1996 ANNUAL ALARA AUDIT REPORT
ENVIROCARE OF UTAH, INC.
LICENSE NUMBER SMC-1559

MARCH 31, 1997

REPORT OF ANNUAL ALARA AUDIT
1996

An audit of the Envirocare of Utah radiation safety program was conducted by the Corporate RSO during the period January 31 - March 14, 1997 to cover the period of operations from September 19, 1995 to December 31, 1996. The first shipments of radioactive waste for disposal were received during the week of September 19, 1994. The first annual ALARA report covered the first 12 months following the start of disposal operations. In order to bring the period covered by the ALARA report into the same time period covered by the annual environmental report, this report covers the period from the end of the first ALARA report through 1996. Future reports will cover the period of January 1 through December 31.

ALARA PROGRAM

Envirocare operates under an ALARA program approved by NRC. Under the plan, the Radiation Safety Committee establishes annual ALARA goals and monitors performance relative to those goals. At it meeting on January 5, 1996, the Radiation Safety Committee reviewed the ALARA goals set the previous year. The goals established in 1995 were an ALARA goal of 500 mrem per year TEDE; an investigation level for deep doses of 50 mrem; an investigation level for lens of the eye dose of 50 mrem; and an investigation level for shallow dose of 100 mrem. When considering the goals for 1996 the Committee decided to leave the goals at the earlier levels and to add an additional goal. With the proposed acceptance of dry active waste at its low activity radioactivity waste disposal operations, and the probable need for manual sorting and sample collection from that material, an ALARA goal of 1,500 mrem to the extremities was set.

AUDIT FINDINGS

Bioassay Results

Workers directly involved with handling 11e.(2) waste are tested by collection of bioassay samples (urine) each quarter. Measurements include gross beta, total K or K-40, total U and isotopic Th. As explained in Envirocare's application for license, bioassay is not a viable method for monitoring exposure to airborne thorium, but the quarterly assay provides an on-going baseline in the event that a bioassay is needed to support evidence of an intake. Because all of the 11e.(2) waste contains significant

factions of Ra-226 and U, those analyses serve as indicators if an intake of waste material - including thorium - occurs. No bioassay samples collected during this period contained concentrations of any of the radionuclides significantly different from initial bioassay results. The conclusion is that there was no detectable intake of radioactivity from 11e.(2) waste operations.

Records of External and Internal Exposure

External Dose Records

During the period covered by the audit external gamma exposure rates measured on the disposal cell ranged from near background to 3 mrem/h. Those persons working in areas likely to result in doses of more than 10 mrem/week were monitored through the use of self reading dosimeters to limit doses to 10 mrem/wk in order to meet the ALARA goal of 500 mrem/y. Records of external exposure measured by TLDs show that the ALARA goal was met.

During the fourth quarter 1995, 60 of the 129 personnel TLDs issued recorded doses at or above the minimum detectable level of 10 mrem. Only four doses were greater than 10 mrem and the highest was 30 mrem.

First quarter 1996 personnel monitoring showed that two employees recorded doses of 10 mrem

Second quarter 1996 TLD reports showed one employee with a deep dose of 10 mrem.

Eight employees received doses of 10 mrem or more during the third quarter 1996, with the highest dose of 40 mrem.

Eight employees received doses of 10 mrem or more during the fourth quarter 1996, with the highest dose of 50 mrem. Receipts and disposal of 11e.(2) waste containing higher concentrations of radioactivity were received during the last two quarters of the year and most of the measured doses were to workers placing the waste or to engineers who are exposed to radiation from the nuclear density gauge used in testing of the disposed waste lifts.

These few measurable doses, out of the approximately 130 badged employees, points up the excellent controls to prevent unnecessary external doses.

Internal Dose Records

Internal doses were not calculated for workers managing 11e.(2) wastes this period. Four high-volume work area samples are collected each week from active areas. Those samples are screened for gross alpha and gross beta radioactivity. Any individual samples which exceed the DAC for Th-232 or Pb-2120 are selected for isotopic analysis for Ra-226, Ra-228, Th-230, Th-232, total U, Pb-210 and Po-210. Results of the analysis are used to calculate the sum-of-fractions for exposure to the measurable radionuclides. For the period September 19, 1995, through December 31, 1995 one sample had sum-of-fractions greater than 0.1 (0.16), but none exceed 1. As all exposed workers were required to wear respirators with protection factors of at least 10, no individual work period would have resulted in an actual exposure to greater than 1.6 percent of the DAC sum-of-fractions. No work area samples collected from the rail car rollover or 11e.(2) waste disposal areas during 1996 exceeded 10 percent of the DAC; therefore, no individual worker would have received an effective intake of greater than one percent of the DAC.

In addition to work area samples, one employee is selected each month to be monitored by means of a breathing zone sample. These employees are selected from those disposing of both LARW and 11e.(2) waste. A five-day composite sample is collected each month from the employee deemed most likely to be exposed to airborne particulate radioactivity. No sample results were found with measurable quantities of radioactivity.

Safety Meetings

Half-hour safety meetings were conducted each week, covering occupational safety, radiation safety, hazardous materials, new procedures and ALARA. Most of the training sessions covered occupational safety and driving, reflecting the relative risks involved in Envirocare's disposal operations and transportation to and from the remotely-located site. The rest covered radiation safety, with three sessions specifically on the subject of ALARA. All training was attended by all on-duty site personnel, both Envirocare and contractor employees, and was documented by sign-in sheets.

Daily Inspection Logs

Daily inspection records were reviewed. All inspections had been performed as required. Action items or deficiencies which had been noted had been documented or corrected, as necessary. No items were found which were likely to result in exceedence of worker radiation dose limits, but some were found which impacted on ALARA considerations. While dust control has improved over the previous year some attention is still needed in this area. The goal is to maintain zero visible dust in waste handling operations. The Site RSO found it necessary to occasionally stop operations, both in waste handling operations and those involving only clean soil, until water could be applied as a dust suppressant.

Radiological Survey and Monitoring Data

Area radiation surveys were conducted weekly as required. External gamma dose rates and surface contamination levels have remained constant in areas outside the waste management area. Haul road surfaces were scraped at the end of the third quarter 1995 to remove accumulated radioactivity, but the effort was only partly successful. Airborne radioactivity concentrations at stations near the haul road have increased over pre-operational levels, but have not shown an additional upward trend with time.

While several of the fenceline monitoring stations - particularly Stations A-5, A-11 and A-14 - show frequent concentrations of gross alpha activity above the normal range, only the quarterly composite samples from A-14 have resulted in a positive measurement of any of the radionuclides included in 11e.(2) waste.

Soil sampling results for the audit period show no increases in radioactivity. These results would be expected based on the very low concentrations of gross radioactivity measured on air filters. The only increases in soil radioactivity were observed in the haul roads.

Exceedences for several radioactive and non-radioactive parameters were reported during 1996. The reason for these is still being investigated, but the most likely finding is that they are due to natural variations in ground water concentrations and to a change in laboratories, with an attendant change in analytical procedures.

Weekly area surveys and quarterly sampling programs show that radioactive contamination on the haul road from the rail car rollover to the 11e.(2) disposal cell had increased from essentially background levels to as high as 0.1 mrem/h at the entrance to the disposal cell area. Removal of some of the road surface reduced dose rate measurements, but additional removal will be needed periodically.

Surveys Required by Radiation Work Permits

No radiation work permits were issued during the period covered by this audit which required special surveys.

Reports on Overexposure

No overexposures, either internal or external, occurred during the period covered by this audit.

Reviews of Operating and Monitoring Procedures

Reviews of Operating and Monitoring Procedures during the audit period showed many procedures needing to be updated and that a number of new procedures were needed to fully cover all phases of the operation. A number of procedures were changed during the past year. At the time of the ALARA audit there were still approximately 15 procedures which were awaiting final review before implementation

Conclusions

While the disposal of 11e.(2) waste continued through the 15 months covered by this audit, the radioactivity concentrations were much lower than during the previous year. Lower radioactivity concentrations in waste and an enhanced program of dust control resulted in much lower concentrations of airborne radioactivity being measured at both work area and fenceline locations. The maximum dose to a worker during 1996 was 50 mrem.

The section of the disposal cell containing the highest concentrations of radioactivity was closed and covered with the radon barrier during September 1996. No reduction in airborne particulate radioactivity or radon concentrations was noted, most likely due to the additional cell space added during the year.

The two main sources of airborne particulate radioactivity are the rail car rollover and waste disposal in the cell. Emissions from these sources are controlled by controlling moisture in incoming waste shipments and by active application of water spray to waste as it is being managed in the cell. The latter area still requires attention, but has shown considerable improvement during the period covered by the audit. It has been necessary at times to stop operations until water could be applied or due to high winds which precluded any type of waste handling. A third source of airborne radioactivity has been identified as the haul road from rail car rollover to disposal cell. Road surfaces are subject to contamination by traffic traveling in both directions between the rollover and disposal cell. Periodic removal of the road surface for disposal as waste helps to keep external gamma doses at acceptable levels, but has minimal effect on airborne radioactivity. Frequent watering of the roads and low speed limits are the most effective means of maintaining fugitive dusts ALARA.

While gross alpha counting of air filters shows some increase in airborne radioactivity at fenceline stations, radiochemical analysis of the quarterly filter composites shows that for the period of this audit radioactivity concentrations were well below the effluent concentration limits.

The conclusion is that the ALARA program has been effective in keeping doses to workers and releases to the environment to very low levels. When consideration is given to the fact that airborne radioactivity concentrations and worker doses are due to both LARW and 11e.(2) operations it is evident that there is little impact on the environment or workers from disposal of 11e.(2) wastes. However, additional effort is still needed to control fugitive emissions of airborne particulate radioactivity.