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**INITIAL VOC & RADIOLOGICAL SUBSURFACE INVESTIGATION REPORT**  
**Veterans Administration - Greater Los Angeles Healthcare System (VA-GLAHS)**  
**11301 Wilshire Boulevard**  
**Los Angeles, CA 90073**

## **1.0 EXECUTIVE SUMMARY**

Allwest Geoscience has prepared this *Initial VOC and Radiological Subsurface Investigation Report* summarizing initial subsurface investigation activities 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.

The VA GLAHS property encompasses an area of approximately 450 acres. The two areas investigated include a baseball field and an area known as the "Arroyo" or "Eastern Canyon". The 'Arroyo/Eastern Canyon' has been previously identified as a burial area for former medical waste, including animal carcasses, medical isotope waste in radiological scintillation vials and other miscellaneous medical debris.

Any volatile organic compounds (VOCs) and radionuclides found in the soil and water in the investigated 'Ball Field' and 'Arroyo/Eastern Canyon' areas did not exceed Preliminary Remediation Goals (PRGs) established for soil and tap water by the U.S. EPA Region IX. In addition, VOCs and radionuclide concentrations in groundwater did not exceed Maximum Contaminant Levels (MCLs) established for drinking water by the California Department of Public Health.

There should be no potential human health risks associated with buried medical waste resulting from historic medical research and disposal at the Veterans Administration (VA) Greater Los Angeles Healthcare System (GLAHS) property within the limits of the investigated area.

### **1.1 Soil Borings, Sampling and Analysis**

Allwest conducted a passive soil gas (PSG) survey, which utilized adsorbent samplers placed within 3 feet of the surface to adsorb compounds in soil gas. Only three (3) VOC analytes (chloroform, benzene and toluene) were detected in soil gas.

Twenty-nine (29) soil borings were advanced utilizing a Geoprobe® brand direct-push sampling rig to depths of 20 to 65 feet below ground surface (bgs) between November 30 and December 9, 2009. Four (4) soil borings were located in the 'Ball Field', twenty-two (22) borings were located in the 'Arroyo/Eastern Canyon' and three (3) groundwater monitoring wells were installed down gradient of the southernmost suspected burial area. Continuous soil samples were retrieved from the bore holes, and selected samples were submitted to various laboratories for chemical and radiological analysis.

Of all VOCs analyzed in the soil, only two (2) VOC compounds (2-butanone and acetone) were detected at low concentrations.

None of the basic list radionuclides (Tritium, Carbon-14, and Chlorine-36) were detected in any of the soil samples collected.

Soil samples were also analyzed for an extended list of about 40 radionuclides, which were less likely to be present in the suspect waste. Several nuclides on the extended list were detected at low levels, but these are all naturally occurring nuclides from potassium, uranium, thorium, and their daughters in soils.

## 1.2 Groundwater Monitoring Well Installation, Sampling and Analysis

To verify the depth to groundwater and to assess the possibility of groundwater impacts, three (3) groundwater monitoring wells were installed down gradient of the suspected southernmost medical waste burial area. Each well extended to an approximate depth of 73 feet bgs. Groundwater was measured at depths of 65 to 66 feet bgs in December 2009 and 64 to 69 feet bgs in August 2010.

Groundwater samples were obtained at the completion of well development on December 9, 2009. To verify the water analysis results, additional groundwater samples were obtained on August 16, 2010. Groundwater samples were submitted to laboratories for chemical and radiological analysis.

In the water samples collected on December 9, 2009, analysis for VOCs showed low levels of benzene, toluene, and 2-butanone. In the follow-up water sampling on August 16, 2010, no VOCs were detected above the method detection limits.

In the water samples collected on December 9, 2009, Tritium was detected at levels as high as 28.7 pCi/L with an average activity level of 22.23 pCi/L. Of the other radionuclides analyzed, Radium-226 and Radium-228 were detected at average activity levels of 4.37 pCi/L and 3.66 pCi/L, respectively. All other radionuclides were not detected at levels exceeding laboratory detection limits.

Bismuth-214, which is produced by Radium-226, was detected by gamma spectroscopy. The samples that went to gamma spectroscopy were not filtered by the lab and had excessive sediment reported. The lab then performed radiochemical analysis for Radium, and reported it at a fraction of the expected level (less than 4 pCi/L versus over 40 pCi/L for Bi-214). The aliquots that went to Radium analysis were filtered and did not contain sediment. It was concluded that the Bismuth-214 measured was in the sediment and not groundwater. This nuclide was also detected in soil samples.

In the water samples collected on August 16, 2010, Tritium was detected at levels as high as 52.5 pCi/L with an average activity level of 26.8 pCi/L. Radium-226 was detected at levels as high as 0.52 pCi/L with an average activity level of 0.45 pCi/L. Radium-228 was only detected in well MW-3 at a level of 1.46 pCi/L with an average activity level of less than 0.90 pCi/L. Carbon-14 and Chlorine-36 were not detected.

## 1.3 Plant (Transpired) Water Sampling and Analysis

Transpired water was collected from green surface vegetation at 14 locations. This method involved collecting water that is transpired from leaves of plants growing above the suspected waste burial areas. The plant's roots draw on the groundwater and transport it up to the leaves, where it is collected.

Transpired plant water was only analyzed for Tritium, which is both the most prevalent radionuclide reported in the disposal area and the most mobile. Tritium was detected in every plant transpiration water sample collected at levels ranging from 51.0 pCi/L to 130.8 pCi/L.

## 1.4 Conclusions

Allwest encountered man-made fill over natural deposits in the soil borings within the 'Ball Field' and 'Arroyo/Eastern Canyon' area. Groundwater in the southernmost end of the investigated area was measured at depths ranging from 64 to 69 feet bgs, with the disparity likely due to seasonal effects.

Volatile Organic Compound (VOC) concentrations in soil did not exceed Preliminary Remediation Goals (PRG) established for both residential and industrial soil, and they did not exceed soil screening levels (SSL), all established by the U.S. EPA Region IX.

VOC concentrations in groundwater did not exceed PRGs established for tap water by the U.S. EPA Region IX and did not exceed Maximum Contaminant Levels (MCLs) established for drinking water by the California Department of Public Health.

None of the basic list radionuclides (Tritium, Carbon-14, and Chlorine-36) were detected in any of the soil samples collected. Several nuclides on the extended list were detected at low levels, but these are all naturally occurring nuclides from potassium, uranium, thorium, and their daughters in soils.

In groundwater samples obtained in December 2009 and August 2010, elevated levels of Tritium and Radium were detected. Since Radium was not included in the VA's disposal records covering canyon disposal, its presence is very likely from natural sources. However, Tritium was reported as the most common nuclide disposed of in the canyon and its presence with an average activity levels of up to 26.8 pCi/L can only be due to that disposal.

Of the other radionuclides analyzed, Radium-226 and Radium-228 were detected at average activity levels of 4.37 pCi/L and 3.66 pCi/L, respectively, in December 2009. However, substantially reduced average activity levels of 0.45 pCi/L and 0.90 pCi/L, respectively, were detected in August 2010.

Radionuclide concentrations in soil did not exceed Preliminary Remediation Goals (PRG) established by the U.S. EPA Region IX.

Radionuclide concentrations in groundwater did not exceed PRGs established for tap water by the U.S. EPA Region IX and did not exceed Maximum Contaminant Levels (MCLs) established for drinking water by the California Department of Public Health.

Tritium was detected in every plant transpiration water sample collected at levels ranging from 51.0 pCi/L to 130.8 pCi/L. The water collected from the leaves of the plants occurs from transpiration of groundwater by plants whose roots tap the groundwater. Transpired plant water was only analyzed for Tritium, which is both the most prevalent radionuclide reported in the disposal area, the most mobile and most likely to migrate along groundwater pathways. The test results show levels increasing from west to east, with two of three maximum locations occurring between the suspected disposal areas and along the east edge of the investigated area. The northernmost maximum location occurs near the center of a suspected disposal area

The levels of Tritium detected across the site suggest the presence of burial wastes in or near the study area. The Tritium appears to be well diffused across the site, which is not surprising given its mobility and long time period since disposal.

Tritium concentrations in the transpiration water collected from the plant leaves did not exceed the PRGs established for tap water (160 pCi/L) by the U.S. EPA Region IX.

In summary, all VOCs and radionuclides found in the soil and water in the investigated 'Ball Field' and 'Arroyo/Eastern Canyon' areas did not exceed Preliminary Remediation Goals (PRGs) established for soil and tap water by the U.S. EPA Region IX. In addition, VOCs and radionuclide concentrations in groundwater did not exceed Maximum Contaminant Levels (MCLs) established for drinking water by the California Department of Public Health.

There should be no potential human health risks associated with buried medical waste resulting from historic medical research and disposal at the Veterans Administration (VA) Greater Los Angeles Healthcare System (GLAHS) property within the limits of the investigated area.