Area of the Los Angeles-San Gabriel Hydrologic Unit. Groundwater in the Santa Monica Hydrologic Subarea is designated as existing beneficial use for municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply (LARWQCB, 1995).

Groundwater is anticipated to be encountered at a depth of approximately 60 feet bgs in the vicinity of the proposed initial investigation areas (VA, 2008).

3.0 SAMPLING STRATEGY

This section provides a brief description of the general approach used to satisfy or meet the requirements set forth in the VA solicitation.

3.1 FIELD SAMPLING PROGRAM

The sampling will progress in a phased approach starting with a passive soil gas survey, followed by soil boring advancement/soil sample collection and groundwater monitoring well installation/soil sampling, followed by groundwater sampling.

Outlined in the following sections are brief descriptions of the sample locations, frequencies of sample collection, and analyses required for soil and groundwater sampling at the two (2) investigation areas on the VA GLAHS facility. Also provided are brief descriptions of the rationale for sampling at the designated locations.

3.1.1 Passive Soil Gas, Soil, and Groundwater Sampling Network

3.1.1.1 Passive Soil Gas Sampling

Allwest proposes to conduct a passive soil gas (PSG) survey at the two (2) investigation locations: 1) Baseball field; and 2) Burial pits in the "canyon." Up to 50 soil vapor probes will be advanced on up to 100-foot centers within the baseball field and burial pits in the "arroyo/canyon." The PSG survey will be conducted in accordance with the State of California Department of Toxic Substances Control (DTSC) Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air document dated December 15, 2004, revised February 7, 2005.

PSG survey probes will be advanced to depths of approximately 3 feet bgs at each proposed location and sorbent vials will be hung inside each probe location at a depth of approximately 4 inches bgs.

The ground surface at each probe location will be covered and after 14 days, the sorbent vials will be retrieved from each probe location and will be submitted to a certified laboratory for chemical analysis. The PSG survey will be coordinated with and PSG samples will be analyzed by Beacon Environmental Services, Inc.

3.1.1.2 Soil Sampling

Allwest will advance up to 8 soil borings spaced on up to 100-ft. centers within the baseball field and up to 22 soil borings spaced on up to 100-ft. centers within the "Arroyo/Canyon" and including the three (3) burial areas. Also, three (3) groundwater monitoring wells will be installed in the "Arroyo/Canyon" to evaluate depth to groundwater, groundwater flow direction and gradient, and water quality in the immediate vicinity of the burial areas.

Soil borings will be advanced to depths ranging from 20 to approximately 60 feet bgs utilizing a Geoprobe® brand direct-push sampling rig. Where applicable, some soil borings may be advanced to depths exceeding 60 feet bgs. Soil borings requiring advancement beyond 60 feet bgs may require advancement utilizing a hollow-stem auger drilling rig. When utilizing the direct-push sampling rig, soil will be retrieved continuously utilizing a 4-foot long large bore sampler fitted with acetate liners, and 5-foot long California split-spoon samplers will be utilized when a hollow-stem auger rig is employed. Lithology will be described continuously and boring logs will

be generated for each soil boring. Two (2) selected soil samples will be retrieved from the soil cores and will be submitted to a California-certified laboratory for chemical analysis. Soil samples will be based lithology from visual inspection and chemical impacts determined by field screening methods.

3.1.1.3 Groundwater Monitoring Wells Installation and Sampling

Allwest will install three (3) groundwater monitoring wells in the vicinity of the burial area within the "Arroyo/Canyon." All field work will be conducted by a California Professional Geologist and a radiation technician under the direct supervision of a Certified Health Physicist.

The groundwater monitoring wells will be installed using a truck-mounted mobile drill rig equipped with continuous-flight hollow-stem augers. The wells will be installed to a depth of approximately 70 feet bgs. Soil samples will be collected continuously utilizing a 5-foot long modified California split-spoon sampler. Soil retrieved will be screened in the field for VOCs using a photoionization detector (PID) and for possible radiation using radiation detectors. The screened vapor concentrations, along with all other pertinent information, will be recorded on boring logs generated by the Professional Geologist in the field. Up to five (5) soil samples collected from each well location will be submitted to a stationary laboratory for chemical analysis. E-MAX Laboratories, Inc. of Torrance California will be utilized to provide VOC analysis and PIKA International/MKM Engineers will be utilized for radiological analysis in their Sacramento, California laboratory. Soil samples will be collected in accordance with EPA Method 5035 sample preservation techniques for VOC analysis.

The groundwater monitoring wells will be constructed of 4-inch diameter schedule 40 PVC slotted casing (0.01-inch) extending from the bottom of the borehole (approximately 70 feet bgs) to a depth of approximately 60 feet bgs followed by blank PVC casing to the ground surface. All casing will be shipped to the site in factory-sealed boxes or wrapping. The filter will consist of #2/12 Monterey sand. The filter pack will extend to a depth of approximately 2 feet above the top of screen.

A 3-foot bentonite seal will be placed above the filter pack and the remaining annulus will be filled with bentonite grout to within 1-foot of the ground surface. The surface completion will consist of a steel, flush-mount, traffic-rated well box placed in 1-foot of concrete. Prior to commencing the proposed well installation activities, a well installation permit will be obtained from the Los Angeles County Department of Public Health, Environmental Health, Water & Sewage/Mountain & Rural Programs. Following the installation activities, the wells will be developed using either a surge block and bailer or an electrical submersible pump until sediment-free water is produced. Subsequently, the well will be surveyed to a known benchmark. Upon 72 hours following well development, groundwater samples will be collected from each groundwater monitoring well.

A mobile pneumatic bladder or electrical submersible pump will be utilized to purge groundwater monitoring wells prior to sample collection utilizing a disposable bailer. Groundwater will be purged in accordance with low-flow sampling methods. Details regarding the low-flow sampling method and procedures are provided in Section 5.1.1.

3.1.2 Sampling Rationale

All sampling (passive soil gas, soil, and groundwater) will be conducted by applying the DOE's Quality Assurance Tool, Visual Sampling Plan (VSP) and the Multi-Agency Radiation Survey & Site Investigation Manual (MARSSIM) DQOs.

3.1.3 Sampling Frequency and Analytical Requirements

Since this is an internal investigation to collect data to assist in evaluating potential human health risks associated with buried medical waste resulting from historic medical research and disposal practices, passive soil gas, soil matrix, and groundwater samples will be collected on 1-time basis. These results will be utilized to evaluate potential human health risks and will be submitted for internal purposes only.

Passive soil gas samples will be analyzed for VOCs only, utilizing EPA method TO-1 7 for sample collection and EPA Method 8260B for analysis using thermal desorption-gas chromatography/mass spectrometry (TD-GC/MS) instrumentation.

Soil samples will be analyzed for VOCs using EPA method 8260B. All soil samples will be analyzed for a reduced suite of radioisotopes including tritium (H^3), Carbon 14 (C^{14}), and chlorine 36 (Cl^{36}). Other selected soil samples will be analyzed for a suite of 40 radioisotopes including those just described. A full list of analytes (VOCs and radioisotopes) is included in Table 2 (Appendix C).

Groundwater samples will be analyzed for VOCs using EPA method 8260B and the full list of 40 radioisotopes. These parameters are summarized in Table 2 (Appendix C).

Details regarding the analytical methods and protocols to be used are provided in Section 4.0 and Section 5.0.

3.2 WASTE CHARACTERIZATION

Soil cores, soil cuttings, groundwater from well purging activities, and decontamination water will be stored onsite temporarily in appropriate containers for subsequent proper disposal by the VA GLAHS.

Allwest will coordinate offsite transport and disposition with VA GLAHS transportation and disposal (T&D) contractors. Details are provided in the *Industrial Derived Waste Plan* included as a separate Appendix.

4.0 REQUEST FOR ANALYSIS

This section describes the analytical methods, sample containers, and preservative requirements. Also, field QC samples to be collected for this project will be discussed in this section.

4.1 ANALYTICAL METHODS

The following EPA analytical methods [*Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846,* Third Edition and final updates (EPA, 1997)] will be used to analyze water samples during this project. **Table 1** summarizes analytical tests to be conducted during the PSG Survey and **Table 2** summarizes analytical tests to be conducted during the soil and groundwater sampling activities proposed at the VA GLAHS.

Detailed information regarding methods, calibration criteria, project-required reporting limits (RLs), and QC acceptance criteria are presented in Section 6.0.

4.2 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

A list of the sample containers, preservatives, and holding time requirements for each analytical method is provided in **Table 3**.

4.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples for this project may include trip blanks, field duplicates, and equipment rinsates. The sampling frequency for field QC samples for this project is summarized in **Table 4**.

4.3.1 Trip Blanks

Trip blanks will consist of hydrochloric acid (HCl)-preserved, organic-free water prepared by the laboratory in 40-milliliter (mL) volatile organic analysis (VOA) vials that will be carried into the field, stored with the sample, and returned to the laboratory for volatile organic compound (VOC) analysis. Trip blanks will be used to determine if samples have been cross-contaminated with VOCs during the packaging and transportation of the samples. Trip blanks will be provided and analyzed for each day that VOC sampling and shipping take place. One Trip blank will accompany each sample cooler.

4.3.2 Field Duplicates

Field duplicates consist of two (2) distinct samples (an original and a duplicate) of the same matrix collected at the same time and location to the extent possible and using the same sampling techniques. The purpose of field duplicates is to measure the consistency of field sampling. Field duplicates will be collected at a frequency of one for every ten samples taken and will be analyzed for the same analytes as the original sample. Field duplicates are uniquely identified so that the identity of the field duplicates is "blind" to the analytical laboratory. Exact locations of field duplicate samples and their identifications will be recorded in the field logbook and other internal paperwork, including the sample tracking log.

4.3.3 Equipment Rinsate Samples

Equipment rinsate samples will be collected only if reusable sampling equipment is used. Rinsate samples consist of organic-free, reagent-grade water collected from the final rinse of the equipment decontamination process.

Rinsate samples will be collected directly from the sampling equipment, placed in appropriate pre-cleaned containers supplied by the analytical laboratory, and analyzed for the same analytes as the field samples under the same analytical conditions. Equipment rinsate samples, collected at a frequency of one per each day of sampling, will help determine the effectiveness of the decontamination procedure and potential for cross-contamination during sampling events.

In the event that dedicated sampling equipment is used, only one equipment rinsate sample will be required. That rinsate sample should be collected immediately after the initial decontamination of the equipment is performed, prior to deployment. Once the initial rinsate is collected and the equipment is deployed, no additional rinsates would be required, unless the equipment is removed from its dedicated location for repair, maintenance, or use in a different location.

Equipment rinsates will not be collected when disposable sampling equipment is used, provided the equipment is certified as clean by the manufacturer, and the original packaging or seal has not been damaged or compromised prior to its use.

4.3.4 Source Blank

One source blank will be collected for laboratory analysis to evaluate potential cross-contamination from the source of water used for the rinsate. One source blank sample will be prepared and submitted to the laboratory for each source of water used during the sampling event.

4.3.5 Temperature Blank

Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and shipment. The laboratory will record the temperature of the blank immediately upon receipt of the samples.

5.0 FIELD METHODS AND SAMPLING PROCEDURES

The following sections provide the sampling procedures and sample handling protocols to be used for this project.

5.1 FIELD SAMPLING PROCEDURES

Groundwater samples will be collected from monitoring wells identified in Section 3.0 at the VA GLAHS. Field measurements of general groundwater quality will also be obtained during the sampling process. A copy of the groundwater sample log used for recording field measurements is provided in **Appendix D**.

The LARWQCB Board Orders that govern the groundwater monitoring requirements at the VA GLAHS specify that each well must be sufficiently purged prior to sampling to ensure that the sample is "representative" of the true aquifer conditions. Therefore, only those methods that provide for purging prior to collecting a sample will be used for this project. These methods include purging with a pneumatic bladder (low-flow) pump or a standard submersible electric pump. The procedures for sampling by these methods are described in detail below.

It is recommended that groundwater samples are collected by the low-flow technique each quarter to provide continuity in terms of the sampling method. However, should equipment problems or changes in field conditions make the use of dedicated pumps impractical, sampling by way of portable low-flow or submersible pumps (electric or pneumatic) based on the procedures outlined below, will constitute an acceptable method for collecting groundwater samples.

5.1.1 Well Water Sampling with a Pneumatic Pump – Low-Flow Method

Samples collected by the low-flow method, using a dedicated or non-disposable pump (either pneumatic or electric), will be obtained by following the appropriate combination of the steps outlined below. Sampling with a non-dedicated bladder pump will be conducted using the following series of steps:

- The internal chambers of the pump and entire length of discharge tubing shall be decontaminated prior to deployment in each well. Use of a dedicated bladder and/or discharge tubing will eliminate the need for decontamination of the internal parts, although the pump housing and other related downhole equipment must still be cleaned prior to redeployment in a different well location.

Using a decontaminated water level indicator, measure the depth of static groundwater level to the nearest 0.005 foot (recorded to the nearest 0.01 foot) from a marked survey point on each wellhead. Record all readings on the groundwater sampling log.

- The bladder pump will be lowered into the well slowly to minimize the disturbance of the water during the insertion process. The pump will be placed so that the intake will rest in the approximate center of the saturated portion of the screened interval.
- The pump will be left in position for at least 24 hours before the start of purging to allow the water in the casing and formation to equilibrate.
- Immediately prior to purging, measure and record the static water level within the well.
- Start pumping at the lowest possible rate (typically 0.2 to 0.5 liters per minute), such that there is little or no water level drawdown. Measure drawdown regularly during the startup period to ensure that drawdown does not exceed the target goal of 0.3 feet. Record flow rate and drawdown reading on the well sampling log. Adjustments to the flow rate should be made at this time to help minimize purging time. During the pump startup period, drawdown may exceed the 0.3 feet target and then "recover" as pump flow adjustments are made.
- Calculate volume of sampling system, based on the volume of the bladder and discharge tubing. Tubing volume can be determined using the equation provided in Step 4 of Section 5.1.2.
- Determine the amount of time necessary for the pump to purge at least one full sampling system volume, based on the flow rate. Allow time for at least one sample system volume to be purged prior to monitoring water quality parameters (see below).
- After clearing one full sample system volume, continue purging until the water quality parameters stabilize.
- During well purging, water quality parameters, turbidity, temperature, electrical conductivity (EC), dissolved oxygen (DO), and pH will be monitored with an appropriate instrument in conjunction with the use of a clear flow-through cell. Readings will be recorded every 3 to 5 minutes (or less frequently, where appropriate). During the early phase of purging, emphasis will be placed on minimizing pumping stress. Purging will be considered complete when water quality parameters have stabilized. The parameters will be considered stable when three consecutive readings fall within the following limits:
    - Turbidity [10% for values > 1 nephelometric turbidity unit (NTU)]
    - EC (10%)
    - Temperature (10%)
    - pH (± 0.5 units)

- Once the water quality parameters stabilize, groundwater samples will be collected in the appropriate sample containers for the required analytes, using care to minimize aeration and sample agitation during the process.
- The samples will be labeled and packaged for shipping in accordance with the methods outlined in Sections 5.4 and 5.5.

Sampling with a mobile pump (pneumatic or electric) will follow the same general procedure, although Steps 1 through 4 will only be required during the initial deployment of the pump into the well. After the initial installation process, Steps 5 through 12 will be performed for sampling with dedicated pneumatic bladder pump systems.

5.1.2 Well Water Sampling with a Standard Submersible Electric Pump

The steps below shall be followed for sampling monitoring wells with submersible pumps (pneumatic or electric):

- The internal chambers of the pump and entire length of discharge tubing shall be decontaminated prior to placement in a well.
- Measure the groundwater level to the nearest 0.01 foot using a decontaminated water level indicator. Measure the level from a marked survey point on the wellhead. Record all readings in the groundwater sampling log.
- Deploy the pump/discharge tubing in the well so that the pump intake lies approximately 2 to 3 feet above the bottom of the screen, where possible. Do not use the submersible electric pump in circumstances where there is less than 3 or 4 feet of water above the bottom of the screen.
- Calculate casing volume and purge volume using the following equation:

$$V = \pi \times [D/2]^2 \times H \times 7.48 \text{ gal/ft}^3$$

Where: V = Casing Volume (gallons)
D = Casing Diameter (feet)
H = Water Column Height (feet)
π = pi or 3.1416

Purge Volume = 3 × casing volume

- Determine the minimum volume of water to be purged from each well before pumping and sample collection. (See equation above.).
- Adjust flow rate to a sustainable rate for the well. Pumping at too high of a rate may cause some wells to become dry within a few short minutes. Adjust flow rate to minimize drawdown and ensure a continuous flow of water that can be sustained for an indefinite period of time.
- Remove one casing volume of water and conduct field water quality measurements, such as temperature, pH, DO, turbidity, and EC. Continue purging and recording of the water quality parameters in 5- to 10-minute intervals until the calculated minimum volume of water has been removed.

- During the early phase of purging, emphasis will be placed on minimizing pumping stress. Purging will be considered complete when water quality parameters have stabilized. The parameters will be considered stable when three consecutive readings fall within the following limits:
    - Turbidity (10% for values > 1 NTU)
    - EC (10%)
    - Temperature (10%)
    - pH (± 0.5 units)
- Collect the water sample after the water quality parameters have stabilized.
- If the well recharges slowly, allow the well to recover to 80 percent of the static level before collecting the sample.
- If the well produces an adequate volume of water, collect the sample directly from the discharge tubing while pumping. When collecting samples for VOC analysis, reduce the flow to the lowest sustainable rate that will provide a laminar flow stream prior to collecting the sample.
- Samples will be labeled and packaged in accordance with Sections 6.4 and 6.5.

5.1.3 Sampling for Volatile Organic Compounds

Sampling for VOCs requires a special collection technique. Field sampling will be planned ahead, and the following conditions will be considered:

- Field sampling must be performed in a manner that aeration or mixing of the sample material is avoided.
- Handling and storage of samples must ensure that exposure of the sample to elevated temperatures at any point during the sample collection is avoided.
- Exposure of the collected sample to air must be minimized.

Steps for the water sample collection for VOCs will be as follows:

- Carefully collect the water samples in a 40-mL VOA vial in a way that minimizes aeration or sample agitation. Aeration and agitation can be minimized by making sure that the water issuing from the discharge line, sample tap, or sample device forms a laminar flow into the VOA vial.
- Fill the vial up to the lid until a meniscus is formed.
- Cap the vial immediately but slowly.
- Check the sample for presence of air bubbles.
- If an air bubble is present, discard the collected sample and resample using a new vial.
- Repeat the previous steps until an air-bubble-free sample is collected.
- Follow Section 6.3 to 6.5 for the labeling, handling, packaging, and shipping of samples.

5.1.4 Sampling for Radioisotopes

A variety of isotopes were disposed of (buried) in the arroyo/eastern canyon, at one time or another. The following list was obtained from previous investigation work and covers the years 1960 to closure (1968):

Nuclide	Quantity (mCi)
Tritium	1171
Carbon-14	53
Iodine-131	138
Chlorine-36	0.042
Mercury-203	0.7
Sodium-24	1.6
Chromium-51	1.5
Iodine-125	13
Phosphorus-32	10.4
Molybdenum-99	21.4
Zinc-65	0.05
Iron-59	1.3
Sodium-22	0.6
Sulfur-35	2.4
Strontium-85	0.05

The high-lighted nuclides have half-lives that are short relative to the age of the burial areas. Thus, they would no longer be present. The remaining three are:

Tritium;
Carbon-14; and
Chlorine-36

All soil and groundwater samples collected will be analyzed for these radio-nuclides.

Contractual List of Radioactive Analytes

The following is a list of radio-nuclides that Allwest is contractually required to analyze for:

Bromine-82	Gold-198	Nickel-63	Sodium-24
Calcium-45	Indium-111	Phosphorus-32	Strontium-85
Calcium-47	Iodine-125	Potassium-42	Strontium-90
Carbon-14	Iodine-131	Radium-226	Sulfur-35
Cesium-137	Iridium-192	Rubidium-81	Technecium-99
Chlorine-36	Iron-59	Rubidium-83	Tritium (H-3)
Chromium-51	Manganese-54	Rubidium-86	Tin-113
Cobalt-57	Mercury-197	Scandium-46	Xenon-133
Cobalt-60	Mercury-203	Selenium-75	Yttrium-90
Gallium-67	Molybdenum-99	Sodium-22	Zinc-65

Approximately 22 soil samples and 3 water samples will be analyzed for these nuclides. The analytical methods to be used are:

By Gamma Spectroscopy

Nuclide	Reporting Limit (pCi/gram soil)	Reporting Limit (pCi/L water)
Bromine-82	0.2	150
Calcium-47	2	1,000
Cesium-137	0.1	60
Chromium-51	0.4	300
Cobalt-57	0.05	20
Cobalt-60	0.1	100
Gallium-67	0.2	150
Gold-198	0.1	70
Indium-111	0.05	50
Iodine-125	2	1,000
Iodine-131	0.06	50
Iridium-192	0.05	50
Iron-59	0.2	100
Manganese-54	0.1	50
Mercury-197	0.3	200
Mercury-203	0.06	50
Molybdenum-99	0.4	300
Potassium-42	1	500
Radium-226	0.2	150
Rubidium-81	0.2	150
Rubidium-83	0.3	200
Rubidium-86	2	1,000
Scandium-46	0.2	150
Selenium-75	0.1	50
Sodium-22	0.1	100
Sodium-24	0.2	150
Strontium-85	0.1	100
Tin-113	0.1	50
Xenon-133	0.5	400
Zinc-65	0.2	200

By Radio-Chemistry

Nuclide	Reporting Limit (pCi/gram soil)	Reporting Limit (pCi/L water)
Tritium (H-3)	0.25	400 (10 for low-level analysis)
Carbon-14	2	330
Chlorine-36	50	100
Calcium-45	50	100
Nickel-63	4	50
Phosphorus-32	1	1
Strontium-90	2	2
Technecium-99	5	10
Yttrium-90	2	2

Sample Containers and Holding Times

Method	Container		Max. Holding Time	
	Soil	Water	Soil	Water
Gamma spectroscopy	0.5L P (plastic)	2L P or G (glass)*	6 months	6 months
Radio-chemistry	0.5L P or G	2L P or G*	6 months	6 months
Tritium	0.5L G	20ml P or G	6 months	6 months

* Preserved with HNO_3 to pH<2

Soil Sampling Locations

Soil sampling locations were selected using the Visual Sample Plan (VSP) software. Since site data regarding tritium in soil is not available, the following assumptions were made:

VSP Input Parameter	Assumed Value	Comment
Primary radionuclides	H-3 and C-14	H-3 proved most conservative
DCGLs	110 and 12 pCi/g	NRC screening limits for H-3 and C-14, respectively
LBGR	55 and 6 pCi/g	Assumed half of DCGL
Sigma	40 and 4 pCi/g	Assumed ~30%
Statistical test	Sign test	Contaminant not significantly present in background
Grid pattern	Triangular w/ random start	
Oversampling	50%	To allow for refused borings, etc.
Error rates	$\alpha = 0.05$; $\beta = 0.05$	

Twenty two (22) locations encompassing the three (3) burial areas in the arroyo/eastern canyon were identified and are shown in Figure 4 (Appendix B). Corresponding location coordinates are presented as follows:

Soil Boring Location	X Coordinate	Y Coordinate
1	6420575.1310	1844820.1301
2	6420547.9224	1844698.0236
3	6420604.8904	1845227.1528
4	6420577.6818	1844982.9393
5	6420523.2646	1845349.2595
6	6420564.0775	1845471.3663
7	6420509.6604	1844426.6753
8	6420618.4946	1844792.9955
9	6420584.4839	1845200.0180
10	6420530.0668	1844589.4843
11	6420638.9011	1844955.8045
12	6420570.8796	1844711.5910
13	6420489.2539	1844508.0798
14	6420598.0882	1844874.4000
15	6420543.6711	1845240.7202
16	6420553.8743	1845362.8270
17	6420608.2914	1845118.6135
18	6420567.4786	1844928.6696
19	6420587.8850	1845091.4786
20	6420533.4679	1845457.7989
21	TBD in the field	TBD in the field
22	TBD in the field	TBD in the field

Two (2) soil samples will be collected from each soil boring advanced in the arroyo/eastern canyon, at or near the disposal depths. These depths will be determined in the field by the geologist during soil boring advancement (direct-push probing), who will examine retrieved soil cores for evidence of waste disposal. Sampling depths are expected to be between 20 and 40 feet bgs. It should be noted that prior studies have been confined to surface sampling and testing, and did not show the presence of elevated radioactivity. This study will focus on sampling below ground surface/grade.

Locations in the ballfield area will be biased rather than random. This area is not part of the disposal/burial area but is adjacent to it. Eight (8) soil boring locations will be selected here based on scientific judgment. One (1) soil sample will be collected at depth from each borehole advanced in the ballfield.

Finally, three (3) groundwater monitoring wells will be installed at selected locations. One groundwater sample will be collected from each well and analyzed for radio-nuclides.

Surface Testing for Tritium

This project will use a novel method of obtaining additional groundwater samples to investigate tritium migration. The method involves collecting water that is transpired from the leaves of plants, growing above the disposal area. The plants' roots draw on the groundwater and transport it up to the leaves, where it is collected. Tritium is both the most prevalent radio-nuclide in the disposal area and the most mobile. It is the most likely to migrate and does so by moving with groundwater.

The Health Physics reference (1993) states, "Tritium in leaves ... has been shown to be a good indicator of tritium in groundwater and air."

The method involves temporarily tenting a tree branch or bush with clear plastic. Plant water continues to be transpired from the leaves and is collected on the plastic. The collected water (~10ml) is drawn off into a vial and sent to a laboratory for low-level analysis. The tent is then removed. There is ample vegetation in the arroyo/eastern canyon and some vegetation surrounding the ballfield for this testing. Approximately 20 samples of transpired water will be collected and analyzed.

A summary of the planned radiological testing is provided in the following table.

Sampling Summary

Media	Approximate Number	Analysis
Soil	50	H-3, C-14 and Cl-36 (basic)
	22 (of 50)	Extended, contractual list
Ground water	3	Basic and extended list
Plant (transpired) water	20	Low-level H-3

5.1.5 Field Measurement Procedures

Field water quality measurements will be made on groundwater samples obtained during purging using a Horiba® brand model U-10 water quality meter or an equivalent instrument. The meter will be capable of measuring pH, temperature, EC, DO, and salinity. Instrument calibration and measurement procedures will follow the instrument manufacturer's instruction manual. Water quality measurements will be performed after the instrument has been successfully calibrated.

5.1.5.1 pH

The pH meter will be auto-calibrated daily before use according to the instrument manufacturer's instruction manual. If field measurements at the site indicate acidic groundwater conditions, a calibration to pH 4.0 will be added. Water quality measurement will proceed once calibration has been performed. Results will be read to an accuracy of 0.1 pH unit.

The pH probe or electrode will be rinsed with deionized water after each standard or sample is analyzed and the probe will be stored properly after each use.

5.1.5.2 Temperature

Sample temperature will be measured directly using the Horiba® brand (or equivalent) water quality checker. Results will be recorded to the nearest 0.1 degree Celsius (°C) or Fahrenheit (°F).

5.1.5.3 Electrical Conductivity

The Horiba® brand (or equivalent) water quality meter will be auto-calibrated daily before use and checked after use according to the instrument manufacturer's manual. For instruments maintained on site for several months, cross check calibration will be performed monthly using standard potassium chloride solutions within the range of the EC meter capability.

Field samples will be analyzed after instrument calibration according to the instrument manufacturer's instruction manual. Results will be recorded to the nearest 0.1 micromhos per centimeter or microsiemens per centimeter.

5.1.5.4 Dissolved Oxygen and Turbidity

DO and turbidity will be measured using the Horiba® brand (or equivalent) water quality meter. Instrument calibration and sample measurement procedures will follow the manufacturer's instruction manual. Results will be measured and reported in milligrams per liter (mg/L) for DO and NTUs for turbidity.

5.1.5.5 Water-Level Measurements

Groundwater levels will be measured using an electronic water level indicator with a pre-calibrated measuring tape attached directly to the probe. The meter will be pre-calibrated by the manufacturer with graduations in English units. Before each use, the tape will be inspected for missing or defective graduation marks and any signs of stretching along its length. Water levels will be recorded to the nearest 0.01 foot as read from the calibrated tape.

5.1.5.6 Instrument Corrective Action Procedure

Appropriate corrective actions must be taken when the calibration of a field instrument fails the instrument-specific calibration QC criteria. The following steps must be followed:

- Check the instrument.
- Investigate the cause of failure.
- Recalibrate the instrument.
- If the instrument recalibration still fails, call the instrument manufacturer for assistance.
- If the problem persists, send the instrument for service.
- If a rental instrument is used, contact the rental office for immediate replacement of the instrument.
- If possible, keep a backup instrument on site.

5.2 DECONTAMINATION PROCEDURES

Decontamination of non-disposable sampling equipment will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam cleaning or by washing with a nonphosphate detergent such as Liquinox®/Alconox® or equivalent. Decontamination water will be collected in 55-gallon drums.

The following steps will be followed for general decontamination of non-disposable sampling equipment:

- **Wash with nonphosphate detergent and water solution** — This step will reduce the amount of gross contamination from the equipment. Use of a clean, 55-gallon polyethylene drum (for groundwater pumps) or a 5-gallon bucket (for most other equipment), approximately 75 percent full of solution, is suggested for this step. This detergent solution will be prepared by diluting nonphosphate detergent in potable water as directed by the manufacturer.
- **Rinse with potable water** — This step will rinse all the detergent solution away from equipment. Use of a clean 55-gallon polyethylene drum (for groundwater pumps) or a 5-gallon bucket (for most other equipment), approximately 75 percent full of potable water, is suggested for this step. Periodic changing of this water is required.
- **Rinse with deionized water** — This step will rinse the equipment of any detergent solution and potable water residues. Rinsing is most effective by applying deionized water from a stainless steel Hudson-type sprayer or Nalgene® squeeze bottle while holding equipment over a 5-gallon bucket. Use of a clean 55-gallon polyethylene drum, approximately 75 percent full of deionized water, will be required for rinsing groundwater pumps and discharge line.

If equipment rinsate samples are to be collected, laboratory reagent-grade water will be used as an additional rinse after Step 3. Water that is falling off the sampling equipment as is it being rinsed with the reagent-grade water will be collected in appropriate sample bottles and analyzed for the same parameters as the field samples.

Specific procedures for decontamination of sample pumps are discussed in Sections 5.2.1 and 5.2.2.

5.2.1 Low-Flow Sampling Equipment

If low-flow sampling methods and a bladder pump are used, the following decontamination procedure will be used:

- Remove the pump from the well.
- Immerse the pump in a bucket or 55-gallon drum filled with deionized water and nonphosphate detergent. If a 55-gallon drum is used, line the drum with a plastic drum liner before adding the soap and water.
- Wash outside of pump and pump for 10 minutes.
- Follow with two tap water rinses and two deionized water rinses for 5 minutes each.

5.2.2 Portable Sampling Pump

If a portable electrical submersible (Grundfos Rediflo-2®) pump is used to collect samples, all equipment that comes in contact with the sample will be triple-rinsed with three types of cleaning media. The fundamental steps followed for the decontamination process will be:

- Remove pump from the well.
- Immerse pump in a plastic 55-gallon drum containing the nonphosphate soap solution (see Step 1, Section 6.2) through pump and discharge tubing for approximately 2 minutes or until several gallons of the soap solution have been passed through the pump and tubing.
- Remove the pump from the soapy solution, immerse in the second plastic 55-gallon drum containing the potable water rinse (see Step 2, Section 6.2). Pump the rinse water through the pump and discharge line for approximately 2 minutes or until several gallons of the potable water rinse have been passed through the pump and tubing.
- Remove the pump from the potable water, rinse, and immerse it in the third plastic 55-gallon drum containing deionized or distilled water (see Step 3, Section 6.2). Pump the final rinse water through pump and discharge tubing for approximately 2 minutes or until several gallons of the potable rinse water have been passed through the pump and tubing.

5.3 SAMPLE NUMBER

Each sample will be identified by a 10-digit number (XXXX-XXX-YYY) as follows:

XXXX-XXX:	7-character designation of the project number and CTO number (for example, 1990-066)
YYY:	3-character designation of the consecutive sample number (for example, 004)

For example, in the sample identification number 3454-066-004, "3454" represents the project number, "066" represents the CTO number, and "004" represents the fourth sample collected for the project.

The sample number will be recorded in the field logbook, on the labels, and chain-of-custody (COC) record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

5.4 SAMPLE LABELING

Sample labels are necessary to prevent misidentification of samples. Sample labels will be filled out in indelible black ink and affixed to sample containers at the time of sample collection. Each sample label will be covered with clear tape. Each sample container will be labeled with the following, at a minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Sampler's initials
- Analyses required
- Preservative (if any)

5.5 SAMPLE PACKAGING AND SHIPMENT

Immediately after sample labeling, custody seals will be affixed to each sample container. Clear tape will be applied over the custody seals to prevent accidental breakage. For VOA vials, the custody seal will be placed on the outside of the first resealable bag; then the vials will be placed in a second resealable bag. This will prevent any contact with the adhesive from the custody seal and the vials. Other sample containers will be placed in double-resealable plastic bags to protect the sample from moisture and to prevent breakage and potential cross-contamination during transportation to the laboratory. All glass sample containers will be protected with bubble wrap first, then placed in resealable bags if transported by a commercial carrier. VOA vials should be individually wrapped with bubble wrap, then placed in a resealable bag, a custody seal placed over the bag, clear tape secured over the custody seal, and then placed in another resealable bag.

Each cooler will be shipped with a temperature blank. A temperature blank is a container filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the cooler will be recorded by the laboratory on the COC record immediately upon receipt of the samples.

Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples transported by a laboratory-assigned courier will be packed in a sample cooler with sufficient ice to keep the samples cooled. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. The COC record will be completed and signed by the courier. The cooler(s) and the top two copies (white and pink) of the COC record will then be released to the courier for transportation to the laboratory.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Double-bagged ice will be added inside the plastic bag at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This will be repeated until the cooler is filled with ice as the top

layer in the cooler. The COC record will include the airbill number, and the "Received By" box will be labeled with the commercial courier's name. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the airbill will be placed on the cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, then the original airbill will be placed on the cooler with the COC record, and copies of the airbill will be placed on the other coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2, etc.). Saturday deliveries should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by the commercial courier.

5.6 FIELD DOCUMENTATION

To maintain the integrity and traceability of samples, all information pertinent to field sampling will be recorded in a field logbook. All samples will be properly labeled and custody-sealed prior to being transported to the laboratory and will be accompanied by completed COC documentation. All documentation will be recorded in a field logbook in indelible black ink.

Example forms for groundwater sampling activities include the following:

- Appendix 1 Groundwater Sampling Log
- Appendix 2 Sample Tracking Log
- Appendix 3 Field Calibration Form

5.6.1 Chain-of-Custody

To establish the documentation necessary to trace sample possession from the time of collection through analysis and disposal, a COC record will be completely filled out and will accompany every sample. Samples will be delivered to the laboratory for analysis as soon as practicable.

At a minimum, the following items will be recorded on the COC record:

- Project name
- Project location/Site ID
- Project number (e.g. 1990.066E)
- Purchase order number
- Sample ID
- Sampler name
- Sampler signature
- Project contact
- Airbill number (if applicable)
- Date (of sample collection)
- Time (of sample collection to the nearest minute, 24-hour clock)
- Sample type (matrix)
- Turnaround time
- Sample location codes
- Sample depth in feet (start, end), for soil only

- QC type:
  - REG: regular sample
  - FD: field duplicate
  - TB: trip blank
  - ER: equipment rinsate
- Composite description (if applicable)
- Laboratory name
- Number of sample containers
- Laboratory ID
- Analyses required
- Comments
  - Matrix spike/matrix spike duplicate (MS/MSD) samples
  - Observations specific to sample
  - Electronic data format (EDF), if required
- Transfer signature (to relinquish samples)
  - The sampler will be the first person to relinquish sample possession
- Courier/laboratory representative signature (for commercial carrier, record airbill number here)
- Date/time (of custody transfer)
- Laboratory instructions
- Data package requirement (Level III or IV)

5.6.2 Custody Seals

Sample custody seals are used to detect unauthorized tampering of samples from the time of sample collection to the time of analysis. The seals will be signed or initialed and dated by the sampler. The seals will be placed on the sample containers and shipping containers in such a way that they must be broken in order to open the containers. Seals will be affixed to containers before the samples leave the custody of the sampling personnel.

5.6.3 Field Logbooks

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. All entries will be recorded in indelible black ink. At the end of each workday, the logbook pages will be signed by the responsible sampler, and any unused portions of the logbook pages will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used.

At a minimum, the logbook will contain the following information:

- Project name and site location
- Date and time
- Personnel in attendance
- General weather information
- Work performed

- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from this SAP
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

5.6.4 Document Corrections

Changes or corrections on any project documentation will be made by crossing out the erroneous item with a single line and initialing (by the person performing the correction) and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out line. The new information should be written clearly above the crossed-out

6.0 PROJECT ORGANIZATION

This section identifies the key individuals from the VA GLAHS and subcontractors who are responsible for the oversight and/or implementation of the proposed field activities. The key points of contact for the project are listed in Section 6.1 below.

6.1 POINTS OF CONTACT

The following list provides contact information for VA GLAHS Environmental Program Manager and other key contacts for the project:

Agency	Contact	Title
VA GLAHS Environmental Management 11301 Wilshire Blvd. Bldg. 218 Room 308 Los Angeles, CA 90073	Mr. Ben K. Spivey, M.S. (310) 268-3565	Chief, Occupational Safety & Health Senior Industrial Hygienist
VA GLAHS Environmental Management 11301 Wilshire Blvd. Bldg. 218 Room 308 Los Angeles, CA 90073	Mr. Joseph P. Olson (310) 478-3711 x44039	Environmental Engineer
VHA National Health Physics Program 2200 Fort Roots Dr. Bldg. 101 Rm. 208 North Little Rock, AR 72114	Mr. Thomas E. Huston, Ph.D. (501) 257-1578	Director, VHA National Health Physics Program

Agency	Contact	Title
Allwest Geoscience, Inc. 1751 Jenks Dr. Corona, CA 92880	Mr. John Gery, PE (951) 284-7103	Project Director QA/QC Manager
Atlas Environmental Engineering, Inc. 3185 Airway Ave. Suite D-1 Costa Mesa, CA 92626	Mr. Jay A. Boughter, PG/CHMM (949) 350-4682	Field Director QA/QC Field Manager
Premiere Environmental Consultants 23811 Washington Ave Suite C110-248 Murrieta, CA 92562	Ms. Monica Oscarson (951) 600-8075	Certified Industrial Hygienist
PIKA International, Inc. 5025 Arnold Dr. McClellan, CA 95652	Mr. Joel Cehn (510) 268-1571	Certified Health Physicist
Skalsky & Associates, Inc. 27356 Becedas Mission Viejo, CA 92691	Mr. Harry Skalsky, Ph.D. (949) 855-2363	Toxicologist

7.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objectives of this SAP and QAPP are to outline procedures for the collection and assessment of data that are within acceptable ranges of precision, accuracy, representativeness, completeness, and comparability (PARCC) to meet the project DQOs. The DQOs associated with environmental data are a function of the sampling plan rationale and the procedures used to collect the samples, as well as the analytical methods and instrumentation used. However, uncertainty cannot be eliminated entirely from environmental data.

7.1 DATA QUALITY OBJECTIVES

The DQO process is a seven-step planning approach based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision making are appropriate for the intended application. The DQO process, as defined by the EPA and MARSSIM, consists of the following seven (7) steps that are designed to provide a systematic approach to resolving issues that pertain to this remediation project (EPA, 2000):

- Stating the Problem
- Identifying the Decisions
- Identifying Inputs to the Decisions
- Defining the Boundaries
- Developing a Decision Rule
- Specifying Limits on the Decision Error
- Optimizing Sampling Design

The DQOs for the VA GLAHS initial investigation project are presented in **Table 5** (Appendix C).

7.1.1 MARSSIM

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. The MARSSIM guidance focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

The radiological survey design is developed and documented using the DQO Process. The DQOs for the project are established and preliminary surveys (e.g., scoping, characterization) are performed to provide information necessary to design the final status survey for compliance demonstration.

A minimum amount of information is required from the preliminary surveys to develop an effective final status survey design. This includes:

- Sufficient information to justify classification and specification of boundaries for survey units (the default is Class 1 which results in the highest level of survey effort); and
- An estimate of the variability of the contaminant concentration in the survey unit (σ_s) and the reference area (σ_r) if necessary.

After the preliminary surveys are completed, the final status survey design can be developed. There are approximately 10 major steps in the development of a survey design that integrates scanning surveys with direct measurements and sampling. Several of these steps are:

- Classify Areas by Contamination Potential
- Group/Separate Areas into Survey Units
- Determine Number of Data Points
- Select Instrumentation
- Develop an Integrated Survey Design

7.1.2 U.S. DOE QUALITY ASSURANCE TOOL, VISUAL SAMPLING PLAN (VSP)

Allwest will implement the U.S. Department of Energy's Quality Assurance tool, Visual Sampling Plan (VSP) to develop a conceptual site model and preliminary soil boring locations using the data from the Phase I Radiological Survey. VSP is a software tool for selecting the correct number and location of environmental samples so that statistical test results performed on the data collected via the sampling plan have the required confidence for decision making. VSP provides sample designs and sample-size equations needed for specific statistical tests appropriate for several types of environmental problems. The following is a list of the sampling goals that can be addressed in the current version of VSP:

Sampling Goal	User's Guide Section
Compare Average to Fixed Threshold	3.2.1
Compare Average to Reference Average	3.2.2
Estimate the Mean	3.2.3
Construct Confidence Interval on Mean	3.2.4
Compare Proportion to Fixed Threshold	3.2.5

Sampling Goal	User's Guide Section
Compare Proportion to Reference Proportion	3.2.6
Estimate the Proportion	3.2.7
Locating a Hot Spot	3.2.8
Find UXO Target Areas	3.2.9
Assess degree of confidence in UXO presence	3.2.10
Non-statistical approach	3.2.11
Establish boundary of contamination	3.2.12
Sampling within buildings	3.2.13

Allwest conducted VSP modeling with data input using U.S. EPA Region IX Preliminary Remediation Goals (PRGS). The VSP modeling revealed that soil samples should be collected at a total of 42 locations for the two (2) investigation areas (approximately 17 in the Ball Field Area and approximately 25 in the Arroyo/Eastern Canyon Area).

Allwest anticipates that continuous soil samples will be collected from each soil boring location within the two (2) investigation areas, with two (2) to three (3) soil samples submitted to the laboratory for chemical analysis. Proposed soil boring locations are presented on Figure 4 and VSP modeling output data is included in Appendix A. A list of radionuclides of interest for the proposed investigation is included in Table 2 of Appendix C.

7.2 ANALYTICAL DATA QUALITY OBJECTIVES

Analytical data will be obtained using published, standard methods in a state of California Department of Public Health (DPH)-certified laboratory. Analytical DQOs will be assessed through measures of PARCC parameters. The analytical methods used, project-required RLs, and project QC criteria are also detailed in this document.

7.2.1 Quality Control Criteria

QC criteria definitions are as follows:

- **Precision**—A measure of the reproducibility of a set of replicate results or the agreement among repeat observations made under the same conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. For this project, a laboratory control sample (LCS) will be used to determine the precision of the analytical method. Total precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate, laboratory duplicate, and MSD samples will be used to assess field and analytical precision, and the precision measurement will be determined using the relative percent difference (RPD) between the duplicate sample results. The formula for calculating the RPD is as follows:

$$RPD = 100 \times 2 \times (\text{result} - \text{duplicate result})/(\text{result} + \text{duplicate result})$$

- **Accuracy**—The nearness of a result or the mean of a set of results to the true or accepted value. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into a LCS against a control limit. Surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. The formula for calculating accuracy uses the following equation to determine percent recovery (%R) of specific analytes.

  %R = 100 x (spiked sample result - unspiked sample result)/amount of spike added

- **Representativeness**—The degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter mostly concerned with the proper design of the sampling program.

- **Completeness**—The percentage of measurements made that are judged to be valid measurements. The completeness goal is to generate a sufficient amount of valid data to meet project needs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with a rejected ("R") flag.

  The requirement of completeness is 95 percent for aqueous samples and 90 percent for soil samples and is determined using the following equation:

  % completeness = 100 x (number of valid analyte results/number of possible results)

- **Comparability**—A qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurements for similar samples and sample conditions. The objective for the QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats.

7.2.2 Project Reporting Limits

The RLs established for the VA GLAHS initial investigation site samples are presented in **Table 6** (Appendix C).

7.2.3 Project Quality Control Limits

The precision and accuracy QC limits for each method are presented in **Table 7** (Appendix C).

8.0 ANALYTICAL QUALITY CONTROL PROCEDURES

This section describes laboratory qualification, sample custody and documentation, QC procedures, QC samples, preventative maintenance, data review, and deliverables.

8.1 LABORATORY QUALIFICATION

The analytical laboratories selected to analyze samples for this project will be certified by the California DHS for all of the analytical methods required for the project. In addition, the laboratory must successfully complete the NFESC Laboratory Evaluation Program prior to sampling activities and maintain current status throughout the duration of the project.

The laboratory selected for the project must be capable of providing the required turnaround times, project QC, and data deliverables required by this SAP and QAPP.

8.2 LABORATORY SAMPLE CUSTODY AND DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported are essential in any sampling and analysis program. The handling of the samples and transferring of custody must be well-documented given the evidentiary nature of the analytical data. A sample is considered to be in one's custody if it meets any of the following criteria:

- In actual possession or in view of the person who collected the sample
- Locked in a secure area
- Placed in an area restricted to authorized personnel

The samples will be delivered to the person in the laboratory authorized to receive samples (referred to as the sample custodian). Upon receipt of a sample, the sample custodian will inspect the condition of the sample (including the temperature of the cooler) and the custody seal, reconcile the information on the sample label against that on the COC record, assign a unique laboratory tracking number, log the sample in the laboratory logbook, and store the sample in a secured sample storage room.

The Allwest contracted Project Chemist will be informed immediately of any inconsistencies between the COC record and the sample containers received. Any deviations from accepted sample handling procedures will be documented, and the Allwest contracted Project Chemist will be informed.

8.2.1 Corrections to Custody Documentation

Changes or corrections on any project documentation will be made by crossing out the erroneous item with a single line initialing (by the person performing the correction) and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out line. The new information will be written above the crossed-out item. Corrections must be written clearly and legibly with indelible black ink.

8.3 LABORATORY QUALITY CONTROL PROCEDURES

The analytical laboratory must have written standard operating procedures (SOPs) defining the instrumentation, instrumentation maintenance, tuning, calibration, method detection and RLs, QC requirements, blank requirements, and step-by-step procedures for each analytical method. The SOPs must be available to the analysts performing the work. The SOPs must meet or exceed the requirements of the analytical methods cited in this SAP and in the *Quality Systems Manual for Environmental Laboratories* [Department of Defense (DoD), 2000]. The laboratory must maintain logs of all activities that have an impact on the quality of the laboratory results.

Any portion of the method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of the Allwest contracted Project Chemist.

The laboratory must maintain the instruments in working condition required by the methods specified for the analyses. Sufficient redundancy in equipment must be available in the laboratory to handle downtime situations.

Method substitution because of instrumental failure will not be permitted without approval from the Allwest contracted Project Chemist.

8.4 LABORATORY QUALITY CONTROL SAMPLES

The following subsections describe in detail the laboratory QC samples required by this project.

8.4.1 Calibration

All instruments and equipment must be calibrated in accordance with the specified methods, unless different instructions are included in this document. Each instrument must be calibrated with the standard solutions appropriate to the type of instrument and the calibration range established for the method.

Initial calibrations (ICALs) are performed when the method is first used and again whenever the continuing calibrations fail to meet their respective acceptance criteria. In addition, if the instrument undergoes significant maintenance, the ICAL must be repeated.

Continuing calibrations verify that the instrument performance has remained within the limits set at the time of the ICAL. The frequency of continuing calibrations is specified in referenced methods.

8.4.2 Instrument/Calibration Blanks

Instrument blanks are run to ensure that analytes from previous runs are out of the system and do not contaminate succeeding runs. Instrument blanks must be run following calibration runs, before sample analyses are performed, and after samples containing high concentrations of potentially interfering materials are found.

Target analytes must not appear in the instrument blanks at concentrations greater than half the required RLs. If the laboratory consistently observes contaminants in the instrument blanks, the laboratory must investigate the source of the contamination and eliminate it, if possible.

8.4.3 Method Blanks

Method blanks are prepared in the same manner as the samples, using the same reagents and glassware used for samples. The purpose of the method blank is to ensure that the equipment and reagents used in preparing the samples are free of contaminants that could interfere with the analysis. The method blank must be prepared and analyzed for each batch of 20 project samples or less per matrix (aqueous and solid) type.

The method blank must not exhibit analytes at concentrations greater than half the required RLs. If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis must be stopped, the source of contamination

identified and corrected, and the analysis repeated. Contamination in the method blank above half the RLs will require that the entire associated batch of extracts or digestates be reprepared and reanalyzed. Hence, it is very important to make sure that no such contamination is present.

8.4.4 Laboratory Control Samples

LCSs are purchased samples containing known concentrations of specific target analytes. LCSs can also be prepared by spiking known amounts of target analytes into a well-characterized blank matrix. The matrix will be organic-free, laboratory reagent-grade water for water samples and clean sand or equivalent for soil samples.

The LCS is prepared and run at a frequency of one (1) per twenty (20) project samples per matrix with the associated samples, using the same reagents and volumes. If insufficient quantity of sample is available for the MS/MSD, the LCS will be prepared and analyzed in duplicates. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be reprepared, together with a new LCS, and re-analyzed.

8.4.5 Matrix Spike and Matrix Spike Duplicate

The MS/MSD serves to determine whether matrix effects are affecting recoveries. For inorganic analyses, only a single MS may be performed per batch. A MS/MSD is prepared by spiking a known amount of solution to two portions of a sample being run in a batch.

Once the spike is added to the MS/MSD samples, these samples are carried through the complete sample preparation process along with the other samples in the batch. The MS/MSD recoveries are compared against each other and against the known amount of the spike. From this data, both accuracy and precision can be determined. The laboratory will perform a MS/MSD at a frequency of one (1) per twenty (20) project samples per matrix. To prepare a project-specific MS/MSD, field personnel will collect additional sample volumes at a frequency of one (1) per twenty (20) samples. Field personnel will designate samples for MS/MSD analysis on the COC record.

8.4.6 Duplicates

Two (2) types of duplicates, field and laboratory, will be performed. Field duplicates are two samples that are duplicates of each other. The purpose of field duplicates is to measure the consistency of field sampling. The field duplicate is treated the same as the other field samples, and identification is withheld from the laboratory. Field duplicates will be collected at a frequency of one for every ten samples per matrix. Field duplicates will not be applicable to the collection of waste characterization samples.

The laboratory duplicate is created by the laboratory, where two aliquots are intentionally taken from the same sample and analyzed in parallel. This analysis serves to measure the precision of laboratory operations. Duplicate analyses will be applied only for inorganic analyses.

8.5 PREVENTIVE MAINTENANCE

All instruments must be maintained in accordance with the manufacturers' recommended procedures. The laboratory must define in its QA plan the frequency and type of maintenance for each instrument. The laboratory must also record all maintenance activities in an instrument logbook.

In addition to preventive maintenance, the laboratory must keep a sufficient supply of replacement parts on hand for those parts known to require frequent changes due to wear and tear or contamination.

Whenever preventive or corrective maintenance is applied to an instrument, the laboratory must demonstrate the instrument's return to operating conditions and must recalibrate the instrument prior to resumption of sample analyses.

8.6 DATA REVIEW

All data reported by the laboratory must be reviewed in accordance with the SOPs and as described in the following subsections.

8.6.1 Analyst Review

Each analyst that generates a data set is responsible for ensuring that 100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.

8.6.2 Peer Review

One hundred percent of all data sets must be reviewed by an independent peer analyst. Peer reviews must be performed by an analyst that is qualified to perform the subject analytical method. The peer review must be comprehensive and include the following:

- Check 100 percent of manual entries for transcription errors
- Check 100 percent of manual calculations for accuracy
- Spot-check computer calculations to verify program validity
- Check for compliance with method- and project-specific QC requirements
- Check for completeness of raw data or supporting materials
- Confirm spectral assignments
- Check descriptions of deviations from method or project requirements
- Check for appropriate use of significant figures and rounding
- Check reported values for dilutions
- Evaluate reasonableness of results

8.6.3 Technical Review

Technical reviews by the responsible supervisor or designated alternate must be performed on 100 percent of reported data. The same individual may not perform peer and technical reviews on the same data set. The technical review must include the following:

- Check for compliance with method- and project-specific requirements
- Check the completeness of the reported information
- Check the information in the report narrative
- Evaluate the reasonableness of the results

If the responsible supervisor is the only qualified peer reviewer for a method, the requirement for the technical review is waived.

8.6.4 Management Review

One hundred percent of all data must receive management approval prior to release. The scope and content of management's review is at the laboratory's discretion. Authority to release data may be delegated to a technical supervisor or other party, if the term of the delegated authority is documented in the QA program file.

8.6.5 Quality Assurance Review

QA reviews of data from each section of the laboratory must be conducted on a routine basis. Annually, at least 10 percent of data reports generated using each analytical method must be reviewed by a member of the QA staff. The QA reviews must include the following:

- Check for compliance with required QC practices
- Check for compliance with approved SOPs
- Check for compliance with method and project requirements

QA data reviews may be conducted after the subject data have been reported to Allwest.

8.7 DELIVERABLES

The following sections describe the deliverable documents that will be submitted to Allwest by the analytical laboratory.

8.7.1 Hard-copy Deliverables

Two (2) copies of the hard-copy data will be submitted to Allwest by the contracted laboratory. The report pages will be sequentially numbered. The report will contain a table of contents referencing individual sections in the data package, original white copy of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and non-conformances. Every sample collected by Allwest will be cross-referenced to the associated QC samples. When revisions to data reports are required, the revised pages will be stamped with the notation "amended or revised report".

To allow third-party validation, two types of data packages will be required. They will be referred to as EPA Level III-equivalent or IV-equivalent packages. For this project, Allwest will request that 80 percent of the groundwater data be submitted in an EPA Level III-equivalent data package and 20 percent submitted in an EPA Level IV-equivalent data package. All data packages will be assembled in the following sequence:

- Cover page (with laboratory service identification number, Allwest project name, and Allwest project number)
- Original COC records (including cooler temperature and sample condition)
- Sample receipt forms
- Cross-reference table
- Case narrative
- Organic raw data sequence (by test):
    - Sample result forms, including method blanks
    - Sample raw data after each result form (EPA Level IV only)

- Surrogate summaries (surrogate results may appear on the sample result forms)
- QC summaries
- Tune data [gas chromatograph/mass spectrometer (GC/MS) only]
- ICAL
- Daily calibration checks, including related continuing calibration verifications (CCVs)
- Resolution check standards (GC/MS and pesticides) (if applicable)
- QC (LCS, MS/MSD) raw data (EPA Level IV only)
- Instrument run log
- Sample preparation log

- Inorganic raw data sequence:
  - Sample results forms, including method blanks
  - Sample raw data (EPA Level IV only)
  - QC summaries
  - ICAL
  - Daily calibration checks, including all related CCVs
  - Calibration blanks, including all related continuing calibration blanks
  - Interference check standards A and B for inductively coupled plasma-atomic emission spectrometer (ICP-AES) only
  - QC raw data (EPA Level IV only)
  - Post-digestion spike results
  - Analytical spike results
  - Method of standard additions
  - ICP-AES serial dilutions
  - Instrument run log
  - Sample preparation log

8.7.2 Electronic Deliverables

The electronic data deliverable (EDD) will be in ASCII format. This will be compatible with the Navy Environmental Data Transfer Standard to be adopted by the VA. The laboratory EDD will conform to NEDD/NRIS and EWI #6 standards. Both the EDD and the hard-copy report will present results to two or three significant figures. For organic results, two significant figures will be used for all results. For inorganic results, two significant figures will be used for results less than 10 and three significant figures will be used for results greater than 10. Results for QC analyses (method blanks, MS/MSD, LCS, and duplicates) will be reported up to three significant figures. The EDD for each sample delivery group is due at the same time as the hard-copy report, 21 calendar days after the last sample of the sample delivery group has been delivered to the laboratory.

In addition, the laboratory will submit data in the State Water Resources Control Board Underground Storage Tank program 'EDF'. The laboratory will check all EDFs using the Electronic Data Consistency Checker (EDCC) software, which generates a report summarizing any errors/warnings found in the EDF. The report must be submitted to Allwest along with the EDF, and must indicate zero errors for the EDF to be acceptable. 'Warnings' may be acceptable

in the report, but must be discussed in the EDCC documentation. If Allwest determines that errors exist in the EDF, the laboratory must correct the errors and resubmit the EDF. A complete EDF submission includes a diskette containing the EDF files and a hard-copy EDCC report showing zero errors.

9.0 DATA QUALITY MANAGEMENT

9.1 DATA MANAGEMENT

The following sections describe the requirements for the management of hard-copy data and electronic data.

9.1.1 Hard-copy Report

All relevant raw data and documentation, including, but not limited to, logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least 7 years. Allwest will be notified 30 days before disposal of any relevant laboratory records.

Allwest will maintain copies of all COC records. Laboratory reports will be logged in upon receipt and filed in chronological order. The second copy of the report will be sent for third-party data validation.

9.1.2 Electronic Data

Electronic data deliverables (EDDs) are required for all groundwater analytical results at MCLB. An automated LIMS must be used to produce the EDD. Manual creation of the deliverable (data entry by hand) is unacceptable. The laboratory will verify EDDs internally before they are issued. The EDD will correspond exactly to the hard-copy data. No duplicate data will be submitted. EDDs will be delivered in Naval Electronic Data Deliverable (NEDD)/Naval Installation Restoration Information Solution (NIRIS) format in accordance with Environmental Work Instruction #6 specifications (NAVFAC Southwest, 2005b). Results that should be included in all EDDs are as follows:

- Target analyte results for each sample and associated analytical methods requested on the chain-of-custody form
- Method and instrument blanks and preparation and calibration blank results reported for the sample delivery group (SDG)
- Percent recoveries for the spike compounds in the MS, MSDs, blank spikes, or LCSs
- Matrix duplicate results reported for the SDG
- All re-analysis, re-extractions, or dilutions reported for the SDG, including any associated with samples and the specified laboratory QC samples

Electronic copy data must be retained for a minimum of 3 years after final data have been submitted. The subcontractor will use an electronic storage device capable of recording data for long-term, off-line storage. Raw data will be retained on an electronic data archival system.

9.2 DATA EVALUATION

All data will be evaluated by the Allwest contracted Project Chemist based on method requirements and the results of the QC samples, the level of contamination of samples indicated by the method blanks analysis, and the overall indication of interference due to contamination. The following data qualifiers will be used in the report:

J	-	Result is estimated
U	-	Analyte is not detected at or above the stated RL
R	-	Data are rejected
UJ	-	Analyte is not detected, but there is an uncertainty about the RL

Data qualifying will be used to alert end users to uncertainties associated with the data. The evaluation flags will be entered into a special field in the electronic database. Thus, when data processing is complete, the data for each analyte will have the flag designated by the laboratory and the flag designated by the evaluator, as appropriate.

10.0 QUALITY ASSURANCE OVERSIGHT

QA oversight for this project will include system audits of field activities and of the laboratory subcontracted by Allwest for the VA to perform the analysis.

10.1 FIELD AUDITS

The Allwest and VA QA Officers may schedule audits of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The audit will also include observations of COC procedures, field documentation, instrument calibrations, and field measurements.

Field documents and COC records will be reviewed to ensure that all entries are printed or written in indelible black ink, dated, and signed.

Sampling operations will be reviewed and compared to this SAP and other applicable SOPs. The auditor will verify that the proper sample containers are used, the preservatives are added or are already present in the container, and the documentation of the sampling operation is adequate.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, the calibration is done at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

10.1.1 Corrective Action

Non-conformance identified during the field audit will be recorded on a Non-conformance Report. All non-conformance and corrective actions will be processed in accordance with Allwest protocols.

The Allwest QC Program Manager will monitor corrective action documentation, verify implementation of the corrective action, track and analyze the corrective action, and closeout corrective action documentation upon completion of the corrective action.

10.2 LABORATORY AUDITS

Laboratories selected to perform the analyses are required to have successful completion of the VA laboratory evaluation process throughout the project. This process consists of a laboratory QA plan review, performance evaluation samples, a data package review, and an on-site audit. Because of this requirement, Allwest will not perform an on-site audit or visit unless it is deemed necessary.

Laboratory oversight by Allwest will include a thorough review of the preliminary report and hard-copy data packages. The information that may be obtained from the data packages consists of the following:

- Correctness of COC procedures
- Adherence to method holding times
- Project RLs
- Spiking levels, frequency, and recovery
- Accuracy of analytical methods through the LCSs and surrogates

10.2.1 Corrective Action

The laboratory will have a QA/QC and corrective action program that addresses all out-of-control situations. Laboratories that provide analytical data for this contract will be currently certified by the California Department of Public Health (DPH) Environmental Laboratory Accreditation Program (ELAP) for analysis of hazardous materials for each method specified and following completion of analyses, laboratory personnel will verify compliance with the minimum QC requirements of the project and the laboratory QA/QC plan. If any of the parameters fall outside the control limits, corrective action will be implemented.

Initial corrective action is to verify that no obvious calculation errors have occurred. If appropriate, reanalysis will be performed. If the reanalysis confirms the initial out-of-control limits result, the chemist will notify the laboratory supervisor, who will initiate the corrective action process. Corrective actions may include, but are not limited to, the following:

- Verification of dilution factors
- Examination of sample for non-homogeneity
- Verification of sample preparation
- Checking of standard preparation logbook
- Verification of instrument performance
- Checking of reagent-grade water purity
- Monitoring chemist's method performance for procedure verification

Notification and prompt involvement of the Allwest contracted Project Chemist in the corrective action process are absolutely necessary in determining an appropriate resolution. Corrective action records will document all steps taken in the corrective action process, beginning with a description of the problem and ending with a final resolution. A copy of the corrective action report will be sent to the Allwest contracted Project Chemist immediately and will be maintained in the project files at Allwest.

All corrective action reports will be maintained by the laboratory in a project file and delivered to Allwest as part of the hard-copy deliverable.

11.0 SAP AND QAPP REVISION OR AMENDMENT

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, this SAP and QAPP will be revised or amended. The modification process will be based on EPA guidelines, direction from the QA Officer, and will be in conjunction with *Environmental Work Instruction (EWI) #2, 3EN2.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs)* (NAVFAC, 2001b).

12.0 REFERENCES

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APPENDIX A

VSP MODEL

MARSSIM

Systematic sampling locations for comparing a median with a fixed threshold (Nonparametric)

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. Figure 4 in Appendix C shows planned sampling locations in the field, and a table that lists sampling location coordinates is follows.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median (mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	42
Number of samples on map [a]	42
Number of selected sample areas [b]	2
Specified sampling area [c]	217520.18 ft^2
Size of grid / Area of grid cell [d]	71.9656 feet / 5179.05 ft^2
Grid pattern	Square

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

Sampling Location Coordinates

Arroyo/Canyon Area: Area 9					
X Coord	Y Coord	Label	Value	Type	Historical
3440.6788	1316.8324		0	Systematic	
3440.6788	1388.7981		0	Systematic	
3440.6788	1460.7637		0	Systematic	
3512.6444	1460.7637		0	Systematic	
3440.6788	1532.7293		0	Systematic	
3512.6444	1532.7293		0	Systematic	
3440.6788	1604.6950		0	Systematic	
3512.6444	1604.6950		0	Systematic	
3440.6788	1676.6606		0	Systematic	
3512.6444	1676.6606		0	Systematic	
3584.6100	1676.6606		0	Systematic	
3440.6788	1748.6262		0	Systematic	
3512.6444	1748.6262		0	Systematic	
3584.6100	1748.6262		0	Systematic	
3512.6444	1820.5918		0	Systematic	
3584.6100	1820.5918		0	Systematic	
3512.6444	1892.5575		0	Systematic	
3584.6100	1892.5575		0	Systematic	
3512.6444	1964.5231		0	Systematic	
3512.6444	2036.4887		0	Systematic	
3512.6444	2108.4544		0	Systematic	
3512.6444	2180.4200		0	Systematic	
3512.6444	2252.3856		0	Systematic	
3512.6444	2324.3513		0	Systematic	

Arroyo/Canyon Area: Area 9					
X Coord	Y Coord	Label	Value	Type	Historical
3512.6444	2396.3169		0	Systematic	
3512.6444	2468.2825		0	Systematic	
3584.6100	2468.2825		0	Systematic	
3656.5757	2468.2825		0	Systematic	
3656.5757	2540.2481		0	Systematic	

Ball Field Area: Area 8					
X Coord	Y Coord	Label	Value	Type	Historical
3458.1450	2490.9865		0	Systematic	
3530.1106	2490.9865		0	Systematic	
3458.1450	2562.9521		0	Systematic	
3530.1106	2562.9521		0	Systematic	
3602.0762	2562.9521		0	Systematic	
3458.1450	2634.9177		0	Systematic	
3530.1106	2634.9177		0	Systematic	
3602.0762	2634.9177		0	Systematic	
3674.0419	2634.9177		0	Systematic	
3458.1450	2706.8834		0	Systematic	
3530.1106	2706.8834		0	Systematic	
3602.0762	2706.8834		0	Systematic	
3602.0762	2778.8490		0	Systematic	

Primary Sampling Objective

The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach

A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs

The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median (mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),

n is the number of samples,

S_{total} is the estimated standard deviation of the measured values including analytical error,

Δ is the width of the gray region,

α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,

β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,

$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,

$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

Analyte		Parameter					
	n[a]	S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
NAPHTHALENE	41	3 mg/kg	2 mg/kg	0.055	0.1	1.59819	1.28155
GAMMA & BETA EMITTERS	42	3 cpm	2 cpm	0.05	0.1	1.64485	1.28155
TOLUENE	42	3 mg/kg	2 mg/kg	0.05	0.1	1.64485	1.28155

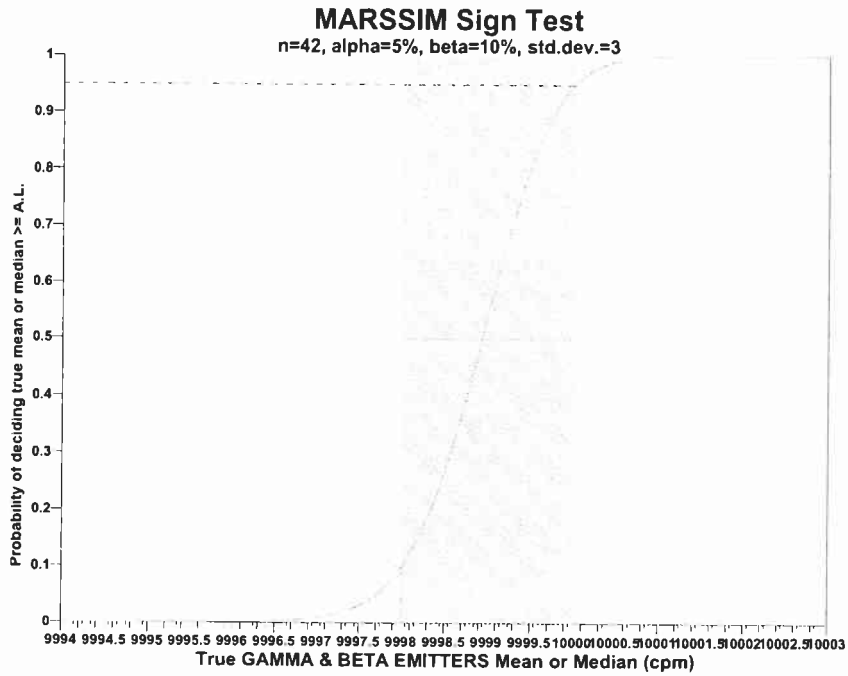
[a] The final number of samples has been increased by the MARSSIM Overage of 20%

[b] This value is automatically calculated by VSP based upon the user defined value of α

[c] This value is automatically calculated by VSP based upon the user defined value of β

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median (mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to _; the upper horizontal dashed blue line is positioned at 1-_ on the vertical axis; the lower horizontal dashed blue line is positioned at _ on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of _ at _ and the upper bound of _ at 1-_. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. The computed sign test statistic is normally distributed,
2. The variance estimate, s^2, is reasonable and representative of the population being sampled,
3. The population values are not spatially or temporally correlated, and
4. The sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level and examining the resulting changes in the number of samples. The following table shows the results of this analysis.

Number of Samples							
AL=1.7		α=0.5		α=5.5		α=10.5	
		s=6	s=3	s=6	s=3	s=6	s=3
LBGR=90	β=5	22	22	14	14	11	11
	β=10	18	18	11	11	9	9
	β=15	17	17	9	9	8	8
LBGR=80	β=5	22	22	14	14	11	11
	β=10	18	18	11	11	9	9
	β=15	17	17	9	9	8	8
LBGR=70	β=5	22	22	14	14	11	11
	β=10	18	18	11	11	9	9
	β=15	17	17	9	9	8	8

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Data Analysis for NAPHTHALENE

The following data points were entered by the user for analysis.

NAPHTHALENE (mg/kg)										
Rank	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0						

SUMMARY STATISTICS for NAPHTHALENE								
N	84							
Min	0							
Max	0							
Range	0							
Mean	0							
Median	0							
Variance	0							
Std Dev	0							
Std Error	0							
Skewness	-1.#IND							
Interquartile Range	0							
Percentiles								
1%	5%	10%	25%	50%	75%	90%	95%	99%
0	0	0	0	0	0	0	0	0

Outlier Test

Walsh's Test was performed to detect outliers in the data. The number of outliers selected to test for was 1, and the significance level achieved with a sample size of n=84 is 10%. The test will determine whether the largest, the smallest, or both the largest and smallest values are outliers at the 10% level of significance.

Data should not be excluded from analysis solely on the basis of the results of this or any other statistical test. If any values are flagged as possible outliers, further investigation is recommended to determine whether there is a plausible explanation that justifies removing or replacing them.

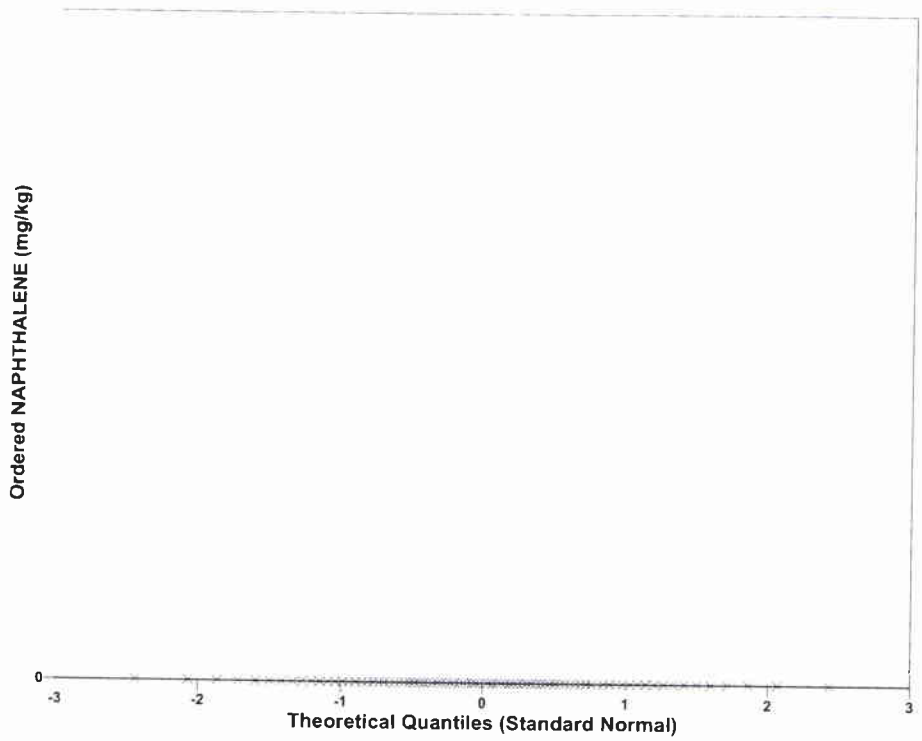
Outliers are indicated for the smallest sample if the test statistic calculated is less than zero, while outliers are indicated for the largest sample if the test statistic is greater than zero.

WALSH'S TEST for NAPHTHALENE		
Potential Outliers	**Test Statistic**	**Outliers Indicated?**
Smallest sample	0	No
Largest sample	0	No

Walsh's test did not conclude that the smallest or the largest values are outliers at the 10% significance level.

Data Plots

The Q-Q plot graphs the quartiles of a set of n data against the quartiles of a specific distribution. We show here only the Q-Q plot for an assumed normal distribution. The pth quartile of a distribution of data is the data value, x_p, for which a fraction p of the distribution is less than x_p. If the data plotted on the normal distribution Q-Q plot closely follow a straight line, even at the ends of the line, then the data may be assumed to be normally distributed. If the data points deviate substantially from a linear line, then the data are not normally distributed.



Tests for NAPHTHALENE

A goodness-of-fit test was performed to test whether the data set had been drawn from an underlying normal distribution. The Lilliefors test was used to test the null hypothesis that the data are normally distributed. The test was conducted at the 5% significance level, i.e., the probability the test incorrectly rejects the null hypothesis was set at 0.05.

NORMAL DISTRIBUTION TEST	
Lilliefors Test Statistic	0
Lilliefors 5% Critical Value	0.09667

The calculated Lilliefors test statistic is less than the 5% Lilliefors critical value, so we cannot reject the hypothesis that the data are normal, or in other words the data appear to follow a normal distribution at the 5% level of significance. The Q-Q plot displayed above should be used to further assess the normality of the data.

Upper Confidence Limit on the True Mean

Two methods were used to compute the upper confidence limit (UCL) on the mean. The first is a parametric method that assumes a normal distribution. The second is the Chebyshev method, which requires no distributional assumption.

UCLs ON THE MEAN	
95% Parametric UCL	0
95% Non-Parametric (Chebyshev) UCL	0

Because the data appear to be normally distributed according to the goodness-of-fit test performed above, the parametric UCL (0) may be a more accurate upper confidence limit on the true mean and may be used as an alternative to the MARSSIM Sign test.

MARSSIM Sign Test

The Sign test was performed in accordance with the guidance given in section 8.3.2 of MARSSIM. Each measurement was subtracted from the action level to obtain n differences $d_i = AL - X_i$. Any differences of zero were discarded from consideration and the sample size was reduced accordingly. The test statistic S+ was calculated by counting the positive differences. S+ was then compared with the critical value k, which was obtained using the formula

$$\frac{n}{2} + \frac{z_{1-\alpha}}{2}\sqrt{n}$$

where

n is the number of samples

$z_{1-\alpha}$ is the $(1-\alpha)$ percentile of a standard normal distribution.

If $S+ > k$, then the null hypothesis is rejected.

MARSSIM SIGN TEST		
Test Statistic S+	**94.5% Critical Value**	**Null Hypothesis**
84	50	Reject

The test rejected the null hypothesis that the mean value at the site exceeds the threshold, so conclude the site is clean.

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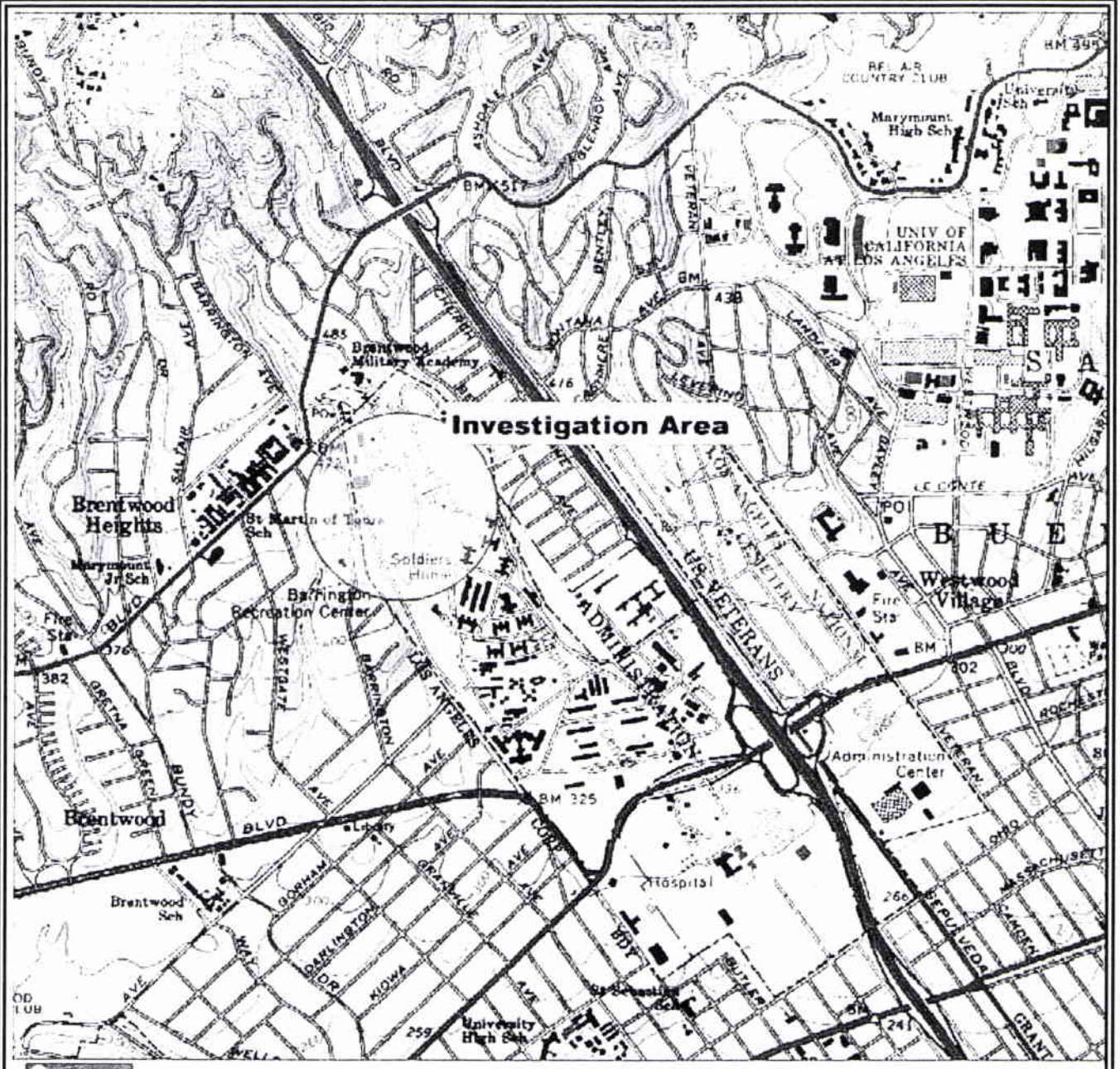
* - The report contents may have been modified or reformatted by end-user of software.

APPENDIX B

FIGURES



Map: 7.5' USGS Topographic Map Beverly Hills Quadrangle
Date: <1980> (photorevised 1989)
Scale: 1: 25000

ALLWEST GEOSCIENCE

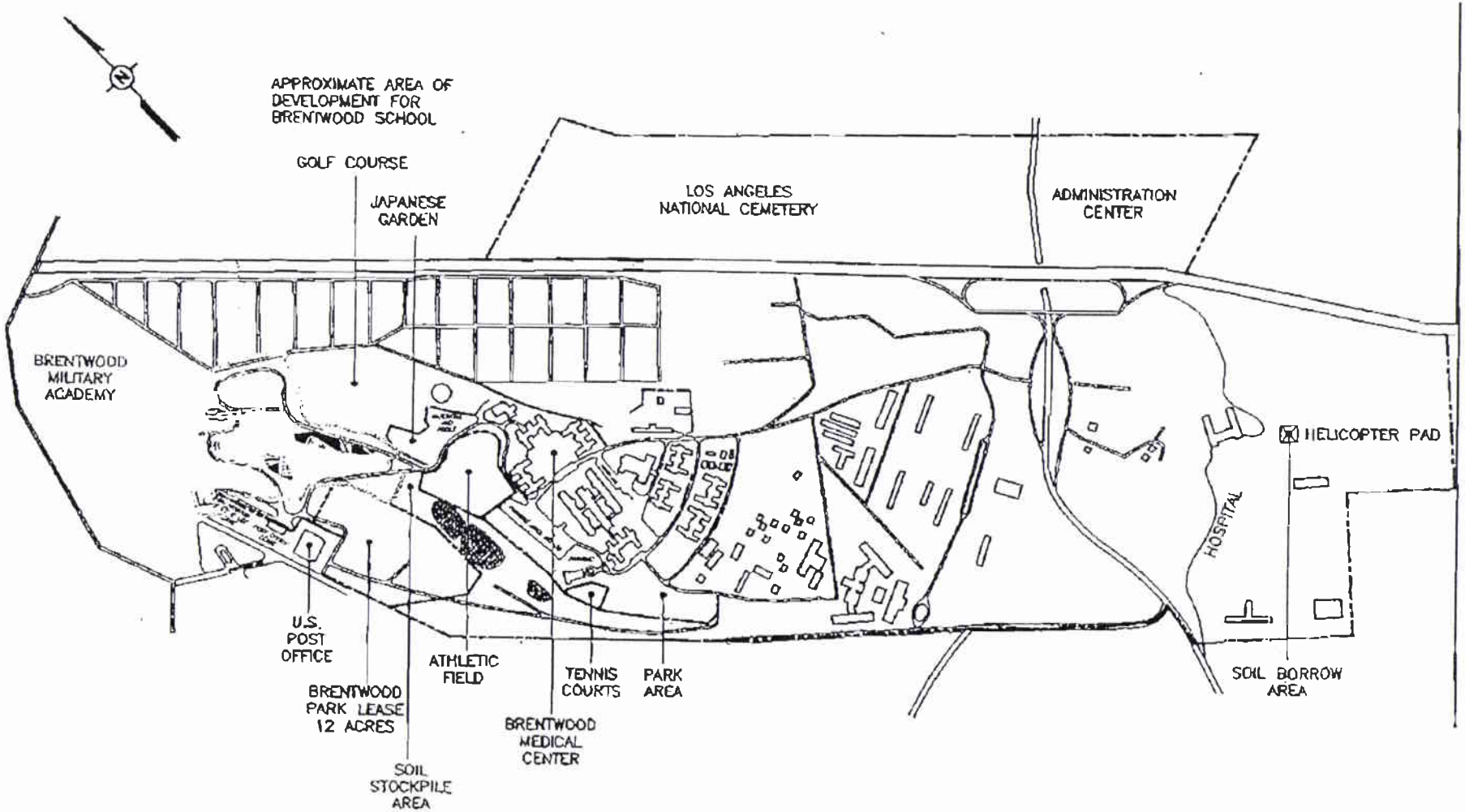
VA GLAHS

11301 WILSHIRE BOULEVARD
LOS ANGELES, CALIFORNIA

SITE VICINITY MAP

NORTH

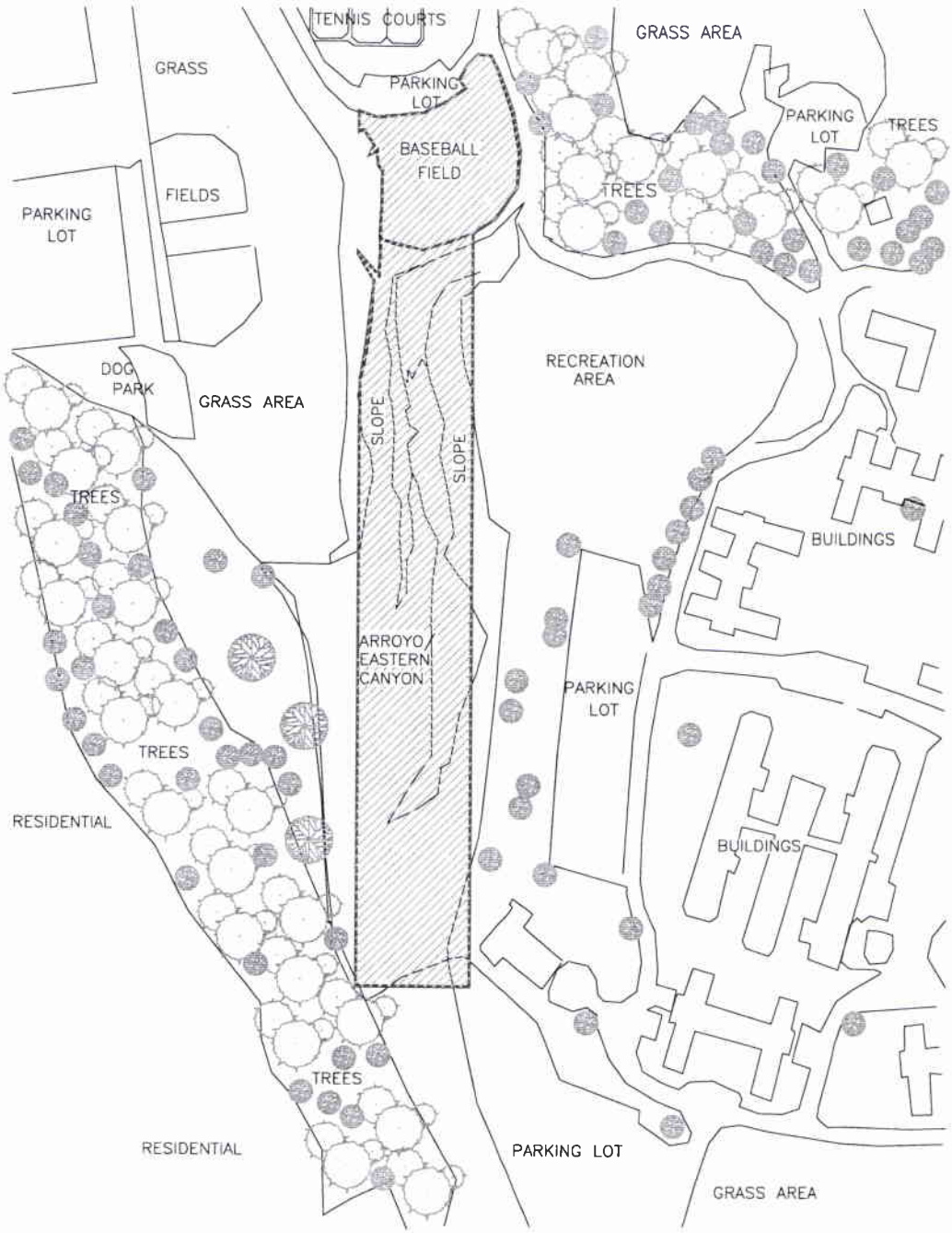
FIGURE 1



LEGEND:

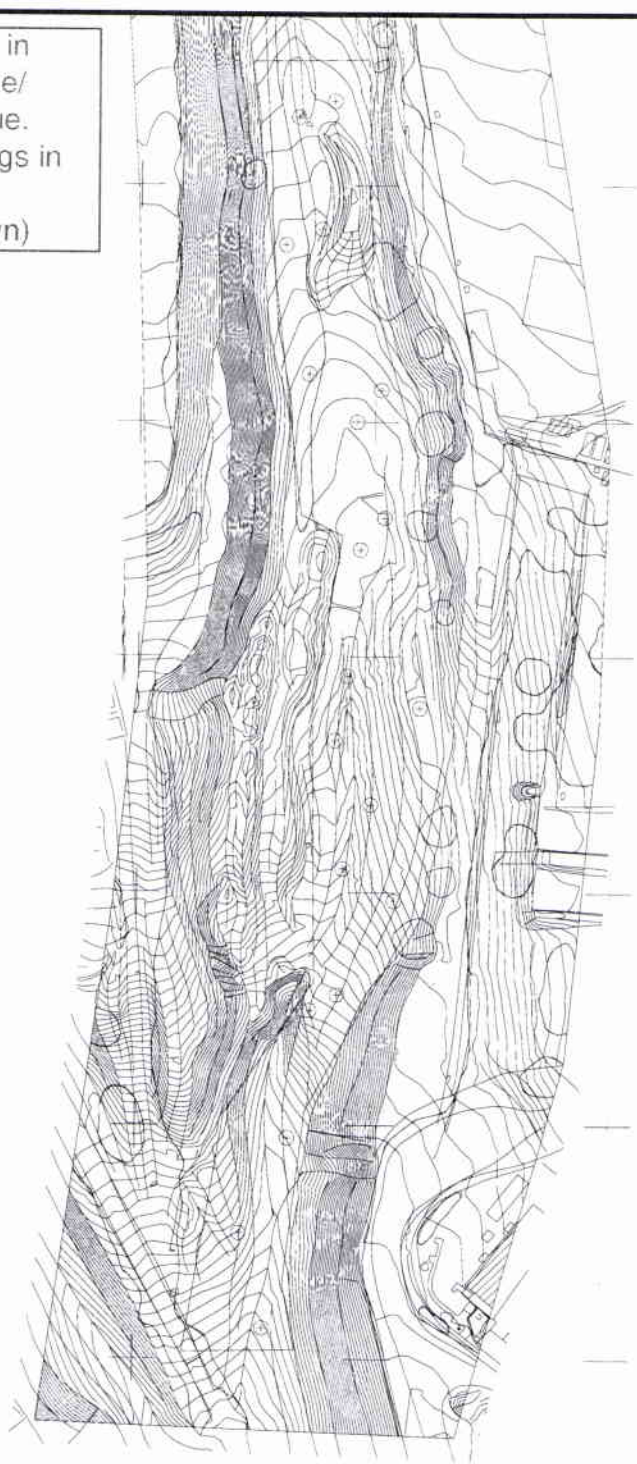
- BURIED HISTORICAL SOLID WASTE DISPOSAL AREA
- BURIED HISTORICAL MEDICAL WASTE DISPOSAL AREA

NORTH	Design By: ADAPTED FROM A SITE PLAN PROVIDED BY LOCUS TECHNOLOGIES	Drawn By: EFD	Date: 05/07/2008
	NOT TO SCALE	VA GLAHS	SITE FACILITY MAP
ALLWEST GEOSCIENCE		11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	DRAWING NUMBER: DVA-F2
			FIGURE 2



NORTH	Design By: ADAPTED FROM AN AERIAL PHOTOGRAPH PROVIDED BY ALLWEST GEOSCIENCE	Drawn By: EFD	Date: 05/07/2008
	0 SCALE 300' (APPROXIMATE DIMENSIONS)		
ALLWEST GEOSCIENCE	VA GLAHS 11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	INVESTIGATION AREAS	
		DRAWING NUMBER: DVA-F3	FIGURE 3

Arroyo Study Area in yellow. VSP sample/ boring points in blue. Northings & eastings in separate table. (Ball field not shown)



VA GLAHS

11301 Wilshire Boulevard
Los Angeles, California

PROPOSED
SOIL BORING
LOCATIONS

ALLWEST GEOSCIENCE Inc.

Scalee: NTS

Date: 10/2008

FIGURE 4

APPENDIX C

TABLES

TABLE 1

Passive Soil Gas Survey Target Compounds	
TPH C_5-C_9	Bromoform
TPH C_{10}-C_{14}	1,1,2,2-Tetrachloroethane
Vinyl Chloride	o-Xylene
1,1-Dichloroethene	1,2,3-Trimethylbenzene
trans 1,2-Dichloroethene	Isopropylbenzene
Methyl-tert-butyl ether (MTBE)	1,3,5-Trimethylbenzene
1,1-Dichloroethane	1,2,4-Trimethylbenzene
cis 1,2 Dichloroethene	1,3 -ichlorobenzene
Chloroform	1,4-Dichlorobenzene
2,2-Dichloropropane	1,2-Dichlorobenzene
1,2-Dichloroethane	n-Butylbenzene
1,1,1-Trichloroethane	1,2,4-Trichlorobenzene
1,1-Dichloropropene	Naphthalene
Carbon Tetrachloride	Hexachlorobutadiene
Benzene	Trichlorobenzene
1,2-Dichloropropane	2-Methylnaphthalene
Trichloroethene (TCE)	Tetrachlorobenzene
1,1,2-Trichloroethane	Acenaphthylene
Toluene	Acenaphthene
1,3-Dichloropropane	Pentachlorobenzene
1,2-Dibromomethane (EDB)	Heptadecane
Tetrachloroethene (PCE)	Hexachlorobenzene
1,1,1,2-Tetrachloroethane	Phenanthrene
Chlorobenzene	Anthracene
Ethylbenzene	Fluoranthene
p & m-Xylene	Pyrene

Additional compounds may be added to meet specific requirements

The reporting quantification level (RQL) for each compound is 25 nanograms (ng) and the RQL for TPH is 2,500 ng; however, actual detection limits are lower

Source: Beacon Environmental Services, Inc.

TABLE 2

List of Analytes (Soil & Groundwater)

RADIOISOTOPES	VOCs	VOCs
Bromine-82	Ethylbenzene	Dibromomethane
Calcium-45	Styrene	Bromochloromethane
Calcium-47	cis-1,3-Dichloropropene	Chloroethane
Carbon-14	Trans-1,3-Dichloropropene	Vinyl Chloride
Cesium-137	n-Propylbenzene	Methylene Chloride
Chlorine-36	n-Butylbenzene	Carbon Disulfide
Chromium-51	4-Chlorotoluene	Bromoform
Cobalt-57	1,4-Dichlorobenzene	Bromodichloromethane
Cobalt-60	1,2-Dibromomethane	1,1-Dichloroethane
Gallium-67	1,2-Dichloroethane	1,1-Dichloroethene
Gold-198	4-Methyl-2-Pentanone (MIBK)	Trichlorofluoromethane
Indium-111	1,3,5-Trimethylbenzene	Dichlorofluoromethane
Iodine-125	Bromobenzene	1,2-Dichloropropane
Iodine-131	Toluene	2-Butanone (MEK)
Iridium-192	Chlorobenzene	1,1,2-Trichloroethane
Iron-59	1,2,4-Trichlorobenzene	Trichloroethene
Manganese-54	Chlorodibromomethane	1,1,2,2-Tetrachloroethane
Mercury-197	Tetrachloroethene	1,2,3-Trichlorobenzene
Mercury-203	Xylene (Total)	Hexachlorobutadiene
Molybdenum-99	sec-Butylbenzene	Naphthalene
Nickel-63	1,3-Dichloropropane	o-Xylene
Phosphorous-32	cis-1,2-Dichloroethene	2-Chlorotoluene
Potassium-42	Trans-1,2-Dichloroethene	1,2-Dichlorobenzene
Radium-226	MTBE	1,2,4-Trimethylbenzene
Rubidium-81	m,p-Xylene	1,2-Dibromo-3-chloropropane
Rubidium-83	1,3-Dichlorobenzene	1,2,3-Trichloropropane
Rubidium-86	Carbon Tetrachloride	tert-Butylbenzene
Scandium-46	1,1-Dichloropropene	Isopropylbenzene
Selenium-75	2-Hexanone	p-Isopropyltoluene
Sodium-22	2,2-Dichloropropane	
Sodium-24	1,1,1,2-Tetrachloroethane	
Strontium-85	Acetone	
Strontium-90	Chloroform	
Tin-113	Benzene	
Tritium (H-3)	1,1,1-Trichloroethane	
Xenon-133	Bromomethane (Methyl Bromide)	
Zinc-65	Chloromethane	

TABLE 3

SAMPLE CONTAINER, PRESERVATIVE & HOLDING TIME REQUIREMENTS
VA GLAHS INITIAL SUBSURFACE RADIOLOGICAL INVESTIGATION

PARAMETER	EPA METHOD NUMBER	SAMPLE VOLUME	SAMPLE CONTAINER	PRESERVATIVE	HOLDING TIME
Organic Analyses					
VOCs (soil)	SW 846 8260B	4 oz.	Acetate Liner or Brass Tube	Chill to 4±2° C	14 Days
VOCs (GW)	SW 846 8260B	3 @ 40 ml.	Glass vial w/Teflon®-lined septum	To pH<2 w/HCl; Chill to 4±2° C	14 Days
Radiological Analyses					
Gamma Spectroscopy (soil)		0.5 L	Plastic	Chill to 4±2° C	6 Months
Gamma Spectroscopy (GW)		2L	Plastic or Glass	To pH<2 w/HNO^3; Chill to 4±2° C	6 Months
Radio-Chemistry (soil)		0.5 L	Plastic or Glass	Chill to 4±2° C	6 Months
Radio-Chemistry (GW)		2L	Plastic or Glass	To pH<2 w/HNO^3; Chill to 4±2° C	6 Months
Tritium (soil)		0.5 L	Glass	Chill to 4±2° C	6 Months
Tritium (GW)		20 ml	Plastic or Glass	Chill to 4±2° C	6 Months

TABLE 4

FIELD QC SAMPLE FREQUENCY
VA GLAHS INITIAL SUBSURFACE RADIOLOGICAL INVESTIGATION

QC SAMPLE TYPE	FREQUENCY OF ANALYSIS	QC SAMPLE MATRIX
Matrix spike and matrix spike duplicate	5%	Soil/Groundwater
Field duplicate	10%	Soil/Groundwater
Trip Blank	1 per cooler w/samples for VOCs	Soil/Groundwater
Equipment Rinsate Blank	1 per day per piece of equipment	Soil/Groundwater
Source Blank	1 per source water	Soil/Groundwater

MS and MSDs will be selected by the sampler

TABLE 5

DATA QUALITY OBJECTIVES

1.0 MARSSIM DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQOs) for the surface and subsurface investigation include the collection of appropriate data to support a future assessment of human health risks associated with potential VOC and radiological impacts resulting from buried medical waste. To ensure that a sufficient quality and quantity of subsurface (soil and hydrogeologic) and chemical data of are collected during field activities described in the workplan outline, the following seven-step process is presented:

- Step 1 - State the Problem
  - Describe the problem and identify the resources available to resolve the problem;
- Step 2 - Identify the Decision
  - Identify the questions the study would attempt to answer;
- Step 3 - Inputs to the Decision
  - Identify the information needed to support the decision and the measurements requiring to be collected to resolve the decision statement;
- Step 4 - Define the Study Boundaries
  - Specify the spatial and temporal aspects of the environmental media the data must represent to support the decision;
- Step 5 - Develop a Decision Rule
  - Develop unambiguous "If...then" statements that define the conditions that would trigger an alternative action;
- Step 6 - Specify the Limits on Decision Factors
  - Specify the acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data; and
- Step 7 - Optimize the Design for Obtaining Data
  - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

Step 1

The problem statement (Step 1) is as follows: "VOC and low level radioactive medical waste have been determined to be buried in the Arroyo/Eastern Canyon. A previous surface radiological survey was conducted and determined there was no evidence of elevated single readings in any of the surveyed areas. It was determined that the average reading in the two (2) canyons (Arroyos) and the Brentwood School lower soccer fields bordering the GLAHS, were somewhat higher than other surveyed areas or the control areas, but there was no obvious explanation for the differences. Nothing was revealed by the surface "Walkover" scanning that would warrant additional surface scanning.

It was concluded that, overall, there was nothing detected by surface scanning that appeared to be distinguishable from natural background radiation, and any external gamma radiation exposure received by current visitors to the parks or the surrounding areas that may be due to potential impacts on or near the ground surface is minimal (MECA, 2006). However, the local public is convinced otherwise, and therefore, the VA GLAHS determined that a surface and subsurface

investigation combined with a human health risk assessment would aid in collecting the proper data required to dispel the notion of any potential threats to human health and the environment."

Step 2

Step 2 of the DQO process (Identify the Inputs to the Decision) asks the key question(s) that this Scoping Document attempts to address: "What initial surface and subsurface data including passive soil gas survey (PSG) sampling and analysis, borehole characterization, groundwater monitoring well installation, sampling and chemical analysis, and human health risk assessment would: 1) improve understanding of the potential impacts to sensitive receptors at the ground surface (public health); and 2) support the development and evaluate potential groundwater impacts?" The criteria necessary to determine whether the proposed surface and subsurface investigation would answer this question include, but may not necessarily be limited to:

- Adequacy of collected data to initially document the fate and transport of chemicals of concern (COCs) in vadose zone soil and possibly groundwater beneath the site at present, and COCs that may pose potential threats to public health in the future; and
- Adequacy of collected data to initially define "background" or "ambient" chemical concentrations in groundwater in the nearby area of buried medical waste.

Step 3

Step 3 of the DQO process (Identify the Inputs to the Decision) identifies the kind of initial surface and subsurface information that is required to address the question posed in accordance with Step 2. This information would include:

- Three-dimensional lithologic and geochemical information;
- Determining source areas of COCs;
- Defining potential impacts to vadose zone soil and groundwater;
- Groundwater elevation and quality data obtained through measurements and sampling; and
- Determine the potential for impacts to public health.

Step 4

Step 4 of the DQO process (Define the Study Boundaries) defines the spatial and temporal aspects of the field monitoring, sampling and analytical activities proposed in this Scoping Document. The areas of investigation described in this Scoping Document are shown in Figure 3. The timeframe for conducting the field activities described in this Scoping Document would be June through July of 2008. The field investigation would proceed in a series of three steps. The first step would be to conduct the PSG survey, followed by surface and subsurface sampling utilizing a direct-push sampling rig and/or hollow stem auger drilling rig, followed by groundwater monitoring well installation utilizing a hollow-stem auger drilling rig.

Analytical data collected during these 3 steps will go through the validation process, and a human health risk assessment will be conducted. A final report summarizing all field screening, sampling and analysis activities and conclusions of the human health risk assessment would be available in mid August.

Step 5

Step 5 of the DQO process (Develop a Decision Rule) determines whether the proposed data collection activities would be of sufficient quantity and quality to satisfy the DQOs. Given that Visual Sampling Plan and MARSSIM procedures were followed in generating this document, Allwest anticipates that the field screening data and surface and subsurface analytical results would achieve adequacy standards.

Step 6

Step 6 of the DQO process (Specify the Limits on Decision Errors) would be based on measurement errors, rather than sampling errors, provided that measurement errors would likely be the primary factors affecting any decision error. Laboratory-validated data would be required to limit measurement errors. Sampling errors would be limited, to the extent practicable, by following the procedures described in this Scoping Document and in the Quality Assurance Project Plan, along with federal and local regulatory guidelines.

Step 7

Step 7 of the DQO process (Optimize the Design for Obtaining Data) will be accomplished by applying the DOE's Quality Assurance Tool Visual Sampling Plan and the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) DQOs.

The DQOs listed above and the associated field and laboratory analytical activities described in this Scoping Document would be conducted including, but not necessarily limited to:

- Conducting a passive soil gas (PSG) survey and laboratory analysis;
- Collecting surface soil samples and laboratory analysis;
- Collecting subsurface soil samples and laboratory analysis;
- Groundwater monitoring well installation, development, and sampling; and
- Conducting a human health risk assessment.

2.0 MARSSIM

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. The MARSSIM guidance focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

The radiological survey design is developed and documented using the DQO Process. The DQOs for the project are established and preliminary surveys (e.g., scoping, characterization) are performed to provide information necessary to design the final status survey for compliance demonstration.

A minimum amount of information is required from the preliminary surveys to develop an effective final status survey design. This includes:

- Sufficient information to justify classification and specification of boundaries for survey units (the default is Class 1 which results in the highest level of survey effort); and
- An estimate of the variability of the contaminant concentration in the survey unit (σ_s) and the reference area (σ_r) if necessary.

After the preliminary surveys are completed, the final status survey design can be developed. There are approximately 10 major steps in the development of a survey design that integrates scanning surveys with direct measurements and sampling. Several of these steps are:

- Classify Areas by Contamination Potential
- Group/Separate Areas into Survey Units
- Determine Number of Data Points
- Select Instrumentation
- Develop an Integrated Survey Design

3.0 U.S. DOE QUALITY ASSURANCE TOOL, VISUAL SAMPLING PLAN (VSP)

Allwest will implement the U.S. Department of Energy's Quality Assurance tool, Visual Sampling Plan (VSP) to develop a conceptual site model and preliminary soil boring locations using the data from the Phase I Radiological Survey. VSP is a software tool for selecting the correct number and location of environmental samples so that statistical test results performed on the data collected via the sampling plan have the required confidence for decision making. VSP provides sample designs and sample-size equations needed for specific statistical tests appropriate for several types of environmental problems. The following is a list of the sampling goals that can be addressed in the current version of VSP:

Sampling Goal	User's Guide Section
Compare Average to Fixed Threshold	3.2.1
Compare Average to Reference Average	3.2.2
Estimate the Mean	3.2.3
Construct Confidence Interval on Mean	3.2.4
Compare Proportion to Fixed Threshold	3.2.5
Compare Proportion to Reference Proportion	3.2.6
Estimate the Proportion	3.2.7
Locating a Hot Spot	3.2.8
Find UXO Target Areas	3.2.9
Assess degree of confidence in UXO presence	3.2.10
Non-statistical approach	3.2.11
Establish boundary of contamination	3.2.12
Sampling within buildings	3.2.13

Allwest conducted VSP modeling with data input using U.S. EPA Region IX Preliminary Remediation Goals (PRGS). The VSP modeling revealed that soil samples should be collected at a total of 30 locations for the two (2) investigation areas (approximately 8 in the Ball Field Area and approximately 22 in the Arroyo/Eastern Canyon Area).

Allwest anticipates that continuous soil samples will be collected from each soil boring location within the two (2) investigation areas, with two (2) soil samples submitted to the laboratory for chemical analysis. Proposed soil boring locations are presented on Figure 4 and VSP modeling output data is included in Appendix A. A list of radionuclides of interest for the proposed investigation is included in Table 2.

TABLE 6

REPORTING LIMITS

By Gamma Spectroscopy

Nuclide	Reporting Limit (pCi/gram soil)	Reporting Limit (pCi/L water)
Bromine-82	0.2	150
Calcium-47	2	1,000
Cesium-137	0.1	60
Chromium-51	0.4	300
Cobalt-57	0.05	20
Cobalt-60	0.1	100
Gallium-67	0.2	150
Gold-198	0.1	70
Indium-111	0.05	50
Iodine-125	2	1,000
Iodine-131	0.06	50
Iridium-192	0.05	50
Iron-59	0.2	100
Manganese-54	0.1	50
Mercury-197	0.3	200
Mercury-203	0.06	50
Molybdenum-99	0.4	300
Potassium-42	1	500
Radium-226	0.2	150
Rubidium-81	0.2	150
Rubidium-83	0.3	200
Rubidium-86	2	1,000
Scandium-46	0.2	150
Selenium-75	0.1	50
Sodium-22	0.1	100
Sodium-24	0.2	150
Strontium-85	0.1	100
Tin-113	0.1	50
Xenon-133	0.5	400
Zinc-65	0.2	200

TABLE 6
REPORTING LIMITS

By Radio-Chemistry

Nuclide	Reporting Limit (pCi/gram soil)	Reporting Limit (pCi/L water)
Tritium (H-3)	0.25	400 (10 for low-level analysis)
Carbon-14	2	330
Chlorine-36	50	100
Calcium-45	50	100
Nickel-63	4	50
Phosphorus-32	1	1
Strontium-90	2	2
Technecium-99	5	10
Yttrium-90	2	2

VOCs in SOIL

ANALYTES	MDL	RL	UNIT	RPD	LOW	HIGH	UNIT
SOIL							
Ethylbenzene	2	5	µg/kg	30	75	125	%
Styrene	2	5	µg/kg	30	75	125	%
cis-1,3-Dichloropropene	2	5	µg/kg	30	70	125	%
trans-1,3-Dichloropropene	2	5	µg/kg	30	65	125	%
n-Propylbenzene	2	5	µg/kg	30	65	135	%
n-Butylbenzene	2	5	µg/kg	30	65	140	%
4-Chlorotoluene	2	5	µg/kg	30	75	125	%
1,2-Dichlorobenzene	2	5	µg/kg	30	70	125	%
1,2-Dibromomethane	2	5	µg/kg	30	70	125	%
1,2-Dichloroethane	2	5	µg/kg	30	70	135	%
4-Methyl-2-pentanone (MIBK)	5	10	µg/kg	30	45	145	%
1,3,5-Trimethylbenzene	2	5	µg/kg	30	65	130	%
Bromobenzene	2	5	µg/kg	30	65	120	%
Toluene	2	5	µg/kg	30	70	125	%
Chlorobenzene	2	5	µg/kg	30	75	125	%
1,2,4-Trichlorobenzene	2	5	µg/kg	30	65	130	%
Chlorodibromomethane	2	5	µg/kg	30	65	130	%
Tetrachloroethene	2	5	µg/kg	30	65	140	%
Xylene (Total)	2	15	µg/kg				%
sec-Butylbenzene	2	5	µg/kg	30	65	130	%
1,3-Dichloropropane	2	5	µg/kg	30	75	125	%
cis-1,2-Dichoroethene	2	5	µg/kg	30	65	125	%
trans-1,2-Dichloroethene	2	5	µg/kg	30	65	135	%
Methyl tert-butyl Ether (MTBE)	2	5	µg/kg				%

ANALYTES	MDL	RL	UNIT	RPD	LOW	HIGH	UNIT
SOIL							
m,p-Xylene	2	10	µg/kg	30	80	125	%
1,3-Dichlorobenzene	2	5	µg/kg	30	70	125	%
Carbon Tetrachloride	2	5	µg/kg	30	65	135	%
1,1-Dichloropropene	2	5	µg/kg	30	70	135	%
2-Hexanone	5	10	µg/kg	30	45	145	%
2,2-Dichloropropane	2	5	µg/kg	30	65	135	%
1,1,1,2-Tetrachloroethane	2	5	µg/kg	30	75	125	%
Acetone	5	10	µg/kg	30	20	160	%
Chloroform	2	5	µg/kg	30	70	125	%
Benzene	2	5	µg/kg	30	75	125	%
1,1,1-Trichloroethane	2	5	µg/kg	30	70	135	%
Bromomethane	2	10	µg/kg	30	30	160	%
Chloromethane	2	10	µg/kg	30	50	130	%
Dibromomethane	2	5	µg/kg	30	75	130	%
Bromochloromethane	2	5	µg/kg	30	70	125	%
Chloroethane	2	5	µg/kg	30	40	155	%
Vinyl Chloride	2	5	µg/kg	30	60	125	%
Methylene Chloride	2	10	µg/kg	30	55	140	%
Carbon Disulfide	2	5	µg/kg	30	45	160	%
Bromoform	2	5	µg/kg	30	55	135	%
Bromodichloromethane	2	5	µg/kg	30	70	130	%
1,1-Dichloroethane	2	5	µg/kg	30	75	125	%
1,1-Dichloroethene	2	5	µg/kg	30	65	135	%
Trichlorofluoromethane	2	5	µg/kg	30	25	185	%
Dichlorodifluoromethane	2	10	µg/kg	30	35	135	%
1,2-Dichloropropane	2	5	µg/kg	30	70	120	%
2-Butanone (MEK)	5	10	µg/kg	30	30	160	%
1,1,2-Trichloroethane	2	5	µg/kg	30	60	125	%
Trichloroethene	2	5	µg/kg	30	75	125	%
1,1,2,2-Tetrachloroethane	2	5	µg/kg	30	55	130	%
1,2,3-Trichlorobenzene	2	5	µg/kg	30	60	135	%
Hexachlorobutadiene	2	10	µg/kg	30	55	140	%
Naphthalene	2	5	µg/kg	30	40	125	%
o-Xylene	2	5	µg/kg	30	75	125	%
2-Chlorotoluene	2	5	µg/kg	30	70	130	%
1,2-Dichlorobenzene	2	5	µg/kg	30	75	120	%
1,2,4-Trimethylbenzene	2	5	µg/kg	30	65	135	%
1,2-Dibromo-3-chloropropane	2	10	µg/kg	30	40	135	%
1,2,3-Trichloropropane	2	5	µg/kg	30	65	130	%
tert-Butylbenzene	2	5	µg/kg	30	65	130	%
Isopropylbenzene	2	5	µg/kg	30	75	130	%
p-Isopropyltoluene	2	5	µg/kg	30	75	135	%

VOCs in GROUNDWATER

ANALYTES	MDL	RL	UNIT	RPD	LOW	HIGH	UNIT
GROUNDWATER							
Ethylbenzene	0.2	1	µg/L	30	75	125	%
Styrene	0.2	1	µg/L	30	65	135	%
cis-1,3-Dichloropropene	0.2	1	µg/L	30	70	130	%
trans-1,3-Dichloropropene	0.2	1	µg/L	30	55	140	%
n-Propylbenzene	0.2	1	µg/L	30	70	130	%
n-Butylbenzene	0.2	1	µg/L	30	70	135	%
4-Chlorotoluene	0.2	1	µg/L	30	75	130	%
1,2-Dichlorobenzene	0.2	1	µg/L	30	75	125	%
1,2-Dibromomethane	0.2	1	µg/L	30	80	120	%
1,2-Dichloroethane	0.2	1	µg/L	30	70	130	%
4-Methyl-2-pentanone (MIBK)	5	1	µg/L	30	60	135	%
1,3,5-Trimethylbenzene	0.2	1	µg/L	30	75	130	%
Bromobenzene	0.2	1	µg/L	30	75	125	%
Toluene	0.2	1	µg/L	30	75	120	%
Chlorobenzene	0.2	1	µg/L	30	80	130	%
1,2,4-Trichlorobenzene	0.2	1	µg/L	30	65	135	%
Chlorodibromomethane	0.2	1	µg/L	30	60	135	%
Tetrachloroethene	0.2	1	µg/L	30	45	150	%
Xylene (Total)	0.2	1	µg/L				%
Sec-Butylbenzene	0.2	1	µg/L	30	70	125	%
1,3-Dichloropropane	0.2	1	µg/L	30	75	125	%
cis-1,2-Dichoroethene	0.2	1	µg/L	30	70	125	%
trans-1,2-Dichloroethene	0.2	1	µg/L	30	60	140	%
Methyl tert-butyl Ether (MTBE)	0.2	1	µg/L	30	65	125	%
m,p-Xylene	0.5	1	µg/L	30	75	130	%
1,3-Dichlorobenzene	0.2	1	µg/L	30	75	125	%
Carbon Tetrachloride	0.2	1	µg/L	30	65	140	%
1,1-Dichloropropene	0.2	1	µg/L	30	75	130	%
2-Hexanone	5	1	µg/L	30	55	130	%
2,2-Dichloropropane	0.2	1	µg/L	30	70	135	%
1,1,1,2-Tetrachloroethane	0.2	1	µg/L	30	80	130	%
Acetone	5	1	µg/L	30	40	140	%
Chloroform	0.2	1	µg/L	30	65	135	%
Benzene	0.2	1	µg/L	30	80	120	%
1,1,1-Trichloroethane	0.2	1	µg/L	30	65	130	%
Bromomethane	0.2	1	µg/L	30	35	160	%
Chloromethane	0.2	1	µg/L	30	40	125	%
Dibromomethane	0.2	1	µg/L	30	75	125	%
Bromochloromethane	0.2	1	µg/L	30	65	130	%
Chloroethane	0.2	1	µg/L	30	60	135	%
Vinyl Chloride	0.2	1	µg/L	30	50	145	%

ANALYTES	MDL	RL	UNIT	RPD	LOW	HIGH	UNIT
GROUNDWATER							
Methylene Chloride	0.5	1	µg/L	30	55	140	%
Carbon Disulfide	0.2	1	µg/L	30	35	160	%
Bromoform	0.3	1	µg/L	30	70	130	%
Bromodichloromethane	0.2	1	µg/L	30	75	120	%
1,1-Dichloroethane	0.2	1	µg/L	30	70	135	%
1,1-Dichloroethene	0.2	1	µg/L	30	70	130	%
Trichlorofluoromethane	0.2	1	µg/L	30	60	145	%
Dichlorodifluoromethane	0.2	1	µg/L	30	30	155	%
1,2-Dichloropropane	0.2	1	µg/L	30	75	125	%
2-Butanone (MEK)	5	1	µg/L	30	30	150	%
1,1,2-Trichloroethane	0.2	1	µg/L	30	75	125	%
Trichloroethene	0.2	1	µg/L	30	70	125	%
1,1,2,2-Tetrachloroethane	0.2	1	µg/L	30	65	130	%
1,2,3-Trichlorobenzene	0.2	1	µg/L	30	55	140	%
Hexachlorobutadiene	0.2	1	µg/L	30	50	140	%
Naphthalene	0.5	1	µg/L	30	55	140	%
o-Xylene	0.2	1	µg/L	30	80	120	%
2-Chlorotoluene	0.2	1	µg/L	30	75	125	%
1,2-Dichlorobenzene	0.2	1	µg/L	30	70	120	%
1,2,4-Trimethylbenzene	0.2	1	µg/L	30	75	130	%
1,2-Dibromo-3-chloropropane	0.5	1	µg/L	30	50	130	%
1,2,3-Trichloropropane	0.5	1	µg/L	30	75	125	%
tert-Butylbenzene	0.2	1	µg/L	30	70	130	%
Isopropylbenzene	0.2	1	µg/L	30	75	125	%
p-Isopropyltoluene	0.2	1	µg/L	30	75	130	%

TABLE 7

QUALITY CONTROL SAMPLES FOR PRECISION AND ACCURACY
VA GLAHS INITIAL SUBSURFACE RADIOLOGICAL INVESTIGATION

QC TYPE	Precision	Accuracy	Frequency
Field QC	Field duplicate RPD MS/MSD RPD	Trip Blank Equipment Blank Source Blank	Field Duplicate = 1/10 samples Trip Blank = 1/cooler w/samples for VOCs analysis Equipment Rinsate = 1/day/piece of equipment Source Blank = 1/source water
Laboratory QC	MS/MSD RPD Field Duplicate RPD	MS/MSD %R Method Blanks LCS or Blank Spikes Surrogate Standards %R Internal Standards %R	

%R Percent recovery
LCS Laboratory control sample
MS/MSD Matrix spike/Matrix spike duplicate
RPD Relative percent difference

APPENDIX D

SAMPLE TRACKING LOGS

SAMPLE TRACKING LOG
INITIAL INVESTIGATION
VA GLAHS
LOS ANGELES, CALIFORNIA

Sample No.	Collection		Well Number/ Location	Depth (feet)	Matrix		Analyses	TAT (days)	COC No.	Result Rec. Date	Laboratory	Comments/ Sampler
	Date	Time			Soil	Water						

WELL DEVELOPMENT LOG / WELL SAMPLING LOG

Project Name: _____ **Well Number:** _____
Project Number: _____ **Equipment:** _____
Date: _____ _____
Site Engineer: _____ **Contractor:** _____

	Before	*Reference Point*	*After*
Depth to Water (ft)	_____	_____	_____
Depth to Sediment (ft)	_____	_____	_____
Thickness of Sediment (ft)	_____		_____

Depth of Well (ft) _____
Diameter of Casing (ft) _____
Water Column Height (ft) _____

Casing Volume (gals) $=\pi(\text{Diam. of Casing (ft)}/2)^2$ (Water Column Height (ft))(7.48 gals/ft^3) = _____
Casing Volumes Purged _____

Total Volume Purged (gals) _____

Time	pH	Turbidity (NTU)	Temp (°C)	Conductivity (µmhos)	Dissolved Oxygen (mg/L)	Salinity (%)	Comments

Notes Sampling Procedures: _____

LOW-FLOW SAMPLING LOG

Project Name: _____ Well Number: _____
Project Number: _____ Equipment: _____
Date: _____ Sample ID: _____
Site Engineer(s): _____ Contractor: _____

Reference Point _____
Depth to Water (ft) _____
Depth to Sediment (ft) _____
Water Column Height (ft) _____

Casing Diameter (in ft) _____

Pump Controller Settings:
Cycles per minute (CPM) _____
Refill Time (seconds) _____
Discharge Time (seconds) _____

h - Length of discharge tubing (feet) _____
D - Diameter of discharge tubing (inches) _____
TV - Volume of Tubing (ml) _____
[TV (in ml) = $155*D^2h$]

BV - Bladder volume (ml) _____

SSV - Sampling System Volume (ml) _____
[SSV = TV + BV]

Time Required to Purge SSSVSSV _____ (minutes) Total Volume Purged (ml) _____

Time	pH	Temp. (°C)	Conductivity (umhos)	Dissolved Oxygen (mg/L)	ORP (mv)	Flow Rate (mL/min)	Comments

Notes Sampling

pH/TEMPERATURE/CONDUCTIVITY/TURBIDITY

FIELD CALIBRATION FORM

Project Name: _____

Calibration by: _____ Date: _____

Instrument Manufacturer: _____ Model: _____

Serial Number: _____

Battery: _____

AUTO CALIBRATION

Solution Manufacturer: _____

Expiration Date: _____

	Pre-Sampling	Post-Sampling
Time:		

INSTRUMENT CHECK-OUT

Auto Calibration Solution Parameters	Standard Solution	Instrument Response	
		Pre-Sampling	Post-Sampling
pH Buffer	4.0		
Temperature	--		
Conductivity	4.49 (mS/cm)		
Turbidity	0.0 (NTUs)		
Dissolved Oxygen*	--		

* Instrument response calibrated to calculated dissolved oxygen content of saturated air at the elevation and air temperature of the sampling location.

Comments: _____

_____

_____

_____

APPENDIX 3

HEALTH AND SAFETY PLAN

SITE SPECIFIC HEALTH & SAFETY PLAN

for:

VA Greater Los Angeles Hospital Site (GLAHS) Subsurface VOC & Radiological Investigation Project
2008

Prepared for:

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May 21, 2008

Revision (0)

Health and Safety Plan Acknowledgment/Sign-In Sheet

I have read and understand the Health and Safety Plan for the scope of work I am to perform.

Date	Print Name	Signature	Firm Name

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ACRONYMS AND ABBREVIATIONS

AL	Action Level
ANSI	American National Standards Institute
APF	Assigned Protection Factor
APR	Air Purifying Respirator
CAL/OSHA	California Occupational Safety and Health Administration
CIH	Certified Industrial Hygienist
CHP	Certified Health Physicist
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
EZ	Exclusion Zone
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations & Emergency Response
HEPA	High Efficient Particulate Air Filter
IDLH	Immediate Danger to Life and Health
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OV	Organic Vapor
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
SAR	Supplied Air Respirator
SHSO	Site Health and Safety Officer
SZ	Support Zone
VA	Veterans Administration
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

The contents of this Health and Safety Plan (HASP) address the overall health and safety considerations for site personnel present during boring and collection of impacted soils (and related activities). This document defines the minimum health and safety requirements to be undertaken during the site activities associated with the project. This HASP defines general applicability and general responsibilities with respect to compliance with Health and Safety programs established for this work and has been prepared in accordance with the following regulations and standards:

- California Code of Regulations (CCR), Title 8, Section 5192, Hazardous Waste Operations and Emergency Response (HAZWOPER);
- CCR, Title 8, Section 5155, Airborne Contaminants (Dusts, Fumes, Mists, Gases & Vapors);
- CCR Title 8, Section 5194, Hazard Communication (HazCom) Standard; and
- CCR, Title 8, Subchapter 4, Construction Safety Orders (applicable sections).

This Health and Safety Plan (HASP) outlines project personnel, individual responsibilities, anticipated hazards due to site work, appropriate personal protective equipment, and steps to take in the event of an emergency and other health and safety requirements necessary for this operation to be completed safely and in compliance with applicable regulations and client requirements.

Project personnel will familiarize themselves with the contents of this HASP and sign the HASP compliance form attached hereto. Personnel will be expected to abide by this HASP and notify their supervisor or the health and safety department if project conditions require additional procedures or changes to procedures described within this HASP.

1.1 STATEMENT OF POLICY

Allwest Geoscience recognizes its responsibility and need to provide healthful and safe working conditions for all of its employees. It is the desire of Allwest Geoscience to emphasize safe working conditions and to request the help and cooperation of all its employees and subcontractors in our accident prevention endeavors. Such effort will require each person to accept their share of responsibility in complying with Federal, State, local regulations and client and company procedures.

A HASP is written for each project to ensure the well being of all field personnel and the community surrounding the site. The plan also represents the minimum health and safety requirements to be observed for all personnel engaged in construction activities. Accordingly, all persons entering the site will follow the policies and procedures established in the HASP. Non-compliance with any health and safety requirement will result in disciplinary action up to, and including, termination of employment.

1.2 SITE OVERVIEW

The project site is located within the City of Los Angeles, California. The Veterans Administration Greater Los Angeles Healthcare System (GLAHS) is located west of the San Diego (405) freeway, north of Wilshire Boulevard, east of Barrington Avenue and south of Sunset Boulevard. This site was a former medical waste burial site from the 1950's to approximately 1968. During this period, the GLAHS was known to have buried waste from animal experiments, including animal carcasses, medical isotope waste in radiological scintillation vials and other miscellaneous medical debris including syringes. Based on previous site assessment data and communication from the Veteran Administration to Allwest Geoscience, principal chemicals of concern (COCs) include (but are not limited to):

- Volatile Organic Compounds (VOCs), and
- Radionuclides.

1.3 PROJECT OBJECTIVES

The overall goal of this project is the safe execution of project related activities which include:

1. Environmental engineering firm to perform boring and collection of soil samples and install groundwater monitoring wells at site in accordance with approved Work Plan.
2. Monitor field-related activities to ensure community/personal safety.
3. Provide adequate air monitoring to ensure personal protective equipment is used in accordance with this Plan.
4. Limit VOC and fugitive dust emissions during site activities.
5. Document onsite activities.

2.0 PROJECT PERSONNEL AND RESPONSIBILITIES

All employees of Allwest Geoscience and their subcontractors equally share responsibility for the individual and collective health and safety of all personnel on the site. All employees recognize that individual initiative; accountability; and ownership forms the heart of our dedication to health and safety. Non-compliance with any health and safety requirement will result in disciplinary action up to, and including, termination of employment and/or contract.

Employees know that production and schedule cannot take precedence over health and safety and know that any individual, without reprisal, can stop any work activity, when a health and safety threat, or potential threat exists.

The following sections identify the responsibilities for the various levels of employees and their responsibilities for this project. However,

- Some tasks may overlap between personnel,
- Some duties may change between personnel, and
- Some personnel may perform dual roles.

2.1 CERTIFIED INDUSTRIAL HYGIENIST

The Certified Industrial Hygienist (CIH) is responsible for development of this site specific Health and Safety Plan. The CIH is a subconsultant to Allwest Geoscience, and assists site personnel to ensure projects are being done safely and within regulations. Additional duties include:

- Preparing site-specific health and safety plans.
- Reviewing Phase 1 Site Assessment(s) for project site and general vicinity of site to identify potential health and safety hazards.
- Determining potential and/or known Chemicals of Concern (COCs) specific to the project site.
- Selection of proper Personal Protective Equipment (PPE) specific to site activities.
- Performing air monitoring to determine compliance with airborne contaminant Action Levels (ALs).
- Keeping project managers and field personnel advised on federal, state and other health and safety regulations and furnishing interpretations of these regulations.
- Participating in pre-project planning conferences.
- Providing educational training materials (informational programs) designed to develop and maintain an effective health and safety program.

2.2 PROJECT MANAGER

The PM is responsible for all aspects of the project including health and safety, along with all project activities. The PM will communicate with the Certified Industrial Hygienist (CIH) as needed throughout the course of field operations or when conditions at the Site change. Some additional responsibilities are:

- Ensuring all project tasks receive appropriate health and safety review before commencement of field activities, confirming that necessary equipment, facilities and staffing are available to implement the task.
- Monitoring the personnel on the project to assure compliance with the corporate health and safety program.
- Maintaining all safety and health personnel files, including medical, training and accident records.
- Assisting on the preparation of site-specific health and safety plans under the direction of the CIH.
- Visiting the project site and performing inspections to see if there are any unsafe physical conditions or unsafe practices being used by employees.
- Making sure all employees are aware of the potential hazards associated with the project.
- Having the authority to terminate operations if unsafe conditions are present.
- Having the authority to terminate any employee that fails to follow the health and safety program.
- Reviewing accident, first aid and near miss reports; and seeing that corrective action is being taken to prevent reoccurrence.

2.3 SITE HEALTH AND SAFETY OFFICER

On this project the Site Health and Safety Officer (SHSO) will ensure effective implementation of the HASP. The SHSO will work closely with the CIH and CHP. The SHSO health and safety responsibilities include:

- Holding and documenting daily and weekly site health and safety meetings, using the time to review safe practices that cover the work being performed.
- Being thoroughly familiar with the health and safety program for the project.
- Conducting documented safety inspections and promptly resolving any findings.
- Giving detailed instructions as to job performance and explaining hazards and safety precautions when assigning personnel to their job.
- Identifying and ensuring those conditions affecting employee's health and safety are monitored and the existing personal protective equipment (PPE) remains appropriate.

- Considering the health and safety factors in operational planning, providing PPE, warning signs, barricades, fire extinguishers, etc. in advance.
- Supervising all hazardous work or work that is new and unusual.
- Maintaining an adequate stock of and control over first aid supplies and other safety equipment to insure their immediate availability and making sure there are an adequate number of first aid trained people on the project at all times.
- Introducing the health and safety program to new site personnel.
- Assuring that subcontractors comply with this HASP.
- Ensuring that injured workers receive first aid or medical attention, accompanying the injured worker to the clinic or hospital, and securing a drug test.
- Notifying the appropriate personnel in the event of an accident or incident.
- Investigating all accidents, first aid incidents, or near misses, and correct any unsafe practices and conditions.

2.4 SITE PERSONNEL

All Allwest Geoscience site personnel, including their subcontractors, are responsible for reading and following all provisions of the health and safety program, including this HASP. Site personnel report to the Project Manager. All site personnel are responsible for the following:

- Wearing appropriate Personal Protective Equipment (PPE) specific for the job task.
- Attending all safety meetings.
- Inspecting tools and equipment before each use.
- Documenting, in writing, daily equipment inspections.
- Making full use of safeguards provided and report any safeguard missing or not accomplishing its intended function.
- Operating machinery or equipment only if trained to do so.
- Stopping operations if unsafe conditions exist.
- Correcting any unsafe hazard when observed.
- Reporting all accidents, near misses and injuries, no matter how minor to the PM & SHSO immediately.
- Knowing where first aid, firefighting equipment and other safety devices are located.

2.5 SITE VISITORS

Site visitors will not be allowed physical entry in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) without current HAZWOPER training documentation, proper PPE as required by this HASP, and permission from the Site Health and Safety Officer.

Site visitors are bound by, and to, the same health and safety requirements. It is the responsibility of all to make sure site visitors comply and uphold the HASP.

Site visitors have the following responsibilities:

- Attend a site specific health and safety orientation training.
- Adhere to this HASP.
- Wear site specific PPE.
- Perform proper decontamination procedures.

3.0 TRAINING

Allwest Geoscience's personnel and their subcontractors will have received appropriate training by qualified trainers prior to initiating site activities. Documentation of all training can be found in **Appendix B - Site Personnel HAZWOPER Training Certifications**).

3.1 FIELD PERSONNEL

Field personnel will be trained to work in compliance with the California Occupational Safety and Health Administration (Cal/OSHA) standards. Site personnel will not engage in field activities associated with hazardous materials until they have been trained to a level commensurate with their job function and responsibilities, and with the degree of anticipated hazard.

Before field personnel work in the EZ, they will have received 40 hours of Hazardous Waste Site Operations & Emergency Response (HAZWOPER) training and three days of on-the-job training under the direct supervision of a trained, experienced health and safety professional. The specific training requirements include the following subjects:

- Recognition of health, safety and other hazards present on the site.
- Use of PPE.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure.
- Site control measures.
- Decontamination procedures.
- Confined space entry procedures.
- Spill containment measures.

In addition to the initial 40-hour training, all field and supervisory personnel will receive eight hours of HAZWOPER refresher training annually. The refresher training will include topics similar to those presented during the 40-hour course and at a minimum will include:

- Recent changes or updates in regulatory requirements.
- Recognition of health, safety and other hazards potentially present at hazardous waste sites.
- Use of PPE.
- Work practices employees can use to minimize risks from hazards.
- Safe use of engineering controls and safety equipment.

- Medical monitoring program components and how to recognize signs and symptoms of overexposure.
- Site control measures.
- Decontamination procedures.
- Review of recent case studies.

3.2 SUPERVISORY PERSONNEL

Onsite managers and supervisors will receive the same training as the general workers they supervise. Additionally, they will receive eight hours of supervisory training to enhance their ability to provide guidance and make informed decisions. Supervisory training topics include:

- Health and safety program, design, implementation, auditing and enforcement.
- Health hazard recognition, assessment, and monitoring procedures and techniques.
- PPE program design and implementation.
- Emergency response procedures.
- Case studies.

3.3 FIRST AID AND CARDIOPULMONARY RESUSCITATION

At a minimum, one field person per shift will be onsite during field operations that is trained in First Aid, and cardiopulmonary resuscitation (CPR) procedures, according to the Red Cross or the American Heart Association guidelines.

4.0 MEDICAL SURVEILLANCE AND SUBSTANCE ABUSE

4.1 MEDICAL SURVEILLANCE

As part of Allwest Geoscience's established Corporate Health and Safety Program, the services of an occupational physician who has specialized training in occupational medicine will be used to provide the minimum medical examinations and surveillance specified for all Allwest Geoscience personnel and subcontractors assigned to field projects. The examinations are required for any workers entering the EZ or the Contamination Reduction Zone (CRZ) under Cal/OSHA standards.

Allwest Geoscience and their subcontractors provide pre-employment medical examinations as well as medical examinations and annual physicals for those employees enrolled in the Medical Surveillance program. Records of these examinations will be maintained in accordance with Cal/OSHA requirements in the Corporate Office.

4.2 SUBSTANCE ABUSE

Allwest Geoscience and their subcontractors are committed to an alcohol and drug free work place for all employees. Allwest Geoscience recognizes that alcohol, drug, or other substance abuse by employees will impair their ability to perform properly and will have serious adverse effects on the safety, efficiency, and productivity of all employees.

The misuse of legitimate drugs or the use, possession, distribution, or sale of illicit or unprescribed controlled drugs on company business is strictly prohibited and is grounds for immediate termination. Possession, use, distribution, or sale of alcoholic beverages on company premises is not allowed. Being unfit for work because of alcohol or drugs or prescription medications is strictly prohibited and is grounds for disciplinary action, including termination of employment. When working under a client's Substance Abuse Policy, the most stringent requirements will be followed.

5.0 JOB HAZARD ANALYSIS

Environmental site assessment projects may pose a multitude of health and safety concerns, any one of which could result in serious injury or death. These hazards are a function of the nature of the site as well as the work being performed. They include:

- Chemical hazards
- Physical hazards
- Biological hazards

5.1 CHEMICAL HAZARDS

Exposure to chemical hazards (if present) will be in the form of inhalation, ingestion, or skin/eye contact. Hazardous property information for these chemical constituents is provided in this section of the HASP.

Chemical contaminants of concern (COC) at this project site include, but are not limited to:

- Volatile Organic Compounds (VOCs)

Health Effects of Volatile Organic Compounds (VOCs):

Eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness.

The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those with no known health effect. As with other pollutants, the extent and nature of the health effect will depend on many factors including level of exposure and length of time exposed. Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and memory impairment are among the immediate symptoms that some people have experienced soon after exposure to some organics. At present, not much is known about what health effects occur from the levels of organics usually found in homes. Many organic compounds are known to cause cancer in animals; some are suspected of causing, or are known to cause, cancer in humans.

5.2 PHYSICAL HAZARDS

Physical contaminants of concern (COC) at this project site include, but are not limited to:

- Radionuclides.
- Utilities

- Vehicular traffic
- Noise, and
- Heat

5.2.1 Radionuclides and Radiation

The project site is a former burial site, which was used to bury medical waste containing low level radioactive material. The primary radionuclides, expected to still be present, are tritium and carbon-14. The primary hazard from these is through ingestion or inhalation. There is very little hazard from incidental contact, since the radiation emitted from these is very weak.

Radiation monitoring is necessary to identify the radionuclides encountered and make any necessary health and safety adjustments.

5.2.1 Underground Utilities

Prior to excavation activities, the Allwest Geoscience or their subcontractor competent person MUST determine if any underground utilities (sewer, telephone, fuel, electric, water, etc.) are present near the project boring and groundwater installation site. Contact the local underground utilities companies or designated utility hotlines. The respective utility group will come out to the site and mark their underground services free of charge. Exposed utilities should be protected, supported, or removed as necessary. The local utility companies should be involved to help make these decisions.

5.2.2 Public Vehicular Traffic

Site personnel exposed to public vehicular traffic shall be provided with, and wear, warning vests, or other suitable garments marked with or made of reflecting or high-visibility material.

5.2.3 Hearing Conservation

This plan outlines the requirements of Allwest Geoscience's Hearing Conservation Program and provides information and guidance on selecting, training, and using hearing protection devices in accordance with Cal/OSHA regulations. Allwest Geoscience's objective is to provide a place of employment that is safe and healthful and will not subject employees to avoidable hazards associated with harmful noise levels.

Noise monitoring will be conducted when personnel may be subjected to sound-pressure levels exceeding 85 dBA. A hand-held sound-pressure level device will be used to measure noise within the immediate work area(s). Feasible engineering or administrative controls shall be used to mitigate excessive noise. When such controls fail to reduce sound-pressure levels within the specified limit, PPE shall be selected, evaluated, provided and used in accordance with the hearing conservation program.

5.2.4 Heat Stress

Heat stress is a significant potential hazard associated with the work task performed and the type and degree of protective equipment used in hot weather environments. Local weather conditions

may produce conditions that will require restricted work schedules in order to protect employees. Monitoring for heat stress will follow one of two protocols depending on whether impermeable clothing (Tyvek ®, Saranex®, rain gear, etc.) or permeable clothing (cotton coveralls) is worn. This section will apply to both hazardous and non-hazardous waste workers at the site.

Frequency of physiological monitoring will increase as the ambient temperature increases or if slow recovery rates are indicated. The break time will be sufficient to allow workers to recover from the effects of heat stress. This will be accomplished by measuring the recovery heart rate and oral temperature.

The break time duration will be determined using the following methodology and criteria:

- Seat person being monitored and take oral temperature,
- Measure pulse in the following sequence:
- Pulse #1: 30 seconds to 1 minute after sitting
- Pulse #2: 2½ to 3 minutes after sitting.

An excessive heat stress condition exists when any of the following conditions exist:

- Oral or ear temperature exceeds 99.5 °F
- If pulse #2 is greater than 90 beats per minute
- Pulse #1 is greater than 100 beats per minute

Workers cannot return to work until:

- Oral or ear temperature is below 99.5 °F
- Pulse rate is below 90 beats per minute
- Recovery heart rate for workers with heart rates over 90 beats per minute is less than 10 beats per minute less than the original heart rate.

Adhering to the guidelines for heat stress prevention and monitoring will greatly minimize the possibility of the occurrence of heat stress. Site personnel will also be aware of the symptoms of heat-related disorders and be prepared to administer the appropriate treatments.

Prevention

The following are recommended guidelines to prevent heat stress:

- Provide plenty of fluids. An electrolyte replacement drink or water will be available. For workers performing work inside the exclusion zone, fluid intake may occur in the contamination reduction zone. Workers will first perform a partial decontamination process that will include removal of gloves and washing of hands and face prior to consumption of fluids. The site safety officer will monitor the partial decontamination and fluid consumption process to ensure that ingestion of site contaminants does not occur.

- Work in pairs whenever conducting Level B activity or a permitted activity.

- Provide cooling devices. Ice vests or on-site showers can be provided to reduce body temperature and/or cool protective clothing.

- The amount and type of undergarments worn will be left to the preference of each individual unless prone to heat stress, especially heat rash. In this case, the worker should wear "long john" cotton type underwear to keep skin off chemical resistant clothing.

- Adjustment of the work schedule. When practicable, the most labor-intensive tasks should be carried out during the coolest part of the day.

- Shaded or cooled rest areas. Shaded or cooled rest areas will be provided when site environmental and/or workers physiological responses warrant.

Recognition and Treatment

Any personnel who observes any of the following forms of heat stress either in themselves or in another worker, will report this information to his or her immediate supervisor or the site safety officer:

- Heat Rash (or prickly heat)

  Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.

  Symptoms: Eruption of red pimples around sweat ducts accompanies by intense itching and tingling.

  Treatment: Remove sources of irritation and cool the skin with water or wet cloths.

- Heat Cramps or Heat Prostration

  Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

  Symptoms: Sudden development of pain and/or muscle spasms in the abdominal region.

  Treatment: Remove the worker to the contamination reduction zone. Remove protective clothing. Decrease body temperature and allow a period of rest in a cool location.

- Heat Exhaustion – **SERIOUS**

  Cause: Overexertion in a hot environment and profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

  Symptoms: Muscular weakness, staggering gait, nausea, dizziness and shallow breathing.

  Treatment: Perform the following while making arrangements for transport to a medical facility. Remove the worker to the contamination reduction zone. Remove protective

clothing. Lie the worker down in a cool place and raise the head and shoulder slightly. **Cool without chilling.** Apply ice bags or cold wet cloth to the head. Sponge bare skin with cool water or rubbing alcohol. If possible, place the worker in a tub of cool water. Do not give stimulants. Transport to a medical facility.

- Heat Stroke –**EXTREMELY SERIOUS**

Cause: Same as heat exhaustion

Symptoms: **No perspiration**, dry mouth, pain in the head, dizziness, nausea.

Treatment: Perform the following while making arrangements for transport to a medical facility. Remove the worker to the contamination reduction zone. Remove protective clothing. Lie the worker down in a cool place and raise the head and shoulder slightly. **Cool without chilling.** Apply ice bags or cold wet cloth to the head. Sponge bare skin with cool water or rubbing alcohol. If possible, place the worker in a tub of cool water. Do not give stimulants. Transport to a medical facility.

5.3 BIOLOGICAL HAZARDS

Certain activities to be conducted on site may cause exposure to biological hazards including, but not limited to:

- Buried medical syringes containing bioinfectious materials (low biohazard risk);
- Buried medical hypodermic needles containing bioinfectious materials (low biohazard risk).
- Insects (ants, bees, and mosquitoes) and snakes in outdoor work environments.

The protective clothing selected for each task should provide protection against potential biological hazards. Personnel should use caution and be alert for potential biological hazards while conducting site activities. If warranted, the pant bottoms and sleeve cuffs may be closed with tape to mitigate the risk of insects contacting skin.

Cal/OSHA's Bloodborne Pathogen Regulation as found in CCR, Title 8, Section 5192, Bloodborne Pathogens, shall apply to handling of medical wastes, if any, detected at this project site. The medical waste has been buried for a long period of time (many years); therefore, it is the opinion of the CIH that only a low biohazard risk. Facts are as follows:

- **Human Immunodeficiency Virus (HIV):**
  HIV causes AIDS, is fragile and does not live outside the body (unless frozen, then it may live for years);
- **Hepatitis A Virus (HAV):**
  HAV can live outside the body for months, depending on the environmental conditions.
- **Hepatitis B Virus (HBV):**
  HBV can survive outside the body at least 7 days and still be capable of transmitting infection.
- **Hepatitis C Virus (HBC):**
  Recent studies have shown that HCV can survive outside the body and still transmit infection for 16 hours, but not longer than 4 days.

However, the CIH recommends the use of Universal Precautions if medical wastes are discovered during the course of this environmental site assessment. ***Universal Precautions*** is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

Site personnel shall utilize proper PPE to prevent skin or eye contact with medical wastes. Caution shall be used if sharps are discovered; prevent needle sticks by being observant of surroundings and while collecting soil samples. Do not eat or drink while boring, collecting soil samples or installing groundwater monitoring wells. Use good hygiene practices to prevent exposure to medical wastes. Wash hands prior to eating or drinking. Remove contaminated PPE and/or work clothes if contact with medical wastes occur.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Level C PPE is anticipated for the majority of work described herein. Upgrading to Level B PPE may be appropriate based on real-time air monitoring results.

6.1 PPE LEVELS

The level of protection required for Allwest Geoscience personnel and subcontractors during the work will be determined by the Certified Industrial Hygienist (CIH) for each task based on the best available data, applicable Cal/OSHA Permissible Exposure Limits (PELs), and the provisions of this HASP. The level of PPE selected for each task will be based on the following:

- The type, concentration and toxicity of the chemical substance in the work environment, particularly in the ambient atmosphere
- The potential for worker exposure to substances in air, splashes of liquids, or other direct contact with material during work activities
- The potential for worker exposure to physical hazards associated with specific tasks

Appropriate PPE selection will be based on direct-read instruments (e.g., PID and dust monitor readings) (Table 1 provides exposure limits and response actions based on direct-read instrumentation). Real-time monitoring for chemical specific concentrations will be performed using either colorimetric tubes and/or direct-read, chemical specific instruments to provide information on chemical-specific values in the worker breathing zone. This information will be used as a tool to determine whether PPE downgrading is appropriate.

Below is a summary of the three primary levels encountered on hazardous waste projects and required PPE for the various parts of the body. (A fourth level, Level A, requires a comprehensive study of the site by the CIH before work is performed.) All equipment shall be inspected before each use and replaced if the integrity or suitability is questionable or if an obvious defect exists.

6.1.1 Level D

The atmosphere contains no known hazard. Concentrations of airborne organic compounds do not exceed background levels upwind of the work zone. Work functions preclude splashes, immersion in, unexpected inhalation of, or direct contact with hazardous concentrations of harmful chemicals.

PPE includes -- Coveralls or standard work uniforms, as needed

Steel-toed safety boots

Leather Gloves

Safety glasses with side shields

Hard hat

Hearing protection (will carry and use as needed)

High-visibility safety vests

6.1.2 Level C

Concentrations of known airborne organics in the breathing zone are present. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator (APR) and chemically protective clothing are available that can protect against the contaminants. The substance has adequate warning properties, and the criteria for using an APR have been met. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin.

PPE includes -- Level D requirements, plus

Tyvek® or Saranex®

Chemical-resistant outer boots or disposable boot covers

Disposable, surgical inner gloves

Disposable, chemical-resistant outer gloves

Respiratory protective equipment to be determined by CIH and CHP, based on observed site conditions and air monitoring results:

Full Face-piece Powered Air Purifying Respirator (PAPR) equipped with Organic Vapor (OV)/HEPA cartridges (*NIOSH *APF = 50), or

Full Face-piece Air Purifying Respirator (APR) equipped with Organic Vapor (OV)/HEPA cartridges, (NIOSH APF = 50), or

Half Face-piece Air Purifying Respirator (APR) equipped with Organic Vapor (OV)/HEPA cartridges and tight fitting chemical goggles (NIOSH APF = 10).

***NIOSH** = National Institute for Occupational Safety and Health NIOSH is responsible for testing and certification of respirators, and assignment of APFs for respirators.

***APF** = Assigned Protection Factor
The assigned protection factor (APF) of a respirator reflects the level of protection that a properly functioning respirator would be expected to provide to a population of properly fitted and trained users. For example, an APF of 10 for a respirator means that a user could expect to inhale no more than one tenth of the airborne contaminant present.

6.1.3 Level B

The types and atmospheric concentrations of substances have been identified require a high level of respiratory protection, but less skin protection than Level A. This involves atmospheres with concentrations of specific substances that do not represent a severe skin hazard or that do not meet the criteria for APRs.

PPE includes Level C requirements, plus

Respiratory protective equipment to be determined by CIH and CHP, based on observed site conditions and air monitoring data:

Full Face-piece Supplied Air Respirator (SAR) operating in the pressure demand mode, air supplied by clean compressed air and system equipped with a 5-minute egress bottle (NIOSH APF = 2,000), or

Self-contained breathing apparatus (SCBA) operating in the pressure demand mode (NIOSH APF = 10,000).

6.2 PPE PROTECTION

The following subsections outline general list of Allwest Geoscience's PPE requirements for the various parts of the body.

6.2.1 Head Protection

The following is a *general* list of Allwest Geoscience's PPE requirements relating to head protection:

- Approved hard hats, in good condition are required while working:

- In any environmental site assessment area
- In any posted shop area
- Anytime work is being performed overhead
- When directed by the HASP or JHA
- When instructed by the PM or SHSO

Hard hats may not be altered or changed.

Do not alter the suspension or punch holes in the hard hat

Whenever hard hats are worn, the bill will face forward, except when being used with an attachment, such as welding hoods or while surveying.

- Protective headgear worn near electrical lines and equipment shall be Class B
- Hard hats will comply with American National Standards Institute (ANSI) guidelines

6.2.2 Eye and Face Protection

Safety glasses are required at all times while on the project site, as a minimum level of eye protection. Additional *general* requirements are given below:

- *Safety Glasses* with rigid side shields will meet ANSI.
- Safety *Sun Glasses* with side shields will meet ANSI. They may be worn only in adequate light. Prescription wearers are permitted to wear "drop-in" type sunglasses.

6.2.3 Hearing Protection

The following is a *general* list of Allwest Geoscience's PPE requirements relating to hearing protection:

- Hearing protection is required in all posted areas.
- A good rule of thumb is that hearing protection should be used anytime you must raise your voice above a normal level to be heard by someone standing 3-feet away.
- Continuous high noise may require that a qualified person monitor the sound levels.
- Even short exposures to very loud noises can cause damage to your hearing.
- Hazardous noise areas need to be identified with signs. The signs need to warn employees of the noise hazard and specify hearing protection requirements.
- Whenever sound-pressure levels equal or exceed 85 dBA, a continuing, effective hearing conservation program shall be administered in accordance with OSHA standards.

6.2.4 Respiratory Protection

The following is a *general* list of the Allwest Geoscience's PPE requirements relating to respiratory protection:

- The Certified Industrial Hygienist (CIH) and Certified Health Physicist (CHP) will identify the need for respirators based on the contaminants of concern, the concentrations of airborne contaminants, and regulatory requirements.

- Only those persons who have a respirator card issued within the last year showing a Doctor's approval, proper training and a Fit-Test for the respirator being issued are allowed to wear a respirator.

During active soil disturbance, Allwest Geoscience will monitor dust and VOC levels to determine the appropriate PPE for each task. The exposure limits and response actions are listed on **Table 1, Exposure Limits and Response Action.**

All respiratory equipment will be checked before each use to ensure it has been adequately cleaned and is in good working order. Any damaged, defective, or suspect PPE should be reported to the SHSO immediately.

6.2.5 Clothing

The following is a *general* list of Allwest Geoscience's PPE requirements relating to environmental site assessment site clothing:

- Do not wear clothing, which could get caught in machinery or otherwise cause an accident (such as dragging pant cuffs, torn or loose long sleeves, or torn clothing).

- At a minimum, employees will wear long pants and shirts that cover the shoulders. (Long sleeved shirts are preferred.)

- A high-visibility safety vest shall be worn at all times.

6.2.6 Skin Precautions

The following is a *general* list of Allwest Geoscience's requirements relating to skin precautions:

- Protect your skin from sun, welding, and hot pipe burns by wearing protective clothing, protective equipment, and gloves.

- Shirts will be worn at all times and will cover your shoulders (a short sleeve T-shirt is the minimum allowed). Long pants are also required.

- Individuals should provide their own sun blocking products when exposure to strong sunlight is necessary.

- Avoid contact with poisonous plants. If contact is made with the skin, wash the area with soap and cool water.

- Avoid wearing aftershave or scented lotions or perfumes since they may attract stinging or biting insects.

6.2.7 Back Protection

Use the following *general* lifting techniques:

- Be sure of a good grip and good footing.
- Keep the load close to your body.
- Keep your back straight when lifting.
- Bend your knees and use your leg muscles, not your back muscles.
- Do not twist your body while lifting.
- Never try to lift more than you can safely handle. Consider the size, shape, and weight of what you are lifting.

6.2.8 Hand Protection

Suitable gloves shall be worn for most environmental site assessment work, below are *general* requirements:

- Leather palmed gloves shall be worn when handling materials with sharp edges or which could produce splinters.
- Leather gloves shall be worn for handling rigging.
- Neoprene gloves shall be worn when working with oils, acids or caustics.
- PVC-coated gloves shall be worn when working with petroleum products.
- Do not use gloves that could be caught when operating rotating equipment.
- Remove rings and other jewelry while using hand and power tools or doing electrical work.

6.2.9 Leg and Ankle Protection

The following is a *general* list of Allwest Geoscience's PPE requirements relating to leg and ankle protection:

- Pants must not drag.
- Snake chaps or snake leggings are to be worn whenever there is a danger of snakebites.
- Wear kneepads for prolonged work on your knees.

6.2.10 Foot Protection

The following is a *general* list of Allwest Geoscience's PPE requirements relating to foot protection:

- Approved safety boots or shoes with safety toe protection shall be worn at all times.
- In construction areas, footwear will be of a sturdy leather type; will cover the ankles and have heavy soles.
- No tennis shoes or open toe shoes will be allowed.
- Foot Guards are to be worn when jackhammering, tamping, or similar activities with high potential for foot injury.
- Specially selected chemical protective boots with safety toe protection will be used on jobs subject to chemically hazardous conditions where the potential for foot injury exists.
- Protective footwear will comply with ANSI.

7.0 ACCIDENT PREVENTION PLAN

This section details general hazards expected on all environmental site assessment projects, the controls necessary to minimize these hazards to the extent possible, and investigation and reporting procedures if an accident does occur.

7.1 ACCIDENT INVESTIGATION POLICY

The following is a list of accidents that must be reported to the PM and SHSO immediately:

- Accidents likely to result in permanent disability or death
- Accidents requiring hospitalization
- Accidents which have or are likely to receive coverage by news media
- Accidents involving equipment or vehicles
- Accidents or "near-miss" type accidents resulting from violations of health and safety rules, whether by employees, management or subcontractor employees
- Accidents involving the equipment and/or employees of subcontractors or material suppliers at the site
- Accidents to third party property or personnel
- Fire, windstorm, earthquakes, floods, or other "Acts of God", criminal acts, any accidents, which involve a potential insurance claim or loss

7.1.1 Notification and Reporting Procedures

In the event of an onsite accident or incident, the PM and SHSO will be notified immediately. The PM and SHSO will be responsible for initiating first aid and contacting emergency medical services, if necessary. The PM and SHSO will also initiate any site response or contingency plans, if necessary.

Initial notification of an accident or incident may be verbal, in person, by hand signals, or by an alarm device such as an air horn. In high-hazard areas where radio or other communications are hampered or impractical, air horns and the buddy system will be used. Specific onsite procedures will be given at the initial site orientation meeting.

The procedure for reporting the above referenced accidents shall be as follows:

- The highest ranking management representative of Allwest Geoscience's closest to the accident shall initiate a brief preliminary telephone report to one of Allwest Geoscience's company officers as soon as possible after the needs of the injured, health and safety of the public, etc. have been met.
- As soon as the extent and effect of the accident can be reasonably estimated and determined, a written report shall be submitted to Allwest Geoscience's corporate office.

7.1.2 Accident Investigation Procedures

The following accident investigation procedure shall be employed as applicable:

- As soon as practicable, the highest ranking representative from Allwest Geoscience, at the scene of the accident shall take a statement from all possible witnesses to the accident noting their names, addresses, employers, titles or crafts, and a brief summary of their statements concerning the accident. A copy of Allwest Geoscience's Accident/Incident Report is included in Appendix A, Health and Safety Forms. This report needs to be submitted to Allwest Geoscience's Corporate Office within 24 hours of the accident or incident. .

- A detailed inspection concerning the probable cause of the accident should be made in a written report of the cause and effect of the accident. This written report should be made as soon as possible after the accident. If a subcontractor or material supplier is involved in the accident, a determination should be made concerning the subcontractor's employer, the extent of the employer's liability, any third party liability for the accident, and a review of possible insurance coverage summarized. A drawing or diagram of the location of the accident with directions should accompany the written report.

- The PM and SHSO will be responsible for conducting an investigation of all onsite accidents involving personal injury, illness, death, property damage, or incidents regarded as "near-misses". The investigation will consist of conducting interviews with witnesses and/or persons involved in the accident; inspecting the accident site and equipment involved in the accident; reviewing the operating procedures, existing site or weather conditions, and qualifications, training, or experience of the work area involved; and examination of generally accepted safety procedures and regulations.

- The objective of the investigation is to clarify the actual events of the accident, to establish the probable cause or causes, and to determine appropriate preventative or protective measures. The PM and SHSO will prepare a written report of the findings, including recommendations for preventing future incidents. The report will be discussed in detail with the PM and SHSO and any subcontractors. The conclusions reached regarding the accident and preventative measures will be included in the next daily tailgate safety meeting.

7.2 GENERAL ACCIDENT PREVENTION PROCEDURES

The following procedures are mandatory for all Allwest Geoscience and subcontractor personnel. All site visitors entering the EZ or CRZ will follow these procedures.

- Never work alone in an isolated area.

- Allowing only individuals current in OSHA 40-hour HAZWOPER training access to the EZ or CRZ.

- Locating emergency equipment in readily accessible, uncontaminated locations.

- Being observant of the immediate surroundings and the surroundings of others. It is a team effort to notice and warn of impending dangers.

- Maintaining at least one copy of this HASP at the job site and requiring all site workers and visitors to be familiar with the content, either through a thorough briefing by the Certified Industrial Hygienist (CIH), prior to entering the EZ.

- Providing at least one person per shift currently trained in basic First Aid and CPR procedures on the job site during project operations.

- Restricting food, beverages, or tobacco products from contaminated areas or potentially contaminated areas. Taking medication, smoking or applying cosmetics are also prohibited. These activities are allowed only in the Support Zone (SZ). Additionally, jewelry, clothing and long hair which may become entangled or entrapped in machinery will either be removed (jewelry) or restrained (loose clothing and long hair) prior to starting work activities.

- Mounting fire extinguishers on vehicles such as trucks and heavy equipment. Where there is a potential for fire, fire extinguishers appropriate to the potential fire conditions will be located in the SZ or another location within an uncontaminated area in the EZ.

- Adequate illumination (no quartz lights allowed in plant) will be provided in all work areas, buildings, and storage facilities.

- Electrical equipment wiring, cables, switches, and current and overload protection will meet applicable regulations and be maintained in a manner which provides protection for employees from shock hazards and injury and prevents property damage. Ground-fault protection will be provided wherever electrical equipment is used.

7.2.1 Buddy System

All work activities will be conducted using the buddy system to:

- Provide assistance

- Verify the integrity of the PPE

- Observe their partner for signs of heat stress, cold stress, or chemical exposure

- Notify the PM and SHSO, if emergency assistance is needed

8.0 SITE CONTROL MEASURES

The activities required during environmental site assessment activities may contribute to the unwanted movement of contaminants from the site to uncontaminated areas. Response personnel and equipment may become contaminated and transfer the material into clean areas. Material may become airborne due to its volatility, or the disturbance of contaminated soil may cause it to become windblown. To minimize the transfer of hazardous substances from the site, contamination control procedures are needed. Two general methods are used: establishing site work zones and removing contaminants from people and equipment.

8.1 CONTROL AT THE SITE

To reduce the possibility of contact with any contaminant present and removal of contaminants, personnel, or equipment leaving the site will be controlled.

The possibility of exposure or translocation of substances can be reduced or eliminated by:

- Minimizing the number of personnel and equipment onsite
- Establishing work zones within the site
- Establishing control points to regulate access to work zones
- Conducting operations in a manner that reduces the exposure of personnel and equipment and to eliminate the potential for airborne dispersion
- Implementing appropriate decontamination procedures
- Insuring PPE requirements are followed.

8.2 WORK ZONES

One method of preventing or reducing the migration of contaminants is to delineate zones on the site in which prescribed operations occur. Three contiguous zones are recommended:

- Exclusion Zone
- Contamination Reduction Zone
- Support Zone

These site zones will be maintained during off hours and weekends, when necessary. The zones will remain intact until all equipment and supplies have been decontaminated and removed. The SHSO will ensure that the zones are intact when leaving the area, and he will be responsible for breaking down the zones when the site activities are complete. These zones are subject to change, based on the actual construction activities. The SHSO will monitor the zones to ensure they remain effective.

8.2.1 Exclusion Zone

All people entering the EZ will wear appropriate PPE as required by CIH and this HASP; a minimum level of protection for this site is Level C. An entry and exit point for personnel and equipment will be established at the periphery of the EZ by the SHSO to regulate the flow of personnel and equipment. Only people and equipment necessary to perform assigned site activities will be allowed in the EZ. Factors that will be considered in extending the boundary will be the physical area necessary to conduct operations, and the potential for contaminants leaving the area.

8.2.2 Contamination Reduction Zone

Between the EZ and the SZ is the CRZ, which provides a transition between the potentially contaminated EZ and the clean SZ. The CRZ will serve as a buffer to further reduce the probability of the SZ becoming contaminated. It will provide additional assurance that the physical transfer of contaminating substances on people, equipment, or in the air will be limited through a combination of decontamination and zone restrictions. Exit from the EZ will be through the CRZ and all personnel and equipment decontamination will occur in this zone. Personnel and supplies associated with performing decontamination activities will be found in this zone.

The CRZ will be defined as the area 20 feet outside the EZ or as established by the SHSO. The decontamination facilities will be placed in this zone and moved to keep pace with the location of the actual work.

8.2.3 Support Zone

The SZ will be considered a non-contaminated area. The location of the support facilities will be upwind of the EZ (where possible) and readily accessible to the nearest road. Support facilities, equipment vehicles, first aid station, fire extinguisher, cellular telephone, hand-wash facilities, food, potable water, a personnel entry and exit log for the EZ will be located in this zone. Potentially contaminated personal, clothing, equipment, or samples are not permitted in this zone unless the contamination has been containerized. Visitors who have not received appropriate training will be restricted to this zone.

9.0 DECONTAMINATION PROCEDURES

To prevent harmful materials from being transferred into clean areas or from exposing unprotected workers, all field personnel exiting an area of potential contamination will undergo decontamination. All equipment used in the EZ shall be decontaminated in the CRZ prior to entering the SZ. All personnel exiting the EZ shall undergo decontamination through the CRZ prior to entering the SZ. These areas will be monitored by the SHSO.

9.1 EQUIPMENT DECONTAMINATION

Equipment used in the EZ, CRZ, or otherwise coming in contact with known or suspected toxic or hazardous materials will be decontaminated in the designed decontamination area. Decontamination is required prior to leaving the site or when equipment is being transferred within activities.

If the tools or equipment cannot be satisfactorily decontaminated at the completion of the project, then they will be disposed of appropriately according to their waste classification. At the completion of the project, the decontamination area will be decontaminated and cleaned. All decon water will be placed in appropriate containers pending chemical analyses for proper evaluation of disposition.

9.2 SMALL EQUIPMENT AND PERSONNEL DECONTAMINATION

A decontamination station will be set up when non-disposable sampling equipment or PPE is used. Equipment and PPE will be decontaminated immediately after use. Decontamination activities will consist of seven stations:

- *Station 1* – Equipment drop – Deposit equipment used in the EZ on plastic drop cloths.
- *Station 2* – Boots and gloves wash and rinse – While standing in a washtub, scrub outer boots and outer gloves with water and rinse.
- *Station 3* – Outer glove removal – Remove outer gloves and place in container with plastic liner.
- *Station 4* – Respirator cartridge or filter removal or replacement – If worker leaves the EZ for the sole purpose of changing out respirator cartridges or filters, this is the last step in the decontamination procedure. Once cartridges or filters have been replaced, outer gloves are donned, joints taped and worker returns to the EZ.
- *Station 5* – Outer boots, tyvek coveralls, and glove removal – Remove outer boots, Tyvek® coveralls and inner gloves and place in container with plastic liner.
- *Station 6* – Respiratory removal – Remove respirator face piece.
- *Station 7* – Field wash – Wash hands and face thoroughly.

10.0 AIR/HAZARD MONITORING AND MITIGATION MEASURES

10.1 AIR MONITORING

Air monitoring will be implemented during site activities that are anticipated to disturb impacted soils (soil boring, soil sampling, installation of groundwater monitoring wells) due to potential chemicals of concern (COCs) that are present in the subsurface soils. Principal COCs include Volatile Organic Compounds (VOCs) and Radionuclides. Since COCs have varying hazard/warning properties, and varying Cal/OSHA Permissible Exposure Limits (PELs), a more conservative approach shall be applied to initial personal protection equipment.

Appropriate PPE selection will be based on direct-read instruments (e.g., PID and dust monitor readings) (Table 1 provides exposure limits and response actions based on direct-read instrumentation). Real-time monitoring for chemical specific concentrations will be performed using either colorimetric tubes and/or direct-read, chemical specific instruments to provide information on chemical-specific values in the worker breathing zone. This information will be used as a tool to determine whether PPE downgrading is appropriate.

Because of the type and concentration levels of COCs that may be present in the worker breathing zone, Level B PPE will be utilized initially. Allwest Geoscience will utilize a combination of direct-read instruments (e.g., photoionization detectors [PIDs] and chemical-specific colorimetric tubes) for organic compounds, and dust monitors for airborne particulate as primary mechanism for air quality monitoring. Accordingly, conservative PPE will be utilized unless air monitoring indicates that ALL potential airborne COCs are below the Action Levels (ALs) indicated in this HASP. Only the Certified Industrial Hygienist (CIH) or Site Health and Safety Officer (SHSO) working under the direct supervision of the CIH shall have authority to recommend PPE downgrading.

The location of air monitoring equipment will be based on the highest potential for elevated COCs in the worker breathing zone. The actual location(s) will be determined by the SHSO.

Readings from air monitoring equipment will be logged in the Field Log Book when monitoring for potential VOCs or dust associated with site activities.

Air quality surveys will be employed during the removal action and investigation activities to evaluate airborne concentrations of contaminants in reference to their Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs). Air quality monitoring requirements are described below.

10.2 DUST MONITORING

Airborne dust levels will be measured at 15-minute intervals for the first hour. If monitoring measurements consistently display levels below action levels, the monitoring frequency may be decreased to every hour. Dust levels will be measured utilizing a MiniRAM PDM-3 real-time dust meter or equivalent. The MiniRAM will be zeroed at the beginning of each workday. A record of the time, location, and MiniRAM readings will be kept as part of the Site documentation.

Total dust levels shall be mitigated during investigation activities, as necessary, using a combination of engineering controls (i.e., dust suppression with water mist), safe work practices,

and PPE.

Personnel will be required to wear half- or full-face air purifying respirators with high efficiency particulate air (HEPA) filter cartridges when dust levels exceed 5 mg/m^3 (action level) for 5 minutes or more, or when visible dust conditions persist due to unusually windy conditions. The action level of 5 mg/m^3 is established conservatively based upon one-half the PEL for total dust of 10 mg/m^3. If dust/particulate monitoring indicates levels above 5.0 mg/m^3 (action level for dust), dust control measures will be implemented until levels can be sustained below the action level. If dust levels remain above the action level with the aid of dust control measures, work will cease until levels can be sustained below the action level. (Refer to **Table 1 for exposure limits and response actions**.)

10.3 VAPOR MONITORING

Levels of VOCs potentially accumulating in the vicinity worker breathing zone will be monitored using a MiniRAE 2000 (a photoionization detector [PID] instrument) with an 11.7 electron-volt (eV) lamp. The PID will be calibrated in accordance with the manufacturer's specifications at the beginning of each workday, at a minimum. A record of the specific instrument used, as well as the time, location, and meter readings, will be kept as part of the Site documentation.

If organic vapor levels in the breathing zone exceed 2.5 parts per million (ppm) for one minute or more, personnel will be required to wear half-face air purifying respirators with organic vapor/HEPA cartridges. The action level of 2.5 ppm is established conservatively based on the "short term exposure limit" (STEL) for benzene of 5 ppm for 15 minutes. If organic vapor levels exceed 25 pm (e.g., ten times the action level of 2.5 ppm) for one minute or more, full-face respirators with organic vapor/HEPA cartridges will be required, as well as an increase in vapor control measures. If organic vapor levels exceed 100 ppm for one minute or more, work will be temporarily suspended until appropriate vapor control measures can be implemented to reduce VOCs to an acceptable level. These action levels are short-term action levels and are set conservatively to address worst-case individual and additive chemical constituents, as well as the relative response of the instruments to the various chemicals.

10.4 MITIGATION MEASURES

Mitigation measures for odors, vapors, and dust will include the use of appropriate engineering controls including (but not limited to):

1. The application of water
2. The application of non-toxic, biodegradable foam
3. The application of odor suppressants such as Ecosorb™ or SimpleGreen™
4. The application of an acrylic polymer

Engineering controls will be available and used as necessary during all earthmoving activities when a potential for odor, vapor, or dust generation is present. If action levels for vapor or dust are exceeded during earthmoving activities, work stoppage shall occur until additional mitigative measures are evaluated and implemented. (Refer to Table 1 – Exposure Limits and Response Actions.)

11.0 EMERGENCY RESPONSE PLAN

The following subsections document a set of procedures to be followed in the event that a fire, significant release of compounds, or other emergency occurs on the project. Allwest Geoscience will supply and maintain an industrial size first aid kit at the site to accommodate all field personnel.

Directions and a map to the Hospital are provided in this HASP. A list of phone numbers for emergency personnel is also included in this HASP.

11.1 EMERGENCY PROCEDURES

Careful consideration will be given to the relative possibility of fire, explosion or release of vapors, dusts, or gases that may impinge on the surrounding community. Control measures will be employed as necessary to preclude any possibility of offsite migration of contaminants. Because of the hazards onsite the possibility for an emergency exists. During project site work, a telephone will be identified in a location known to all personnel, which allows them to contact the appropriate emergency services.

11.1.1 Evacuation Routes and Procedures

In the event of an emergency that necessitates an evacuation of the site, personnel will be expected to proceed to the designated assembly point using the established evacuation route. In the event of an environmental release, the evacuation route will be upwind or crosswind to the source. Personnel will remain at the assembly point until an authorized individual provides further instructions.

11.1.2 Medical Emergency Procedures

Personnel who become ill or injured in the EZ will be decontaminated to the extent possible. If the injury or illness is minor, full decontamination should be competed and first aid administered prior to transport. If condition is serious, gross contamination should be removed, the victim wrapped with a blanket and "tagged" as contaminated. First aid should be administered while awaiting emergency responders. Any person being transported to a clinic or hospital for treatment should take information or a MSDS regarding the possible contamination exposure with them. Any vehicle used to transport contaminated personnel will be decontaminated as necessary.

11.1.3 Fire Emergencies

In the event of a fire, site personnel may use firefighting equipment available onsite to control or extinguish the fire if it is safe to do so. Personnel should not try to control or extinguish fires beyond the incipient stage. In the event of a fire at the site, personnel should do the following:

- Ensure all equipment is shut down
- Secure area until emergency assistance arrives
- Rally at assembly point and take a head count
- Meet emergency responders and advise

12.0 HEALTH AND SAFETY MEETINGS AND INSPECTIONS

Health and safety meetings and inspections are vital to ensure the information collected from the client and previous site investigations is relayed to the site personnel in the field. This information is necessary to ensure that everyone working on the project understands the associated hazards and controls, and that work is being done safely and according to all applicable regulations and requirements.

12.1 HEALTH AND SAFETY MEETINGS

12.1.1 Site Orientation Meeting

Once all project employees have been identified, the SHSO will conduct a meeting at the project site. This meeting is to define the project, including:

- Type of work
- Types of hazards expected
- Actual work zone locations
- Emergency response actions, locations of phones, extinguishers, first aid kits, etc.
- Review of site specific safety and health plan and job hazard analysis
- Coordinate with the other onsite safety and health departments
- Attend any onsite site-specific training

All new site personnel shall be given a general safety and health orientation prior to starting work and will be given specific instructions as needed by the SHSO.

12.1.2 Daily Toolbox Meetings

A five-minute informal meeting shall be given at the project site each morning. The SHSO shall conduct this meeting. A copy of the Safety Meeting Form is included as **Appendix A, Health and Safety Forms**. Subjects may include:

- Daily work activities and proper PPE needed
- Unsafe or changed site conditions
- Employee tasks and how to perform them safely
- Comments and suggestions from site personnel
- Chemical and physical hazards associated with each day's activities
- Emergency response procedures, including first aid, evacuation routes, and emergency phone numbers

- Slip, trip, fall, and pinch hazards associated with onsite equipment

12.2 HEALTH AND SAFETY INSPECTIONS

The Project Manager & Site Health and Safety Officer will conduct periodic scheduled and unscheduled inspections or audits of site conditions, equipment, and activities to determine whether the HASP is adequate and is being followed.

12.2.1 Inspections

Each employee is expected to inspect his/her equipment, tools, and work area before, during, and after each shift. If a problem or situation exists, he/she is to notify the PM and SHSO.

In order to make safety inspections effective, the following guidelines should be observed:

- Develop a checklist for each site, listing the items that should be inspected.
- Review the results of these inspections with supervisors and workers.
- Re-inspect any identified problems to assure that they have been corrected.
- Document all inspections and subsequent follow-up actions. Retain these records until site activities are completed and as long as required by regulatory agencies.

At a minimum of once a week, the SHSO shall conduct an inspection to assure that operations are being performed in accordance with this HASP. Inspections may include:

- Housekeeping and sanitation
- Safety warning signs, labels and barricades
- Security
- Potential fire hazards and fire extinguishers
- First aid equipment
- Spill containment and control supplies
- Employees wearing the proper PPE
- General site conditions

If violations are found, the SHSO has the authority to stop work and correct the problem. The SHSO should also notify the PM of his findings and corrective measures.

12.2.2 Follow-Up Procedures

In most incidences, the SHSO will verbally inform site personnel of the health or safety violation. Minor violations shall be corrected at this time. If the violation warrants a stop in work, the SHSO will do so. He and the employee or employees, will work together to correct the situation. This work stoppage will need to be documented on the Project Safety Inspection Log prepared by the SHSO.

If an employee, given the proper equipment, tools, and training fails to perform safely, disciplinary actions will be taken, up to the point of termination. Written documentation of the violation will be placed into the employee's file, with a copy submitted to the PM. After the second written notice, the employee could be suspended without pay or terminated. A major or willful violation could result in immediate termination.

TABLE 1

EXPOSURE LIMITS AND RESPONSE ACTIONS – ORGANIC VAPORS (PERSONNEL BREATHING ZONE ONLY)

INSTRUMENT: PID/OVM (11.7 eV LAMP)

Reading above Background	Location	Duration of Reading	Action	PPE
Background	Breathing Zone	-----	Continue periodic monitoring of subsurface soil disturbing activities.	Level D
> Background but ≤2.5 ppm	Breathing Zone	≥1 Minute	Continue monitoring of subsurface soil disturbing activities. Implement dust control/VOC control such as water spraying.	Level D
>2.5 but ≤25 ppm	Breathing Zone	≥1 Minute	Provide half-face respiratory protection w/organic vapor/ HEPA filter cartridges. Perform continuous monitoring of subsurface soil disturbing activities. Continue dust control/VOC control such as water spraying.	Level C
>25 but ≤100 ppm	Breathing Zone	≥1 Minute	Provide full-face respiratory protection w/organic vapor/ HEPA filter cartridges. Perform continuous monitoring of subsurface soil disturbing activities. Continue dust control/VOC control such as water spraying or other appropriate methods.	Level C
>100 ppm	Breathing Zone	≥1 Minute	Evacuate the work area moving in an upwind direction. Contact the CIH.	CIH may recommend Level B

EXPOSURE LIMITS AND RESPONSE ACTIONS – TOTAL DUST

INSTRUMENT: MINIRAM DUST MONITOR OR VISUAL OBSERVATIONS

Reading above Background	Location	Duration of Reading	Action	PPE
Background	Point of Operations/ Release Source Point	-----	Continue periodic monitoring.	Level D
>Background or visible emissions	Breathing Zone	>1 Minute	Perform continuous monitoring of Operator and Laborer Breathing Zone. Initiate dust control measures.	Level D
>5 mg/m^3 but less than 10 mg/m^3	Breathing Zone	≥5 Minute	Provide half- or full-face respirator protection with HEPA filter cartridges. Increase dust control measures. If the action level of 5 mg/m^3 persists, discontinue operations and evacuate personnel until airborne dust can be controlled.	Level C
≥10 mg/m^3 or continuous visible emissions	Breathing Zone	Instantaneous	Evacuate the work area moving in an upwind direction. Contact the CIH.	CIH may recommen d Level B

EXPOSURE LIMITS AND RESPONSE ACTIONS – RADIATION

Instrument & Action Level	Location	Action	Comment
Dose rate meter 250 uR/hour	30cm from object or material	Stop work until dosimetry is obtained.	
LMI 43-93 alpha – 20cpm, net beta – 300cpm, net	contact with object or material	Set up a radioactive materials area (RMA) in the EZ. Smear for tritium.	Evaluate need for air sampling.
Air sampler - 25% DAC	Breathing Zone	Evacuate the work area moving in an upwind direction. Contact the CHP.	Air sampling only initiated by order of CHP.

TABLE 2
SITE EMERGENCY FORM

Minimum Level of Protection: Level D – Maximum Level of Protection: Level B

EMERGENCY PHONE NUMBERS **IN THE EVENT OF ANY EMERGENCY CONTACT PROJECT MANAGER (PM) and SITE HEALTH AND SAFETY OFFICER**

Ambulance	911
Fire	911
Police	911
Hospital Name/Address & Phone Number	**VA Greater Los Angeles Health** 11301 Wilshire Blvd. LA, CA (310) 478-3711 Or: **UCLA Medical Center** 10833 Le Conte Avenue LA, CA (310) 478-3711
Primary Contractor	Allwest Geoscience, Inc. (951) 284-7100
Project Manager (PM)	Jay Boughter, Atlas Environmental & Engineering, Inc. (714) 890-7129 (office) (949) 350-4682 (cell)
Site Health and Safety Officer (SHSO)	To be determined
Certified Industrial Hygienist (CIH)	Monica Oscarson, Premiere Environmental Consultants, Inc. (951) 440-0653 (cell) (951) 600-8075 (office)
Certified Health Physicist (CHP)	Joel I. Cehn, PIKA, International, Inc. 510-914-6262 (cell) 510-268-1571 (office)
CHEMTREC	800-424-9300
Poison Control	409-833-7409
US EPA National Response Center	800-424-8802

APPENDIX A – HEALTH AND SAFETY FORMS

ACCIDENT/INCIDENT REPORT

Person Completing Report _____ **Incident Date** _____

Incident Time: _____ Location _____ Project # _____

Person Involved in Incident _____ Telephone _____

Driver Name (if motor vehicle accident) _____ Telephone _____

Type of Incident:

- ☐ Personal Injury/Illness
- ☐ Chemical Exposure
- ☐ Equipment Damage
- ☐ Theft
- ☐ Property Damage
- ☐ Permit/Code Compliance
- ☐ Near Miss Event
- ☐ Unsafe Condition/Action
- ☐ Fire/Explosion
- ☐ Spill/Release
- ☐ Customer Incident
- ☐ Newspaper/Radio/TV
- ☐ Motor Vehicle Accident
- ☐ Other _____

Circle one, based on initial findings:

Preventable/Non-Preventable

Personal Injury ☐ Yes ☐ No (If no, go to next section)

- ☐ First Aid Only
- ☐ Hospitalization
- ☐ Medical Treatment
- ☐ Possible Injury, Not Confirmed

Person Injured:

Employee (If so, complete First Report of Injury)

- ☐ Subcontractor
- ☐ Client/Public/Other

Nature of Injury, Illness, or Exposure: _____

_____

_____

Describe nature of incident, how it occurred, who was involved, and witnesses and possible causal factors: (Attach additional sheets if necessary)

_____

_____

_____

☐ First Report of Injury Attached ☐ Police Report Attached

Describe immediate actions taken and persons notified: (Attach additional sheets if necessary)

_____

_____

_____

Action Taken to Prevent Recurrence (Attach additional sheets if necessary)

_____

_____

_____

Report Prepared by (signature): _____ Date: _____

Employee's Signature _____ Date: _____

HEALTH AND SAFETY MEETING FORM

JOB NAME: _____ ***JOB NUMBER*** _____ ***DATE*** _____

Specialized Topic

Items of discussion

-
-
-
-

Meeting Attended by:

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Supervisor's Signature:_____

APPENDIX B

SITE PERSONNEL
HAZWOPER TRAINING CERTIFICATES

Appendix C

Radiation Survey Procedure

Appendix C – Radiation Survey Procedure

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Appendix C – Radiation Survey Procedure

1.0 PURPOSE

The purpose of this plan is to describe the field procedures that will be used to conduct radiation surveys during field investigations at GLAVA in W. Los Angeles, CA. This radiological survey will develop data to:

(1) Ensure that worker protection plans are adequate, and
(2) Alert investigators to any unexpected site conditions.

2.0 CONTAMINANTS OF CONCERN

A variety of isotopes were disposed of in the landfill, at one time or another. The following list was obtained from Reference 1 and covers the years 1960 to closure (1968):

Nuclide	Quantity (mCi)
Tritium	1171
Carbon-14	53
Iodine-131	138
Chlorine-36	0.042
Mercury-203	0.7
Sodium-24	1.6
Chromium-51	1.5
Iodine-125	13
Phosphorus-32	10.4
Molybdenum-99	21.4
Zinc-65	0.05
Iron-59	1.3
Sodium-22	0.6
Sulfur-35	2.4
Strontium-85	0.05

The high-lighted nuclides have half-lives that are short relative to the age of the landfill. Thus, they would no longer be present. The remaining three are:

- Tritium,
- Carbon-14 and
- Chlorine-36.

These isotopes emit beta radiations only

3.0 SURVEY DESIGN

This section describes the overall approach to performing the field surveys for this project. Soil samples will be taken from the investigation areas using direct push methods. Coring tubes will be removed from the soil enclosed in cloth sleeves, minimizing the chance of surface contamination. Due to the soil being encased in metal tubes, radiation surveys will not be able to detect beta radioactivity inside the tubes. Beta surveys will nevertheless be performed to detect any contamination on the exterior of the tubes. Gamma radiation is able to penetrate the tube wall, so gamma surveys will be performed to confirm that no gamma-emitting nuclides are present (above natural background levels).

3.1 FIELD MEASUREMENTS OF BETA RADIATION

Beta radioactivity will be measured using a scintillation detector system (Ludlum Instruments Model 2360 ratemeter/scaler coupled to a Ludlum Instruments Model 43-93 or the equivalent). This radiation detection system measures beta energies in the range of about 30 to 3,000 kilo electron volts (keV). The instruments will be calibrated within one year of use. The technicians will source-check the instrument daily prior to use. This process excludes the betas emitted by tritium. Tritium betas will be measured by wipe testing.

3.2 WIPE TESTING

Un-sleeved coring tubes and drill bits will be wipe tested upon removal from the soil. A large area wipe will be taken using a Masslinn® (or similar) cloth. The cloth will be field counted using a LMI 43-93 probe (or similar). Action levels are given in Table 1. Coring tubes and drill bits that exceed the action level for this test will be wipe tested for tritium, using low-level (LSC) analysis. These tubes will then be wrapped in plastic sheet and placed in a radioactive materials area in the EZ. Additional analysis of the wipe samples may also be performed, if determined by the CHP.

TABLE 1. ACTION LEVELS

Instrument & Action Level	Location	Action	Comment
Dose rate meter 250 uR/hour	30cm from object or material	Stop work until dosimetry is obtained.	
LMI 43-93 alpha – 20cpm, net beta – 300cpm, net	contact with object or material or wipe	Set up a radioactive materials area (RMA) in the EZ. Smear for tritium.	Evaluate need for air sampling.
Air sampler 25% DAC	Breathing Zone	Evacuate the work area moving in an upwind direction. Contact the CHP.	Air sampling only initiated by order of CHP.

3.3 FIELD MEASUREMENTS OF GAMMA EXPOSURE RATE

Gamma exposure rate measurements will be used to determine whether specific materials exhibit radioactivity levels that are significantly above background. Gross gamma exposure rates will be measured using a gamma scintillation detector system (Ludlum Instruments Model 2350 ratemeter/scaler analyzer coupled to a Ludlum Instruments Model 44-10 or the equivalent). This radiation detection system measures energies in the range of about 100 to 3,000 kilo electron volts (keV). The instruments will be calibrated within one year of use. The technicians will source-check the instrument daily prior to use.

The field surveys will consist of gamma scanning of the soil, cores, drill cuttings, etc. Any individual reading that is greater than twice background will be investigated further. For example, elevated scans shall be supplemented with static, 1-minute readings. The stop work action level for gamma exposure rate is given in Table 1.

3.4 DETERMINATION OF BACKGROUND

Background count rates will be measured similarly in an unaffected area and subtracted from study area data. Action levels are net of natural background.

4.0 STANDARD OPERATING PROCEDURES

PIKA's standard operating procedures will be followed, as appropriate. These are included by reference:

PIKAP-001	Operation of Contamination Survey Meters
PIKAP-002	Alpha-Beta Sample Counting Instrumentation
PIKAP-003	Operation of Micro-R Survey Meters
PIKAP-004	Operation of Ionization Chambers
PIKAP-007	Air Sampling
PIKAP-008	Radiation and Contamination Surveys

5.0 ENVIRONMENTAL PROTECTION

Planned operations do not threaten off-site populations. Nevertheless, on-site measurements will be evaluated for the potential off-site impacts. The most likely pathway to off-site populations is via wind transport of particulates. Particulate samplers will be available to evaluate this pathway if site conditions warrant.

6.0 REFERENCES

Environmental Impact Report, Brentwood Recreation Center, Veterans Administration, 1981-83.

APPENDIX 4

INVESTIGATIVE DERIVED WASTE PLAN

INVESTIGATIVE DERIVED WASTE PLAN
FOR THE
INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION

VETERANS ADMINISTRATION
GREATER LOS ANGELES HEALTHCARE SYSTEM
11301 WILSHIRE BOULEVARD
LOS ANGELES, CA 90073

PROJECT NO. 02-3454EI-4

October 2, 2008

Prepared For:

Department of Veterans Affairs
Veterans Administration - Greater Los Angeles Healthcare System
11301 Wilshire Boulevard, Building 218, Room 308
Los Angeles, CA 90073

Prepared By:

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Project No. 02-3454EI-4
October 2, 2008

Veterans Administration Greater Los Angeles Healthcare System
11301 Wilshire Boulevard
Building 218, Room 308
Los Angeles, CA 90073

Attention: Mr. Ben Spivey
Chief, Occupational Safety and Health

Subject: **INVESTIGATIVE DERIVED WASTE PLAN (IDW) PLAN FOR THE INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION**

Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS)
11301 Wilshire Boulevard
Los Angeles, CA 90073

Dear Mr. Spivey:

Pursuant to the conditions of the contract, Allwest Geoscience, Inc., has prepared this *Investigative Derived Waste (IDW) Plan for the VOC and Radiological Subsurface Investigation* to conduct a subsurface investigation that would assist in evaluating potential human health risks associated with buried medical waste resulting from historic medical research and disposal practices at the Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS) campus.

Allwest Geoscience, Inc., has developed a workplan that has utilized the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) Data Quality Objectives (DQO), which are established to provide information necessary to conduct the overall investigation, evaluation and risk assessment.

We appreciate the opportunity to provide the requested environmental services. If you have any questions concerning this report, please contact the undersigned.

Sincerely,

ALLWEST GEOSCIENCE, INC.

JOHN R. GERY
Principal Geotechnical Engineer
California Registration No. RGE 336
Expires 12/31/09

REGISTERED PROFESSIONAL ENGINEER
JOHN R. GERY
No. 336
Expires 12-31-09
GEOTECHNICAL
STATE OF CALIFORNIA

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INVESTIGATIVE DERIVED WASTE (IDW) PLAN FOR THE INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION

1.0 INTRODUCTION

1.1 Purpose and Objectives

This *Investigative Derived Waste (IDW) Plan for the Initial VOC and Radiological Surface and Subsurface Investigation* was prepared for the initial VOC and radiological surface and subsurface investigation at the Veterans Administration (VA) Greater Los Angeles Healthcare System (GLAHS) property (Figures 1 and 2). This IDW Plan provides guidance for waste management necessary to identify disposal criteria for waste materials generated during the initial investigation activities.

The primary objective of this IDW Plan is to properly identify the types of waste that are anticipated to be generated during implementation of the initial VOC and radiological surface and subsurface investigation and present a strategy for compliantly managing the waste. This plan addresses the waste characterization strategy; requirements for waste storage, labeling, packaging and transportation, and treatment, if required; and designated facilities for ultimate disposal of the waste. This IDW Plan also identifies required records and reports and discusses strategies for minimizing waste during the initial

2.0 SITE BACKGROUND

The VA GLAHS property encompasses an area of approximately 450 acres (URS, 2000). Two (2) investigation areas include a practice baseball field and an area known as the "Arroyo" or "Eastern Canyon" (MECA, 2007). The Arroyo or Eastern Canyon has been previously identified as a burial area for former medical waste from animal experiments, including animal carcasses, medical isotope waste in radiological scintillation vials and other miscellaneous medical debris including syringes (MECA, 2007).

Two (2) sites have been selected for this investigation: the "Ball Field" which measures approximately 200 feet by 200 feet and the adjacent "Arroyo" or "Eastern Canyon" which measures approximately 125 feet wide by 1,000 feet long (Figure 3).

3.0 WASTE GENERATION

The following sections provide descriptions of the waste streams and associated disposal options for that waste expected to be generated as a result of the initial VOC and radiological subsurface investigation.

Waste streams will be characterized by U.S. Department of Energy orders and in accordance with "Hazardous Waste Determination" of "Standards Applicable to Generators of Hazardous Waste" (40 CFR 262.11). Hazardous waste determinations (HWDs) will be performed on the waste streams described in section 3.1.

3.1 Waste identification

The only waste expected to be encountered during the initial investigation is the result of past disposal practices of waste material discarded from medical experiments including VOCs and low-level radioactive material or low-level radioactive waste (LLW). Based on a review of site records, Allwest does not expect to encounter other waste types including but not limited to: industrial wastes; hazardous wastes; mixed low-level radioactive wastes (MLLW); high-level radioactive wastes (HLW) or transuranic (TRU) radioactive wastes.

4.0 GENERAL REQUIREMENTS

The LLW waste streams resulting from the proposed initial investigation will include, but will not necessarily be limited to: personal protective equipment (PPE), unused or unaltered soil sample material/soil cores, decontamination fluids, well development and purged groundwater, and miscellaneous contaminated sampling equipment (scoops, disposable bailers, etc.). This waste will be managed in accordance with provisions included in this IDW Plan.

4.1 Waste Minimization and Segregation

Wherever possible, waste minimization strategies will be employed during this initial investigation. Waste minimization for this project will be accomplished through designing and planning to ensure efficient operations that will not generate unnecessary waste. Emphasis will be placed on waste reduction philosophies and techniques, and personnel will be encouraged to continuously attempt to improve methods for minimizing waste generation. Practices to be instituted to support waste minimization include, but are not necessarily limited to, the following:

- Restricting material entering radiological buffer areas to those needed for work performance;
- Substituting recyclable items for non-hazardous and easily disposed of items;
- Reusing items when practical;
- Segregating contaminated from non-contaminated waste.
- Utilize a direct-push sampling rig to collect soil cores and soil samples which does not generate soil cuttings and thereby eliminates soil cutting accumulation on the ground surface and eliminates the need for soil cutting containerization and subsequent offsite transport for proper disposal.

4.2 Characterization Strategy

Waste generated during the initial investigation will be characterized using approved sampling and analytical results (both existing and new) or disposal history records. Initial waste characterization based solely on disposal history records must ensure that chemical, physical and radiological properties of the waste are adequately determined. The designation must be accomplished with sufficient accuracy to ensure that subsequent treatment, storage, or disposal (TSD) of the waste is protective of human health and the environment.

As outlined in Section 3, preliminary classifications have been made of anticipated waste types based on disposal history records and existing characterization data regarding the source(s) of the expected waste. Subsequent to generation, any or all of the waste may be re-classified. Before ultimate disposal, waste may be characterized further to ensure compliance with waste facility acceptance criteria. Appropriate and required documentation of waste characterization will be completed in compliance with the applicable waste acceptance criteria.

4.3 VA GLAHS Waste Management and Disposition

Waste generated at the VA GLAHS property as a result of the proposed initial investigation includes buried medical waste comprised of biological waste and low-level radioactive waste (LLW). These various types of waste may contain contaminants such as volatile organic compounds (VOCs) and low-level radioactive material (i.e. radioisotopes). A list of 40 radioisotopes expected to possibly be encountered during the investigation is included as Table 1 (attached). Waste material generated during the initial investigation will be containerized, stored temporarily onsite at the secured "Arroyo/Eastern Canyon" investigation area, then will be transported offsite by a licensed waste transporter to a licensed facility for proper disposal.

4.3.1 Waste Transported Offsite to Non-VA GLAHS Facilities

All of the waste generated during the initial investigation is planned for offsite transport and proper disposal to licensed facilities.

Appropriateness of a waste disposal option is based on whether a particular waste could reasonably be expected to cause or contribute to an environmentally significant release of hazardous substances from a selected facility. Releases of hazardous substances to the air or groundwater in quantities that could reasonably be expected to pose a significant threat to human health and/or the environment are considered environmentally significant. Any waste described in this plan that would be reasonably expected to exceed this threshold criterion will not be transported offsite for subsequent disposal unless special provisions are made and documented to mitigate the potential for release. The primary list of hazardous substances in accordance with CERCLA is contained in "Designation of Hazardous Substances" of "Designation, Reportable Quantities, and Notification" (40 CFR 302.4). As the initial investigation proceeds and additional information becomes available, reviews that are more detailed will be conducted to ensure that waste planned for specific disposal options meets the detailed waste acceptance criteria for each specific facility.

4.3.2 Waste Packaging and Transportation

Before investigative waste is transported offsite to a proper disposal facility, the transportation and disposal (T&D) subcontractor to the VA and VA T&D personnel will be contacted to ensure the waste is properly handled, packaged, labeled, and transported in accordance with VA GLAHS T&D requirements and the safety basis requirements of "Nuclear Safety Management" (10 CFR 830, Subpart B) and DOT hazardous materials required by "Packaging and Transportation Safety" (DOE O 460.1B) for the onsite transport of LLW and possible MLLW soil from the investigative areas to the proper offsite disposal/treatment facility.

Waste containers in staging areas will be labeled and marked in accordance with the applicable receiving facility's requirements. Waste generated during investigative activities shall meet the receiving facility's waste acceptance criteria and be labeled in accordance with applicable requirements.

Any CERCLA waste destined for an offsite facility shall, at a minimum, have an Integrated Waste Tracking System (IWTS) label, radiation label (if applicable), and a CERCLA waste label to ensure that personnel know the contents within the container. The CERCLA waste label shall identify the project that generated the waste, the date the waste container was filled, the waste description (e.g., debris or sample cores), and the waste hazards (e.g., radioactive, VOCs, or RCRA waste codes). Before offsite transport, additional labeling may be required, including DOT labeling.

Any information not known when waste containers are initially labeled will be added when the information is known. As applicable, VA GLAHS personnel will provide IWTS bar codes for containers. A new bar code will be affixed to each container when waste is first placed in the container. Waste labels must be visible, legibly printed or stenciled, and placed on the container in such a manner that a full set of labels and markings is visible during an inspection.

Sampling and transportation will occur in compliance with the applicable WAC, DOT requirements, and RCRA regulations. Contact with the disposal/treatment facility must be made in advance to allow both the facility and the shipper the time required to make any preliminary arrangements.

4.3.3 Managing Waste Information

Information pertaining to waste characteristics, waste generation and storage locations, disposition plans, and waste shipments for CERCLA MLLW, CERCLA LLW, and alpha LLW generated at the VA GLAHS two (2) investigation sites is maintained in an electronic database. Material profiles are developed in the database to store characterization information that is specific to a particular waste stream. As the waste is generated, information pertaining to individual containers of waste are is reported in individual database container profiles. The information in the database material profiles and container profiles is certified by a waste technical specialist (WTS), who certifies that a hazardous waste determination (HWD) has been performed and that the information is complete and accurate based on the analytical results or disposal history records used for characterization. The WTS also certifies that the information for the container falls within the bounds of the parent material profile. A different WTS follows with an independent review of the information for completeness and accuracy. Finally, the information in the material and container profiles is approved by a WTS who authorizes the T&D subcontractor to dispose of the waste in accordance the disposition path defined in the IWTS material profile. The WTS also verifies that the waste meets the acceptance criteria of the facility or facilities where the waste will be disposed of. This approval must not be performed by the WTS performing the review.

Waste technical specialists use the information in the IWTS material and container profiles to ensure that CERCLA waste meets the acceptance criteria of the receiving facility. The IWTS also tracks shipment of waste to various areas or facilities using specific IWTS shipping tasks. Receiving locations, including those located outside the boundaries of the VA GLAHS, must approve waste shipments before they are shipped. This approval is not documented in the IWTS database but is maintained in a hard copy file with waste characterization information.

Note that not all CERCLA waste is tracked in the IWTS database. An example of waste that would be tracked in the IWTS is color-coded material such as yellow shoe covers. Since yellow shoe covers are typically used for protection against radioactive contamination, a specified profile has been prepared for color-coded PPE that has been surveyed and determined not to be contaminated with radioactivity or that has been used for training purposes.

Another example would be containers that had all contents removed, and the empty containers are not radiologically contaminated. Container profiles are typically not prepared for industrial waste because the waste is shipped to the facility in re-usable receptacles or in bulk shipments or is non-containerized.

There may be MLLW waste generated at physical interfaces between Voluntary Consent Order- and CERCLA-managed programs. The MLLW waste generated to support CERCLA activities will be managed as CERCLA investigation-derived waste (IDW). Any MLLW waste generated to support Voluntary Consent Order activities will be managed in accordance with applicable RCRA and TSCA regulations.

4.3.4 Staging, Inspection, and Recordkeeping

The use of staging piles during implementation of this plan is not planned. Rather, the solid non-flowing IDW is planned to be actively managed within the work zone. If a decision is made to stage waste before treatment and/or disposal, staging will occur near the two (2) investigation areas. The staging and inspection of waste generated from the initial investigation activities will be performed in accordance with this IDW plan. The following list outlines the requirements applicable to staging piles and their use:

- If staging piles will be used for staging of solid, non-flowing IDW, the waste will be placed on impervious liners
- Construction of the base will ensure there is at least a 2% slope away from the soil waste pile to ensure proper drainage
- The bottom liner material for the soil will be of sufficient strength and design to withstand the planned staging and subsequent removal of soil
- The bottom liner will extend at least 1.5 m (5 ft) beyond every edge of the waste soil pile
- The use of an impervious man-made material will be implemented to cover the soil piles at all times when the soil is not being actively managed (i.e., placing, sampling, or removing waste)
- The cover will extend beyond the bottom liner and will be secured so that the staging pile soil is not exposed to wind, precipitation, or elements
- The cover will be constructed of impervious material, sufficient to withstand site conditions (e.g., sun, wind, cold, heat, and movement to expose or cover the working face)
- Waste will not be added or removed during inclement weather, such as periods of precipitation or high winds. Incompatible waste will not be stored in close proximity to a staging pile
- Waste staging piles will be appropriately barricaded and signed
- If containers will be used for staging of solid, non-flowing waste, a dense pack arrangement will be implemented to the maximum extent possible, while implementing as-low-as-reasonably-achievable principles (that is, effective shielding, distance, and time). A dense pack arrangement consists of two (2) rows of containers with minimal space between ends and sides of containers in the two (2) rows. Due to the configuration of a dense pack arrangement, viewing the sides and back of each container is not possible; the tops and bottoms of the stacked containers are only minimally visible. Aisle spacing will be provided between dense pack rows to allow inspection and maintenance
- Waste staging piles and containers will be inspected weekly

The liner system could be a geosynthetic, asphalt, or concrete slab (minimum 10 cm [4 in] thick). Geosynthetic material could be 30-, 60-, or 100-mil-thick high-density polyethylene with or without a geosynthetic cushion. Compatibility between the liner material and expected waste will be a criterion in liner selection. Covers could be a geosynthetic material (e.g., high-density polyethylene, very low-density polyethylene, polypropylene, or Hypalon) or a 15-mil scrim-reinforced high-density polyethylene. Compatibility between the cover material and expected waste will be a criterion in cover selection. Another criterion will be the ability to withstand sustained winds of 35 to 50 miles per hour (mph) with appropriate anchorage.

Containers used for staging will be selected ensure compatibility with the waste being managed. Waste that may be managed in containers includes IDW (e.g., soil cores and debris such as PPE and sample containers). The waste containers will be managed to enable inspection and ensure that no releases are associated with their management.

Waste containers will be placed onto a solid base consisting of plywood sheets covered with a double layer of plastic sheeting. A 4-inch high berm will be constructed around the base to provide for secondary containment and to control runoff to the surrounding area.

4.3.5 Managing Waste in the Temporary Storage Units

A temporary storage area for IDW will be established near the two (2) investigation areas. Upon completion of the initial investigation and upon receipt of analytical results, the IDW will be transported offsite under the direction of VA GLAHS T&D personnel.

5.0 REFERENCES

1. 10 CFR 830, Subpart B, 2003, *Safety Requirements – Code of Federal Regulations, Office of the Federal Register*, January 2003
2. 40 CFR 243, 2003, *Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste - Code of Federal Regulations, Office of the Federal Register*, July 2003
3. 40 CFR 261.3, 2003, *Definition of Hazardous Waste - Code of Federal Regulations, Office of the Federal Register*, July 2003
4. 40 CFR 262.11, 2003, *Hazardous Waste Determination - Code of Federal Regulations, Office of the Federal Register*, July 2003
5. 40 CFR 300.440, 2003, *Procedures for Planning and Implementing Off-Site Response Actions - Code of Federal Regulations, Office of the Federal Register*, July 2003
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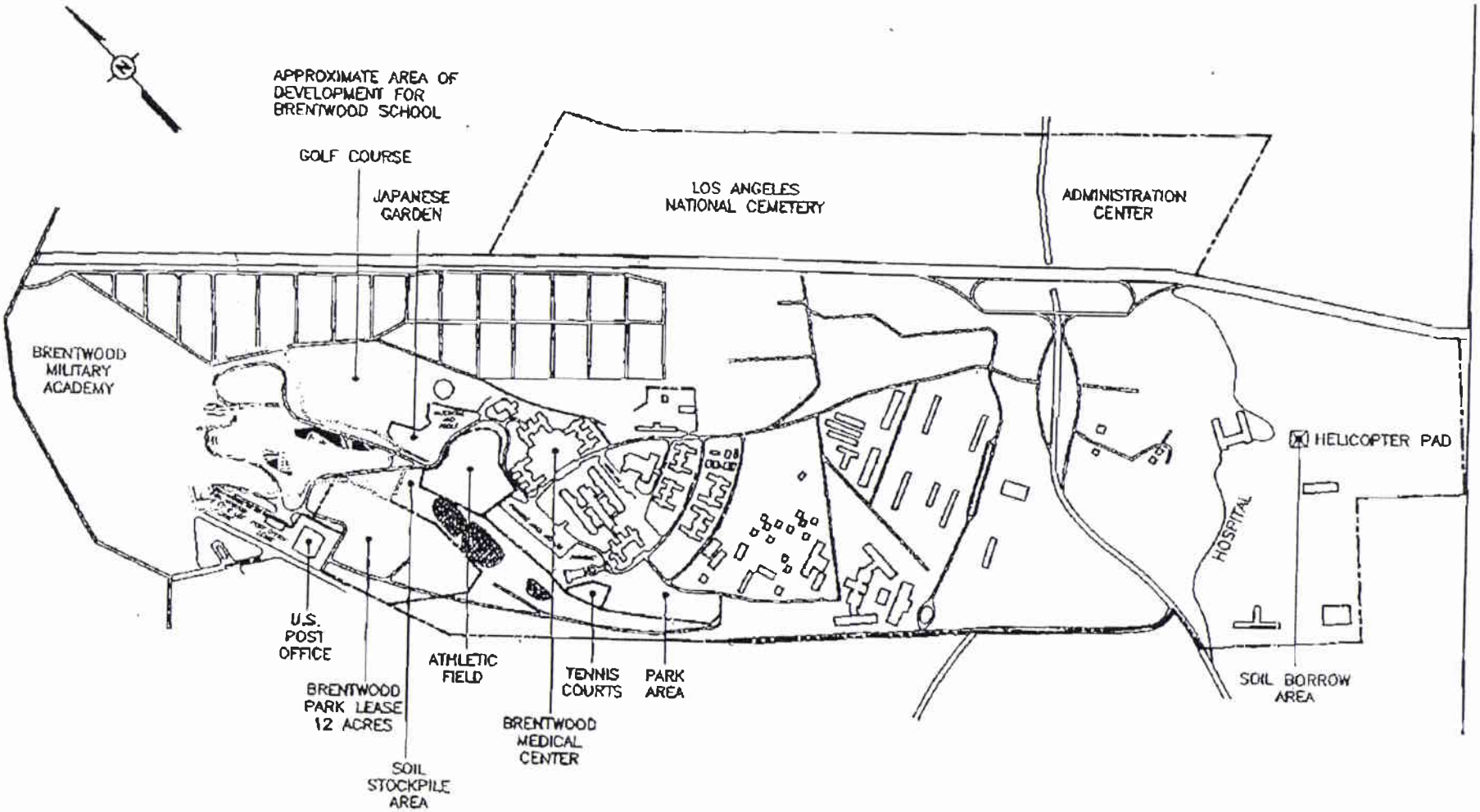
APPENDIX A

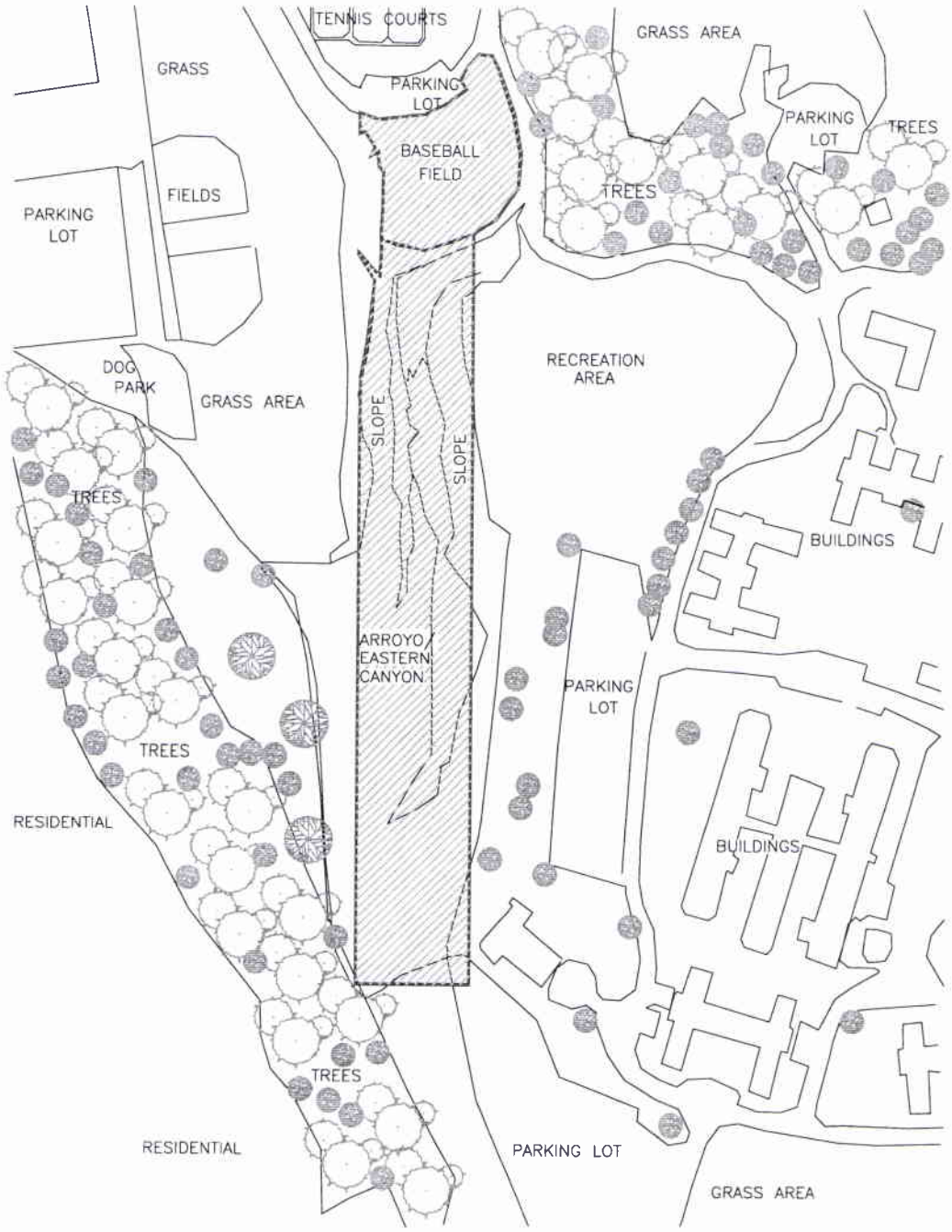
FIGURES



LEGEND:

- BURIED HISTORICAL SOLID WASTE DISPOSAL AREA
- BURIED HISTORICAL MEDICAL WASTE DISPOSAL AREA

NORTH	Design By: ADAPTED FROM A SITE PLAN PROVIDED BY LOCUS TECHNOLOGIES	Drawn By: EFD	Date: 05/07/2008
	NOT TO SCALE	VA GLAHS	SITE FACILITY MAP
ALLWEST GEOSCIENCE		11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	DRAWING NUMBER: DVA-F2
			FIGURE 2



NORTH	Design By: ADAPTED FROM AN AERIAL PHOTOGRAPH PROVIDED BY ALLWEST GEOSCIENCE	Drawn By: EFD	Date: 05/07/2008
	0 SCALE 300' (APPROXIMATE DIMENSIONS)		
ALLWEST GEOSCIENCE	VA GLAHS 11301 WILSHIRE BOULEVARD LOS ANGELES, CALIFORNIA	INVESTIGATION AREAS	
		DRAWING NUMBER: DVA-F3	FIGURE 3

APPENDIX B

TABLES

Basic Properties of the Radionuclides of Interest

Isotope	Element Atomic No.	Half-Life	Primary Radiation Emitted
Bromine (Br) – 82	35	1.471 D	
Calcium (Ca) – 45	20	162.7 D	Beta (β)
Calcium (Ca) – 47	20	4.536 D	Beta (β) & Gamma (γ)
Carbon (C) – 14	6	5,715 Y	Beta (β)
Cesium (Cs) – 137	55	30.2 Y	Beta (β) & Gamma (γ)
Chlorine (Cl) – 36	17	301,000 Y	Beta (β)
Chromium (Cr) – 51	24	27.70 D	Gamma (γ)
Cobalt (Co) – 57	27	271.8 D	
Cobalt (Co) – 60	27	5.271 Y	Beta (β) & Gamma (γ)
Gallium (Ga) – 67	31	3.260 D	Gamma (γ)
Gold (Au) – 198	79	2.694 D	Beta (β)
Indium (In) – 111	49	2.8 D	Gamma (γ)
Iodine (I) – 125	53	59.4 D	Beta (β) & Gamma (γ)
Iodine (I) – 131	53	8.04 D	Beta (β) & Gamma (γ)
Iridium (Ir) – 192	77	73.83 D	Beta (β) & Gamma (γ)
Iron (Fe) – 59	26	44.5 D	Beta (β) & Gamma (γ)
Manganese (Mn) – 54	25	312.2 D	Gamma (γ)
Mercury (Hg) – 197	80	2.672 D	
Mercury (Hg) – 203	80	46.61 D	
Molybdenum (Mo) – 99	42	2.748 D	
Nickel (Ni) – 63	28	100Y	Beta (β)
Phosphorous (P) – 32	15	14.28 D	Beta (β)
Potassium (K) – 42	19	12.26 H	
Radium (Ra) – 226	88	1,599 Y	Alpha (α)
Rubidium (Rb) – 81	37	4.57H	
Rubidium (Rb) – 83	37	86.2 D	
Rubidium (Rb) – 86	37	18.65 D	Beta (β)
Scandium (Sc) – 46	21	83.81 D	Beta (β) & Gamma (γ)
Selenium (Se) – 75	34	119.78 D	Gamma (γ)
Sodium (Na) – 22	11	2.605 Y	Gamma (γ)
Sodium (Na) – 24	11	14.96 H	Beta (β) & Gamma (γ)
Strontium (Sr) – 85	38	50.52 D	Gamma (γ)
Strontium (Sr) – 90	38	29.1 Y	Beta (β)
Sulfur (S) – 35	16	87.2 D	Beta (β)
Technetium (Tc) – 99	43	213,000 Y	Gamma (γ)
Tin (Sn) –113	50	115.1 D	
Tritium (H) – 3	1	12.33 Y	Beta (β)
Xenon (Xe) – 133	54	5.243 D	Gamma (γ)
Yttrium (Y) – 90	39	2.67 D	Beta (β)
Zinc (Zn) – 65	30	243.8 D	Gamma (γ)

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Project No. 02-3454EI-2
October 9, 2008

National Health Physics Program
Veterans Health Administration
2200 Fort Roots Drive
North Little Rock, Arkansas 72114

Attention: Mr. Gary E. Williams

Subject: **NOTIFICATION OF START OF FIELD EXPLORATION AND SAMPLING FOR INITIAL VOC AND RADIOLOGICAL SUBSURFACE INVESTIGATION**
Contract No. VA-262-P-0304

Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS)
11301 Wilshire Boulevard
Los Angeles, CA 90073

Dear Mr. Williams:

This letter is a formal notification that Allwest Geoscience, Inc., plans to commence field exploration and sampling at the project site for the Radiological Subsurface Investigation, Contract No. VA-262-P-0304, on October 27, 2008.

Pursuant to a meeting with Ben Spivey and Ronald Nusbaum at the Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS) campus, a revised schedule of completion for the project has been submitted.

Allwest Geoscience, Inc., has developed a workplan that has utilized the Multi Agency Radiation Survey & Site Investigation Manual (MARSSIM) Data Quality Objectives (DQO), which are established to provide information necessary to conduct the overall investigation, evaluation and risk assessment. The Workplan, along with the HASP, SAP/QAPP and IDW Plan attached as appendices, is being submitted with this notification.

We appreciate the opportunity to provide the requested environmental services. If you have any questions or comments concerning this notification, please contact the undersigned.

Sincerely,

ALLWEST GEOSCIENCE, INC.

JOHN R. GERY
Principal Geotechnical Engineer
California Registration No. RGE 336

cc: Ben Spivey, Ronald Nusbaum (VA-GLAHS)

Department of Veterans Affairs

115HP/NLR

Central Arkansas Veterans Healthcare System
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Little Rock, Arkansas 72205-5484

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